ED 090 015   SE 017 568

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TITLE   Algebra I, Package 03-04, Solving Equations and
                Problems.
INSTITUTION   Arnold Public Schools, Nebr.
SPONS AGENCY   Bureau of Elementary and Secondary Education
                (DHEW/OE), Washington, D.C.
PUB DATE   72
NOTE   42p.; For related documents; see SE 017 553 through
                567 and SE 017 569 through 575   .

EDRS PRICE   MF-$0.75 HC-$1.85 PLUS POSTAGE
DESCRIPTORS   *Algebra; Grade 9; Individualized Instruction;
                *Instructional Materials; Objectives; Problem
                Solving; *Secondary School Mathematics; *Teaching
                Guides; *Tests
IDENTIFIERS   Elementary Secondary Education Act Title III; ESEA
                Title III

ABSTRACT
            This teacher guide is part of the materials prepared
for an individualized program for ninth-grade algebra and basic
mathematics students. Materials written for the program are to be
used with audiovisual lessons recorded on tape cassettes. For an
evaluation of the program, see ED 086 545. In this guide, the teacher
is provided with objectives for each topic area and guided to
materials written for a given topic. Three short criterion tests are
included for each topic covered. Techniques for solving algebraic
equations are presented in this package. This work prepared under an
ESEA Title III contract. (JP)

ALGEBRA I

Package # 03-04

SOLVING EQUATIONS AND PROBLEMS

Prepared By

Russ Thompson and Albert Fuller

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SOLVING EQUATIONS AND PROBLEMS

You have had some experience in solving simple open
sentences. However, the methods you will learn in this
package are more sophisticated than the methods you have
been using and are based upon some of the properties of
real numbers. It is very important that you understand and
use the methods presented in this package. Do not make
the mistake of ignoring the new methods and continuing to
use the old. Eventually, the problems you are asked to
solve will become so difficult that the old methods will
not suffice. If you have not learned the new methods, you
will not be able to solve the problem.

PACKAGE GOAL: to understand and be able to use the new
methods of solving equations and problems.

PACKAGE OBJECTIVES:

1. Given an equation such as $x + 31 = 8$ or $x - 5 = 13$, show how to solve by using transformation by addition.

2. Given an equation such as $x + 31 = 8$, show how to solve by using transformation by subtraction.

3. Given an equation such as $\frac{1}{6} x = 132$ or $3x = 96$, show how to solve by using transformation by multiplication.

4. Given an equation such as $3x = 96$, show how to solve by using transformation by division.

5. Given an equation, show how to solve by using as many transformations as necessary.

6. Given an equation having the variable in both members, show how to solve it.

7. Given a word problem, write an equation which is the translation of the word problem, then write the solution.

8. Given a function, write the value of the function for any given member of the domain.

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I. U. # 03-04-01

Transforming Equations by Addition

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OBJECTIVES:

1. When asked to state the addition property of
    equality, you will write, "If a,b, and c are
    any real numbers such that a = b, then
    a + c = b + c and c + a = c + b".

2. Given an equation such as x + 31 = 8 or
    x - 5 = 13, show how to solve by using
    transformation by addition.

ACTIVITIES:

Study:
  <u>S & M</u>: pages 111 - 114 (objectives 1 and 2).

Suggested exercises:
  <u>S & M</u>: pages 115 - 116; ex. 1 - 25, odd (objective 2).

Criterion Test 03-04-01-01

1. State the additive property of equality.

2. Solve by using transformation by addition.
    (Show all steps.)

    (a) $x + 19 = 25$
    (b) $-7 + x = 13$
    (c) $-x + 15 = 12$

Criterion Test 03-04-01-02

1. State the additive property of equality.

2. Solve by using transformation by addition.
    (Show all steps.)

    (a) $x + 8 = -13$
    (b) $-7 + x = -3$
    (c) $-x + 5 = 17$

Criterion Test 03-04-01-03

1. State the additive property of equality.

2. Solve by using transformation by addition.
    (Show all steps.)

    (a) $x + 14 = 3$
    (b) $-11 + x = 14$
    (c) $-x + 3 = 11$

Answers to Criterion Tests

Criterion Test 03-04-01-01

    1. If a, b, and c are any real numbers such that
        a = b, then a + c = b + c and c + a = c + b.

    2. (a) $x + 19 = 25$
             $x + 19 + (-19) = 25 + (-19)$
             $x = 6$

        (b) $-7 + x = 13$
             $7 + (-7) + x = 7 + 13$
             $x = 20$

        (c) $-x + 15 = 12$
             $-x + 15 + (-15) = 12 + (-15)$
             $-x = -3$
             $x = 3$

Criterion Test 03-04-01-02

    1. If a, b, and c are any real numbers such that
        a = b, then a + c = b + c and c + a = c + b.

    2. (a) $x + 8 = -13$
             $x + 8 + (-8) = 13 + (-8)$
             $x = -21$

        (b) $-7 + x = -3$
             $7 + (-7) + x = 7 + (-3)$
             $x = 4$

        (c) $-x + 5 = 17$
             $-x + 5 + (-5) = 17 + (-5)$
             $-x = 12$
             $x = {}^{-}12$

ANSWERS TO CRITERION TESTS:

Criterion Test 03-04-01-03

1. If a, b, and c are any real numbers such that
   a = b, then a + c = b + c and c + a = c + b.

2. (a) x + 14 = 3
        x + 14 + (-14) = 3 + (-14)
        x = -11

   (b) -11 + x = 14
        11 + (-11) + x = 11 + 14
        x = 25

   (c) -x + 3 = 11
        -x + 3 + (-3) = 11 + (-3)
        -x = 8
        x = -8

I. U. # 03-04-02

Transforming Equations By Subtraction

OBJECTIVES:

1. When asked to state the rule for subtraction, you
    will write, "For all real numbers a and b,
    a - b = a + (-b).

2. Given two real numbers, find their difference.

3. Given an equation such as x + 31 = 8, show
    how to solve by using transformation by sub-
    traction.

ACTIVITIES:

  Study:
    S & M: pages 116 - 118 (pay special attention to
             example 4, part b, on page 1?8. (objectives
             1,2,and 3).

Suggested exercises:
    S & M: page 121; ex. 1 - 17, odd (objective 2).
             page 121; ex. 19 - 26, (objective 3).

Criterion Test 03-04-02-01

1. State the rule for subtraction.

2. Rewrite each of the following differences as a
   sum and simplify.

   (a) -32   (b) 48   (c) -10   (d) $(x + 7) - (x - 3)$
        -17   -13   5

3. Solve by using transformation by subtraction.(Show all steps)

   (a) $x + 38 = 14$
   (b) $-17 = y + 6$

Criterion Test 03-04-02-02

1. State the rule for subtraction.

2. Rewrite each of the following differences as a
   sum and simplify.

   (a) -17   (b) -4   (c) 14   (d) $(x + 1) - (-2 + x)$
        -11   3   -17

3. Solve by using transformation by subtraction.(Show all steps)

   (a) $x + 17 = 31$
   (b) $-5 = y + 9$

Criterion Test 03-04-02-03

1. State the rule for subtraction.

2. Rewrite each of the following differences as a
   sum and simplify.

   (a) -14   (b) -8   (c) 32   (d) $(x + 5) - (-4 + x)$
         8   -11   -19

3. Solve by using transformation by subtraction. (Show all steps)

   (a) $x + 10 = 20$
   (b) $-15 = y + 15$

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Answers:

Criterion Test 03-04-02-01

1. For all real numbers a and b, a – b = a + (–b)

2. (a) $\begin{array}{r} -32 \\ \underline{17} \\ -15 \end{array}$ (b) $\begin{array}{r} 48 \\ \underline{13} \\ 61 \end{array}$ (c) $\begin{array}{r} -10 \\ \underline{-5} \\ -15 \end{array}$

   (d) (x + 7) + (–x + 3) = 10

3. (a) x + 38 = 14
       x + 38 – 38 = 14 – 38
       x = –24

   (b) –17 = y + 6
       –17 – 6 = y + 6 – 6
       –23 = y

Criterion Test 03-04-02-02

1. For all real numbers a and b, a – b = a + (–b).

2. (a) $\begin{array}{r} -17 \\ \underline{11} \\ -6 \end{array}$ (b) $\begin{array}{r} -4 \\ \underline{-3} \\ -7 \end{array}$ (c) $\begin{array}{r} 14 \\ \underline{17} \\ 31 \end{array}$

   (d) (x + 1) + (2 – x) = 3

3. (a) x + 17 = 31
       x + 17 – 17 = 31 – 17
       x = 14

   (b) –5 = y + 9
       –5 – 9 = y + 9 – 9
       –14 = y

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Answers (continued)

Criterion Test 03-04-02-03

1. For all real numbers a and b, a - b = a + (-b).

2. (a) $\begin{array}{r} -14 \\ \underline{-8} \\ -22 \end{array}$ (b) $\begin{array}{r} -8 \\ \underline{11} \\ 3 \end{array}$ (c) $\begin{array}{r} 32 \\ \underline{19} \\ 51 \end{array}$

    (d) (x + 5) + (4 - x) = 9

3. (a) x + 10 = 20
        x + 10 - 10 = 20 - 10
        x = 10

    (b) -15 = y + 15
        -15 - 15 = y + 15 - 15
        -30 = y

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I. U. # 03-04-03

Transforming Equations By Multiplication

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OBJECTIVES:

1. When asked to state the multiplication property
    of equality, you will write, "If a,b, and c are
    any real numbers such that a = b, then ac = bc
    and ca = cb.

2. Given an equation such as $\frac{1}{5}x = -32$ or $3x = 96$,
    show how to solve by using transformation by
    multiplication.

ACTIVITIES:

Study:
  <u>S & M</u>: pages 123 - 123 (objectives 1 and 2).

Suggested exercises:
  <u>S & M</u>: page 125; ex. 1 - 17, odd (objective 2).

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CRITERION TESTS

Criterion Test 03-04-03-01

1. State the multiplication property of equality.

2. Solve each equation by using transformation by
    multiplication. (Show all work.)

    (a) $\frac{1}{9}y = 15$
    (b) $5x = 125$
    (c) $\frac{-1}{7}x = -49$

Criterion Test 03-04-03-02

1. State the multiplication property of equality.

2. Solve each equation by using transformation by
    multiplication. (Show all work)

    (a) $\frac{1}{8}y = 25$
    (b) $4x = 24$
    (c) $-\frac{1}{3}x = 39$

Criterion Test 03-04-03-03

1. State the multiplication property of equality.

2. Solve each equation by using transformation by
    multiplication.

    (a) $\frac{1}{7}x = 32$

    (b) $6x = 54$

    (c) $-\frac{1}{8}x = 72$

ANSWERS TO CRITERION TESTS

Criterion Test 03-04-03-01

1. If a, b, and c are any real numbers such that
   a = b, then ac = bc and ca = cb.

2. (a) $\frac{1}{9} \cdot y = 15$ (b) $5x = 125$ (c) $\frac{-1}{7}x = -49$

   $9 \cdot \frac{1}{9} y = 9 \cdot 15$ $\frac{1}{5} \cdot 5x = \frac{1}{5} \cdot 125$ $-7 \cdot \left(\frac{-1}{7}x\right) = -7(-49)$

   $y = 135$ $x = 25$ $x = 343$

Criterion Test 03-04-03-02

1. If a, b, and c are any real numbers such that
   a = b, then ac = bc and ca = cb.

2. (a) $\frac{1}{8} y = 25$ (b) $4x = 24$

   $8 \cdot \frac{1}{8} y = 8 \cdot 25$ $\frac{1}{4} \cdot 4x = \frac{1}{4} \cdot 24$

   $y = 200$ $x = 6$

   (c) $\frac{-1}{3} x = 39$

   $-3 \cdot \left(\frac{-1}{3} x\right) = -3 \cdot 39$

   $x = -117$

Criterion Test 03-04-03-03

1. If a, b, and c are any real numbers such that
   a = b, then ac = bc and ca = cb.

2. (a) $\frac{1}{7}x = 32$ (b) $6x = 54$

   $7 \cdot \frac{1}{7} x = 7 \cdot 32$ $\frac{1}{6} \cdot 6x = \frac{1}{6} \cdot 54$

   $x = 224$ $x = 9$

   (c) $-\frac{1}{8} x = 72$

   $-8 \left(-\frac{1}{8} x\right) = -8(72)$

   $x = -576$

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I. U. # 03-04-04

Transforming Equations By Division

OBJECTIVES:

1. When asked to state the rule for division, you
    will write, "For all real numbers a and all non-
    zero numbers b, a ÷ b = a · 1/b.

2. Given two real numbers, find their quotient

3. Given an equation such as 3x = 96, show how to
    solve by using transformation by division.

ACTIVITIES:

Study:
  <u>S & M</u>: pages 125 - 127 (pay special attention to
           part a of the example on page 127)
           (objectives 1,2, and 3).

  <u>HBW</u>:   pages 82 - 83 (objective 2).

Suggested exercises:

  <u>S & M</u>: page 129; ex. 1 - 17, odd (objective 2).
          page 129; ex. 19 - 25, odd (objective 3).

  <u>HBW</u>:   page 83; ex. 1 - 12 (objective 2).

Criterion Test 03-04-04-01

1. State the rule for division.

2. State the value of each quotient.

   (a) 39 ÷ (-3)
   (b) 0/6
   (c) 6/-2
   (d) $\dfrac{-8}{-1/2}$

3. Solve by using transformation by division. (Show all steps.)

   (a) 33x = 231
   (b) -7x = 35

Criterion Test 03-04-04-02

1. State the rule for division.

2. State the value of each quotient.

   (a) 72 ÷ (-8)
   (b) 8/-4
   (c) 0/7
   (d) $\dfrac{-6}{-1/3}$

3. Solve by using transformation by division. (Show all steps.)

   (a) 15x = 225
   (b) -5x = 35

Criterion Test 03-04-04-03

1. State the rule for division.

2. State the value of each quotient.

   (a)   45 ÷ (-9)
   (b)   10/-2
   (c)   0/-5
   (d)   -14/-7

3. Solve by using transformation by division.   (Show
   all steps.)

   (a)   12x = 144
   (b)   -3x = -54

Answers:

Criterion Test 03-04-04-01

    1. For all real numbers a and all non zero numbers
       b, a ÷ b = a · 1/b.

    2. (a) -13   (b) 0   (c) -3   (d) 16

    3. (a) $33x = 231$ (b) $-7x = 35$
            $\dfrac{33x}{33} = \dfrac{231}{33}$ $\dfrac{-7x}{-7} = \dfrac{35}{-7}$
            $x = 7$ $x = -5$

Criterion Test 03-04-04-02

    1. For all real numbers a and all non zero real
       numbers b, a ÷ b = a ÷ 1/b.

    2. (a) -9   (b) -2   (c) 0   (d) 18

    3. (a) $15x = 225$ (b) $-5x = 35$
            $\dfrac{15x}{15} = \dfrac{225}{15}$ $\dfrac{-5x}{-5} = \dfrac{35}{-5}$
            $x = 15$ $x = -7$

Criterion Test 03-04-04-03

    1. For all real numbers a and all non zero numbers
       b, a ÷ b = a · 1/b.

    2. (a) -5   (b) -5   (c) 0   (d) 2

    3. (a) $12x = 144$ (b) $-3x = -54$
            $\dfrac{12x}{12} = \dfrac{144}{12}$ $\dfrac{-3x}{-3} = \dfrac{-54}{-3}$
            $x = 12$ $x = 18$

I. U. # 03-04-05

Using Several Transformations

To Solve Equations

You will need to recall:

An expression like 3x + 5x can be simplified by using the
distributive property: 3x + 5x = (3 + 5)x = 8x.   Also,
$$\frac{x}{5} = \frac{1}{5} \cdot x$$

OBJECTIVE:

    1. Given an equation, show how to solve it by
       using as many transformations as necessary.

ACTIVITIES:

    Study:
      S & M: pages 130 - 131   (objective 1).

    Suggested exercises:
      S & M: page 132; ex. 1 - 29, odd   (objective 1).

Criterion Test 03-04-05-01

    1.   Solve: (Show all steps)

        (a) $4x + 5 = 17$
        (b) $x/5 - 7 = -13$
        (c) $5x + 3x - 4x = -16$
        (d) $-7 + 4x - x + 12 = -4$

Criterion Test 03-04-05-02

    1.   Solve: (Show all steps)

        (a, $3x - 5 = 16$
        (b) $x/2 + 8 = -12$
        (c) $5x + 14x - 9x = 100$
        (d) $4x - 2 + 8 - 2x = -14$

Criterion Test 03-04-05-03

    1.   Solve: (Show all steps)

        (a) $8x + 5 = -11$
        (b) $-6 + x/3 = 12$
        (c) $11x - 7x + 2x = 48$
        (d) $12 - 3x + 8x - 12 = -30$

Answers:

Criterion Test 03-04-05-01

1.   (a) $4x + 5 = 17$ (b) $x/5 - 7 = -13$
              $4x + 5 - 5 = 17 - 5$ $x/5 - 7 + 7 = -13 + 7$
              $4x = 12$ $x/5 = -6$
              $4x/4 = 12/4$ $5 \cdot x/5 = 5 \cdot (-6)$
              $x = 3$ $x = -30$

    (c) $5x + 3x - 4x = -16$ (d) $-7 + 4x - x + 12 = -4$
              $4x = -16$ $5 + 3x = -4$
              $4x/4 = -16/4$ $-5 + 5 + 3x = -5 + (-4)$
              $x = -4$ $3x = -9$
                                   $3x/3 = -9/3$
                                 $x = -3$

Criterion Test 03-04-05-02

1.   (a) $3x - 5 = 16$ (b) $x/2 + 8 = -12$
              $3x - 5 + 5 = 16 + 5$ $x/2 + 8 - 8 = -12 - 8$
              $3x = 21$ $x/2 = -20$
              $3x/3 = 21/3$ $2 \cdot x/2 = 2 \cdot (-20)$
              $x = 7$ $x = -40$

    (c) $5x + 14x - 9x = 100$ (d) $4x - 2 + 8 - 2x = -14$
              $10x = 100$ $2x + 6 = -14$
              $10x/10 = 100/10$ $2x + 6 - 6 = -14 - 6$
              $x = 10$ $2x = -20$
                                 $2x/2 = -20/2$
                                 $x = -10$

Answers (continued)

Criterion Test 03-04-05-03

1.   (a) $8x + 5 = -11$ (b) $-6 + x/3 = 12$
            $8x + 5 - 5 = -11 - 5$ $6 - 6 + x/3 = 12 + 6$
            $8x = -16$ $x/3 = 18$
            $8x/8 = -16/8$ $3 \cdot x/3 = 3 \cdot 18$
            $x = -2$ $x = 54$

    (c) $11x - 7x + 2x = 48$ (d) $12 - 3x + 8x - 12 = -30$
            $6x = 48$ $5x = -30$
            $6x/6 = 48/6$ $5x/5 = -30/5$
            $x = 8$ $x = -6$

I. U. # 03-04-06

Solving Equations With the

Variable in Both Members

OBJECTIVE:

    1. Given an equation having the variable in both
       members, show how to solve it.

ACTIVITIES:

    Study:
      S & M: pages 138 - 141 (objective 1).

    Suggested exercises:
      S & M: pages 141 - 142; ex. 1 - 35, odd (red an-
            swer book shows some of the steps)
            (objective 1).

Criterion Test 03-04-06-01

    1.   Solve each equation for x. (Show steps)

        (a) $2x - 3 + 5x = x + 15$
        (b) $11x = 8x + 42$
        (c) $2x - 42 = -x$
        (d) $12w - 8t = 2x$

Criterion Test 03-04-06-02

    1.   Solve each equation for x. (Show steps)

        (a) $-2x + 7 = 5x - 21$
        (b) $9x = 84 - 5x$
        (c) $4x + 6 = 2x$
        (d) $24a - 3x = 5x$

Criterion Test 03-04-06-03

    1.   Solve each equation for x. (Show steps)

        (a) $-14 + x = 4x + 16$
        (b) $9x - 70 = 2x$
        (c) $54 - 2x = 7x$
        (d) $5x - 2y = 1$

Answers:

Criterion Test 03-04-06-01

1. (a) $2x - 3 + 5x = x + 15$
    $7x - 3 = x + 15$
    $7x - x = 15 + 3$
    $6x = 18$
    $6x/6 = 18/6$
    $x = 3$

   (b) $11x = 8x + 42$
    $11x - 8x = 42$
    $3x = 42$
    $3x/3 = 42/3$
    $x = 14$

   (c) $2x - 42 = -x$
    $2x + x = 42$
    $3x = 42$
    $\frac{3x}{3} = \frac{42}{3}$
    $3x = 42 \qquad x = 14$

   (d) $12v - 8t = 2x$
    $\frac{12v - 8t}{2} = \frac{2x}{2}$
    $6v - 4t = x$

Criterion Test 03-04-06-02

1. (a) $-2x + 7 = 5x - 21$
    $-2x - 5x = -21 - 7$
    $-7x = -28$
    $\frac{-7x}{-7} = \frac{-28}{-7}$
    $x = 4$

   (b) $9x = 84 - 5x$
    $9x + 5x = 84$
    $14x = 84$
    $\frac{14x}{14} = \frac{84}{14}$
    $x = 6$

   (c) $4x + 6 = 2x$
    $4x - 2x = 6$
    $2x = 6$
    $\frac{2x}{2} = \frac{6}{2}$
    $x = 3$

   (d) $24a - 3x = 5x$
    $24a = 5x + 3x$
    $24a = 8x$
    $\frac{24a}{8} = \frac{8x}{8}$
    $3a = x$

Criterion Test 03-04-06-03

1. (a) $-14 + x = 4x + 16$
    $x - 4x = 16 + 14$
    $-3x = 30$
    $\frac{-3x}{-3} = \frac{30}{-3}$
    $x = -10$

   (b) $9x - 70 = 2x$
    $9x - 2x = 70$
    $7x = 70$
    $\frac{7x}{7} = \frac{70}{7}$
    $x = 10$

   (c) $54 - 2x = 7x$
    $-2x - 7x = -54$
    $-9x = -54$
    $\frac{-9x}{-9} = \frac{-54}{-9}$
    $x = 6$

   (d) $5x - 2y = 1$
    $5x = 2y + 1$
    $\frac{5x}{5} = \frac{2y + 1}{5}$
    $x = \frac{2y + 1}{5}$

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I. U. # 03-04-07

Using Equations to Solve Problems

OBJECTIVE:

1. Given a word problem, write an equation which
    is the translation of the word problem, then
    write the solution.

ACTIVITIES:

Study:
S & M: pages 133 - 134 (objective 1).
       pages 142 - 143, sample problem (objective 1).

H B W: pages 130 - 131, 132 - 133, and example on
       pages 135.

Be sure you read each problem carefully. Do not
set out to solve a problem until you thoroughly under-
stand it. Do not try to memorize a pattern for solving
a certain type of problem, but instead, learn how to
translate from a word description to a numerical sentence.
If you will do this you can solve any word problem that
leads to a number sentence you can solve. This is a
very important instructional unit because solving pro-
blems is what mathematics is all about.

Suggested exercises:
S & M: pages 135 - 137; ex. 1 - 27, odd (objective 1)
       pages 134 - 165; ex. 1 - 33, odd (objective 1)
       143

Criterion Test 03-04-07-01

1. Write an equation that is the translation of
    each problem and find the solution.

    (a) Mrs. Uglymug is five times as old as her
        daughter, Ikk. Twenty-one years from now,
        she will be twice as old as Ikk. How old
        is Ikk?

    (b) The perimeter of a rectangle is 28 feet.
        The length is 2 less than 3 times the width.
        Find the dimensions of the rectangle.

    (c) The difference of two numbers is 10. Seven
        times the smaller number is 2 more than the
        larger. What are the numbers?

Criterion Test 03-04-07-02

1. Write an equation that is the translation of
    each problem and find the solution.

    (a) Two years from now, Sylvester will be
        twice as old as Ferdinand. Now he is 5
        years older than Ferdinand. How old is
        Ferdinand?

    (b) Homer Brewer bought a bottle and a fancy
        cork for 75¢. If the cork cost 5¢ more
        tnan the bottle, find the cost of each.

    (c) The length of a rectangle is twice the
        width. The perimeter is 60 yards. Find
        the dimensions.

Criterion Test 03-04-07-03

1. Write an equation that is the translation of
   each problem and find the solution.

   (a) If 5 is subtracted from three times a
       number, the result is 10. What is the
       number?

   (b) A six foot board is cut into two pieces,
       one twice as long as the other. How
       long are the pieces?

   (c) Dilbert Dingbat weighs 12 pounds more than
       twice the weight of his sister, Della.
       What is the weight of each if their combined
       weight totals 180 pounds?

Answers:

Criterion Test 03-04-07-01

1. (a) let x = Ikk's age now
        $5x$ = Mrs. Uglymug's age now
        $x + 21$ = Ikk's age in 21 years
        $5x + 21$ = Mrs. Uglymug's age in 21 years

        $5x + 21 = 2(x + 21)$
        $5x + 21 = 2x + 42$
        $5x - 2x = 42 - 21$
        $3x = 21$
        $x = 7$ Ikk is 7 years old

   (b) let x = width
        $3x - 2$ = length

        $2x + 2(3x - 2) = 28$
        $2x + 6x - 4 = 28$
        $8x = 28 + 4$
        $8x = 32$ The rectangle is 4 ft. by 10 ft.
        $x = 4$

   (c) let x = smaller number
        $x + 10$ = larger number

        $7x = 2 + x + 10$
        $7x - x = 12$
        $6x = 12$
        $x = 2$ the smaller number is 2
    $x + 10 = 12$ the larger number is 12

Answers:

Criterion Test 03-04-07-02

1. (a) let x = Ferdinand's age now
          x + 5 = Sylvester's age now
          x + 2 = Ferdinand's age two years from now
          x + 7 = Sylvester's age two years from now

          x + 7 = 2(x + 2)
          x + 7 = 2x + 4
          x - 2x = 4 - 7
          -x = -3
          x = 3

      Ferdinand is 3 years old

   (b) let x = cost of bottle
          x + 5 = cost of cork

          x + (x + 5) = 75
          2x + 5 = 75
          2x = 70
          x = 35

      The bottle cost 35¢, and the cork cost 40¢

   (c) let x = width
          2x = length

          2(x) + 2(2x) = 60
          2x + 4x = 60
          6x = 60
          x = 10

      The rectangle is 10 yards by 20 yards

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Answers:

Criterion Test 03-04-07-03

1. (a) let x = the number

        $3x - 5 = 10$
        $3x = 15$
        $x = 5$

    The number is 5

   (b) let x = shorter piece
        2x = longer piece

        $x + 2x = 6$
        $3x = 6$
        $x = 2$

    The pieces are 2 ft. and 4 ft.

   (c) let x = weight of Della
        2x + 12 = weight of Dilbert

        $x + (2x + 12) = 180$
        $3x = 180 - 12$
        $3x = 168$
        $x = 56$

    Della weighs 56 pounds and Dilbert weighs 124 pounds

I. U. # 03-04-08

Functions

OBJECTIVES:

1. Given a notation such as $f: x \rightarrow x^2 + 1$, write
   the meaning of the notation.

2. Given a function and its domain, specify the
   range of the function.

3. Given a function, write the value of the func-
   tion for any given member of the domain.

ACTIVITIES:

Study:
   S & M: pages 146 - 148 (objectives 1,2, and 3).

Suggested exercises:
   S & M: page 148; ex. 1 - 6 (objective 1).
            page 149; ex. 7 - 15, odd (objective 2).
            page 149 - 150; ex. 17 - 35, odd (objective 3).

Criterion Test 03-04-08-01

1. Give the meaning of k: $n \rightarrow 3n^2 + 1$

2. Specify in roster form the range of the given function.

   (a) g: $x \rightarrow x(x + 3)$, D = {0,3,-7}
   (b) h: $y \rightarrow y^2 - 1$, D = {1,3,5}

3. Given f: $f(x) = (x + 2)^2$, find:

   (a) $f(3)$
   (b) $f(-2)$

Criterion Test 03-04-08-02

1. Give the meaning of g: $x \rightarrow x^2 - 5$

2. Specify in roster form the range of the given function.

   (a) f: $x \rightarrow 2x^2 + 1$, D = {2,4,-6}
   (b) h: $y \rightarrow y - 2$, D = {47,48,50}

3. Given f: $f(x) = x(2x-1)$, find:

   (a) $f(-3)$
   (b) $f(4)$

Criterion Test 03-04-08-03

1. Give the meaning of h: $x \rightarrow x - 7$

2. Specify in roster form the range of the given function.

   (a) f: $x \rightarrow 2x + 2$, D = {-5,-3,0}
   (b) g: $y \rightarrow y^2 - y$, D = {-3,4,5}

3. Given f: $f(x) = 2x^2 + 1$, find:

   (a) $f(-2)$
   (b) $f(2)$

Answers:

Criterion Test 03-04-08-01

    1. The function k that pairs n with $3n^2 + 1$.

    2. (a) R = {0, 18, 28}
        (b) R = {0, 8, 24}

    3. (a) 25
        (b) 0

Criterion Test 03-04-08-02

    1. The function g that pairs x with $x^2 - 5$.

    2. (a) R = {9, 33, 73}
        (b) R = {45, 46, 48}

    3. (a) 21
        (b) 28

Criterion Test 03-04-08-03

    1. The function h that pairs x with x - 7.

    2. (a) R = {-10, -4, 2}
        (b) R = {12, 12, 20}

    3. (a) 3
        (b) 9

03-04

END OF PACKAGE