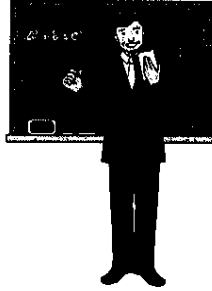


# Chapter 2: Algebraic Expressions and Equations



2.1: Simplifying Algebraic Expressions



2.2: Solving Equations



2.3: Proportions



2.4: Formulas



2.5: Solving Inequalities



2.6: Problem Solving



## 2.1 Simplifying Algebraic Expressions

*Why do we need to simplify algebraic expressions?*

**Example:**

**Simplify:**  $-2x(3y)$

$$-2x(3y)$$

**Solution:**  $-2 \cdot 3xy$

$$-6xy$$

**Practice Examples:**

**Simplify**

a.  $-5(2x)$

$$-10x$$

b.  $\frac{2}{3} \cdot \frac{3}{8}x$

$\times$

c.  $-4a(-2b)(-3c)$

$$(-4)(-2)(-3)abc$$

$$8(-3)abc$$

$$\boxed{-24abc}$$

d.  $(-2he)(2l)(-1p)$

4 help

### Distributive Property

Solve:  $2(3+5)$

$$2(8)$$

$$\boxed{16}$$

$$2(3+5)$$

$$2(3) + 2(5)$$

$$6 + 10$$

$$\boxed{16}$$

Example: Use distributive property to simplify

$$-2(x+3)$$

Solution:  $-2(x+3)$

$$-2x - 2(3)$$

$$\boxed{-2x - 6}$$

Practice Examples:  
Simplify

a.  $2(5x+3)$

$$2(5x) + 2(3)$$

$$\boxed{10x + 6}$$

b.  $-3(-2-4x+2y)$

$$6 + 12x - 6y$$

c.  $-1(x-4)$

$$-x + 4$$

d.  $4(6x-5)2$

$$8(6x-5)$$

$$48x - 40$$

$$(24x - 20)2$$

$$48x - 40$$

**Like Terms-** are terms with exactly the same variables raised to exactly the same powers.

Like Terms

$2x$  and  $5x$

$-4x^3$  and  $2x^3$

$\frac{2}{5}x^2y$  and  $x^2y$

Unlike Terms

$2x$  and  $3y$

$5x^2$  and  $-6x^3$

$x^2$  and  $x^2y$

**Practice Examples:**

**Simplify**

a.  $\underline{-3x} + \underline{5x} + 4x^2$

$$2x + 4x^2$$

b.  $\underline{5x} - 6 + \underline{8x} - 1$

$$5x + 8x - 6 - 1$$

$$13x - 7$$

$$-7 + 13x$$

c.  $-3x^2y + 5xy^2$

Done

d.  $\overbrace{x(5-2x)} + 3 - 4x^2$

$$5x - 2x^2 + 3 - 4x^2$$

$$-2x^2 - 4x^2 + 5x + 3$$

$$-6x^2 + 5x + 3$$

e.  $\overbrace{5(x+3)} - \overbrace{2(4-x)} - \overbrace{4(3x-1)}$

$$5x + 15 - 8 + 2x - 3x + 1$$

$$5x + 2x - 3x + 15 - 8 + 1$$

$$\boxed{4x + 8}$$

**Why do we need to simplify algebraic expressions?**

Varies

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## Section 2.1: Simplifying Algebraic Expressions Practice Problems

Simplify

1.  $-3(2x)(-6)$   $36x$

$$\begin{aligned} & -3(2)(-6)x \\ & -6(-6)x \\ & 36x \end{aligned}$$

2.  $\left(\frac{15}{7}a\right)\left(\frac{14}{3}b\right)$   $10ab$

$$\begin{aligned} & \left(\frac{15}{7}\right)\left(\frac{14}{3}\right)ab \\ & 10ab \end{aligned}$$

3.  $a(5b)(-3c)(-4d)$   $60abcd$

$$\begin{aligned} & 5(-3)(-4)abcd \\ & -15(-4) \\ & 60abcd \end{aligned}$$

4.  $-2xy(5.5z)$   $-11xyz$

$$-11xyz$$

5.  $2(x+5)$   $2x+10$

$$\begin{aligned} & 2(x+5) \\ & 2x+10 \end{aligned}$$

6.  $-4(2x+3y-z)$   $-8x-12y+4z$

$$\begin{aligned} & -4(2x+3y-z) \\ & -8x-12y+4z \end{aligned}$$

7.  $-(3a-b-5c)$   $-3a+b+5c$

$$\begin{aligned} & -(3a-b-5c) \\ & -3a+b+5c \end{aligned}$$

9.  $-2(x+4y-5z)3$   $-6x-24y+30z$

$$\begin{aligned} & -2(3)(x+4y-5z) \\ & -6(x+4y-5z) \\ & -6x-24y+30z \end{aligned}$$

10.  $5a+3a^2-a-a^2$   $2a^2+4a$

$$\begin{aligned} & 3a^2-a^2+5a-a \\ & 2a^2+4a \end{aligned}$$

11.  $4xy-5xy^2+3xy$   $7xy-5xy^2$

$$\begin{aligned} & 4xy+3xy-5xy^2 \\ & 7xy-5xy^2 \end{aligned}$$

12.  $5-3x(x-4)+3x-x^2$   $-4x^2+15x+5$

$$\begin{aligned} & 5-3x(x-4)+3x-x^2 \\ & 5-3x^2+12x+3x-x^2 \\ & -3x^2-x^2+12x+3x+5 \\ & -4x^2+15x+5 \end{aligned}$$

13.  $3(4x+3)-(-x-5)-2(3x+4)$

$$\begin{aligned} & 12x+9+x+5-6x-8 \\ & 12x+x-6x+9+5-8 \\ & 13x-6x+14-8 \\ & 7x+6 \end{aligned}$$



## 2.2 Solving Equations

*How do you solve equations?*

**Equation-** statement indicating that two expressions are equal

**Example:** Is 10 a solution of:  $-3x + 5 = 5x - 25$  ?

$$-3x + 5 = 5x - 25$$

**Solution:**  $-3(10) + 5 = 5(10) - 25$

$$-30 + 5 = 50 - 25$$

$$-25 = 25$$

10 is not a solution of:  $-3x + 5 = 5x - 25$

**Practice Examples:**

a) Is -2 a solution of:  $-x + 8 = 3x + 16$ ?

$$-(-2) + 8 = 3(-2) + 16$$

$$2 + 8 = -6 + 16$$

$$10 = 10$$

Yes -2  
is a solution

b) Is -1 a solution of:  $x^2 + 8 = -x^2 - 8$ ?

$$(-1)^2 + 8 = -(-1)^2 - 8$$

$$1 + 8 = -1 - 8$$

$$9 = -9$$

No, -1 is  
Not a solution

## Solving Equations (One Step)

**Example:**  $x - 9 = 12$

**Solution:**

$$\begin{array}{r} x - 9 = 12 \\ +9 \quad +9 \\ \hline x = 21 \end{array}$$

**Check:**

$$\begin{array}{r} x - 9 = 12 \\ 21 - 9 = 12 \\ 12 = 12 \end{array}$$

**Example:**  $x + 5 = 32$

**Solution:**

$$\begin{array}{r} x + 5 = 32 \\ -5 \quad -5 \\ \hline x = 28 \end{array}$$

**Check:**

$$\begin{array}{r} x + 5 = 32 \\ 28 + 5 = 32 \\ 32 = 32 \end{array}$$

### Practice Examples: Solve for x

**Example:**  $x - 10 = -5$

$$\begin{array}{r} +10 \quad +10 \\ \hline \boxed{x = 5} \end{array}$$

$$\begin{array}{l} \checkmark 5 - 10 = -5 \\ -5 = -5 \end{array}$$

**Example:**  $x + 7 = -11$

$$\begin{array}{r} -7 \quad -7 \\ \hline \boxed{x = -18} \end{array}$$

$$\begin{array}{l} \checkmark -18 + 7 = -11 \\ -11 = -11 \end{array}$$

**Example:**  $-12 + x = 20$

$$\begin{array}{r} +12 \quad +12 \\ \hline \boxed{x = 32} \end{array}$$

$$\begin{array}{l} \checkmark -12 + 32 = 20 \\ 20 = 20 \end{array}$$

**Example:**  $6 + x = -3$

$$\begin{array}{r} -6 \quad -6 \\ \hline \boxed{x = -9} \end{array}$$

$$\begin{array}{l} \checkmark 6 + (-9) = -3 \\ -3 = -3 \end{array}$$

## Solving Equations (Two Step)

Example:  $2x - 3 = 5$

$$\begin{array}{r} 2x - 3 = 5 \\ +3 \quad +3 \\ \hline 2x = 8 \\ \div 2 \quad \div 2 \\ \hline x = 4 \end{array}$$

Check:

$$\begin{array}{l} 2x - 3 = 5 \\ 2(4) - 3 = 5 \\ 8 - 3 = 5 \\ 5 = 5 \end{array}$$

Example:  $-3x + 5 = -13$

$$\begin{array}{r} -3x + 5 = -13 \\ -5 \quad -5 \\ \hline -3x = -18 \\ \div -3 \quad \div -3 \\ \hline x = 6 \end{array}$$

Check:

$$\begin{array}{l} -3x + 5 = -13 \\ -3(6) + 5 = -13 \\ -18 + 5 = -13 \\ -13 = -13 \end{array}$$

Practice Examples: Solve for x

Example:  $-1x + 4 = 10$

$$\begin{array}{r} -1x + 4 = 10 \\ -4 \quad -4 \\ \hline -1x = 6 \\ \div -1 \quad \div -1 \\ \hline x = -6 \end{array}$$

$\checkmark -(-6) + 4 = 10$   
 $6 + 4 = 10$   
 $10 = 10$

Example:  $\frac{x}{2} - 3 = -5$

$$\begin{array}{r} \frac{x}{2} - 3 = -5 \\ +3 \quad +3 \\ \hline \frac{x}{2} = -2 \\ \cdot 2 \quad \cdot 2 \\ \hline x = -4 \end{array}$$

$\checkmark \frac{-4}{2} - 3 = -5$   
 $-2 - 3 = -5$   
 $-5 = -5$

Example:  $5 - 6x = 21$

$$\begin{array}{r} 5 - 6x = 21 \\ -5 \quad -5 \\ \hline -6x = 16 \\ \div -6 \quad \div -6 \\ \hline x = \frac{-16}{6} = -2\frac{2}{3} \end{array}$$

$\checkmark 5 - \frac{6}{1}(-\frac{2}{3}) = 21$   
 $5 + 16 = 21$   
 $21 = 21$

Example:  $-7 + \frac{2}{3}x = 1$

$$\begin{array}{r} -7 + \frac{2}{3}x = 1 \\ +7 \quad +7 \\ \hline \frac{2}{3}x = 8 \end{array}$$

$\cdot 3 \cdot \frac{2x}{3} = 8 \cdot 3$   
 $\frac{2x}{2} = \frac{24}{2}$   
 $x = 12$

$\cdot \frac{3}{2} \cdot \frac{2}{3}x = \frac{8}{1} \cdot \frac{3}{2}$   
 $x = \frac{24}{2}$   
 $x = 12$



## More Solving Equations

Practice Examples:

$$\frac{4}{3} \cdot \frac{3}{4}x = \frac{2}{1} \cdot \frac{4}{3} = \frac{2}{1}$$

$$\boxed{x = 8}$$

$$-\frac{1}{4}x + 6 = 9$$

$$\underline{-6} \quad \underline{-6}$$

$$= \frac{4}{1} \cdot -\frac{1}{4}x = 3 \cdot -4$$

$$\boxed{x = -12}$$

$$7 - 1x = 13$$

$$\underline{-7} \quad \underline{-7}$$

$$\frac{-1x = 6}{-1} \quad \frac{-7}{-1}$$

$$\boxed{x = -6}$$

$$-5(x-3) + 3x = 11$$

$$-5x + 15 + 3x = 11$$

$$-2x + 15 = 11$$

$$\underline{-15} \quad \underline{-15}$$

$$\frac{-2x = -4}{-2} \quad \frac{-15}{-2}$$

$$\boxed{x = 2}$$

## Solving Equations with variables on both sides

**Example:**  $6x - 15 = 4x + 13$

$$6x - 15 = 4x + 13$$

Move variables on one side and numbers on other side of equal

$$6x - 15 = 4x + 13$$

$$\begin{array}{r} -4x \quad -4x \\ \hline \end{array}$$

**Solution:**  $2x - 15 = 13$

$$\begin{array}{r} +15 \quad +15 \\ \hline \end{array}$$

$$2x = 28$$

$$\div 2 \quad \div 2$$

$$x = 14$$

### Practice Examples:

a.  $6x - 7 = 4x + 3$

$$\begin{array}{r} -4x \quad -4x \\ \hline \end{array}$$

$$2x - 7 = 3$$

$$\begin{array}{r} +7 \quad +7 \\ \hline 2x = \frac{10}{2} \end{array}$$

$$\boxed{x = 5}$$

b.  $-7x + 3 = 4x - 19$

$$\begin{array}{r} -4x \quad -4x \\ \hline \end{array}$$

$$-11x + 3 = -19$$

$$\begin{array}{r} -3 \quad -3 \\ \hline -11x = \frac{-22}{-11} \end{array}$$

$$\boxed{x = 2}$$

c.  $-3(4x - 5) = 5x + 3x - 15$

$$-12x + 15 = 8x - 15$$

$$\begin{array}{r} -8x \quad -8x \\ \hline \end{array}$$

$$-20x + 15 = -15$$

$$\begin{array}{r} -15 \quad -15 \\ \hline -20x = \frac{-30}{-20} \end{array}$$

$$\boxed{x = \frac{3}{2}}$$

d.  $-(x - 4) - 5x = 4(-8 - 3x)$

$$-x + 4 - 5x = -32 - 12x$$

$$-6x + 4 = -32 - 12x$$

$$\begin{array}{r} +12x \quad +12x \\ \hline 6x + 4 = -32 \end{array}$$

$$\begin{array}{r} -4 \quad -4 \\ \hline 6x = \frac{-36}{6} \end{array}$$

$$\boxed{x = -6}$$

### Special Cases

e.  $3(x + 5) - 4(x + 4) = -x - 1$

$$3x + 15 - 4x - 16 = -x - 1$$

$$-x - 1 = -x - 1$$

$$\begin{array}{r} +x \quad +1 \quad +x \quad +1 \\ \hline \end{array}$$

$$-x = -x$$

$$\boxed{-1 = -1}$$

All Solutions

f.  $-4(x - 3) + 2x = 2(10 - x)$

$$-4x + 12 + 2x = 20 - 2x$$

$$-2x + 12 = 20 - 2x$$

$$\begin{array}{r} -2x + 12 = -2x + 20 \\ \hline +2x \quad +2x \end{array}$$

$$12 \neq 20$$

No Solution

### Solving Equations with fractions

Example:  $\frac{1}{6}x + \frac{5}{2} = \frac{1}{3}$

$$\frac{1}{6}x + \frac{5}{2} = \frac{1}{3}$$

To eliminate fraction multiply the ENTIRE equation by the LCD

The LCD of 2, 3, and 6 is 6.

Solution:  $6\left[\frac{1}{6}x + \frac{5}{2} = \frac{1}{3}\right]$

$$6\left[\frac{1}{6}x\right] + 6\left[\frac{5}{2}\right] = 6\left[\frac{1}{3}\right]$$

$$x + 15 = 2$$

$$\quad -15 \quad -15$$

$$x = -13$$

$$6 \left[ \frac{1}{6}x + \frac{5}{2} = \frac{1}{3} \right]$$

$$\frac{6}{1} \cdot \frac{1}{6}x + \frac{3 \cdot 6}{1} \cdot \frac{5}{2} = \frac{2 \cdot 6}{1} \cdot \frac{1}{3}$$

$$1x + 15 = 2$$

$$\quad -15 \quad -15$$

$$\boxed{x = -13}$$

Practice Examples: Solve for x

$$12 \left[ \frac{2}{3} = -\frac{2}{3}x + \frac{3}{4} \right]$$

$$\frac{4 \cdot 12}{1} \cdot \frac{2}{3} = \frac{4 \cdot 12}{1} \cdot \left(-\frac{2}{3}x\right) + \frac{12 \cdot 3}{1} \cdot \frac{3}{4}$$

$$8 = -8x + 9$$

$$\quad -9 \quad \quad -9$$

$$\frac{-1}{-8} = \frac{-8x}{-8}$$

$$\boxed{x = \frac{1}{8}}$$

$$18 \left[ -\frac{5}{6}x - 3x = \frac{1}{3}x + \frac{11}{9} \right]$$

$$\frac{3 \cdot 18}{1} \cdot \left(-\frac{5}{6}x\right) - 18 \cdot 3 = \frac{6 \cdot 18}{1} \cdot \frac{1}{3}x + \frac{2 \cdot 18}{1} \cdot \frac{11}{9}$$

$$-15x - 54x = 6x + 22$$

$$-69x = 6x + 22$$

$$\quad -6x \quad \quad -6x$$

$$\frac{-75x}{-75} = \frac{22}{-75}$$

$$\boxed{x = \frac{-22}{75}}$$

How do you solve equations?

Varies

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## Section 2.2: Solving Equations Practice Problems

1. Is -3 a solution of:  $-x - 5 = 2x - 2$ ?

$$\begin{aligned} -(-3) - 5 &= 2(-3) - 2 \\ 3 - 5 &= -6 - 2 \\ -2 &= -8 \end{aligned}$$

NO

2. Is -2 a solution of:  $-x^2 + 10 = -3|x| + 12$ ?

$$\begin{aligned} -(-2)^2 + 10 &= -3|-2| + 12 \\ -4 + 10 &= -3(2) + 12 \\ 6 &= 6 \end{aligned}$$

YES

Solve for the variable. Check your work.

3.  $-7 + x = -7$

$$\begin{array}{r} -7 + x = -7 \\ +7 \quad +7 \\ \hline x = 0 \end{array}$$

X = 0

$$\begin{aligned} \checkmark -7 + 0 &= -7 \\ -7 &= -7 \end{aligned}$$

4.  $b + (-3) = 8$

$$\begin{array}{r} b + (-3) = 8 \\ +3 \quad +3 \\ \hline b = 11 \end{array}$$

b = 11

$$\begin{aligned} \checkmark 11 + (-3) &= 8 \\ 8 &= 8 \end{aligned}$$

5.  $-y + 3 = -15$

$$\begin{array}{r} -y + 3 = -15 \\ -3 \quad -3 \\ \hline -y = -18 \\ \frac{-y}{-1} = \frac{-18}{-1} \end{array}$$

y = 18

$$\begin{aligned} \checkmark -18 + 3 &= -15 \\ -15 &= -15 \end{aligned}$$

6.  $-5 + \frac{a}{4} = 11$

$$\begin{array}{r} -5 + \frac{a}{4} = 11 \\ +5 \quad +5 \\ \hline \frac{a}{4} = 16 \end{array}$$

a = 64

$$4 \cdot \frac{a}{4} = 16 \cdot 4$$

a = 64

$$\begin{aligned} \checkmark -5 + \frac{64}{4} &= 11 \\ -5 + 16 &= 11 \\ 11 &= 11 \end{aligned}$$

7.  $2w + 3 = 10$

$$\begin{array}{r} 2w + 3 = 10 \\ -3 \quad -3 \\ \hline 2w = 7 \\ \frac{2w}{2} = \frac{7}{2} \end{array}$$

w = 3.5

$$\begin{aligned} \checkmark 2(3.5) + 3 &= 10 \\ 7 + 3 &= 10 \\ 10 &= 10 \end{aligned}$$

w = 3.5

8.  $3 - 6r = 15$

$$\begin{array}{r} 3 - 6r = 15 \\ -3 \quad -3 \\ \hline -6r = 12 \\ \frac{-6r}{-6} = \frac{12}{-6} \end{array}$$

r = -2

r = -2

$$\begin{aligned} \checkmark 3 - 6(-2) &= 15 \\ 3 + 12 &= 15 \\ 15 &= 15 \end{aligned}$$

9.  $\frac{2}{5}x - 4 = 8$

$$\begin{array}{r} \frac{2}{5}x - 4 = 8 \\ +4 \quad +4 \\ \hline \frac{2}{5}x = 12 \end{array}$$

$\frac{2}{5}x = 12$

$$\frac{5}{2} \cdot \frac{2}{5}x = \frac{12 \cdot 5}{1 \cdot 2}$$

x = 30

$$\begin{aligned} \checkmark \frac{2}{5}(30) - 4 &= 8 \\ 12 - 4 &= 8 \\ 8 &= 8 \end{aligned}$$

X = 30

10.  $-2 - \frac{3}{4}f = -14$

$$\begin{array}{r} -2 - \frac{3}{4}f = -14 \\ +2 \quad +2 \\ \hline -\frac{3}{4}f = -12 \end{array}$$

$-\frac{3}{4}f = -12$

$$\frac{-4}{3} \cdot -\frac{3}{4}f = \frac{-12 \cdot -4}{1 \cdot 3}$$

f = 16

f = 16

$$\checkmark -2 - \frac{3}{4}(16) = -14$$

$$\begin{aligned} -2 - 12 &= -14 \\ -14 &= -14 \end{aligned}$$

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## Section 2.2: Solving Equations Practice Problems Continue

11.  $2(3k-4)=22$

$k=5$

$2(3k-4)=22$

$6k-8=22$

$\frac{+8}{6k} = \frac{+8}{6}$   
 $\frac{+8}{6k} = \frac{+8}{6}$

$k=5$

$\checkmark 2(3(5)-4)=22$

$2(15-4)=22$

$2(11)=22$   
 $22=22$

13.  $3x+4=2x-5$

$x=-9$

$3x+4=2x-5$   
 $\frac{-2x}{-2x}$

$x+4=-5$   
 $\frac{-4}{-4}$

$x=-9$

$\checkmark 3(-9)+4=2(-9)-5$

$-27+4=-18-5$

$-23=-23$

15.  $\frac{2}{5}x-4=8$

$x=30$

$\frac{2}{5}x-4=8$   
 $\frac{+4}{+4}$

$\checkmark \frac{2}{5}(30)-4=8$

$12-4=8$

$8=8$

$\frac{5}{2} \cdot \frac{2}{5}x = 12 \cdot \frac{5}{2}$

$x = \frac{60}{2} = 30$

17.  $3x+4=2x-5$

$x=-9$

$3x+4=2x-5$   
 $\frac{-2x}{-2x}$

$x+4=-5$   
 $\frac{-4}{-4}$

$x=-9$

$\checkmark 3(-9)+4=2(-9)-5$

$-27+4=-18-5$

$-23=-23$

18

19.  $-\frac{2}{9} = \frac{5}{6}x - \frac{1}{3}$

$x = \frac{2}{15}$

$\frac{18}{1} \cdot -\frac{2}{9} = \frac{18}{1} \cdot \frac{5}{6}x - \frac{18}{1} \cdot \frac{1}{3}$

$-4 = 15x - 6$   
 $\frac{+6}{+6}$

$\frac{2}{15} = \frac{15x}{15}$

$x = \frac{2}{15}$

12.  $-(x-8)+3x+5=17$

$x=2$

$-(x-8)+3x+5=17$

$2x+13=17$

$\frac{-13}{2x} = \frac{-13}{2}$   
 $\frac{-13}{2x} = \frac{-13}{2}$

$x=2$

$\checkmark -(2-8)+3(2)+5=17$

$-(-6)+6+5=17$

$6+6+5=17$

$17=17$

14.  $2(3r+4)=5(-2r-8)$

$r=-3$

$6r+8=-10r-40$

$\frac{+10r}{+10r}$   
 $16r+8=-40$

$\frac{-8}{16r} = \frac{-48}{16}$   
 $\frac{-8}{16r} = \frac{-48}{16}$

$r=-3$

$\checkmark 2(3(-3)+4)=5(-2(-3)-8)$

$2(-5)=5(-2)$

$-10=-10$

16.  $-2-\frac{3}{4}f=-14$

$f=16$

$-2-\frac{3}{4}f=-14$

$\frac{+2}{+2}$   
 $-\frac{3}{4}f=-12$

$\frac{4}{3} \cdot -\frac{3}{4}f = -12 \cdot \frac{4}{3}$

$f=16$

$\checkmark -2-\frac{3}{4}(\frac{16}{1})=-14$

$-2-12=-14$

$-14=-14$

18.  $2(3r+1)+6=5(-2r-8)$

$r=-3$

$6r+2+6=-10r-40$

$6r+8=-10r-40$

$\frac{+10r}{+10r}$   
 $16r+8=-40$

$\frac{-8}{16r} = \frac{-48}{16}$

$\frac{-8}{16r} = \frac{-48}{16}$   
 $r=-3$

$\checkmark 2(3(-3)+1)+6$

$2(-8)+6=$

$-16+6=-10$

$\checkmark 5(-2(-3)-8)$

$5(6-8)=$

$5(-2)=-10$

12

20.  $\frac{1}{2}b + \frac{13}{3} = -\frac{3}{4}b + 2b$

$b = 5\frac{7}{9}$

$\frac{12}{1} \cdot \frac{1}{2}b + \frac{12}{1} \cdot \frac{13}{3} = \frac{12}{1} \cdot -\frac{3}{4}b + 12(2b)$

$6b + 52 = -9b + 24b$

-50-

$6b + 52 = 15b$

$\frac{-6b}{-6b}$

$\frac{52}{9} = \frac{9b}{9}$

$b = \frac{52}{9} = 5\frac{7}{9}$



## 2.3: Proportions

*What are proportions and how do you solve them?*

**Example:**

Write a proportion that solves the problem:

A man can eat 5 hamburgers in 2.5 minutes.  
How many hamburgers can the man eat in 10 minutes?

a. Set up the proportion:

b. Solve the proportion:

$$\begin{array}{l} \text{Hamburger} \\ \text{Min.} \end{array} \quad \frac{5}{2.5} = \frac{x}{10}$$

**Solution:**

a. Set up the proportion:

$$\frac{\text{hamburgers}}{\text{minute}} : \quad \frac{5}{2.5} = \frac{x}{10}$$

b. Solve the proportion:

$$\frac{5}{2.5} = \frac{x}{10}$$

$$2.5x = 5(10)$$

$$2.5x = 50$$

$$\div 2.5 \quad \div 2.5$$

$$x = 20$$

$$2.5x = 5(10)$$

$$\frac{2.5x}{2.5} = \frac{50}{2.5}$$

$$\boxed{x = 20}$$

In 10 minutes the man can eat 20 hamburgers.

**Practice Example:**

Write a proportion that solves the problem:

A motorcycle can travel 600 miles on 20 gallons of gasoline.  
How many gallons of gas are needed to travel 100 miles?

a. Set up the proportion:

$$\frac{\text{miles}}{\text{gallons}} \quad \frac{600}{20} = \frac{100}{x}$$

b. Solve the proportion:

$$\begin{aligned} 600x &= 20(100) \\ 600x &= \frac{2000}{600} \end{aligned} \quad \begin{array}{r} 600 \overline{) 2000} \\ \underline{1800} \phantom{0} \\ 200.0 \end{array}$$
$$x = 3.\overline{3}$$

Write a proportion that solves the problem:

Jim can type 120 words in 3 minutes.  
How many minutes would it take Jim to type 500 words?

a. Set up the proportion:

$$\frac{\text{words}}{\text{min.}} \quad \frac{120}{3} = \frac{500}{x}$$

b. Solve the proportion:

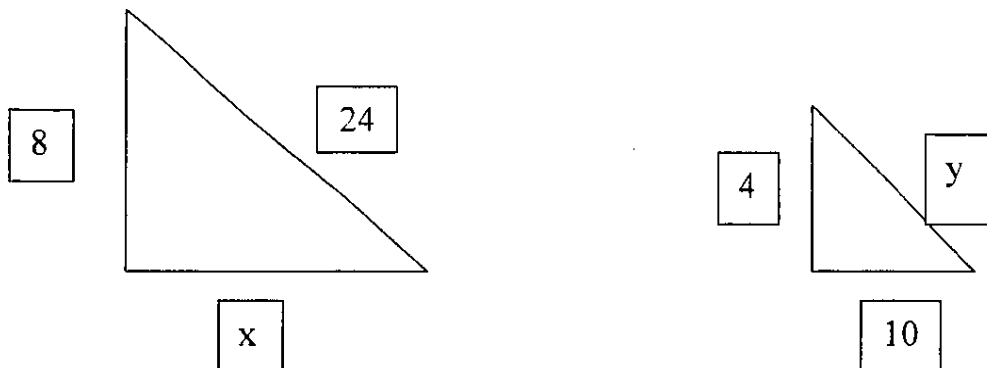
$$\begin{aligned} 120x &= 3(500) \\ 120x &= \frac{1500}{120} \end{aligned}$$
$$x = 120 \overline{) 1500}$$
$$\begin{array}{r} \phantom{x = } 120 \overline{) 1500} \\ \underline{120} \phantom{0} \\ \phantom{x = } 300 \phantom{0} \\ \underline{240} \phantom{0} \\ \phantom{x = } 600 \phantom{0} \end{array}$$

12.5

12.5  
minutes

# Proportions

**Proportion-** is a mathematical statement that two equal ratios



**Example:**

Solve for x using proportions

**Solution:**

$$\frac{\text{Large Triangle}}{\text{Small Triangle}} \quad \frac{8}{4} = \frac{x}{10}$$

Big  $\frac{8}{4} = \frac{x}{10}$   
Little

Solve proportion by multiplying the diagonals.

$$4x = 8(10)$$

$$4x = 80$$

$$\div 4 \quad \div 4$$

$$x = 20$$

$$\frac{4x}{4} = \frac{80}{4}$$

$$\boxed{x = 20}$$

$$\frac{\text{Large Triangle}}{\text{Small Triangle}} \quad \frac{8}{4} = \frac{20}{10}$$

Solve for y:

Big  $\frac{8}{4} = \frac{24}{y}$   
Little

$$8y = 24(4)$$

$$\frac{8y}{8} = \frac{96}{8}$$

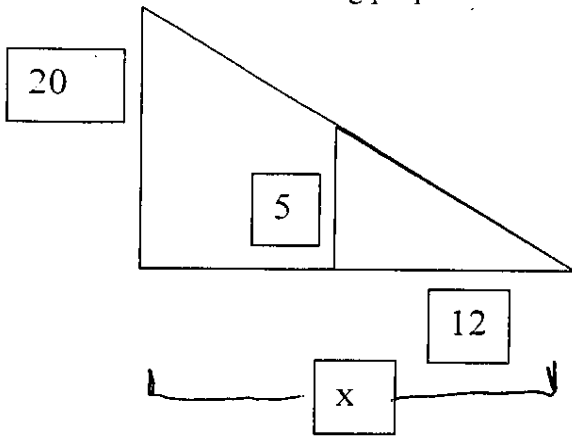
$$\begin{array}{r} 12 \\ 8 \overline{)96} \\ \underline{-8} \phantom{0} \\ 16 \\ \underline{-16} \\ 0 \end{array}$$

$$\boxed{y = 12}$$



**Practice Examples:**

Solve for x using proportions



$$\frac{B}{L} \quad \frac{20}{5} = \frac{x}{12}$$

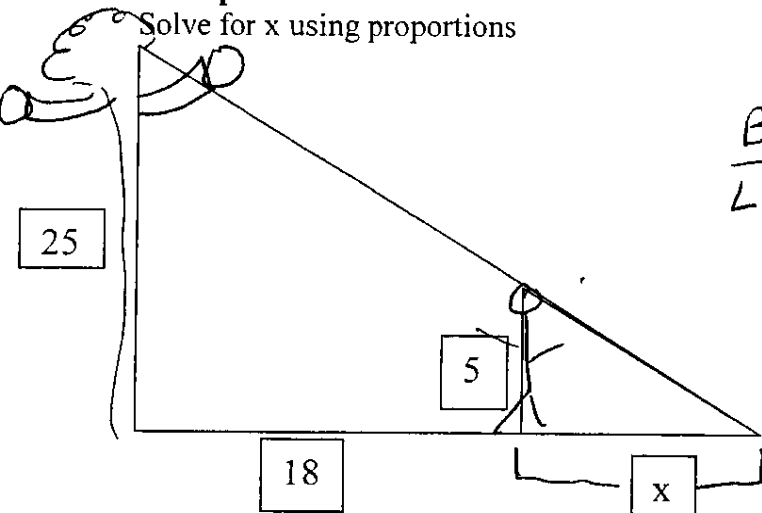
$$5x = 12(20)$$

$$\frac{5x}{5} = \frac{240}{5}$$

$$x = 48$$

**Example:**

Solve for x using proportions



$$\frac{B}{L} \quad \frac{25}{5} = \frac{18+x}{x}$$

$$25x = 5(18+x)$$

$$25x = 90 + 5x$$

$$\begin{array}{r} -5x \\ \hline \end{array}$$

$$\frac{20x}{20} = \frac{90}{20} \quad x = 4.5$$

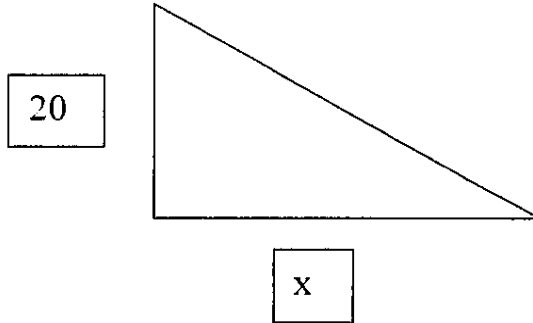
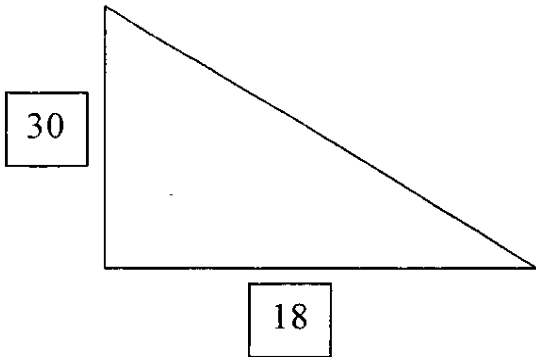
A 25 foot streetlight casts light pass a 5 foot tall person, causing a shadow. The person is standing at the base of the streetlight. How long is the shadow?

*What are proportions and how do you solve them?*

*Varies*

## 2.3: Proportions Practice Problems

1. Solve for x using proportions



$$\frac{30}{18} = \frac{20}{x}$$

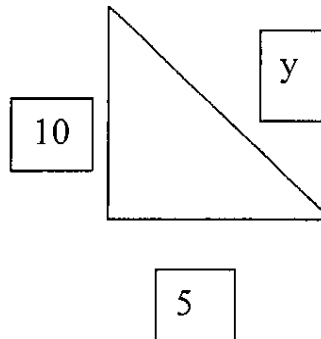
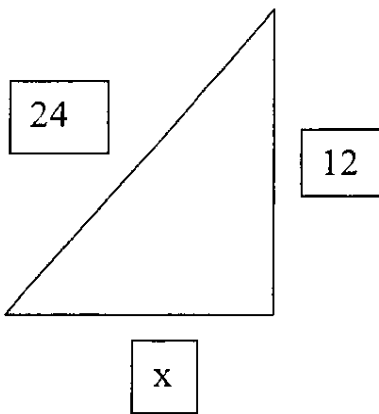
$$30x = 20(18)$$

$$30x = 360$$

$$\frac{30x}{30} = \frac{360}{30}$$

$$x = 12$$

2. Solve for x and y using proportions



Solve for x

$$\frac{12}{10} = \frac{x}{5}$$

$$10x = 12(5)$$

$$\frac{10x}{10} = \frac{60}{10}$$

$$x = 6$$

Solve for y

$$\frac{12}{10} = \frac{24}{y}$$

$$12y = 24(10)$$

$$12y = 240$$

$$\frac{12y}{12} = \frac{240}{12}$$

$$y = 20$$

## 2.3: Proportions Practice Problems Continue

3. Set up a proportion of the following situation (Do not solve the proportion):  
Jim can paint a room in 3 hours. How long would it take Jim to paint 5 rooms?

$$\frac{\text{Room}}{\text{Hours}} \quad \frac{1}{3} = \frac{5}{x}$$

Circle which of the following proportions are the same as your proportion?

$$\frac{1}{3} = \frac{5}{x}$$

$$\frac{1}{3} = \frac{x}{5}$$

$$\frac{x}{5} = \frac{3}{1}$$

$$\frac{x}{5} = \frac{3}{1}$$

$$\frac{3}{1} = \frac{5}{x}$$

$$\frac{5}{1} = \frac{x}{3}$$

4. Set up and solve the following proportion:

A car can travel 500 miles on 25 gallons of gas.

How many miles can the car travel on 10 gallons of gas?

$$\begin{array}{l} \text{miles} \\ \text{gallons} \end{array} \quad \frac{500}{25} = \frac{x}{10}$$

$$25x = 500(10)$$

$$\frac{25x}{25} = \frac{5000}{25}$$

$$\boxed{x = 200}$$

200 miles

5. Set up and solve the following proportion:

If 5 pounds of candy cost \$6, how much does 7 pounds of candy cost?

$$\frac{\text{pounds}}{\text{dollars}} \quad \frac{5}{\$6} = \frac{7}{x}$$

$$5x = 7(6)$$

$$\frac{5x}{5} = \frac{42}{5}$$

$$\boxed{x = 8.4}$$

$$\boxed{\$8.40}$$



## 2.4 Formulas

*Why do we need to solve for variables in Formulas?*

**Formulas used in the real world:**

Retail price = cost + markup

$$r = c + m$$

Interest = (Principle)(Rate)(Time)

$$I = PRT$$

Perimeter of rectangle = 2 (Length) + 2 (Width)

$$P = 2L + 2W$$

Volume of Cylinder =  $\pi$  (Radius)<sup>2</sup> (Height)

$$V = \pi \cdot r^2 \cdot h$$

**Example:**

Find the perimeter of a rectangle given the length is 12 feet and the width is 10 feet.

$$P = 2L + 2W$$

$$P = 2(12) + 2(10)$$

$$P = 24 + 20$$

$$P = 44 \text{ feet}$$

**Example:**

Find the length of a rectangle given the perimeter is 100 feet and the width is 15 feet.

$$P = 2W + 2L$$

$$100 = 2(15) + 2L$$

$$100 = 30 + 2L$$

$$\begin{array}{r} -30 \\ -30 \end{array}$$

$$\frac{70}{2} = \frac{2L}{2}$$

$$L = 35 \text{ ft}$$

$$P = 2W + 2L$$

$$\begin{array}{r} -2W \\ -2W \end{array}$$

$$\frac{P-2W}{2} = \frac{2L}{2}$$

$$L = \frac{P-2W}{2} = \frac{100-2(15)}{2}$$

-57-

$$\frac{100-30}{2} = \frac{70}{2} = 35$$

**Solving Formulas for specific variable:**

**Solve for m:**

$$r = c + m$$
$$\underline{-c \quad -c}$$

$$\boxed{m = r - c}$$

**Solve for R:**

$$\frac{I}{P T} = \frac{P R T}{P T}$$

$$\boxed{R = \frac{I}{P T}}$$

**Solve for h:**

$$\frac{V}{\pi r^2} = \frac{\pi \cdot r^2 \cdot h}{\pi r^2}$$

$$\boxed{h = \frac{V}{\pi r^2}}$$

**Solving equation for specific variable:**

**Example:** Solve for z:  $x = -5u - 4z$

**Solution:**

Step 1: Get z on one side:

$$\begin{aligned} x &= -5u - 4z \\ +5u & \quad +5u \\ \hline x + 5u &= -4z \end{aligned}$$

Solve for z

$$\begin{aligned} X &= -5u - 4z \\ +5u & \quad +5u \\ \hline \end{aligned}$$

Step 2: Get z alone:

$$\frac{x + 5u}{-4} = \frac{-4z}{-4}$$

$$\frac{x+5u}{-4} = \frac{-4z}{-4}$$

$$\frac{x + 5u}{-4} = z$$

$$z = \frac{x+5u}{-4}$$

Step 3: Divide both terms by -4

$$-\frac{x}{4} - \frac{5u}{4} = z$$

$$z = -\frac{1}{4}x - \frac{5}{4}u$$

Step 4: Pull the fraction in front:

$$z = -\frac{1}{4}x - \frac{5}{4}u$$

**Practice Examples:**

Solve for x:  $w = 2x + 4z$

$$\begin{aligned} w &= 2x + 4z \\ -4z & \quad -4z \\ \hline w - 4z &= 2x \\ \frac{w - 4z}{2} &= \frac{2x}{2} \end{aligned}$$

$$x = \frac{w - 4z}{2} = \frac{1}{2}w - 2z$$

Solve for b:  $6a = -3b + 4c$

$$\begin{aligned} 6a &= -3b + 4c \\ -4c & \quad -4c \\ \hline 6a - 4c &= -3b \\ \frac{6a - 4c}{-3} &= \frac{-3b}{-3} \end{aligned}$$

$$b = \frac{6a - 4c}{-3} = -2a + \frac{4}{3}c$$

**Why do we need to solve for variables in Formulas?**

Varies

## Section 2.4: Formulas Practice Problems

1. The formula for the volume of a rectangle is: Volume = Length(Width) (Height) or  $V = lwh$ , Find the height given the Volume of a rectangle is  $300 \text{ ft}^3$ , the length is 12 feet, and the width is 5 feet.

$$V = L(W)(H)$$

$$300 = (12)(5) H$$

$$\frac{300}{60} = \frac{60 H}{60}$$

$$\boxed{H = 5 \text{ ft}}$$

2. The formula for the surface area of a rectangular solid is: Surface Area = 2(length)(width) + 2(length)(height) + 2(width)(height) or  $SA = 2lw + 2lh + 2wh$  Find the width given the Surface Area of a rectangle solid is  $164 \text{ m}^2$ , the length is 4 meters, and the height is 3 feet.

$$SA = 2lw + 2lh + 2wh$$

$$164 = 2(4)w + 2(4)(3) + 2w(3)$$

$$164 = 8w + 24 + 6w$$

$$164 = 14w + 24$$

$$\frac{-24}{140} = \frac{14w}{14} \quad \frac{-24}{14}$$

$$\boxed{w = 10 \text{ meters}}$$

3. The formula to find distance given rate and time is: Distance = rate(time) or  $D = rt$  Solve for "r"

$$\frac{D}{t} = \frac{r \cdot t}{t}$$

$$\boxed{r = \frac{D}{t}}$$

4. The area of a trapezoid is: Area =  $\frac{1}{2}$  (Height)(Base 1 + Base 2) or  $A = \frac{1}{2} h (b_1 + b_2)$  Solve for "b1"

$$2 \cdot A = \frac{1}{2} h (b_1 + b_2) \cdot \frac{2}{1}$$

$$\frac{2A}{h} = \frac{h(b_1 + b_2)}{h}$$

$$\frac{2A}{h} = b_1 + b_2$$

$$\frac{-b_2}{-b_2} = \frac{-b_2}{-b_2}$$

$$\boxed{b_1 = \frac{2A}{h} - b_2}$$

- 60 -

## Section 2.4: Formulas Practice Problems Continue

5. Solve for x:  $3d = x - 2w$

$$\begin{array}{r} 3d = x - 2w \\ +2w \quad +2w \end{array}$$

$$\boxed{x = 3d + 2w}$$

6. Solve for w:  $\frac{3a}{-3z} = \frac{-3wz}{-3z}$

$$\frac{3a}{-3z} = w$$

$$\boxed{w = -\frac{a}{z}}$$

7. Solve for b:  $p = 3b + 4v$

$$\begin{array}{r} p = 3b + 4v \\ -4v \quad -4v \end{array}$$

$$\frac{p-4v}{3} = \frac{3b}{3}$$

$$\boxed{b = \frac{p-4v}{3} \text{ or } \frac{1}{3}p - \frac{4}{3}v}$$

8. Solve for y:  $2x = -h - 5y$

$$\begin{array}{r} 2x = -h - 5y \\ +h \quad +h \end{array}$$

$$\frac{2x+h}{-5} = \frac{-5y}{-5}$$

$$\boxed{y = \frac{2x+h}{-5} \text{ or } -\frac{2}{5}x - \frac{1}{5}h}$$

9. Solve for x:  $8y = 8x + 4z$

$$\begin{array}{r} 8y = 8x + 4z \\ -4z \quad -4z \end{array}$$

$$\frac{8y-4z}{8} = \frac{8x}{8}$$

$$x = \frac{8y-4z}{8} = \frac{8}{8}y - \frac{4}{8}z$$

$$\boxed{x = y - \frac{1}{2}z}$$

10. Solve for z:  $7x = 2y + 10z$

$$\begin{array}{r} 7x = 2y + 10z \\ -2y \quad -2y \end{array}$$

$$\frac{7x-2y}{10} = \frac{10z}{10}$$

$$\boxed{z = \frac{7x-2y}{10} \text{ or } \frac{7}{10}x - \frac{2}{10}y}$$

$$\boxed{z = \frac{7}{10}x - \frac{1}{5}y}$$





## 2.5 Solving Inequalities

*What is different when you solve for inequalities?*

### Inequality Symbols

- < is less than
- > is greater than
- $\leq$  is less than or equal to
- $\geq$  is greater than or equal to

### Notation when using a line graph

- is used for less than or greater than
- is used for less than or equal to or greater than or equal to

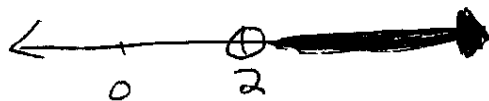
### Notation when using interval notation

- ( ) is used for less than or greater than
- [ ] is used for less than or equal to or greater than or equal to

### Example:

**Graph**  $x > 2$

Use line graph:



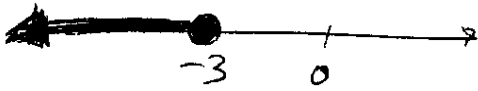
Use interval notation

$(2, \infty)$

**Example:**

**Graph**  $x \leq -3$

Use line graph:



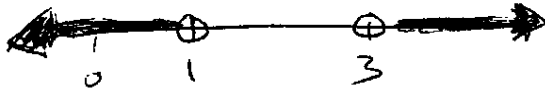
Use interval notation

$$(-\infty, -3]$$

**Example:**

**Graph**  $x > 3$  or  $x < 1$  or it can be written  $1 > x > 3$

Use line graph:



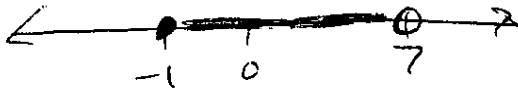
Use interval notation

$$(-\infty, 1) \cup (3, \infty)$$

**Example:**

**Graph**  $-1 \leq x < 7$        $x \geq -1$

Use line graph:



Use interval notation

$$[-1, 7)$$

## Solving Inequalities

**Example:** Is 10 a solution to  $2x - 5 \geq 7$ ?

$$\begin{aligned} 2(10) - 5 &\geq 7 \\ 20 - 5 & \\ 15 &\geq 7 \end{aligned}$$

Yes

If you:

- 1) Multiply or Divide
- 2) Both sides
- 3) By a negative

Then the Inequality flips

**Example:** Solve for x:  $2x - 5 > 7$

**Solution:** Solve for x:

$$\begin{aligned} 2x - 5 &> 7 \\ +5 &+5 \\ 2x &> 12 \\ \div 2 &\div 2 \\ x &> 6 \end{aligned}$$

$$\begin{aligned} 2x - 5 &> 7 \\ +5 &+5 \\ \hline 2x &> 12 \end{aligned}$$

$$\frac{2x}{2} > \frac{12}{2}$$

$$\boxed{x > 6}$$

**Example:** Solve for x:  $-3x + 2 < 23$

**Solution:** Solve for x:

~~$$\begin{aligned} -3x + 2 &< 23 \\ -2 &-2 \\ -3x &< 21 \\ \div -3 &\div -3 \\ x &< -7 \end{aligned}$$~~

$$\begin{aligned} -3x + 2 &< 23 \\ -2 &-2 \\ \hline -3x &< 21 \end{aligned}$$

$$\begin{aligned} -3x &< 21 \\ \div -3 &\div -3 \end{aligned}$$

$$x > -7$$

**Practice Examples:**

Solve for x:  $10 - 2x > 15$

$$\begin{array}{r} -10 \\ \hline \end{array} \quad \begin{array}{r} -10 \\ \hline \end{array}$$

$$\begin{array}{r} -2x > 5 \\ \hline -2 \quad -2 \end{array}$$

$$\boxed{x < -2.5}$$

Solve for y:  $6x - 8 \leq 8x + 10$

$$\begin{array}{r} -8x \\ \hline \end{array} \quad \begin{array}{r} -8x \\ \hline \end{array}$$

$$\begin{array}{r} -2x - 8 \leq 10 \\ \hline +8 \quad +8 \end{array}$$

$$\begin{array}{r} -2x \leq 18 \\ \hline -2 \quad -2 \end{array}$$

$$\boxed{x \geq -9}$$

Solve for y:  $8(\widehat{y+1}) \geq 2(\widehat{y-4}) + y$

$$8y + 8 \geq 2y - 8 + y$$

$$8y + 8 \geq 3y - 8$$

$$\begin{array}{r} -3y \\ \hline \end{array} \quad \begin{array}{r} -3y \\ \hline \end{array}$$

$$\begin{array}{r} 5y + 8 \geq -8 \\ \hline -8 \quad -8 \end{array}$$

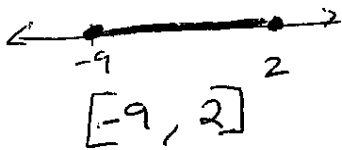
$$\begin{array}{r} 5y \geq -16 \\ \hline \end{array}$$

$$y \geq \frac{-16}{5} = -3\frac{1}{5}$$

## Compound Inequality

Solve for x:  $-5 \leq x + 4 \leq 6$   
 $-4 \quad -4 \quad -4$

$$-9 \leq x \leq 2$$



Solve for x:  $-12 < 2x - 6 < 16$

$$\begin{array}{ccc} +6 & +6 & +6 \\ \hline \end{array}$$

$$-6 < \frac{2x}{2} < \frac{22}{2}$$

$$\boxed{-3 < x < 11}$$

Solve for x:  $-11 \leq 3(7-x) < 8$

$$\begin{array}{ccc} -11 \leq 21 - 3x < 8 \\ \underline{-21} \quad \underline{-21} \quad \underline{-21} \\ -32 \leq -3x < -13 \\ \underline{-3} \quad \underline{-3} \quad \underline{-3} \end{array}$$

$$\boxed{\frac{32}{3} > x \geq \frac{13}{3}}$$

*What is different when you solve for inequalities?*

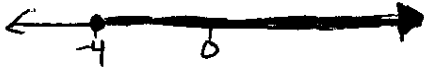
Varies

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## Section 2.5: Solving Inequalities Practice Problems

1. Graph  $x \geq -4$

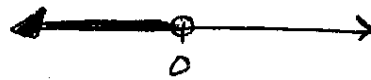
Use line graph:



Use interval notation  $[-4, \infty)$

2. Graph  $x < 0$

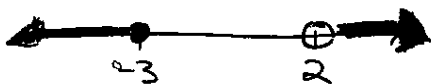
Use line graph:



Use interval notation  $(-\infty, 0)$

3. Graph  $-3 \geq x > 2$   $x \leq -3$

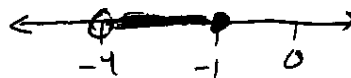
Use line graph:



Use interval notation  $(-\infty, -3] \cup (2, \infty)$

4. Graph  $-4 < x \leq -1$

Use line graph:



Use interval notation  $(-4, -1]$

### Practice Examples:

5. Solve for x:  $3x - 4 > 11$

$$3x - 4 > 11$$

$$\begin{array}{r} +4 \\ +4 \end{array}$$

$$\frac{3x}{3} > \frac{15}{3}$$

$$\boxed{x > 5}$$

6. Solve for y:  $12 - y \geq 11$

$$12 - y \geq 11$$

$$\begin{array}{r} -12 \\ -12 \end{array}$$

$$\frac{-y}{-1} \geq \frac{-1}{-1}$$

$$\boxed{y \leq 1}$$

7. Solve for x:  $2x - 5 \geq 4x + 8$

$$2x - 5 \geq 4x + 8$$

$$\begin{array}{r} -4x \\ -4x \end{array}$$

$$-2x - 5 \geq 8$$

$$\begin{array}{r} +5 \\ +5 \end{array}$$

$$\frac{-2x}{-2} \geq \frac{13}{-2}$$

$$\boxed{x \leq -\frac{13}{2}}$$

8. Solve for w:  $-2(3w - 4) + 5 < 4(-w + 7)$

$$-6w + 8 + 5 < -4w + 28$$

$$-6w + 13 < -4w + 28$$

$$\begin{array}{r} +4w \\ +4w \end{array}$$

$$-2w + 13 < 28$$

$$\begin{array}{r} -13 \\ -13 \end{array}$$

$$\frac{-2w}{-2} < \frac{15}{-2}$$

$$\boxed{w > -\frac{15}{2}}$$

## Section 2.5: Solving Inequalities Practice Problems Continue

9. Solve for z:  $-5 \leq z+5 \leq 12$

$$\begin{array}{r} -5 \leq z+5 \leq 12 \\ \underline{-5} \quad \underline{-5} \quad \underline{-5} \end{array}$$

$$\boxed{-10 \leq z \leq 7}$$

10. Solve for x:  $-11 < 3-4x < 19$

$$\begin{array}{r} -11 < 3-4x < 19 \\ \underline{-3} \quad \underline{-3} \quad \underline{-3} \end{array}$$

$$\begin{array}{r} -14 < -4x < 16 \\ \underline{-4} \quad \underline{-4} \quad \underline{-4} \end{array}$$

$$\boxed{\begin{array}{l} \frac{7}{2} > x > -4 \\ \text{or} \\ -4 < x < \frac{7}{2} \end{array}}$$

11. Solve for y:  $-3 \leq -2(1-3y) < 10$

$$-3 \leq -2(1-3y) < 10$$

$$-3 \leq -2+6y < 10$$

$$\begin{array}{r} \underline{+2} \quad \underline{+2} \quad \underline{+2} \end{array}$$

$$\begin{array}{r} -1 \leq 6y < 12 \\ \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \end{array}$$

$$\boxed{-\frac{1}{6} \leq y < 2}$$

12. Solve for b:  $-2 \leq 6(3-b)+4b < 25$

$$-2 \leq 6(3-b)+4b < 25$$

$$-2 \leq 18-6b+4b < 25$$

$$\begin{array}{r} -2 \leq -2b+18 < 25 \\ \underline{-18} \quad \underline{-18} \quad \underline{-18} \end{array}$$

$$\begin{array}{r} -20 \leq -2b < 7 \\ \underline{-2} \quad \underline{-2} \quad \underline{-2} \end{array}$$

$$\boxed{\begin{array}{l} 10 \geq b > -\frac{7}{2} \\ \text{or} \\ -\frac{7}{2} \leq b < 10 \end{array}}$$



## 2.6 Problem Solving

*How do you solve word problems?*

### Problem Solving Strategy

1. Analyze the problem
2. Form an equation
3. Solve the equation
4. State the conclusion
5. Check the result

### Example:

A CD is priced at \$15.00, but it is on sale for 20% off. What is the sale price of the CD?

#### 1. Analyze the problem

Given: Original Price: \$15.00      Discount: 20% off      Unknown: x (sale price)

#### 2. Form an equation

$$\begin{array}{r} \text{Original Price} - \text{Discount} = \text{Sale Price} \\ 15 \qquad - 0.20(15) = x \end{array}$$

#### 3. Solve the equation

$$15 - 0.20(15) = x$$

$$15 - 3 = x$$

$$x = 12$$

#### 4. State the conclusion

The sale price of a CD that was \$15.00 discount 20% is \$12.00

#### 5. Check the result

$$\begin{array}{l} 15 - 0.20(15) = x \\ 15 - 0.20(15) = 12 \\ 15 - 3 = 12 \\ 12 = 12 \end{array}$$



## Problems Solving Lab for MAT0024C

1. A pair of jeans is priced at \$50.00, but is on sale for 25% off. What is the sale price of the pair of jeans?

- a. \$37.50
- b. \$40.00
- ~~c. \$66.66~~
- ~~d. \$12.50~~

$$\begin{array}{r} .25 \\ \times 50 \\ \hline 1250 \end{array}$$

Original - Discount = <sup>sale</sup> price

$$50 - .25(50) = x$$

$$50 - 12.50 = x$$

$$\begin{array}{r} 50.00 \\ -12.50 \\ \hline 37.50 \end{array}$$

$x = 37.50$

2. If a television costs \$311 after a 35% discount, what was the original cost?

- ~~a. \$276.00~~
- b. \$419.85
- ~~c. \$888.57~~
- d. \$478.46

$$\begin{array}{r} 100\% \\ -35\% \\ \hline 65\% \end{array}$$

Original - Discount = <sup>New</sup> price

$$1x - .35x = 311$$

$$\frac{.65x}{.65} = \frac{311}{.65}$$

$$x =$$

$$\begin{array}{r} 65 \overline{) 31100} \\ \underline{260} \phantom{00} \\ 5100 \\ \underline{47846} \\ 280 \end{array}$$

3. If a DVD player costs \$306 after a 30% increase in price, what was the original cost?

- ~~a. \$91.80~~
- b. \$214.20
- ~~c. \$437.14~~
- d. \$235.39

$$\begin{array}{r} 100\% \\ +30\% \\ \hline 130\% \end{array}$$

Original + Increase = <sup>New</sup> price

$$1x + .30x = 306$$

$$\frac{1.30x}{1.30} = \frac{306}{1.30}$$

$$x =$$

$$\begin{array}{r} 1.30 \overline{) 30600} \\ \underline{23539} \\ 70610 \\ \underline{130000} \\ 46000 \end{array}$$

4. Find the amount of money now necessary to be invested at 5% simple interest to yield \$200 interest in 8 years.

- a. \$125.00
- b. \$500.00
- c. \$320.00
- d. \$2500.00

$$I = P \cdot r \cdot t$$

$$200 = P \cdot (.05)(8)$$

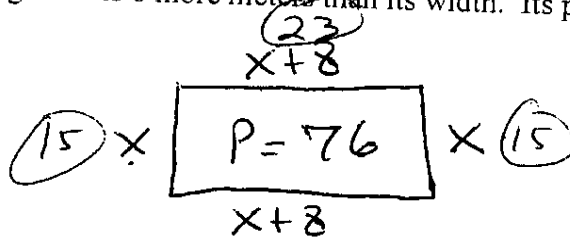
$$\frac{200}{.4} = \frac{.4P}{.4}$$

$$\begin{array}{r} .05 \\ \times 8 \\ \hline .40 \end{array}$$

$$P = \begin{array}{r} 4 \overline{) 2000} \\ \underline{500} \\ 2000 \\ \underline{2000} \\ 0 \end{array} \quad \boxed{P = 500}$$

5. The length of a rectangular garden is 8 more meters than its width. Its perimeter is 76 meters. Find the length of the garden.

- a. 23 meters
- b. 76 meters
- c. 345 meters
- d. 15 meters



$$L = x + 8 = 15 + 8 = 23$$

$$W = x = 15$$

$$x + x + 8 + x + x + 8 = 76$$

$$4x + 16 = 76$$

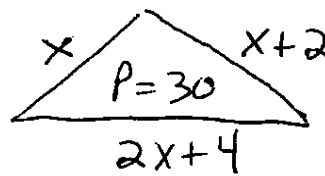
$$\begin{array}{r} 4x + 16 = 76 \\ -16 \quad -16 \\ \hline 4x = 60 \\ \frac{4}{4} \quad \frac{60}{4} \end{array}$$

$$\begin{array}{r} 4 \overline{) 60} \\ \underline{40} \phantom{0} \\ 20 \phantom{0} \\ \underline{20} \\ 0 \end{array}$$

$$\boxed{x=15}$$

6. The perimeter of a triangle is 30 inches. The length of the middle side is 2 inches more than the length of the smaller side and the largest side is 4 inches more than twice the length of the smallest side. Find the length of the smallest side.

- a. 6 inches
- b. 8 inches
- c. 4 inches
- d. 2 inches



$$S = x = 6$$

$$m = x + 2 = 6 + 2 = 8$$

$$L = 2x + 4 = 2(6) + 4 = 16$$

$$x + x + 2 + 2x + 4 = 30$$

$$4x + 6 = 30$$

$$\begin{array}{r} 4x + 6 = 30 \\ -6 \quad -6 \\ \hline 4x = 24 \\ \frac{4}{4} \quad \frac{24}{4} \end{array}$$

$$\boxed{x=6}$$

7. If 8 times a number is increased by 20, the result is 26 less than the square of the number. Choose the equation that could be used to find this number, x.

- a.  $8x + 20 = 26 - x^2$
- b.  $8x + 20 = x^2 - 26$
- c.  $28x = x^2 - 26$
- d.  $8(x + 20) = x^2 - 26$

$$8x + 20 = x^2 - 26$$

8. Identify the proportion listed below that solves the problem: A car can travel 603 miles on 11 gallons of gasoline. How far can the car travel on 36 gallons?

a.  $\frac{11}{603} = \frac{36}{x}$

c.  $\frac{603}{36} = \frac{11}{x}$

miles  $\frac{603}{11} = \frac{x}{36}$   
gallons

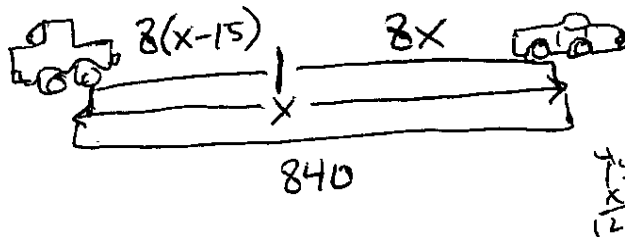
b.  $\frac{11}{603} = \frac{x}{36}$

d.  $\frac{603}{x} = \frac{36}{11}$

$11x = 603(36)$

9. Two cars start from the same point and travel in opposite directions. The rate of the slower car is 15 miles per hour less than the rate of the faster car. After 8 hours they are 840 miles apart. Find the speed of the cars.

- a. 90 mph and 75 mph
- b. 105 mph and 90 mph
- c. 60 mph and 45 mph
- d. 100 mph and 85



Car	D =	R	T
Slow	$8(x-15)$	$x-15$ <sup>60-15=45</sup>	8
Fast	$8x$	$x$ <sup>60</sup>	8
Total	840		

$$8(x-15) + 8x = 840$$

$$8x - 120 + 8x = 840$$

$$16x - 120 = 840$$

$$\begin{array}{r} +120 \quad +120 \\ 16x = 960 \\ \hline 16 \quad 60 \\ \hline x = 60 \end{array}$$

10. If a student completed this worksheet that covers word problems that are on the state competency exam to pass this class and had some difficulty. Should the student make sure that they ask questions, always go to class, take good notes, complete their homework, and seek extra help when needed?

- a. Yes
- b. Yes
- c. Yes
- d. Yes

## Answers to Word Problem Lab for MAT0024C

1. A

To find the discount you multiply the original price by the percent of the discount.

So, the discount is  $\$50.00(0.25) = \$12.50$ .

To find the sale price you subtract the original price from the discount.

So, to find the sale price you take  $50.00 - 12.50 = 37.50$ . The sale price is  $\$37.50$ .

---

2. D

Check

Original Cost - Discount = Sale Price

$$478.46 - .35(478.46) = 311$$

$$X - .35X = 311$$

$$478.46 - 167.46 = 311$$

$$1X - .35X = 311$$

$$311 = 311$$

$$\frac{.65X = 311}{.65 \quad .65}$$

$$X = 478.46$$

---

3. D

Original Cost + Increase = New Price

Check:  $235.39 + .30(235.39) = 306$

$$X + .30X = 306$$

$$235.39 + 70.61 = 306$$

$$1X + .30X = 306$$

$$306 = 306$$

$$\frac{1.30X = 306}{1.30 \quad 1.30}$$

$$X = \$235.39$$

---

**4. B**

The formula to find simple interest is: Interest = Principal x Rate x Time ( $I = P \cdot R \cdot T$ )

The information gives would lead to:  $200 = X (0.05) (8)$

Then simplify:  $200 = X(0.4)$

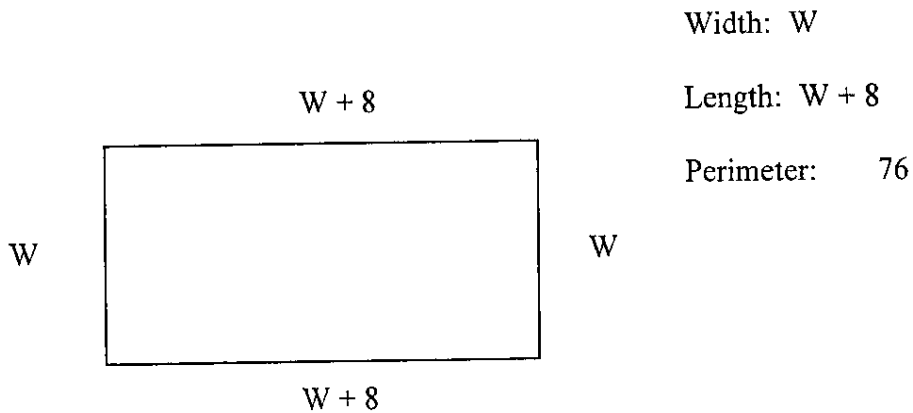
Then solve for x by dividing both sides by 0.4:  $200/0.4 = X(0.4)/0.4$

$X = \$500.00$ , the principal (amount to be invested) is \$500.00.

Check:  $200 = 500(0.05)(8)$   
 $200 = 200$

---

**5. A**



Equation:  $W + W + 8 + W + W + 8 = 76$

Width:  $W = 15$

Combine Like Terms:  $4W + 16 = 76$

Length:  $15 + 8 = 23$

$$\frac{4W}{4} = \frac{60}{4}$$

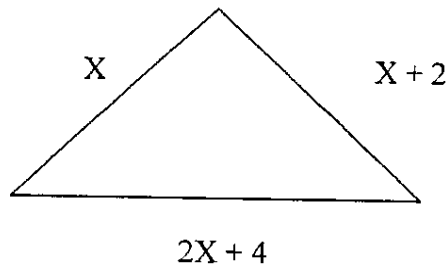
Check:  $15 + 23 + 15 + 23 = 76$   
 $76 = 76$

Solve:  $W = 15$

---

6. A

Small:  $X$   
Middle:  $X + 2$   
Large:  $2X + 4$   
Perimeter: 30



The equation will be:  $X + X + 2 + 2X + 4 = 30$

Combine like terms:  $4X + 6 = 30$

Solve:

$$\begin{array}{r} -6 \quad -6 \\ \hline 4X = 24 \\ \hline 4 \quad 4 \\ \hline X = 6 \end{array}$$

$$\begin{array}{l} \text{Check: } 6 + 6 + 2 + 2(6) + 4 = 30 \\ \quad \quad 6 + 8 + 16 = 30 \\ \quad \quad 14 + 16 = 30 \\ \quad \quad 30 = 30 \end{array}$$

Small:  $X = 6$   
Middle:  $6 + 2 = 8$   
Large:  $2(6) + 4 = 16$

---

7. B

Translate the problem to:

$$8x + 20 = x^2 - 26$$

---

8. A

$$\frac{\text{miles}}{\text{gallons}} = \frac{603}{11} = \frac{x}{36}$$

$$\text{Matches: } \frac{11}{603} = \frac{36}{x}$$

---

Note: If your proportion does not match the proportion on the test, multiply the diagonals to see which matches.

9. C

Type	D	R	T
Fast Car	8X	X	8
Slow Car	8(X - 15)	X - 15	8
Total	840		

Fill in the 4 x 4 chart with the given information.

To fill in the distance column use the formula Distance = Rate x Time

You now have the formula:

$$8X + 8(X - 15) = 840$$

Distributive Property:  $8X + 8X - 120 = 840$

Combine Like Terms:  $16X - 120 = 840$

$$\begin{array}{r} + 120 \quad + 120 \\ \text{Solve for X: } \quad \frac{16X}{16} = \frac{960}{16} \end{array}$$

$$X = 60$$

Substitute X into the chart and answer the question:

Type	D	R	T
Fast Car	8(60) = 480 miles	60 mph	8
Slow Car	8(60 - 15) = 360 miles	60 - 15 = 45 mph	8
Total	840 miles		

10. UMMMMMMMMMMMMMMMMMMMM!!!!!!! The answer is YES!!!

The competency exam is very important. To pass MAT0024C Elementary Algebra you need an 80% or better on the competency exam.

Note: Use test taking strategies like eliminating the incorrect answers first, then look at the possible choices.

*How do you solve word problems?*

*Varies*

## Section 2.6: Problem Solving Practice Problems

1. A CD is priced at \$15.00, but it is on sale for 20% off. What is the sale price of the CD?

- a. \$3.00
- b. \$10.00
- c. \$18.00
- d. \$12.00

$$\text{Original} - \text{Discount} = \text{Sale Price}$$

$$15 - .20(15) = X$$

$$15 - 3 = X$$

$$\boxed{X = 12}$$

2. If a sony play station costs \$250 after a 15% discount, what was the original cost?

- e. \$294.12
- f. \$212.50
- g. \$287.50
- h. \$399.46

$$\text{Original} - \text{Discount} = \text{Sale Price}$$

$$X - .15X = 250$$

$$\begin{array}{r} .85X = 250 \\ \hline .85 \quad .85 \end{array}$$

$$\begin{array}{r} .85 \overline{)250.00} \\ \underline{294.117} \\ 85 \overline{)25000} \end{array}$$

$$\boxed{X = 294.12}$$

3. If a palm pilot costs \$1300 after a 20% increase in price, what was the original cost?

- a. \$1625.00
- b. \$1083.33
- e. \$1560.00
- f. \$1040.00

$$\text{Original} + \text{Increase} = \text{New Price}$$

$$X + .20X = 1300$$

$$\begin{array}{r} 1.20X = 1300 \\ \hline 1.20 \quad 1.20 \end{array}$$

$$\begin{array}{r} 1.20 \overline{)1300.00} \\ \underline{1083.333} \\ 120 \overline{)130000} \end{array}$$

$$\boxed{X = 1083.33}$$

4. Find the simple interest percent if you invested \$1000.00 for 5 years and you received \$500.00 in interest.

- a. 20%
- b. 50%
- c. 10%
- d. 40%

$$I = P \cdot r \cdot t$$

$$500 = (1000) r (5)$$

$$\begin{array}{r} 500 = 5000 r \\ \hline 5000 \quad 5000 \end{array}$$

$$r = .10$$

$$r = 10\%$$



5. The width of a rectangular garden is 8 meters less than its length. Its perimeter is 76 meters. Find the length of the garden.

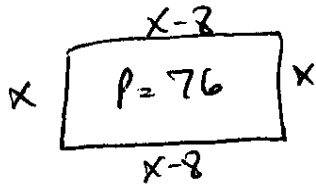
- e. 23 meters
- f. 76 meters
- g. 345 meters
- h. 15 meters

$$L = X$$

$$W = X - 8$$

$$L = \boxed{23}$$

$$W = 23 - 8 = \boxed{15}$$



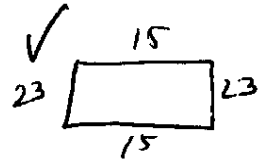
$$X + X - 8 + X + X - 8 = 76$$

$$4X - 16 = 76$$

$$\begin{array}{r} +16 \\ \hline 4X = 92 \end{array}$$

$$\frac{4X = 92}{4} = \frac{92}{4}$$

$$X = \boxed{23}$$



$$23 + 15 + 23 + 15 = 76$$

$$76 = 76$$

6. The perimeter of a triangle is 51 inches. The length of the middle side is 5 inches more than the length of the smaller side and the largest side is 4 inches less than three times the length of the smallest side. Find the length of the middle side.

- e. 10 inches
- f. 15 inches
- g. 26 inches
- h. 5 inches

$$\text{Small} = X$$

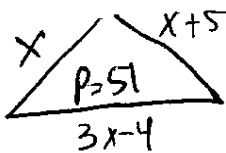
$$\text{middle} = X + 5$$

$$\text{large} = 3X - 4$$

$$S = \boxed{10}$$

$$M = 10 + 5 = \boxed{15}$$

$$L = 3(10) - 4 = 30 - 4 = \boxed{26}$$



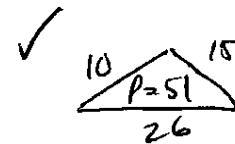
$$X + X + 5 + 3X - 4 = 51$$

$$5X + 1 = 51$$

$$\begin{array}{r} -1 \\ \hline 5X = 50 \end{array}$$

$$\frac{5X = 50}{5} = \frac{50}{5}$$

$$X = \boxed{10}$$



7. If 10 times a number is decreased by 29, the result is the product of 42 and the square of the number. Choose the equation that could be used to find this number,  $x$ .

- e.  $10x + 29 = 42/x^2$
- f.  $10x - 29 = 42x^2$
- g.  $10(29)x = x^2 - 42$
- h.  $10(x - 29) = 42x^2$

$$10x - 29 = 42x^2$$

8. Identify the proportion listed below that solves the problem: A car can travel 1200 miles on 60 gallons of gasoline. How many gallons do you need to travel 100 miles?

a.  $\frac{60}{1200} = \frac{100}{x}$

c.  $\frac{1200}{60} = \frac{1000}{x}$

b.  $\frac{60}{1200} = \frac{x}{100}$

d.  $\frac{1200}{x} = \frac{60}{100}$

$$\begin{array}{l} \text{miles} \\ \text{gallons} \end{array} \frac{1200}{60} = \frac{100}{x}$$

$$1200x = 60(100)$$

9. Two shrimp boats start from the same port at the same time, but they head in opposite directions. The slower boat travels 15 knots per hour slower than the fast boat. At the end of 12 hours, they were 600 nautical miles apart. How many nautical miles had the slow boat traveled by the end of the 12-hour period?

- a. 210 nautical miles
- b. 17.5 nautical miles
- c. 2.5 nautical miles
- d. 390 nautical miles

$$12(x-15) + 12x = 600$$

$$12x - 180 + 12x = 600$$

$$24x - 180 = 600$$

$$\begin{array}{r} +180 \quad +180 \\ \hline 24x = 780 \end{array}$$

$$\begin{array}{r} 24x = 780 \\ \hline 24 \quad 24 \\ \hline x = 32.5 \end{array}$$

$$x = 32.5$$

Distance

slow B  $12(32.5 - 15)$

$12(17.5)$

210 miles

$\downarrow$	D =	R	T
slow B	$12(x-15)$	$x-15$	12
fast B	$12x$	$x$	12
Total	600		

10. If a student had some difficulty completing this worksheet that covers word problems that are on the state competency exam, that is REQUIRED to pass this class and the student wanted to do well on the competency exam, what should the student do?

- a. Ask questions
- b. Always go to class and take good notes
- c. Complete their homework
- d. Seek extra help when needed like the instructor and the tutoring center (1-131)
- e. ALL THE ABOVE!!!!

## Answers to Section 2.6: Problem Solving Practice Problems

1. D

To find the discount you multiply the original price by the percent of the discount.

So, the discount is  $\$15.00(0.20) = \$3.00$ .

To find the sale price you subtract the original price from the discount.

So, to find the sale price you take  $15.00 - 3.00 = 12.00$ . The sale price is  $\$12.00$ .

---

2. A

Check

Original Cost - Discount = Sale Price

$$294.12 - .15(294.12) = 250$$

$$X - .15X = 250$$

$$294.12 - 44.12 = 250$$

$$1X - .15X = 250$$

$$250 = 250$$

$$\frac{.85X = 250}{.85 \quad .85}$$

$$X = 294.12$$

---

3. B

Original Cost + Increase = New Price

Check:  $1083.33 + .20(1083.33) = 1300$

$$X + .20X = 1300$$

$$1083.33 + 216.67 = 1300$$

$$1X + .20X = 1300$$

$$1300 = 1300$$

$$\frac{1.20X = 1300}{1.20 \quad 1.20}$$

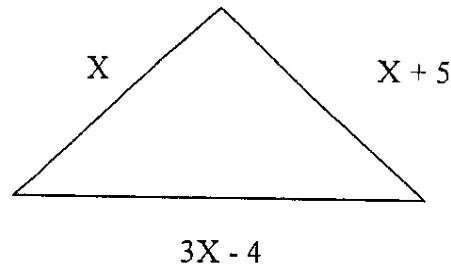
$$X = \$1083.33$$

---



6. B

Small:  $X$   
Middle:  $X + 5$   
Large:  $3X - 4$   
Perimeter: 51



The equation will be:  $X + X + 5 + 3X - 4 = 51$

Combine like terms:  $5X + 1 = 51$

Solve:

$$\begin{array}{r} -1 \quad -1 \\ \hline 5X = 50 \\ 5 \quad 5 \end{array}$$

$$X = 10$$

$$\text{Check: } 10 + 10 + 5 + 3(10) - 4 = 51$$

$$10 + 15 + 26 = 51$$

$$25 + 26 = 51$$

$$51 = 51$$

Small:  $X = 10$

**Middle:  $10 + 5 = 15$**

Large:  $3(10) - 4 = 26$

---

7. B

Translate the problem to:

$$10x - 29 = 42x^2$$

---

8. B

$$\frac{\text{gallons}}{\text{miles}} = \frac{60}{1200} = \frac{x}{100}$$

Note: If your proportion does not match the proportion on the test, multiply the diagonals to see which matches.

---

9. A

Type	D	R	T
Fast Boat	12X	X	12
Slow Boat	12(X-15)	X	12
Total	600		

Fill in the 4 x 4 chart with the given information.

To fill in the distance column use the formula Distance = Rate x Time

You now have the formula:

$$12X + 12(X - 15) = 600$$

$$\text{Distributive Property: } 12X + 12X - 180 = 600$$

$$\text{Combine Like Terms: } 24X - 180 = 600$$

$$\text{Solve for X: } \begin{array}{r} \phantom{24}X \\ \phantom{24} \\ \hline 24 \end{array} = \begin{array}{r} \phantom{24}X \\ \phantom{24} \\ \hline 24 \end{array} = \frac{780}{24}$$

$$X = 32.5$$

Substitute X into the chart and answer the question:

Type	D	R	T
Fast Boat	12(32.5) = 390 miles	32.5 knots	12
Slow Boat	12(32.5-15) = 210 miles	32.5-15 = 17.5 knots	12
Total	600 miles		

The answer from the chart is the slow boat traveled 210 miles.

---

10. UMMMMMMMMMMMMMMMMMMMM!!!!!! The answer is E!!!

The competency exam is very important.

To pass MAT0024C Elementary Algebra you need an 80% or better on the competency exam.

Note: Use test taking strategies like eliminating the incorrect answers first, then look at the possible choices.

Test 1 (Chapter 1 / 2) REVIEW

Questions from Chapter 1 and 2

1. Add:  $(-7) + 5 + (-3)$

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

2. Subtract:  $5.8 - (-2.8)$

$$\begin{array}{r} 5.8 + 2.8 \\ \hline 11.6 \end{array}$$

3. Multiply:  $(-7)(2)(-3)$

$$\begin{array}{r} \checkmark \\ -14(-3) \\ \hline 42 \end{array}$$

4. Solve:  $\frac{2}{3} + \frac{1}{4}$

$$\begin{array}{r} \frac{2}{3} = \frac{8}{12} \\ + \frac{1}{4} = \frac{3}{12} \\ \hline \frac{11}{12} \end{array}$$

5. Solve:  $4\frac{1}{2} - 2\frac{3}{16}$

$$\begin{array}{r} 4\frac{1}{2} = 4\frac{8}{16} \\ - 2\frac{3}{16} \\ \hline 2\frac{5}{16} \end{array}$$

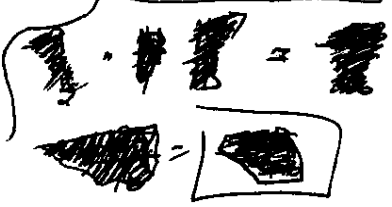
6. Solve:  $\left(3\frac{2}{7}\right)\left(1\frac{1}{13}\right)$

$$\frac{23}{7} \cdot \left(\frac{14}{3}\right) = \frac{46}{3} = 15\frac{1}{3}$$

7. Solve:  $\left(-2\frac{1}{4}\right) \div \left(1\frac{1}{13}\right)$

$$\begin{array}{l} -\frac{9}{4} \div \frac{14}{13} \\ -\frac{9}{4} \cdot \frac{13}{14} = -\frac{117}{56} \end{array}$$

$$\frac{-117}{56} \text{ or } -2\frac{5}{56}$$



8. Solve:  $40 = -8(x - 3)$

$$\begin{array}{r} 40 = -8x + 24 \\ -24 \quad -24 \\ \hline 16 = -8x \\ \div -8 \quad \div -8 \\ \hline x = -2 \end{array}$$

$$x = -2$$

9. Solve:  $\frac{3}{5}y - 4 = 2$

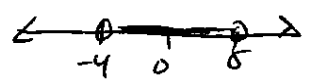
$$\begin{array}{l} \frac{3}{5}y - 4 = 2 \\ +4 \quad +4 \\ \hline \frac{3}{5}y = 6 \\ \cdot \frac{5}{3} \quad \cdot \frac{5}{3} \\ \hline y = \frac{30}{3} = 10 \end{array}$$

$$y = 10$$

10. Graph:  $-18 < 3x - 6 < 9$

$$\begin{array}{r} +6 \quad +6 \quad +6 \\ \hline -12 < 3x < 15 \\ \div 3 \quad \div 3 \quad \div 3 \\ \hline -4 < x < 5 \end{array}$$

$$-4 < x < 5$$



Questions on the State Exam

11. Simplify:  $6 - 18 \div 9 - 4$

$$\begin{aligned} & \checkmark \\ & 6 - 2 - 4 \\ & 4 - 4 \\ & \boxed{0} \end{aligned}$$

12. Simplify:  $23 - (8)^2 \div (14 - 6) \cdot 6$

$$\begin{aligned} & 23 - 64 \div (8) \cdot 6 \\ & 23 - 8 \cdot 6 \\ & 23 - 48 \\ & \boxed{-25} \end{aligned}$$

13. Simplify:  $|8 + (-14)| + 9$

$$\begin{aligned} & |-6| + 9 \\ & 6 + 9 \\ & \boxed{15} \end{aligned}$$

14. Simplify:  $-6[6(x+5) + x]$

$$\begin{aligned} & -6[6x + 30 + x] \\ & -6[7x + 30] \\ & \boxed{-42x - 180} \end{aligned}$$

15. Evaluate when  $w = -4$ :  $-6w^2 + 5w + 3$

$$\begin{aligned} & -6(-4)^2 + 5(-4) + 3 \\ & -6(16) + -20 + 3 \\ & -96 + -20 + 3 \\ & -116 + 3 = \boxed{-113} \end{aligned}$$

16. Solve for  $r$ :  $-2(-9r - 6) = 6(r + 5)$

$$\begin{aligned} & 18r + 12 = 6r + 30 \\ & \underline{-6r} \quad \underline{-6r} \\ & 12r + 12 = 30 \\ & \underline{-12} \quad \underline{-12} \\ & 12r = 18 \quad \boxed{r = \frac{18+6}{12+6} = \frac{3}{2} = 1.5} \end{aligned}$$

17. Solve for  $y$ :  $\frac{6}{5}y - \frac{2}{3} = 4$

$$15 \left[ \frac{6}{5}y - \frac{2}{3} = 4 \right]$$

$$3 \frac{15}{1} \cdot \frac{6}{5}y - \frac{15}{1} \cdot \frac{2}{3} = 15 \cdot 4$$

$$18y - 10 = 60$$

$$\begin{array}{r} +70 \\ \hline 18y = 70 \end{array}$$

$$y = \frac{70+2}{18+2} = \frac{35}{9} = \boxed{3\frac{8}{9}}$$

18. Solve for  $t$ :  $x = -8z + 7t$

$$\begin{array}{r} x = -8z + 7t \\ +8z \quad +8z \\ \hline \end{array}$$

$$\frac{x+8z}{7} = \frac{7t}{7}$$

$$t = \frac{x+8z}{7}$$

$$t = \frac{1}{7}x + \frac{8}{7}z$$



19. If 5 less than twice the square of a number, then the result is 7 more than three times a number. Choose the equation that could be used to find this number,  $x$ .  
DO NOT SOLVE THE PROBLEM, JUST SET UP THE EQUATION.

$$2x^2 - 5 = 3x + 7$$

20. Write a proportion that solves the problem: A motorcycle can travel 705 miles on 19 gallons of gasoline. How many gallons of gas are needed to travel 1253 miles?  
DO NOT SOLVE THE PROBLEM, JUST SET UP THE PROPORTION.

$$\frac{\text{miles}}{\text{gallons}} \quad \boxed{\frac{705}{19} = \frac{1253}{x}}$$

21. Simplify:  $(7x^2 - 8x + 4) - (6x^2 - 8x - 5)$

$$\begin{aligned} &7x^2 - 8x + 4 - 6x^2 + 8x + 5 \\ &7x^2 - 6x^2 - 8x + 8x + 4 + 5 \\ &\boxed{x^2 + 9} \end{aligned}$$

22. Simplify:  $-7x(-4x + 7)$

$$\boxed{28x^2 - 49}$$

23. Simplify:  $(4x - 7)(6x - 7)$

$$\begin{aligned} &\overbrace{(4x - 7)} \overbrace{(6x - 7)} \\ &24x^2 - 28x - 42x + 49 \\ &\boxed{24x^2 - 70x + 49} \end{aligned}$$

24. Solve the inequality:  $14x + 4 \leq 26x + 20$

$$\begin{aligned} &14x + 4 \leq 26x + 20 \\ &\underline{-26x} \quad \underline{-26x} \\ &-12x + 4 \leq 20 \\ &\quad \underline{-4} \quad \underline{-4} \\ &-12x \leq 16 \\ &\quad \underline{-12} \quad \underline{-12} \\ &x \geq -\frac{16}{12} \\ &\boxed{x \geq -\frac{4}{3}} \end{aligned}$$

## Word Problems on State Exam

A pair of jeans is priced at \$75.00, but is on sale for 20% off. What is the sale price of the jeans?

$$\text{Original} - \text{Discount} = \text{Sale Price}$$

$$75 - .20(75) = x$$

$$75 - 15 = x$$

$$\boxed{x = 60}$$

If a digital camera costs \$375 after a 25% discount, what was the original cost?

$$\text{Original} - \text{Discount} = \text{Sale Price}$$

$$x - .25x = 375$$

$$\frac{.75x}{.75} = \frac{375}{.75}$$

$$\boxed{x = 500}$$

If a DVD player costs \$690 after a 15% increase in price, what was the original cost?

$$\text{Original} + \text{Increase} = \text{New Price}$$

$$x + .15x = 690$$

$$\frac{1.15x}{1.15} = \frac{690}{1.15}$$

$$\boxed{x = 600}$$

Find the simple interest **percent** to yield \$100 interest in 5 years when \$500 is invested.

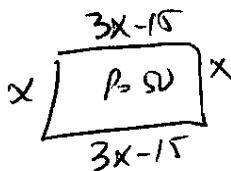
$$I = P \cdot r \cdot t$$

$$100 = 500 \cdot r \cdot 5$$

$$\frac{100}{2500} = \frac{2500r}{2500}$$

$$\boxed{r = \frac{100}{2500} = .04 = 4\%}$$

The length of a rectangular pool is 15 less than three times its width. Its perimeter is 50 meters. Find the **length** of the pool.



$$L = 3x - 15$$

$$w = x$$

$$L = \frac{3(10) - 15}{115}$$

$$w = \boxed{10}$$

$$3x - 15 + x + 3x - 15 + x = 50$$

$$8x - 30 = 50$$

$$\frac{8x}{8} = \frac{80}{8}$$

$$\boxed{x = 10}$$

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$$\text{Length} = 15$$

