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DEVELOPMENT AND EVALUATION OF A REMEDIAL NUMERICAL SKILLS WORKBOOK FOR NAVY TRAINING

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(6) DEVELOPMENT AND EVALUATION OF A REMEDIAL
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This report is concerned with the development of a Navy-relevant numerical skills workbook for use in Navy recruit training commands. The development of a test instrument for selecting students who should use the workbook is also addressed. This project was undertaken by the Training Analysis and Evaluation Group (TAEG) and Memphis State University as one of several initiatives in response to tasking by the Chief of Naval Education and Training (CNET) in the area of improving basic academic skills.   (continued)

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The results of a field test of the workbook by personnel of the Orlando Recruit Training Command Academic Remedial Training and Apprentice Training divisions were positive. Both the workbook and associated tests proved to be useful tools. Students are interested in, and motivated by, the Navy-related materials in the workbook.

The workbook, intended as a prototype for future development, is to be distributed to Navy Junior ROTC students in high schools throughout the United States. Adoption of this workbook by both Apprentice Training and Academic Remedial Training divisions is also being considered.

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SECTION I

INTRODUCTION

BACKGROUND

In today's all volunteer force environment, basic skills training for enlisted Navy personnel has become an increasing necessity. Reading, verbal language, and mathematic instruction have been addressed in various programs that have been developed by the Navy. The current emphasis on basic skills training is expected to continue into the foreseeable future.

The requirement for quantitative skills is apparent in many types of Navy training for jobs that involve applications of modern technology. While the need for basic numerical skills among general detail personnel is less obvious, the use of quantitative skills is necessary in many daily functions. A recent study (Graham, Jones, and Kaiser, 1980) revealed that almost 6 percent of a sample of Navy recruits scored at the sixth grade level or lower on mathematical skills. More than 13 percent scored below the eighth grade level. The median grade equivalent was 10.6 grade level.

Two groups appeared to be the best candidates for qualitative skill training: recruits enrolled in the Academic Remedial Training (ART) program and sailors in Apprentice Training. The current ART program consists largely of remedial reading instruction and does not include remedial numerical skills instruction which is a part of most comprehensive basic skills instructional programs. The current Apprentice Training curriculum includes a heavy emphasis on numerical skills and many sailors in the program would benefit from basic numerical skills training.

Consequently, the Training Analysis and Evaluation Group (TAEG) was tasked by the Chief of Naval Education and Training (CNET) to produce a Navy-relevant numerical skills workbook working in cooperation with the Chief of Naval Technical Training.[1] The development of this workbook was initiated to provide a training aid that could be used by personnel who have difficulty with elementary mathematics.

The workbook, Improving Your Navy Numerical Skills, was designed as a companion document to a Navy-relevant remedial reading workbook Improving Your Navy Reading Skills (described in Kincaid and Curry, 1979), previously developed by the TAEG. The remedial reading workbook was developed by TAEG to increase the Navy-relevant content in ART and has been incorporated into the curriculum. It has also been selected as part of the Navy Junior Reserve Officers Training Corps (NJROTC) program. The workbook is identified as NAVEDTRA 37081 and nearly 20,000 copies are now in use in 250 high schools across the country.

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[1] CNET ltr Code N-53 of 20 Dec 1978

PURPOSE

The purpose of this report is to describe the development of the format and content of the Navy-relevant numerical skills workbook and the evaluation of the workbook in two Navy programs. The workbook was envisaged as a necessary supplement to the ART curriculum which does not now contain instruction in basic numerical skills. It was seen as a useful supplement to Apprentice Training for those recruits specifically identified as needing basic numerical skills training.

ORGANIZATION OF THE REPORT

In addition to this introduction, the report contains three sections and three appendices. Section II describes the selection of topics and format for the workbook and the development of an assessment test to be used in conjunction with the workbook for placement and student evaluation. Section III describes the field test of the workbook including subjects and additional data gathered such as standardized test scores and performance of the ART trainees in recruit training. Section IV describes results of the field test and contains suggestions for implementing the workbook. The workbook, Improving Your Navy Numerical Skills, is presented as appendix A. Appendix B contains two forms of the numerical skills assessment test. The User's Guide describing proper techniques for implementing the workbook and administering the tests is presented as appendix C.

SECTION II

DEVELOPMENTAL ACTIVITIES

This section of the report describes the approach employed in developing the workbook, the tests, and lesson materials. Except for final revision of the lessons, these efforts preceded the field test of the workbook.

DEVELOPMENTAL PLAN

During the summer of 1979, a team of research and curriculum specialists from the Department of the Navy and Memphis State University initiated an effort to prepare an elementary numerical skills workbook and correlated tests for use with enlisted Navy personnel. The strategy employed was to identify Navy-relevant topics requiring numerical skill application, to develop training and testing materials, and to revise the materials based on student use.

The identification of potential topics for the workbook was performed initially by staff members from TAEG. Consultation with personnel in Apprentice Training was an important part of this effort. The topics were reviewed and recommendations concerning their use were made by personnel from the Naval Technical Training Command. Members of the project team from Memphis State University developed the lessons for the workbook and the correlated tests. Revisions in the materials were made to include recommended changes resulting from expert reviews and student critiques of the lessons.

WORKBOOK

The workbook, Improving Your Navy Numerical Skills, presented in appendix A, was designed for use with students in the Navy who are not proficient in elementary mathematics. The specifications for the workbook covered three areas as reflected by the workbook sections: Basic Numerical Skills, Numerical Skills in the Navy, and Numerical Skills in Personal Finances. The first section contains exercises on the basic operations of addition, subtraction, multiplication, and division. The second section addresses the application of numerical skills in Navy-relevant situations. The final section is concerned with the application of numerical skills to financial responsibilities of the individual in Navy and civilian life.

The three sections of the workbook are organized in topical areas with one or more lessons on each topic. The introduction to each topic deals with the significance, concepts, and/or formulas related to the topic. The lessons that follow the introduction to a topic include learner objectives and application exercises as well as review exercises, where appropriate. The answers to the exercises are reported in the back of the workbook. A separate answer booklet that follows the format of the workbook is available for the student to use in recording answers to the exercises.

TEST

The Navy Numerical Skills Test contained in appendix B was developed for use in conjunction with the workbook. The 50 items on each of the two forms

of the test contain content that is correlated with the topics and related exercises presented in the workbook. The first 24 items (Part I) on each test deal with the basic numerical skills covered in the first section of the workbook. The remaining 26 items (Part II) are based on the skill applications addressed in the second and third sections.

The test is designed to permit its use as a placement instrument and an evaluation instrument as described in the User's Guide (appendix C). Students who obtain scores of 20 or higher on the 24 items in Part I can be exempt from doing the first section of the workbook. The two forms of the test permit its use as a pretest and posttest to measure the student's improvement as a result of completing the workbook. Comparisons can be made of the pretest and posttest scores on each part of the test and on the total.

SECTION III

FIELD TEST

Field test of the workbook involved two facets: determining the reli-
abilities of the two forms of the Navy Numerical Skills Test and assessing the
effects of using the workbook, Improving Your Navy Numerical Skills, with
students. This section of the report describes the subjects, data sources,
and workbook implementation.

SUBJECTS

Four groups of subjects were involved in testing related to the instru-
mentation and the workbook field test. Two groups of new recruits were
selected to respond to the Navy Numerical Skills Test in order to obtain
reliability data on the instrument. One group composed of 31 males and 32
females responded to Form A while another group composed of 32 males and 32
females responded to Form B. These groups of recruits represented hetero-
geneous samples of subjects reporting to the Recruit Training Command, Orlando,
in May 1980.

The field test of the workbook was conducted with two groups of Navy
personnel at the Recruit Training Command, Orlando, in the early months of
1980. One of the groups of subjects consisted of 25 students (5 females and
20 males) who had been assigned to Apprentice Training. These students were
not qualified for technical training based on their aptitude test scores.
They were assigned to Apprentice Training for general detail assignment
training before reporting to the Fleet.

The second group of test subjects was comprised of 25 students (13
females and 12 males) who were assigned to Academic Remedial Training. They
were recruits who had been diagnosed as having reading deficiencies that would
delay or prevent completion of recruit training (generally defined as reading
grade level of 6.0 or below). Most of these recruits would also be expected
to receive Apprentice Training upon completion of Academic Remedial Training
and recruit training.

DATA SOURCES

Test data utilized in the field test were provided by four instruments:
the Armed Services Vocational Aptitude Battery (ASVAB), the Gates-MacGinitie
Reading Test, the Test of Adult Basic Education (TABE), and the Navy Numerical
Skills Test. Ages of the subjects were obtained from available student
records. In addition, subject matter review was provided by subject matter
and reading experts as well as students involved in the field test.

The ASVAB (forms 5, 6, and 7) is a standardized instrument that measures
aptitude based on 12 subtests. The subtests deal with various academic
subjects (e.g., reading, mathematics, science, and electronics) and vocational
subjects (e.g., mechanics, shop, and automotive information). The test is
administered to all personnel prior to their enlistment in the military

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services. Raw scores are converted to percentile scores to facilitate inter-
pretation. The percentile scores from the subtests on arithmetic reasoning
and word knowledge were utilized in the field test. These data were obtained
from the records of the subjects to provide descriptive information.

The Gates-MacGinitie Reading Test is a standardized instrument that
measures vocabulary and comprehension. The reading comprehension part of
Level D for fifth and sixth reading grade levels is administered to all Navy
recruits during their first week of recruit training. Raw scores on the
Gates-MacGinitie are transformed to reading grade level scores using the test
norms. The instrument is used to identify those recruits who are to be
assigned to Academic Remedial Training. The records of the subjects provided
their reading grade level scores on comprehension. These data were used as
descriptive information of the subjects.

The TABE is a normed instrument that assesses mathematical performance on
computation and concepts/problem solving. Based on test items adapted from
the 1970 edition of the California Achievement Tests, the test items on the
TABE reflect language and content appropriate for adults. Grade equivalent
scores are obtained by conversion of the raw scores using the norm tables.
Level M of the TABE for the fourth through the sixth grade range was admin-
istered to all subjects involved in the field test to provide descriptive data
before the workbook was utilized.

The Navy Numerical Skills Test is an instrument that measures performance
on the specific numerical skills addressed in the workbook. As described
previously, items 1 through 24 assess basic numerical operations while items
25 through 50 measure proficiency in applying the skills to the topics covered
in the workbook. The two forms (A and B) of the instrument were used with the
subjects in the two field groups as pretests and posttests. Form A was
administered as the pretest for the subjects in Academic Remedial Training
while Form B was used for this purpose with the subjects in Apprentice Training.
The alternate form was used as the posttest with each group. The raw scores
for the two parts and total test were utilized in the analyses to determine
the change in performance for each group.

WORKBOOK IMPLEMENTATION

The field test of the numerical skills workbook was conducted in the
early part of 1980 at the Recruit Training Command, Orlando. Because of
differences in training schedules, the approach used in implementing the
workbook differed for the subjects in Apprentice Training and in Academic
Remedial Training. The total time devoted to workbook utilization was the
same for the two groups.

The field test of the workbook with the subjects in Apprentice Training
was completed within 1 week. The students were tested with the TABE and the
Navy Numerical Skills Test, Form B, on the first day of the week. The work-
book was utilized as assigned classroom work for 20 hours of supervised study
during the remainder of the week. All sections of the workbook were assigned

to the students for completion during the supervised study period. An instructor was available to answer questions about the lessons and to assist students on an individual basis. Form A of the Navy Numerical Skills Test was administered as a posttest at the end of the week.

The subjects in Academic Remedial Training participated in the workbook field test over a period of 1 month. The TABE and the Navy Numerical Skills Test, Form B, were administered to the subjects at the beginning of the period. Approximately 1 hour was allocated each day to work on the exercises in the three workbook sections assigned to the students. A total of about 20 hours was spent in the workbook exercises. The students worked under the supervision of an instructor who could answer questions about the exercises and assist students individually. Form B of the Navy Numerical Skills Test was administered as a posttest at the end of the test period.

During the field test process, reviews of the workbook were performed by subject matter experts and reading specialists. As a result of the reviews, more computational examples were suggested for the lessons on Estimating Paint Jobs, Tackles and Hooks, Measuring Temperature, and Breaking Strength and Safe Working Load. Additional background information was recommended for Breaking Strength and Safe Working Load. More word problems were suggested for the lessons on Military Time. Suggestions were made to expand the explanation of some formulas and to use more Navy terminology in the word problems.

The field test subjects in Apprentice Training provided comments on the materials after they had completed the lessons. The students unanimously agreed that the workbook was helpful in reviewing numerical skills and learning new applications. While the exercises on basic numerical skills were generally viewed as easy, difficulties were encountered in doing the lessons on some topics in other sections, especially Interest. The comments suggested that more time was needed to do the lessons on Interest, the last topic in the workbook.

SECTION IV

RESULTS

Data collected on the instrumentation and field test of the workbook are discussed in this section of the report. The results are organized into two parts: (1) descriptive data on the subjects and instrumentation and (2) field test performance data.

DESCRIPTIVE DATA

The two groups of recruits involved in assessing the reliability of the Navy Numerical Skills Test are representative of the population of Navy recruits. Table 1 shows their reading grade levels (Gates-MacGinitie), arithmetic reasoning (ASVAB), and word knowledge (ASVAB). The reading grade level means for the two groups were a little above the 10th grade. The comparison of the means on each variable indicated that the two groups did not differ significantly on any variable.

TABLE 1. SUMMARY OF DATA OF RECRUITS (REPRESENTATIVE OF
TOTAL RECRUIT POPULATION) ON DESCRIPTIVE VARIABLES

Variable	Group		
	I* (N=63)	II* (N=64)	t**
Reading Grade Level (Gates)			
Mean	10.26	10.21	.08
S.D.	2.16	2.46	
Arithmetic Reasoning (ASVAB)			
Mean	52.57	52.11	.21
S.D.	7.99	7.37	
Word Knowledge (ASVAB)			
Mean	54.78	54.50	.15
S.D.	5.88	7.27	

* Groups I and II are two typical recruit companies
** $t = \pm 2.01$, df=48, level of significance = .05

Descriptive data were collected on several variables for the subjects in Apprentice Training and Academic Remedial Training who participated in the field test of the workbook (table 2). The mean ages of the two groups were 19.5 years for the Apprentice Training subjects and 19.1 years for the Academic Remedial Training students. On arithmetic reasoning (ASVAB), the percentile means for both groups were approximately 10 points, or one standard deviation,

TABLE 2. SUMMARY OF DATA OF APPRENTICE TRAINING AND ACADEMIC
REMEDIAL TRAINING STUDENTS ON DESCRIPTIVE VARIABLES

Variable	Group		
	Apprentice Training	Academic Remedial Training	t*
Age			
N	25	25	
Mean	19.48	19.08	.90
S.D.	1.81	1.29	
Arithmetic Reasoning (ASVAB)			
N	25	21	
Mean	44.44	43.00	.93
S.D.	4.58	5.72	
Word Knowledge (ASVAB)			
N	25	22	
Mean	50.44	43.59	3.60
S.D.	6.73	6.29	
Reading Comprehension (Gates)			
N	25	25	
Mean	8.63	4.79	7.38
S.D.	2.25	1.31	
Computation (TABE)			
N	25	25	
Mean	7.16	7.08	.20
S.D.	1.38	1.42	
Concepts/Problem Solving (TABE)			
N	25	25	
Mean	7.98	6.72	3.21
S.D.	1.18	1.57	
Total Math (TABE)			
N	25	25	
Mean	7.51	6.95	1.52
S.D.	1.27	1.33	

*t=± 2.01, df= 44, 45, or 48, level of significance = .05

below the Navy median (of 55). The Apprentice Training subjects had a per-centile mean on word knowledge (ASVAB) that was near the overall Navy median while the percentile mean for the Academic Remedial Training subjects was more than one standard deviation below the overall Navy median. The reading grade level (Gates) means revealed that the Apprentice Training students scored near the middle of the eighth grade and the Academic Remedial Training students scored in the latter part of the fourth grade. Both group means were at the lower seventh grade level on computation (TABE). The Apprentice Training students had a mean near the eighth grade on concepts/problem solving (TABE) while the Academic Remedial Training students had a mean in the upper part of the sixth grade. On the total score for the TABE, the mean for the Apprentice Training subjects was in the middle of the seventh grade, and the mean for the Academic Remedial Training subjects was near the seventh grade level.

Comparisons of the means on the descriptive variables for the two field test groups are shown in table 2. The two groups did not differ significantly with respect to age, arithmetic reasoning, computation, and total mathematics. The Apprentice Training students scored significantly higher than the Academic Remedial Training students on word knowledge, reading comprehension, and concepts/problem solving. These differences were anticipated since the Academic Remedial Training students had been previously diagnosed as having reading deficiencies and the Apprentice Training students are generally higher achievers in most academic skill areas (but still below Navy averages).

The data from the administration of the Navy Numerical Skills Test to the two groups of recruits represented additional descriptive information. (See table 3.) On the 24 items of Part I, both groups had means that almost reached 23 which demonstrated high performance on basic numerical skills. On the 26 items of Part II, the mean for one group exceeded 17 while the mean for the other group exceeded 16 which reflected performance in the 60 percent range for both groups. The total score means for the two groups were approximately 40 and 39 on the 50 items. Comparison of the two groups on the part scores and total score revealed that all differences in means were nonsignificant.

TABLE 3. SUMMARY OF DATA OF RECRUITS ON THE NUMERICAL SKILLS TEST

	Test Form		
	A (N=63)	B (N=64)	t*
Part I			
Mean	22.94	22.75	.72
S.D.	1.39	1.53	
Part II			
Mean	17.48	16.28	.99
S.D.	3.99	4.59	
Total			
Mean	40.48	39.03	.94
S.D.	4.56	5.68	

*t=$\pm$ 2.01, df=48, level of significance = .05

The estimated reliabilities for Form A and Form B of the Navy Numerical Skills Test were computed using the Kuder-Richardson Formula 20 and the Spearman-Brown correlation formula. Data from the responses of the two groups of recruits and the two field test groups were used in the computations. (See table 4.) The estimated reliability of Form A ranged from .75 to .86 on the Kuder-Richardson Formula 20 and from .78 to .86 on the Spearman-Brown for the three populations investigated. The estimated reliability of Form B varied from .80 to .82 on the Kuder-Richardson Formula 20 and from .79 to .87 on the Spearman-Brown for the three populations investigated.

TABLE 4. RELIABILITY ESTIMATES FOR THE NUMERICAL SKILLS TEST

Subjects	N	Test Form	
		A	B
Recruits			
Group I	63		
K-R 20		.75	---
S-B		.78	---
Group II	64		
K-R 20		---	.82
S-B		---	.85
Apprentice Training			
Students	25		
K-R 20		.86	.82
S-B		.86	.79
Academic Remedial			
Training Students	25		
K-R 20		.80	.80
S-B		.84	.87

Note: K-R 20 = Kuder-Richardson Formula 20 Correlation
       S-B = Spearman-Brown Correlation Formula

FIELD TEST PERFORMANCE DATA

The responses of the Apprentice Training subjects on the Navy Numerical Skills Test were analyzed for the pretest (Form B) and the posttest (Form A). (See table 5.) The analyses were performed for the two parts of the instrument and the total test. The means for the 24 items in Part I on basic numerical skills indicated that most of the items were answered correctly on both the pretest and the posttest (22.28 and 23.08, respectively). The means for the 26 items in Part II on applied numerical skills indicated that almost half of the responses (mean of 12.96) were correct on the pretest while almost two-thirds of the responses (mean of 16.68) were correct on the posttest. Obviously, the means for the total score reflected the composite for the two parts of the test with about 70 percent of the responses being correct on the pretest and almost 80 percent being correct on the posttest.

TABLE 5. SUMMARY OF DATA OF APPRENTICE TRAINING SUBJECTS
(N=25) ON THE NAVY NUMERICAL SKILLS TEST

	Pretest-Form B		
	Mean	S.D.	t*
Part I	22.28	2.84	---
Part II	12.96	4.20	---
Total	35.24	5.80	---
	Posttest-Form A		
Part I	23.08	1.87	---
Part II	16.68	4.49	---
Total	39.76	5.75	---
	Change		
Part I	.80	1.53	2.62
Part II	3.72	3.43	5.42
Total	4.52	3.38	6.69

*t=$\pm$ 2.06, df=24, level of significance = .05 (t test compares mean
change score against an expected mean change of 0)

The change scores of the Apprentice Training subjects were computed for
the two parts and the total on the Navy Numerical Skills Test. A change score was
obtained by subtracting the pretest score from the posttest score. The t test was
calculated by comparing the mean for the change scores against an expected
change of 0. The change score means were .80 for Part I 3.72 for Part II, and
4.52 for the total. The results of the t test comparisons revealed that all
change score means were significant statistically.

Analyses were conducted with the responses of the Academic Remedial Training
subjects on the pretest (Form A) and the posttest (Form B) with the Navy Numerical
Skills Test. (See table 6.) The scores on the two parts and total test were
anlayzed. With regard to the 24 items in Part I of the test, the means revealed
that the subjects performed very well on the pretest (21.80) and the posttest
(23.08). On the 26 items in Part II, the means indicated that about two-fifths of
the responses (mean of 10.08) on the pretest were correct while slightly more
than half of the responses (mean of 13.44) on the posttest were correct. The
total score means reflected the same trend as the part scores with about 64 per-
cent correct responses on the pretest and 73 percent correct responses on the
posttest.

TABLE 6.   SUMMARY OF DATA OF ACADEMIC REMEDIAL TRAINING
SUBJECTS (N=25) ON THE NAVY NUMERICAL SKILLS TEST

	Mean	S.D.	t*
Pretest-Form A			
Part I	21.80	3.10	---
Part II	10.08	3.75	---
Total	31.88	5.66	---
Posttest-Form B			
Part I	23.08	1.93	---
Part II	13.44	4.40	---
Total	36.52	5.51	---
Change			
Part I	1.28	2.82	2.26
Part II	3.36	3.04	5.52
Total	4.64	3.19	7.27

*$t = \pm 2.06$, df=24, level of significance = .05 (t test compares
mean change score against an expected mean change of 0)

The pretest scores were subtracted from the posttest scores to derive the
change scores of the Academic Remedial Training subjects on the two parts and
total for the Navy Numerical Skills Test. This is the same statistical pro-
cedure as described above for the Apprentice Training subjects. Change score
means were again compared against a hypothesized change of 0. The means for
the change scores were 1.28 for Part I, 3.36 for Part II, and 4.64 for the
total. The t test comparisons indicated that all change score means were
statistically significant.

SECTION V

CONCLUSIONS AND RECOMMENDATIONS

This final section of the report presents the conclusions and recommendations that were derived from the results of the study. Both the tests and the workbook are addressed.

CONCLUSIONS

The conclusions related to the Navy Numerical Skills Test are:

1. The two forms of the test have adequate reliabilities for use with the general Navy recruit population as well as the special training population involved in the study.

2. The scores of students on Part I of the test can be used as the basis for screening to identify students who need to improve their basic numerical skills.

3. The two forms of the test are essentially equivalent forms based on the performance of the samples from the general recruit population.

4. The test can be utilized in the placement of students and for the evaluation of students and the evaluation of student performance gains from using the workbook.

5. Additional norming data should be gathered and subsequently published if the test is adopted for use.

The conclusions concerning the workbook are:

1. The content of the workbook is relevant and valid for enlisted Navy personnel.

2. The workbook can be used effectively to improve the applied numerical skills of enlisted Navy personnel who have relatively low academic skills.

3. The workbook section on basic numerical skills is not beneficial to most students in the special populations of the study because they scored high on the pretest.

RECOMMENDATIONS

The recommendations regarding the Navy Numerical Skills Test are:

1. A total score in the range of 35 to 40 should be established as a pass score for students who are considered for workbook assignment.

2. A score of 20 on Part I of the test should be considered as indicating that a student does not need to have the first section of the workbook assigned.

It should be noted that these figures are preliminary and would be revised as the test becomes more widely used.

The recommendations relating to the workbook are:

1.   The workbook should be considered for use with students who have difficulty with elementary numerical skills (e.g., students in Apprentice Training and Academic Remedial Training as well as referrals from some Class "A" schools).

2.   The workbook should be viewed as a potential training aid in elementary mathematics curricula. (It has been incorporated into a mathematical skills curriculum developed by the Navy which will be field tested in Fiscal Year 1981.)

3.   The workbook should be reviewed for use in programs for special populations. One program, NJROTC, has already adopted it for use and is assigning a NAVEDTRA number and planning to print 6,000 copies.

4.   The strategy used in developing the workbook should be regarded as an effective prototype for designing other mathematical skill training aids.

5.   Informal observations from the field study suggest a student to instructor ratio of 25 to 1 when the workbook is used in a class setting.

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Training Analysis and Evaluation Group, Orlando, FL. 32813. (AD A079268)

APPENDIX A

IMPROVING YOUR NAVY NUMERICAL SKILLS WORKBOOK

Improving your
NAVY NUMERICAL SKILLS

$$\frac{3}{8} = 37.5\%$$

$$\begin{array}{r} 440 \\ + 98 \\ \hline 538 \end{array}$$

N
W E
S

LEAVE AND EARNINGS STATEMENT

$1415 = 2:15\ p.m.$

$I = P \times R \times T$

Prepared by

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IMPROVING YOUR NAVY NUMERICAL SKILLS

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The development of this numerical skills workbook was undertaken as one aspect of a broader effort to prepare instructional resources for basic skills training in the Navy. The initiative for the workbook was an outgrowth of other developmental activities related to basic skills training under the sponsorship of the Chief of Naval Education and Training (CNET) and the Chief of Naval Technical Training (CNTT). The Training Analysis and Evaluation Group (TAEG) and Memphis State University participated jointly in this parti-cular effort.

The workbook is designed as a resource for teaching numerical operations to students in the Navy whose skills are at a basic level. It is appropri-ately used by recruits and other sailors identified as needing training in basic numerical skills related to Navy job performance. The content includes material on the basic numerical operations as well as the application of the operations to job situations in the Navy and financial responsibilities faced while in the Navy. The purpose of the workbook is to assist the student in acquiring basic numerical skills by doing exercises on topics that are important and interesting to the student. Consequently, the topics covered by the lessons in the sections on Navy life and personal finance were selected on the basis of their relevance to students in the Navy environment.

The design of the workbook permits the student to begin at an elementary level in learning or reviewing the basic numerical operations in the first section of the workbook. If the student is sufficiently proficient in the basic operations, only the two sections involving applications in the Navy and personal fiances may be assigned to the student. Each lesson in the last two sections has review exercises using the numerical skills required to do the exercises on applications. The answers to the exercises reported in the back of the workbook provide a means of giving immediate feedback to the student as the lessons are completed.

Supplementary materials that are available to use with the workbook include two forms of a numerical skills test and an answer booklet. The tests may be used as diagnostic and evaluative tools with the workbook. The results from one form of the test can be used to make a decision about assigning the first section of the workbook to the student. The other form of the test can be used to measure the student's performance level upon completion of the workbook. The answer booklet is used to record the student's answers to the exercises, thereby making the workbook reusable as an instructional resource.

Appreciation is expressed to the following personnel who contributed to the development of the workbook:

SMCM G. Hopkins and BMCS J. Martin of the Apprentice Training School, Orlando, who reviewed several drafts and conducted a field test of the work-book. BMCS J. Martin also authored a locally published training aid on tackles and hooks that was used for one of the lessons.

LCDR J. Keefer, LT F. Jackson, and PO2 K. Lister of the Academic Remedial Training (ART) Division, Recruit Training Command, Orlando, who reviewed the workbook draft and arranged a field test with ART recruits.

INTRODUCTION

The introduction to this workbook presents information to two groups who would be involved in its use: instructors and students.

Instructor

The workbook is organized into three sections: Basic Numerical Skills, Numerical Skills in the Navy, and Numerical Skills in Personal Finances. The first section provides explanations and exercises for the basic operations of addition, subtraction, multiplication, and division. The second focuses on the application of numerical skills in Navy-relevant stituations. The final section deals with the application of numerical skills to financial responsibilities of the individual in the Navy and civilian life.

The three sections of the workbook are organized on the basis of topics with one or more lessons on each topic. The introduction to each topic deals with the significance, concepts, and/or formulas related to the topic. The lessons that follow the discussion include learner objectives and application exercises as well as review exercises where appropriate. The answers to the exercises are reported on pages 147-160 of the workbook. The stuuents's answers to the exercises can be recorded in the separate answer booklet that follows the format of the workbook sections.

The Navy Numerical Skills Test is correlated with the topics and related exercises contained in the workbook. Two forms of the test (A and B) are available to use with students and can be administered in either order. Part I (items 1 - 24) of the test deals with the basic numerical skills covered in the first section of the workbook. Part II (Items 25-50) is based on the skill applications addressed in the second and third sections of the workbook. A score of 20 or higher on the 24 items in Part I is recommended as a passing score for a student on a pretest with either form of the test. In this case, you could suggest that the student skip the first section of the workbook. If the student has difficulty with exercises in the other sections, you could recommend that the student do the exercises in the first section as a review. The alternate form of the test can be used as a posttest to measure the student's improvement as a result of completing the workbook. Comparisons can be made of the pretest and posttest scores on each part of the test and the total scores.

The workbook should be used under the supervision of an instructor although the instructor does not need to be with the students all the time that they are doing the exercises. In addition to administration of the test, the instructor will need to make decisions about the assignment of the first section of the workbook. Limited instruction on some topics may be necessary with selected students. The instructor may also need to answer students' questions about the exercises and review the completed exercises for a topic or lesson with students. The ratio of students to instructor should be limited to a maximum of 25 to 1.

The format of the workbook allows the individual student to be self-paced. The student may find that some sets of exercises are easy and complete them quickly. Other exercises may be harder for the student and require

longer to achieve mastery of the skills addressed. You can expect that students will proceed through the workbook at different paces because the lessons will vary in difficulty from student to student.

The operational procedures for the instructor are summarized as follows:

1. Administer the pretest with the Navy Numerical Skills Test - Form A or Form B, periodically varying the form used as a pretest.

2. Classify the students into two groups - those who score below 20 or Part I and those who score 20 or above on Part I.

3. Assign the complete workbook to the students who score below 20 on Part I and the last two sections of the workbook to the students who score 20 or above on Part I.

4. Monitor student progress and give assistance as needed or requested.

5. Administer the posttest with the Navy Numerical Skills Test as students complete the workbook, using the form not administered as the pretest.

6. Compare the pretest and posttest scores to determine the improvement of students.

Student

The workbook on Improving Your Navy Numerical Skills was developed to help you improve your skills in working with numbers. The exercises deal with the skills of addition, subtraction, multiplication, and division. The symbols used in working with numbers are described. The formulas used in some types of exercises are also given and defined.

The workbook has sections on the basic numerical skills, the use of numerical skills in particular Navy settings, and the use of numerical skills in personal finances. The first section provides a review of the four basic operations involving numbers. The next section deals with topics related to situations in the Navy that require the use of numerical skills. The last section covers topics concerned with financial responsibilities in the Navy and outside the Navy.

The Navy Numerical Skills Test is used to measure your skills before and after doing the exercises in the workbook. The test contains two parts on basic numerical skills and applied numerical skills. Your score on the first part of the test may be high enough for your instructor to recommend that you could skip the first section of the workbook. In any case, you might want to do the first section as a review. All students are expected to do the exercises in the second and third sections of the workbook.

An Answer Booklet is available for you to use in writing your answers to the workbook exercises. You should write your answers in the answer booklet rather than in the workbook. The answers to the exercises are found in the back of the workbook (pages 147-160). Do the exercises and write your answers

in the answer booklet. Then, you can check your answers by comparing them with the answers in the back of the workbook.

The workbook should be used under the supervision of an instructor. In some situations, you might use it in independent study. You can receive help from the instructor if you do not understand how to do the exercises for any of the lessons. You may also ask the instructor to review your work in doing the exercises on a lesson or topic after you have completed them.

The organization of the workbook allows you to work as fast or as slow as you can. You may complete the exercises for some lessons quickly because they are easy for you. You may work at a slower pace on other lessons because they are harder or you need more time to be sure that you fully understand what you are doing. You should work as fast as you can in completing the workbook.

The ability to do the exercises in the workbook can help you be an important member of the Navy. The topics chosen for the lessons deal with many subjects that will be useful to you in the Navy. Hopefully, you will find that working with numbers can be interesting while, at the same time, you improve your basic numerical skills.

TABLE OF CONTENTS

BASIC

NUMERICAL

SKILLS

INTRODUCTION

The lessons in this section have been developed to help you refine your basic numerical skills. Each area represents a skill that you will need to use many times during your Navy career. The skills will not be new to you because you have used them many times before. However, it is necessary to review them from time to time because they are easily forgotten.

You should approach these skills with a positive frame of mind knowing that they will be used later in your training. Hopefully, a good review of the numerical skills will give you a headstart on the calculations when you encounter them in Navy life.

Review of Terms and Number System

As you may remember, working with numbers also involves special words and symbols. We will review these words and symbols at the beginning of each lesson where they are introduced. Let us briefly review our numerical system. We use symbols to represent words. The symbols we use for our numerical system are:

Word	Symbol
zero	0
one	1
two	2
three	3
four	4
five	5
six	6
seven	7
eight	8
nine	9

Notice that we use ten symbols in our number system. These symbols are also referred to as digits. The word ten is represented by two symbols, or digits: a one and a zero, 10.

The way the symbols or digits are arranged is very important. The placement of digits in the number 8543 is shown below:

```
thousands
hundreds
tens
ones

8 5 4 3
```

The number in words is eight thousand five hundred forty three.

Another way to remember the way digits are arranged is to think of the odometer of a new car. An odometer is a meter in the dashboard of a car that records the miles traveled by the car. As you drove the car away from the dealer, the miles it had been driven may have looked like this on the odometer:

| 0 | 0 | 0 | 0 | 0 | 1 |

The car may have been driven one mile to load and unload the car and that mileage is shown in the "ones" place. (Note: Odometers on cars have a digit on the right side that shows tenths of a mile. This digit is a different color than the digits for miles. In the example, the digits for tenths of a mile will not be discussed.)

After you drove the car home, the miles driven may have looked like this:

| 0 | 0 | 0 | 0 | 1 | 0 |

It is nine miles from the car dealer's lot to your home and a 1 is shown in the "tens" place. Your new car has now been driven ten miles. As the car is driven, it is interesting to see the zero digits shown in the windows. At a hundred miles, the 1 is in the "hundreds" place:

| 0 | 0 | 0 | 1 | 0 | 0 |

At a thousand miles, you may need to have the dealer's service department check your new car. A thousand miles has been reached when the digit 1 is shown in the "thousands" window:

| 0 | 0 | 1 | 0 | 0 | 0 |

The digits of a number must be placed in the proper columns to avoid making errors in your calculations. In working the exercise problems, you must be careful to line up the digits in the proper columns. When the problem is printed or typed, the digits are in the proper placement, such as:

$$\begin{array}{r} 328 \\ + 11 \\ \hline 339 \end{array}$$

hundreds	tens	ones
3	2	8
+	1	1
3	3	9

However, as you write the problem, it is often easy to put the digits in the wrong place due to carelessness, such as:

$$
\begin{array}{r}
328 \\
+\ 11 \\
\hline
438
\end{array}
$$

Develop your habits of being neat and careful early:

$$
\begin{array}{r}
328 \\
+\ 11 \\
\hline
339
\end{array}
$$

It will save you from making errors as you proceed through the workbook.

ADDITION

Lesson 1

OBJECTIVE:

The learner will be able to solve addition problems using one-digit numbers.

TERMS AND DEFINITIONS IN ADDITION:

The answer to an addition problem is called the sum or may be referred to as the total. The sign, +, means do the operation of adding numbers. The + symbol is sometimes called a "plus." An example of an addition problem is shown below:

$$\text{plus} \longrightarrow \bigoplus \begin{array}{c} 2 \\ 3 \\ \hline 5 \end{array} \longleftarrow \text{sum or total}$$

EXERCISES: Add the pairs of numbers below.

1.	6 +3	2.	4 +3	3.	5 +2	4.	3 +1	5.	7 +2	6.	8 +1

7.	9 +2	8.	6 +4	9.	4 +2	10.	5 +3	11.	9 +3	12.	8 +2

There are other ways to write problems in addition. Rather than placing the digits to be added under each other in a column, we can place them in a line or row. An example is shown below:

$$2 + 3 = 5$$

(Note: The = symbol is called "equals.")

We can rewrite this problem in the way we did the previous exercise:

$$\begin{array}{r} 2 \\ +3 \\ \hline 5 \end{array}$$

If you wish to rewrite the problems in this manner because it is easier to avoid making a mistake, you should do so.

EXERCISES: Add the pairs of numbers below.

13. 2 + 2 = ____   14. 4 + 4 = ____   15. 3 + 3 = ____

16. 6 + 2 = ____   17. 5 + 4 = ____   18. 7 + 4 = ____

Sometimes we can mix words and symbols. An example of this would be:

2 plus 3 is 5

Notice the word <u>plus</u> is used in place of the + symbol and the word <u>is</u> is used for the = symbol. Replacing words with symbols, we see the problem in the same way as previous exercises:

2 + 3 = 5

EXERCISES: Add the pairs of numbers below.

19. 8 plus 3 is ____   20. 6 plus 8 is ____

21. 8 plus 7 is ____   22. 5 plus 6 is ____

23. 9 plus 7 is ____   24. 7 plus 5 is ____

A part of developing your numerical skills is being able to change words to symbols and numbers and to perform the correct calculation. Quite often the problems you will solve will be in the form of words or a story. You should look for certain key words that tell you the type of problem you will need to solve.

An example is the following:

Two plus four is six.

Underlining the key words and replacing them with symbols, we see:

2   +   4   =   6
<u>Two</u> <u>plus</u> <u>four</u> <u>is</u> <u>six</u>.

Another example is the following:

Two rounds of ammunition are placed in a maga-
zine with three rounds already in it. What is
the total number of rounds in the magazine?

Converting words to symbols and underlining the key words, we can begin to write the problem as we have done in earlier exercises.

2   +
<u>Two</u> rounds of ammunition are placed in <u>(are added to)</u>
          3   =
a magazine with <u>three</u> rounds already in it. What <u>is</u>
          5
the <u>total</u> number of rounds in the magazine?

____ + ____ = total

2 added to 3 is 5   or 2 + 3 = 5

EXERCISES: Solve the problems below.

25. nine plus four is ____

26. Seven destroyers are joined at sea by six cruisers. What is the total number of ships in the combined group?

Answer_____

27. A sailor takes seven days of leave in May and seven days of leave in June. What is the total number of days of leave taken in May and June?

Answer_____

28. A seaman worked six hours on Monday and two hours on Tuesday to finish a paint job? What is the total number of hours it took to finish the job?

Answer_____

29. A yeoman receives one paycheck at the middle of each month and one paycheck at the end of each month. How many paychecks does the yeoman receive each month?

Answer_____

30. A repair crew has four seamen and one chief. What is the total number of persons in the repair crew?

Answer_____

ADDITION

Lesson 2

OBJECTIVE:

The learner will be able to add pairs of two-digit and three-digit numbers.

SKILLS NEEDED TO ADD TWO-DIGIT AND THREE-DIGIT NUMBERS:

You may have noticed when adding one-digit numbers that the sum is sometimes a two-digit number. For example:

$$\begin{array}{r} 9 \\ + 3 \\ \hline 12 \end{array}$$

With single digits this is no problem. However, suppose we have a two-digit number and a one-digit number to add, such as:

$$\begin{array}{r} 19 \\ + 3 \end{array}$$

The sum of the digits in the "ones" column is 12. The 9 + 3 = 12. We place the 2 or the "ones" part of the number into the "ones" part of our sum.

$$\begin{array}{cc} \text{tens} & \text{ones} \\ 1 & 9 \\ + & 3 \\ \hline & 2 \end{array}$$

We then "carry" the 1 or the "tens" part of the sum of 9 + 3 over to the tens column in our problem.

$$\begin{array}{cc} \text{tens} & \text{ones} \\ 1 & \\ 1 & 9 \\ + & 3 \\ \hline & 2 \end{array}$$

We then add the digits in the "tens" part.

$$\begin{array}{cc} \text{tens} & \text{ones} \\ 1 & \\ 1 & 9 \\ + & 3 \\ \hline 2 & 2 \end{array}$$

Our answer then is:

$$\begin{array}{r} 19 \\ + \ 3 \\ \hline 22 \end{array}$$

If we were adding numbers with more than two digits, we would use the same procedures to "carry" over to the hundreds column, the thousands column, or other columns to the left.

EXERCISES:

A. Addition of two-digit numbers.

| 1. | 42 +27 | 2. | 53 +87 | 3. | 66 +71 | 4. | 94 +56 | 5. | 42 +88 |

6.   11 + 14 = ____   7.   45 + 43 = ____   8.   63 + 76 = ____

9.   21 + 34 = ____   10.   79 + 19 = ____

11.   22 plus 44 is ____   12.   60 plus 77 is ____

13.   39 plus 84 is ____   14.   99 plus 10 is ____

15.   40 plus 40 is ____

B. Addition of three-digit numbers.

| 1. | 123 +456 | 2. | 567 +111 | 3. | 812 +718 | 4. | 100 +101 | 5. | 919 +708 |

6.   645 + 321 = ____   7.   222 + 444 = ____   8.   999 + 100 = ____

9.   213 + 409 = ____   10.   127 + 628 = ____

11.   449 plus 818 is ____   12.   774 plus 477 is ____

13.   117 plus 712 is ____   14.   505 plus 705 is ____

15.   317 plus 603 is ____

ADDITION

Lesson 3

OBJECTIVE:

The learner will be able to add numbers using decimal points and dollar signs.

INFORMATION:

In previous lessons on number systems and placement of digits, we reviewed the columns of "ones," "tens," "hundreds," and so on. Often we deal with numbers smaller than one, yet greater than zero. They will not go in the "ones" column. Since they are smaller than one, they should go to the right of the "ones" column and indeed they do. In order to separate these numbers that are smaller than one, we use the <u>decimal point.</u> The symbol for a decimal point is a period (.). The most obvious example of using decimal points is solving problems involving money. We do have money less than one dollar or "ones." We call them cents but we often express them as parts of a dollar. Twenty-five cents is often called a "quarter of a dollar," or simply a "quarter," and is written $.25 to show that it is .25 of a dollar. The placement of numbers using the decimal point is shown below:

```
                   t
                   n
                   i
                   o
                   p
    s   s           s
    d   d           h
    n   e   s       t
    a   r   n   s   l   d
    s   d   e   e   a   e
    u   n   t       m   r
    o   u       s   i   h
    h       s   e   c   t
    t   h   n   n   e   n
        d   e   o   d   u
    t   n   t   .   .   h
    8   5   4   3 . 9   2
```

Notice that just as before, the digits to the right represent smaller amounts. For instance, "ones" are smaller amounts than "tens" and are to the right. "Tenths" are smaller than "ones" and are placed to the right. Of course, the decimal point separates the "ones" and the "tenths." "Hundredths" are smaller amounts than "tenths" and are placed further to the right. We will take a closer look using money to show this placement. There are 100 cents in each dollar. Therefore one cent is one hundredth of one dollar. One cent is shown as:

$ .01

Notice the digit 1 is in the hundredths column. Now let us look at a larger amount of money. One dime is the same as 10 cents. There are 10 dimes in one dollar, therefore 1 dime or 10 cents is one tenth of one dollar. Ten cents or a dime is shown as:

$ .10

Comparing the placement of digits, we see:

$$one\ cent\ =\ \$\ .01$$
$$ten\ cents\ =\ \$\ .10$$

Notice that one cent is smaller than ten cents and the digit for the smaller number is farthest to the right.

Solving problems with decimals is not difficult but it does require a great deal of care in lining up the decimal points. It may help you to place the decimal points first before writing the digits to make sure the digits are in the correct column:

```
First           .
                .
              ------
                .

Second        3.15
            +12.20
              ------
                .

Third         3.15
            +12.20
              ------
             15.35
```

EXERCISES: Find the sum.

1.	$266.19 + 34.49	2.	$2.38 + .44	3.	$723.66 +394.30	4.	$16,732.76 + 3,445.98
5.	$216.19 + 50.00	6.	$791.19 + 9.73	7.	$3,038.56 +4,045.89	8.	$45.39 +75.97
9.	$97.04 +12.13	10.	$ 451.00 +1,723.01	11.	$8,097.14 + 566.80	12.	$566.80 + .32
13.	$501.98 +103.38	14.	$16,732.76 + 3,445.98	15.	$2.63 +3.69	16.	$45.98 +23.66
17.	$8.38 +7.94	18.	$.24 +.98	19.	$5.98 +8.74	20.	$6.73 +1.93

SUBTRACTION

Lesson 1

OBJECTIVE:

The learner will be able to subtract pairs of one-digit numbers.

TERMS AND DEFINITIONS IN SUBTRACTION:

The answer to a subtraction problem is called the _difference_. The sign, -, means do the operation of subtracting one number from another number. The - symbol is sometimes called a "minus." An example of a subtraction problem is shown below:

$$
\begin{array}{r}
5 \\
\text{minus} \rightarrow \ominus\ 2 \\
\hline
3 \leftarrow \text{difference}
\end{array}
$$

EXERCISES: Do the subtraction problems below.

1.	7 −4	2.	6 −6	3.	9 −7	4.	3 −2
5.	8 −5	6.	8 −4	7.	9 −1	8.	5 −3

Just as we saw in addition, there are other ways to write problems in subtraction. Rather than placing the digits to be subtracted under each other in a column, we can place them in a line or row. An example is shown below:

$$5 - 2 = 3$$

We can rewrite this problem in the way we did the previous exercise:

$$
\begin{array}{r}
5 \\
-2 \\
\hline
3
\end{array}
$$

If you wish to rewrite the problem in this manner because it is easier to avoid making a mistake, you should do so.

EXERCISES: Do the subtraction problems below.

9. 4 − 2 = _____   10. 9 − 8 = _____

11. 7 − 6 = _____   12. 8 − 3 = _____

Sometimes we can mix words and symbols. An example of this would be:

5 minus 2 is 3

Notice the word minus is used in place of the – symbol and the word is is used for the = symbol. Replacing words with symbols, we see the problem in the same way as previous exercises:

5 – 2 = 3

EXERCISES: Do the subtraction problems below.

13.   6 minus 1 is _____   14.   4 minus 3 is _____

15.   8 minus 6 is _____   16.   7 minus 4 is _____

As we saw in addition, the problems you will solve in subtraction sometimes will be in the form of words or a story. You should look for key words that will tell you the type of problem you will need to solve.

As example is the following:

Nine minu six is three.

Underlining the key words and replacing them with symbols, we see:

9   –   6   =   3
Nine minus six is three.

Another example is the following:

Five rounds of ammunition in a magazine are drecreased by
two rounds that are fired. What is the difference? (How
many rounds are left in the magazine?)

Converting words to symbols and underlining the key words, we can begin to write the problem as we have done in earlier exercises.

5   –
Five rounds of ammunition in a magazine are decreased (minus) by
2   =
two rounds that are fired. What is the difference? (How many

rounds are left in the magazine?)

_____ – _____ = difference

5 decreased by 2 is 3   or 5 – 2 = 3

EXERCISES: Solve the problems below.

17. eight minus seven is _____

18. A sailor who has seven days of leave uses two days of leave for personal business. How many days of leave does the sailor have left?

Answer_____

19. A seaman begins a paint job that takes six hours to complete and works three hours. How many hours will be needed to finish the job?

Answer_____

20. A marksman fires six rounds of ammunition at a target and hits the target five times. How many times did the marksman miss the target?

Answer_____

SUBTRACTION

Lesson 2

OBJECTIVE:

The learner will be able to subtract two-digit numbers from two-digit and three-digit numbers.

SKILLS NEEDED TO SUBTRACT TWO-DIGIT AND THREE-DIGIT NUMBERS:

Often you have to subtract a large number from a small number in the same column, for example:

```
     tens ones
      4    2
    -      9
    ---------
```

We must subtract 9 from 2 in the "ones" column. We cannot take a larger number from a smaller number. To solve this problem, we must "borrow." We will "borrow" one ten from the "ten's" column. Remember there are ten "ones" in one "ten." So we then have:

```
     tens ones
      3    10
      4    2
    -       9
    ---------
```

Because we have borrowed a "ten" from the "tens" column, we have one less "ten." The 4 becomes one less or 3. The ten is moved over to the "ones" column. Now we can add the 10 "ones" we borrowed to the 2 ones already in the ones column. Now our problem looks like this:

```
      3    10
           +2
      4    12
    -       9
```

We can subtract the 9 from 12, giving a difference of 3:

```
      3
      4    12
    -       9
    ---------
            3
```

To complete our problem, we see there is no digit to subtract from 3 to get a difference. When no digit is in the column, we can put a "zero" (0) in the blank place if we wish:

$$
\begin{array}{r}
3 \\
\cancel{4} \quad 12 \\
-(0) \quad 9 \\
\hline
3
\end{array}
$$

Since 3 minus 0 is 3, we enter a 3 in the tens column of our difference:

$$
\begin{array}{r}
3 \\
\cancel{4} \quad 12 \\
-(0) \quad 9 \\
\hline
3 \quad 3
\end{array}
$$

The correct answer for the difference in this problem is 33. This shows the way to "borrow" numbers from one place to another.

We can check our answer if we wish by adding the difference to the smaller number:

$$
\begin{array}{r}
42 \\
-\,9 \\
\hline
33
\end{array}
\qquad \longrightarrow \qquad
\begin{array}{r}
9 \\
+33
\end{array}
$$

The sum of these two numbers should be the same as the larger number in the original subtraction problem.

$$
\begin{array}{r}
9 \\
+33 \\
\hline
42
\end{array}
\quad \underline{\text{Same}} \quad
\begin{array}{r}
42 \\
-\,9 \\
\hline
33
\end{array}
$$

Be checking our work, we are sure we have solved the problem correctly. To keep from making mistakes, you may rewrite the problem just as we have done in our example. It will be a little more work but by doing a small step at a time, you can keep the problem neat and be sure of each step as you learn to master the skill.

In doing some subtraction problems, you will have to borrow from more than one column. Look at this example:

$$
\begin{array}{c c c}
\text{hundreds} & \text{tens} & \text{ones} \\
1 & 0 & 0 \\
- & 4 & 2 \\
\hline
\end{array}
$$

We cannot subtract 2 from 0 since 0 is smaller than 2. According to the previous example, we would borrow a "ten" from the "tens" column. However, there are 0 "tens" in the number 100 and we cannot borrow a ten from 0 tens. We have to borrow 1 "hundred" from the "hundreds" column to get 10 tens.

$$
\begin{array}{ccc}
0 & 10 & \\
\cancel{1} & 0 & 0 \\
- & 4 & 2 \\
\hline
\end{array}
$$

We still need to borrow a "ten" from the "tens" column. The next step is to borrow 1 ten from the 10 tens that we have now. This step is shown as follows:

$$
\begin{array}{ccc}
 & 9 & \\
0 & \cancel{10} & 10 \\
\cancel{1} & \cancel{0} & \cancel{0} \\
- & 4 & 2 \\
\hline
\end{array}
$$

Now we can subtract the 2 from the 10 in the ones column. Then, we subtract the 4 from the 9 in the tens column giving us a difference of 58:

$$
\begin{array}{ccc}
 & 9 & \\
0 & \cancel{10} & 10 \\
\cancel{1} & \cancel{0} & \cancel{0} \\
- & 4 & 2 \\
\hline
 & 5 & 8 \\
\end{array}
$$

We can check our answer by adding the difference to the smaller number:

$$
\begin{array}{r}
58 \\
+42 \\
\hline
100 \\
\end{array}
$$

EXERCISES:

A. Subtraction of two-digit numbers from two-digit numbers.

1.	77 −32	2.	83 −19	3.	59 −29	4.	71 −24
5.	21 −18	6.	41 −19	7.	37 −18	8.	60 −27

9. 98 − 19 = _____   10. 29 − 16 = _____   11. 31 − 15 = _____

12. 50 − 12 = _____   13. 67 − 59 = _____   14. 72 − 67 = _____

15. 87 − 12 = _____   16. 24 − 22 = _____

17. 35 minus 17 is _____   18. 48 minus 16 is _____

19. 53 minus 13 is _____   20. 63 minus 18 is _____

B. Subtraction of two-digit numbers from three-digit numbers.

1. 272   2. 621   3. 492   4. 172
    - 18   - 25   - 20   - 19

5. 372   6. 523   7. 838   8. 720
    - 91   - 87   - 88   - 20

9. 100 - 20 = _____   10. 737 - 42 = _____   11. 923 - 72 = _____

12. 254 - 62 = _____   13. 321 - 10 = _____   14. 407 - 26 = _____

15. 597 - 74 = _____   16. 672 - 37 = _____

17. 711 minus 82 is _____   18. 894 minus 44 is _____

19. 182 minus 62 is _____   20. 963 minus 27 is _____

SUBTRACTION

Lesson 3

OBJECTIVE:

The learner will be able to subtract using decimal points.

INFORMATION:

The recruit should review the discussion of decimals from Addition - Lesson 3.

An example of subtraction with decimals is as follows:

```
          hundreds
          tens
          ones     tenths
                   hundredths
          3  4  3 . 2  9
        -       6 . 3  4
```

By looking at the problem, we can see that we will have to borrow because we cannot subtract 3 tenths from 2 tenths or 6 ones from 3 ones.

After borrowing 10 tenths from the ones column and 10 ones from the tens column, the problem looks like this:

```
              12
           3  2     12
        3  4  3  .  2  9
        -     6  .  3  4
```

Now we can work the problem and find the difference of 336.95:

```
              12
           3  2
        3  4  3  .  2  9
        -     6  .  3  4
        3  3  6  .  9  5
```

We can check the problem by adding the difference to the smaller number as follows:

```
        336.95
      +   6.34
        343.29
```

EXERCISES: Find the differences.

1.   217.73
      - 55.54

2.   1,305.63
      - 158.64

3.   1,163.00
      - 800.92

4.   566.80
      -   1.57

5.   4.58
      - .99

6.   1,000.00
      - 328.19

7.   81.00
      - 65.14

8.   6.99
      - 1.23

9.   57.32
      - 56.99

10.   57.39
      - 25.97

11.   .0073
      - .0016

12.   38.5675
      -   .2789

13.   2.81495
      - 2.65739

14.   16,732.76
      - 3,443.98

15.   2.63
      - 2.25

16.   .71
      -   .23

17.   97.0400
      -   .0613

18.   2.38
      - .44

19.   12.13
      - 8.00

20.   .17985
      - .01463

MULTIPLICATION

Introduction

Having reviewed and mastered the skill of addition and subtraction, we will now look at ways to solve multiplication problems. The terms used in multiplication and an example are shown below:

$$
\begin{array}{r}
4 \\
\text{multiply by or times } \enclose{circle}{\times}\ 3 \\
\hline
12 \leftarrow \text{product}
\end{array}
$$

The symbol for multiplication is an x. In words, we often refer to the x as "times" or "multiply by." In our example, the words would be 4 times 3 is 12 or 4 multiplied by 3 equals 12. Our answer is called a product. In our example, 12 is the product of 4 multiplied by 3. Multiplication is a special case of addition. Remember in addition, we added two or more different numbers. In multiplication, we are simply adding the same number several times. Look at our example again:

$$
\begin{array}{r}
4 \\
\times\ 3 \\
\hline
12
\end{array}
$$

We are saying add the number 4 three times, or:

$$
\begin{array}{r}
4 \text{ (take this number)} \\
\times 3 \text{ (add it this number of times)} \\
\hline
12 \text{ (this is the product)}
\end{array}
$$

Let us do just that to see if it is correct:

$$
\begin{array}{rl}
4 & \text{one time} \\
+4 & \text{two times} \\
\hline
8 & \text{sum} \\
+4 & \text{three times} \\
\hline
12 & \text{sum}
\end{array}
$$

The sum of adding 4 three times or 4 + 4 + 4 = 12 is the same as the product of 4 x 3 = 12. Multiplication makes adding the same number many times simple. For example, if we had a problem of:

$$
\begin{array}{r}
120 \\
\times\ 48 \\
\hline
\end{array}
$$

We would have to add 120 a total of 48 times. This would take a long time to do. Solving the problem by multiplication makes this much easier and faster.

Before solving multiplication problems, you will need to know the multiplication tables. The multiplication tables from 0 through 9 are on the next page.

Multiplication Tables

	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

MULTIPLICATION

Lesson 1

OBJECTIVE:

The learner will be able to multiply two one-digit numbers.

EXERCISES:

Multiply the pairs of numbers below.

1.   3
     x 3
	2. 9
	     x 7
		3. 7
		     x 3
			4. 1
			     x 7
				5. 8
				     x 6

6.   1
     x 1
	7. 4
	     x 8
		8. 4
		     x 4
			9. 7
			     x 7
				10. 1
				     x 9

11.   5
     x 5
	12. 3
	     x 2
		13. 9
		     x 2
			14. 5
			     x 4
				15. 8
				     x 2

16.   6
     x 6
	17. 7
	     x 6
		18. 2
		     x 2
			19. 6
			     x 4
				20. 5
				     x 2

MULTIPLICATION

Lesson 2

OBJECTIVE:

    The learner will be able to multiply two-digit numbers by one-digit numbers.

PROCEDURES:

    Carrying is used in multiplication as we used it in addition. You can review the information on carrying in Addition - Lesson 2.

Example

    Multiply 19 x 4:

$$\begin{array}{r} 19 \\ \times\ 4 \\ \hline \end{array}$$

Multiply the numbers in the ones column: 4 x 9 = 36

$$\begin{array}{r} 1\ \ ⑨ \\ \times\ \ ④ \\ \hline \end{array}$$

Put the 6 in the ones column below the line and the 3 above the 1 in the tens column:

$$\begin{array}{r} ③ \\ 1\ \ 9 \\ \times\ \ 4 \\ \hline ⑥ \end{array}$$

Multiply 4 x 1 = 4 and add the 3: 4 + 3 = 7

$$\begin{array}{r} +3 \\ ①\ \ 9 \\ \times\ \ ④ \\ \hline 6 \end{array}$$

Put the 7 under the 1 in the tens column:

$$\begin{array}{r} 1\ \ 9 \\ \times\ \ 4 \\ \hline ⑦\ \ 6 \end{array}$$

The correct answer or product is 76:

$$\begin{array}{r} 19 \\ \times\ 4 \\ \hline 76 \end{array}$$

EXERCISES: Multiply the pairs of numbers below.

1.	12 x 2	2.	19 x 5	3.	16 x 4	4.	17 x 8	5.	10 x 1
6.	11 x 7	7.	12 x 9	8.	15 x 5	9.	13 x 3	10.	21 x 5
11.	33 x 7	12.	42 x 4	13.	44 x 6	14.	56 x 2	15.	60 x 8

As we saw in addition and subtraction, sometimes a multiplication problem will be found in a word description. When this happens, look for the key words and numbers to decide what the problem is and then solve it.

Example

A base grounds supervisor needs 12 crews of sailors to do some cleaning jobs. Each crew will be composed of 3 sailors. How many sailors are needed to form the crews?

We read the problem and underline the key words and numbers to find out what the problem is.

A base grounds supervisor needs 12 crews of sailors to do some cleaning jobs. Each crew will be composed of 3 sailors. How many sailors will be needed to form the crews?

The key words and numbers show that we have a multiplication problem. We need to multiply the number of crews (12) times the number of sailors in each crew (3) to find out how many sailors are needed to form the crews. Be completing the problem, we can see that 36 sailors are needed:

$$
\begin{array}{r}
12 \\
\times\ 3 \\
\hline
36
\end{array}
$$

EXERCISES: Solve the problems below.

16. A sailor puts $4 in a savings account each week. At the end of 78 weeks, how much money will the sailor have saved?

Answer_____

17. A Navy recruiter drives an average of 41 miles in business travel each working day. How many miles will the recruiter drive in 5 working days?

Answer_____

18. A chief uses 9 gallons of gas each week for pleasure driving. How many gallons of gas will the chief use for pleasure driving in 52 weeks?

Answer_____

19. Chief Petty Officer Gray has 81 weeks left in his current enlistment. Since a week has 7 days, how many days are left in his enlistment period?

Answer_____

20. Over a period of 35 weeks, a sailor spent an average of $6 each week on recreation. How much money did the sailor spend for recreation during the period?

Answer_____

MULTIPLICATION

Lesson 3

OBJECTIVE:

The learner will be able to multiply two-digit and three-digit numbers by two-digit numbers.

PROCEDURES:

We use the same steps in multiplying a number by a two-digit number as we use with a one-digit number. However, we do the steps twice, once for the digit in the ones column and once for the digit in the tens column. The product is the sum of the answers we get each time we do the steps.

Example

Multiply 36 x 29:

$$
\begin{array}{r}
36 \\
\times\,29 \\
\hline
\end{array}
$$

Multiply the numbers in the ones column: 9 x 6 = 54

$$
\begin{array}{r}
3 \;\textcircled{6} \\
\times\,2 \;\textcircled{9} \\
\hline
\end{array}
$$

Put the 4 in the ones column below the line and the 5 above the 3 in the tens column:

$$
\begin{array}{r}
\textcircled{5} \\
3 \quad 6 \\
\times\,2 \quad 9 \\
\hline
\textcircled{4}
\end{array}
$$

Multiply 9 x 3 = 27 and add the 5: 27 + 5 = 32

$$
\begin{array}{r}
+5 \\
\textcircled{3} \quad 6 \\
\times\,2 \;\textcircled{9} \\
\hline
4
\end{array}
$$

Put the 3 in the hundreds column and the 2 in the tens column:

$$
\begin{array}{r}
3 \quad 6 \\
\times\,2 \quad 9 \\
\hline
\textcircled{3}\,\textcircled{2}\,4
\end{array}
$$

Multiply the 2 in the tens column times the 6 in the ones column
(Note: the 2 in the tens column stands for the number 20):
2 x 6 = 12

```
      3⑥
    x②9
```

Put the 2 in the tens column below the line and the 1 above the
3 in the tens column:

```
     ①
     3 6
   x 2 9
   3 2 4
     ②
```

Multiply 2 x 3 = 6 and add the 1: 6 + 1 = 7

```
    +1
     ③6
    x②9
   3 2 4
     2
```

Put the 7 in the hundreds column:

```
     3 6
   x 2 9
   3 2 4
   ⑦2
```

Add the two numbers below the line:

```
     3 6
   x 2 9
   3 2 4
   7 2
  (1 0 4 4)
```

The correct answer or product is 1044:

```
     36
   x 29
    324
     72
   1044
```

EXERCISES: Multiply the pairs of numbers below.

1.   227
    x 19

2.   66
    x 12

3.   87
    x 28

4.   167
    x 33

5.   427
    x 57

6.   83
    x 24

7.   91
    x 66

8.   75
    x 22

9.   813
    x 64

10.   123
    x 15

11.   321
    x 51

12.   92
    x 91

13.   890
    x 10

14.   467
    x 27

15.   84
    x 11

16.   971
    x 24

17.   890
    x 67

18.   111
    x 77

19.   902
    x 14

20.   803
    x 12

MULTIPLICATION

Lesson 4

OBJECTIVE:

The learner will be able to multiply pairs of numbers with as many as three digits when the exercises are written in the form of a number statement.

INFORMATION:

Multiplication problems may be written as:

12 x 2 = _____   or   6 x 6 = _____

These are different forms of writing:

```
    12              6
   x 2            x 6
```

If you wish to rewrite the problems in this manner because it is easier to avoid making a mistake, you should do so.

EXERCISES: Find the product for each pair of numbers below.

1. 6 x 5 = _____   11. 123 x 24 = _____

2. 7 x 7 = _____   12. 487 x 86 = _____

3. 82 x 27 = _____   13. 143 x 11 = _____

4. 9 x 9 = _____   14. 227 x 16 = _____

5. 14 x 3 = _____   15. 495 x 81 = _____

6. 21 x 9 = _____   16. 904 x 10 = _____

7. 18 x 12 = _____   17. 26 x 26 = _____

8. 14 x 21 = _____   18. 42 x 42 = _____

9. 12 x 12 = _____   19. 77 x 14 = _____

10. 437 x 10 = _____   20. 153 x 31 = _____

DIVISION

Introduction

Division problems may be written in two forms:

$$4\overline{)\,8\,} \qquad \text{or} \qquad 8 \div 4$$

In words, the problem in the example means 4 divided into 8 or 8 divided by 4.

When we solve a division problem, the answer we get is called a quotient.

$$4\overline{)\,8\,}\;\overset{\textcircled{2}}{}\leftarrow\text{quotient}$$

Division is related to multiplication. We will look at the multiplication table for 3 to see how they are similar.

$$
\begin{aligned}
3 \times 0 &= 0 \\
3 \times 1 &= 3 \\
3 \times 2 &= 6 \\
3 \times 3 &= 9 \\
3 \times 4 &= 12 \\
3 \times 5 &= 15 \\
3 \times 6 &= 18 \\
3 \times 7 &= 21 \\
3 \times 8 &= 24 \\
3 \times 9 &= 27
\end{aligned}
$$

Now, look at the products from our multiplications:

$$
\begin{aligned}
&0 \\
&3 \\
&6 \\
&9 \\
&12 \\
&15 \\
&18 \\
&21 \\
&24 \\
&27
\end{aligned}
$$

If we divide these products by the number 3 for the multiplication table we are using, we can see the relationship to division:

$$
\begin{aligned}
0 \div 3 &= 0 \qquad & 15 \div 3 &= 5 \\
3 \div 3 &= 1 \qquad & 18 \div 3 &= 6 \\
6 \div 3 &= 2 \qquad & 21 \div 3 &= 7 \\
9 \div 3 &= 3 \qquad & 24 \div 3 &= 8 \\
12 \div 3 &= 4 \qquad & 27 \div 3 &= 9
\end{aligned}
$$

Division is sometimes defined as the inverse of multiplication. As you can see, it is important to know the multiplication tables to do division as well as multiplication.

DIVISION

Lesson 1

OBJECTIVE:

The learner will be able to divide one-digit numbers into one-digit numbers.

EXERCISES: Find the quotient for each problem below.

1. $2\overline{)8}$

2. $1\overline{)0}$

3. $6\overline{)6}$

4. $4\overline{)8}$

5. $5\overline{)5}$

6. $2\overline{)6}$

7. $3\overline{)9}$

8. $1\overline{)1}$

9. $9\overline{)0}$

10. $2\overline{)4}$

11. $7 \div 7 = $ _____

12. $0 \div 6 = $ _____

13. $6 \div 3 = $ _____

14. $2 \div 1 = $ _____

15. $8 \div 8 = $ _____

16. $4 \div 4 = $ _____

17. $8 \div 1 = $ _____

18. $0 \div 7 = $ _____

19. $4 \div 1 = $ _____

20. $9 \div 9 = $ _____

DIVISION

Lesson 2

OBJECTIVE:

The learner will be able to divide one-digit numbers into two-digit numbers.

PROCEDURES:

In Lesson 1 we worked with short division that could be solved by remembering our multiplication tables. As we start dividing numbers with two or more digits, we can use long division to help us keep our calculations correct. As we use long division, we should be aware of another term called the remainder.

Example

An example of a long division problem is shown below.

$$65 \div 5 =$$

It will help us solve the problem if we rewrite it in the following form:

$$5\overline{)65}$$

We will divide the first number under our division sign by 5:

$$⑤\overline{)⑥5}$$

We see that $6 \div 5$ or $5\overline{)6}$ will go 1 time and place our answer above the 6:

$$5\overline{)\overset{①}{6\,5}}$$

Now we will multiply 1 x 5:

$$\begin{array}{r} x \leftarrow 1 \\ \downarrow \\ 5\overline{)6\,5} \end{array}$$

The answer is 5 and we place this under the 6:

$$\begin{array}{r} x \leftarrow 1 \\ \downarrow \\ 5\overline{)6\,5} \\ \rightarrow = 5 \end{array}$$

Now we subtract the 5 from the 6 to give use a difference of 1:

$$\begin{array}{r} \overset{1}{5\overline{)6\,5}} \\ \underline{-5} \\ 1 \end{array}$$

Notice the digit 1 is left over in this part of the division problem. The 1 is less than 5 and is referred to as a <u>remainder</u>. We still have some more work to do. Now we bring down the five under the division sign to place it beside the remainder of 1:

$$
\begin{array}{r}
1 \\
5\,\overline{\smash{\big)}\,6\,⑤} \\
-5\ \downarrow \\
\overline{1\,⑤}
\end{array}
$$

Now we have another simple division problem to solve, that is 15 ÷ 5 or 5/$\overline{15}$. In our example this is:

$$
\begin{array}{r}
1 \\
5\,\overline{\smash{\big)}\,6\ 5} \\
-5 \\
\hline
\boxed{5\,\overline{\smash{\big)}\,1\ 5}}
\end{array}
$$

Fifteen divided by 5 equals 3:

$$
5\overline{\smash{)}15}\ \ ^{3}
$$

We place this answer or quotient above the 5 in our problem like this:

$$
\begin{array}{r}
1\ ③ \\
5\,\overline{\smash{\big)}\,6\ 5} \\
-5 \\
\\
5\,\overline{\smash{\big)}\,1\ 5}
\end{array}
$$

Now multiplying 3 x 5, we get a product of 15:

$$
\begin{array}{r}
x \leftarrow \\
\downarrow \qquad \uparrow \\
1\ 3 \\
5\,\overline{\smash{\big)}\,6\ 5} \\
\downarrow \quad -5 \\
\hline
1\ 5 \\
=\ \rightarrow -1\ 5 \\
\hline
0
\end{array}
$$

Subtracting 15 from 15, the difference is zero or no remainder. There are no more numbers to bring down, so we now have our final answer or quotient.

$$
\begin{array}{r}
13 \\
5\overline{\smash{)}65} \\
-5 \\
\hline
15 \\
-15 \\
\hline
0
\end{array}
$$

The answer to 65 ÷ 5 = 13

Remember, it is very important to keep your numbers in line. Working with numbers is like marching. You must keep your numbers "dressed right" and "covered down." Just as a company commander should make sure his troops are in proper lines and columns, you should make sure your numbers are properly placed.

EXERCISES: Fine the quotient for each problem below.

1. $2\overline{)18}$

2. $4\overline{)52}$

3. $6\overline{)42}$

4. $8\overline{)32}$

5. $1\overline{)10}$

6. $3\overline{)96}$

7. $5\overline{)95}$

8. $7\overline{)84}$

9. $9\overline{)27}$

10. $8\overline{)64}$

11. $72 : 6 =$ _____

12. $76 : 4 =$ _____

13. $68 : 2 =$ _____

14. $81 : 9 =$ _____

15. $49 : 7 =$ _____

16. $70 : 5 =$ _____

17. $69 : 3 =$ _____

18. $21 : 1 =$ _____

19. $58 : 2 =$ _____

20. $36 : 4 =$ _____

DIVISION

Lesson 3

OBJECTIVE:

The learner will be able to divide one-digit numbers into three-digit numbers.

EXERCISES:

Find the quotient for each problem below.

1. $4\overline{)612}$ 10. $684 \div 6 =$ _____

2. $2\overline{)194}$ 11. $168 \div 8 =$ _____

3. $1\overline{)371}$ 12. $244 \div 4 =$ _____

4. $3\overline{)495}$ 13. $650 \div 2 =$ _____

5. $5\overline{)870}$ 14. $870 \div 5 =$ _____

6. $7\overline{)924}$ 15. $996 \div 3 =$ _____

7. $9\overline{)738}$ 16. $728 \div 8 =$ _____

8. $2\overline{)546}$ 17. $534 \div 6 =$ _____

9. $4\overline{)256}$ 18. $984 \div 8 =$ _____

Sometimes division problems are stated in a word description. When you find this situation, you should look for key words and numbers to find out what the problem is. Then, you can solve it.

Example

A sailor decides to put $200 in a savings account. He plans to make 4 deposits of equal amounts. How much must he deposit each time?

As we read the problem, we will underline the key words and numbers. This will show us what the problem is.

A sailor decides to put $200 in a savings account. He plans to make 4 deposits of equal amounts. How much must he deposit each time?

The key words and numbers show that we need to solve a division problem. We should divide the total amount to be put in the savings account ($200) by

the number of equal deposits (4) to find out how much each deposit will be. By completing the problem, we can see that each deposit should be $50:

$$\$200 \div 4 = \$50$$

EXERCISES: Solve the problems below.

19. Seaman Green has completed 497 days of his current enlistment in the Navy. (Each week has 7 days.) How many weeks has Seaman Green completed of his current enlistment?

Answer_____

20. A sailor had to drive 405 miles to visit his family while on leave. He drove this distance in 9 hours. How many miles per hour was his average speed?

Answer_____

DIVISION

Lesson 4

OBJECTIVE:

The learner will be able to divide two-digit numbers into three-digit numbers.

PROCEDURES:

At this point, we have reviewed short division and improved our skill in working long division problems. Solving division problems that use numbers with two and three digits requires a little more work. The reason for this is because we have not memorized multiplication tables of two-digit and three-digit numbers. It would be very hard to memorize multiplication tables for numbers such as 74 or 351. Luckily, we do not have to do this. The multiplication tables we have already memorized have enough information to solve these problems. We will try an example and put our information and skills to work.

Example

$$5268 \div 84 =$$

or

$$84/\overline{5268}$$

First look at the number outside the division sign:

$$(8\ 4)/\overline{5\ 2\ 6\ 8}$$

It is smaller or larger than the first two digits inside the division sign?

$$(8\ 4)/(\overline{5\ 2})6\ 8$$

Since 52 is smaller than 84, we cannot divide. Therefore, our next step is to include the next digit under the division sign:

$$8\ 4\ /(\overline{5\ 2\ 6})8$$

526 is larger than 84

Since 526 is larger than 84, we know it will divide more than one time. We do not know how many times 526 can be divided by 84. To solve this problem, look at the first digit on the left outside the division sign:

$$(8)4\ /\overline{5\ 2\ 6\ 8}$$

How many times will 8 go into 52?

$$8\ 4\ /(\overline{5\ 2})6\ 8$$

The answer or quotient is 6 with a remainder. We will place this 6 over the 6
inside our division sign:

$$84 \,/\, \overline{5\ 2\ 6\ 8} \quad \overset{\textcircled{6}}{}$$

Now we multiply 84 x 6 = 504:

$$
\begin{array}{r}
x \;\leftarrow\; 6 \\
\downarrow \\
84 \,/\, \overline{5\ 2\ 6\ 8} \\
\rightarrow\; =\underline{5\ 0\ 4}
\end{array}
$$

We subtract this product from the first three digits under the division sign:

$$
\begin{array}{r}
6 \\
84 \,/\, \overline{5\ 2\ 6\ 8} \\
\underline{-5\ 0\ 4} \\
2\ 2
\end{array}
$$

The difference is 22 or a remainder of 22. Notice that 22 is less than 84.
Next we bring down the 8 under the division sign so it is beside the remainder
or 22:

$$
\begin{array}{r}
6 \\
84 \,/\, \overline{5\ 2\ 6\,\textcircled{8}} \\
\underline{-5\ 0\ 4}\;\downarrow \\
2\ 2\,\textcircled{8}
\end{array}
$$

Notice that 228 is larger than 84. We know it will divide by 84 more than one
time. We do not know how many times 228 can be divided by 84. We will solve
the problem just as before. Look at the first digit on the left outside the
division sign:

$$
\begin{array}{r}
6 \\
\textcircled{8}4 \,/\, \overline{5\ 2\ 6\ 8} \\
\underline{-5\ 0\ 4} \\
2\ 2\ 8
\end{array}
$$

How many times will 8 go into 22?

$$
\begin{array}{r}
6 \\
84 \,/\, \overline{5\ 2\ 6\ 8} \\
\underline{-5\ 0\ 4} \\
\textcircled{2\ 2}\,8
\end{array}
$$

The answer or quotient is 2. We will place the 2 over the 8 inside our
division sign:

$$
\begin{array}{r}
6\,\textcircled{2} \\
84 \,/\, \overline{5\ 2\ 6\ 8} \\
\underline{-5\ 0\ 4} \\
2\ 2\ 8
\end{array}
$$

Now we multiply 84 x 2 = 168:

```
x      ←        ↑
↓            6 ②
8 4 / 5 2 6 8
       -5 0 4
↓         2 2 ○
=      →  1 6 8
```

Then, we subtract this product:

```
              6 2
8 4 / 5 2 6 8
       -5 0 4
          2 2 8
         -1 6 8
            6 0
```

The difference or remainder is 60. Since 60 is less than 84, we cannot divide by a larger number. There are no more numbers to bring down. Our quotient or answer to 5268 ÷ 84 is 62 with a remainder of 60. Our final solution would look like:

```
              6 2
8 4 / 5 2 6 8
       -5 0 4
          2 2 8
         -1 6 8
            6 0 remainder
```

We can check our work by multiplying 84 x 62 and adding 60:

```
        84
      x 62
       168
       504
      5208
      + 60
      5268
```

EXERCISES: Find the quotient for each problem below.

1. 59/$\overline{826}$ 11. 850 ÷ 50 = _____

2. 22/$\overline{892}$ 12. 954 ÷ 61 = _____

3. 37/$\overline{752}$ 13. 829 ÷ 72 = _____

4. 46/$\overline{598}$ 14. 747 ÷ 83 = _____

5. 65/$\overline{520}$ 15. 658 ÷ 94 = _____

6. 74/$\overline{456}$ 16. 555 ÷ 15 = _____

7. 83/$\overline{372}$ 17. 463 ÷ 26 = _____

8. 92/$\overline{276}$ 18. 370 ÷ 37 = _____

9. 71/$\overline{187}$ 19. 192 ÷ 48 = _____

10. 30/$\overline{900}$ 20. 901 ÷ 19 = _____

NUMERICAL

SKILLS

IN THE

NAVY

MILITARY TIME

Introduction

Military functions have specific times when they must be performed. Personnel responsible for carrying out these functions must maintain the same time schedule. Therefore, military time is standardized using a 24-hour clock that makes it easier to communicate accurately about time.

The wristwatch or clock that you have used as a civilian is based on a 12-hour morning and a 12-hour afternoon/evening. It is necessary to use a.m. or p.m. to show that the time is morning or evening. The military clock differs in that all counting begins and ends at midnight. The midnight is termed 2400 hours; then counting begins anew with 1:00 a.m. being 0100 hours. The hours before ten o'clock of the morning have a zero in front of the number to make all military time standard with a four digit number. Military time does not use the colon (:) that is placed between the digits showing hours and the digits showing minutes in civilian time.

Converting Civilian Time To Military Time

Changing civilian time to military time is easy for the hours between midnight and noon. One step is to add a zero in front (at the left side) of the numbers if the time is between midnight and 9:59 a.m. civilian time. For example, the first step is as follows:

8:50 a.m. is written 08:50 a.m.

Then, the colon (:) is removed from the number:

08:50 a.m. becomes 0850 hours

Thus, 8:50 a.m. in civilian time is 0850 hours in military time.

For times between 10:00 a.m. and 12:00 noon, we only remove the colon to convert from civilian time to military time. For example,

10:20 a.m. is written 1020 hours

We can see that 10:20 a.m. in civilian time becomes 1020 hours in military time.

A special step is necessary if we change civilian time to military time for the hours between noon and midnight. Since there are 12 hours between midnight and noon, it is necessary to add 1200 to civilian time in the p.m. as you change to 24-hour military time.

First, 2:45 p.m. is changed to 245 hours

Then, 245 hours is added to 1200 hours to get 1445 hours

Thus, 2:45 p.m. in civilian time is the same as 1445 hours in military time.

Another example is the following:

9:30 p.m. is changed to 930 hours

930 hours is added to 1200 hours to get 2130 hours

As you can see, 9:30 p.m. in civilian time becomes 2130 hours in military time.

Converting Military Time To Civilian Time

Changing military time to civilian time is simple. If the particular military time is less than 1200 hours, the change requires two steps. First, add a colon between the second and third digits. For example,

1150 hours is written 11:50

Then, a.m. is added to the civilian time since the civilian time is in the morning.

1150 hours becomes 11:50 a.m.

If the military time is less than 1000 hours, the zero is dropped at the beginning of the number:

0712 hours becomes 7:12 a.m.

An extra step is necessary if the military time is later than 1200 hours. You must subtract 1200 from the time. Look at an example using 1525 hours military time.

1525 minus 1200 is 0325

Then, the colon is placed in the number and the zero is dropped at the beginning of the number.

3:25

Since the military time we are using is more than 1200 hours, it is in the afternoon. This means that the time is p.m. in civilian time. Write p.m. following the number:

3:25 p.m.

Therefore, 1525 hours military time is the same as 3:25 p.m. in civilian time.

Lesson 1

OBJECTIVE:

Given the time in civilian or military time, the learner will convert to the other time.

EXERCISES:

Remember that military time is based on a 24-hour day.

Complete these time exercises.

1.   9:15 a.m.   = _____ hrs

2.   7:45 p.m.   = _____ hrs

3. _____ =   1800 hrs

4. _____ =   1715 hrs

5.   6:05 a.m.   = _____ hrs

6. _____ =   0800 hrs

7.   4:24 p.m.   = _____ hrs

8.   3:02 a.m.   = _____ hrs

9.   9:25 p.m.   = _____ hrs

10. _____ =   2350 hrs

11.   11:00 p.m.   = _____ hrs

12.   10:15 a.m.   = _____ hrs

13. _____ =   0902 hrs

14.   1:05 p.m.   = _____ hrs

15. _____ =   2214 hrs

Greenwich Mean Time

The system for standard military time throughout the world is called Greenwich mean time (GMT), named for Greenwich, England. In order to compute GMT, the surface of the earth is divided into 24 zones with each zone covering 15° longitude. Each zone differs by 1 hour from the zone next to it. The initial time zone, also called the zero zone, is known as Greenwich mean time (the "Z" zone on the GMT chart).

The zones that are east of the GMT zero zone are numbered from 1 to 12 to the opposite side of the world from Greenwich, England. They are designated as MINUS because their zone numbers must be SUBTRACTED from local time to obtain GMT. The local time in these zones is ahead of GMT. Each of these zones also has an assigned letter from A through M (J omitted).

The zones that are west of the GMT zero zone are numbered from 1 to 12 to the opposite side of the world. They are designated as PLUS because their zone numbers must be ADDED to local time to obtain GMT. The local time in these zones is behind GMT. Each of these zones also has an assigned letter from N through Y.

The 12th zone is divided by the 180th meridian or 180° longitude. The minus half of the zone lies in the east longitude and the plus half is in the west longitude. The 180th meridian is the international date line.

The time zones of the 48-adjacent states of the United States are based on GMT zones. These time zones and their GMT designations are as follows:

Eastern Standard Time	Zone R (+5)
Central Standard Time	Zone S (+6)
Mountain Standard Time	Zone T (+7)
Pacific Standard Time	Zone U (+8)

Since Central Standard Time (+5) is one hour behind Eastern Standard Time (+6), you have to add one more hour to convert to GMT. You have to add three more hours if you are in the Pacific Standard Time zone (+8) instead of being in the Eastern Standard Time zone (+5).

In converting from local time to GMT, you must add or subtract a number as indicated by the plus or minus sign and the number for your time zone. Using military time, the local time might be 0900 in zone R. Since the sign and number for zone R is +5, you add 5 hours to 0900 to obtain 1400 GMT. You write 1400 GMT as 1400Z (Z being the zero zone for GMT).

GMT is often reported in a form known as a "date-time group" having six numerals. The first two numerals of a date-time group show the day of the month. For example, the date-time group 121730Z is a time for the 12th day of the particular month. Dates between the 1st day of the month and the 9th day of the month are preceeded by a zero (for example, 051133Z). The four numerals that follow show the military time in GMT. For example, 1900 GMT on the eighth day of any month would be written as 081900Z.

GREENWICH MEAN TIME ZONE CHART

HOURS	+12	+11	+10	+9	+8	+7	+6	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12
ZONE	Y	X	W	V	U	T	S	R	Q	P	O	N	Z	A	B	C	D	E	F	G	H	I	K	L	M

Lesson 2

OBJECTIVE:

Given a time zone table, the learner will convert local civilian time to Greenwich mean time.

EXERCISES:

Convert the following to Greenwich mean time.

                                                          Answer

1. 4 August, Zone R, 1:00 p.m.   _____

2. Zone A, 9:00 a.m.   _____

3. Zone G, 11:00 p.m.   _____

4. 10 September, Zone P, 9:30 a.m.   _____

5. Zone W, 8:30 a.m.   _____

6. Zone B, 6:15 a.m.   _____

7. 15 October, Zone S, 6:00 p.m.   _____

8. Zone V, 7:30 p.m.   _____

9. 16 April, Zone O, 11:00 a.m.   _____

10. 4 August, Zone Z, 9:15 a.m.   _____

Lesson 3

OBJECTIVE:

Given specific information on time to complete particular tasks, the learner will perform calculations concerning manhours and lapsed time.

PROCEDURES:

Manhours

The word "manhours" is a term that is used to describe the amount of time to perform a job. One manhour is one person working for a period of one hour. One person working for two hours represents two manhours. The amount of time spent by two or more persons working on a job can be summed by adding the amount of time spent by each person. For example, two persons who use one hour each doing a job spend two manhours (1 + 1) to do the job. Thus, one person who does a job in two hours requires two manhours. Two persons who do the same job in one hour also require two manhours.

Examples:

1. Cleaning a storeroom requires the work of three men for a period of four hours. How many manhours are required to clean the storeroom?

   Number of persons: 3 men
   Amount of time: 4 hours
   Manhours: 3 men x 4 hours = 12 manhours

2. Fourteen manhours are required to chip the paint on a deck area of a ship. If seven men are assigned to the job, how long will it take for them to complete the job?

   Manhours required: 14 manhours
   Number of men: 7 men
   Time required: 14 manhours ÷ 7 men = 2 hours

Lapsed Time

The term "lapsed time" is used to refer to the amount of time between two readings of time. We are in situations frequently where we want to know how long it is between two times or how long it took to do something. The solutions to these problems can be found by computing the lapsed time.

If we are computing the lapsed time within the same hour, the problem is simple.

Example: What is the lapsed time between 0920 hours and 0945 hours?

Solution: We simply subtract the two numbers.
0945 - 0920 hours = 25 minutes.

If we must calculate the lapsed time between two times that are not in the same hour, the problem is more difficult. We must remember that:

1 hour = 60 minutes

The procedures can be illustrated with an example.

Example: How much time will pass between 1430 hours and 1745 hours?

Solution: We must solve the problem in several steps.

Step 1.   Subtract 1430 hours (the beginning time) from the next whole hour (1500 hours). (Remember that 1430 hours means 14.50 hours.)

1500 hours - 1430 = 30 minutes

Step 2.   Subtract 1500 hours from the whole hours at the ending time (1700 hours).

1700 hours - 1500 hours = 2 hours

(Note: This step is not needed if the difference in hours is less than 2 hours.)

Step 3.   Subtract 1700 hours from 1745 hours.

1745 hours - 1700 hours = 45 minutes

Step 4.   Add the minutes obtained in steps 1 and 3.

30 minutes + 45 minutes = 75 minutes

Step 5.   Convert the minutes obtained in step 4 to hours and minutes.

75 minutes = 1 hour 15 minutes

(Note: This step is not needed if the sum obtained in step 4 is less than 60 minutes.)

Step 6.   Add the results in step 2 and step 5 to get the answer.

2 hours + 1 hour 15 minutes = 3 hours 15 minutes

EXERCISES:

A. Review - Multiplication and Divison

1.   9   2.   2.5   3.   5/$\overline{20}$ 4.   3/$\overline{18}$
     x 3   x 6

B. Review - Addition and Subtraction

1. 1625 hours +0120 hours	2. 0940 hours +0335 hours	3. 1350 hours -0215 hours	4. 0830 hours -0145 hours

C. Application

(Remember: Before starting on each exercise, decide whether it deals with manhours or lapsed time. Then, use the appropriate procedures.)

1. The job of painting the outside walls of a barracks requires 16 manhours to complete. If 4 sailors are assigned to do the job, how many hours will they need to finish the job?

Answer_____

2. The inspection of the reduction gears in the engine of a ship requires two sailors with each working four hours. How many manhours are required to do the job?

Answer_____

3. To clean a regulator requires 2.0 manhours. If a man begins at 0930, what time will he finish if he takes a 15 minute smoke break during the job?

Answer_____

4. A work party of nine sailors is assigned a groundskeeping job on a Navy base that will require 3.5 hours for the party to complete. How many manhours are required to do the job?

Answer_____

5. To test a speed-limiting governor requires 0.4 manhours. If you do the job alone and begin at 1300 hours, what time will you finish the job?

Answer_____

6. You take a promotion examination that begins at 1415 hours and ends at 1630 hours. How much time is required to complete the examination?

Answer_____

FINDING DIRECTIONS

Introduction

A compass is an instrument that is used to measure direction or heading. Direction is measured in degrees from North. The magnetic compass is the standard instrument on Navy ships to measure direction. This type of compass contains a magnetized needle attached to a circular compass card. The compass card is divided into 360° and is numbered all the way around in a clockwise direction. The needle and 0° reading on the card always point toward the magnetic North Pole. A line, called the lubber's line, marks the fore-and-aft line of the ship or the ship's heading.
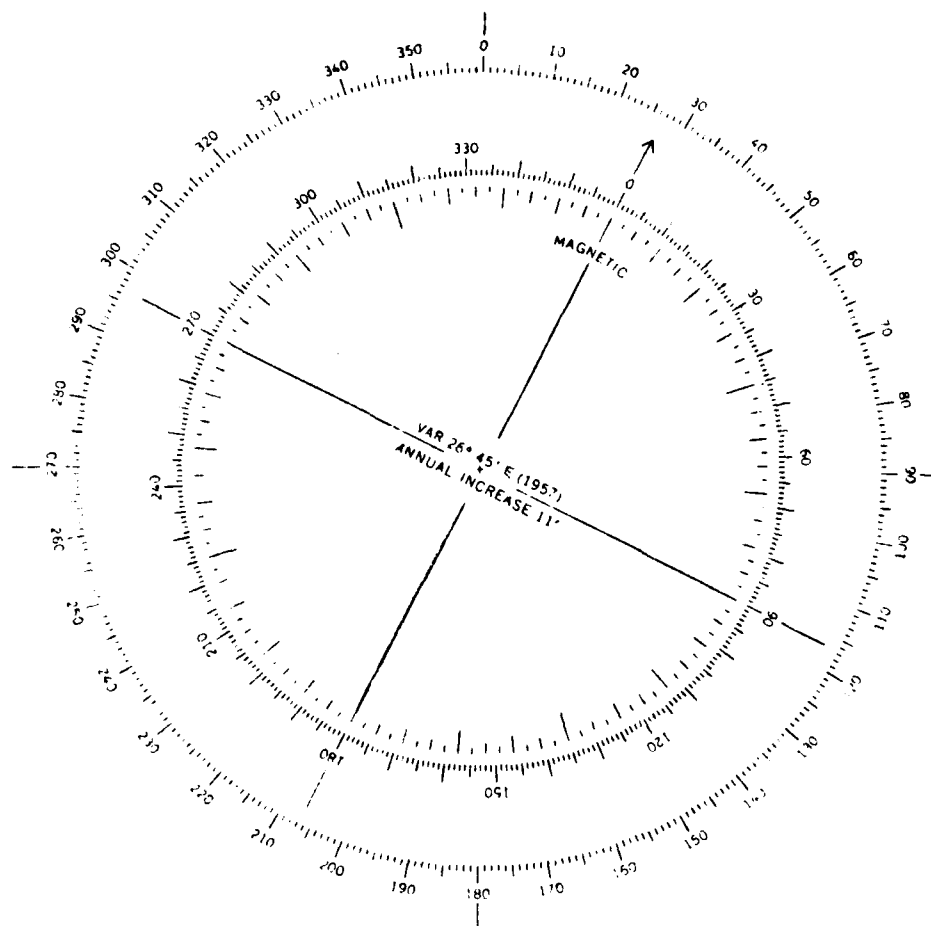
A heading is usually written as a number with three digits followed by the symbol for degrees. The symbol that means degrees is a small, raised circle placed to the right of the number (°). Headings of less than ten degrees are written with zeros as the first two numerals, for example 003°. Headings between ten degrees and ninety-nine degrees are written with a zero as the first numeral, for example 030°. Headings of one hundred degrees or more have a numeral other than zero as the first digit, for example 300°. As you can see, the number of zeros used at the beginning of the number in writing a heading is very important. Note the difference in 003°, 030°, and 300°.

The magnetic compass usually does not point directly North because it points toward the magnetic North Pole rather than the true North Pole. The difference between the true heading and the magnetic heading, called compass error, is composed of variation and deviation. Variation is the difference between the true heading and the magnetic heading. The amount of variation differs at different points on the earth's surface and increases or decreases at a certain know annual rate. Deviation is caused by the magnetic properties of any metal in the vicinity of the compass. The amount of deviation varies depending on the compass heading.

Because of variation and deviation, three types of headings may be used: compass heading, magnetic heading, or true heading. The compass heading is the direction that is read from a ship's compass, for example 030° compass heading. The magnetic heading is the heading in relation to the magnetic North Pole or the compass heading correted for deviation, for example 033° magnetic heading. The true heading is the heading in relation to the true North Pole or the compass heading corrected for both deviation and variation, for example 037° true heading.

A compass heading can be changed or "corrected" to a true heading. On the other hand, a true heading can be changed or "uncorrected" to a compass heading. Variation for a specific locality is shown on the compass card for the locality. The chart shows the variation as of a particular year and the annual increase or decrease. Deviation for a specific compass is shown on a deviation table mounted near the compass. Variation and deviation are given as easterly (°E) or westerly (°W) errors. In converting or correcting from compass headings to true headings, you add easterly errors and subtract westerly errors. In converting or uncorrecting from true headings to compass headings, you subtract easterly errors and add westerly errors.

Definitions

Deviation: The error in a compass reading that is caused by the magnetic properties of metals near the compass

Variation: The difference in degrees between true North and magnetic North at a specific place on the earth's surface

Compass heading: The reading from a ship's compass that shows direction

Magnetic heading: The compass heading corrected for deviation; heading in relation to the magnetic North Pole

True heading: The compass heading corrected for deviation and variation; heading in relation to the true North Pole

Lesson 1

OBJECTIVE:

Given illustrations of compass headings, the learner will read and record the headings.

EXERCISES:

For each exercise, read the compass heading and record the heading to the nearest degree.

1.
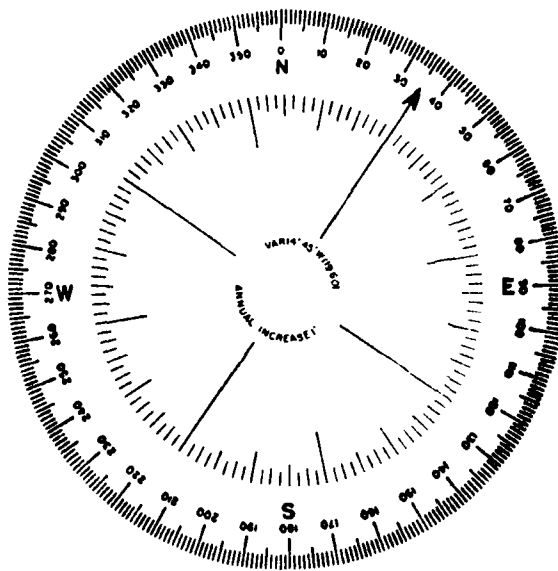
Answer_____

2.
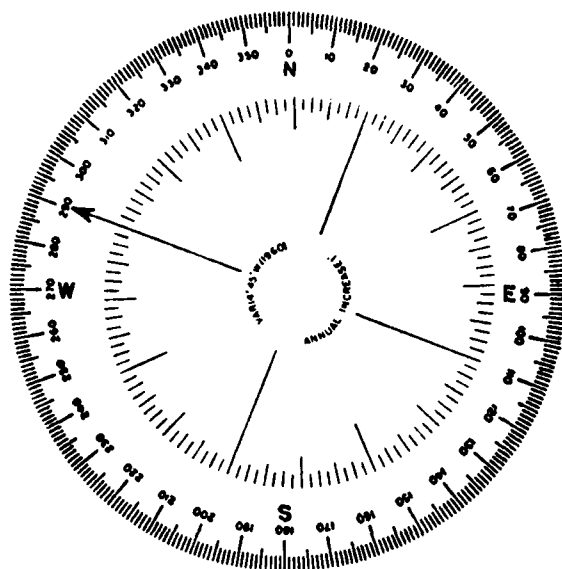
Answer_____

3.
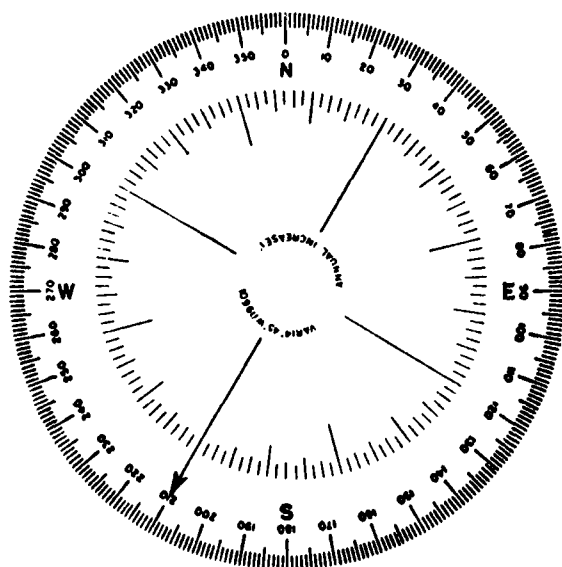
Answer_____

4.
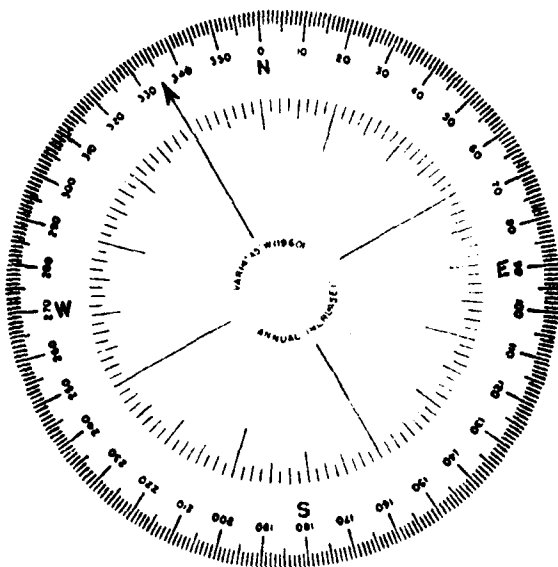
Answer_____

5.
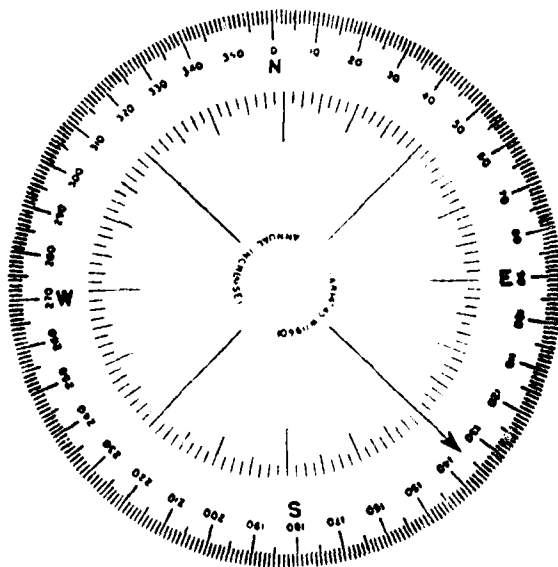
Answer_____

Lesson 2

OBJECTIVE:

Given readings of compass headings and amounts of deviation, the learner will determine the magnetic headings.

EXERCISES:

A. Review - Addition

1.	40 + 9	2.	117 + 14	3.	255 + 10	4.	340 + 15	5.	175 + 9

B. Review - Subtraction

1.	55 - 8	2.	350 - 14	3.	275 - 11	4.	135 - 16	5.	230 - 12

C. Application

(Reminder to the learner: In correcting from compass heading to magnetic heading, ADD easterly (E) deviations and SUBTRACT westerly (W) deviations.)

1. Your compass reading shows a heading of 155°. If the deviation is 12°E, what is the magnetic heading?

Answer_____

2. The compass heading of a ship is 325° and the deviation is 17°W. What is the magnetic heading?

Answer_____

3. A compass heading of 025° is read. With a deviation of 8°W, what is the magnetic heading?

Answer_____

4. If a compass shows a heading of 245° and has a deviation of 9°E, what is the magnetic heading?

Answer_____

5. A compass reading shows a heading of 360°. If the deviation is 14°W, what is the magnetic heading?

Answer_____

Lesson 3

OBJECTIVE:

    Given readings of true headings and amounts of deviations and variations, the learner will determine the magnetic headings and the compass headings.

EXERCISES:

A. Review - Addition

1.	25 + 3	2.	170 + 12	3.	345 + 16	4.	240 + 12	5.	195 + 18

B. Review - Subtraction

1.	125 - 12	2.	330 - 9	3.	275 - 10	4.	150 - 18	5.	85 - 7

C. Application

    (Reminder to learner: In converting or "uncorrecting" from true heading to magnetic heading and from magnetic heading to compass heading, SUBTRACT easterly (E) variations and deviations and ADD westerly (W) variations and deviations.)

    In the exercises that follow, the true heading as might be determined from a chart is given. For each true heading, a variation and a deviation are also given. Compute the magnetic heading and the compass heading for each true heading.

Compass Heading	Deviation	Magnetic Heading	Variation	True Heading
2. _____°	3°W	1. _____°	3°E	030°
4. _____°	1°E	3. _____°	15°W	045°
6. _____°	9°E	5. _____°	12°E	090°
8. _____°	18°E	7. _____°	5°W	135°
10. _____°	16°E	9. _____°	9°E	180°
12. _____°	11°E	11. _____°	6°W	225°
14. _____°	5°W	13. _____°	16°E	270°
16. _____°	17°W	15. _____°	2°W	315°
18. _____°	16°W	17. _____°	7°E	330°
20. _____°	12°W	19. _____°	8°W	360°

ESTIMATING PAINT JOBS

Introduction

A task that you will encounter in your Navy career is painting. The Navy consumes vast quantities of paint both aboard ship and on base and you will need to know how much to order from supply to do each job. To determine how much paint to get from supply, you must know three things: (1) the type of paint to be used, (2) how the paint is to be applied, and (3) the area in square feet to be covered.

PAINT COVERAGE PER GALLON

Type	Application	Square Feet (Sq Ft) Coverage Per Gallon
Enamel	Brush	400 sq ft
Enamel	Spray	500 sq ft
Haze Gray	Brush	500 sq ft
Haze Gray	Roller	500 sq ft
Gray Deck	Brush	500 sq ft

You will probably be told the type of paint and method of application to use. The area to be painted must be calculated in square feet. To estimate the area of a surface to be painted, you must first know its size and shape. The size of many surfaces can be estimated by simply pacing off the distance (about three feet per step) if a ruler or tape measure is not available. Shapes generally fall into one of two possible forms, either the rectangle or the triangle.
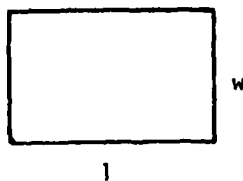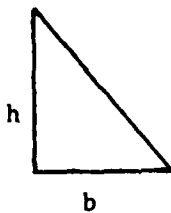
RECTANGLE   TRIANGLE   COMBINATION

The area of a rectangle is determined by multiplying the length (l) times the width (w). In the rectangle above assume the length is 9 feet and the width is 5 feet. Therefore, the total surface to be painted is 45 square feet. (This area is the same as 45 separate blocks, each measuring one foot by one foot.) The square feet of the area is found in the following way:

Area of a rectangle = length (l) x width (w)

$$A = 9 \text{ feet} \times 5 \text{ feet}$$

$$A = 45 \text{ square feet}$$

Example

Calculate the square feet in a rectangular area that is 26 feet long and 6 feet wide.

Step 1: Formula to use to find the area of a rectangle

$$A = l \times w$$

Step 2: Dimensions of the area

$$l = 26 \text{ feet}$$

$$w = 6 \text{ feet}$$

Step 3: Put the dimensions in the formula

$$A = 26 \text{ feet} \times 6 \text{ feet}$$

Step 4: Calculate the answer (area)

$$A = 156 \text{ square feet}$$

The area of a triangle is determined in a similar way. You can see that if the illustration of the rectangle is cut into two pieces with a diagonal line, it forms two equal triangles labeled I and II below.
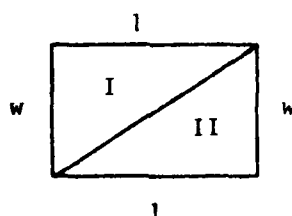
The area of a triangle can then be found by dividing the area of a rectangle by 2.
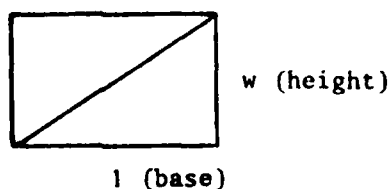
$$A = \frac{l \times w}{2}$$

Some people prefer to use different terms when finding the area of a triangle. For these people, the bottom line of the triangle is called the **base** (the length of the rectangle) and the line from the base to the top of the triangle is called the **height** (the width of the rectangle). Do not be confused by the change in words. To find the area of a triangle, you multiply the base (b) times the height (h) and then divide by two:

$$A = \frac{b \times h}{2}$$ (same as previous formula with different words)

$$A = \frac{9 \text{ feet} \times 5 \text{ feet}}{2}$$

$$A = \frac{45 \text{ square feet}}{2}$$

$$A = 22.5 \text{ square feet}$$

Example

Calculate the square feet in a trianglar area that has a height of 8 feet and a base of 18 feet.

Step 1: Formula to use to find the area of a triangle

$$A = \frac{b \times h}{2}$$

Step 2: Dimensions of the area

$$b = 18 \text{ feet}$$

$$h = 8 \text{ feet}$$

Step 3: Put the dimensions in the formula

$$A = \frac{18 \text{ feet} \times 8 \text{ feet}}{2}$$

Step 4: Calculate the answer

$$A = \frac{144 \text{ square feet}}{2} = 72 \text{ square feet}$$

When surfaces to be painted are odd shaped, you can use a combination of forms to determine the amount of square feet.
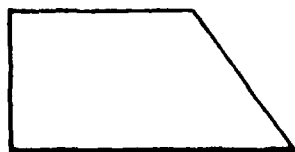
is estimated as   plus

One final point concerning estimates of the amount of paint to be used deals with units of measure. Errors in painting estimates can be made because measurements may be taken in inches or yards rather than in feet. Be sure to translate your units of measure into feet so that the correct amount of paint in gallons can be determined from the paint coverage table.

Remember 12 inches = 1 foot

1 yard   = 3 feet

Symbols of measures:

" = inches

' = feet

Abbreviation:

foot or feet = ft

Lesson 1

OBJECTIVE:

Given the size of an area to be painted, the type of paint, and method of application, the learner will determine the amount of paint required to cover the area.

EXERCISES:

A. Review - Division

1. 400/2,800   2. 500/4,500   3. 400/5,200

4. 4,800 ÷ 400 = _____   5. 7,500 ÷ 500 = _____   6. 4,000 ÷ 500 = _____

B. Review - Formulas

1. One side of a recruit barracks is in need of painting. The bulkhead (wall) has no windows or doors and measures 38 feet by 25 feet. What formula is used to compute the square feet in area in the wall?

Answer_____

2. A trianglar area is to be painted. Give the formula used to compute the area of a triangle.

Answer_____

3. If a surface to be painted has an odd shape, two formulas may be used to compute the area in square feet. What must be done with the two results from using the formulas?

Answer_____

C. Application

(Use the table on the first page of this unit for information on square foot coverage for different types of paints and applications.)

1. A Senior Chief ordered Seaman Alvarez to get enough enamel and brushes to paint a compartment (room) that had 800 square feet of surface. How many gallons of enamel should Seaman Alvarez get from supply?

Answer_____
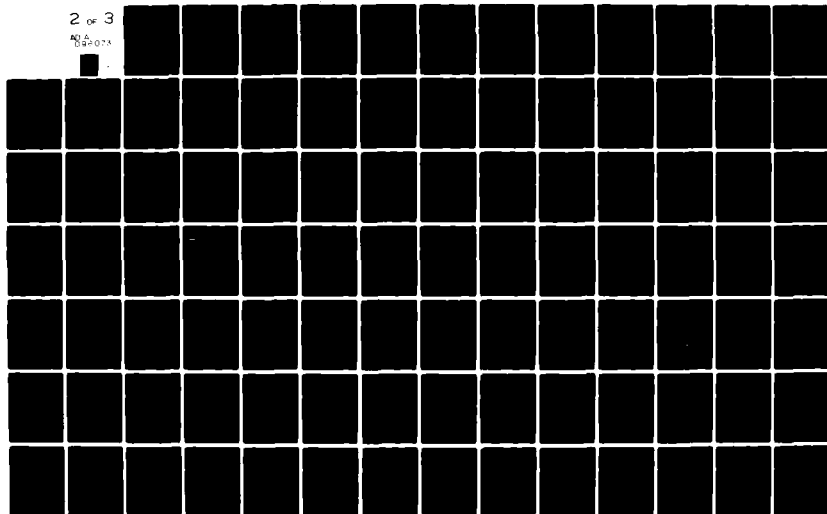
2. Seaman Pearson has been tasked to paint a large arrow on the deck of a ship. Gray deck paint will be applied by brush. How much paint is needed if the total area of the arrow is 2,500 square feet?

Answer_____

3. The Captain wants the outside of the warehouse spray painted. He estimated that the rectangular shape of the surface contained 5,000 square feet. How many gallons of enamel will be needed?

Answer_____

4. Captain Gregg ordered all crosswalks at intersections painted with gray deck paint. The four crosswalks at the twenty intersections cover 16,000 square feet of roadway. How many gallons of paint need to be ordered?

Answer_____

5. The bulkhead space to be painted in twelve buildings measures 96,400 square feet. Commander Browner wants to know how many gallons of enamel will be needed if it is applied by brush?

Answer_____

Lesson 2

OBJECTIVE:

Given the sizes of rectangular and triangular areas, the learner will compute the area in square feet.

EXERCISES:

1.	12	2.	27	3.	23.5	4.	789
	x 4		x 9		x 18		x 6.7

5.	3.3	6.	8.5	7.	13.5	8.	196
	x 4		x 2.5		x 4.3		x 25.3

B. Review - Division

1. 148 ÷ 2 = _____   2. 318 ÷ 2 = _____   3. 750 ÷ 2 = _____

4. 2/$\overline{1,017}$ 5. 2/$\overline{17.6}$ 6. 2/$\overline{39.6}$ 7. 2/$\overline{51.8}$ 8. 2/$\overline{67.85}$

C. Application

Calculate the area in square feet for the following figures.
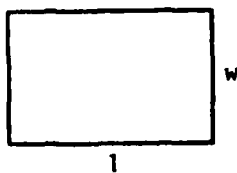
	Rectangle	Answer
1.	length = 12 ft, width = 9 ft	_____
2.	length = 7.5 ft, width = 9 ft	_____
3.	length = 123 ft, width = 2.5 ft	_____
4.	length = 3.5 ft, width = 5.5 ft	_____
5.	length = 25 ft, width = 8.3 ft	_____
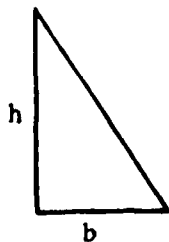
	Triangle	Answer
6.	base = 7 ft, height = 12 ft	_____
7.	base = 13.3 ft, height = 8 ft	_____
8.	base = 15.7 ft, height = 18.5 ft	_____
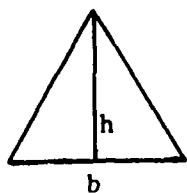
Triangle   Answer

9. base = 12 ft, height = 12 ft   _____

10. base = 142 ft, height = 17.5 ft   _____

11. base = 6.7 ft, height = 7.3 ft   _____

15'

8'

x   y   z

25'
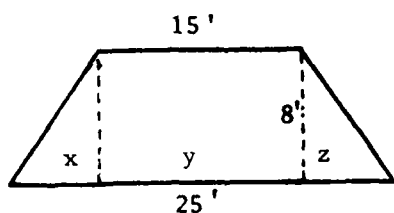
Combined Figures

Think of the
figure as three
pieces

x 8'   y 8'   8' z

5'   15'   5'
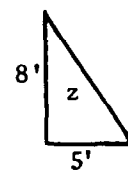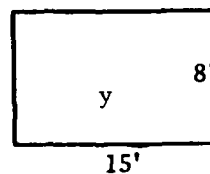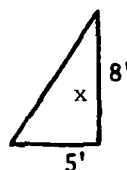
$$A_x = \frac{b \times h}{2}$$ $$A_y = l \times w$$ $$A_z = \frac{b \times h}{2}$$

$$A_x = \frac{5 \text{ ft} \times 8 \text{ ft}}{2}$$ $$A_y = 15 \text{ ft} \times 8 \text{ ft}$$ $$A_z = \frac{5 \text{ ft} \times 8 \text{ ft}}{2}$$

$$A_x = \frac{40 \text{ sq ft}}{2}$$ $$A_y = 120 \text{ sq ft}$$ $$A_z = \frac{40 \text{ sq ft}}{2}$$

$$A_x = 20 \text{ sq ft}$$ $$A_z = 20 \text{ sq ft}$$

$$A_x = 20 \text{ sq ft}$$

$$A_y = 120 \text{ sq ft}$$

$$A_z = \underline{\ 20\ } \text{ sq ft}$$

Total Area = 160 sq ft

Answer

A

B

|-------- C -------|
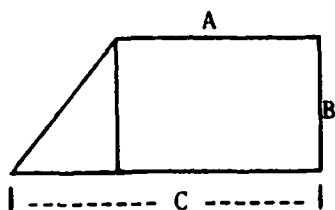
12. A = 12 ft, B = 8 ft, C = 16 ft

_____

13. A = 18 ft, B = 7 ft, C = 25 ft

_____

14. A = 12.5 ft, B = 6.3 ft, C = 21.5 ft

_____

Lesson 3

OBJECTIVE:

Given the sizes of areas to be painted, the learner will determine the amount of paint to cover the areas using different types of paints and applications.

EXERCISES:

A. Review - Multiplication

1. 120 x 25 = _____   2. 87 x 22 = _____   3. 12 x 48 = _____

4. 60 x 3.3 = _____   5. 25 x 6.5 = _____   6. 17 x 5.7 = _____

B. Review - Division

1. 420 ÷ 2 = _____   2. 1,071 ÷ 2 = _____   3. 742 ÷ 2 = _____

4. 400/7,600   5. 500/9,250   6. 400/5,100

C. Application

Use the table in the "Introduction" of this unit to solve the exercises below. Calculate your answers to one decimal place.

1. How much paint is needed for each figure using the type of paint and application method specified?

a.

50'

120'
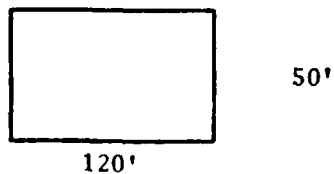
Enamel, Brush   Answer_____

b.

15'

27'
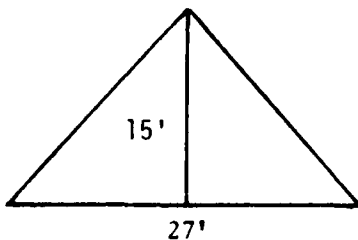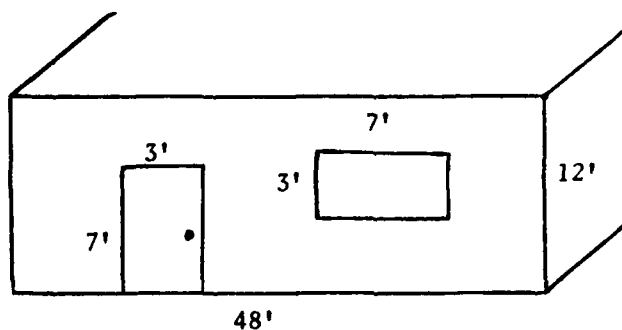
Haze Gray, Brush   Answer_____

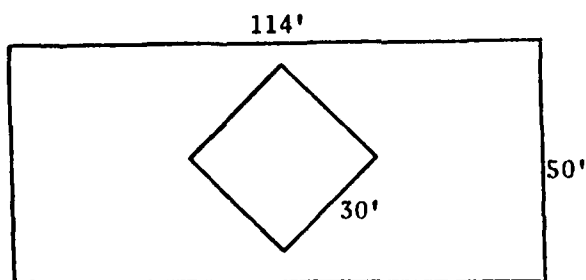c.
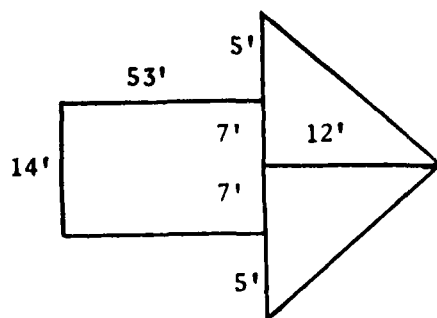
Gray Deck, Brush   Answer_____

d.

(Find area of surface less window and door)

Enamel, Spray   Answer_____

e.

(Paint the area
outside the square)

Haze Gray, Roller   Answer_____

2. Senior Chief Walsh needs a single stripe 18 inches wide painted down the center of the warehouse. He plans to use gray deck paint and have it brushed the full length of the warehouse which is 132 feet long. How much paint does he need?

Answer_____

3. Master Chief Collins has received orders to paint the indoor firing range bulkheads with enamel. This job involves painting 2 rectangular side bulkheads; each is 108 feet long and 23 feet high. The end bulkhead is 32 feet long and 23 feet high. How many gallons will he need to spray the three bulkheads?

Answer_____

4. Commander Harris has instructions to paint the stalls in the head. There are 19 metal partitions measuring 5.5 feet by 6 feet for the 18 heads. How much enamel will he need to brush both sides of these partitions? (Note: remember that each partition has two sides.)

Answer_____

5. Orders have been given to paint both sides of all the doors in building A-1. Enamel is to be brushed on a total of 42 doors. The doors have the following sizes:

a.   25 doors: 6' 9" by 3'

b.   10 doors: 6' 9" by 3' 6"

c.   7 doors: 6' 9" by 4'

How much paint is needed?

Answer_____

TACKLES AND HOOKS

Introduction

Many times in your Navy life, you will use tackles and hooks. These are simple machines which help you multiply the applied force so that loads can be lifted easier. No doubt you have used these tools to lift an automobile engine, to lift a rack of hay, or to hold a boat in place. This unit deals with the mathematical aspect of tackles and hooks so that you will understand why they multiply the force.

Since tackle is used to multiply the force applied to a load, it is necessary to determine the advantage (called mechanical advantage) which enables a smaller force to lift a heavy load. To determine the mechanical advantage (MA) of a tackle, count the number of falls (lines) extending from it. Figure 1 shows 4 lines extending from the tackle; therefore, its mechanical advantage is 4 to 1, which may be written as 4:1 or $\frac{4}{1}$

Figure 1

Figure 2

What is the mechanical advantage of the tackle in Figure 2? If you count the falls (lines) extending from the block, you will see there are two. Thus, the mechanical advantage is 2 to 1.

The load (L) in pounds that can be lifted equals the mechanical advantage (MA) of a tackle times the applied force (F) expressed in pounds. Mathematically, this statement can be written as a formula:

$$L = MA \times F$$

We can use the formula to find the load that can be lifted if the tackle has a given mechanical advantage and a specific force is applied. For example:

$$MA = 4:1 \text{ or } \frac{4}{1}$$

$$F = 50 \text{ lbs}$$

$$L = \frac{4}{1} \times 50 \text{ lbs} = 200 \text{ lbs}$$

(Note: Abbreviation for pound is <u>lb</u> and for pounds is <u>lbs</u>)

In other words, a force of 50 pounds applied with a tackle having a mechanical advantage of 4:1 can lift a load of 200 pounds.

The mechanical advantage (MA) of a tackle can be found if we divide the weight of a load (L) by the force (F) required to lift it. The formula for finding the mechanical advantage is:

$$MA = \frac{L}{F}$$

If a force of 50 pounds is required to lift a load weighing 200 pounds, the mechanical advantage is calculated as follows:

$$MA = \frac{200 \text{ lbs}}{50 \text{ lbs}}$$

$$MA = 4 \text{ (or 4:1 or 4 to 1)}$$

If a force of 50 pounds can lift a weight of 200 pounds, the mechanical advantage of the tackle is 4 to 1.

The force (F) required to lift a particular load (L) can be calculated if we divide the load by the mechanical advantage (MA) of the tackle. Expressed mathematically, the formula to find the force is:

$$F = \frac{L}{MA}$$

If a load weighing 200 pounds is lifted with a tackle having a mechanical advantage of 4 to 1 (or 4), the force required is found as follows:

$$F = \frac{200 \text{ lbs}}{4}$$

$$F = 50 \text{ lbs}$$

The answer shows that a force of 50 pounds is required to lift a weight of 200 pounds if the mechanical advantage of the tackle is 4 to 1.

Problems involving tackles can require the computation of load (L), mechancial advantage (MA), or force (F).

Example: A force of 75 pounds can lift a load of 375 pounds
            with a particular tackle. What is the mechanical
            advantage of the tackle?

Solution: We must decide whether the problem deals with L, MA,
            or F. The question tells us that we need to find
            the MA.

Step 1:   Choose the formula to compute MA.

$$MA = \frac{L}{F}$$

Step 2:   Identify the L and F stated in the problem.

L = 375 pounds

F = 75 pounds

Step 3:   Put these values in the formula for MA.

$$MA = \frac{375 \text{ pounds}}{75 \text{ pounds}}$$

Step 4:   Solve the problem.

MA = 5

Note: The MA is usually stated as a ratio of a number "to
        one."

The answer to the problem is:

MA = 5 to 1

Lesson 1

OBJECTIVE:

Given *two of the three factors needed*, the learner will be able to calculate the mechanical advantage, force, or load for a tackle system.

EXERCISES:

A. Review - Division

1. 50/2,000‾

2. 40/1,680‾

3. 150/750‾

4. 5/750‾

5. 4/880‾

6. 3/960‾

B. Review - Multiplication

1.   200
    x 4

2.   450
    x 2

3.   650
    x 3

C. Application

1. What is the mechanical advantage of the following tackle systems?

a.

b.

c.

MA = _____ to _____   MA = _____ to _____   MA = _____ to _____

2. If the mechanical advantage of a tackle is 4 to 1, what force is needed to lift a load of 2,200 pounds?

Answer_____

3. A force of 50 pounds will lift a load weighing 300 pounds. What is the mechanical advantage of the system?

Answer_____

4. The mechanical advantage of a system is 5 to 1 and a force of 300 pounds is applied. What is the weight of the largest load that can be lifted?

                                                    Answer_____

5. A system requires a force of 200 pounds to lift 400 pound load. What is the mechanical advantage of the system?

                                                    Answer_____

6. A system with a mechanical advantage of 4 to 1 has a force of 150 pounds applied to lift a load. How much does the load weigh?

                                                    Answer_____

7. The mechanical advantage of a system is 6 to 1. What force is needed to lift a 900 pound load?

                                                    Answer_____

8. The mechanical advantage of a system is 3 to 1. What force is required to lift a 1,200 pound load?

                                                    Answer_____

9. The force required to lift a 3,000 pound weight is 500 pounds. What is the mechanical advantage of the system?

                                                    Answer_____

10. A system has a mechanical advantage of 5 to 1. What force is needed to lift a load of one ton?

                                                    Answer_____

FLOODING RATES

Introduction

Investigators must make accurate reports on damage that occurs to a ship
in an accident or a war. A hole in a ship will cause flooding if the hole is
beneath the surface of the water. The amount of flooding depends on the dia-
meter of the hole and the depth of the hole beneath the surface of the water.
An accurate estimate of these two factors is needed to determine the number
and types of pumps that are required to remove the water.

The flooding rate in gallons per minute (gpm) can be determined from pre-
pared tables. However, estimates of the diameter of the hole and its depth
below water are needed to use such tables. The amount of water in gallons
that will pass through the hole can be calculated for a specific period of
time by multiplying the flooding rate by the time in minutes.

USE OF TABLE:

Using the "Table of Flooding Rates" presented on the next page will be
explained using an example.

> Example: An accident makes a hole in a ship below the surface of the
> water. A sailor estimates that the hole has a diameter of
> 5 inches and is 6 feet below the water. How many gallons
> of water will be flooded into the compartment before pump-
> ing operations begin 8 minutes after the hole is made?

The solution to the problem requires specific steps. First, use the
table to find the flooding rate for a hole that has a diameter of 5 inches and
is 6 feet under the water. Look across the top of the table under the heading
"Diameter of Hole (inches)" to find the column with 5" at the top. Look down
the left side of the table under the heading "Depth of Hole (feet) Beneath
Water" to find the row with 6' at the side. The number where the column and
row meet shows a flooding rate of 741 gallons per minute (gpm).

Then, multiply the flooding rate for the particular hole (741 gpm) times
the number of minutes of flooding (8 minutes) to find the amount of water
flooded into the compartment.

$$741 \times 8 = 5,928$$

The calculation shows that 5,928 gallons of water would flood through the hole
in 8 minutes.

TABLE OF FLOODING RATES
(Gallons Per Minutes*)

Diameters of Hole (inches)

Depth of Hole (feet) Beneath	1"	2"	3"	4"	5"	6"	7"	8"	9"	10"
1'	13	49	109	194	303	436	593	775	980	1,210
2'	18	69	154	274	428	616	839	1,095	1,386	1,711
3'	21	84	189	336	524	755	1,027	1,341	1,697	2,095
4'	25	97	218	388	605	871	1,186	1,549	1,960	2,420
5'	28	109	244	433	677	974	1,326	1,731	2,191	2,705
6'	30	119	267	475	741	1,067	1,452	1,897	2,400	2,963
7'	33	129	289	513	801	1,153	1,569	2,049	2,593	3,201
8'	35	137	308	548	856	1,232	1,677	2,190	2,772	3,422
9'	37	146	327	581	908	1,307	1,778	2,323	2,940	3,629
10'	39	153	345	612	957	1,377	1,875	2,448	3,099	3,825

Note: Flooding rate (gallons per minute) equals the product of: area (A) of the hole (square inches), square root of depth (D) of the hole below the surface of the water (feet), and a constant or fixed value of 15.4

$$Rate = A \times \sqrt{D} \times 15.4$$

*Table entries are rounded up to the nearest gallon based on use of numbers to four decimal places in the computations.

Lesson 1

OBJECTIVE:

Given a table of flooding rates in gallons per minute (gpm) for particular sizes of holes and depths under water, the learner will read the flooding rates for specific size holes and depths under water.

EXERCISES:

Use the Table of Flooding Rates on the previous page to read the values for the exercises below.

Depth of Hole Under Water	Diameter of Hole	Flooding Rate	
8'	5"	1.	_____ gpm
3'	9"	2.	_____ gpm
5'	2"	3.	_____ gpm
9'	6"	4.	_____ gpm
4'	1"	5.	_____ gpm
2'	10"	6.	_____ gpm
6'	3"	7.	_____ gpm
7'	7"	8.	_____ gpm
10'	4"	9.	_____ gpm
1'	8"	10.	_____ gpm

Lesson 2

OBJECTIVE:

Given the sizes of holes and depths under water, the learner will use values from a table to compute the amount of flooding for specific periods of time.

EXERCISES:

A. Review - Multiplication

1.	367 x 14	2.	1,234 x 7	3.	537 x 10	4.	2,872 x 3	5.	465 x 6

B. Application

Use the Table of Flooding Rates presented earlier to do the exercises below.

Depth of Hole Under Water	Diameter of Hole	Minutes of Flooding		Gallons of Water Flooded
4'	7"	5 min.	1.	_____
9'	3"	4 min.	2.	_____
5'	6"	7 min.	3.	_____
2'	4"	12 min.	4.	_____
7'	6"	3 min.	5.	_____
8'	9"	15 min.	6.	_____

MEASURING TEMPERATURE

Introduction

Temperature scales are used to measure how hot or cold something is. The two temperature scales that are used are the Fahrenheit scale (°F) and the Celsius scale (°C). The Fahrenheit scale is still used in this country for most measurements of temperature. The movement toward metric measurement can be expected to increase the use of the Celsius scale.

Each temperature scale has two main reference points: the boiling point of pure water and the freezing point of pure water. The boiling point is 212°F or 100°C. The freezing point is 32°F or 0°C. The difference between the two points is 180°F or 100°C. A comparison of the units for the two scales shows that 1°C = 1.8°F (180°/100°) and 1°F = .56°C (100°/180°). It should be noted that each scale can measure temperatures below zero as indicated by use of the minus sign (-).

The conversion of temperature measurements from one scale to the other scale can be made using appropriate formulas.

Fahrenheit scale to Celsius scale

$$°C = (°F - 32°) : 1.8$$

The formula expressed in words says:

Degrees Celsius equals the difference between degrees Fahrenheit and 32° divided by 1.8.

Example: Convert 212°F to °C.

Formula: $°C = (°F - 32°) : 1.8$

Solution: $°C = (212° - 32°) : 1.8$

$°C = 180° : 1.8 = 100°$

Celsius scale to Fahrenheit scale

$$°F = (°C \times 1.8) + 32°$$

The formula expressed in words says:

Degrees Fahrenheit equals the sum of two numbers: (1) degrees Celsius times 1.8 and (2) 32°

Example: Convert 50°C to °F

Formula: $°F = (°C \times 1.8) + 32°$

Solution: $°F = (50° \times 1.8) + 32°$

$°F = 90° + 32° = 122°$

Lesson 1

OBJECTIVE:

Given a figure showing the Fahrenheit and Celsius scales for measuring temperature, the learner will estimate the temperature on one scale when given the temperature on the other scale.

EXERCISES:

Using the figure below, estimate the Fahrenheit temperature (°F) or the Celsius temperature (°C) for the temperature given.

FAHRENHEIT SCALE   CELSIUS SCALE

FAHRENHEIT   CELSIUS
TEMPERATURES   TEMPERATURES

°F 270	266		130 °C
260			
250	248		120
240			
230	230		110
220			
210	212	WATER BOILS OR CONDENSES	100
200			90
190	194		
180	176		80
170			
160	158		70
150			
140	140		60
130			
120	122		50
110	104		40
100			
90	86		30
80			
70	68		20
60			
50	50		10
40			
32	32	ICE MELTS - WATER FREEZES	0
20			
10	14		-10
0	4		-20
-10			
-20	22		-30
-30			
-40	40		-40

180 DIVISIONS   100 DIVISIONS

MERCURY

MELTING ICE

BOILING WATER

1. 50°C = _____ °F   6. 110°F = _____ °C

2. 74°F = _____ °C   7. 25°C = _____ °F

3. -25°C = _____ °F   8. -10°F = _____ °C

4. 200°F = _____ °C   9. 85°C = _____ °F

5. 67°C = _____ °F   10. 98°F = _____ °C

Lesson 2

OBJECTIVE:

Given a temperature in degrees Celsius, the learner will determine the equivalent degrees Fahrenheit.

EXERCISES:

A. Review - Addition

1.	47	2.	65	3.	25	4.	77	5.	189
	+32		+32		+32		+32		+ 32

B. Review - Multiplication

1.	8	2.	23	3.	60	4.	121	5.	82
	x 1.8		x 1.8		x 1.8		x 1.8		x 1.8

C. Application

To do the exercises below, use the formula:

$$°F = (°C \times 1.8) + 32°$$

Report your answer to the nearest degree.

1. Standard barometric pressure is based on measurement at sea level with the temperature at 15°C. What is the temperature in °F?

    Answer_____

2. If superheated steam has a temperature of 149°C, what is the temperature in °F?

    Answer_____

3. A milk dispenser should keep milk at about 5°C. What is the approximate °F?

    Answer_____

4. The oven temperature for baking a particular bread is 210°C. What is the required temperature in °F?

    Answer_____

5. An electric griddle has a maximum temperature of 228°C. What is its maximum temperature in °F?

    Answer_____

Lesson 3

OBJECTIVE:

Given a temperature in degrees Fahrenheit, the learner will determine the equivalent degrees Celsius.

EXERCISES:

A. Review - Subtraction

1. 142   2.   87   3.   245   4.   121   5.   201
   - 32   -32   - 32   - 32   - 32

B. Review - Division

1.   1.8/$\overline{54}$ 2.   1.8/$\overline{99}$ 3.   1.8/$\overline{81}$

4.   44 : 1.8 = _____   5.   128 ÷ 1.8 = _____

C. Application

To do the exercises below, use the formula:

$$°C = (°F - 32°) ÷ 1.8$$

Report your answer to the nearest degree.

1. The compression stroke of a diesel engine may cause the temperature of the air in the cylinder to reach 800°F. How hot would the air be in °C?

Answer_____

2. Temperature in the stratosphere averages about 67°F. What is the average temperature in °C?

Answer_____

3. The lowest temperature theoretically possible is called absolute zero which is -460°F. What is the temperature of absolute zero in °C?

Answer_____

4. Temperatures above 140°F kill most bacteria if maintained long enough. How many °C does 140°F equal?

Answer_____

5. Oxygen at or below -297°F remains in a liquid state. What temperature does -297°F equal in °C?

Answer_____

BREAKING STRENGTH AND SAFE WORKING LOAD
(Lines and Wire Ropes)

Introduction

Lines and wire rope are essential tools used in the Navy for many purposes. Major uses of lines and wire rope are to lift cargo and to fasten cargo so that it remains in place during transport. These tools must be capable of holding during times of stress to insure that the cargo does not become damaged. It is also important that they hold under stress conditions to prevent possible injuries to personnel.

As a member of the Navy, you will be using lines and wire rope from time to time. You will soon become aware of the importance of these tools. The exercises on this topic will involve calculating the breaking strength and safeworking loads of lines and wire rope. To perform your calculations, you will need to refer to (1) comparison factors, (2) safety factors, (3) symbols, and (4) formulas.

The computation of the breaking strength (BS) of synthetic lines requires the use of a comparison factor (CF). Synthetics include nylon, polyester, polyethylene, and polyproplene. The strength of manila line is used as the standard to compare the strength of synthetic lines. The comparison factors for synthetics show that they are stronger than manila line. The table of CF values for synthetics is presented below.

COMPARISON FACTORS (CF) FOR SYNTHETIC LINES

Type of Synthetic	Strength*
Nylon	2.5
Polyester (Dacron)	2.0
Polyethylene	1.4
Polypropylene	1.4

*Based on rating of manila as 1.0

The safe working load (SWL) of a line or wire rope is the load (in pounds) that can be moved safely and economically with the line or wire rope. The SWL is obtained by dividing a number, called the safety factor (SF), into the breaking strength (BS) of the line or wire rope. The SF is based on the type of line or wire rope and its condition. The table of SF values for lines and wire ropes is presented next.

SAFETY FACTORS (SF) FOR VARIOUS LINES AND WIRE ROPE

Working Conditions	Types of Line and Wire Rope			
	Manila	Nylon/ Polyester	Polypropylene/ Polyethylene	Wire Rope
Best	5	3	5	5
Average	10	4	6	(increase
Poor	15	6	8	for wear)

SYMBOLS NEEDED:

    BS: breaking strength in pounds
    SWL: safe working load for a single part of a line or wire rope
    CF: comparison factor (synthetics to manila)
    SF: safety factor
     C: circumference in inches
     D: diameter in inches

FORMULAS NEEDED:

1. Breaking strength (BS) and safe working (SWL) of <u>manila</u>:

    a. $BS = C^2 \times 900$ pounds   Note: $C^2 = C \times C$

    b. $SWL = \dfrac{BS}{SF}$

2. Breaking strength (BS) and safe working load (SWL) of <u>synthetics</u> (nylon, polyester, polyethylene, or polypropylene):

    a. $BS = C^2 \times 900$ pounds $\times CF$

    b. $SWL = \dfrac{BS}{SF}$

3. Breaking strength (BS) and safe working load (SWL) of <u>wire rope</u>:

    a. $BS = C^2 \times 8,000$ pounds

    b. $SWL = \dfrac{BS}{SF}$

    Note: If wire is galvanized, reduce the breaking strength by 10%.

4. Circumference:

$$C = 3.14 \times D$$

IMPORTANT NOTE:

<u>Lines</u> are measured by circumference (C). For example, a 3-inch line has a circumference of 3 inches.

<u>Wire rope</u> is measured by diameter (D). For example, a 2-inch wire rope has a diameter of 2 inches.

Lesson 1

OBJECTIVE:

Given tabular information and formulas, the learner will compute the breaking strength (BS) for different types of lines and wire ropes.

PROCEDURES:

The procedures for finding the breaking strength (BS) of lines and wire ropes can be shown by an example.

Example   What is the BS of a 3-inch polyester line?

Solution:

Step 1.   Find the formula for computing the (BS) of a polyester line.

$$BS = C^2 \times 900 \times CF \text{ pounds}$$

Step 2.   Since synthetic lines have a comparison factor (CF), find the CF in the table of comparison factors.

$$CF = 2.0 \text{ for a polyester line}$$

Step 3.   Put the values in the formula.

$$BS = 3^2 \times 900 \times 2 \text{ pounds}$$

Step 4.   Calculate the BS.

$$BS = 3 \times 3 \times 900 \times 2 \text{ pounds}$$

$$BS = 16,200 \text{ pounds for a 3-inch polyester line}$$

EXERCISES:

A. Review - Multiplication

1. 2 x 610 = _____   2. 5 x 840 = _____   3. 9 x 915 = _____

4. 12 x 12 x 2 = _____   5. 6 x 6 x 8 = _____   6. 3.14 x 2 = _____

B. Application

1. Find the BS of a 2-inch manila line.

Answer_____

2. Determine the BS of a 3-inch polypropylene line.

Answer_____

3. What is the BS of a 2.5-inch polyethylene line?

Answer_____

4. What is the BS of a wire rope that is 1-inch in diameter?

Answer_____

5. Determine the BS of a 4-inch nylon line.

Answer_____

Lesson 2

OBJECTIVE:

Given tabular information and formulas, the learner will compute the safe working load (SWL) for different types of line and wire rope.

PROCEDURES:

The procedures for finding the safe working load (SWL) of lines and wire ropes can be shown by an example.

Example What is the SWL of a 2-inch diameter wire rope that is in used condition with a safety factor (SF) of 10?

Solution:

Step 1. Find the formula for computing the SWL of a wire rope.

$$SWL = \frac{BS}{SF}$$

Step 2. The formula shows that the BS must be calculated first. The formula to find the BS of wire rope is:

$$BS = C^2 \times 8,000 \text{ pounds}$$

Step 3. Since wire rope is measured in diameter, the circumference (C) must be calculated. (This step is not needed to compute the SWL for lines since they are measured by circumference.)

$$C = 3.14 \times D$$

$$C = 3.14 \times 2 = 6.28$$

Step 4. Put the values in the formula for the BS of wire ropes.

$$BS = 6.28 \times 6.28 \times 8,000 \text{ pounds}$$

Step 5. Calculate the BS.

$$BS = 39.4344 \times 8,000 \text{ pounds} = 315,475.2 \text{ pounds}$$

Step 6. The numbers to be put in the formula for SWL are BS = 325,475.2 (computed) and SF = 10 (stated in the problem.) Put the values in the formula for SWL.

$$SWL = \frac{315,475.2}{10} \text{ pounds}$$

Step 7. Calculate the SWL.

$$SWL = 31,547.52 \text{ pounds}$$

EXERCISES:

A. Review - Division

1. $4/\overline{3,160}$ 2. $8/\overline{5,280}$ 3. $12/\overline{6,780}$

4. $16/\overline{2,160}$ 5. $2,000/\overline{8,000}$

B. Application

1. Find the SWL of a 2-inch manila line that has been used many times and is in poor condition.

Answer_____

2. Calculate the SWL of a new 2-inch diameter wire rope.

Answer_____

3. Find the SWL of a 3-inch polyester line that is in average condition.

Answer_____

4. Calculate the SWL of a 1-inch diameter wire rope that is in poor condition. (Use a SF of 20.)

Answer_____

5. A 4-inch manila line in average condition is selected to lift a load weighing 1,200 pounds. Will this line be safe to lift the load?

Answer_____

6. Calculate the SWL of a new 3-inch diameter galvanized wire rope.

Answer_____

7. Find the SWL of a 5-inch polyethylene line in excellent condition. Report your answer to the nearest ton. (A ton equals 2,000 pounds.)

Answer_____

NUMERICAL

SKILLS

IN

PERSONAL

FINANCES

BASIC PAY

Introduction

As a member of the Navy, you will want to know how to do calculations with your military pay. This task requires information from a table on basic pay. You will need to use the numerical skills of addition, subtraction, multiplication, and division and to work with decimals.

Basic pay for enlisted personnel is found in a table that shows monthly pay based on your status in the Navy. (See table that follows.) To find your basic pay, you need to know your pay grade and years of service. In the table, each pay grade is listed on the left side under the heading "Pay Grade" and is preceded by the letter "E." The headings at the top show the "Years of Service" categories beginning with "Under 2" and increasing to "Over 26" years of service. The number in each space shows the monthly basic pay for a particular pay grade and years of service. If your years of service are not shown at the top of the table, you use the heading for the years of service that is closest but smaller than yours. For example, if you have five years of service, you use the heading for "Over 4" years of service to find your monthly basic pay.

In addition to basic pay, you could receive allowances for quarters and subsistence. The allowance for quarters is based on pay grade and differs for personnel without dependents (full rate or partial rate) and personnel with dependents. The allowance for subsistence varies according to the condition under which it is received. The total pay received for a month would be the monthly basic pay plus any allowances for quarters and subsistence.

An example will show you how to use the table to find your monthly basic pay. Petty Officer E-4 Jack Jones has completed three years of service in the Navy. How much is his monthly basic pay? Look at the following portion of the basic pay table:

Years of Service

Pay Grade	Under 2	Over 2	Over 3	Over 4	Over 5
E-5	562.20	611.70	641.40	669.30	713.10
E-4	540.30	570.60	603.90	651.00	676.80
E-3	519.60	548.10	570.30	592.80	

Look on the left side of the table under the heading "Pay Grade" and find the row labeled "E-4." Then, look across the top of the table under the heading "Years of Service" and find the column labeled "Over 3." The box where the row labeled "E-4" and the column labeled "Over 3" meet shows the monthly basic pay for an E-4 with three years of service. The amount shown in the box is $603.90 per month. The same procedures are used to find the basic pay for any combination of pay grade and years of service shown in the table.

MONTHLY BASIC PAY - ENLISTED MILITARY MEMBERS
MONTHLY BASIC PAY

Years of Service

Pay Grade	Under 2	Over 2	Over 3	Over 4	Over 6	Over 8	Over 10	Over 12	Over 14	Over 16	Over 18	Over 20	Over 22	Over 26
E-9							1265.40	1294.20	1323.60	1354.30	1384.20	1411.20	1485.60	1629.60
E-8						1061.70	1091.40	1120.50	1149.90	1179.90	1207.20	1236.90	1309.50	1455.60
E-7	741.30	800.10	829.80	858.60	888.30	916.20	945.60	975.00	1019.10	1047.90	1077.60	1091.40	1164.90	1309.50
E-6	640.20	698.10	727.20	757.80	786.00	814.80	844.80	888.30	916.20	945.60	960.00			
E-5	562.20	611.70	641.40	669.30	713.10	742.20	771.90	800.10	814.80					
E-4	540.30	570.60	603.90	651.00	676.80									
E-3	519.60	548.10	570.30	592.80										
E-2	500.10													
E-1	448.80													

Monthly Basic Allowance for Quarters Rates

Pay Grade	Without Dependents Full Rate	Without Dependents Partial Rate	With Dependents
E-9	$205.20	$18.60	$288.60
E-8	189.00	15.30	266.70
E-7	160.80	12.00	248.10
E-6	146.10	9.90	228.30
E-5	140.40	8.70	209.70
E-4	123.90	8.10	180.60
E-3	110.70	7.80	160.80
E-2	97.30	7.20	160.80
E-1	92.40	6.90	160.80

Basic Allowance for Subsistence Rates

Enlisted Members

When on leave or authorized to mess separately	$3.21 per day
When rations in-kind are not available	$3.62 per day
When assigned to duty under emergency conditions where no messing facilities of the United States are available	$4.79 per day

MONTHLY BASIC PAY - ENLISTED MILITARY MEMBERS
MONTHLY BASIC PAY

Years of Service

Pay Grade	Under 2	Over 2	Over 3	Over 4	Over 6	Over 8	Over 10	Over 12	Over 14	Over 16	Over 18	Over 20	Over 22	Over 26
E-9							1265.40	1294.20	1323.60	1354.30	1384.20	1411.20	1485.60	1629.60
E-8						1061.70	1091.40	1120.50	1149.90	1179.90	1207.20	1236.90	1309.50	1455.60
E-7	741.30	800.10	829.80	858.60	888.30	916.20	945.60	975.00	1019.10	1047.90	1077.60	1091.40	1164.90	1309.50
E-6	640.20	698.10	727.20	757.80	786.00	814.80	844.80	888.30	916.20	945.60	960.00			
E-5	562.20	611.70	641.40	669.30	713.10	814.80	945.60	975.00	1019.10					
E-4	540.30	570.60	603.90	651.00	676.80	742.20	844.80	888.30	916.20					
E-3	519.60	548.10	570.30	592.80			771.90	800.10	814.80					
E-2	500.10													
E-1	448.80													

Monthly Basic Allowance for Quarters Rates

Pay Grade	Without Dependents Full Rate	Partial Rate	With Dependents
E-9	$205.20	$18.60	$288.60
E-8	189.00	15.30	266.70
E-7	160.80	12.00	248.10
E-6	146.10	9.90	228.30
E-5	140.40	8.70	209.70
E-4	123.90	8.10	180.60
E-3	110.70	7.80	160.80
E-2	97.30	7.20	160.80
E-1	92.40	6.90	160.80

Basic Allowance for Subsistance Rates

Enlisted Members

When on leave or authorized to mess separately	$3.21 per day
When rations in-kind are not available	$3.62 per day
When assigned to duty under emergency conditions where no messing facilities of the United States are available	$4.79 per day

Lesson 1

OBJECTIVE:

Given a military pay schedule, the learner will locate the correct monthly basic pay and allowances when pay scale and years of service are stated.

EXERCISES:

The Military Pay Schedule should be used to do the exercises below.

1. A recruit with a pay grade of E-1 and under 2 years of service receives _____ in monthly basic pay.

2. A Chief Petty Officer (E-7) with 14 years of service receives _____ in montly basic pay.

3. An E-5 without dependents who receives a full rate allowance for quarters would be paid _____ per month for quarters.

4. An E-8 with 17 years of service would receive a monthly basic pay of _____.

5. A Petty Officer who receives an allowance for subsistence when rations in-kind are not available would be paid _____ per day.

6. A seaman apprentice with less than 2 years of service has been promoted from E-1 to E-2. His monthly basic pay after the promotion would be _____.

7. A seaman at pay grade E-3 can expect a monthly basic pay of _____ after completing 2 years of service.

8. An E-2 with dependents who receives an allowance for quarters would be paid _____ per month.

9. An E-7 who has eleven years of service would receive a monthly basic pay of _____.

10. A sailor with eight years of service receives a monthly basic pay of $814.80. His pay grade is _____.

Lesson 2

OBJECTIVE:

Given information on basic pay, allowance for quarters, and/or subsistence rates for enlisted personnel in the Navy, the learner will solve problems involving addition and subtraction of numbers.

EXERCISES:

A. Review - Addition

1. $467.40   2. $419.40   3. $ 86.40   4. $1,236.90   5. $512.10
    + 91.50   + 86.40   + 90.00   + 117.00   +103.50

B. Review - Subtraction

1. $90.00   2. $504.90   3. $1,182.30   4. $505.80   5. $856.20
    -86.40   -115.80   -   91.50   -172.50   -136.50

C. Application

1. An E-3 with 4 years of service receives monthly basic pay of $592.80.
    If he receives $110.70 in monthly basic allowance for quarters, what is
    his total pay per month?

                                                          Answer_____

2. An E-4 received $603.90 in monthly basic pay and an allowance of $96.30
    for subsistence during a month. How much was he paid for the month?

                                                          Answer_____

3. An E-5 with 5 years of service received a monthly basic pay of $669.30,
    a monthly allowance of $140.40 for quarters, and an allowance of $108.60
    for subsistence during a given month. How much was he paid for the
    month?

                                                          Answer_____

4. A sailor received $550.78 in total pay for a month, but $50.68 was an
    allowance for subsistence. How much did he receive in basic pay?

                                                          Answer_____

5. A sailor received $1,073.10 in total pay for a month. The allowance for
    quarters was $228.30. How much was the basic pay received?

                                                          Answer_____

6. An E-3 with 3 years of service received $570.30 in monthly basic pay, $160.80 in basic allowance for quarters, and $96.30 in basic allowance for subsistence. What is the difference (in dollars and cents) between the allowance for quarters and the allowance for subsistence received?

Answer_____

Lesson 3

OBJECTIVE:

Given information on basic pay, allowance for quarters, and/or subsistence rates for enlisted personnel in the Navy, the learner will solve problems involving the multiplication of numbers.

EXERCISES:

A. Review - Multiplication

1. $533.10
    x   3

2. $883.50
    x   6

3. $666.30
    x   12

4. $115.80
    x   9

5. $8.10
    x   5

6. $3.38
    x 21

B. Application

1. An E-1 with under 2 years of service receives a monthly basic pay of $448.80. How much basic pay would he receive for three months?

    Answer_____

2. An E-3 with 4 years of service received a monthly basic pay of $592.80 for two months of a year. He was promoted to E-4 with a monthly basic pay of $651.00. How much basic pay did he receive for the entire year?

    Answer_____

3. A sailor received a daily basic allowance for subsistence of $3.62 while on an assignment for 63 days. What was the total amount that he was paid for subsistence?

    Answer_____

4. An E-5 with 6 years of service received a monthly basic pay of $713.10 and a monthly basic allowance of $141.40 for quarters. How much was he paid for a year?

    Answer_____

5. An E-9 with 13 years of service was assigned duty under emergency conditions for a month with 31 days. He received a monthly basic pay of $1,294.20, a monthly basic allowance of $205.20 for quarters, and a basic allowance of $4.79 per day for subsistence. What was the total amount paid to him for the month?

    Answer_____

6. While on leave, a sailor was entitled to receive a basic allowance of $3.21 per day for subsistence. His leave was extended from 15 days to 22 days. How much additonal subsistence allowance did he receive as a result of extending the leave?

Answer_____

Lesson 4

OBJECTIVE:

Given information on basic pay, allowance for quarters, and/or subsistence rates for enlisted personnel in the Navy, the learner will solve problems involving the division of numbers.

EXERCISES:

A. Review - Division

1. $67.60 ÷ 20 = _____

2. $3,322.80 ÷ 6 = _____

3. $1,243.00 ÷ 12 = _____

4. 12/$14,511.60

5. $419.40/$856.20

B. Application

1. An E-3 with 3 years of service earns $6,842.40 per year in basic pay. How much is his monthly pay?

    Answer_____

2. Over a period of six months, an E-7 received $964.80 in allowance for quarters. What was the monthly allowance for quarters rate?

    Answer_____

3. An E-8 with 10 years of service received $1,358.10 in monthly basic pay and monthly allowance for quarters. The allowance for quarters was $266.70. What percentage of his total monthly payment did his basic pay represent?

    Answer_____

4. An E-9 received an allowance for subsistence in the amount of $112.22 during the month of January. How much per day did he receive for subsistence?

    Answer_____

5. The total basic pay received by a sailor was $6,145.20 for a twelve-month period. During the last three months, he received $48.00 per month more than he did during the first nine months. How much per month was he paid during the first nine months?

    Answer_____

LEAVE AND EARNINGS STATEMENT

Introduction

An important record that you will need to understand is the Navy "Leave and Earnings" statement. This is the service record that tells you how much you have earned at your pay grade (basic pay) and have received in allowances for other things like quarters and subsistence. A sample leave and earnings statement has been printed on the next page where you can find your basic pay in box 17, quarters allowance in box 18, and subsistence allowance in box 19.

The leave and earnings statement also tells you how much has been deducted from your pay. It provides a record of your payments for life insurance (SGLI) - box 34, federal income tax withheld (FITW) - box 35, and Social Security (FICA) - box 36. State income taxes will also appear on your "Leave and Earnings Statement" if your state of residence collects an income tax - box 38. Other deductions will be reported in boxes 39 - 42.

The amount of leave time you have earned is also included on this statement. This allows you to keep track of the amount of leave time you have earned, the amount used, and the amount you have left. Normally, a sailor can expect to gain 2.5 days of leave time for each month of service.

Other numbers appear on the "Leave and Earnings Statement" that show total amounts. For example, the income tax and Social Security figures are totaled for each pay period and printed in a box with the abbreviation "YTD" (Year to Date). Box 53 contains a figure for the total amount of federal income tax withheld through the date of this statement (FITW YTD) for this year. Likewise, box 56 on the statement contains the amount withheld for Social Security (FICA Tax YTD) for the year. Boxes 60 and 61 report the amount of taxable state wages (SITW WAGE YTD) earned in the current year and state income tax withheld (SITW YTD) to date for your current state of residence.

During your career in the Navy, you will do many things that show up on your "Leave and Earnings Statement." You must learn to understand what information appears on this statement and how it is determined. This is one important record in your Navy career.

S/N 0102-LF-001-6241 **LEAVE AND EARNINGS STATEMENT**

1 NAME (Last First MI)			2 SSN	3	4 SERV	

6 PAY GRADE	7 YRS	8 PERD	9 OPED	10 EAOS DATE	11	12 DSSN	13 PRD CNTRD	14 DATE PREP	15 APPROP DATA	16 AMOUNT W Y

17 BP	18 BAQ	19 BAS	20	21	22	23		FICA ENT
26	27	28	29	30	31	32		TOTAL ALLOT
34	35 FITW	36 FICA	37 SIT	38 SITW	39	40	41	42	TOTAL DED

44 TYPE	AMOUNT		DATE	DSSN	PR VOUCHER NO	45 TYPE	AMOUNT		DATE	DSSN	PR VOUCHER NO	TOTAL PMT
42 TYPE	AMOUNT		DATE	DSSN	PR/VOUCHER NO	48 TYPE	AMOUNT		DATE	DSSN	PR VOUCHER NO	TOTAL PMT

50 INCOME THIS PERIOD	51 INCOME YTD	52 EXEM	53 FITW YTD	54 FICA WAGE THIS PERIOD	55 FICA WAGE YTD	56 FICA TAX YTD	57 FORECAST OF AMOUNTS DUE AS INDICATED BELOW	58 AMT PMT
59 HS	EARN	USED	BAL	CNT	TOT	60 SITW WAGE YTD (CURRENT STATE)	61 SITW YTD (CURRENT STATE)	N O R M	DATE	AMOUNT	DATE	AMOUNT

62

63	ENTITLEMENTS	DATE	AMOUNT	64	DEDUCTION	DATE	AMOUNT

65		PAYMENT		
	PR NO	D O SYMBOL	DATE	AMOUNT

FORM
DD REV 1 AUG 78 **1624**   **NAVY (7220)**   (See Legend on reverse)   FORM APPROVED BY COMPTROLLER GENERAL U.S.

EXPLANATION OF HEADINGS
FOR THE LEAVE AND EARNINGS STATEMENT

THIS IS YOUR LEAVE AND EARNINGS STATEMENT · IT IS YOUR PAY ACCOUNT
FOR THE PERIOD SHOWN IN BLOCK THIRTEEN

**LISTED BELOW IS AN EXPLANATION OF THE PREPRINTED CAPTIONS
IN THOSE BLOCKS WHICH ARE NOT CONSIDERED SELF-EXPLANATORY.**

BLOCK = CAPTION		EXPLANATION
5	UIC	Unit identification code
7	YRS	Whole years of creditable service
8	PEBD	Pay entry base date (YR./MO./DA.) Actual or constructive date of entry into service
9	OPED	Other pay entry date (YR/MO/DA). Base date for use in determining when certain pay/allowances begin to accrue (CMA, medical or dental pay)
10	EAOS DATE	Expiration active obligated service date
12	DSSN	Disbursing station symbol number
13	PRD COVERED	Period covered by this statement (MODA/MODA)
14	DATE PREP	Date this statement was prepared (YR/MO/DA)
15	APPROP DATA	Appropriation and Functional Account Number (FAN) to which the member's pay is to be charged
16	AMOUNT BF	Amount from block 58 of last statement
17	BP	Basic pay
18	BAQ	Basic allowance for quarters
19	BAS	Basic allowance for subsistence (includes RATS LV, RATS SFP and other BAS)
20-24	ENT (other)	Pay and allowances other than BP, BAQ, BAS
25	TOTAL ENT	Total of blocks 17-24
26-32	ALOT	Allotments
33	TOTAL ALOTS	Totals of blocks 26-32
34	SGLI	Servicemen's Group Life Insurance premium
35	FITW	Federal Income Tax withheld
36	FICA	Federal Insurance Contributions Act (Social Security tax) deductions
37	SC	State Code for SITW this period
38	SITW	State Income Tax Withheld
39-42	DED (other)	Deductions other than SGLI, FITW, FICA, SITW
43	TOTAL DEDS	Total of Blocks 34-42
44-45	PMTS	
	TYPE	Type of payment. (Blank is regular or special payment. TXL indicates a tax levy payment to IRS. DEP indicates dependent emergency payment.)
	AMOUNT	Amount of payment
	DATE	Date of payment
	DSSN	Disbursing station symbol number
	PR/VOUCHER	Payroll number or Voucher number

BLOCK = CAPTION		EXPLANATION
46	TOTAL PMTS	Total payments from blocks 44-45
47-48	PMTS	Same as blocks 44-45
49	TOTAL PMTS	Total payments from blocks 47-48
50	INCOME THIS PERIOD	Wages subject to FITW for period covered
51	INCOME YTD	Wages subject to FITW for this calendar year thru end of the period covered
52	EXEM	Marital status (for tax purposes) and number of dependents
53	FITW YTD	FITW for this calendar year thru end of the period covered
54	FICA WAGE THIS PERIOD	Wages subject to FICA withholding for the period covered
55	FICA WAGE YTD	Wages subject to FICA withholding for this calendar year thru end of the period covered
56	FICA TAX YTD	FICA taxes withheld for this calendar year thru end of the period covered
57	FORECASTS OF AMOUNT DUE	Forecasts of amounts due on the paydays indicated
58	AMT DUE/CF	Amount due member on last payday of period covered (block 16+ block 25- block 33- block 43- block46-block 49= amount shown in block 58)
59	LEAVE	
	BF	Leave balance brought forward at beginning of fiscal year, when active duty began, or day after LSL was paid or carried forward
	EARN	Cumulative days leave earned since leave balance was established. Will normally increase by 2.5 days each month
	USED	Cumulative days leave used since the leave balance was established
	BAL	Leave balance at the end of the period covered by the LES
	LOST	Leave lost at the end of the fiscal year
	XCS	Excess leave taken. Cumulative days for this enlistment or tour of active duty.
60	SITW WAGE YTD (Current State)	Total taxable pay earned for calendar year for State currently claimed
61	SITW YTD (Current State)	State Income Tax Withheld for calendar year for State currently claimed
62	REMARKS	A remark will usually be preceded by the number of the block to which it refers.
63-66		For use by the DO

**LISTED BELOW ARE THE MOST SIGNIFICANT ABBREVIATIONS WHICH MAY APPEAR
IN THE UNCAPTIONED BLOCKS AND/OR THE REMARKS SECTION OF THIS FORM.**

	ADV-PAY	Advance pay and allowances
CAC		Clothing allowance civilian
CAX		Clothing allowance extra
CAS		Clothing allowance special initial
	CH	Change
	CHRG	Charge
CMA		Clothing maintenance allowance
CN	CN-PAY	Continuation pay
COL	COLA	Cost of living allowance
DBL	DBLTY-SVRNC	Disability severance pay
DEM	DEMO-PAY	Demolition duty pay
DEN	DENTL-PAY	Dental pay
DEP		Dependent evacuation pay
DTN	DTNTN	Dentention of pay
DVN	DVNG-PAY	Diving duty pay
ESD	STRESS	Experimental stress duty
ESN	ESNTL-SVC-PA	Essential service pay
FIN	FINE	Fine consent; fine non-consent
FLT	FLT-DECK-PAY	Flight deck hazardous duty pay
FLY	FLY-PAY	Flying duty pay
	FM	From
FOR	FORN-PAY	Foreign duty pay
FSA		Family separation allowance
	FY	Fiscal year
HFP		Hostile fire pay

HOU		Housing allowance
IND	INDEBT	Indebtedness
LSL		Lump sum leave
	LV	Leave
MED	MED-PAY	Medical pay
MSC		Miscellaneous
	NORM	Normal pay based on known continuing entitlements and deductions
OPT	OPTM-PAY	Optometry pay
PAR	PARA-PAY	Parachute duty pay
PFP	PARTL-FORFTR	Partial forfeiture of pay
PMA		Personal money allowance
PRO		Proficiency pay
	RATS	Rations
RB		Reenlistment bonus
REA	READJMT-PAY	Readjustment pay
RNL		Reenlistment
SEA	SEA-PAY	Sea duty pay
SUB	SUB-PAY	Submarine duty pay
SVR	SVRNC	Severance pay
TFP	TOTL-FORFTR	Total forfeiture of pay
TLA		Temporary lodging allowance
TXL		Tax levy
UAA	UNIF-ADD	Uniform allowance · additional
UAI	UNIF-INIT	Uniform allowance · initial

Lesson 1

OBJECTIVE:

Given a legend (explanation of headings) for a Leave and Earnings Statement, the learner will locate information about earnings, deductions, and leave.

EXERCISES:

Use the "Explanation of Headings" on the previous page to do the exercises below.

1. The letters used to indicate a deduction for social security are _____.

2. The number of the box in which your Social Security withholding for the year to date is printed is _____.

3. Box 17 contains the letters BP. These letters stand for _____.

4. Box 14 should contain the date on which the statement was prepared. A Leave and Earnings Statement prepared on May 25, 1979 would have the numbers ___/___/___.

5. The basic allowance for quarters would be found in box number _____.

6. The cumulative number of days of leave used since the beginning of the fiscal year is found in the box labeled _____.

7. The amount of money you should receive on the last payday of the period covered is shown in box number _____.

8. The amount of federal income tax withheld to date in the current year would be reported in box number _____.

9. The amount due for BAQ is found in box number _____.

10. The amount paid to the sailor the last time he got paid is shown in box number _____.

Lesson 2

OBJECTIVE:

Given a Leave and Earnings Statement, the learner will add and subtract amounts to determine earnings, deductions, and leave.

EXERCISES:

A. Review - Addition

1. $302.67   2. $25.12   3. $397.81   4. $165.09
    +125.82   +49.99   +398.19   + 67.92

5. $579.66 + $32.54 = _____   6. $179.71 + $1.89 = _____

7. 317 + 14.5 = _____   8. $189.75
                                   424.87
                                 + 132.44

9. $50 + $89.50 + $72.88 = _____   10. .50 + 22.5 + 18.75 = _____

B. Review - Subtraction

1. $108.59   2. $725.18   3. $457.88   4. $1071.15
    - 72.36   - 13.72   -368.93   - 783.27

5. $115 - $78 = _____   6. $721.25 - $18.74 = _____

7. $174.21   8. $87 - $7.21 = _____
    - 81.92

9. $1040 - $9.88 = _____   10. $1751.00 - $159.68 = _____

C. Application

Use the Leave and Earnings Statement for E-4 Scott following the next page to do the exercises below.

1. The total entitlement for Petty Officer Scott equals _____.

Answer_____

2. The leave time earned and brought forward for the last fiscal year equals _____.

Answer_____

3. Petty Officer Scott received a pay check on this payday for a total
of _____.

Answer_____

4. Federal tax deductions for FITW-YTD and FICA-YTD on Scott's Leave and
Earnings Statement equal _____.

Answer_____

5. The leave balance at the end of this period is _____ days.

Answer_____

6. What is the period covered by this statement?

Answer_____

7. What were Petty Officer Scott's total deductions for military insurance,
federal income tax, and FICA?

Answer_____

8. How much would Petty Officer Scott have to increase his savings allot-
ment to have $50.00 put in savings each pay period?

Answer_____

9. The basic pay grade for an E-5 with over 3 years service is $641.40
per month. What increase in monthly basic pay would Scott expect if
he were promoted to an E-6?

Answer_____

10. Under normal circumstances, 2.5 days of leave are added to leave time
each month. How much leave time will Petty Officer Scott have in two
months if no leave is used?

Answer_____

NSN 9100-LF-001-6241

1. NAME (Last, first)						2. SSN		3.		4. SERV	5. RC
SCOTT, ROBERT						162-28-8493				USN	12345

S V C	6. PAY GRADE	7. YRS	8. PEBD	9. OPED	10. EAOS DATE	11	12. DSSN	13. PRD COVERED	14. DATE PREP	15. APPROP DATA	16. AMOUNT +
	E4	0377	032500	000000	811010		121	0501/0531	790525	MPN12345	77486

E N T	17. BP	18. BAQ	19. BAS	20	21	22	23	24	25. TOTAL ENT +
	60390	12390	9630						82410

A L O T	26 S	2500	27	28	29	30	31	32	33. TOTAL ALOTS −
									2500

D E D	34. SGLI	35. FITW	36. FICA	37. SC	38. SITW	39	40	41	42	43. TOTAL DEDS −
	300	7548	3442							11290

P M T S	44. TYPE AMOUNT	DATE	DSSN	PR/VOUCHER NO	45. TYPE AMOUNT	DATE	DSSN	PR/VOUCHER NO	46. TOTAL PMTS −
	39200	790413	5121	01220		00000	000	00000	39200
47. TYPE AMOUNT	DATE	DSSN	PR/VOUCHER NO	48. TYPE AMOUNT	DATE	DSSN	PR/VOUCHER NO	49. TOTAL PMTS −	
	00000	000	00000		00000	000	00000		

T A X	50. INCOME THIS PERIOD	51. INCOME YTD	52. EXEM	53. FITW YTD	54. FICA WAGE THIS PERIOD	55. FICA WAGE YTD	56. FICA TAX YTD	57. FORECASTS OF AMOUNTS DUE AS INDICATED BELOW	58. AMT DUE/CF =
	60390	315450	S01	37740	60390	315450	17210		29419

L V	59. BF	EARN	USED	BAL	LOST	XCS	60. SITW WAGE YTD (CURRENT STATE)	61. SITW YTD (CURRENT STATE)	N O R M	DATE	AMOUNT	DATE	AMOUNT
	0020	0200	0120	1000	0000	0000	3935.46	120.32		790615	31700	790630	31700

62

    26 S THRU 7905   75.00
        (Savings)

63	ENTITLEMENTS	DATE	AMOUNT	64	DEDUCTIONS	DATE	AMOUNT

65.	PAYMENTS		
PR NO	D O SYMBOL	DATE	AMOUNT

66. NOTATION OF AMOUNT DUE

FORM
DD REV. 1 AUG. 78 1624   **NAVY (7220)**   (See Legend on reverse)   FORM APPROVED BY COMPTROLLER GENERAL U.S (TEST) OCTOBER 27 1967

Lesson 3

OBJECTIVE:

Given a Leave and Earnings Statement, the learner will be able to compute percentage amounts of earnings, deductions, and leave.

EXERCISES:

A. Review - Multiplication

1.   32   2.   150   3.   385   4.   75
    x .50   x .75   x .20   x .33

5.   848   6.   1,575   7.   164   8.   72
    x .12   x .67   x .25   x 1.50

B. Review - Division

1. 75 ÷ 3 = _____   2. 848 ÷ 8 = _____

3. 1,225 ÷ 75 = _____   4. 650 ÷ 25 = _____

5. 988 ÷ 6 = _____   6. 464 ÷ 8 = _____

7. 25 ÷ 6 = _____   8. 275 ÷ 700 = _____

C. Application

Use E-4 Scott's Leave and Earnings Statement on the previous page to do the exercises below.

1. Petty Officer Scott has used 12 days of leave time this year. He has earned 20 days of leave. What percentage of his leave time earned this year has he used?

Answer_____

2. Next month Scott will have $37.00 deducted from his basic pay for a savings allotment. What percent has Scott increased his savings allotment?

Answer_____

3. The next pay grade for Scott is 7.7% above his current basic pay. How much would his basic pay increase if he was promoted?

Answer_____

4. If Scott was a resident of Pennsylvania, he would pay a state income tax of $60.39 per month. How much state income tax would he be required to pay in a year?

Answer_____

5. When Scott has earned around $4,000, he will have paid approximately $250 in social security (FICA). What percentage rate is being use to compute FICA?

Answer_____

6. When Scott has earned about $6,000 in income, he will have paid $900 in federal income taxes. What percentage of his basic pay will be paid in taxes?

Answer_____

7. If Scott's first paycheck was $392.00, what percent was this of his basic pay of $603.90 per month?

Answer_____

8. A BAQ entitlement of $124.00 and a BAS entitlement of $96.00 increased Scott's income for the month. What percentage of his basic pay of $603.90 does the sum of these two entitlements equal?

Answer_____

BUDGET PREPARATION

Introduction

One important use for your computational skills is preparing a personal budget. A budget is a plan for using your money for the things you have to do and for the things you want to do. Use of a budget helps a person provide for his needs without overextending his "take home" pay. For those who do not make the best use of their money, they often find that they have "too much month remaining at the end of the money."

Budgets are highly personal. They are designed to meet each individual's needs. Your friend's budget will be different from your own. As your needs change, you will need to change your budget. In fact, as you transfer to another duty station or go on sea duty, your budget will probably need to be changed.

Budgets are not difficult to prepare. They do require careful thought and close figuring of your money needs. In the Navy, many of your needs are provided. Housing, utilities, medical bills, and food are just some of the services that you do not need to pay from your take home pay. However, you will not use the messhall for all your meals. Snacks at the Exchange cafeteria, meals eaten at a fast food store on the weekend, and a really nice dinner at a good restaurant are some examples of food you must pay for elsewhere.

From previous lessons, you have seen how to find your basic pay. You know how your basic pay is divided for taxes, social security, and other deductions to arrive at your "take home" pay. This "take home" pay is the amount that you will use in preparing your personal budget.

As an example of "how to prepare a budget" and for use in problems dealing with a budget, let us work with Seaman Apprentice (SA) John R. Rockbottom as he prepares his budget. Remember that your budget will be different, but you will be able to see the way a budget may be figured.

SA Rockbottom is an E-2 with under 2 years of service. Assume that his monthly basic pay is $467.40. SA Rockbottom's Leave and Earnings statement for one payday shows $181.96 because he is paid two times during one month. His take home pay for one month would be 2 x $181.96 or $363.92.

First, SA Rockbottom determines his financial or money needs. He knows that as a sailor, the Navy expects him to maintain a well groomed and clean appearance at all times. Haircuts and grooming articles such as soap, razor blades, and shoe polish cost him about $10.00 per week. Therefore, SA Rockbottom sets aside $10.00 a week as an estimate for personal grooming.

$10.00 per week for Personal Grooming

SA Rockbottom then looks at his clothing needs. The work he is doing requires him to wear the dungaree working uniform most of the time. He would like to buy one or two extra sets in addition to his original basic issue. The cost of one additional uniform is $15.00. Two dungaree uniforms would be

2 x $15.00 or $30.00.   SA Rockbottom feels that this will take care of his need for uniforms for the next six months. He then itemizes:

$30.00 per six months for Military Clothing

Next, Rockbottom looks at maintaining his clothing.   Laundry and dry cleaning service at the base has been about $12.00 per week.

$12.00 per week for Laundry and Cleaning

Rockbottom carefully thinks if there are any other expenses that he is responsible for to do his job as a sailor. Are there any dues to messes, any functions that may require him to pay a fee, or other expenses? He is unsure, but he is aware of a unit picnic that is scheduled about every three months. He decides to put aside $5.00 for the picnic.

$5.00 per three months for Picnic (Organizational Function)

SA Rockbottom does not have any outstanding debts or a car. If he did have, he would certainly have to list these payments in his budget. He makes certain that all of his needs and obligations are listed.

Rockbottom decides to put some of his take home pay in savings. He has heard that it is wise to save 10 percent of your pay or one dollar out of every ten.   Rockbottom knows that his monthly take home pay is $363.92.   Ten percent is equal to:

$$\begin{array}{r} \$363.92 \\ \times\quad .10 \\ \hline 00000 \\ 36392 \\ \hline \$36.3920 \end{array} \text{ or } \$36.39$$

Rounding this number off, Rockbottom decides to put $36.00 each month in a savings account. He may wish to put one-half ($18.00) in a savings bond and the rest in a savings account. He itemizes this as:

$18.00 per month for Savings Account

$18.00 per month for Savings Bond

$36.00 per month for Savings

Rockbottom decides that the best way to begin this savings is to have the money deducted each month from his pay check. This can be done through the Finance Office and makes the savings simple.

Rockbottom now itemizes his obligations and needs that he expect over the next six months. Let us list them in the order that Rockbottom has written them.

$10.00 per week Personal Grooming

$30.00 per six months Military Clothing

$12.00 per week Laundry and Cleaning

$5.00 per three months Picnic

$36.00 per month Savings

Notice that the list has dollars per week, per month, per three months, and per six months. It is necessary to change all of these to the same unit of time. Since six months is the longest time period used, let us look at all of these items in terms of six months. There are 26 weeks in six months. Rockbottom will spend 26 times his weekly amount for Personal Grooming. He will also spend 2 times his three-months amount for Picnics and 6 times his monthly amount for Savings.

$$\$10.00 \times 26 = \$260.00$$
$$30.00 \times 1 = 30.00$$
$$12.00 \times 26 = 312.00$$
$$5.00 \times 2 = 10.00$$
$$36.00 \times 6 = \underline{216.00}$$
$$\$828.00$$

Rockbottom's needs total $828.00 for the six months. How much take home pay will he receive during this period? His Leave and Earnings Statement shows that he takes home $363.92 each month. In six months, he will take home $2,183.52 ($363.92 x 6). He has budgeted for $828.00. His unbudgeted total for six months is:

$$\$2,183.52$$
$$- \underline{828.00}$$
$$\$1,355.52$$

What is the total unbudgeted take home pay each payday? (There are 12 paydays in each six month period.)

SA Rockbottom has budgeted his needs and obligations. However, he still has some work to do. The work that is left to be done is the fun part because he must now look at his wants rather than his needs. He begins to list what he would like or plans to do for the next six months.

Rockbottom expects to eat meals away from the base on each Saturday evening and all day Sunday while on liberty. He also expects to eat one meal off the base during the week. This would amount to about 5 meals during the week. The meals will cost from $2.00 for a short order (hamburger, french fries, and a drink) to $10.00 for a steak with tips at a restaurant. Rockbottom believes that he can eat each of his 5 meals at an average cost of $4.00.

5 meals x $4.00 = $20.00 per week off base for Food

Rockbottom decides to set aside $5.00 for drinks and snacks during the week. When this is added to the outside meals, Rockbottom now has set aside:

$25.00 per week for Food

SA Rockbottom plans to purchase two new sets of civilian clothes to wear on liberty. The cost of clothes ranges considerably, but it is possible to buy a nice shirt for $12.00 and trousers for $18.00. Two sets will cost $60.00. Rockbottom wants to budget this for a period of six months. A pair of shoes will cost approximately $30.00 and accessories such as a belt and socks to finish Rockbottom's civilian clothing will cost $10.00. He now has budgeted:

$60.00 per six months Shirts and Trousers

30.00 per six months Shoes

+ 10.00 per six months Acessories

$100.00 per six months Civilian Clothes

Rockbottom will have 15 days leave due in six months. He plans to go home. A round trip plane ticket from the base to home costs $240.00. He knows that if he is to have the money for the ticket, he must begin to put aside the money now. He must also plan to have some money to spend while he is at home. He believes that he will spend an additional $160.00 while home on leave. He itemizes his vocation:

$240.00 Air Fare

+ 160.00 Expenses

$400.00 per six months for Vacation

Since Rockbottom has no car, he must make some allowance for transportation. Fortunately, the base has some bus service to town and other places of interest at low cost. By using low cost transportation to and from the base, Rockbottom feels that his transportation will cost about $4.00 a week. He sets this aside:

$4.00 per week for Transportation

Let us check SA Rockbottom's budgeted wants up to this point. Just as before, the itemized listing is:

$ 25.00 per week Food

$100.00 per six months Civilian Clothing

$400.00 per six months Vacation

$ 4.00 per week Transportation

These costs must be calculated for a six months period. Therefore, the costs would be:

$ 650.00   Food

100.00   Civilian Clothing

400.00   Vacation

+ 104.00   Transportation

$1,254.00   Total Costs

Remember, we earlier determined the amount that Rockbottom had not budgeted. His budget now looks like this:

$1,355.52   Unbudgeted

-1,254.00   Budgeted for wants

$ 101.52   Presently Unbudgeted

Rockbottom can now place this unbudgeted amount in a category labeled "Miscellaneous" for incidental or unexpected expenses. Remember that this $101.52 is for a six month pay period. It must be broken down by each payday. How much money does Rockbottom have that is unbudgeted each payday?

At this point, SA Rockbottom has completed the process of deciding how much he will spend on his needs and wants during a period of six months. A listing of his needs and wants makes up the categories in his budget. The amount to set aside from each paycheck for each category can be computed by dividing 12 into the budget amount for six months. Rockbottom's budget would be as follows:

Six Months Period	Each Paycheck	Budget Category
$ 260.00	$ 21.67	Personal Grooming
30.00	2.50	Military Clothing
312.00	26.00	Laundry and Clearning
10.00	.83	Organizational Functions
216.00	18.00	Savings
650.00	54.17	Food
100.00	8.33	Civilian Clothing
400.00	33.33	Vacation
104.00	8.67	Transportation
+ 101.52	+ 8.41	Miscellaneous
$2,183.52	$181.96	Total Expected Expenses

By careful preparation, you can plan to use your money wisely. You can avoid getting into dept beyond your ability to pay your obligations. You should review your budget from time to time to see if it still meets your needs and goals. You must remember that your budget is yours. Rockbottom's budget will not work for you nor will your friend's budget work for you. Your budget is highly personal to you, your needs, and your wants.

BUDGET WHEEL
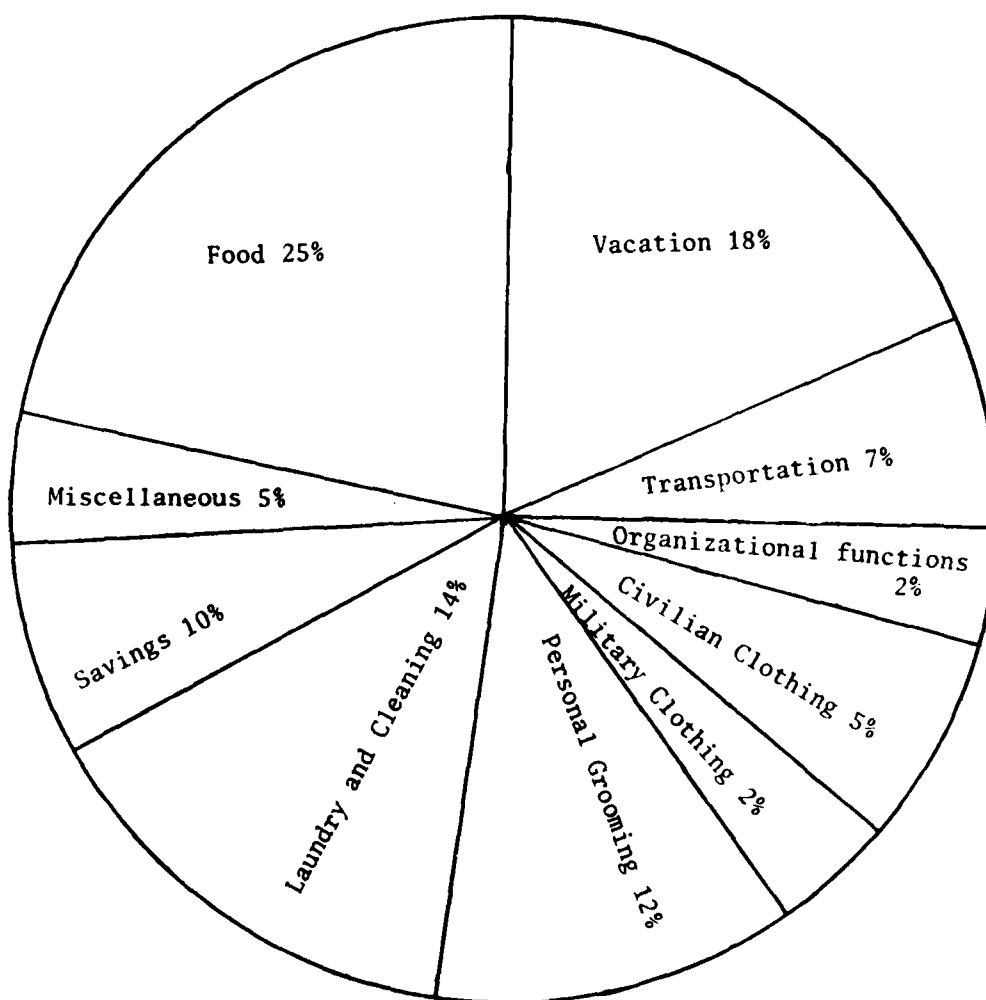
Lesson 1

OBJECTIVE:

Given a sample distribution of costs, the learner will use the percentages to compute amounts for specific budget categories.

EXERCISES:

A. Review - Multiplication

1. $415.20	2. $63.13	3. $827.00	4. $910.00	5. $127.50
x .08	x .14	x .21	x .06	x .05

B. Application

Use the budget wheel on the previous page for these calculations. Consider earnings used in the exercises to be take home pay. Compute your answers to two decimal places.

1. Your monthly income (take home pay) is $390.08. How much should you set aside for transportation?

Answer_____

2. Your income is $405.29 per month. How much will you budget for food?

Answer_____

3. How much money is budgeted each month for miscellaneous expenses if your pay is $350.06 per month?

Answer_____

4. How much money must you set aside for savings if your pay is $467.40 per month?

Answer_____

5. If you have an income of $419.40 per month, how much will you spend on laundry and cleaning?

Answer_____

6. A sailor spends 2 percent of his $390.08 monthly income on military clothes and 5 percent on civilian clothes. How much money does this represent?

Answer_____

7. Seaman Gonzales is setting aside money for a vacation. How much of his monthly pay of $427.52 is budgeted for this purpose?

Answer_____

8. What amount of money from a monthly income of $532.80 is represented by the category "Personal Grooming"?

Answer_____

Lesson 2

OBJECTIVE:

    Given a sample distribution of costs, the learner will use the percentages to calculate amounts for specific budget categories over an extended period of time.

EXERCISES:

A. Review - Multiplication

1.	214.25	2.	875	3.	295	4.	$5.25	5.	$34.50
	x 14		x 17		x 22		x 6		x 4

B. Application

    Use the budget wheel presented previously for these calculations. Consider earnings used in the exercises to be take home pay. Compute your answers to two decimal places.

1. Food expenditures should not exceed _____ for three months if the sailor's take home pay is $405.29 per month.

<div align="right">Answer_____</div>

2. A sailor earns $444.83 per month. How much should be set aside for savings during a one year period?

<div align="right">Answer_____</div>

3. An enlisted man earns $427.52 per month. How much money will he spend on civilian clothing during a six months period?

<div align="right">Answer_____</div>

4. Over a two year enlistment, a sailor earns $350.06 for the first three months and $390.08 for the remainder of his enlistment. How much will he spend on personal grooming during the period of two years?

<div align="right">Answer_____</div>

5. How much money would be spent on laundry and cleaning over a 1.5 year period if a sailor earns $477.12 per month?

<div align="right">Answer_____</div>

6. Compute the yearly expenses for military clothes and organizational functions if a sailor earns $462.38 per month.

<div align="right">Answer_____</div>

BANKING

Writing Checks

There was a time several years ago when almost everyone carried cash with them. Workers were paid in cash and purchases were made in cash or on credit, which was paid by cash at the end of the month. Today, however, most of us put our money in a bank and write checks for most of our purchases.

Checks have several advantages over cash. For example, if a check is stolen, it cannot be cashed easily because the bank has a copy of your signature on file and can compare this sample with the signature on the check to determine whether or not the check has been forged. Checks also give you a written record of how you spend your money and they are useful in setting up a budget. A well-kept checkbook can tell you exactly how much money you have to spend each month.

Anyone can open a checking account by depositing money in a bank. Checks can then be drawn against the amount of money you have in the bank, your bank balance. Most businesses will take checks in payment for goods or services if you have proper identification, such as a driver's license, credit card, or identification card.

Checks are useful in paying bills by mail. They give you a record of which bills you have paid for income tax purposes as well. Also, it is never a good idea to send cash by mail.

Checks are convenient and recognized ways to pay for the goods and services you buy, but it is important to remember several things about check writing.

1. When you open a checking account, you will sign a card, called a signature card, using the same name you will use when you sign checks. Remember to always sign each check the same way or the bank may not accept the signature as yours.

2. Most banks, especially in larger cities, require the use of personal checks. These checks are pre-printed with your name and address for the purpose of identification. You purchase these checks when you open your account.

3. You should never knowingly write a check if you do not have enough money in the bank to cover it. People who give bad checks quickly develop a bad credit rating.

4. Keep your check stubs up to date. Check them and your checkbook balance against your statement each month. Banks have been known to make mistakes.

5. Make a note of what you are writing the check for. Very few people can remember what each check in a checkbook was written for.

```
Balance          |                              Check # _____
Forward_____   |
                 |                      Date_____19___
Deposit_____   | Pay to the
                 | Order of_____$__(amount)___
Balance_____   |
                 |
Deduction_____  |       (amount)_____Dollars
                 |
Balance_____   |
This Check To    |        FIRST BANK
                 |        MIAMI, FLORIDA
_____    |
Date_____    |
Check#_____   | For_____    _____
                 |                         (signature)
                 |
```

Explantion of Terms

Balance Forward: Balance brought forward or the amount of money in your
                   account after writing the last check

Deposit: The amount of money you put in your account by making a deposit.
           The amount of the deposit is a plus (+) number that you add to
           the "Balance Forward."

Balance: The amount of money you have in your account after making a deposit
           or writing a check

Deduction: The amount of money you take out of your account by writing a
             check. The amount of the deduction is a minus (-) number that
             you subtract from the "Balance" on the line above it.

This Check To: The name of the person or company to whom the check is written

Date: The date on which you wrote the check

Check #:   A number printed on the check by the bank. You can use the number
           to put the checks in order when you receive your monthly statement
           to see if any checks are outstanding (have not been drawn against
           your account).

Pay To The Order Of: The name of the person or company to whom the check is
                       written

For: The purpose for which the check is written (example, groceries)

(amount):   The amount for which the check is written

(signature):   Your signature as you signed your name on your bank signature
               card

The check below has been completed using the following information:

Sam Smith has $50.00 in his account at the bank. On July
9, 1978, he goes to Harris Grocery and writes a check for
$15.25 to pay for some groceries. His check number is 114.

Balance Forward *50.00*	Check # _114_
Deposit ___—___	Date _July 9_ 19_78_
	Pay to the Order of _Harris Grocery_ $_15.25_
Balance _50.00_	
Deduction _15.25_	_Fifteen and 25/100_ ————— Dollars
Balance *34.75*	
This Check To _Harris Grocery_	FIRST BANK
Date _7/9/78_	MIAMI, FLORIDA
Check# _114_	For _Groceries_ _Sam Smith_

Lesson 1

OBJECTIVE:

   Given amounts of deposits and expenditures by check, the learner will prepare checkbook records of banking transactions.

EXERCISES:

A.   Review - Addition

1. $89.73	2. $27.90	3. $421.33	4. $572.45	5. $ 62.30
+310.57	+51.80	+430.50	+ 27.55	+390.30

B.   Review - Subtraction

1. $463.75	2. $347.86	3. $217.28	4. $173.65	5. $87.43
- 28.00	- 22.63	- 6.39	- 15.80	- 9.23

C. Application

Tom Jones has an account in the First Bank of Miami, Florida. As of October 1, 1978, he had a balance in his account of $42.10. Using the information below, write checks for Tom's purchases and keep the check stubs up to date with the proper information and the current bank balance. Do not forget to record the deposits that were made.

Balance Forward as of October 1, 1978: $42.10

For the month of October, 1978:

Date		Expenditures - Checks Written	Amount
10-2-78	(check No. 201)	Sam's Drugs	$14.67
10-5-78	(check No. 202)	Hart's Grocery	8.62
10-10-78	(check No. 203)	MasterCharge	10.00
10-18-78	(check No. 204)	Smith's Auto	5.25
10-24-78	(check No. 205)	Greengate Cafe	11.13
		Deposits	
10-2-78		Paycheck	$419.40

For the month of November, 1978:

Date		Expenditures - Checks Written	Amount
11-4-78	(check No. 206)	Hart's Grocery	$23.40
11-10-78	(check No. 207)	MasterCharge	10.00
11-11-78	(check No. 208)	Cash	20.00
11-15-78	(check No. 209)	Bill's Record Shop	13.11
11-21-78	(check No. 210)	Whit's Department Store	56.31
11-29-78	(check No. 211)	Cash	10.00
11-30-78	(check No. 212)	Acme Body Shop	203.00
		Deposits	
11-4-78		Paycheck	$419.40
11-29-78		Book Club Refund	32.00

Balance Forward_____	Check # ___201___
	Date_____19___
Deposit_____	Pay to the Order of_____$_____
Balance_____	
Deduction_____	_____Dollars
Balance_____ This Check To_____	FIRST BANK MIAMI, FLORIDA
Date_____ Check#____201___	For_____ _____

Balance Forward_____	Check # ___202___
	Date_____19___
Deposit_____	Pay to the Order of_____$_____
Balance_____	
Deduction_____	_____Dollars
Balance_____ This Check To_____	FIRST BANK MIAMI, FLORIDA
Date_____ Check#____202___	For_____ _____

Balance Forward_____	Check # ___203___
	Date_____19___
Deposit_____	Pay to the Order of_____$_____
Balance_____	
Deduction_____	_____Dollars
Balance_____ This Check To_____	FIRST BANK MIAMI, FLORIDA
Date_____ Check#____203___	For_____ _____

Balance
Forward_____

Deposit_____

Balance_____

Deduction_____

Balance_____
This Check To

_____
Date_____
Check#____204____

Check #____204____

Date_____19__

Pay to the
Order of_____$_____

_____Dollars

FIRST BANK
MIAMI, FLORIDA

For_____   _____

Balance
Forward_____

Deposit_____

Balance_____

Deduction_____

Balance_____
This Check To

_____
Date_____
Check#____205____

Check #____205____

Date_____19__

Pay to the
Order of_____$_____

_____Dollars

FIRST BANK
MIAMI, FLORIDA

For_____   _____

Balance
Forward_____

Deposit_____

Balance_____

Deduction_____

Balance_____
This Check To

_____
Date_____
Check#____206____

Check #____206____

Date_____19__

Pay to the
Order of_____$_____

_____Dollars

FIRST BANK
MIAMI, FLORIDA

For_____   _____

Balance
Forward_____

Deposit_____

Balance_____

Deduction_____

Balance
This Check To
_____
Date_____
Check#____207

Check #____207

Date_____19___

Pay to the
Order of_____$_____

_____Dollars

FIRST BANK
MIAMI, FLORIDA

For_____   _____

Balance
Forward_____

Deposit_____

Balance_____

Deduction_____

Balance
This Check To
_____
Date_____
Check#____208

Check #____208

Date_____19___

Pay to the
Order of_____$_____

_____Dollars

FIRST BANK
MIAMI, FLORIDA

For_____   _____

Balance
Forward_____

Deposit_____

Balance_____

Deduction_____

Balance
This Check To
_____
Date_____
Check#____209

Check #____209

Date_____19___

Pay to the
Order of_____$_____

_____Dollars

FIRST BANK
MIAMI, FLORIDA

For_____   _____

```
Balance                    |                              Check #    210
Forward_____           |
                           |                     Date_____19___
Deposit_____           | Pay to the
                           | Order of_____$_____
Balance_____            |
                           |
Deduction_____            | _____Dollars
                           |
Balance_____            |
This Check To              |          FIRST BANK
_____            |          MIAMI, FLORIDA
Date_____            |
Check#____210              | For_____    _____
```

```
Balance                    |                              Check #    211
Forward_____           |
                           |                     Date_____19___
Deposit_____           | Pay to the
                           | Order of_____$_____
Balance_____            |
                           |
Deduction_____            | _____Dollars
                           |
Balance_____            |
This Check To              |          FIRST BANK
_____            |          MIAMI, FLORIDA
Date_____            |
Check#____211              | For_____    _____
```

```
Balance                    |                              Check #    212
Forward_____           |
                           |                     Date_____19___
Deposit_____           | Pay to the
                           | Order of_____$_____
Balance_____            |
                           |
Deduction_____            | _____Dollars
                           |
Balance_____            |
This Check To              |          FIRST BANK
_____            |          MIAMI, FLORIDA
Date_____            |
Check#____212              | For_____    _____
```

Making a Bank Deposit

Just as you write a check when you take money out of the bank, you fill out a deposit slip when you put money into the bank. Your checkbook contains deposit slips which you should complete and include when you make each bank deposit. The bank will check the amount you are going to deposit and give you a receipt for that amount.

A deposit must be entered in your checkbook on the check stub so that it can be added to your bank balance to keep it current. Remember to check the amount of your deposit against the amount the bank has credited to your account. It is also a good idea to keep your deposit slips each month until you receive your bank statement in case a deposit was not credited to your account in the proper way.

Deposit slips contain separate spaces for currency (money in bill form, such as one or five dollar bills), coins, and checks. Make sure you write the proper amount in the space allowed for it on the deposit slip. Most people only deposit one or two items on a single deposit slip, but it contains several spaces for checks if necessary.

You can also obtain cash at the same time you make your deposit without having to write a check. Deduct the amount of cash you want from the deposit, enter the total deposit minus that amount, and sign the deposit slip to receive your cash.

Example: Sam Smith deposited a ten dollar bill, five dollars in quarters, and two checks in his account on May 1, 1978. One of the checks was for $15.00 from his father James and the other was a book club refund in the amount of $35.00. Sam wanted to receive twenty-five dollars when he made the deposit.

DEPOSIT RECORD			
Date _May 1_ 19_78_	Currency	10	00
	Coin	5	00
	C _James Smith_	15	00
	H _Book Club_	35	00
	E		
FIRST BANK	C		
MIAMI, FLORIDA	K		
	S		
Sam Smith	total from other side ____		
Sign if you are receiving cash	TOTAL	65	00
	less cash received	25	00
	TOTAL DEPOSIT	40	00
Itemize additional checks on reverse side			

(The reverse side of the Deposit Record would have space to list additional checks as shown in Application Exercise 2.)

Lesson 2

OBJECTIVE:

Given the amounts of items to be deposited and cash received, the learner will prepare bank deposit forms.

EXERCISES:

A. Review - Addition

1.		2.		3.		4.		5.	
	$243.50		$427.35		$625.		$376.00		$236.00
	3.15		6.00		72.90		123.80		561.50
	+ 7.30		+ 29.75		+ 33.60		+ 62.50		+405.85

B. Application

1. On August 2, 1978, James Taylor made a deposit in the First Bank of Miami, Florida. He deposited two ten dollar bills, $20.00 in dimes, and checks in the following amounts:

U.S. Navy paycheck	$419.20
Al's Office Supply	23.00
Income tax refund	300.00
Paul Taylor	5.25

James wanted to receive $50.00 in cash when he made his deposit. Using the deposit slip below, complete the information and enter it in the proper spaces.

```
                             DEPOSIT RECORD
  Date_____19____   Currency_____|____
                                 Coin_____|____
                                 C  _____|____
                                 H  _____|____
                                 E  _____|____
        FIRST BANK               C  _____|____
        MIAMI, FLORIDA           K  _____|____
                                 S  _____|____
                                 total from other side_____|____
                                       TOTAL_____|____
  _____       less cash received_____|____
  Sign if you are receiving cash  TOTAL DEPOSIT_____|____
              Itemize additional checks on reverse side
```

2.   On September 30, 1978, Carl Lee Simon made a deposit in the First Bank of Miami, Florida. He deposited one ten-dollar bill, $5.60 in coins, and checks in the following amounts:

U.S. Navy paycheck	$378.25	Bill's Garage	$15.00
Joe Jackson	31.00	Jim Brown	6.50
Fourth Savings & Loan	8.90	Big Motor Co.	400.00
HAL Corp.	12.88	Al's Gifts	3.63

Carl wanted to receive $100.00 in cash when he made his deposit. Using the deposit slip below, complete the information and enter it in the proper spaces.

```
                         DEPOSIT RECORD
  Date_____19____   Currency_____
                                   Coin_____
                                   C  _____
                                   H  _____
                                   E  _____
     FIRST BANK                    C  _____
     MIAMI, FLORIDA                K  _____
                                   S  _____
                                   total from other side_____
  _____        TOTAL_____
  Sign if you are receiving cash   less cash received_____
                                   TOTAL DEPOSIT_____
            Itemize additional checks on reverse side
```

```
Checks
(List Each Check Separately)   DOLLARS   CENTS
  1.
  2.
  3.
  4.
  5.
  6.
  7.
  8.
  9.
 10.
 TOTAL (enter on other side)   $
```

INTEREST

Introduction

When making large purchases many people do not have the cash on hand to pay for their purchases. Therefore, they borrow money. It is not difficult to borrow money when purchasing an automobile, a boat, or a home. The key is the ability to pay the installment payments. Lending institutions such as banks and loan companies are in the business of loaning money to individuals. However, they charge interest on the loans.

Interest is defined as money paid for the use of someone else's money. For example, a person may wish to borrow $1,000.00 and the lending agency will charge him $1,200.00 before the installments are completed. The different between the $1,000 and the $1,200 represents the amount of interest to be paid. Interest comes in various forms: simple interest, add-on interest, bank discount interest, and decreasing monthly interest. The exercises in the lessons that follow will help you understand each of these forms of interest.

Lesson 1

Simple Interest

OBJECTIVE:

Given the principal, rate, and time, the learner will calculate the interest and total amount for simple interest loans or savings accounts.

PROCEDURE:

As the name implies, simple interest is the easiest type of interest to compute. It is interest paid in one payment when the original amount of the loan is repaid. It is also the amount of money added to a savings account after the money has been on deposit for a period of time.

Simple interest (I) is computed for a loan or savings account by multiplying three numbers that show the following:

Principal (P) - amount of money borrowed or deposited
Rate (R) - annual percentage of interest charged or paid
Time (T) - length of time of the load or deposit

The procedure for computing simple interest can be expressed as a mathematical formula using letters as symbols for the terms. The formula is as follows:

$$I = P \times R \times T$$

In words, Interest equals Principal times Rate times Time.

In computing simple interest, the rate is always expressed as a decimal number (11% = .11) and the time is always expressed in years (2 years or 24 months = 2).

Example

You deposit $200 at an 11% annual rate of simple interest for two years. How much interest will you receive? How much will you have in principal and interest at the end of two years?

Remember that the formula to compute the interest is:

$$I = P \times R \times T$$

In the example,

$$P = \$200$$

$$R = .11 \ (11\%)$$

$$T = 2 \ \ (2 \text{ years})$$

$$\begin{array}{ccc} P & R & T \end{array}$$
$$I = \$200 \times .11 \times 2$$

Multiply: $200 x .11 = $22   (interest for 1 year)

Multiply: $ 22 x 2 = $44   (interest for 2 years)

I = $44   (total interest received)

Total Amount = Principal + Interest

Total Amount = $200 + $44 = $244

You would have $244 after a period of two years if you deposited $200 at an 11% annual interest rate.

EXERCISES:

A. Review - Multiplication

1. $600.00
    x   .17

2. $300 x .09 x 2 = _____

3. $107.45
    x   3

4. $100 x .08 x 7 = _____

5. $105.42
    x   6

B. Application

Find the interest and total amount for the exercises below.

	Interest	Total Amount
1. Principal = $350 Rate = 15% Time = 2 years	_____	_____
2. Principal = $400 Rate = 11.5% Time = 36 months	_____	_____
3. Principal = $3,000 Rate = 12.25% Time = 2 years	_____	_____

4. Seaman Jones deposits $500 in a savings account at 10% annual rate of interest for 24 months. Compute the interest and total amount in the account at the end of the time period.

Interest_____

Total
Amount_____

5. Yeoman Miller borrows $1,000 at 9% annual rate of interest for 2.5 years. Compute the interest and total amount due.

Interest_____

Total
Amount_____

Lesson 2

Add-On Interest

OBJECTIVE:

Given the principal, rate, and time, the learner will calculate the interest, total amount due, and monthly payments for add-on interest loans.

PROCEDURE:

Add-on interest is computed on the principal, and the amount of interest is added to the principal to compute the total due. This is the same procedure as you use for simple interest. *The only difference is that a loan with add-on interest is repaid in monthly installments during the stated time period.*

Example

You borrow $1,200 at an annual interest rate of 9% for two years. In order to compute your monthly payments, you will need to compute the interest on the loan and add it to the principal to obtain the total amount due. The steps are the following:

Step 1.   Compute the interest using the simple interest formula:

$$\text{Interest} = \text{Principal} \times \text{Rate} \times \text{Time}$$

$$I = P \times R \times T$$

In the example,

$$P = \$1,200$$

$$R = .09$$

$$T = 2$$

$$I = \$1,200 \times .09 \times 2 = \$216$$

Step 2.   Compute the total amount due:

$$\text{Total Amount} = \text{Principal} + \text{Interest}$$

$$\text{Total Amount} = \$1,200 + \$216 = \$1,416$$

Step 3.   Compute the monthly payment amount:

$$\text{Monthly Payment} = \frac{\text{Total Amount}}{\text{Time (in months)}}$$

Step 4:   Monthly Payment = $\dfrac{\$1,416}{24}$ = $59.00

EXERCISES:

A. Review - Multiplication and Division

1.   250   2.   400   3.   360
      x .10   x .15   x 1.5

4.   6/$\overline{321}$ 5.   36/$\overline{1251}$ 6.   12/$\overline{84}$

B. Application

   Find the interest, total amount due, and monthly payment for the following exercises:

		Interest	Total Amount	Monthly Payment
1.	P = $1,000 R = 8% T = 4 years	1. _____	_____	_____
2.	P = $3,000 R = 12% T = 36 months	2. _____	_____	_____
3.	P = $1,250 R = 10% T = 18 months	3. _____	_____	_____

4. Petty Officer Lopez borrows $900 for one and one-half years at 10% add-on interest. How much will his monthly payment be?

                                   Monthly Payment_____

5. Seaman Apprentice Williams makes a loan of $600 at an add-on interest rate of 11% for two years. How much will the monthly payments be?

                                   Monthly Payment_____

Lesson 3

Bank Discount Interest

OBJECTIVE:

Given the net proceeds, rate, and time, the learner will calculate the principal, interest, and monthly payments for bank discount interest loans.

PROCEDURE:

Bank discount interest is computed differently than the two types of interest already discussed. In calculating bank discount interest, the lender subtracts the interest due from the amount you borrow before you receive the money. The amount of money you receive is the _net proceeds_ (N). The net proceeds plus the interest equals the principal or the total amount of the loan. For this type of loan, the interest is considered to be part of the loan principal.

The procedure for computing the principal of bank discount interest loans can be stated as a mathematical formula:

$$\text{Principal} = \frac{\text{Net Proceeds}}{1 - (\text{Rate} \times \text{Time})} \text{ or } P = \frac{N}{1 - (R \times T)}$$

Rate is expressed as a decimal and time is expressed in years.

(In the formula, the number 1 is a constant or fixed value.)

Example

You receive net proceeds of $180 from a bank discount interest loan with an interest rate of 10% over a period of 1 year. How much is the principal of the loan?

Remember that the formula to compute principal for bank discount interest loans is:

$$\text{Principal} = \frac{\text{Net Proceeds}}{1 - (\text{Rate} \times \text{Time})}$$

In the example,

$$\text{Net Proceeds} = \$180$$

$$\text{Rate} = .10$$

$$\text{Time} = 1$$

$$P = \frac{\$180}{1 - (.10 \times 1)} = \frac{\$180}{1 - .10} = \frac{\$180}{.90} = \$200.00$$

(Note: If you wanted to receive $200 in net proceeds, you would have to make a bank discount interest loan of about $222.22 since the amount of money you receive is less than the loan amount.)

The interest for a bank discount interest loan is found by subtracting the net proceeds from the principal. The formula used is as follows:

$$\underline{Interest} = \underline{Principal} - \underline{Net} \text{ Proceeds}$$

$$I = P - N$$

Using the example above, you could find the interest in the following way:

$$I = \$200.0 - \$180.00 = \$20.00$$

The monthly payment for a bank discount loan equals the principal divided by the time expressed in months. The formula for the calculation is the following:

$$\text{Monthly Payment} = \frac{Principal}{Time \text{ (in months)}}$$

For the example above, the monthly payment is found by the following calculation:

$$\text{Monthly Payment} = \frac{\$200}{12} = \$16.67$$

(Since 12 payments of $16.67 each equal $200.04, the last monthly payment would be $16.63 on 4 cents less than the first 11 payments.)

Special Note:

In the example used above, the stated interest rate is 10%. The calculations show that you would receive net proceeds of $180 and pay $20 in interest for one year. Now, think of the loan as a simple interest loan. In this situation, the principal would be $180 and the amount of interest would be $20. The interest rate can be found by the following formula:

$$\text{Rate} = \frac{Interest}{Principal \times Time \text{ (years)}} \text{ or } R = \frac{I}{P \times T}$$

Using the simple interest formula shows the following results:

$$R = \frac{\$20}{\$180 \times 1} = \frac{\$20}{\$180} = .11 = 11\%$$

As you can see, the way that interest is charged can change the rate. The bank discount interest rate of 10% in the example would require you to pay the same amount of interest as a rate of about 11% on a simple interest loan.

EXERCISES:

A. Review - Division and Multipication

1. $\dfrac{\$104.28}{12}$ = _____   2. (.16 x 2) = _____   3. $\dfrac{\$1,600}{.80}$ = _____

4. $8\overline{)\$117.36}$ 5. $\dfrac{\$103.20}{10}$ = _____   6. $\begin{array}{r} .09 \\ \times\ 3 \\ \hline \end{array}$

B. Application

Find the principal, interest, and monthly payment for the exercises below. (Calculate your answers to two decimal places.)

	Principal	Interest	Monthly Payment
1. Net Proceeds = $1,640 Rate = 12% Time = 1.5 years	1. _____	_____	_____
2. Net Proceeds = $6,480 Rate = 14% Time = 2 years	2. _____	_____	_____
3. Net Proceeds = $3,400 Rate = 8% Time = 36 months	3. _____	_____	_____

4. Chief Petty Officer Solas received $7,500 net proceeds from a bank discount interest loan for 2.5 years at a 10% interest rate. How much was the monthly payment?

Monthly Payment_____

5. Yeoman Smith made a bank discount interest loan that provided $1,800 in net proceeds based on 12.5% interest for two years. How much was the monthly payment?

Monthly Payment_____

Lesson 4

Monthly Interest

OBJECTIVE:

Given the principal, monthly interest rate, and time, the learner will calculate the total interest, total amount, and monthly payment for monthly interest loans.

PROCEDURE:

Monthly interest loans are familiar to most people who have ever made loans for long-term purchases of such things as cars. Interest on these loans is calculated on the declining balance due the lender after each monthly payment. The same procedure is used on balances due with charge card accounts.

The interest for each month can be calculated using the simple interest formula:

$$\underline{Interest} = \underline{Principal} \times \underline{Rate} \times \underline{Time}$$

$$I = P \times R \times T$$

Note: R = rate per month expressed as a decimal and T = 1 month

Example

You borrow $200 at an interest rate of 1% per month. If you pay $20 on the loan at the end of the first month, how much is paid in interest and how much is paid on the principal?

$$I = P \times R \times T$$

$$I = \$200 \times .01 \times 1$$

$$I = \$2$$

The interest payment is $2 with the remainder of the payment or $18 being applied to the principal. The interest for the second month would be calculated for the unpaid balance of the principal or $182.

A very important thing before making a monthly interest loan is to find out how much total interest you will pay on the loan. You should try to find the lowest monthly interest rate possible because it determines the amount of interest you will pay. For example, a loan with a 2% monthly interest rate has an annual rate of 24% while a .5% monthly interest rate has an annual rate of 6%.

Most lenders of money for long-term purchases charge equal monthly payments for the convenience of their customers. The amount of each monthly payment is found by computing the total interest, adding it to the principal, and dividing by the number of months of the loan.

The total interest can be calculated using the following mathematical formula:

$$\text{Total Interest} = \frac{\text{Principal} \times \text{Rate (per month)} \times (\text{Months} + 1)}{2}$$

The numbers 1 and 2 in the formula are constants or fixed values.

Example

You make a loan of $200 at a monthly rate of 1% interest for a period of 12 months. How much will the total interest on the loan be?

$$\text{Total Interest} = \frac{\$200 \times .01 \times (12 + 1)}{2}$$

$$\text{Total Interest} = \frac{\$200 \times .01 \times 13}{2} = \frac{\$200 \times .13}{2} = \frac{\$26}{2}$$

Total Interest = $13

The total amount to be paid is the principal plus the interest. In the example, the principal is $200 and the interest is $13.

$$\text{Total Amount} = \$200 + \$13 = \$213$$

The monthly payment is the total amount divided by the numbers of months that the loan will be repaid. The total amount to be paid is $213 over a period of 12 months.

$$\text{Monthly Payment} = \frac{\$213}{12} = \$17.75$$

EXERCISES:

A. Review - Multiplication and Division

1. $250 x .01 x 25 = _____

2. $125 x .02 x 13 = _____

3. $\dfrac{.01 \times 19}{2}$ = _____

4. $\dfrac{.02 \times 37}{2}$ = _____

5. $\dfrac{\$600 \times .015 \times 13}{2}$ = _____

B. Application

Find the total interest, total amount, and monthly payment in these exercises:

	Total Interest	Total Amount	Monthly Payment
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____

1. P = $450
    R = 2% per month
    T = 12 months

2. P = $3,000
    R = 1% per month
    T = 24 months

3. P = $5,000
    R = 1.5%
    T = 1.5 years

4. Master Chief Hogan borrows $6,500 at a monthly interest rate of 1.75% over a period of 2 years. How much is the monthly payment?

Monthly Payment_____

5. Petty Officer Gomez makes a loan of $800 for one year at a monthly interest rate of 1.25%. How much is the monthly payment of the loan?

Monthly Payment_____

ANSWERS TO EXERCISES

BASIC NUMERICAL SKILLS

ADDITION

Lesson 1:
(1) 9, (2) 7, (3) 7, (4) 4, (5) 9, (6) 9, (7) 11, (8) 10, (9) 6, (10) 8,
(11) 12, (12) 10, (13) 4, (14) 8, (15) 6, (16) 8, (17) 9, (18) 11, (19) 11,
(20) 14, (21) 15, (22) 11, (23) 16, (24) 12, (25) 13, (26) 13, (27) 14,
(28) 8, (29) 2, (30) 5

Lesson 2:
A. (1) 69, (2) 140, (3) 137, (4) 150, (5) 130, (6) 25, (7) 88, (8) 139,
(9) 55, (10) 98, (11) 66, (12) 137, (13) 123, (14) 109, (15) 80

B. (1) 579, (2) 678, (3) 1530, (4) 201, (5) 1627, (6) 966, (7) 666, (8) 1099,
(9) 622, (10) 755, (11) 1267, (12) 1251, (13) 829, (14) 1210, (15) 920

Lesson 3:
(1) $300.68, (2) $2.82, (3) $1118.46, (4) $20,178.74, (5) $266.19,
(6) $800.92, (7) $7,084.45, (8) $121.86, (9) $109.17, (10) $2,174.01,
(11) $8,663.94, (12) $567.12, (13) $605.36, (14) $20,178.74, (15) $6.32,
(16) $69.64, (17) $16.32, (18) $1.22, (19) $14.72, (20) $8.71

SUBTRACTION

Lesson 1:
(1) 3, (2) 0, (3) 2, (4) 1, (5) 3, (6) 4, (7) 8, (8) 2, (9) 2, (10) 1, (11) 1,
(12) 5, (13) 5, (14) 1, (15) 2, (16) 3, (17) 1, (18) 5, (19) 3, (20) 1

Lesson 2:
A. (1) 45, (2) 64, (3) 30, (4) 43, (5) 3, (6) 22, (7) 19, (8) 33, (9) 79,
(10) 13, (11) 16, (12) 38, (13) 8, (14) 5, (15) 75, (16) 2, (17) 18,
(18) 32, (19) 40, (20) 45

B. (1) 254, (2) 596, (3) 472, (4) 153, (5) 281, (6) 436, (7) 750,
(8) 700, (9) 80, (10) 695, (11) 851, (12) 192, (13) 311, (14) 381, (15) 523,
(16) 635, (17) 629, (18) 850, (19) 120, (20) 936

Lesson 3:
(1) 216.19, (2) 1, 146.99, (3) 362.08, (4) 565.23, (5) 3.59, (6) 671.81,
(7) 15.86, (8) 5.76, (9) 0.33, (10) 31.42, (11) 0.0057, (12) 38.2886,
(13) 0.15756, (14) 13,288.78, (15) 0.38, (16) 0.48 (17) 96.9787, (18) 1.94,
(19) 4.13, (20) 0.16522

MULTIPLICATION

Lesson 1:
(1) 9, (2) 63, (3) 21, (4) 7, (5) 48, (6) 1, (7) 32, (8) 16, (9) 49, (10) 9,
(11) 25, (12) 6, (13) 18, (14) 20, (15) 16, (16) 36, (17) 42, (18) 4,
(19) 24, (20) 15

Lesson 2:
(1) 24, (2) 95, (3) 64, (4) 136, (5) 10, (6) 77, (7) 108, (8) 75, (9) 39,
(10) 105, (11) 231, (12) 168, (13) 264, (14) 112, (15) 480, (16) 312,
(17) 205, (18) 468, (19) 567, (20) 210

Lesson 3:
(1) 4,313, (2) 792, (3) 2,436, (4) 5,511, (5) 24,339, (6) 1,992, (7) 6,006,
(8) 1,650, (9) 52,032, (10) 1,845, (11) 16, 371, (12) 8,372, (13) 8,900,
(14) 12,609, (15) 924, (16) 23,304, (17) 59,630, (18) 8,547, (19) 12,628,
(20) 9,636

Lesson 4:
(1) 30, (2) 49, (3) 2,214, (4) 81, (5) 42, (6) 189, (7) 216, (8) 294,
(9) 144, (10) 4,370, (11) 2,952, (12) 41,882, (13) 1,573, (14) 3,632,
(15) 40,095, (16) 9,040, (17) 676, (18) 1,764, (19) 1,078, (20) 4,743

DIVISION

Lesson 1:
(1) 4, (2) 0, (3) 1, (4) 2, (5) 1, (6) 3, (7) 3, (8) 1, (9) 0, (10) 2,
(11) 1, (12) 0, (13) 2, (14) 2, (15) 1, (16) 1, (17) 8, (18) 0, (19) 4,
(20) 1

Lesson 2:
(1) 9, (2) 13, (3) 7, (4) 4, (5) 10, (6) 32, (7) 19, (8) 12, (9) 3, (10) 8,
(11) 12, (12) 19, (13) 34, (14) 9, (15) 7, (16) 14, (17) 23, (18) 21,
(19) 29, (20) 9

Lesson 3:
(1) 153, (2) 97, (3) 371, (4) 165, (5) 174, (6) 132, (7) 82, (8) 273,
(9) 64, (10) 114, (11) 21, (12) 61, (13) 325, (14) 174, (15) 332, (16) 91,
(17) 89, (18) 123, (19) 71, (20) 45

Lesson 4:   (Note: R is "remainder")
(1) 14, (2) 40.55 or 40 R = 12, (3) 20.32 or 20 R = 12, (4) 13, (5) 8,
(6) 6.16 or 6 R = 12, (7) 4.48 or 4 R = 40, (8) 3, (9) 2.63 or 2 R = 45,
(10) 30, (11) 17, (12) 15.64 or 15 R = 39, (13) 11.51 or 11 R = 37,
(14) 9, (15) 7, (16) 37, (17) 17.81 or 17 R = 21, (18) 10, (19) 4,
(20) 47.42 or 47 R = 8

NUMERICAL SKILLS IN THE NAVY

MILITARY TIME

Lesson 1:
(1) 0915, (2) 1945, (3) 6:00 p.m., (4) 5:15 p.m., (5) 0605, (6) 8:00 a.m.,
(7) 1624, (8) 0302, (9) 2125, (10) 11:50 p.m., (11) 2300, (12) 1015,
(13) 9:02 a.m., (14) 1305, (15) 10:14 p.m.

Lesson 2:
(1) 041800Z, (2) 0800Z, (3) 1600Z, (4) 101230Z, (5) 1830Z, (6) 0415Z,
(7) 152400Z, (8) 0430Z, (9) 161300Z, (10) 040915Z

Lesson 3:
A. (1) 27, (2) 15.0, (3) 4, (4) 6
B. (1) 1745 hours, (2) 1315 hours, (3) 1135 hours, (4) 0645 hours
C. (1) 4 hours, (2) 8 manhours, (3) 1145 hours, (4) 31.5 manhours,
   (5) 1324 hours, (6) 2.25 hours

FINDING DIRECTIONS

Lesson 1:
(1) 035°, (2) 290°, (3) 210°, (4) 335°, (5) 135°

Lesson 2:
A. (1) 49, (2) 131, (3) 265, (4) 355, (5) 184
B. (1) 47, (2) 336, (3) 264, (4) 119, (5) 218
C. (1) 167°, (2) 308°, (3) 017°, (4) 254°, (5) 346°,

Lesson 3:
A. (1) 28, (2) 182, (3) 361, (4) 252, (5) 213
B. (1) 113, (2) 321, (3) 265, (4) 132, (5) 78
C. (1) 027, (2) 030, (3) 060, (4) 059, (5) 078, (6) 069, (7) 140, (8) 122,
   (9) 171, (10) 155, (11) 231, (12) 220, (13) 254, (14) 259, (15) 317,
   (16) 334, (17) 323, (18) 339, (19) 008, (20) 020

ESTIMATING PAINT JOBS

Lesson 1:
A. (1) 7, (2) 9, (3) 13, (4) 12, (5) 15, (6) 8

B. (1) $A = 1 \times w$, (2) $A = \frac{b \times h}{2}$, (3) Add the results.

C. (1) 2 gal., (2) 5 gal., (3) 10 gal., (4) 32 gal., (5) 241 gal.

ESTIMATING PAINT JOBS (continued)

Lesson 2:
A. (1) 48, (2) 243, (3) 423.0, (4) 5286.3, (5) 13.2, (6) 21.25, (7) 58.05,
   (8) 4958.8
B. (1) 74, (2) 159, (3) 375, (4) 508.5, (5) 8.8, (6) 19.8, (7) 25.9,
   (8) 33.925
C. (1) 108 sq. ft., (2) 67.5 sq. ft., (3) 307.5 sq. ft., (4) 19.25 sq. ft.,
   (5) 207.5 sq. ft. (6) 42 sq. ft., (7) 53.2 sq. ft., (8) 145.23 sq. ft.,
   (9) 72 sq. ft., (10) 1,242.5 sq. ft., (11) 24.46 sq. ft.,
   (12) 112 sq. ft., (13) 150.5 sq. ft., (14) 107.10 sq. ft.

Lesson 3:
A. (1) 3,000, (2) 1,914, (3) 576, (4) 198.0, (5) 162.5, (6) 96.9
B. (1) 210, (2) 535.5, (3) 371, (4) 19, (5) 18.5, (6) 12.75
C. (1) (a) 15.0 gal., (b) 0.4 gal., (c) 1.8 gal., (d) 1.1 gal., (e) 9.6 gal.,
   (2) 0.4 gal., (3) 11.4 gal., (4) 3.1 gal., (5) 4.7 gal.

TACKLES AND HOOKS

Lesson 1:
A. (1) 40, (2) 42, (3) 5, (4) 150, (5) 220, (6) 320
B. (1) 800, (2) 900, (3) 1,950
C. (1) 5:1, 3:1, 6:1, (2) 550, (3) 6:1, (4) 1,500 lbs, (5) 2:1, (6) 600 lbs,
   (7) 150 lbs, (8) 400 lbs, (9) 6:1, (10) 400 lbs

FLOODING RATES

Lesson 1:
(1) 856, (2) 1,697, (3) 109, (4) 1,307, (5) 25, (6) 1,711, (7) 267,
(8) 1,569, (9) 612, (10) 775

Lesson 2:
A. (1) 5,138, (2) 8,638, (3) 5,370, (4) 8,616, (5) 2,790
B. (1) 5,930, (2) 1,308, (3) 6,818, (4) 3,288, (5) 3,459, (6) 41,580

MEASURING TEMPERATURE

Lesson 1:
(1) 122, (2) 23, (3) -13, (4) 93 (5) 153, (6) 43, (7) 77, (8) -23, (9) 135,
(10) 37

Lesson 2:
A. (1) 79, (2) 97, (3) 57, (4) 109, (5) 221
B. (1) 14.4, (2) 41.4, (3) 108.0 (4) 217.8 (5) 147.6
C. (1) 59°F, (2) 300 °F, (3) 41°F, (4) 410°F, (5) 442°F

MEASURING TEMPERATURE (continued)

Lesson 3:
A. (1) 110, (2) 55, (3) 213, (4) 89, (5) 169
B. (1) 30, (2) 55, (3) 45, (4) 24.44 or 24 R=8, (5) 71.11 or 71 R=2
C. (1) 427°C, (2) 19°C, (3) -273°C, (4) 60°C, (5) -183°C

BREAKING STRENGTH AND SAFE WORKING LOAD

Lesson 1:
A. (1) 1,220, (2) 4,200, (3) 8,235, (4) 288, (5) 288, (6) 6.28
B. (1) 3,600 lbs, (2) 11, 340 lbs, (3) 7,875 lbs, (4) 78,876.8 lbs,
    (5) 36,000 lbs

Lesson 2:
A. (1) 790, (2) 660, (3) 565, (4) 135, (5) 4
B. (1) 240 lbs, (2) 63,101.44 lbs, (3) 4,050 lbs, (4) 3,943.84 lbs, (5) yes,
    (6) 127,780.42 lbs, (7) 3 tons

NUMERICAL SKILLS IN PERSONAL FINANCES

BASIC PAY

Lesson 1:
(1) $448.80, (2) $1,019.10, (3) $140.40 (4) $1,179.90, (5) $3.62, (6) $500.10,
(7) $548.10, (8) $160.80, (9) $945.60, (10) E6

Lesson 2:
A. (1) $558.90, (2) $505.80, (3) $176.40, (4) $1,353.90, (5) $615.60
B. (1) $3.60, (2) $389.10, (3) $1,090.80, (4) $333.30, (5) $719.70
C. (1) $703.50, (2) $700.20, (3) $918.30, (4) $500.10, (5) $844.80,
    (6) $64.50

Lesson 3:
A. (1) $1,599.30, (2) $5,301.00, (3) $7,995.60, (4) $1,042.20, (5) $40.50,
    (6) $70.98
B. (1) $1,346.40, (2) $7,695.60, (3) $228.06, (4) $10,254.00, (5) $1,647.89,
    (6) $22.47

Lesson 4:
A. (1) $3.38, (2) $553.80, (3) $103.58, (4) $1,209.30 (5) 2.04
B. (1) $570.20, (2) $160.80, (3) 80.36%, (4) $3.62, (5) $500.10

LEAVE AND EARNINGS STATEMENT

Lesson 1:
(1) FICA, (2) 56, (3) BASIC PAY, (4) 79/05/25, (5) 18, (6) USED, (7) 58,
(8) 53, (9) 18, (10) 16

Lesson 2:
A. (1) $428.49, (2) $75.11, (3) $796.00, (4) $233.01, (5) $612.20, (6) $181.60,
    (7) 331.5, (8) $747.06, (9) $212.38, (10) $41.75
B. (1) $36.23, (2) $711.46, (3) $88.95, (4) $287.88, (5) $37, (6) $702.51,
    (7) $92.29, (8) $79.79, (9) $1,030.12, (10) $1,591.32
C. (1) $824.10, (2) 20 days, (3) $294.19, (4) $549.50, (5) 10 days, (6) 0501/
    0531, (7) $112.90, (8) $25.00, (9) $37.50, (10) 15 days

Lesson 3:
A. (1) 16, (2) 112.5, (3) 77, (4) 24.75, (5) 101.76, (6) 1,055.25, (7) 41,
    (8) 108
B. (1) 25, (2) 106, (3) 16.33, (4) 26, (5) 164.67, (6) 58, (7) 4.17, (8) 0.39
C. (1) 60%, (2) 48%, (3) $46.50, (4) $724.68, (5) 6.25%, (6) 15%, (7) 64.91%,
    (8) 36.43%

BUDGET PREPARATION

Lesson 1:
A. (1) $33.22, (2) $8.84, (3) $173.67, (4) $54.60, (5) $6.38
B. (1) $27.31, (2) $101.32, (3) $17.50, (4) $46.74, (5) $58.72, (6) $27.31,
    (7) $76.95, (8) $63.94

Lesson 2:
A. (1) 2,999.50, (2) 14,875, (3) 6,490, (4) $31.50, (5) $138.00
B. (1) $303.97, (2) $533.80, (3) $128.26, (4) $1,109.02, (5) $1,202.34,
    (6) $221.94

BANKING

Lesson 1:
A. (1) $400.30, (2) $79.70, (3) $851.83, (4) $600.00, (5) $452.60
B. (1) $435.75, (2) $325.23, (3) $210.89, (4) $157.85, (5) $78.20

BANKING - Lesson 1 - C

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┌─────────────────────────────┬──────────────────────────────────────────────┐
│ Balance                     │                          Check #    201      │
│ Forward   $ 42.10           │                                              │
│                             │                          Date Oct. 2.   1978 │
│ Deposit   $419.40           │ Pay to the                                   │
│                             │ Order of   Sam's Drugs            $14.67      │
│ Balance   $461.50           │                                              │
│                             │                                              │
│ Deduction$ 14.67            │ Fourteen and 67/100─────────────────Dollars  │
│                             │                                              │
│ Balance   $446.83           │          FIRST BANK                          │
│ This Check To               │          MIAMI, FLORIDA                      │
│ Sam's Drugs                 │                                              │
│ Date Oct. 2, 1978           │                                              │
│ Check#    201               │ For Medicine            Tom Jones            │
└─────────────────────────────┴──────────────────────────────────────────────┘
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┌─────────────────────────────┬──────────────────────────────────────────────┐
│ Balance                     │                          Check #    202      │
│ Forward   $446.83           │                                              │
│                             │                          Date Oct. 5.   1978 │
│ Deposit   ────              │ Pay to the                                   │
│                             │ Order of   Hart's Grocery         $8.62      │
│ Balance   $446.83           │                                              │
│                             │                                              │
│ Deduction$ 8.62             │ Eight and 62/100────────────────────Dollars  │
│                             │                                              │
│ Balance   $438.21           │          FIRST BANK                          │
│ This Check To               │          MIAMI, FLORIDA                      │
│ Hart's Grocery              │                                              │
│ Date Oct. 5, 1978           │                                              │
│ Check#    202               │ For Groceries           Tom Jones            │
└─────────────────────────────┴──────────────────────────────────────────────┘
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┌─────────────────────────────┬──────────────────────────────────────────────┐
│ Balance                     │                          Check #    203      │
│ Forward   $438.21           │                                              │
│                             │                          Date Oct. 10.  1978 │
│ Deposit   ────              │ Pay to the                                   │
│                             │ Order of   Mastercharge           $10.00     │
│ Balance   $438.21           │                                              │
│                             │                                              │
│ Deduction$ 10.00            │ Ten and 00/100──────────────────────Dollars  │
│                             │                                              │
│ Balance   $428.21           │          FIRST BANK                          │
│ This Check To               │          MIAMI, FLORIDA                      │
│ Mastercharge                │                                              │
│ Date Oct. 10, 1978          │                                              │
│ Check#    203               │ For Charge card         Tom Jones            │
└─────────────────────────────┴──────────────────────────────────────────────┘
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BANKING - Lesson 1 - C (continued)

Balance Forward $428.21	Check # 204
Deposit ———	Date Oct. 18, 19 78
Balance $428.21	Pay to the Order of Smith's Auto $ 5.25
Deduction$ 5.25	Five and 25/100————————————Dollars
Balance $422.96 This Check To Smith's Auto Date Oct. 18, 1978 Check# 204	FIRST BANK MIAMI, FLORIDA For Auto Bill Tom Jones

Balance Forward $422.96	Check # 205
Deposit ———	Date Oct. 24, 19 78
Balance $422.96	Pay to the Order of Greengate Cafe $ 11.13
Deduction $ 11.13	Eleven and 13/100————————————Dollars
Balance $411.83 This Check To Greengate Cafe Date Oct. 24, 1978 Check# 205	FIRST BANK MIAMI, FLORIDA For Food Tom Jones

Balance Forward $411.83	Check # 206
Deposit $419.40	Date Nov. 4, 19 78
Balance $831.23	Pay to the Order of Hart's Grocery $ 23.40
Deduction $ 23.40	Twenty-three and 40/100————————Dollars
Balance $807.83 This Check To Hart's Grocery Date Nov. 4, 1978 Check# 206	FIRST BANK MIAMI, FLORIDA For Groceries Tom Jones

BANKING - <u>Lesson 1</u> - C (continued)

Balance		Check # 207
Forward __$807.83__		
		Date __Nov. 10,__ 19__78__
Deposit _____	Pay to the	
	Order of __Mastercharge__	__$10.00__
Balance __$807.83__		
Deduction __$ 10.00__	Ten and 00/100————————————————Dollars	
Balance __$797.83__		
This Check To	FIRST BANK	
__Mastercharge__	MIAMI, FLORIDA	
Date __Nov. 10, 1978__		
Check# __207__	For __Charge Bill__ __Tom Jones__	

Balance		Check # 208
Forward __$797.83__		
		Date __Nov. 11,__ 19__78__
Deposit _____	Pay to the	
	Order of __Cash__	__$ 20.00__
Balance __$797.83__		
Deduction __$ 20.00__	Twenty and 00/100————————————————Dollars	
Balance __$777.83__		
This Check To	FIRST BANK	
__Cash__	MIAMI, FLORIDA	
Date __Nov. 11, 1978__		
Check# __208__	For __Cash__ __Tom Jones__	

Balance		Check # 209
Forward __$777.83__		
		Date __Nov. 15,__ 19__78__
Deposit ———	Pay to the	
	Order of __Bill's Record Shop__	__$ 13.11__
Balance __$777.83__		
Deduction __$ 13.11__	Thirteen and 11/100————————————————Dollars	
Balance __$764.72__		
This Check To	FIRST BANK	
__Bill's Record Shop__	MIAMI, FLORIDA	
Date __Nov. 15, 1978__		
Check# __209__	For __Records__ __Tom Jones__	

BANKING - <u>Lesson 1</u> - C (continued)

Balance		Check # ___210___
Forward _$764.72_		
		Date _Nov. 21,_ 19_78_
Deposit _———_	Pay to the	
	Order of _Whit's Department Store_ $_56.31_	
Balance _$764.72_		
Deduction _$56.31_	_Fifty-six and 31/100_——————————Dollars	
Balance _$708.41_		
This Check To	FIRST BANK	
Whit's Dept. Store	MIAMI, FLORIDA	
Date _Nov. 21, 1978_		
Check# ___210___	For _Clothes_ _Tom Jones_	

Balance		Check # ___211___
Forward _$708.41_		
		Date _Nov. 29,_ 19_78_
Deposit _$ 32.00_	Pay to the	
	Order of _Cash_ $_10.00_	
Balance _$740.41_		
Deduction _$10.00_	_Ten and 00/100_——————————Dollars	
Balance _$730.41_		
This Check To	FIRST BANK	
Cash	MIAMI, FLORIDA	
Date _Nov. 29, 1978_		
Check# ___211___	For _Cash_ _Tom Jones_	

Balance		Check # ___212___
Forward _$730.41_		
		Date _Nov. 30,_ 19_78_
Deposit _——_	Pay to the	
	Order of _Acme Body Shop_ $_203.00_	
Balance _$730.41_		
Deduction _$203.00_	_Two hundred three and 00/100_——————Dollars	
Balance _$527.41_		
This Check To	FIRST BANK	
Acme Body Shop	MIAMI, FLORIDA	
Date _Nov. 30, 1978_		
Check# ___212___	For _Auto repair_ _Tom Jones_	

BANKING (continued)

Lesson 2:
A. (1) $253.95, (2) $463.10, (3) $731. 50, (4) $562.30, (5) $1,203.35

B. (1)

DEPOSIT RECORD			
Date August 2, 19 78	Currency	$ 20	00
	Coin	20	00
	C U.S. Navy Paycheck	419	20
	H Al's Office Supply	23	00
	E Income Tax Refund	300	00
FIRST BANK	C Paul Taylor	5	25
MIAMI, FLORIDA	K		
	S		
	total from other side		
James Taylor	TOTAL	$787	45
Sign if you are receiving cash	less cash received	50	00
	TOTAL DEPOSIT	$737	45
Itemize additional checks on reverse side			

(2)

DEPOSIT RECORD			
Date September 30, 19 78	Currency	$ 10	00
	Coin	5	60
	C	378	25
	H	31	00
	E	8	90
FIRST BANK	C	12	88
MIAMI, FLORIDA	K	15	00
	S	6	50
	total from other side	403	63
Carl Lee Simon	TOTAL	$871	76
Sign if you are receiving cash	less cash received	100	00
	TOTAL DEPOSIT	$771	76
Itemize additional checks on reverse side			

Checks (List Each Check Separately)	DOLLARS	CENTS
1. Big Motor Co.	$400	00
2. Al's Gifts	3	63
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
TOTAL (enter on other side)	$ 403.63	

INTEREST

Lesson 1:
A.   (1) $102.00, (2) $54.00, (3) $322.35, (4) $56.00, (5) $632.52
B.   (1) I=$105.00, TA=$455.00, (2) I=$138.00, TA=$538.00, (3) I= $735.00,
     TA=$3,735.00, (4) I=$100.00, TA=$600.00, (5) I=$225.00, TA=$1,225.00

Lesson 2:
A.   (1) 25, (2) 60, (3) 540, (4) 53.5, (5) 34.75, (6) 7
B.   (1) I=$320.00, TA= $1,320.00, MP=$27.50
     (2) I=$1,080.00, TA=$4,080.00, MP=$113.33
     (3) I=$187.50, TA=$1,437.50, MP= $79.86
     (4) $57.50, (5) $30.50

Lesson 3:
A.   (1) $8.69, (2) 0.32, (3) $2,000.00, (4) $14.67, (5) $10.32, (6) 0.27
B.   (1) P=$2,000.00, I=$360.00, MP=$111.11
     (2) P=$9,000.00, I=$2,520.00, MP=$375.00
     (3) P=$4,473.68, I=$1,073.68, MP=$124.27
     (4) $333.33, (5) $100.00

Lesson 4:
A.   (1) $62.50, (2) $32.50, (3) 0.095, (4) 0.37, (5) $58.50
B.   (1) TI=$58.50, TA=$508.50, MP=$42.38
     (2) TI $375.00, TA=$3,375.00, MP=$140.63
     (3) TI=$712.50, TA=$5,712.50, MP=$317.36
     (4) $330.08, (5) $72.08

APPENDIX B

NAVY NUMERICAL SKILLS TEST -- FORM A AND FORM B

NAVY NUMERICAL SKILLS TEST

FORM A

The Navy Numerical Skills Test is divided into Part I: Basic Numerical Skills and Part II: Applied Numerical Skills. Part I contains items 1-24 that represent problems on the numerical skills of addition, subtraction, multiplication, and division. Part II presents problems involving the use of numerical skills in Navy settings (items 25-37) and the use of numerical skills in personal finances (items 38-50).

In doing the problems, read each problem very carefully. Then, solve the problem to find the answer. Look at the four choices of answers to the problem (choices A, B, C, and D) that are given on the test. Mark the letter on the answer sheet that matches the answer you get when you solve the problem.

Instructions

1. Do not make any marks on the test.

2. You can work the problems on separate sheets of paper.

3. Mark you answers on the separate test answer sheet.

4. Mark only one answer for each problem.

5. Be sure to mark an answer for each problem.

6. Erase completely any answer you wish to change.

7. Be sure that the number of the item on the test (for example, number 17) matches the number of the item you mark on the answer sheet (for example, number 17).

8. Complete the items of identification on the answer sheet before beginning the test.

Prepared by
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Memphis, Tennessee 38152
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Orlando, Florida 32813

NAVY NUMERICAL SKILLS TEST

FORM A

Part I: Basic Numerical Skills

1. 6
    +3

A. 3   C. 18

B. 9   D. 63

2. 9 + 5 = _____

A. 95   C. 14

B. 45   D. 4

3. 76 + 25 = _____

A. 51   C. 91

B. 71   D. 101

4. 829
    +463

A. 1,292   C. 466

B. 1,282   D. 366

5. $644.95
    +527.17

A. $ 17.78   C. $1,172.12

B. $117.78   D. $1,272.12

6. $4,279.38
    +3,913.85

A. $8,193.23 C. $1,365.53

B. $8,183.23 D. $ 365.53

7. 7
    -5

A. 2   C. 35

B. 12   D. 75

8. 9 - 4 = _____

A. 94   C. 12

B. 36   D. 5

9. 67 - 29 = _____

A. 106   C. 38

B. 96   D. 28

10.	734 - 48	A. 676	C. 872
		B. 686	D. 882
11.	34.23 -17.64	A. 16.59	C. 41.87
		B. 17.59	D. 51.87
12.	42.5213 - 9.7428	A. 52.2641	C. 33.7785
		B. 51.2641	D. 32.7785
13.	8 x7	A. 13	C. 56
		B. 15	D. 87
14.	67 x 4	A. 248	C. 467
		B. 268	D. 674
15.	73 x26	A. 1,898	C. 584
		B. 1,888	D. 99
16.	254 x 47	A. 2,974	C. 11,638
		B. 9,938	D. 11,938
17.	58 x 23 = ____	A. 1,434	C. 1,234
		B. 1,334	D. 290
18.	634 x 36 = ____	A. 5,706	C. 22,824
		B. 22,624	D. 22,904
19.	3/ $\overline{9}$	A. 3	C. 39
		B. 6	D. 93
20.	78 ÷ 6 = ____	A. 103	C. 13
		B. 84	D. 11

21. 9/$\overline{657}$

A.	77	C.	27
B.	73	D.	10

22. 822 ÷ 6 = ____

A.	137	C.	47
B.	127	D.	42

23. 87/$\overline{609}$

A.	80	C.	8
B.	78	D.	7

24. 936 ÷ 39 = ____

A.	24	C.	63
B.	27	D.	93

Part II: Applied Numerical Skills

25. 8:23 p.m. civilian time is expressed in military time as:

A. 823 hours   C. 1923 hours

B. 1823 hours   D. 2023 hours

26. The Greenwich mean time for 7:05 a.m. local civilian time in zone
     D (-4) is:

A. 0305Z   C. 0705Z

B. 0405Z   D. 1105Z

27. Two sailors are assigned a clean-up job that requires 3 manhours. If
     they begin the job at 1315 hours, what time should they finish?

A. 1315 hours   C. 1545 hours

B. 1445 hours   D. 1615 hours

28. A compass heading of 275° is read at a place where the deviation is
     17° E. (The "E" deviation is added to the compass heading to find
     the magnetic heading.) What is the magnetic heading?

A. 258°   C. 282°

B. 268°   D. 292°

29. A course with a true heading of 240° is required for a ship to reach a target at sea. The variation is 20° W and the deviation 5° E. (Add the "W" deviation and subtract the "E" deviation from the magnetic heading to find the compass heading.) What is the compass heading to reach the target?

A. 225°   C. 255°

B. 245°   D. 265°

30. A surface in the shape of a triangle has a base of 48 feet and a height of 12 feet. What is the area of the triangle

Formula: Area (triangle) = $\dfrac{base \times height}{2}$

A. 233 square feet   C. 288 square feet

B. 238 square feet   D. 576 square feet

31. A warehouse has rectangular walls that are 280 feet in total length and 15 feet high. They will be painted by brush with enamel that covers 400 square feet per gallon. How many gallons of paint will be needed?

A. 1.5 gallons   C. 10.2 gallons

B. 10.1 gallons   D. 10.5 gallons

32. A system of tackles and hooks has a mechanical advantage of 5 to 1. How much force is required to lift a load of 4,500 pounds?

Formula: Force = $\dfrac{Load}{Mechanical\ Advantage}$

A. 4,500 pounds   C. 750 pounds

B. 900 pounds   D. 90 pounds

33. A 5-inch hole located 6 feet below the surface of the water will flood a ship at a rate of 741 gallons per minute. How many gallons of water will flood through the hole in 8 minutes?

A. 3,705 gallons   C. 5,628 gallons

B. 4,446 gallons   D. 5,928 gallons

34. A temperature of 40° C is read on a thermometer. What is the temperature in °F? Formula: °F = (°C x 1.8) + 32°

    A. 40°F   C. 104°F

    B. 72°F   D. 752°F

35. A temperature of 77° F is read on a thermometer. What is the temperature in C? Formula: °C = (°F - 32°) ÷ 1.8

    A. 45°C   C. 32°C

    B. 42°C   D. 25°C

36. A new nylon line has a circumference (C) of 3 inches. What is the breaking strength (BS) of the line?
    Formula: BS = C x C x 2.5 X 900 pounds

    A. 202,500 pounds   C. 20,250 pounds

    B. 67,500 pounds   D. 6,750 pounds

37. A slightly used .5 inch wire rope has a breaking strenth (BS) of 19,720 pounds and a safety factor (SF) of 12. What is the safe working load (SWL) of the wire rope?

    Formula: SWL = $\frac{BS}{SF}$

    A. 19,720 pounds   C. 1,643 pounds

    B. 1,972 pounds   D. 1,463 pounds

38. A sailor who is an E-3 with 3 years of service received monthly basic pay of $570.30 and a monthly allowance for quarters of $160.80. What was the total amount paid for the month?

    A. $630.10   C. $730.10

    B. $631.10   D. $731.10

39. An E-4 with 3 years of service receives basic pay of $603.90 and a basic allowance for quarters of $123.90 each month. How much is he paid for six months?

    A. $4,366.80   C. $4,326.80

    B. $4,362.80   D. $4,266.80

40. A sailor received a total of $5,505.30 in basic pay for a period of nine months. How much was his basic pay per month?

    A. $611.70   C. $607.70

    B. $610.70   D. $601.70

41. The Leave and Earnings Statement for an E-3 shows deductions of $63.48 for FITW, $27.73 for FICA, and $5.00 for SGLI. How much is the total deducted for these items?

    A. $32.73   C. $91.21

    B. $68.48   D. $96.21

42. The basic pay for an E-4 with 4 years of service is $651.00 per month. The deduction for FITW is $81.38 per month. What percentage of the monthly basic pay is deducted for FITW?

    A. 8.0%   C. 12.5%

    B. 10.3%   D. 14.0%

43. A sailor budgets 14% of his monthly pay for laundry and cleaning. If his monthly pay is $548.10, how much is budgeted for this purpose?

    A. $76.73   C. $75.73

    B. $76.43   D. $75.43

44. A sailor spends 7% of his monthly pay for transportation. If his monthly pay is $786.00, how much will he spend on transportation during eight months?

    A. $397.16   C. $436.96

    B. $400.16   D. $440.16

45. A bank record book shows the following:

Balance Forward	$ 89.80
Deposit	$173.40
Balance (I)	
Deduction	$127.60
Balance (II)	

What is the amount that should be shown for <u>Balance (II)</u>

A. $48.80   C. $146.60

B. $135.60   D. $390.80

46. A bank deposit record shows the following:

Currency	$ 12.00
Coin	6.00
Checks:	26.88
	132.40
Total	
Less Cash Received	35.60
TOTAL DEPOSIT	

How much is the <u>TOTAL DEPOSIT</u>?

A. $141.68   C. $176.28

B. $142.68   D. $212.88

47. A loan of $500 (<u>principal</u>) is made at a 12% annual rate of interest for 2 years (<u>time</u>). How much <u>interest</u> will be paid on the loan?
Formula: Interest = Principal x Rate x Time

A. $50.00   C. $100.00

B. $60.00   D. $120.00

48. A loan of $2,400 (<u>principal</u>) is made at an annual interest rate of 9% for a period of two years. The <u>interest</u> on the loan will be $432. How much will the monthly payment be if the principal and interest are paid in two years?

A. $118.00   C. $72.00

B. $100.00   D. $18.00

49. Net proceeds of $540 are received from a bank discount interest loan with an annual interest rate of 10% over a period of 1 year (time). How much is the principal of the loan?

Formula: Principal = $\dfrac{\text{Net Proceeds}}{1 - (\text{Rate} \times \text{Time})}$

A. $490.90   C. $545.45

B. $540.00   D. $600.00

50. A monthly interest loan of $600 (principal) is made at a monthly interest rate of 1% for a period of 12 months. How much will the interest on the loan be?

Formula: Interest = $\dfrac{\text{Principal} \times \text{Rate (per month)} \times (\text{Months} + 1)}{2}$

A. $36   C. $72

B. $39   D. $78

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FORM B

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NAVY NUMERICAL SKILLS TEST

FORM B

Part I: Basic Numerical Skills

1. 5
    +4

    A. 1   C. 20

    B. 9   D. 54

2. 9 + 8 = ____

    A. 98   C. 17

    B. 72   D. 1

3. 87 + 45 = ____

    A. 42   C. 122

    B. 62   D. 132

4. 756
    +327

    A. 1,083   C. 439

    B. 1,073   D. 429

5. $745.38
    +437.96

    A. $207.42   C. $1,183.34

    B. $307.32   D. $1,283.34

6. $5,636.47
    +2,648.97

    A. $8,285.44   C. $3,087.50

    B. $8,275.44   D. $2,987.50

7. 8
    -6

    A. 2   C. 48

    B. 14   D. 86

8. 7 - 3 = ____

    A. 73   C. 10

    B. 21   D. 4

9. 55 - 16 = ____

    A. 71   C. 39

    B. 61   D. 29

10. 942
    - 75

    A. 857   C. 1,007

    B. 867   D. 1,017

11. 42.14
    -25.36

   A. 16.78   C. 66.50

   B. 17.78   D. 67.50

12. 64.7364
    - 7.8596

   A. 72.5960   C. 57.8768

   B. 71.5960   D. 56.8768

13. 9
    x6

   A. 13   C. 54

   B. 15   D. 69

14. 46
    x 6

   A. 246   C. 466

   B. 276   D. 646

15. 67
    x32

   A. 2,144   C. 335

   B. 2,134   D. 99

16. 347
    x 53

   A. 2,776   C. 18,291

   B. 16,291   D. 18,391

17. 46 x 37 = _____

   A. 1,802   C. 1,662

   B. 1,702   D. 460

18. 547 x 25 = _____

   A. 4,829   C. 13,675

   B. 13,475   D. 14,375

19. 4/‾8‾

   A. 2   C. 48

   B. 4   D. 84

20. 91 ÷ 7 = _____

   A. 103   C. 13

   B. 98   D. 10

21. 7/‾595‾

   A. 87   C. 35

   B. 85   D. 13

22. 984 ÷ 8 = ____
   A. 123   C. 42
   B. 110   D. 33

23. 74/ 592‾
   A. 62   C. 9
   B. 47   D. 8

24. 952 ÷ 56 = ____
   A. 17   C. 65
   B. 19   D. 73

Part II: Applied Numerical Skills

25. 9:47 p.m. civilian time is expressed in military time as:

   A. 947 hours   C. 2047 hours

   B. 1947 hours   D. 2147 hours

26. The Greenwich mean time for 11:42 a.m. local civilian time in zone
   G (-7) is:

   A. 0442Z   C. 1142Z

   B. 0742Z   D. 1842Z

27. Two sailors are assigned a clean-up job that requires 5 manhours. If
   they begin the job at 1415 hours, what time should they finish?

   A. 1415 hours   C. 1745 hours

   B. 1645 hours   D. 1915 hours

28. A compass heading of 137° is read at a place where the deviation is
   19° E. (The "E" deviation is added to the compass heading to find the
   magnetic heading.) What is the magnetic heading?

   A. 118°   C. 146°

   B. 128°   D. 156°

29. A course with a true heading of 80° is required for a ship to reach a target at sea. The variation is 6° E and the deviation is 16° W. (Subtract the "E" variation and add the "W" deviation to the true heading to find the compass heading.) What is the compass heading to reach the target?

A. 70°   C. 90°

B. 86°   D. 102°

30. A surface in the shape of a triangle has a base of 36 feet and a height of 12 feet. What is the area of the triangle?

Formula: Area (triangle) = $\dfrac{\text{base x height}}{2}$

A. 161 square feet   C. 216 square feet

B. 211 square feet   D. 432 square feet

31. The rectangular walls of an exercise room measure 360 feet by 15 feet. They will be painted by brush with enamel that covers 400 square feet per gallon. How many gallons of paint will be needed?

A. 1.3 gallons   C. 13.4 gallons

B. 3.5 gallons   D. 13.5 gallons

32. A system of tackles and hooks has a mechanical advantage of 6 to 1. How much force is required to lift a load of 6,300 pounds?

Formula: Force = $\dfrac{\text{Load}}{\text{Mechanical Advantage}}$

A. 6,300 pounds   C. 900 pounds

B. 1,050 pounds   D. 300 pounds

33. A 6 - inch hole located 5 feet below the surface of the water will flood a ship at a rate of 974 gallons per minute. How many gallons of water will flood through the hole in 4 minutes?

A. 5,844 gallons   C. 4,670 gallons

B. 4,870 gallons   D. 3,896 gallons

34. A temperature of 50° C is read on a thermometer. What is the temperature in °F? Formula: °F = (°C x 1.8) + 32°

A. 82°F   C. 122°F

B. 90°F   D. 932°F

35. A temperature of 95° F is read on a thermometer. What is the temperature in °C? Formula: °C = (°F - 32°) ÷ 1.8

A. 63°C   C. 42°C

B. 53°C   D. 35°C

36. A new polyethylene line has a circumference (C) of 3 inches. What is the breaking strength (BS) of the line?
Formula: BS = C x C x 1.4 x 900 pounds

A. 113,400 pounds   C. 11,340 pounds

B. 37,800 pounds   D. 3,780 pounds

37. A slightly used .6 inch wire rope has a breaking strength (BS) of 28,396 pounds and a safety factor (SF) of 15. What is the safe working load (SWL) of the wire rope?

Formula: $SWL = \dfrac{BS}{SF}$

A. 28,396 pounds   C. 1,893 pounds

B. 2,840 pounds   D. 1,839 pounds

38. A sailor who is an E-4 with 2 years of service received monthly basic pay of $570.60 and a monthly allowance for quarters of $180.60. What was the total amount paid for the month?

A. $650.20   C. $750.20

B. $651.20   D. $751.20

39. An E-3 with 2 years of service receives basic pay of $548.10 and a basic allowance for quarters of $110.70 each month. How much is he paid for six months?

    A. $3,952.80   C. $3,908.80

    B. $3,948.80   D. $3,652.80

40. A sailor received a total of $4,676.40 in basic pay for a period of nine months. How much was his basic pay per month?

    A. $519.60   C. $509.60

    B. $510.60   D. $501.60

41. The Leave and Earnings Statement for an E-3 shows deductions of $58.67 for FITW, $23.28 for FICA, and $4.00 for SGLI. How much is the total deducted for these items?

    A. $27.68   C. $75.85

    B. $62.67   D. $85.95

42. The basic pay for an E-3 with 3 years of service is $570.30 per month. The deduction for FITW is $71.29 per month. What percentage of the monthly basic pay is deducted for FITW?

    A. 8.0%   C. 12.5%

    B. 10.3%   D. 14.3%

43. A sailor budgets 12% of his monthly pay for personal grooming. If his monthly pay is $448.80, how much is budgeted for this purpose?

    A. $53.86   C. $52.75

    B. $53.75   D. $43.86

44. A sailor spends 7% of his monthly pay for clothing. If his monthly pay is $651.00, how much will be spent on clothing during nine months?

    A. $383.13   C. $409.53

    B. $405.13   D. $410.13

45. A bank record book shows the following:

Balance Forward	$ 98.60
Deposit	$154.80
Balance (I)	$
Deduction	$138.50
Balance (II)	

What is the amount that should be shown for Balance (II)?

A. $ 16.30

B. $114.90

C. $125.90

D. $391.90

46. A bank deposit record shows the following:

Currency	$ 14.00
Coin	$ 3.00
Checks:	$ 25.68
	$143.80
Total	
Less Cash Received	$ 34.90
TOTAL DEPOSIT	

How much is the TOTAL DEPOSIT?

A. $151.58

B. $152.58

C. $185.48

D. $221.38

47. A loan of $400 (principal) is made at a 15% annual rate of interest for 3 years (time). How much interest will be paid on the loan?
Formula: Interest = Principal x Rate x Time

A. $40.00

B. $60.00

C. $120.00

D. $180.00

48. A loan of $3,600 (principal) is made at an annual interest rate of 9% for a period of three years. The interest on the loan will be $648. How much will the monthly payments be if the principal and interest are paid in three years?

A. $118.00

B. $100.00

C. $72.00

D. $18.00

49. <u>Net proceeds</u> of $360 are received from a bank discount interest loan with an annual interest <u>rate</u> of 10% over a period of 1 year (<u>time</u>). How much is the principal of the loan?

Formula: Principal = $\dfrac{\text{Net Proceeds}}{1 - (\text{Rate} \times \text{Time})}$

A. $327.27

C. $363.64

B. $360.00

D. $400.00

50. A monthly interest loan of $400 (<u>principal</u>) is made at a monthly interest <u>rate</u> of 1% for a period of 12 <u>months</u>. How much will the interest on the loan be?

Formula: Interest = $\dfrac{\text{Principal} \times \text{Rate (per month)} \times (\text{Months} + 1)}{2}$

A. $24

C. $48

B. $26

D. $52

APPENDIX C

NAVY NUMERICAL SKILLS TEST USER'S GUIDE

NAVY NUMERICAL SKILLS TEST
USER'S GUIDE

TEST DESCRIPTION

The Navy Numerical Skills Test contains 50 items that are correlated with the topics and skills addressed in Improving Your Navy Numerical Skills. Two forms of the test (A and B) are available and may be administered in any order in a test-retest situation. Items 1 through 24 in Part I of the test deal with the basic numerical operations of addition, subtraction, multiplication, and division covered in the first section of the workbook. Items 25 through 50 in Part II are based on the basic numerical skill applications addressed in the second and third sections of the workbook.

ADMINISTRATION AND SCORING

The test is administered as an untimed test that can be completed in 20 to 30 minutes. Standard Navy Computer Managed Instruction (CMI) answer sheets or instructor developed answer sheets can be used to record answers. Worksheets should be provided for students to use in working the problems. Students should be told that no marks may be made on the test booklet.

A scoring key is provided for use in hand-scoring the test. The key can be used to program test-scoring equipment to machine-score the test.

USES OF THE TEST

The test is designed for two uses: (1) screening students for placement and (2) assessing skill improvement as a result of using the workbook. With respect to the first use, a score of 20 or higher on the 24 items in Part I is recommended as a passing score on a pretest with either form of the test. In this case, the student could be exempt from doing the exercises in the first section of the workbook. As an assessment tool, the instrument can be utilized as a pretest and posttest to measure a student's improvement in numerical skills as a result of using the workbook.

ANSWER KEY--NUMERICAL SKILLS TEST, FORM A AND FORM B

1.	B	11.	A	21.	B	31.	D	41.	D
2.	C	12.	D	22.	A	32.	B	42.	C
3.	D	13.	C	23.	D	33.	D	43.	A
4.	A	14.	B	24.	A	34.	C	44.	D
5.	C	15.	A	25.	D	35.	D	45.	B
6.	A	16.	D	26.	A	36.	C	46.	A
7.	A	17.	B	27.	B	37.	C	47.	D
8.	D	18.	C	28.	D	38.	D	48.	A
9.	C	19.	A	29.	C	39.	A	49.	D
10.	B	20.	C	30.	C	40.	A	50.	B

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