Foundations of Math 2
Final Exam Review

Name: Key Period: ________

Unit 1 - Transformations and Symmetry:

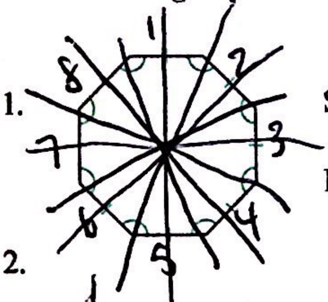
What is Rotational Symmetry: When a shape can be rotated onto itself!

Smallest Angle of Rotational Symmetry = $\frac{360}{\#\text{ of sides}}$

What is a Line of Symmetry: a line in which a shape can be reflected onto itself! (equal to # of sides)

Find the smallest angle of rotational symmetry and lines of symmetry for the following figures:

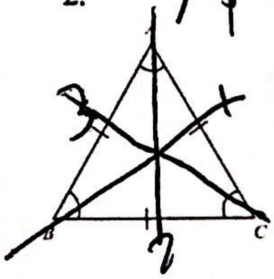
1.



Smallest Angle: $360/8 = \boxed{45^\circ}$

Lines of Symmetry: 8

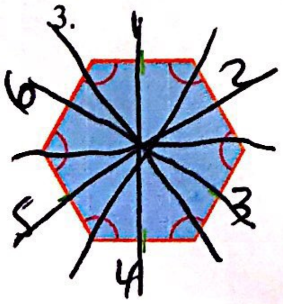
2.



Smallest Angle: $\frac{360}{3} = \boxed{120^\circ}$

Lines of Symmetry: 3

3.



Smallest Angle: $\frac{360}{6} = \boxed{60^\circ}$

Lines of Symmetry: 6

an

n

of sides)

gures:

Types of Transformations: [Slide]

Translation: a set of points moving the same distance and direction

Algebraic Rule: $(x,y) \rightarrow (x \pm \#\ ,\ y \pm \#)$

X: +Right −left

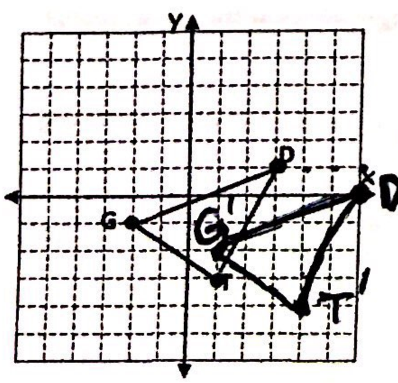
y: + Up − Down

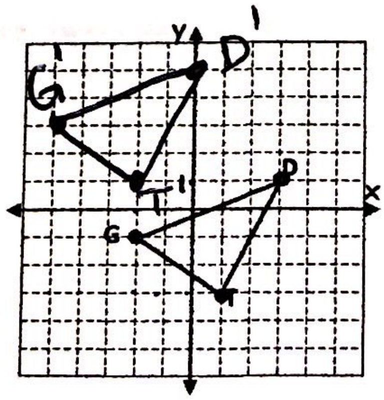
Describe the following Translations:

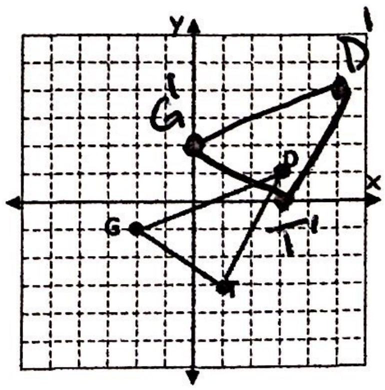
4. $(x,y) \rightarrow (x+6\ ,\ y-4)$ Right 6, Down 4
5. $(x,y) \rightarrow (x-2\ ,\ y+1)$ Left 2, Up 1
6. $(x,y) \rightarrow (x-5\ ,\ y-3)$ Left 5, Down 3
7. $(x,y) \rightarrow (x+7\ ,\ y+6)$ Right 7, Up 6
8. $(x,y) \rightarrow (x-8\ ,\ y+9)$ Left 8, Up 9
9. $(x,y) \rightarrow (x+5\ ,\ y-2)$ Right 5, Down 2

Translate the following with the given algebraic rule:

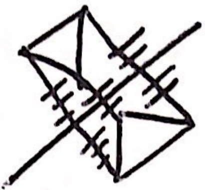
10. $(x,y) \rightarrow (x+3\ ,y-1)$ 11. $(x,y) \rightarrow (x-3\ ,y+4)$ 12. $(x,y) \rightarrow (x+2\ ,y+3)$





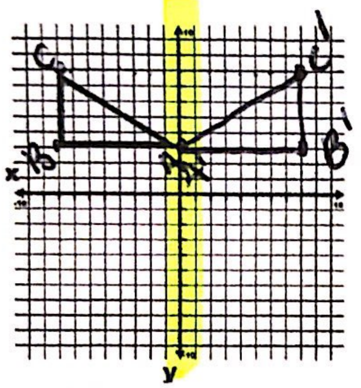


[flip]
Reflection: move across line of reflection
Every point is the same distance from the line.

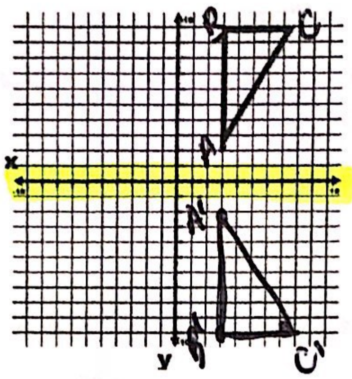


Reflect over the following over the given lines:

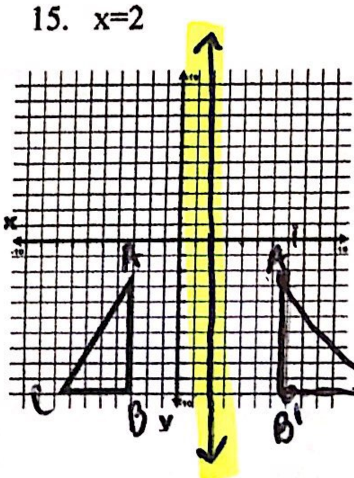
13. y-axis



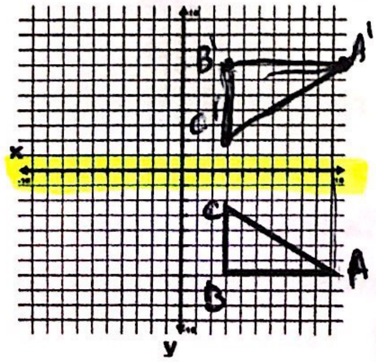
14. x-axis



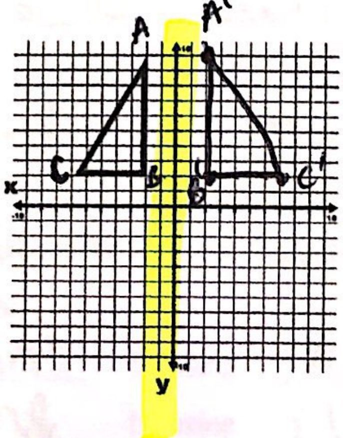
15. x=2



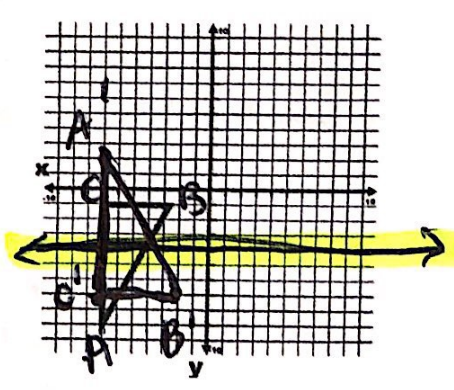
16. x-axis



17. y-axis

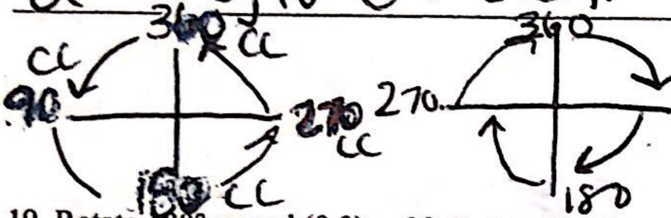


18. y = -4



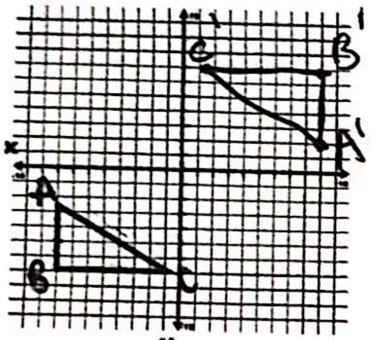
?! [Turn]

Rotation: move points about a center a given degree

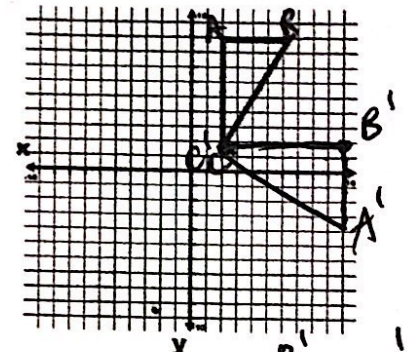


*Patty paper helps!

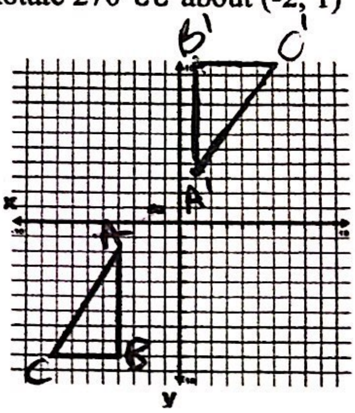
19. Rotate 180°around (0,0)



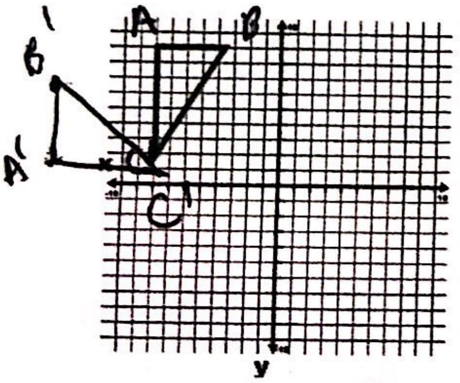
20. Rotate 90 °C around (2,1)



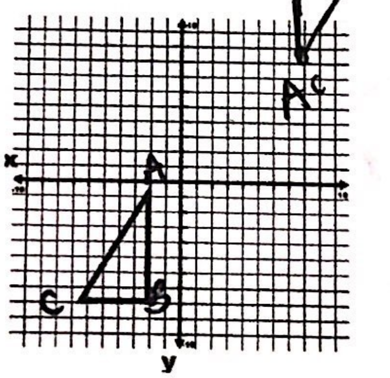
21. Rotate 270°*CC* about (-2, 1)



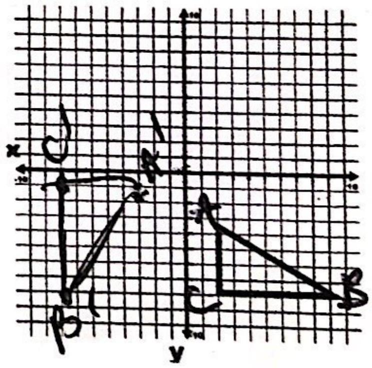
22. Rotate 270°*C* around (-8,1)



23. Rotate 180 °around (3,4)



24.Rotate 90°*CC* about (0, 0)



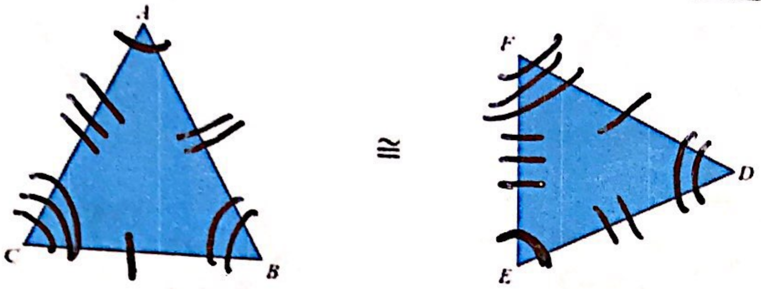
When doing all transformations we always start with the pre-image points A, B, C...

and then we plot the image points A', B', C'... (We call A - prime)

When a pre-image is translated, rotated, and reflected it is congruent to the image.

Unit 2 – Congruency: Congruence Symbol: $\cong$

What does it mean to be Congruent: same shape, same angle measures, same side lengths!



Congruency Statement: $\Delta ABC \cong \Delta EDF$

Using the given congruency statement, find the corresponding congruent parts:

$\Delta KLM \cong \Delta ARN$

25. $< K \cong \angle A$
26. $< N \cong \angle M$
27. $< R \cong \angle L$
28. $< M \cong \angle N$
29. $\overline{LM} \cong \overline{RN}$
30. $\overline{AR} \cong \overline{KL}$
31. $\overline{NA} \cong \overline{MK}$
32. $\overline{LK} \cong \overline{RA}$

■$LOPX \cong$ ■$ERCY$

33. $< P \cong \angle C$
34. $< E \cong \angle L$
35. $< R \cong \angle P$
36. $< Y \cong \angle X$
37. $\overline{LO} \cong \overline{ER}$
38. $\overline{CY} \cong \overline{PX}$
39. $\overline{OP} \cong \overline{RC}$
40. $\overline{XL} \cong \overline{YE}$

We can prove two shapes are congruent through transformations.

To do this we want to match:

Point to point by using translations

Line to line by using rotations

Plane to plane by using reflections

ne
engths!

< M ≅ <N

LK ≅ RA

Y ≅ <X

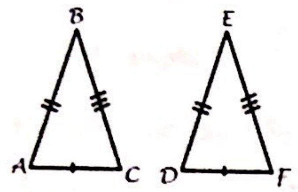
L ≅ YE

ns

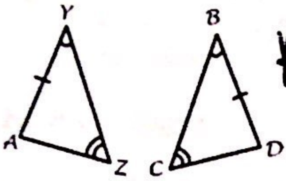
ns

Triangle Congruency Criteria: We can use a combo of sides and angles to prove triangles are congruent

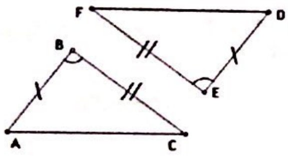
Triangle Criteria That Works:



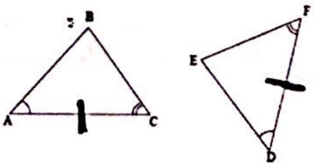
SSS



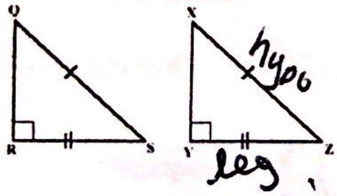
AAS



SAS

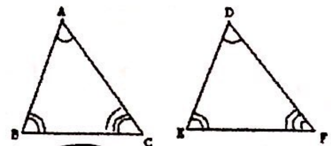


ASA

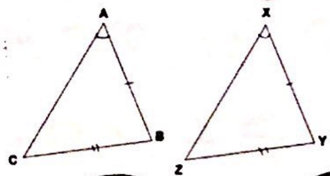


HL

Triangle Criteria That Does Not Work:



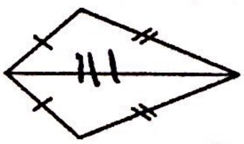
~~AAA~~ no roadside assistance!



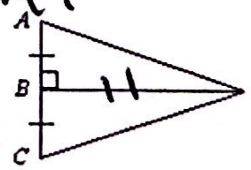
~~ASS~~ ~~SSA~~

No Donkey's here!

Reflexive Property: if side is shared, it must be congruent



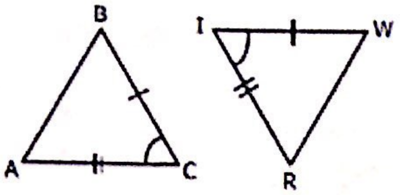
What criteria?
SSS proves congruent



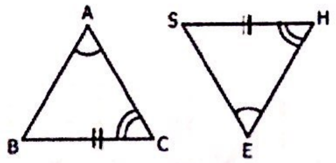
SAS

Determine if the following triangles are congruent. If so, state by which criteria:

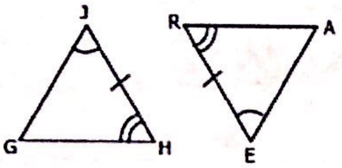
41. Congruent: YES or NO
Criteria: ______ SAS



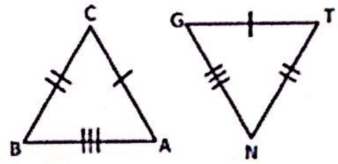
42. Congruent: YES or NO
Criteria: ______ AAS



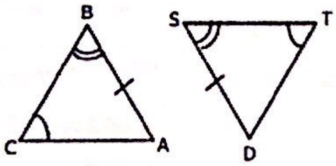
43. Congruent: YES or NO
Criteria: ______ ASA



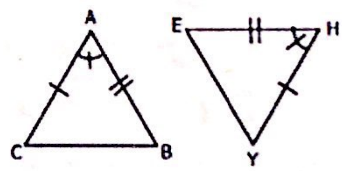
44. Congruent: YES or NO
Criteria: ______ SSS



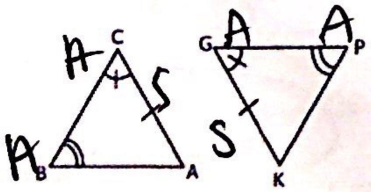
45. Congruent: YES or NO
Criteria: ______ AAS



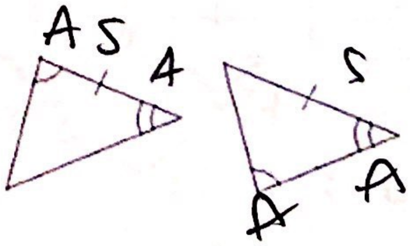
46. Congruent: YES or NO
Criteria: ______ SAS



47. Congruent: YES or NO
Criteria: ______ AAS



48. Congruent: YES or NO
Criteria: ______



different
criteria

Unit 3 – Linear, Quadratic, and Exponential Functions

Types of Functions:

Recursive Function: "Stairs" one step at a time need the previous term

Examples: $f(x) = f(x-1) + 5$

Explicit Function: "elevator" allows you to plug in x and get output directly

Examples: $f(x) = 3x + 2$

Rates of Change:

Quadratic Functions have linear rates of change. When looking at a table we will find that the 2^{nd} difference is constant

Examples: $f(x) = f(x-1) + 2x + 5$

x	-2	-1	0	1	2	3
y	22	6	0	4	18	42

-16 +10 -6 +4 +14 +24

+10 +10 +10

Linear Functions have constant rates of change. When looking at a table we will find that the 1^{st} Difference is constant

Examples: $f(x) = f(x-1) + 2$

x	-2	-1	0	1	2	3
y	-17	-11	-5	1	7	13

+6 +6 +6 +6 +6

Exponential Functions have multiplicative rates of change. When looking at a table we will find that there is a constant multipler.

Examples:

x	-2	-1	0	1	2	3
y	.25	.5	1	2	4	8

x2 x2 x2 x2 x2

Given the following tables determine if the following functions are quadratic, linear, exponential or neither:

49. Quadratic

x	-2	-1	0	1	2	3
y	1	0	1	4	9	16

-1 +1 +3 +5 +7

+2 +2 +2 +2 +2

50. Exponential

x	-2	-1	0	1	2	3
y	.04	.2	1	5	25	125

x5 x5 x5 x5 x5

51. Linear

x	-2	-1	0	1	2	3
y	-10	-5	0	5	10	15

+5 +5 +5 +5 +5

52. Quadratic

x	-2	-1	0	1	2	3
y	0	-2	-2	0	4	10

-2 +0 +2 +4 +6

+2 +2 +2 +2 +2

53. Linear

x	-2	-1	0	1	2	3
y	22	20	18	16	14	12

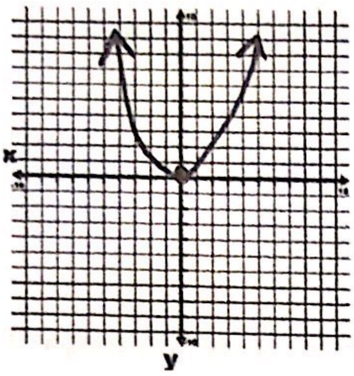
-2 -2 -2 -2 -2

Grap
Sketc
54. Q
Fun
We
Det
57.
60.

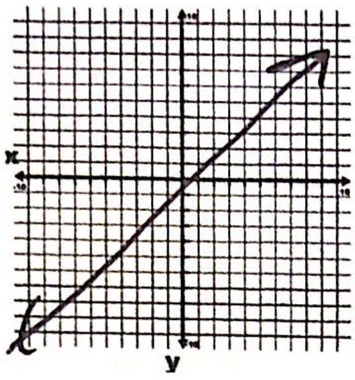
Graphs of functions:

Sketch an example of the following functions:

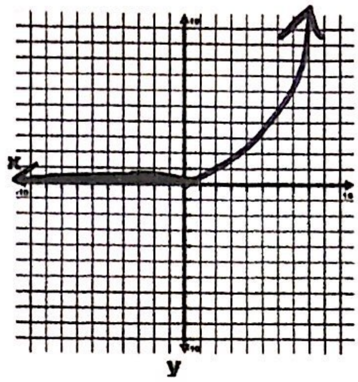
54. Quadratic Function



55. Linear Function



56. Exponential Function



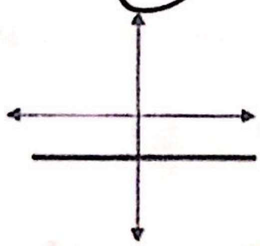
Function or Not a Function?

We can determine if we have a function by seeing if it passes the pencil test

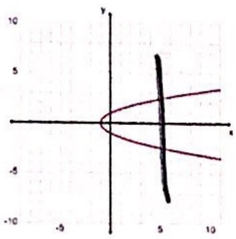
vertical line test

Determine if the following are a function.

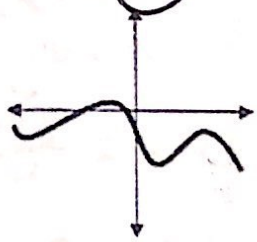
57. Function? YES or NO



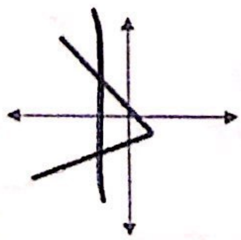
58. Function? YES or NO



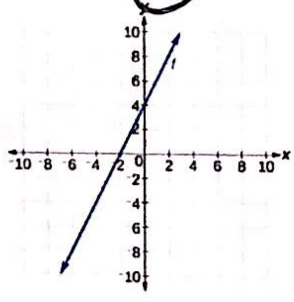
59. Function? YES or NO



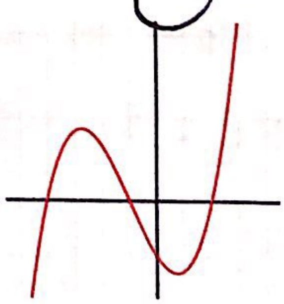
60. Function? YES or NO



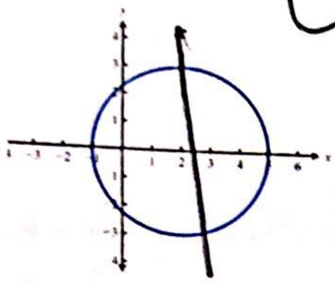
61. Function? YES or NO



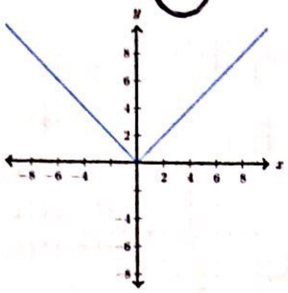
62. Function? YES or NO



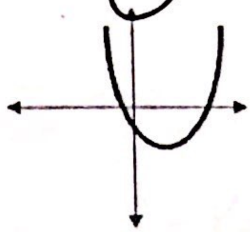
63. Function? YES or NO



64.Function? YES or NO



65. Function? YES or NO



Unit 4 – Structures of Quadratic Functions

Factoring:

When factoring we want to find numbers that multiply to back term

that also add to the middle term

Example: $x^2 - 2x - 8$

-2 | -8

-4+2 | 4 · 2

(x-4)(x+2)

Factor the following quadratics:

66. $x^2 + 8x + 12$

8 | 12

6+2 | 6·2

(x+6)(x+2)

67. $x^2 - x - 12$

| -12

-4+3 | 6 -2

4 · 3

(x-4)(x+3)

68. $x^2 + 6x - 16$

6 | -16

8-2 | 8 · -2

(x+8)(x-2)

69. $x^2 + 8x + 15$

8 | 15

5+3 | 5·3

(x+5)(x+3)

70. $x^2 - 11x + 24$

| 24

| 12·2

| -8·-3

(x-8)(x-3)

71. $x^2 + 5x - 14$

5 | -14

7-2 | 7·-2

(x+7)(x-2)

Complete

When co

Next we

Ex

Complet

72. y

(

74 y

(

76.

Complete the Square:
When completing the square we want to divide middle by 2

Next we want to. square that # and subtract from back term

Example: $y = x^2 - 12x + 28$ -36

$\frac{-12}{2} = -6^2 = 36$

$(x-6)^2$ -8

Complete the square for the following quadratics:

72. $y = x^2 + 12x + 20$ -36

$\frac{12}{2} = 6^2 = 36$

$(x+6)^2$ -16

73. $y = x^2 + 8x + 16$ -16

$\frac{8}{2} = 4^2 = 16$

$(x+4)^2$ $+0$

$(x+4)^2$

74 $y = x^2 - 10x - 15$ -25

$\frac{-10}{2} = (-5)^2 = 25$

$(x-5)^2$ -40

75. $y = x^2 - 18x + 80$ -81

$\frac{-18}{2} = (-9)^2 = 81$

$(x-9)^2$ -1

76. $y = x^2 + 4x + 3$ -4

$\frac{4}{2} = 2^2 = 4$

$\frac{4}{-2}$

$(x+2)^2$ -1

77. $y = x^2 - 16x + 200$ -64

$\frac{-16}{2} = -8 = 64$

$(x-8)^2$ $+136$

Vertex Form: We can describe transformations given the vertex form equation by using the following rules.

$$- \; a \; (x - h)^2 + k$$

Reflect over x-axis	$a > 1$ vertical stretch $a < 1$ vertical shrink	$-h$ Right h $+h$ left h	$+k$ up k $-k$ Down k

Vertex: (h , k)   LOS: x = h

☆ take opposite of h value!

State the transformations given the following quadratics:

78. $y = -2(x-1)^2 + 1$

- Reflect over x-axis
- vertical stretch by 2
- Right 1
- Up 1

79. $y = .25\,(x+3)^2 - 5$

- vertical shrink by .25
- Left 3
- Down 5

80. $y = -(x+6)^2 + 4$

- Reflect over x-axis
- Up 4
- Left 6

81. $y = 3(x-1)^2 - 2$

- vertical stretch by 3
- Right 1
- Down 2

82. $y = .5x^2 - 7$

- Vertical shrink by .5
- Down 7

83. $y = -(x+4)^2$

- Reflect over x-axis
- Left 4

Write the equation of the quadratic where the parent function has been translated:

84. Up 3, Left 6, Reflected over the x-axis: $-(x+6)^2+3$

85. Vertical Stretch by 5, Down 6, Right 2: $5(x-2)^2-6$

ok

86. Left 2, Reflect over the x-axis, Up 4: $-(x+2)+4$

87. Vertical Shrink of .75, Reflect over the x-axis, Up 7: $-.75x^2+7$

State the vertex and line of symmetry of the following:

88. $y = -2(x-1)^2+1$

Vertex: (1,1) LOS: X = 1

89. $y = .25\,(x+3)^2-5$

Vertex: (-3,-5) LOS: X = -3

90. $y = -(x+6)^2+4$

Vertex: (-6, 4) LOS: X = -6

91. $y = 3(x-1)^2-2$

Vertex: (1, -2) LOS: X = 1

92. $y = .5x^2-7$

Vertex: (0,-7) LOS: X = 0

93. $y = -(x+4)^2$

Vertex: (-4,0) LOS: X = -4

Graphing Quadratics: We can determine a quadratic function easily by looking at a graph!

<u>Quadratic Functions in Vertex Form:</u>

First we want to identify the location of the vertex (the highest or lowest point)

When putting it in the equation don't forget to change the sign of x

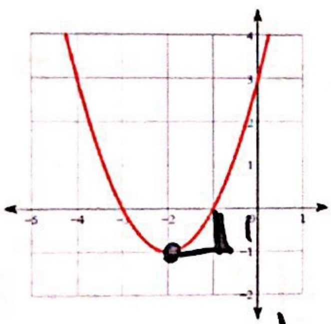
Next we want to determine if there have been any stretches|shrinks!

We can do this by going to vertex move over 1 and up/down = a!

Lastly, check for Reflections by looking to see if your graph is frowning

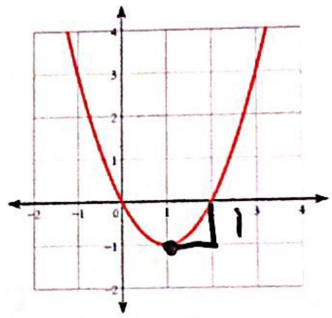
State the quadratic function for the following in Vertex Form:

93.



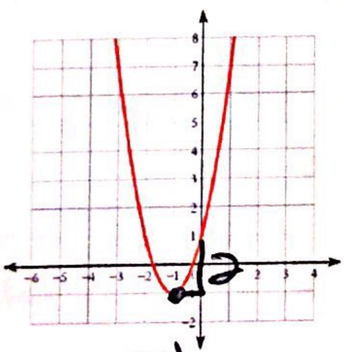
$(x+2)^2 - 1$

94.



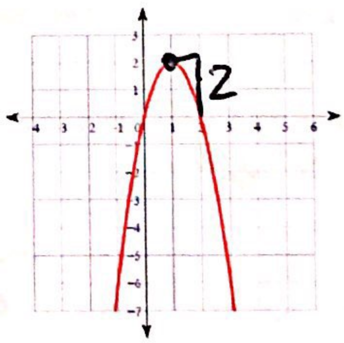
$(x-1)^2 - 1$

95.



$2(x+1)^2 - 1$

96.



$-2(x-1)^2 + 2$

Quadratic Functions in Factored Form:

First we want to identify where the function crosses the x-axis!

When putting it in factored form don't forget to change sign of x.

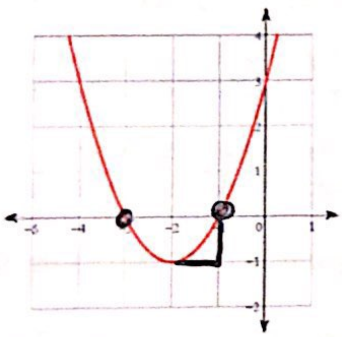
Next we want to determine if there have been any stretches/shrink!

We can do this by going to vertex over 1 and up/down 1!

Lastly, check for Reflections by looking to see if your graph is frowning

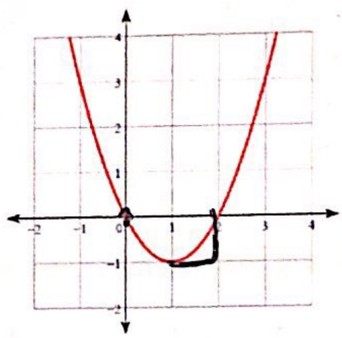
State the quadratic function for the following in Vertex Form:

97.



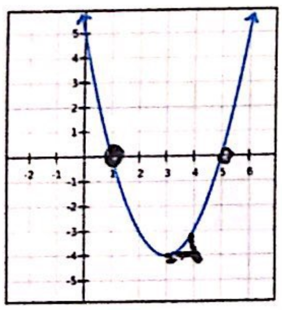
$(x+3)(x+1)$

98.



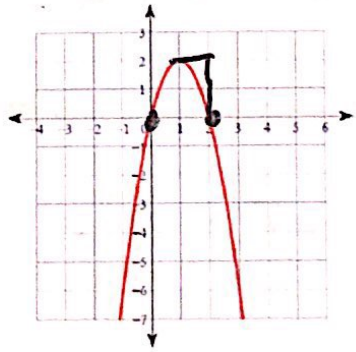
$(x)(x-2)$

99.



$(x-1)(x-5)$

100.



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

Unit 5 – Solving Quadratic Functions

Simplifying Radicals:

When simplifying radicals it is important that we make factor trees.

We want to look for pairs to leave radical.

Anything left stays underneath radical.

If multiple numbers are present in either location we must multiply.

Simplify the following radicals completely.

101. $\sqrt{250}$

25 10

5 5 5 2

$\boxed{5\sqrt{10}}$

102. $\sqrt{48}$

8 6

4 2 3 2

2 2

$2\cdot 2\sqrt{3}$

$\boxed{4\sqrt{3}}$

103. $\sqrt{-16}$

4 4

$\boxed{4i}$

104. $\sqrt{216}$

$\boxed{6\sqrt{6}}$

2 108

4 27

2 2 3 9

3 3

105. $\sqrt{45}$

5 9

3 3

$\boxed{3\sqrt{5}}$

106. $\sqrt{-98}$

2 49

7 7

$\boxed{7i\sqrt{2}}$

107. $\sqrt{-169}$

13 13

$\boxed{13i}$

108. $\sqrt{200}$

2 100

10 10

$\boxed{10\sqrt{2}}$

Looking at Quadratics in Standard Form: ax^2+bx+c

State the abc's of the following quadratic functions. (Make sure they're set =0 and be careful of signs!!

109. $4x^2 + 2x - 3 = 0$

a= 4 b= 2 c= -3

110. $15 + 6x^2 + 7x = 0$

$6x^2+7x+15$

a= 6 b= 7 c= 15

111. $10 + x^2 = 3$

x^2+7

a= 1 b= 0 c= 7

$-26x^2+3x+18$

112. $5x^2 - 3x + 9 = 0$

a= 5 b= -3 c= 9

113. $18 - 26x^2 + 3x = 0$

a= -26 b= 3 c= 18

114. $13 - 3x^2 = 14$

$-3x^2 - 1 = 0$

a= -3 b= 0 c= -1

115. *Let's Try Something New....*

Solve by moving to the left.

$3x^2 + 7x = -9$ $\quad 3x^2 + 7x + 9 = 0$

a= 3 b= 7 c= 9

Solve by moving to the right.

$3x^2 + 7x = -9$ $\quad 0 = -3x^2 - 7x - 9$

a= -3 b= -7 c= -9

What do you notice about the abc values? depending were you move, you have opposite signs!

(This is why our neighbors could have gotten different answers then us when we set equal to zero and yet we were both right! Neat huh?)

If I solved and got the following abc values, what else could our neighbor have gotten??

116. $a = 13$ $b = 22$ $c = -6$

a= -13 b= -22 c= 6

117. $a = -7$ $b = 5$ $c = 54$

a= 7 b= -5 c= -54

118. $a = 2$ $b = -12$ $c = 8$

a= -2 b= 12 c= -8

119. $a = 6$ $b = -14$ $c = 7$

a= -6 b= 14 c= -7

120. $a = 25$ $b = 32$ $c = -45$

a= -25 b= -32 c= 45

121. $a = 15$ $b = -1$ $c = 24$

a= -15 b= 1 c= -24

State the Quadratic Formula:

To help you remember, you could sing our song… or think about this story! *"There once was a negative boy who was unsure if he wanted to go to a radical party. But the boy was feeling squared and missed out on four awesome chicks! The party was not over until 2 am!*

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

Solving using the Quadratic Formula:

122. $x^2 + 16x + 68 = 0$

a= 1 b= 16 c= 68

$$x = \frac{-16 \pm \sqrt{(16)^2-4(1)(68)}}{2(1)}$$

$$x = \frac{-16 \pm \sqrt{-16}}{2} = \boxed{\frac{-16 \pm 4i}{2}}$$

123. $2x^2 - 7x + 6 = 0$

a= 2 b= -7 c= 6

$$x = \frac{7 \pm \sqrt{(-7)^2-4(2)(6)}}{2(2)}$$

$$x = \frac{7 \pm 1}{4} = \boxed{2, \frac{3}{2}}$$

124. $x^2 - 8x + 24 = 0$

a= 1 b= -8 c= 24

$$x = \frac{8 \pm \sqrt{(-8)^2-4(1)(24)}}{2(1)}$$

$$x = \frac{8 \pm \sqrt{-32}}{2} = \boxed{\frac{8 \pm i\sqrt{32}}{2}}$$

125. $2x^2 - 32 = 0$

a= 2 b= 0 c= -32

$$x = \frac{0 \pm \sqrt{(0)^2-4(2)(-32)}}{2(2)}$$

$$x = \frac{0 \pm \sqrt{256}}{4}$$

$$x = \frac{0 \pm 16}{4} = \boxed{4, -4}$$

Quadratic Applications:

126. If a rectangle has dimensions of (2x - 3) inches by (x +1) inches and an area of 12 square inches, what are the actual dimensions of the rectangle?

$(2x-3)(x+1)=12$

$2x^2-x-3=12$

$2x^2-x-15=0$

$x=\frac{1\pm\sqrt{(-1)^2-4(2)(-15)}}{2(2)}$

$x=3$ plug in!

$\boxed{3 \times 4}$

127. If a rectangle has dimensions of (x) inches by (x +5) inches and an area of 22 square inches, what are the actual dimensions of the rectangle?

$x(x+5)=22$

$x^2+5x=22$

$x^2+5x-22=0$

$x=\frac{-5\pm\sqrt{(5)^2-4(1)(-22)}}{2(1)}$

$x=2.82$

plug in!

$\boxed{2.82 \times 7.82}$

128. If a rectangle has dimensions of (x + 2) inches by (x – 6) inches and an area of 30 square inches, what are the actual dimensions of the rectangle?

$(x+2)(x-6)=30$

$x^2-4x-12=30$

$x^2-4x-42=0$

$x=\frac{4\pm\sqrt{(4)^2-4(1)(-42)}}{2(1)}$

$x=\frac{-16\pm 4i}{2}$

Imag

Hmm... not going to work here!

129. If a rectangle has dimensions of (x + 4) inches by (x – 3) inches and an area of 44 square inches, what are the actual dimensions of the rectangle?

$(x+4)(x-3)=44$

$x^2+x-12=44$

$x^2+x-56=0$

$x=\frac{-1\pm\sqrt{(1)^2-4(1)(-56)}}{2(1)}$

$x=7$ plug in!

$\boxed{11 \times 4}$

130. I have completed my review and have asked Mrs. Adkins any questions I had.

YES or NO

you got this!

Good Luck!