Quadratics in Factored Form – Unit 2

Tentative TEST date_____

Reflect – previous TEST mark _____, Overall mark now_____.
Looking back, what can you improve upon?

Learning Goals/Success Criteria

Use the following checklist to help you determine what you know well and where you need additional review.

DAYS & Pages	Can you…	No, I cannot. I need to learn this.	I kind of get it. I don't get the right answers very often.	I get it. I could work on being more consistent.	Yes, I can. I have perfected this!
Day 1 Pg 2	Expand binomials?	☐	☐	☐	☐
Day 2 Pg 3-4	Convert vertex form to standard form?	☐	☐	☐	☐
	Identify the key features of a quadratic in vertex form?	☐	☐	☐	☐
	Identify the key features of a quadratic in standard form?	☐	☐	☐	☐
Day 3 Pg 5-6	Common factor?	☐	☐	☐	☐
	Factor using difference of squares?	☐	☐	☐	☐
Day 4 Pg 7	Factor using sum & product?	☐	☐	☐	☐
Day 5 Pg 8	Factor using more than one factoring method at a time?	☐	☐	☐	☐
Day 6 Pg 9-10	Identify the key features of a quadratic in factored form?	☐	☐	☐	☐
	Convert factored form to standard form?	☐	☐	☐	☐
Day 7 & 8 Pg 11-13	Solve problems involving factored form equations?	☐	☐	☐	☐
Day 9 Pg 14-15	Find vertex from vertex form?	☐	☐	☐	☐
	Find vertex from factored form?	☐	☐	☐	☐
	Find vertex from standard form?	☐	☐	☐	☐
	Find max/min from any form of a quadratic given as a word problem?	☐	☐	☐	☐
Day 10 Pg 16-19	REVIEW	☐	☐	☐	☐

DAY 1 – Expanding Binomials

1. Expand each of the following using the method of your choice.

a. $(x+7)(x+2)$	b. $(x-3)(x+3)$	c. $(x-5)^2$
d. $(3x+1)(x-5)$	e. $(2x+3)^2$	f. $(x-1)(x+3)$
g. $(x+7)^2$	h. $(x+4)(x+12)$	i. $(4x+1)(2x-3)$
j. $x(x+8)$	k. $(3x+5)(4x+7)$	l. $(6x-1)(x+4)$
m. $(x+5)(x-5)$	n. $(9x-1)^2$	o. $(2x-9)(2x+9)$

DAY 2 – Converting Vertex Form to Standard Form

1. Write each equation in standard form.

   a. $y=(x+2)^2+3$ b. $y=2(x-1)^2$ c. $y=-(x+4)^2-1$

2. Determine whether the equations in each set are equivalent.

   a. $y=(x+2)^2$ and $y=x^2+4$

   b. $y=-(x+1)^2+3$ and $y=-x^2-2x-4$

   c. $y=3(x-2)^2-4$ and $y=3x^2-12x+8$

3. a. Which relation has the same graph as $y=2x^2-12x+19$?

   i. $y=2(x-2)^2+17$

   ii. $y=2(x-2)^2+11$

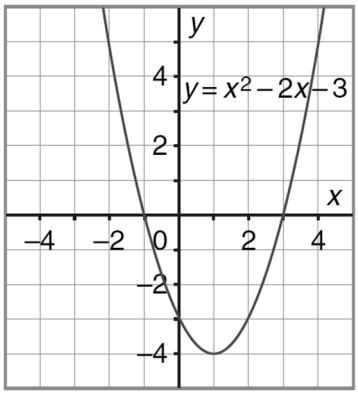
   iii. $y=2(x-3)^2+1$

   Justify your choice.

   b. Determine the coordinates of the vertex for the parabola $y=2x^2-12x+19$. _____

   Explain how you determined these coordinates.

4. The graph of the parabola $y = x^2 - 2x - 3$ is shown.



   a. What are the coordinates of the vertex? _____

   b. Write the equation in vertex form.

   c. Check that the equation in part b is correct by converting it to standard form.

5. $h = -5(t - 0.6)^2 + 11.8$ represents height, in m, of a diver above the water, where t is time, in sec, since the person left the 10 m high platform.

   a. What is the maximum height?

   b. How long after the diver left the platform does she reach her maximum height?

   c. What is the y-intercept (h-int) and what does it represent?

DAY 3 – Common Factoring and Difference of Squares

1. Common factor each of the following.

a. $6x + 8$	b. $6x - 2$	c. $5x + 10$	d. $-3x + 9$
e. $-15x - 25$	f. $2x^2 - 4$	g. $2x^2 + 6x$	h. $-2x^2 - 3x$
i. $3x^2 + 27x$	j. $3x^2 + 3x + 12$	k. $-x^2 + 1x$	l. $12x^2 + 3x - 9$

2. Factor each of the following using difference of squares.

a. $x^2 - 9$	b. $x^2 - 16$	c. $x^2 - 64$	d. $x^2 - 121$
e. $4x^2 - 25$	f. $16x^2 - 81$	g. $x^2 - 1$	h. $9x^2 - 49$
i. $64x^2 - 1$	j. $169x^2 - 25\,y^2$	k. $36x^2 - 25$	l. $64\,a^2 - 81\,b^2$

3. Factor each of the following using the most appropriate method.

a. $50x^2 - 5$	b. $6x^2 - 18x + 24$	c. $4x^2 - 49$	d. $81x^2 - 25$
e. $-x^2 - 3x - 2$	f. $6x - 12$	g. $-2x^2 - 4x - 12$	h. $8x^2 - 40$
i. $81x^2 - 25$	j. $25x^2 - 64$	k. $3x^2 - 15x + 21$	l. $36x^2 - 27x + 3$
m. $100x^2 - 1$	n. $-2x^2 + 6$	o. $36x^2 - 12$	p. $3x^3 - 2x^2 + 1x$

DAY 4 – Sum Product Factoring

1. Factor each of the following using the sum & product method.

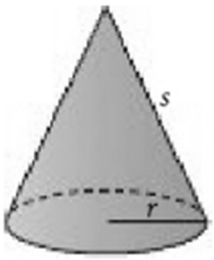
a. $x^2 + 7x + 12$	b. $x^2 - 1x - 12$	c. $x^2 + 13x + 12$
d. $x^2 - 5x - 24$	e. $x^2 + 3x - 88$	f. $m^2 - 9m - 112$
g. $a^2 - 5a - 36$	h. $x^2 - 13x + 30$	i. $a^2 + 10a + 21$
j. $x^2 + 3x + 2$	k. $x^2 - 10x + 25$	l. $x^2 + x - 30$
m. $y^2 - 5y - 14$	n. $x^2 - 13x + 36$	o. $a^2 + 7a + 10$

DAY 5 – Mix of Factoring

1. Factor each of the following fully.

a. $-x^2 + 7x - 12$	b. $3x^2 - 3$	c. $32x^2 - 200$
d. $48x^2 - 27y^2$	e. $3a^2 - 36a - 39$	f. $5x^2 + 10x + 5$
g. $4x^2 + 28x + 24$	h. $8e^2 - 50$	i. $2y^2 - 6y - 8$

2. The surface area of a cone is given by the formula $SA = \pi r^2 + \pi rs$.



   a. Factor the expression for the surface area.

   b. Five cones all have a radius of 20 cm. Their slant height, *s*, is given in the table. Find the surface area of each cone.

Slant Height (cm)
40
45
50
55
60

   c. A cone has a slant height that is 3 times its radius. Use your answer to part (a) to write a simpler form of the expression for the surface area for this cone.

DAY 6 – Quadratics in Factored Form

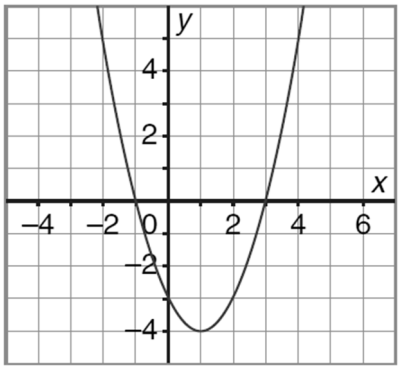
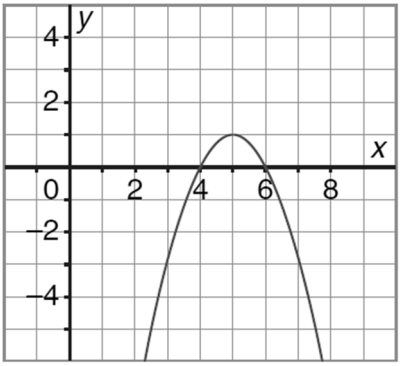
1. Determine the zeros of the graph of each equation.

a. $y=(x-2)(x-5)$	b. $y=(x-7)(x+1)$	c. $y=x(x-10)$

2. Write each equation in factored form. Then determine the zeros of its graph.

a. $y=x^2-10x+9$	b. $y=x^2-4$	c. $y=x^2-9x$

3. Write the equation of each quadratic relation in factored form. Expand each to standard form.

	a. 	b. 
Factored Form		
Standard Form		

4. The equation of a quadratic relation in standard form is $y = 4x^2 - 24x + 36$.

   a. Use the factored form of the equation to explain why the graph of the relation has only one *x*-intercept.

   b. What is the *x*-intercept? _____

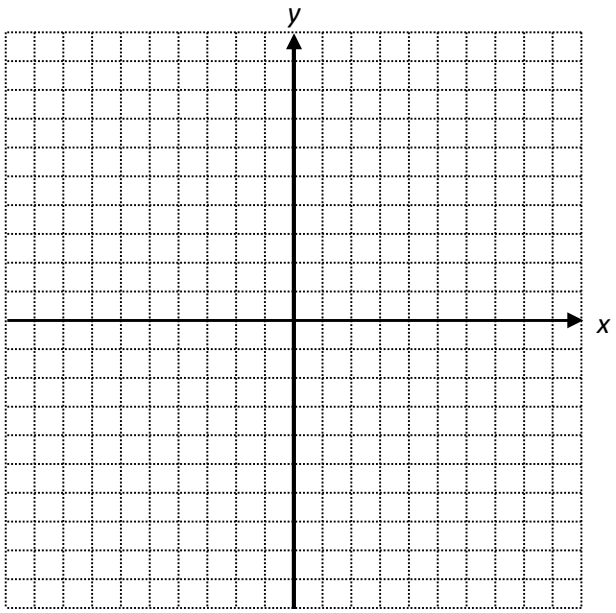
   How would the graph show this? _____

   _____

5.

   a. Sketch the graph of $y = x^2 + 4$ for *x* from –3 to 3.

x	$x^2 + 4$	*y*
–3		
–2		
–1		
0		
1		
2		
3		



   b. Use the graph to explain why $y = x^2 + 4$ cannot be written in factored form

DAY 7 & 8 – Solve Problems

1. A fireworks company is testing a new firework rocket. Once it explodes in the air, its path can be modelled by the relation $h = -4.9t^2 + 44.1t$, where *h* is the rocket's height, in metres, and *t* is the time, in seconds. When will the rocket hit the ground?

2. The speed of a turbine aircraft engine is controlled by a power setting, *x*. The length of time, *t*, in hours, that the engine will run on a given amount of fuel at power setting *x* is given by the relation $t = -0.2x^2 + 3.2x - 5.6$. Find the zeros of the relation.

3. In July 2005, professional skateboarder Danny Way jumped over the Great Wall of china. His path can be modelled by the relation $h = -0.05d^2 + 1.15d$, where *h* is his height above the Great Wall and *d* is his horizontal distance from the take-off ramp, both in metres. Determine the distance between Danny's take-off and landing.

4. The equation $h = -5(t-1)^2 + 7.5$ models the height, *h* metres, of a baseball *t* seconds after it is thrown.
   a. What is the maximum height of the ball? _____
   b. How long does it take for the ball to reach its maximum height? _____
   c. Write an equivalent equation in standard form.

   d. From what height is the ball thrown? _____
      How do you know? _____

5. A student council wants to raise money by selling tickets to a dinner. The income, *T* dollars, for the evening depends on the number *n* of students who buy tickets, according to the equation $T = \frac{1}{10}n^2 + 10n - 2000$.
   a. Find the income if 100 students buy tickets.

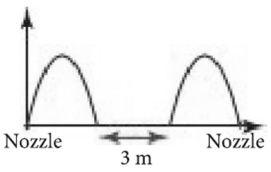
   b. What is the income if no tickets are sold? What might this represent?

   c. Factor the equation.

   d. How many tickets must the student council sell to make a profit? _____

6. The equation $h = -5t^2 + 20t + 25$ gives the height, *h* metres, of a flare *t* seconds after it is fired. For how long is the flare in the air?

7. A fountain will have two identical jets of water side-by-side. The horizontal distance between the streams of water is 3m. The path of water from the jet on the left is modelled by the relation $h = -1.5(d-1)^2 + 1.5$, where *h* is the height of the water and *d* is the horizontal distance from the nozzle, both in metres.



   a. Find the horizontal distance from the left nozzle to where the water hits the ground.

   b. Determine the horizontal distance between the nozzles for the two jets.

DAY 9 – Finding the Vertex of a Quadratic

Practice FACTORED FORM

Complete the chart.

Quadratic	Zeros or x-int	x (axis of symm)	y (optimal val or max/min value)	Vertex and vertex Form	Convert to standard form	y-int
1. $y=(x+1)(x-5)$						
2. $y=-(x-4)(x+2)$						

Practice STANDARD FORM

Complete the chart.

Quadratic	y-int	Zeros or x-int	x (axis of symm)	y (optimal val or max/min value)	Vertex and vertex form
3. $y=x^2-25$					
4. $y=-2x^2+4x+16$					

Practice VERTEX FORM

Complete the chart.

Quadratic	Vertex	Is the vertex a max or a min?	Convert to standard form
5. $y = (x+3)^2 - 6$			
6. $y = -x^2 + 10$			
7. $y = 2(x+1)^2$			

8. A path of a kicked soccer ball is given by $h = -0.025d^2 + d$, where d is horizontal distance, in m, from the point where the ball was kicked and h is the height of the ball above the ground.

    a. When the ball touches the ground again, how far away is it?

    b. What is the maximum height reached by the ball?

9. The path of a tennis ball can be modelled by the function $y = -0.02x^2 + 0.26x + 0.6$, where x is the horizontal distance from the player, in m, and y is the height above the ground, in m.

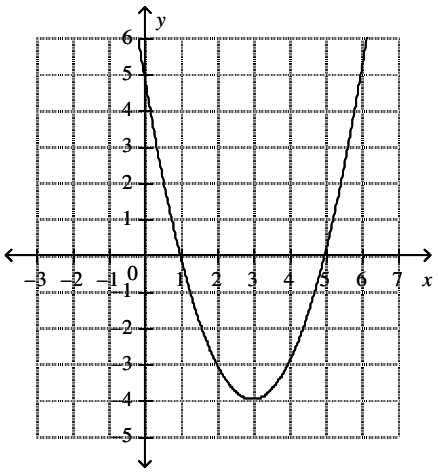
    a. Find where the ball will hit the ground.

    b. Find the maximum height the ball reaches

REVIEW

1. Using the graph (right),
   a. state the zeros of the parabola: _____

   b. Find the value of ′a′ for the parabola:



   c. state the equations of the parabola using both vertex and factored forms

2. Expand each of the following.
   a. $(5x-4)(x+1)$
   c. $(3x+2)^2$
   e. $(4x-1)(6x+1)$
   b. $(x+7)(x-7)$
   d. $(6x-1)(2x+5)$
   f. $(8x-3)^2$

3. Convert each of the following equations in vertex form to standard form.
   a. $-(x+7)^2+5$
   b. $3(x-1)^2-4$

4. Factor each of the following using the most appropriate method.

a. $4x^2+28x+16$

b. x^2-25

c. x^2-8x+7

d. $-15x^6+25x^4-30x^2$

e. $4x^2-100$

f. $x^2-3x-18$

g. $8x^2-40x-24$

h. $36x^2-1$

i. $x^2+20x+100$

5. Factor each of the following. Check for multiple methods.

a. $3x^2-3$

b. $5x^2-15x-50$

c. $12x^2-27$

d. $-3x^2-18x-15$

e. $4x^2+24x+36$

f. $50x^2-2$

6. Convert each of the following equations in standard form to factored form **AND** state the zeros of the relation.

a. $y=9x^2-4$

b. $y=2x^2+16x+14$

c. $y=x^2-12x+11$

d. $y=13x^2+39x$

7. Given the equation for a parabola in vertex form, $y = 2(x - 1.5)^2 - 0.5$,

   a. state the key features known from vertex form

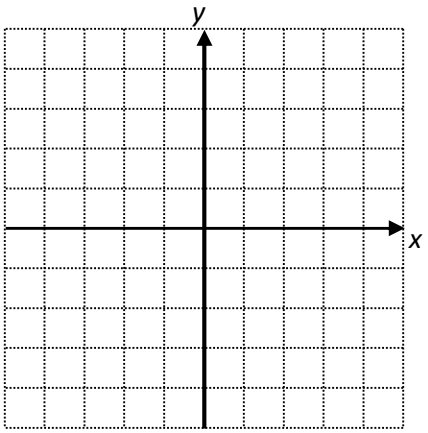
   b. convert to standard form

   c. state the key features known from standard form

   d. convert to factored form (start with standard form)

   e. state the key features known from factored form

   f. use the key features collected to graph the parabola



8. The height h metres of an infield fly ball t seconds after being hit is modelled by the quadratic relation $h = 30t - 5t^2$.
   a. How long is the ball in the air?

   b. What was the maximum height? When does maximum height occur?

9. Write an expression, in factored form, for the area of the figure shown below.