

KNOWLEDGE (KU)		/33
APPLICATION (AP)		/12
THINKING (TI)		/11
COMMUNICATION (CO)		level

Name: ANSWERS

**Test #2 Graphs of Quadratic Relations**

**Knowledge & Understanding (KU)**

1. Determine the degree of each relation. Determine whether the relation is linear, quadratic or neither.

a.)  $y = x(x + 4)$

$y = x^2 + 4x$  ✓  
degree = 2 ✓  
∴ quadratic ✓

b.)  $y = 2x^3 - 4x^2 + 5x - 1$

degree = 3 ✓  
∴ neither ✓

Out of 5

2. Calculate the differences for each of the following tables. Determine whether the relation is linear, quadratic or neither.

a.)

X	Y	1st
-2	-4	
-1	-9	-5
0	-14	-5
1	-19	-5
2	-24	-5

∴ linear ✓

b.)

X	Y	1st	2nd
0	4		
1	8	+4	-10
2	2	-6	+14
3	10	+8	-18
4	0	-10	

∴ neither ✓

Out of 5

3. For the graph below, state the y-intercept, the zeros, the coordinates of the vertex, the equation of the axis of symmetry.

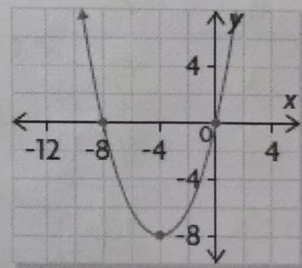
y-int (0, 0) ✓

zeros 0 & -8 ✓

vertex (-4, -8) ✓

A.O.S.  $x = -4$  ✓

Out of 5



4. A quadratic relation has an equation of the form  $y = a(x-t)(x-s)$ . Determine the value of  $a$  when the parabola has  $x$ -intercepts at  $(5, 0)$  and  $(-3, 0)$  and a maximum value of 6.

$x$  of the vertex =  $\frac{s+t}{2}$   
 $= \frac{(5)+(-3)}{2}$   
 $= \frac{2}{2}$   
 $= 1$

$\therefore$   
 $x = 1$   
 $y = 6$   
 $s = 5$   
 $t = -3$   
 $a = ?$

$$y = a(x-s)(x-t)$$

$$(6) = a(1-5)(1+3)$$

$$6 = a(-4)(4)$$

$$\frac{6}{-16} = \frac{-16a}{-16}$$

$$\frac{-6}{16} = a$$

$$\frac{-3}{8} = a$$

$$-0.375 = a$$

Out of 6

5. Expand & simplify.

a.)  $4(x-6)(x+7)$   
 $= (4x-24)(x+7)$   
 $= 4x^2 + 28x - 24x - 168$   
 $= 4x^2 + 4x - 168$

b.)  $(4x-1)(4x+1) - (x+3)^2$   
 $= 16x^2 + 4x - 4x - 1 - (x^2 + 3x + 3x + 9)$   
 $= 16x^2 - 1 - (x^2 + 6x + 9)$   
 $= 16x^2 - 1 - x^2 - 6x - 9$   
 $= 15x^2 - 6x - 10$

Out of 7

6. Create a table of values for one parabola that goes through the point  $(1, 5)$ . How do you know that the table of values represents a parabola?

X	Y	1st	2nd
0	2		
1	5	+3	+1
2	9	+4	+1
3	14	+5	+1
4	20	+6	+1

Out of 5

Since the 2<sup>nd</sup> diff. are constant, the table of values represents a parabola

**Application (AP)**

1. Write a simplified expression for the area of the figure. (Hint:  $A = \frac{(a+b)h}{2}$ )

$$A = \frac{(a+b)h}{2}$$

$$A = \frac{[(x+1) + (3x+1)](2x+2)}{2}$$

$$A = \frac{(x+1+3x+1)(2x+2)}{2}$$

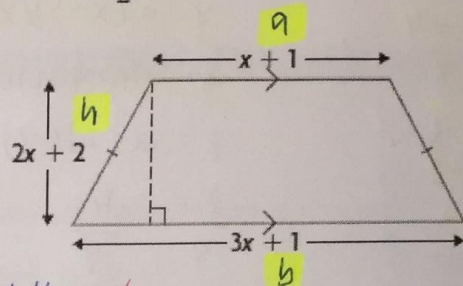
$$A = \frac{(4x+2)(2x+2)}{2}$$

$$A = \frac{8x^2 + 8x + 4x + 4}{2}$$

$$A = \frac{8x^2 + 12x + 4}{2}$$

$$A = \frac{8x^2}{2} + \frac{12x}{2} + \frac{4}{2}$$

$$A = 4x^2 + 6x + 2$$



Out of 4

2. Rahj owns a hardware store. For every increase of 10¢ in the price of a package of batteries, he estimates that sales decrease by 10 packages per day. The store normally sells 700 packages of batteries per day, at \$5.00 per package.

- a.) Determine an equation for the revenue,  $y$ , when  $x$  packages of batteries are sold.  
 b.) How many packages of batteries are sold when the revenue is at a maximum?

a.) revenue = (cost of 1 battery package) (# of battery packages)

$$y = (5 + 0.10x)(700 - 10x)$$

b.)  $y = (5 + 0.10x)(700 - 10x)$

Let  $y = 0$

$$0 = (5 + 0.10x)(700 - 10x)$$

$$0 = 5 + 0.10x$$

$$\frac{-5}{0.10} = \frac{0.10x}{0.10}$$

$$-50 = x$$

$$0 = 700 - 10x$$

$$\frac{-700}{-10} = \frac{-10x}{-10}$$

$$70 = x$$

∴ zeros are -50 & 70

Out of 8

$x$  of the vertex =  $\frac{s+t}{2}$

$$= \frac{-50 + 70}{2}$$

$$= 10$$

∴ # of batteries =  $700 - 10x$

$$= 700 - 10(10)$$

$$= 700 - 100$$

$$= 600$$

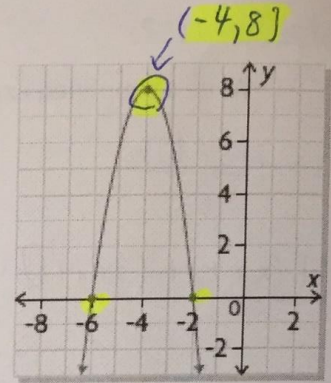
∴ 600 battery packages sold will maximize the revenue

### Thinking & Inquiry (TI)

1. Determine an equation for this quadratic relation in standard form.

$$\begin{aligned} x &= -4 \\ y &= 8 \\ s &= -6 \\ t &= -2 \\ a &= ? \end{aligned}$$

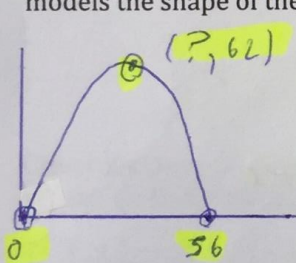
$$\begin{aligned} y &= a(x-s)(x-t) \\ (8) &= a(-4+6)(-4+2) \\ 8 &= a(2)(-2) \\ 8 &= \frac{-4a}{-4} \\ -2 &= a \end{aligned}$$



$$\begin{aligned} \therefore y &= -2(x+6)(x+2) \\ y &= (-2x-12)(x+2) \\ y &= -2x^2 - 4x - 12x - 24 \\ y &= -2x^2 - 16x - 24 \end{aligned}$$

Out of 5

2. The Sunshine Bridge in Pittsburgh is a natural arch that is approximately parabolic in shape. The arch is about 62 m high. It is 56 m across at its base. Determine a quadratic relation, in factored form, that models the shape of the arch.



$$\begin{aligned} a &= ? \\ x &= 28 \\ y &= 62 \\ s &= 0 \\ t &= 56 \end{aligned}$$

$$\begin{aligned} y &= a(x-s)(x-t) \\ (62) &= a(28-0)(28-56) \\ 62 &= a(28)(-28) \\ 62 &= \frac{-784a}{-784} \end{aligned}$$

x of the vertex =  $\frac{s+t}{2}$

$$= \frac{0+56}{2}$$

$$= 28$$

$$-\frac{31}{392} = a$$

$$\therefore y = \frac{-31}{392}x(x-56)$$

Out of 6

or

$$y = -0.08x(x-56)$$