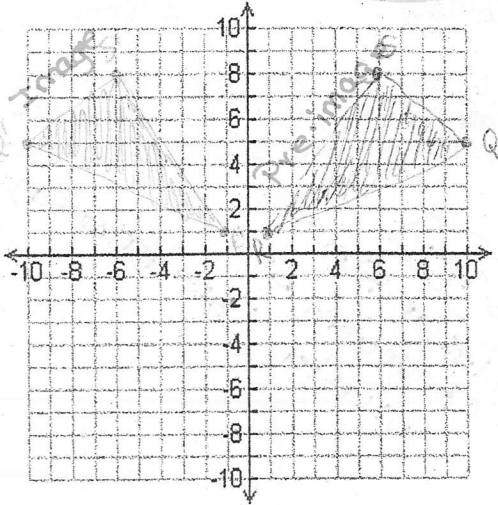




2. Plot the following points for the figure: S(6,8) Q(10,5) R(1,1)

Reflect triangle SQR over the y-axis.



S' (-6,8) Q' (-10,5)

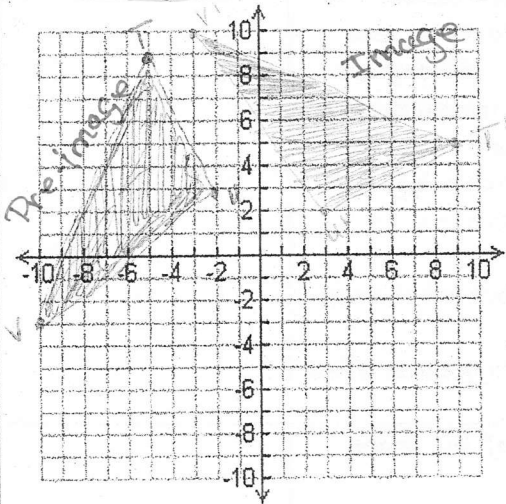
R' (-1,1)

State the rule:

$$(x,y) \rightarrow (-x,y)$$

3. Plot the following points for the figure: T(-5,9) U(-2,3) V(-10,-3)

Rotate triangle NOP 90° clockwise.



Rotate triangle NOP 90° clockwise.

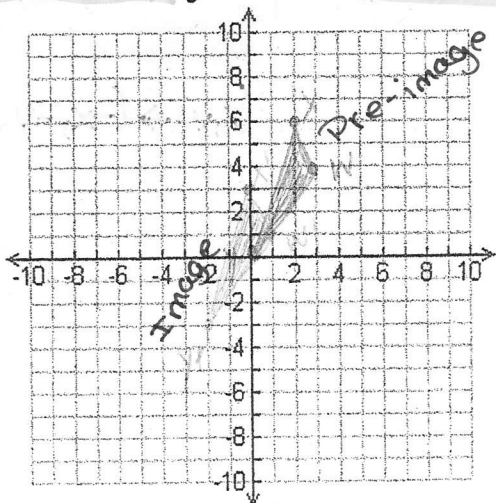
T' (3,2) U' (9,5) V' (-3,10)

State the rule:

$$(x,y) \rightarrow (y,-x)$$

4. Plot the following points for the figure: W(3,4) X(2,6) Y(0,0)

Translate triangle WXY 2 units left and 3 down.



W' (-1,-3) X' (-2,-3)

Y' (-2,3)

State the rule:

$$(x,y) \rightarrow (x-2,y-3)$$

## Unit 2-Quadratic Functions

### Vocabulary

Match each word with its correct definition.

- a. quadratic formula      b. vertex      c. discriminant  
 d. axis of symmetry      e. standard form of a quadratic equation

c 1) a number that can be calculated from any quadratic equation. It is found by using the formula:  $\frac{b^2 - 4ac}{4a}$

d 2) divides the parabola into two congruent halves

e 3) a function that can be written in the form  $ax^2 + bx + c$  of ordered pairs

b 4) represents the maximum or minimum point of the parabola

a 5) one method used to solve a quadratic equation. The formula can be written as:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1. Solve the following quadratic equation by factoring, taking the square root, or using the quadratic formula. Show work. *Hint: Make sure it's in standard form first.*

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

$$2x^2 - 3x - 5 = 0$$

$$(2x - 5)(x + 1) = 0$$

$$2x - 5 = 0 \quad x + 1 = 0$$

$$x = 5/2 \quad x = -1$$

OR

$$x = \frac{3 \pm \sqrt{(-3)^2 - 4(2)(-5)}}{2(2)}$$

$$= \frac{3 \pm \sqrt{49}}{4}$$

$$= \frac{3+7}{4} \text{ or } \frac{3-7}{4} = \frac{10}{4} \text{ or } \frac{-4}{4}$$

Answer:

$$5/2 \text{ and } -1$$

2. a) Given the following function  $y = (x + 2)^2 - 4$ , explain the transformation from the parent function  $y = x^2$ . Use words.

b) What are the zeroes of  $4x^2 - 9 = 0$ ?

$$4x^2 = 9$$

$$x^2 = 9/4$$

$$x = \pm \sqrt{9/4}$$

$$= \pm 3/2$$

Answer:

a) left 2, down 4

$$b) 3/2, -3/2$$

3. The heights of two different projectiles after they are launched are modeled by  $f(x)$  and  $g(x)$ . The function  $f(x)$  is defined as  $f(x) = -16x^2 + 42x + 12$ . The table contains the values for the quadratic function  $g$ .

x	f(x)
0	9
1	33
2	25

Answer:

A. 0.2 feet

B. 3.0 feet

C. 5.4 feet

D. 5.6 feet

What is the approximate difference in the heights achieved by the two projectiles?

Show work:

Maximum height of  $f(x)$

$$39.56$$

Maximum height of  $g(x)$

$$y = -16x^2 + 40x + 9$$

$$34$$

$$39.56 - 34 = 5.56$$

4. Macy's is planning their annual fireworks celebration for the 4<sup>th</sup> of July. A company has given them the following information about their fireworks.

- Find the Quadratic Model for the given table.
- Find the maximum height of the fireworks.
- At what distance are the fireworks at their maximum height?

Time (x) <i>time</i> Sec	Height (y) ft
1	134
2	186
3	206
4	194
5	150
6	74

Answer:

a) Quadratic Regression:

$$y = -16x^2 + 100x + 50$$

b) Vertex:

$$(3.12, 206.25)$$

max height:

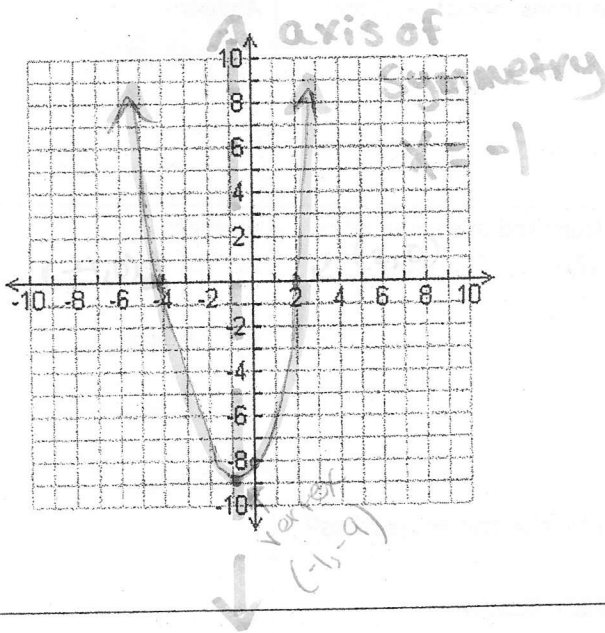
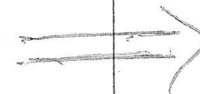
206.25 feet.

c) 3.12 sec.

5. Without using a calculator, fill in the table and graph the function:  $x^2 + 2x - 8 = 0$ . Show all work below:

Answer:

x-intercept(s)	y-intercept	vertex	Axis of Symmetry
-4 and 2	-8	$(-1, -9)$	$x = -1$



$$(x + 4)(x - 2) = 0$$

$$x = -4 \quad x = 2$$

y-int (where  $x = 0$ )

$$-8$$

$$\text{Vertex } x = \frac{-2}{2(1)} = -1$$

$$y = (-1)^2 + 2(-1) - 8 = 1 - 2 - 8 = -9$$



6. A 200-gram sample of a certain radioactive substance has a half-life of 10 minutes.

a) Write an exponential function to model its decay. Define your variables.

$$y = 200 \left(\frac{1}{2}\right)^n \quad \text{or} \quad y = 200 \left(\frac{1}{2}\right)^{x/10}$$

$n = \# \text{ half-lives}$ 
 $x = \text{time}$

b) Find the amount of the substance left after 25 minutes. Show work!

$$n = 25/10 = 2.5$$

$$y = 200 \left(\frac{1}{2}\right)^{2.5}$$

Answer:

a)

b)

35.35 g.

7. A popular antique is gaining value because it is so hard to find. In 1970, its value was \$100, and in 2000, its value is \$750.

a) Use an exponential regression to determine the function that models the value of the antique  $x$  years after 1970. Round to 3 decimals places.

$$(0, 100)$$

$$(30, 750)$$

b) If the same trend continued, how much is the antique worth in 2015?

$$x = 2015 - 1970$$

$$x = 45$$

Answer:

a)

$$y = 100 (1.069)^x$$

b)  $y = 100 (1.069)^{45}$

\$ 2013.71

or

\$ 2054

(using table)

8. Complete the following for the function:  $y = \log(x+3) - 2$

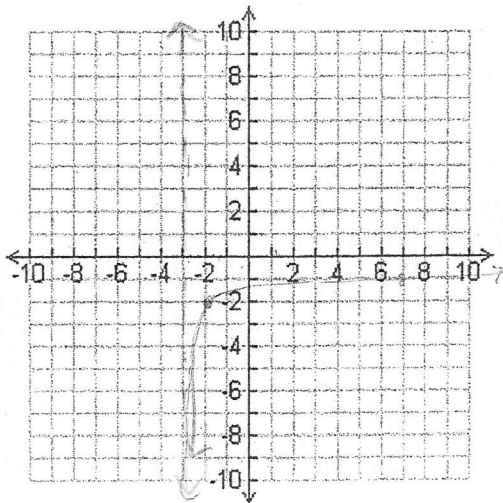
a) Describe the transformations from the parent  $y = \log(x)$ .

b) Find the domain.

c) Find the range.

d) Write the equation of the asymptote.

e) Graph the function. Include the asymptote and at least two accurate points on your graph.



Answer:

a)

left 3  
down 2

b)  $x > -3$

c) all real #s

d)  $x = -3$

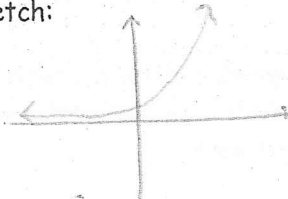
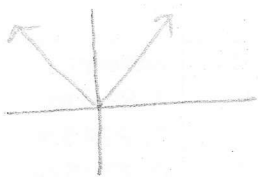


## Unit 4-Advanced Functions

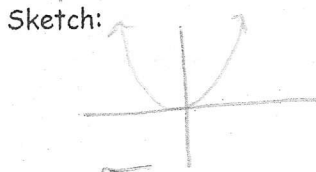
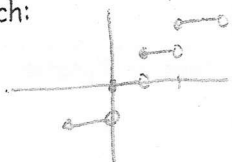
### Vocabulary

Identify the equation of the parent function and sketch a graph of the parent function.

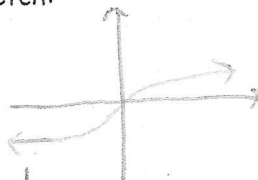
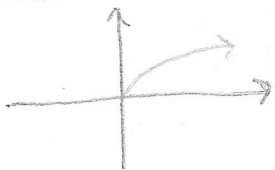
$y = |x|$  1. Absolute Value Function       $y = a \cdot b^x$  2. Exponential Function  
Sketch:      Sketch:



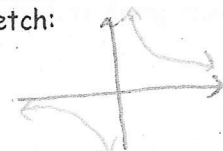
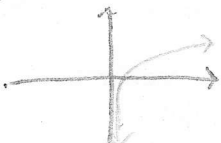
$y = \lfloor x \rfloor$  3. Greatest Integer Function       $y = x^2$  4. Quadratic Function  
Sketch:      Sketch:



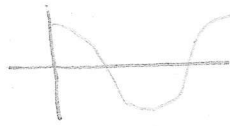
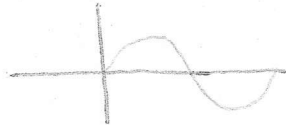
$y = \sqrt{x}$  5. Square Root Function       $y = \sqrt[3]{x}$  6. Cube Root Function  
Sketch:      Sketch:



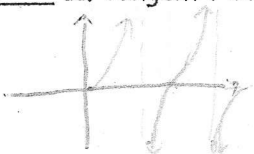
$y = \log x$  7. Logarithmic Function       $y = \frac{1}{x}$  8. Inverse Variation Function  
Sketch:      Sketch:



$y = \sin x$  9. Sine Function       $y = \cos x$  10. Cosine Function  
Sketch:      Sketch:



$y = \tan x$  11. Tangent Function      Sketch:



1. The graph of  $f(x) = x^2$  will be translated 5 units up and 2 units to the right. Which function in standard form describes the graph produced by the translations? Show work:

$$\begin{aligned} y &= (x-2)^2 + 5 \\ &= (x-2)(x-2) + 5 \\ &= x^2 - 4x + 4 + 5 \\ y &= x^2 - 4x + 9 \end{aligned}$$

Answer:

- A.  $g(x) = x^2 + 10x + 23$
- B.  $g(x) = x^2 - 4x + 9$
- C.  $g(x) = x^2 + 4x - 1$
- D.  $g(x) = x^2 - 10x + 27$

2. The volume,  $V$ , of a certain gas varies inversely with the amount of pressure,  $P$ , placed on it. The volume of this gas is  $175 \text{ cm}^3$  when  $3.2 \text{ kg/cm}^2$  of pressure is placed on it. What amount of pressure must be placed on  $400 \text{ cm}^3$  of this gas? Show work:

$$V = \frac{k}{P}$$

$$175 = \frac{k}{3.2}$$

$$k = 560$$

$$V = \frac{560}{400}$$

$$V = 1.40$$

$x = \text{Volume}$   
 $y = \text{pressure}$

- Answer:
- A.  $1.40 \text{ kg/cm}^2$
  - B.  $1.31 \text{ kg/cm}^2$
  - C.  $7.31 \text{ kg/cm}^2$
  - D.  $2.86 \text{ kg/cm}^2$

3. The distance traveled at a constant speed is directly proportional to the time of travel. If Nia traveled 112 miles in 3.5 hours, how many miles will Nia travel in 8.9 hours at the same constant speed? Show work:

$$\frac{112}{3.5} = \frac{x}{8.9}$$

- Answer:
- A. 99.6 mi
  - B. 284.8 mi
  - C. 172.8 mi
  - D. 124.4 mi

4. Evaluate  $f(x) = \begin{cases} 2x + 5 & x < -1 \\ x^2 - 3 & -1 \leq x \leq 2 \\ -3x + 7 & x > 2 \end{cases}$

Show Work:

a.  $f(-5) = -5$       $2(-5) + 5$

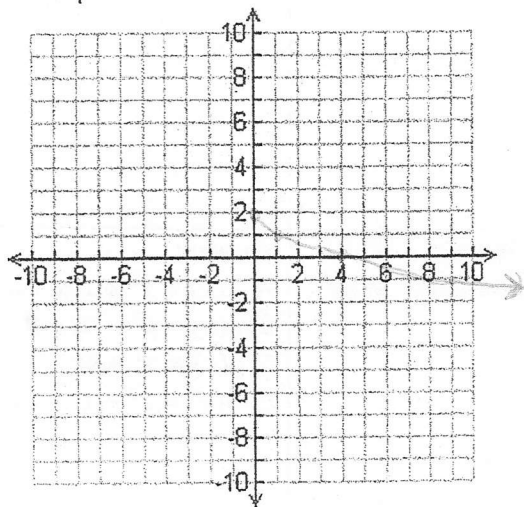
b.  $f(-1) = -2$       $(-1)^2 - 3$

c.  $f(6) = -11$       $-3(6) + 7$

- Type of Function:  
piecewise
- Answer:
- a) -5
  - b) -2
  - c) -11

5. State the following using the function:  $f(x) = -\sqrt{x} + 2$  (6 pts)

- a. Describe the transformation from the parent graph of  $f(x) = \sqrt{x}$ .  
reflection over x-axis, up 2 units
- b. Domain:  $x \geq 0$      Range:  $y \leq 2$
- c. Describe end behavior: As  $x \rightarrow 0$   $y \rightarrow 2$  and as  $x \rightarrow \infty$   $y \rightarrow -\infty$ .
- d. Graph



- Type of Function:
- Answer:
- a)
  - b) see left
  - c)



6. State the following using the function:  $f(x) = 3|x + 1|$  (8 pts)

a. Describe the transformation from the parent graph of  $f(x) = |x|$

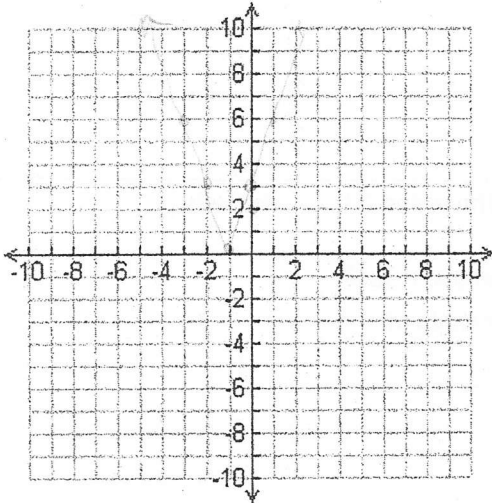
*Vertical stretch, left 1*

b. Domain: *all real #s* Range:  *$y \geq 0$*

c. Vertex:  *$(-1, 0)$*  Axis of Symmetry:  *$x = -1$*

d. End Behavior:  $x \rightarrow -\infty, y \rightarrow \infty$ ,  $x \rightarrow \infty, y \rightarrow \infty$

e. Graph



Type of Function:

Answer:

a)

b)

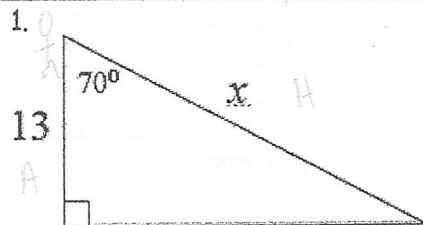
c)

d)

*See left.*

Unit 5-Trigonometric Functions

Label each right triangle with stick man, and the sides (H, O, or A). Write the Trig Equation and then solve. Show all work.



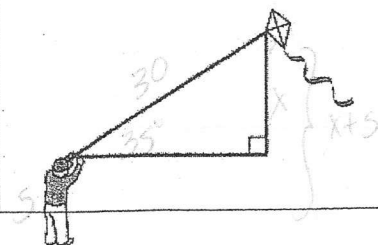
Trig Function:  $\cos 70 = \frac{13}{x}$

Show Work:  $x = \frac{13}{\cos 70}$

Answer:

*38*

2. Damali is flying a kite as shown. The kite is on a 30 foot string and the string is at a  $35^\circ$  angle of elevation. If Damali is holding her end of the string 5 feet above the ground, how far from the ground is the kite?



Trig Function:  $\sin 35 = \frac{x}{30}$

Show Work:  $x = 30 \cdot \sin 35$

Answer:

*17.2*

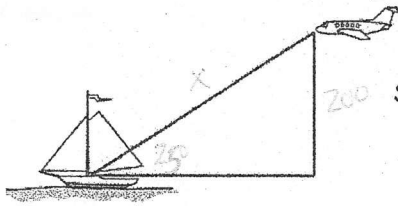
3. A pilot sees a boat at a  $25^\circ$  angle of depression. If the altitude of the plane is 2000 feet, what is the distance between the plane and the boat?

Trig Function:

$$\sin 25 = \frac{2000}{x}$$

Show Work:

$$x = \frac{2000}{\sin 25}$$



Answer:

473.2 feet

4. Draw a diagram. Label each right triangle with stick man, and the sides (H, O, or A). Write a trig equation and solve.

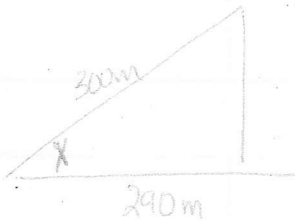
An airplane took off from a runway. When the plane had flown 300 meters, it had covered a horizontal distance of 290 meters. Find the measure of the angle of elevation of the airplane's path.

Picture:

Trig Function:  $\cos x = \frac{290}{300}$

Show Work:

$$\cos^{-1}(290/300)$$



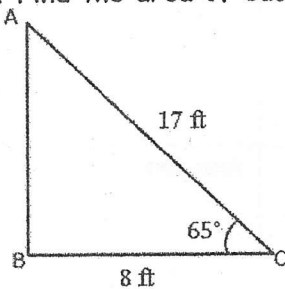
Answer:

$14.8^\circ$

5. Find the area of each triangle.  $\text{Area} = \frac{1}{2} \cdot a \cdot b \cdot \sin C$

Show Work:

$$\frac{1}{2} (8)(17) \sin 65$$



Answer:

$61.6 \text{ ft}^2$

Unit 6-Probability	
<p>Complete the following: A sample space is _____ the set of all outcomes of an experiment</p> <p>The set (A and B) is _____ elements in both A and B</p> <p>The set (A or B) is _____ elements in A or B or both</p> <p><math>P(A)</math> = the probability that A occurs = <math>\frac{\# \text{ outcomes in } A}{\# \text{ outcomes in sample space}}</math></p> <p>The sum of the probabilities of all the events in a sample space should always equal <u>1 or 100%</u>.</p> <p><math>P(A^c)</math> = the probability that A does not occur = <math>1 - P(A)</math></p> <p><math>P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)</math></p> <p>Events are mutually exclusive (disjoint) if <u>they can't occur simultaneously</u>.</p> <p>If A and B are mutually exclusive, then <math>P(A \text{ or } B) = P(A) + P(B)</math>.</p> <p>Events are independent if <u>the outcome of one does not affect the other</u>.</p> <p>Two events are independent if and only if <math>P(A \text{ and } B) = P(A) \cdot P(B)</math></p> <p><math>P(B A)</math> = the probability of B given A has already occurred = <math>\frac{P(A \text{ and } B)}{P(A)}</math></p>	
<p>1a) An experiment consists of tossing 2 coins (a nickel and a dime) and observing the outcomes. List the sample space. <u>{HH, HT, TH, TT}</u></p> <p>1b) A popular brand of pen is available in three colors (red, green or blue) and four tips (bold, medium, fine or micro). How many different choices of pens do you have with this brand? Show work: <u><math>3 \cdot 4 = 12</math></u></p>	<p><b>Answer:</b> a) <u>{HH, HT, TH, TT}</u> b) <u>12</u></p>
<p>2. There are 240 seniors at Mouse Academy. Seventy of those seniors take Calculus or Physics, 40 take Calculus, and 55 take Physics.</p> <p>a) Find the probability that a randomly chosen senior at Mouse Academy takes both Calculus and Physics? <u><math>70 = 40 + 55 - x</math></u></p> <p>b) What is the probability that a randomly chosen senior at Mouse takes neither Calculus nor Physics? <u><math>240 - 70 = \frac{170}{240}</math></u></p>	<p><b>Answer:</b> a) <u>25 take both</u> b) <u><math>\frac{170}{240} = \frac{17}{24}</math> or <u>71%</u></u></p>
<p>3. You put a CD that has 8 songs in your CD player. You set the player to play the songs at random. The player plays all 8 songs without repeating any song. What is the probability that the songs are played in the same order they are listed on the CD? Show work: <u><math>8P_8 =</math></u></p>	<p><b>Answer:</b> <u>40,320</u></p>

4. There are 35 students in your PE class. Five of these students will be selected randomly to represent your class on a 5-person bowling team. What is the probability that the team chosen will be Sally, April, John, Fred and Adam?

Show work:

$${}_{35}C_5 = 324,632$$

Answer:

$$324,632$$

5a. Explain the difference between theoretical and experimental probability.

experimental is based on data from experiment.

5b. What is the theoretical probability of rolling a 6? \_\_\_\_\_

Answer:

a) theoretical =  $\frac{\# \text{ possible}}{\# \text{ total}}$

b)  $\frac{1}{6}$

6. Suppose you have a jar of candies: 4 red, 5 purple and 7 green. Find the following probabilities of the following events:

- a) Selecting a red candy.  $\frac{4}{16}$
- b) Selecting a purple candy.
- c) Selecting a green or red candy.  $7+4=11$
- d) Selecting any color except a green candy.  $\frac{9}{16}$
- e) Find the odds of selecting a red candy.
- f) Find the odds of selecting a purple or green candy.

Answer:

a)  $\frac{4}{16}$

b)  $\frac{5}{16}$

c)  $\frac{11}{16}$      d)  $\frac{9}{16}$

e) 4:12 or 1:3

f) 12:4 or 3:1