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ABSTRACT

The document evaluates Navy Group Four personnel gains in basic arithmetic skills after taking experimental courses in linear measurement and recipe conversion. Categorized as Mental Group Four by receiving scores from the 10th to the 30th percentile of the Armed Forces Qualification Test, trainees received instruction tailored to the level of their abilities and presented within a vocational context. Instruction in measuring linear dimensions was given to 26 Group Four trainees and recipe conversion was taught to 17 Group Four trainees and 23 Commissaryman personnel. All trainees worked individually and at their own rate, with test results showing Group Four personnel achieving proficiency in only some of the required skills. Concluding that mathematical learning capacities of Group Four personnel did not appear to be adequate for learning to perform typically required computational tasks of Navy enlisted men, despite experimental changes in coursework presentation, it is stated that the nature of the difficulties experienced by this group must be clarified before further improvement in training can be accomplished. Tabulation of test results is included and descriptions of meld test problems, the recipe conversion test, and the diagnostic mathematics quiz are appended. (LH)

NPRDC TR 75-23 February 1975

COMPUTATIONAL PERFORMANCE OF GROUP IV PERSONNEL IN VOCATIONAL TRAINING PROGRAMS

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This investigation concerns an evaluation of the performance of Navy Group IV personnel on limited sets of task-related computational operations. Training was tailored to the trainee's level of academic skill and courses were taught within the context of vocational training programs covering linear measurement and recipe conversion. Performance was evaluated both in terms of test score gains and skill level achievement.

For both types of vocational tasks, Group IV personnel achieved significant
(continued)

20. Abstract (continued)

gains in computational skills as a result of training. However, the levels of computational proficiency achieved were judged to be inadequate for effective task accomplishment within relevant Navy ratings.

FOREWORD

This research was performed at the Naval Personnel and Training Research Laboratory (now disestablished) under Work Unit Number MMPB SD.03 (Methodology for Efficient Training of Lower Mental Level Personnel). It was initiated in response to a request from the Department of Defense to determine the training potential of Navy Mental Group IV personnel. A discussion of the scope and objectives of the larger research effort from which the present study developed is presented in PRA SRR 69-12: The development and evaluation of training Group IV personnel: I. Orientation and implementation of the Training Methods Development School (TMDS), by John Steinemann, October 1968.

The assistance of the Service School Command, Naval Training Center, San Diego in providing training materials and administrating course work is gratefully acknowledged.

J. J. CLARKIN
Commanding Officer

SUMMARY

Problem

Navy personnel who receive low preinduction scores on the Armed Forces Qualifications Test (AFQT) experience difficulty in acquiring basic arithmetic skills. In considering assignment possibilities for these personnel, it is important to determine whether their mathematical deficiencies would prevent them from learning to perform the limited sets of task-specific computations required by certain Navy ratings.

Background

Individuals with AFQT scores ranging from the 10th to the 30th percentile are classified as Mental Group IV. Recent studies of Group IV performance have revealed that levels of computational achievement can be significantly enhanced by tailoring instruction to the trainee's level of academic skill. Gains in computational achievement have been most impressive where the operations have been limited to a restricted set of task-related procedures taught within a vocational context. Based on these findings, it was questioned whether Group IVs could master most of the computational skills required by nontechnical Navy ratings if training was task-specific, designed to conform to the student's academic skills, and presented within a vocational context.

Approach

Experimental courses in linear measurement and recipe conversion were developed and administered to classes of Group IV students. Effectiveness of instruction was examined in detail.

Findings

Although Group IV trainees' computational performance improved considerably following the training, they were typically unable to master all of the computational skills required for successful performance of linear measurement and recipe conversion tasks. Levels of achievement in recipe conversion were significantly lower for the Group IV personnel than for a class of Commissaryman Class "A" school trainees who had received similar training. It is concluded that the computational deficiencies of Group IV personnel will limit their ability to perform many of the common vocational skills that are relevant to various Navy ratings. Possibilities for developing more effective methods of compensatory training are discussed.

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COMPUTATIONAL PERFORMANCE OF GROUP IV PERSONNEL IN VOCATIONAL TRAINING PROGRAMS

Introduction

The present study represents an effort to determine how effectively Group IV trainees can be taught to perform practical tasks which involve computational operations. Personnel are categorized as Mental Group IV if they receive low preinduction scores (ranging from the 10th to the 30th percentile) on the Armed Forces Qualification Test (AFQT). Such personnel often experience difficulty in training situations which involve academic cognitive skills such as those measured by the AFQT.

An experimental training program conducted at the Naval Training Center, San Diego studied Group IV learning behavior under controlled conditions. Course work was developed for a number of academic and vocational subject matters. One product of this effort was a set of mathematics training materials called the Practical Arithmetic Self-Study (PASS) Course (Main, 1973). An account of the development and application of this course has been provided in a series of reports (Main, 1974; 1970; 1969). The PASS Course was found to be highly effective in comparison to other available forms of remedial mathematics instruction. It was not sufficiently effective, however, to raise the computational ability of many Group IV trainees to a 9th grade criterion. The 9th grade level is required for the successful performance of many of the tasks a Group IV recruit might be expected to perform while in the Navy.

Training efforts applied to a limited range of quantitative operations have been more successful. For example, with only 4 to 8 hours of instruction, classes of Group IV recruits were trained to read and interpret settings on typical Navy dials and gauges to a level of competency comparable to that of experienced Navy chief and first class petty officers (Van Matre, 1971). Because these initial efforts did achieve limited objectives, an investigation was undertaken to determine whether Group IVs could be trained in other specific tasks. In the present report, two different types of tasks are considered: (1) measuring linear dimensions, and (2) performing recipe conversions. Both tasks require performance of several computational operations of varying difficulty and involve operations which Group IV personnel might be expected to perform in Navy assignments. Moreover, comprehensive programs of instruction in these skills which could be readily adapted for experimental purposes were already available. The goal of the investigation was to determine whether Group IV personnel could master the computational operations involved in performing these tasks if instruction was tailored to the level of the trainees' ability and presented within a vocational context.

Measuring Linear Dimensions

Behavioral Objectives

Linear measuring devices such as steel rules and micrometers are used to some extent in many different Navy work situations and the training materials for this experiment were not oriented to any specific Navy rating. Behavioral objectives for the course were specified in terms of the nature of the operation to be performed and the level of accuracy to be attained. These included: (1) Reading a measurement on a machinist rule or steel tape to the nearest 1/32 of an inch (fractional answers were to be reduced to lowest terms). (2) Reading micrometers and vernier rules to the nearest 1/1000 of an inch. (3) Rounding fractional values as small as 1/64 of an inch and decimal values with as many as four decimal places to specified levels of accuracy. (4) Determining whether a decimal reading falls within tolerance limits specified to the nearest 1/1000 of an inch. (5) Converting between decimal and fractional readings without using conversion tables for fractional values as small as 1/8 of an inch, and, using tables, for values as small as 1/32 of an inch.

Most of the training provided was directly oriented to these objectives. Training in size estimation was given to provide trainees with a basis for judging the reasonableness of their answers.

Methods

Subjects. Trainees were 26 Group IV personnel who were assigned to two classes of the experimental training program following completion of recruit training. The AFQT percentile scores for these trainees ranged from 11 to 28, with a mean of 17.9.

Materials. Training materials were limited to the various devices used to take measurements, including steel rules, tapes, and micrometers. Individual vernier rules were not available, but a large blackboard mock-up was constructed to teach trainees to read vernier scale devices. A special 113-item test was developed for ascertaining levels of competency in measurement skills and in those computational operations which support such skills. This evaluation device was titled The Measurement and Estimation of Linear Dimensions (MELD). Descriptions of MELD test problems are contained in Appendix A. On the basis of preliminary trials, it was found that it was necessary to present test instructions in a clear, concise manner if misinterpretations were to be avoided. Therefore, instructions were standardized and recorded on audio tape.

Procedure. Trainees were administered the MELD test both before and after training. Training consisted of 9 hours of instruction. For one class, training was extended over a period of 4 days; for the other class, over a period of 6 days. No texts or other printed instructional materials were utilized. The instructor simply demonstrated each technique to the class and then allowed the trainees to practice under supervision.

Results

Table 1 presents the percentage of correct responses before and after training for each type of test item on the MELD. In terms of overall test performance, significant gains were made. On the average, the 26 trainees answered approximately 58 of the 113 items correctly before training and 80 correctly following training. The mean gain score for these trainees was 21.8 (SD = 8.7). Application of a t-test indicates this level of gain is significant at the .001 level.

TABLE 1

Percent of Correct Responses on MELD Test Items (N = 26)

Type of Problem		Number of Items	% Correct Response PRE	% Correct Response POST
Size Estimations	Feet & Yards	10	56	85
	Inches (Fractions)	11	63	83
	Inches (Decimals)	6	57	69
Fixed Rule Measurement	Steel Tape (Indirect)	3	51	65
	Steel Rule (Indirect)	11	52	62
	Steel Rule (Direct)			
	Draw Lengths	4	57	76
	Measure Lines	9	61	83
	Measure Diameters	4	49	58
Adjustable Rule Measurement	Vernier Rule (Indirect)	2	4	0
	Micrometer (Indirect)	4	2	32
	Micrometer (Direct)	2	0	52
Conversions	Units of Length	3	44	49
	Fraction-Decimal			
	Comparison	8	45	57
	Calculation	6	36	68
	Tables	12	42	66
Rounding Off Readings	Fractions	4	20	22
	Decimals	10	9	40
Specifying Tolerances		2	17	19
Reducing Answers		2	37	50

From Table 1, it may be seen that final levels of performance varied considerably for different types of measurement skills. The highest levels of performance were achieved for skills involving the determination of observable physical dimensions rather than the interpretation of symbolic representations. For example, size estimations and measurements with fixed rule scales involved the visualization and manipulation of discrete observable physical values. Readings on adjustable vernier rule and micrometer scales, conversion, rounding, reducing, and specification of tolerances, on the other hand, all involve the manipulation of symbolic representations of actual dimensions. Many of these latter measurement skills appear to be extremely difficult for Group IV personnel to acquire.

In terms of line measurements with steel rules, it was possible to determine levels of performance as a function of the size of the fractional unit required in the answer. A comparison of levels of accuracy obtained through making line measurements directly and reading them from simulated scales is presented in Figure 1. While the accuracy of direct readings remained relatively high, those of indirect readings declined as the size of the fractional unit in the answer decreased. The single exception of this trend occurred for the smallest unit on the scale (1/32 of an inch).

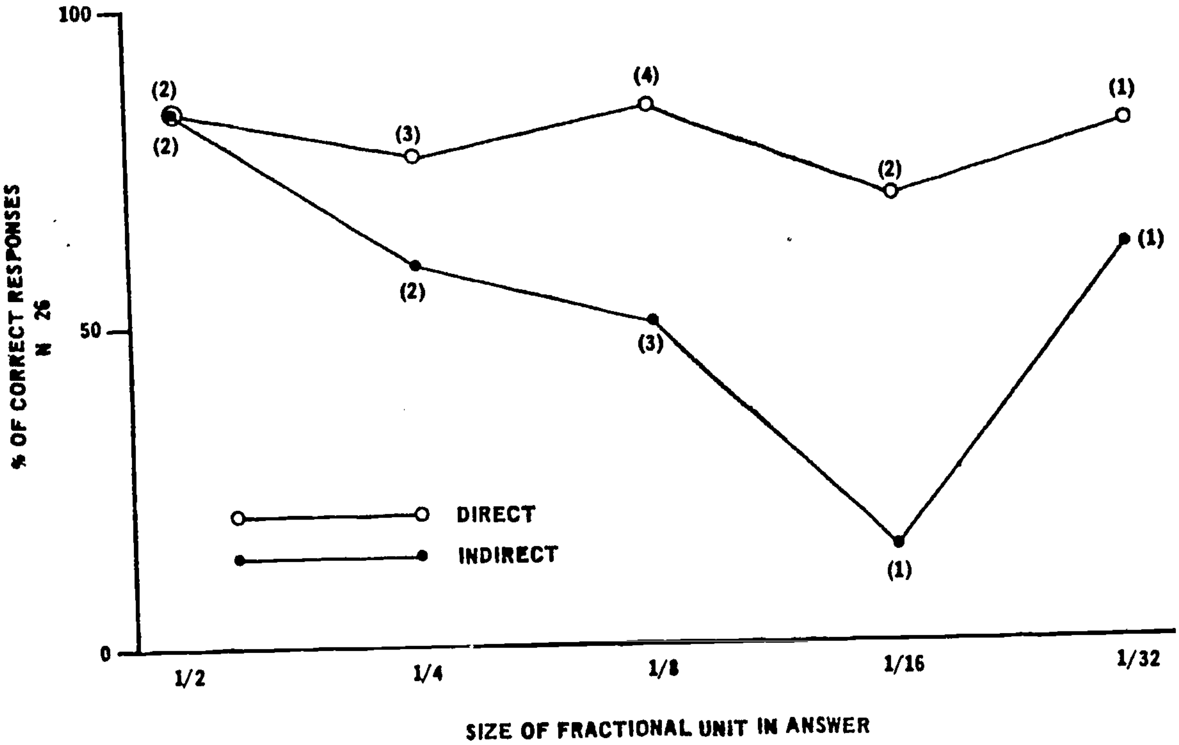


Figure 1. Levels of accuracy for direct and indirect line measurement as a function of the size of fractional units in the answers. (Numbers of test items are indicated in parentheses.)

Discussion

Group IV personnel were able to improve their general measurement performance and achieved considerable accuracy in making direct measurements with steel rules. However, their level of achievement was quite low for other skills. In reading adjustable rule scales, for example, the rate of correct posttest responses ranged from 0% to 52%. Trainees also experienced considerable difficulty in learning to perform a number of tasks involving the interpretation of readings (e.g., converting units, rounding off answers, and specifying tolerances). In general, trainees performed most effectively when they were measuring or estimating values that could be represented objectively rather than symbolically. Highest levels of accuracy were obtained when readings were taken directly rather than read from simulated scales.

Performing Recipe Conversions

Behavioral Objectives

Behavioral objectives for the recipe conversion course had already been established by the Navy Commissary School. In brief, the task to be mastered consisted of taking a standard Navy recipe with ingredients specified in amounts necessary for preparing 100 servings and computing the amounts for any required number of servings. Trainees were also asked to calculate reductions in the size of serving portions in order to compensate for insufficient quantities of available ingredients. The successful performance of these conversion operations required mastery of a number of types of arithmetic computations, including decimal multiplication and division, fraction-decimal conversion, unit conversion, and solution of ratio equations.

Methods

Subjects. Two groups of trainees participated in this experiment. One group consisted of 17 Group IV trainees assigned to the experimental training program. The other was made up of 23 Commissaryman personnel who were attending the Navy Class "A" Commissaryman School at the Naval Training Center (NTC). The mean AFQT percentile scores of the Group IV personnel ranged from 10 to 30 with a mean of 20.7. AFQT scores for the Commissaryman students were not available. However, these personnel were representative of the typical input to Class "A" Commissaryman Schools.

Materials. Training materials consisted of a two-part programmed course in recipe conversion designed by Service School Command, NTC, San Diego. The course was developed as a separate instructional unit that could be integrated into the existing training program. Testing instruments included a 15-item criterion test designed to cover those procedures presented in the programmed course, and a supplementary diagnostic mathematics quiz designed to cover relevant arithmetic operations but without reference to recipe conversion per se. Copies of these two test instruments are displayed in Appendix B.

Procedures. Both Group IV trainees and Class "A" School students received the recipe conversion programmed instruction course as a separate unit apart from any other course work they were taking. Prior to being assigned to the recipe conversion course, Group IV trainees had received a 14-hour review which covered all of the computational procedures involved in the coursework. All trainees worked individually and at their own rate, receiving assistance from the instructor as needed. Trainees were administered the criterion test on recipe conversion individually upon completion of the course. In addition, Group IV students were administered the supplementary mathematics quiz as a group both before and after training. Since study was self-paced, training time varied from trainee to trainee. Up to two 3-hour periods were available for study. However, it should be noted that no Class "A" student took more than 3 hours to complete the course, and no Group IV student took less than 3 hours.

Results

For the 15-item criterion test on recipe conversions, the mean number of problems missed by the 17 Group IV students was 10.8 (SD = 2.8), while the mean number missed by the 23 Class "A" School students was 5.0 (SD = 4.2). Application of a t-test indicated this difference to be significant at the .01 level.

Having established that the Group IV students performed relatively poorly on the criterion test, a diagnostic evaluation of their performance on the 25-item supplementary mathematics quiz was performed. The results of this analysis are presented in Table 2. An overall gain score was also calculated for each of the 17 trainees by subtracting the number of posttest errors from the number of pretest errors. The mean gain score was computed to be 6.2 (SD = 3.2). Application of a t-test indicated this gain to be significant at the .01 level.

From the data presented in Table 2, it may be seen that levels of achievement on the math quiz differed considerably, depending on the type of computational procedures involved. Percentages of correct responses were relatively high for problems involving operations with decimals (converting, rounding, multiplying, and dividing), and relatively low for problems involving unit conversions or the solution of ratio equations.

Discussion

Results of the second experiment paralleled those of the first in that Group IV trainees were only able to achieve proficiency in some of the required skills. Their level of achievement was significantly lower than that of the Class "A" Commissaryman School trainees even though they took longer to complete the course.

TABLE 2

Group IV Performance on Computational Items Related to Recipe Conversion (N = 17)

Type of Computation	Number of Items	% Correct Responses PRE	% Correct Responses POST
Fraction-Decimal Conversion	5	68	96
Rounding Decimals	7	47	83
Multiplying & Dividing with Decimals	8	33	65
Unit Conversion	6	39	36
Ratio Solution	1	18	29

The poor showing of the Group IV personnel may be related to their inability to master certain of the computational skills involved in performing recipe conversions. Although test scores indicated significant gains in the performance of tasks requiring such skills following training, gains were largely limited to simple decimal computations. In terms of performing unit conversions and solving ratio equations, the Group IV personnel remained relatively incompetent.

Conclusions

Findings from the two experiments presented in this report are not necessarily in conflict with those of earlier investigations which found that Group IV personnel could learn to read dials and gauges to a very acceptable degree of accuracy. Differences in achievement may be attributed to the nature of the tasks and the complexity of the operations being performed.

In conclusion, Group IV personnel experience considerable difficulty in learning to perform certain basic computational operations such as converting units, interpreting tolerances, and determining ratio solutions. Such difficulties persist even when limited sets of operations are taught within the context of a vocational task. If it becomes necessary to utilize Group IV personnel in task situations that require workers to perform such operations, more effective training methods will be needed.

At this point, it may be questioned, whether better methods for training Group IVs can, indeed, be developed. The research cited in the present study involved attempts to facilitate learning by changing the manner in which coursework was presented. These attempts were only partially successful.

An alternative approach for developing more effective methods of training would be to improve the learning capacities of the trainees. This alternative, which has received relatively little attention, may be critical to the development of truly effective remedial programs. Even the best designed instruction places certain demands on the learner. A trainee must maintain his attention on the coursework. He must be able to receive instructions, remember rules and procedures, and apply them under appropriate situations. If he cannot meet these demands, the best training methods will be inadequate.

In terms of mathematics training, the learning capacities of Group IV personnel do not appear to be adequate. Despite improvements in coursework presentations, they continue to experience a great deal of difficulty in learning to perform computational tasks that are typically required of Navy enlisted men. Whether or not Group IV learning capacities can be improved is not clear because the reasons why they fail to perform effectively have not been identified. It may be that the required behaviors can not be taught within the time frame of a training program, but must be gained through long years of experience. At any rate, the nature of the difficulties that Group IV personnel experience must be clarified before methods for improving the effectiveness of their training can be adequately assessed.

References

Main, R. E. Development and evaluation of an experimental course in applied mathematics for Group IV personnel (Research Report SRR 70-8). San Diego: Naval Personnel and Training Research Laboratory, September 1969.

Main, R. E. The effectiveness of flash cards in a mathematics self-study course for Group IV personnel (Research Memorandum SRM 70-20). San Diego: Naval Personnel and Training Research Laboratory, June 1970.

Main, R. E. Practical Arithmetic Self-Study (PASS) Course: Books I and II. San Diego: Navy Personnel Research and Development Center, September 1973.

Main, R. E. Computational achievement of Group IV trainees with a self-study format: Effects of introducing audio, withdrawing assistance, and increasing training time (Technical Report TR 75-11). San Diego: Navy Personnel Research and Development Center, September 1974.

Van Matre, N. H. Instrument reading training course for Group IV personnel (Research Report SRR 71-26). San Diego: Naval Personnel and Training Research Laboratory, May 1971.

APPENDIX A

DESCRIPTIONS OF MELD TEST PROBLEMS

APPENDIX A

I. Size Estimation

Given a list of lengths expressed in either: (a) yards or feet, (b) fractional portions of an inch, or (c) decimal portions of an inch; and an observable set of actual physical lengths, the testee is required to estimate which of the listed dimensions correspond to each of the physical lengths.

II. Fixed Rule Measurements

Steel Tapes (Indirect)

Given depictions of portions of steel tapes marked with arrows, the testee is required to indicate the distance from the start of the tape to the arrow. (Readings involve fractional units no smaller than 1/8 of an inch and must be specified in feet, inches, and fractions of an inch.)

Steel Rules (Indirect)

Given depictions of steel rules (photographs or drawings) marked with arrows, the testee will indicate the length between the arrows. (Readings involve fractional units no smaller than 1/32 of an inch.)

Steel Rules (Direct)

Given a standard machinist steel rule, the testee will measure the lengths of (a) lines and (b) diameters of circles (readings involve fractional units no smaller than 1/8 of an inch) and will (c) draw lines to specified lengths (drawings involve units no smaller than 1/32 of an inch and must be accurate to the nearest 1/64 of an inch).

III. Adjustable Rule Measurements

Indirect Readings

Given depictions of (a) Vernier rules or (b) micrometer scales, the testee will indicate the size of the dimension indicated by the reading on the scale (to the nearest 1/1000 of an inch).

Direct Readings

Given micrometer devices and metal bars of specified dimensions, the testee will determine the width of each bar with the micrometer (to the nearest 1/1000 of an inch).

IV. Conversions

Units of Length

Given a list of measurements expressed in yards, feet, and inches, the testee is required to express them in feet and fractions of feet.

Fraction-Decimal Conversion by Comparison

Given sets of three fractional and/or decimal values, the testee is required to select, by observation, the largest value.

Fraction-Decimal Conversion by Calculation

Given lists of fractional and decimal values (equivalent to 1/2, 1/4, or 1/8), the trainee is required to calculate the equivalent decimal or fractional value.

Fraction-Decimal Conversion with Tables

Given lists of fraction and decimal values (equivalent to 1/2 1/4, 1/8, 1/16, 1/32), the trainee is required to identify the equivalent decimal or fractional value in a fraction-decimal conversion table.

V. Rounding Off Readings

Fractional Answers

Given a photographic representation of a rectangle being measured with a steel rule, the trainee is required to express the reading to the nearest inch, and to the nearest 1/4, 1/8, and 1/16 of an inch.

Decimal Answers

Given a set of decimal values expressed to the nearest 1/10,000 of an inch, the trainee is required to express the readings to the nearest 1/10 of an inch.

VI. Specifying Tolerances

Given a required dimension for a metal bar and a set of available dimensions, all expressed as decimals to the nearest 1/1,000 of an inch, the trainee is required to identify which of the available dimensions are acceptable for tolerances of $\pm.01$ and $\pm.005$ inches.

VII. Reducing Answers

Given a set of fractional values, the trainees will indicate which of the values can be reduced or are equivalent to other specified fractional values.

APPENDIX B

RECIPE CONVERSION TEST MATERIALS

APPENDIX B

Criterion Test on Recipe Conversion

This test was administered to all trainees following training. It provided a measure of the student's ability to determine a working factor (W/F), a decimal multiple that is dependent on the number of required servings, and calculate required amounts of ingredients from a standard Armed Forces Recipe Commissary Service (AFRCS) card.

1. What is the correct W/F when the desired number of servings is 68?

   1. ____________________

2. If the desired number of servings is 9, what is the correct W/F?

   2. ____________________

3. When feeding a crew of 245 men, the correct W/F is

   3. ____________________

For questions 4 through 10 the following instructions will apply. Using the recipe card provided, question #4 corresponds to ingredient #4 on the recipe card, etc. All ingredients must be computed to their lowest measurement, do not leave any ingredient in its decimal amount. Compute to the nearest 1/4 oz. or in volume to the nearest even amount. The recipe is to be adjusted for 225 servings.

4. The required amount of yeast, active, dry, is

   4. ____________________

5. The required amount of water, warm (105^{o} to 110^{o}), is

   5. ____________________

6. The required amount of sugar, granulated, is

   6. ____________________

7. The required amount of water (65^{o}F.) is

   7. ____________________

8. The required amount of milk, nonfat, dry, is

   8. ____________________

9. The required amount of sugar, granulated, is

   9. ____________________

10. The required amount of yeast food is

    10. ____________________

11. The AFRCS card lists ground beef at 18 pounds, the limiting amount of ground beef is 56 pounds, for these amounts, what will the W/F be? Round decimals to two places.

    11. ____________________

12. Using the W/F computed in question 11, the AFRCS card lists 1 pound 4 oz. of green peppers, to the nearest 1/4 oz., what is the required quantity of green peppers?

    12. ____________________

13. The AFRCS card indicates that each portion of corned beef is 5 ounces. You desire to reduce the portion size to 4 ounces, the desired number of servings is 460, compute the correct W/F. Round decimals to two places.

    13. ____________________

14. The AFRCS card indicates that each portion of chocolate pudding is 4 ounces. You desire to raise the portion size to 6 ounces. The desired number of servings is 340, compute the correct W/F.

    14. ____________________

15. The AFRCS lists beef at 39 pounds, to prepare this recipe you are limited to 12 pounds, the correct W/F will be

    15. ____________________

APPENDIX B (continued)

Diagnostic Mathematics Quiz

This quiz duplicates the mathematical operations involved in the Criterion Test on Recipe Conversion. It was administered to Group IV trainees before and after training.

1. Write out the following fraction as a decimal.

   $\frac{235}{100}$ = ____________ Answer

2. Work this division problem. Carry your answer to three decimal places.

   $100\overline{)430}$ ____________ Answer

3. Work this division problem. Carry your answer to two decimal places.

   $100\overline{)76}$ ____________ Answer

4. Reduce each of the following values by moving its decimal point two places to the left.

   a. 136 ____________ b. 7 ____________

   c. 35 ____________ d. 19375 ____________

5. Multiply as indicated.

   a. $\begin{array}{r} 3.66 \\ \underline{\times\ 5} \end{array}$ b. $\begin{array}{r} 7.6 \\ \underline{\times .42} \end{array}$

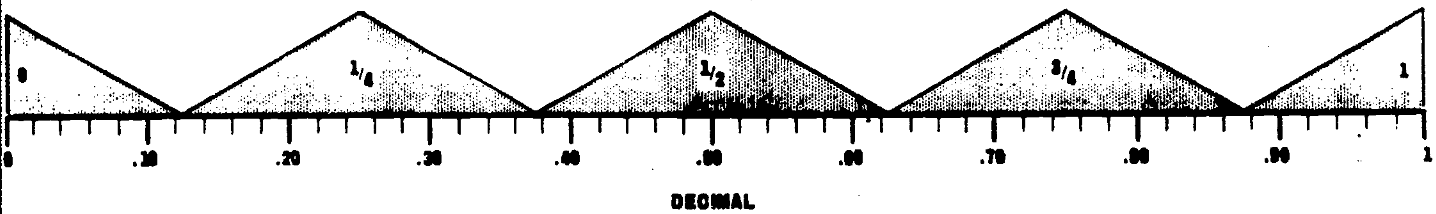
   ____________________ Answer ____________________ Answer

6. Write .60 feet as a decimal number in inches. (1 ft = 12 in.)

________________________ Answer

7. Round off each decimal value to the nearest fractional value on the conversion chart below.

ROUNDED OFF FRACTIONS



a. .65 __________ Answer   b. .85 __________ Answer

c. .50 __________ Answer   d. .93 __________ Answer

8. Multiply 6.43 by 46, then, multiply the decimal portion of your answer by 17. What is your final answer?

__________ Answer

9. You need a piece of pipe that you can cut into 8 lengths, each 4.5 inches long. How long a piece do you need? First find your answer in inches, then convert to feet. Remember, 1 ft. = 12 in.)

Answer ____________________ inches

Answer ____________________ feet

10. Convert 92 inches into feet and inches (1 ft. = 12 in.)

Answer _____ feet _____ inches

11. Work the following series of operations.

1st Multiply these values: 354 x 16

2nd Multiply the last two digits of your 1st answer by 4.

3rd Multiply the last two digits of your 2nd answer by 3.

4th Multiply the last two digits of your 3rd answer by 2.

_____Answer

12. Sometimes we need to change decimal units into smaller units. For example, 2.83 yards can be changed to 2 yards, 2 feet, 5.88 inches. If we round off to the nearest inch, we get 2 yards, 2 feet, 6 inches.

In the same manner, change 4.72 yards into yards, feet, and inches. Round off your answer to the nearest inch. (Remember, 1 yard = 3 feet, and 1 foot = 12 inches.)

4.72 yards = _______ yards _______ feet _______ inches

13. Do the following division problems, carry your answer to three decimal places then round off to two decimal places.

a. $18\overline{)17}$

b. $18\overline{)67.356}$

ANSWER

ANSWER

____
(rounded off to two places)

____
(rounded off to two places)

14. Round off the following numbers from three to two decimal places.

a. 2.857 Answer________________

b. .063 Answer________________

c. .097 Answer________________

15. In order to make concrete stepping stones, we would mix 90 lbs. of cement and 120 lbs. of gravel. However, we only have 60 lbs. of cement. In order to keep our mix the same, how much gravel should we use with the 60 lbs. of cement.

Answer ______________lbs.

16. Sometimes it is handy to change small units into larger ones. For example, 49 inches may be changed to 1 yard, 1 foot, 1 inch.

    In the same manner, change 99 inches into larger units. (Remember 1 yard = 3 feet = 36 inches, and 1 foot = 12 inches.)

99 inches = _______ yards _______ feet _______ inches

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