

**Common Core Math 2**  
**Final Exam Review Packet**

Name: Key

Use this packet for questions from every unit that will help you prepare for the Final Exam  
Honors Math 2.

Topic	Lessons	Packet Pages
Probability	Odds, Independent/Dependent, Mutually Inclusive/Exclusive, Permutations, Combinations, Conditional Probability	2-3
Transformations	Rotations, Reflections, Translations, Dilations	4-6
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Advanced Functions	Solving Rational Equations, Extraneous Solutions, Solving Inverse Equations, Transformation of Functions, solving variation	16-17
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## Probability Review:

**Odds, Independent and Dependent Events, Mutually Exclusive/Inclusive, Permutations and Combinations, Conditional Probability**

**Odds vs. Probability**

Odds: Likelihood of an event occurring to it not occurring

Probability: Likelihood of an event occurring to total number of outcomes

**Independent/Dependent (AND) vs. Mutually Inclusive/Exclusive (OR)**

AND...MULTIPLY	OR...ADD
<b>Independent</b> One event does not affect the outcome of the second event Ex: Flipping a coin and rolling a die  $P(A) \times P(B)$	<b>Mutually Exclusive</b> The events cannot happen at the same time Ex: Being a boy vs being a girl  $P(A) + P(B)$
<b>Dependent</b> One event affects the outcome of the second event Ex> picking a card and picking a second card without replacing the first card  $P(A) \times P(B)$ (after A happens)	<b>Mutually Inclusive</b> The events can happen at the same time Ex: Being a boy and having blue eyes  $P(A) + P(B) - P(A \text{ and } B)$
<b>Permutations and Combinations</b> Permutation: Order matters $nPr$  Combination: Order doesn't matter $nCr$	<b>Conditional Probability</b> A probability where a certain prerequisite condition has already been met  $P(A   B) = \frac{P(A \text{ and } B)}{P(B)}$

Practice Questions:

1. 21 students at school have an allergy to peanuts, shellfish, or both. 14 have an allergy to peanuts, 12 have an allergy to shellfish. How many students have an allergy to both peanuts and shellfish?

A. 12

B. 7

C. 5

D. 2



2. A total of 540 customers, who frequented an ice cream shop, responded to a survey asking if they preferred chocolate or vanilla ice cream.

- 308 of the customers preferred chocolate ice cream 232 pref. vanilla
- 263 of the customers were female 277 male
- 152 of the customers were males who preferred vanilla ice cream

3. A teacher is making a multiple choice quiz. She wants to give each student the same questions, but have each student's questions appear in a different order. If there are twenty-seven students in the class, what is the least number of questions the quiz must contain?

$$\begin{aligned} 2P_2 &= 2 \\ 3P_3 &= 6 \\ 4P_4 &= 24 \\ 5P_5 &= 120 \end{aligned}$$

} at least 5 to get 27 or more unique orders

4. How many ways can a school pick 5 people for student council if there are 21 people to choose from?

$${}_{21}C_5 = 20349$$

What is the probability that a customer chosen at random is a male or prefers vanilla ice cream?

A. 419/540

B. 119/180

C. 197/540

D. 38/135

$$P(M \text{ or } V) = P(M) + P(V) - P(M \text{ and } V)$$

$$\frac{277}{540} + \frac{232}{540} - \frac{152}{540} = \frac{357}{540} = \frac{119}{180}$$

5. Determine whether the following situations would require calculating a permutation or a combination:

i. Selecting three students to attend a conference in Washington, DC  $C$

ii. Selecting a lead and an understudy for a school play.  $P$

iii. Assigning students to their seats on the first day of school.  $P$

iv. Selecting a President, Vice President and Secretary for student council.  $P$

v. Selecting 7 people to decorate for the homecoming dance  $C$

6. A coach must choose five starters from a team of 12 players. How many different ways can the coach choose the starters?

$${}_{12}C_5 = 792$$

7. If there are 14 people applying for a job a gym, how many different ways can the boss choose the gymnastics instructor, desk manager and janitor?

$${}_{14}P_3 = 2184$$

8. What is the total number of possible 4-letter arrangements of the letters m, a, t, h, if each letter is used only once in each arrangement?

$${}_4P_4 = 24$$

9. A locker combination system uses three digits from 0 to 9. How many different three-digit combinations with no digit repeated are possible?

$${}_{10}P_3 = 720$$

10. A bag contains three chocolate, four sugar, and five lemon cookies. Greg takes two cookies from the bag, at random, for a snack. Find the probability that Greg did not take two chocolate cookies from the bag. Explain why using the complement of the event of not choosing two chocolate cookies might be an easier approach to solving this problem.

$$P(\text{not 2 choc. cookies}) = 1 - P(2 \text{ choc. cookies})$$

$$P(2 \text{ choc. cookies}) = \frac{3}{12} \times \frac{2}{11} = \frac{1}{22}$$

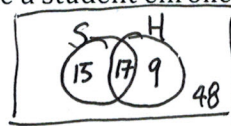
$$P(\text{not 2 choc. cookies}) = 1 - \frac{1}{22} = \frac{21}{22}$$

11. Of 50 students going on a class trip, 35 are student athletes and 5 are left-handed. Of the student athletes, 3 are left-handed. Which is the probability that one of the students on the trip is an athlete or is left-handed?

$$P(\text{Athlete or LH}) = P(\text{Athlete}) + P(\text{LH}) - P(\text{Athlete + LH})$$

$$= \frac{35}{50} + \frac{5}{50} - \frac{3}{50} = \frac{37}{50}$$

12. There are 89 students in the freshman class at Northview High. There are 32 students enrolled in Spanish class and 26 enrolled in history. There are 17 students enrolled in both Spanish and history. If a freshman is selected at random to raise the flag at the beginning of the school day, what is the probability that it will be a student enrolled in Spanish or history?



$$P(S \text{ or } H) = \frac{41}{89}$$

13. What is the probability of rolling a 5 on the first number cube and rolling a 6 on the second number cube?

$$\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$$

14. The sections on a spinner are numbered from 1 through 8. If the probability of landing on a given section is the same for all the sections, what is the probability of spinning a number less than 4 or greater than 7 in a single spin?

$$P(<4) + P(>7) - P(\text{Both})$$

$$\frac{3}{8} + \frac{1}{8} - 0 = \frac{4}{8} = \frac{1}{2}$$

15. A movie company surveyed 1000 people. 229 people said they went to see the new movie on Friday, 256 said they went on Saturday. If 24 people saw the movie both nights, what is the probability that a person chosen at random saw the movie on Friday or Saturday?

$$P(F \text{ or } S) = P(F) + P(S) - P(F \text{ and } S)$$

$$\frac{229}{1000} + \frac{256}{1000} - \frac{24}{1000} = \frac{461}{1000}$$

## Geometric Transformations Review:

Rotations, reflections, translations, and dilations.

<u>Reflections</u>	<u>Rotations</u>	<u>Translations</u>
$r_{x\text{-axis}}(x, y) \rightarrow (x, -y)$ $r_{y\text{-axis}}(x, y) \rightarrow (-x, y)$ $r_{y=x}(x, y) \rightarrow (y, x)$ $r_{y=-x}(x, y) \rightarrow (-y, -x)$	$R_{90\text{ degrees}}(x, y) \rightarrow (-y, x)$ (Same as 270 clockwise) $R_{180\text{ degrees}}(x, y) \rightarrow (-x, -y)$ $R_{270\text{ degrees}}(x, y) \rightarrow (y, -x)$ (Same as 90 clockwise)	$(x, y) \rightarrow (x \pm \#, y \pm \#)$  $x + \# = \text{right}$ $y + \# = \text{up}$ $x - \# = \text{left}$ $y - \# = \text{down}$

Dilation – a transformation that produces an image that is the same shape as the original, but is a different size. (The image is similar to the original object) Dilation is a transformation in which each point of an object is moved along a straight line. The straight line is drawn from a fixed point called the center of dilation.

$$\text{Scale factor} = \frac{\text{image length}}{\text{original length}}$$

A dilation is an enlargement if the scale factor is greater than 1. A dilation is a reduction if the scale factor is between 0 and 1.

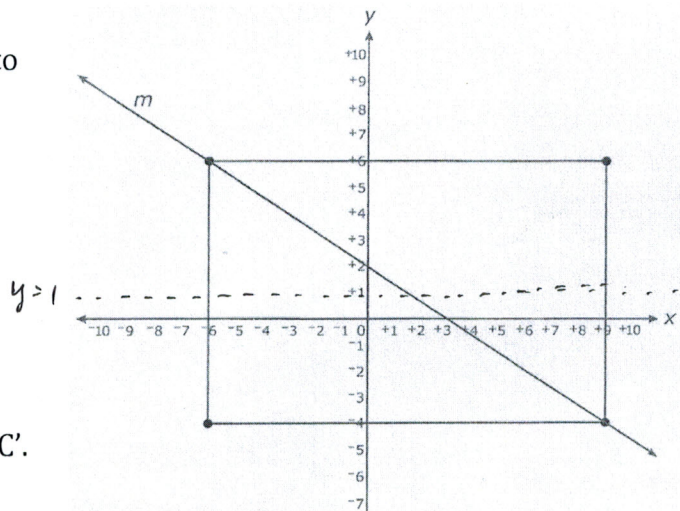
1. Which transformation will always produce a congruent figure?

- A.  $(x, y) \rightarrow (x + 2, 3y)$     C.  $(x, y) \rightarrow (2x, 2y)$   
 B.  $(x, y) \rightarrow (x - 3, y)$     D.  $(x, y) \rightarrow (2x, y + 1)$

*Just translation without changing size of sides.*

2. Which transformation will carry the rectangle show to the right onto itself?

- A. reflection over line m  
 B. reflection over line  $y=1$   
 C. rotation  $90^\circ$  CCW about the origin  
 D. rotation  $270^\circ$  CCW about the origin

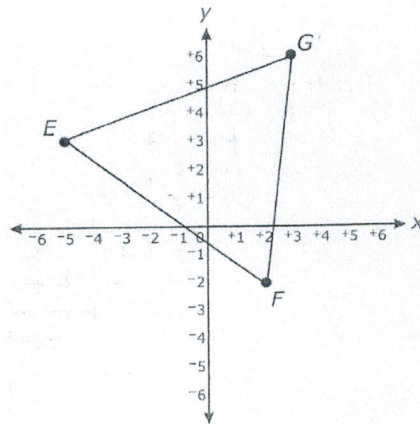


7.  $\triangle ABC$  is dilated by a scale factor of  $k$  producing  $\triangle A'B'C'$ . How does angle A compare to angle A'?

- A. Angle A' will be  $k$  time larger than Angle A  
 B. Angle A' will be  $k$  times smaller than Angle A  
 C. Angle A' will be the measure of Angle A +  $k$   
 D. Angle A' will be the same as Angle A

*Dilation by scale factor changes sides proportional so new figure is similar and so angles are congruent.*

3. Triangle EGF is graphed below.



Triangle EGF will be rotated 90 degrees CCW around the origin and will then be reflected across the y-axis, producing an image triangle. Which additional transformation will map the image triangle back onto the original triangle?

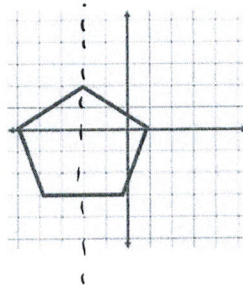
$$R_{90^\circ}: (x, y) \rightarrow (-y, x)$$

$$R_{y\text{-axis}}: (-y, x) \rightarrow (y, x)$$

Need to swap x and y to get back to original  $\rightarrow$  reflect across  $y=x$

- A. rotation 270 degrees CCW
- B. rotation 180 degrees CCW
- C. reflection across  $y=-x$
- D. reflection across  $y=x$

4. Which line of reflection would carry the figure onto itself?

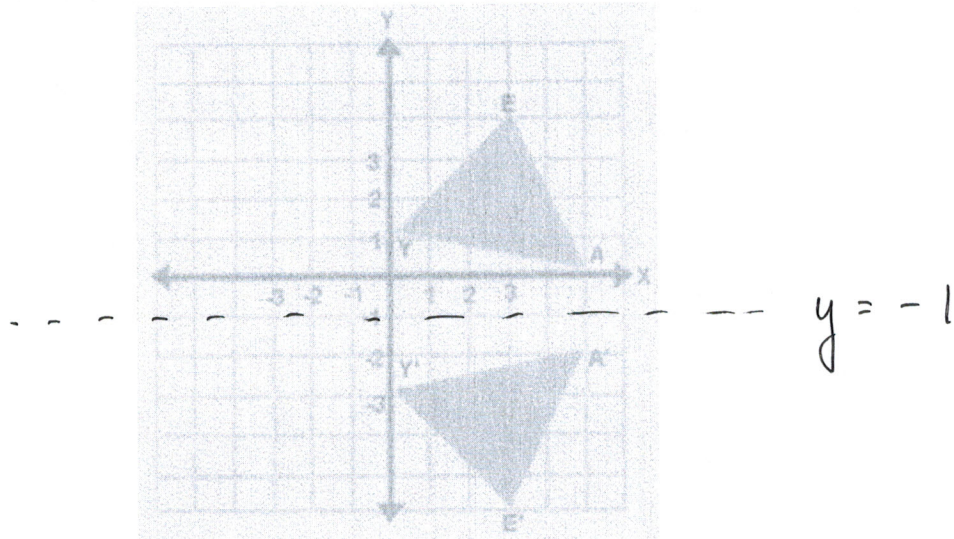


- A.  $y = x$
- C.  $x = -2$
- B.  $y = -2$
- D.  $x = 1$

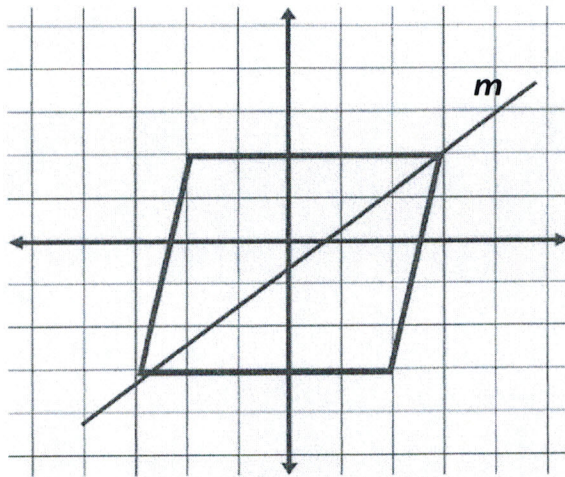
5. The translation  $(x, y) \rightarrow (x - 2, y + 4)$  maps  $\triangle ABC$  onto  $\triangle A'B'C'$ . What translation maps  $\triangle A'B'C'$  onto  $\triangle ABC$ ? *right 2 down 4*

- A.  $(x, y) \rightarrow (x + 2, y - 4)$
- B.  $(x, y) \rightarrow (x + 2, y + 4)$
- C.  $(x, y) \rightarrow (x - 2, y + 4)$
- D.  $(x, y) \rightarrow (x - 2, y - 4)$

6. For the figure below, what is the line of reflection that maps  $\triangle AEY$  onto  $\triangle A'E'Y'$ ?



8. For the parallelogram below, which line of reflection would carry the parallelogram onto itself?



- A. x-axis
- B. y-axis
- C. Line  $y=x$
- D. Line  $m$

# Similarity & Congruence Review:

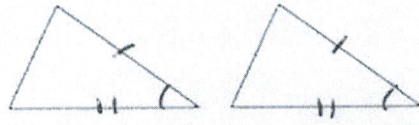
## Triangle Congruence

Side-Side-Side (SSS)



Three pairs of congruent sides

Side-Angle-Side (SAS)



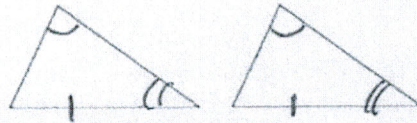
Two pairs of congruent sides and one pair of congruent angles. Angle between the pair of sides

Angle-Side-Angle (ASA)



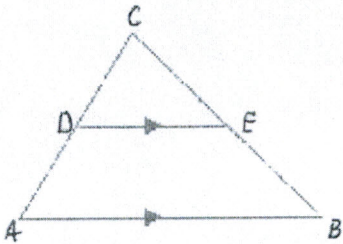
two pairs of congruent angles and one pair of congruent sides. Sides between the pair of angles

Side-Angle-Angle (SAA)



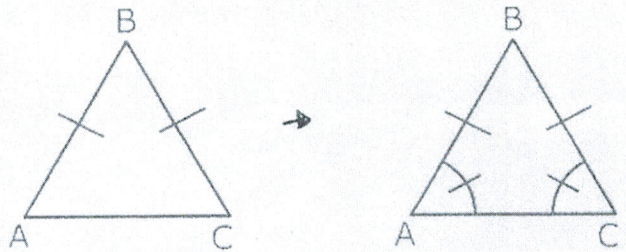
two pairs of congruent angles and one pair of congruent sides. Sides not between the pair of angles.

## Triangle Midsegment Thm



$$\overline{DE} \parallel \overline{AB} \text{ and } DE = \frac{1}{2}AB$$

## Isosceles Triangles



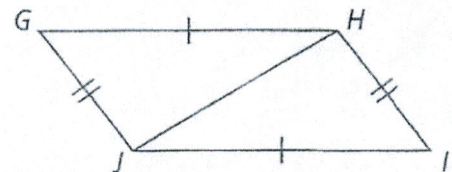
1. Based on the given information in the figure at the right, how can you justify that  $\triangle JHG \cong \triangle HJI$  ?

A. ASA

B. AAS

**C. SSS**

D. SAS



2. Which statement cannot be justified given only that  $\triangle PBJ \cong \triangle TIM$  ?

A.  $\overline{PB} \cong \overline{TI}$

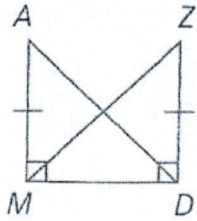
B.  $\angle B \cong \angle I$

C.  $\angle BJP \cong \angle IMT$

**D.  $\overline{JP} \cong \overline{MI}$**

3. In the figure at the right, which theorem or postulate can you use to prove  $\triangle ADM \cong \triangle ZMD$  ?

- A. ASA
- B. AAS
- C. SSS
- D. SAS**



6. Which pair of triangles can be proven congruent by SSS?

- A.
- B.
- C.**
- D.

4. Which pair of triangles can be proven congruent by the ASA postulate?

- A.
- C.**
- B.
- D.

7. Which pair of triangles can be proven congruent by SAS?

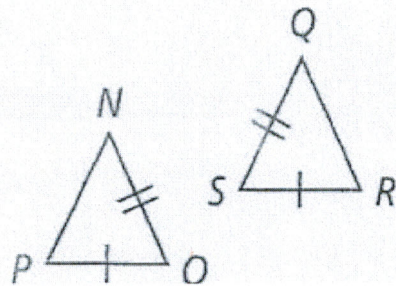
- A.
- B.
- C.
- D.**

5. Which pair of triangles can be proven congruent by the AAS postulate?

- A.
- C.
- B.
- D.**

8. What additional information do you need to prove  $\triangle NOP \cong \triangle QSR$  ?

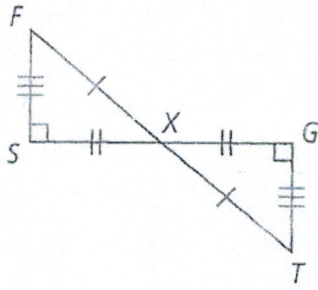
- A.  $\overline{PN} \cong \overline{SQ}$
- B.  $\overline{NO} \cong \overline{QR}$
- C.  $\angle P \cong \angle S$
- D.**  $\angle O \cong \angle S$



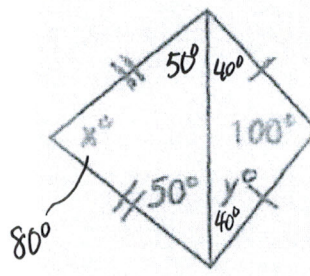


9. Given the diagram, which of the following must be true?

- A.  $\Delta XSF \cong \Delta XTG$
- B.  $\Delta SXF \cong \Delta GXT$**
- C.  $\Delta FXS \cong \Delta XGT$
- D.  $\Delta FXS \cong \Delta GXT$

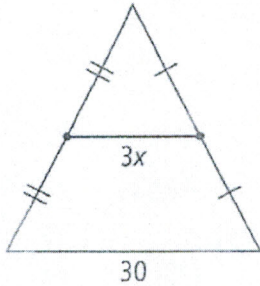


13. Solve for x and y.



$x = 80^\circ$   
 $y = 40^\circ$

10. Solve for x



$3x = \frac{1}{2}(30)$   
 $3x = 15$   
 $x = 5$   
or  
 $2(3x) = 30$   
 $6x = 30$   
 $x = 5$

11. Use diagram at right to find XZ

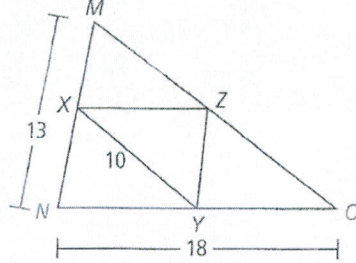
Assume X, Y, and Z are midpoints

a. Find XZ.

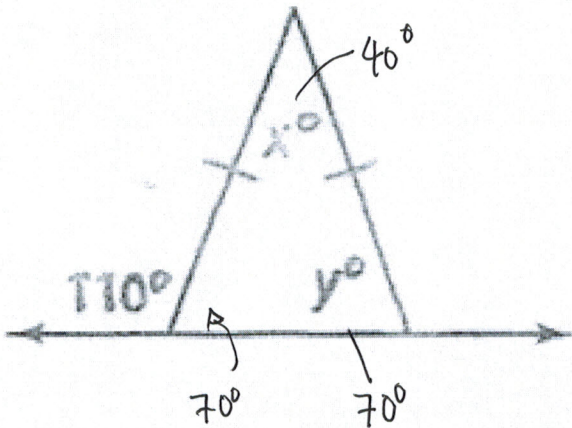
$XZ = \frac{1}{2}(18) = 9$

b. If  $XY = 10$ , find MO.

$MO = 2XY = 2(10)$   
 $20$

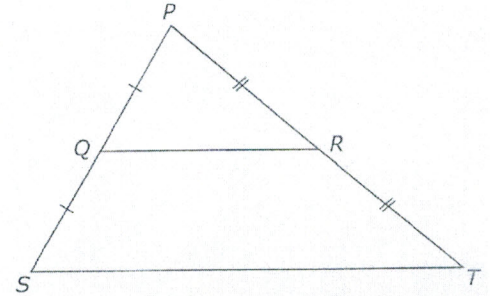


12. Solve for x and y.



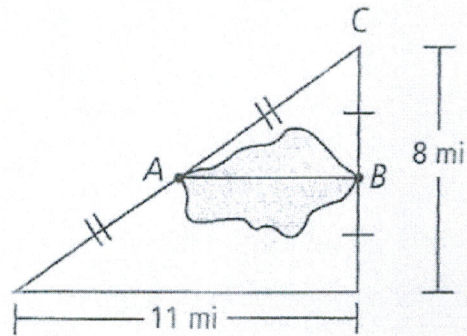
$x = 40^\circ$   
 $y = 70^\circ$

14. Which statement must be true about the triangle below?



- A.  $PQ + QS = PR + RT$
- B.  $\Delta PQR \cong \Delta PST$
- C.  $ST = 2 \cdot QR$**
- D.  $\angle S \cong \angle T$

15. Use the figure at the below.



a. What is the distance across the lake?

$AB = \frac{1}{2}(11) = 5.5 \text{ mi}$

b. Is it shorter distance from A to B or from B to C? Explain.

$BC = 4 \text{ mi}$   
B to C

Similarity & Congruence Notes/Help:

# Polynomials:

Adding & Subtracting polynomials – Add like terms, the exponents don't change!

Ex: $(3x^2 - 4 + 2x) + (5x - 6x^2 + 7)$ $= -3x^2 + 7x + 3$	Ex: $(3x^2 - 4 + 2x) - (5x - 6x^2 + 7)$ $= 9x^2 - 3x - 11$
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Multiplying Polynomials – Each term in a polynomial has to be multiplied to each term in the other polynomial. Exponents change when terms are multiplied!

Ex: $4b(cb - zd)$ $= 4b^2c - 4bzd$	Ex: $(4x - 5)(x + 2)$ $= 4x^2 + 8x - 5x - 10$ $= 4x^2 + 3x - 10$
Ex: $(2x^2 - 6x + 1)(x + 3)$ $= 2x^3 + 6x^2 - 6x^2 - 18x + x + 3$ $= 2x^3 - 17x + 3$	Ex: $(x + 5)(x - 2)(3x + 4)$ $= (x^2 + 3x - 10)(3x + 4)$ $= 3x^3 + 4x^2 + 9x^2 + 12x - 30x - 40$ $= 3x^3 + 13x^2 - 18x - 40$

1.  $(3x^5 + 17x^3 - 1) + (-2x^5 - 6)$

$$x^5 + 17x^3 - 7$$

2.  $(6x^2 - 3x + 2) - (-6x^2 + 3x - 5)$

$$12x^2 - 6x + 7$$

3.  $(x + 2)(x^2 + 2x + 3)$

$$\begin{array}{r} x^3 + 2x^2 + 3x \\ + 2x^2 + 4x + 6 \\ \hline x^3 + 4x^2 + 7x + 6 \end{array}$$

4.  $(3x - 4)(6x + 7)$

$$\begin{array}{r} 18x^2 + 21x - 24x - 28 \\ 18x^2 - 3x - 28 \end{array}$$

5.  $(4x^2 - 3y^2 + 5xy) - (8xy + 3y^2)$

$$\begin{array}{r} 4x^2 - 6y^2 - 3xy \\ 4x^2 - 3xy - 6y^2 \end{array}$$

6. Which expression is equivalent to  $t^2 - 36$ ?

- A.  $(t - 6)(t - 6)$     **C.**  $(t + 6)(t - 6)$   
B.  $(t - 12)(t - 3)$     D.  $(t - 12)(t + 3)$

7. Which of the following is equivalent to  $(5t + 3)^2$ ?

- A.  $10t + 9$   
B.  $25t^2 + 9$   
**C.**  $25t^2 + 30t + 9$   
D.  $10t^2 + 30t + 9$

8. Which expression is equivalent to  $(x + 1)(3x - 2)(x + 4)$ ?

- A.  $5x + 3$   
B.  $3x^3 - 8$   
**C.**  $3x^3 + 13x^2 + 2x - 8$   
D.  $16x^2 + 2x - 8$

$$\begin{array}{r} (x+1)(3x^2+10x-8) \\ 3x^3+10x^2-8x \\ + 3x^2+10x-8 \\ \hline 3x^3+13x^2+2x-8 \end{array}$$

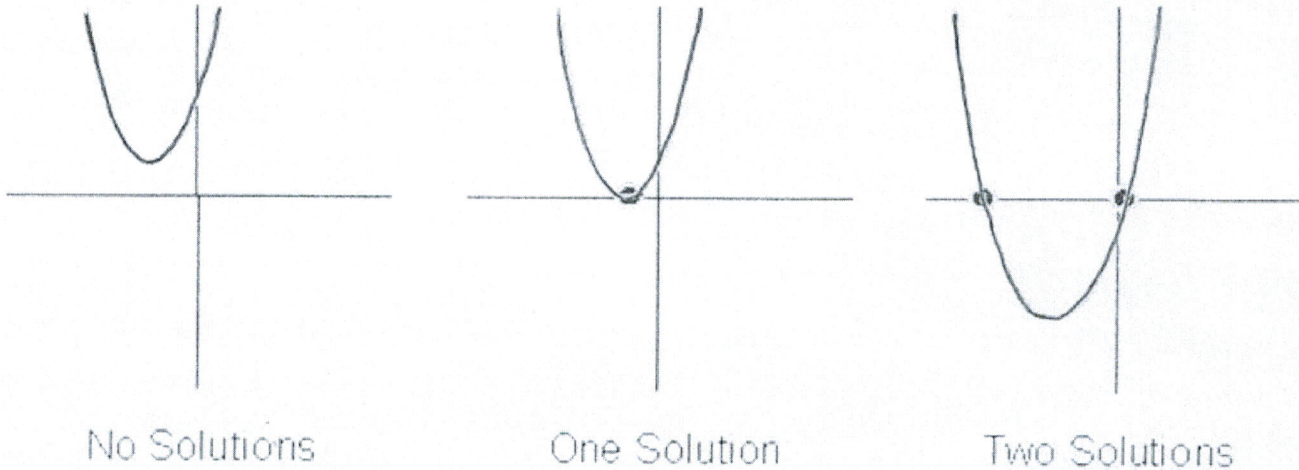
## Quadratic Review

Standard Form  $f(x) = ax^2 + bx + c$

$c$  is the  $y$ -intercept of a quadratic, positive  $a$  (faces up like a U), negative  $a$  (faces down)

Solutions (known as  $x$ -intercepts, zeros, or roots) of a quadratic can be found three ways:

Method 1) Graphing – Graph the function in  $y=$ , 2<sup>nd</sup>, trace, zero (left bound, enter, right bound, enter, guess, enter)



Method 2) Factoring – transform a quadratic from standard form into factored form then use zero-product property

Ex: Solve  $f(x) = 3x^2 + 7x - 6$

Factored form:  $(3x - 2)(x + 3) = 0$

Set each factor equal to zero and solve for variable.

$$3x - 2 = 0$$

$$x + 3 = 0$$

$$3x = 2$$

$$x = -3$$

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

Method 3) Quadratic Formula – works for every quadratic!!  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$  use the  $a$ ,  $b$ ,  $c$ , from standard form.

Ex: Solve  $f(x) = 3x^2 + 7x - 6$      $a = 3, b = 7$  and  $c = -6$

$$x = \frac{-7 \pm \sqrt{(7)^2 - 4(3)(-6)}}{2(3)} = \frac{-7 \pm 11}{6} \quad \text{so } x = 2/3 \text{ and } x = -3$$

**Discriminant  $b^2 - 4ac$**

If  $b^2 - 4ac > 0$  the quadratic has TWO real solutions.

If  $b^2 - 4ac = 0$  the quadratic has ONE real solutions.

If  $b^2 - 4ac < 0$  the quadratic has NO real solutions. (2 imaginary)

$$b^2 - 4ac$$

1. Which function has exactly one solution?

- B.  $4x^2 + 12x + 9 = 0$      $144 - 4(4)(9) = 0$   
 C.  $4x^2 - 6x - 9 = 0$      $36 - 4(4)(-9) = 180$   
 D.  $4x^2 + 6x + 9 = 0$      $36 - 4(4)(9) = -108$

2. 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  $g(x)$ .

$$f(x) \text{ max} = (1.31, 39.56)$$

$$g(x) = -16x^2 + 40x + 9$$

$$g(x) \text{ max} = (1.25, 34)$$

x	g(x)
0	9
1	33
2	25

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

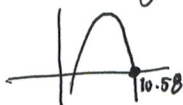
$$39.6 - 34$$

- A. 0.2 feet                      C. 5.4 feet  
 B. 3.0 feet                       D. 5.6 feet

3. A company found that its monthly profit,  $P$ , is given by  $P = -10x^2 + 120x - 150$  where  $x$  is the selling price for each unit of the product. Which of the following is the best estimate of the maximum price per unit that the company can charge without losing money?

- A. \$300  
 B. \$210

C. \$11  
 D. \$6



4. A ball is thrown from the top of a building. The table shows the height,  $h$ , (in feet) of the ball above the ground  $t$  seconds after being tossed.

t	1	2	3	4	5	6
h	299	311	291	239	155	39

$$h = -16t^2 + 60t + 255$$

How long after the ball was tossed was it 80 feet above the ground?

- A. about 5.1 seconds                       C. about 5.7 seconds  
 B. about 5.4 seconds                      D. about 5.9 seconds

5. Which of the following is a factor of

$$4ab + 2a + 6b + 3?$$

- A.  $(2a-3)$                       C.  $(2b-1)$   
 B.  $(2a+3)$                       D.  $(2b+3)$

$$2a(2b+1) + 3(2b+1)$$

$$(2a+3)(2b+1)$$

$$A. 4x^2 - 12x - 9 = 0 \quad 144 - 4(4)(9) = 288$$

6. If  $t$  is an unknown constant, which binomial must be a factor of  $7m^2 + 14m - tm - 2t$ ?

$$7m(m+2) - t(m+2)$$

- A.  $(7m+t)$                        C.  $(m+2)$   
 B.  $(m-t)$                       D.  $(m-2)$

7. What is the equation of a parabola with the vertex  $(3, -20)$  and passes through the point  $(7, 12)$ ?

- A.  $y = 2x^2 + 12x - 2$                       C.  $y = -2x^2 + 12x - 38$   
 B.  $y = 2x^2 - 12x - 2$                       D.  $y = 2x^2 - 12x + 38$

ANS  $x = 3 + 7, 12$  is solution.

8. The function  $C = 75x + 2600$  gives the cost, in dollars, for a small company to manufacture  $x$  items. The function  $R = 225x - x^2$  gives the revenue, also in dollars, for selling  $x$  items. How many items should the company produce so that the cost and revenue are equal?

$$75x + 2600 = 225x - x^2 \quad (x-20)(x-130) = 0$$

$$x^2 - 150x + 2600 = 0 \quad x = 20 \text{ or } x = 130$$

9. What is the discriminant of  $4x^2 + 28x = -49$ ?

$$4x^2 + 28x + 49 = 0 \quad b^2 - 4ac \rightarrow 28^2 - 4(4)(49) = 0$$

10. The graph of the function  $x^2$  will be shifted down 2 units and to the right 3 units. Write an equation in vertex form that corresponds to the resulting graph.

$$y = (x-3)^2 - 2$$

11. Brian used the quadratic formula to solve a quadratic equation and his result is below. Write the original quadratic equation he started with in standard form.

$$b = -8 \quad x = \frac{8 \pm \sqrt{(-8)^2 - 4(1)(-2)}}{2(1)}$$

$$a = 1$$

$$c = -2 \quad y = x^2 - 8x - 2$$

12. A rocket is launched. The function that models this situation is  $h(t) = -16t^2 + 96t + 180$

- i. What is the height of the rocket 2 seconds after launch? 308 ft  
 ii. What is the max value? 324 ft  
 iii. When is the rocket 100 feet above ground?  $t = 6.745$