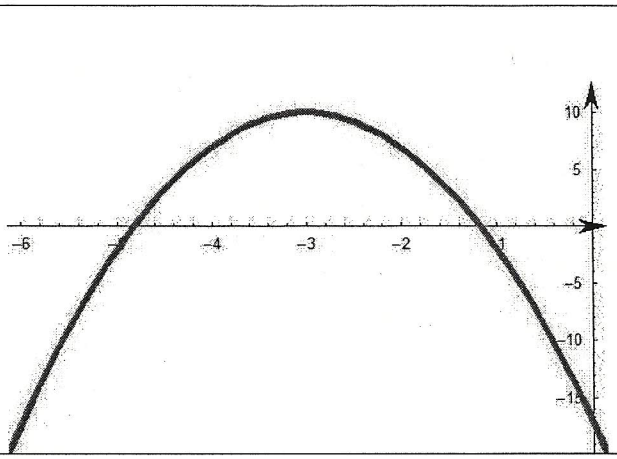
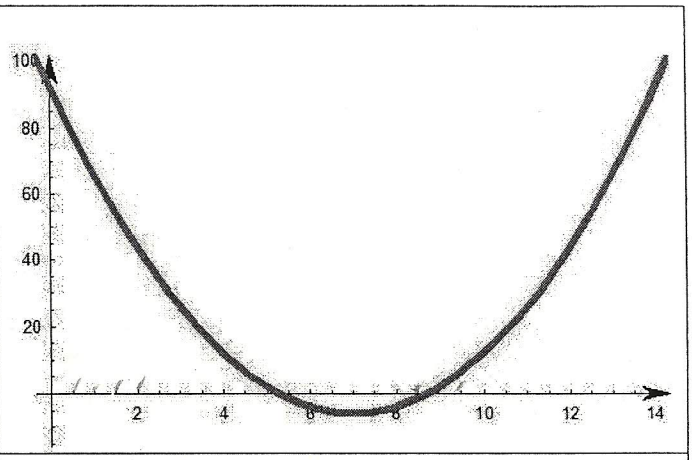
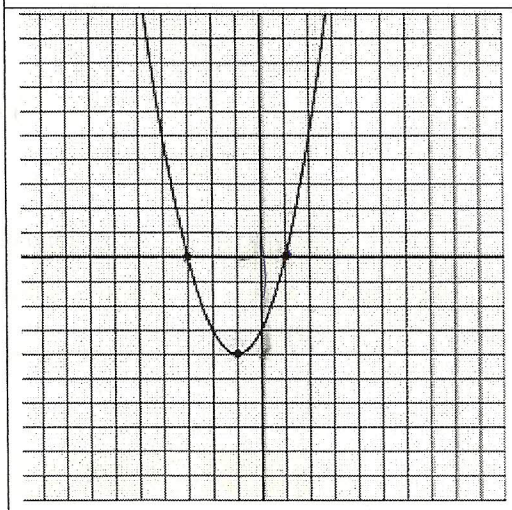
QUADRATICS TEST REVIEW

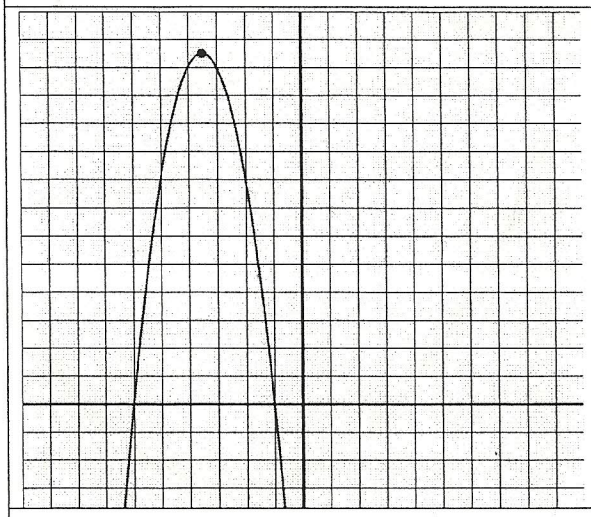
Name: TEACHER ANSWER KEY

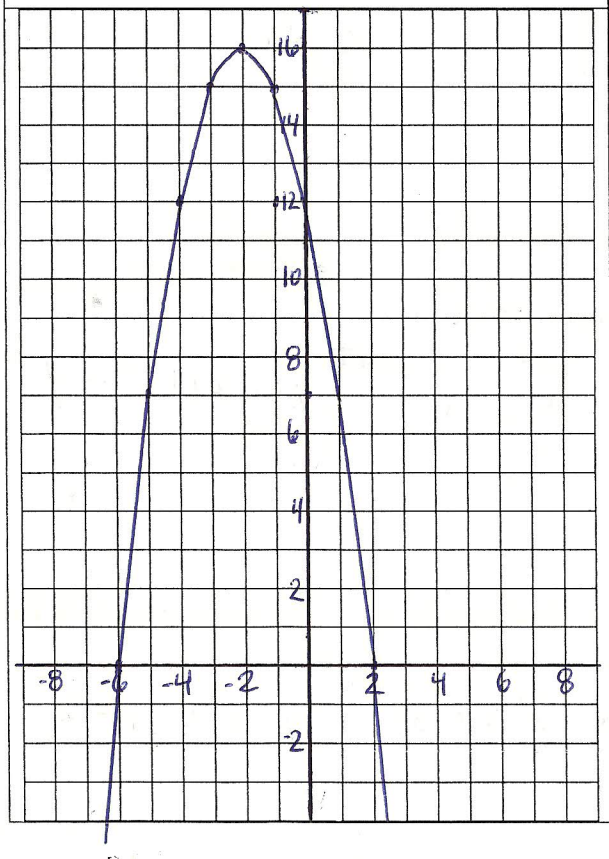
1. **For the following parabolas, fill in the table which follows.**

Parabola Graph		
Vertex	(3,10)	(7,-5)
Optimal Value	10	-5
Axis of Symmetry	x=3	x=7
Zeroes	(-1.2,0) & (-4.8,0)	(5.25,0) & (8.75.0)
Direction of Opening	down	up
Y – intercept	-17	92.5

2. **Complete the table.**

Parabola Graph	**Describe Translation**	**Equation (Vertex Form)**
	translated to the left 1 unit and down 4 units	$y=(x+1)^2-4$
	Equation (Factored Form)	**Equation (Standard Form)**
	$y=(x-1)(x+3)$	$y=x^2+2x-3$

Parabola Graph	Describe Translation	Equation (Vertex Form)
	• reflected in the x axis • stretched by a factor of 2 • translated 3.5 units to the left • translated 12.5 units up.	$y=-2(x+3.5)^2+12.5$
	Equation (Factored Form) $y=-2x^2-14x-12$ $y=-2(x^2+7x+6)$ $y=-2(x+6)(x+1)$	**Equation (Standard Form)** $y=-2(x+3.5)(x+3.5)+12.5$ $y=-2(x^2+7x+12.25)+12.5$ $y=-2x^2-14x-24.5+12.5$ $y=-2x^2-14x-12$

Parabola Graph	Describe Translation	Equation (Vertex Form) vertex: (-2, 16)
	• reflected in x-axis • translated 2 units to the left • translated 16 units up.	① The zeros are (-6, 0) & (2, 0) ② The axis of symmetry: $\frac{-6+2}{2}=\frac{-4}{2}$ $=-2$ ∴ axis of sym is $x=-2$ ③ sub $x=-2$ into equation: $y=-x^2-4x+12$ $y=-(-2)^2-4(-2)+12$ $y=-4+8+12$ $y=16$ ④ equation in V. form ⇒ $y=-(x+2)^2+16$
	Equation (Factored Form) $y=-(x+6)(x-2)$	**Equation (Standard Form)** $y=-(x^2+6x-2x-12)$ $y=-(x^2+4x-12)$ $y=-x^2-4x+12$

3. **A ball is hit into the air. Its height, h in metres after t seconds is $h = -5(t-4)^2 + 120$.**

a) In which direction does the parabola open?

down

b) What are the coordinates of the vertex?

(4, 120)

c) What does the vertex represent?

That the ball reaches it's maximum height of 120 m after 4 seconds.

d) From what height was the ball hit?

The ball is "hit" when t (or time) is 0.

$h = -5(t-4)^2 + 120$

$h = -5(0-4)^2 + 120$

$h = -5(-4)^2 + 120$

$h = -5(16) + 120$

$h = 40$ m

∴ the ball was hit from a height of 40 m.

e) Find one other point on the parabolic curve and interpret its meaning.

I will solve for the height of the ball when the time is 2 seconds.

$h = -5(t-4)^2 + 120$

$h = -5(2-4)^2 + 120$

$h = -5(-2)^2 + 120$

$h = -5(4) + 120$

$h = -20 + 120$

$h = 100$

∴ after 2 seconds, the ball is 100m high.

4. **The equation P = - 0.2(n – 600)(n – 90) describes a company's profit P, based on how many units are sold, n.**

a) **What are the break even points of the company?**

→ occur at the zeros:

(90, 0) & (600, 0)

only need to do this to solve question

b) **How many units must be sold to make a maximum profit?**

→ Maximum occurs at the vertex. (Need to find)

① axis of symm:

$\frac{90+600}{2} = 345$

∴ axis of sym is when $x = 345$

② sub $x = 345$ into equation.

$P = -0.2(345-600)(345-90)$

$P = -0.2(-255)(255)$

$P = \$13005$

∴ max profit is $13005 and you need to sell 345 units.

c) **What is the profit when no units are sold?**

sub "0" in for n:

$P = -0.2(n-600)(n-90)$

$P = -0.2(0-600)(0-90)$

$P = -0.2(-600)(-90)$

$P = \$-10\,800$

∴ the maximum profit when no units are sold is $-10 800.

d) **Describe a scenario where your solution could make sense in terms of the question asked.**

The solution in (c) makes sense because even if you sell no units in a day, you still have to cover costs such as employees, suppliers, hydro, etc. Therefore, you would be out $10 800.

5. **A soccer ball is kicked from ground level. When it has traveled 35 m horizontally, it reaches its maximum height of 25 m. The soccer ball lands on the ground 70 m from where it was kicked.**

a) Model this situation with a relations in the form $y = a(x-h)^2 + k$

(1) What I know:

Vertex: (35, 25)

zero: (70, 0)

$y = a(x-35)^2 + 25$

↑ need to solve for "a" to get the multiplier

(2) sub one other point, (70, 0) into equation to solve.

$y = a(x-35)^2 + 25$

$0 = a(70-35)^2 + 25$

$-25 = 1225a$

$\frac{-25}{1225} = a$

$-0.02 = a$

∴ equation is $y = -0.02(x-35)^2 + 25$

b) What is the soccer ball's height when it is 50 m from where it was kicked?

$y = -0.02(x-35)^2 + 25$

$y = -0.02(50-35)^2 + 25$

$y = -0.02(15)^2 + 25$

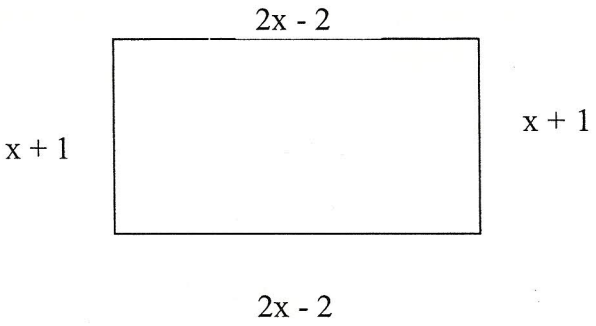
$y = -0.02(225) + 25$

$y = -4.5 + 25$

$y = 20.5$ m

∴ the balls height is 20.5 m.

6. **Find the area and perimeter of the rectangle shown.**



$A = LW$

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

$= 2x^2 - 2x + 2x - 2$

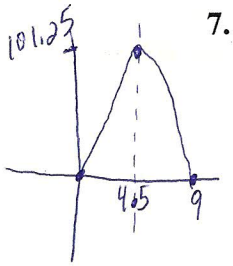
$= 2x^2 - 2$

Perimeter $= 2L + 2W$

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

$= 4x - 4 + 2x + 2$

$= 6x - 4$



7. **A projectile is fired straight up from the ground. It reaches a maximum height of 101.25 m after 4.5 s. Then, it falls to the ground 4.5 s later.**

a) **Write a relation that models this situation.**

① $y = a(x-4.5)^2 + 101.25$

② sub point (9,0) into equation to solve for a.

③ $0 = a(9-4.5)^2 + 101.25$

$-101.25 = a(4.5)^2$

$\frac{-101.25}{20.25} = a$

$-5 = a$

④ The relation is:

$y = -5(x-4.5)^2 + 101.25$

b) **What is the height of the projectile after 3 seconds?**

Sub 3 into equation for x:

$y = -5(x-4.5)^2 + 101.25$
$y = -5(3-4.5)^2 + 101.25$
$y = -5(-1.5)^2 + 101.25$
$y = -5(2.25) + 101.25$
$y = -11.25 + 101.25$
$y = 90$

∴ after 3 seconds, the ball is 90 m high

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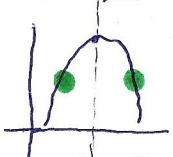
c) **Is there another time that the projectile is the same height above the ground? Explain.**

Yes, because a parabola is symmetrical, so except for the vertex, the are 2 values of x for every value of y.



d) **<u>Prove</u> your answer above. [Do the Math to show at what time the projectile would be the same height as your solution in (b)]**

I need to find the "other" value for x when y = 90.

$90 = -5(x-4.5)^2 + 101.25$

$90 - 101.25 = -5(x-4.5)^2$

$\frac{-11.25}{-5} = (x-4.5)^2$

$\sqrt{2.25} = \sqrt{(x-4.5)^2}$

$1.5 = x - 4.5$

$6 = x$

∴ the projectile would have the same height (90m) at 3 seconds and at 6 seconds.