

# Sample Free Response Questions (Solutions)

1. Consider the area of a rectangle expressed as  $5x^2 + 12x + 7$ .

a. Give the dimensions of the rectangle expressed as variables.

$$\text{Area} = 5x^2 + 12x + 7$$

$$\begin{aligned}\text{Area} &= 5x^2 + 12x + 7 \\ &= (5x + 7)(x + 1)\end{aligned}$$

In the rectangle, the width is  $(5x + 7)$  and the length is  $(x + 1)$  or the length is  $(5x + 7)$  and the width is  $(x + 1)$ .

2. Consider a rectangle with a width of  $(x + 3)$  feet and a length of  $(x + 8)$  feet.

a. If the area is  $237 \text{ ft}^2$ , what is the area of the rectangle?

$$\begin{array}{|c|} \hline 234 \text{ ft}^2 \\ \hline \end{array} \quad (x+8)$$

$$\begin{aligned}\text{Area} &= \text{Length} * \text{width} \\ 237 &= (x+3)(x+8) \\ 237 &= x^2 + 8x + 3x + 24 \\ 237 &= x^2 + 11x + 24 \\ -237 &= \qquad \qquad -234\end{aligned}$$

$$x = 10$$

$$\text{width} = 10 + 3 = 13$$

$$\text{length} = 10 + 8 = 18$$

$$0 = x^2 + 11x - 210$$

$$0 = (x+21)(x-10)$$

$$x = -21 \text{ or } x = 10$$

b. Were there any extraneous  $x$ -values? Explain why or why not?

yes. The  $x = -21$  value is extraneous because lengths cannot be negative.

4 Consider  $y = x^2 - x - 6$ .

a Find the zeros of the Quadratic equation.

$$y = x^2 - x - 6$$

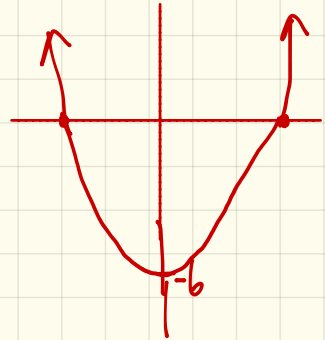
Trinomial  
GCF  
Factoring Trinomials (set = 0)

$$0 = (x - 3)(x + 2)$$
$$x - 3 = 0 \quad \text{or} \quad x + 2 = 0$$
$$x = 3 \quad \text{or} \quad x = -2$$

b What is the meaning of the solutions of the Quadratics

The  $x$ -values represent the  $x$ -intercepts which are  $(3, 0)$  and  $(-2, 0)$ .

c Sketch a graph of the quadratic.



5) Consider  $y = -2x^2 + 36x + 170$

a) Convert into vertex form.

$$y = -2x^2 + 36x + 170 \quad \begin{array}{l} a = -2 \\ b = 36 \end{array}$$

vertex formula:

$$x = \frac{-b}{2a} = \frac{-36}{2(-2)} = \frac{-36}{-4} = 9$$

$$y = -2(9)^2 + 36(9) + 170 = 332$$

vertex:  $(9, 332)$

$$\begin{aligned} \text{Vertex form: } y &= a(x-h)^2 + k \\ &= -2(x-9)^2 + 332 \end{aligned}$$

b) What is the vertex and axis of symmetry?

vertex:  $(9, 332)$

axis of symmetry:  $x = 9$

c) State the transformations of the Quadratic.

The Quadratic equation is shifting right 9 units, up 332 units, stretch by a factor of 2, and open downward.

d) Sketch a graph of the quadratic.



6. Consider  $y = -3(x+4)^2 + 2$

a) Determine the vertex and axis of symmetry.

vertex:  $(-4, 2)$

axis of symmetry:  $x = -4$

b) State the transformations of the Quadratic.

The transformations of the Quadratic is shifting up 2 units, left 4 units, stretch by a factor of 3, and opening downward.

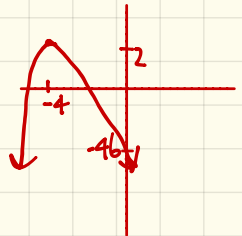
c) Convert into standard form.

$$\begin{aligned}y &= -3(x+4)^2 + 2 \\&= -3[(x+4)(x+4)] + 2 \\&= -3[x^2 + 4x + 4x + 16] + 2 \\&= -3[x^2 + 8x + 16] + 2 \\&= -3x^2 - 24x - 48 + 2 \\&= -3x^2 - 24x - 46\end{aligned}$$

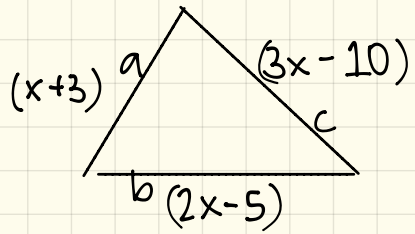
d) What is the y-intercept of the Quadratic?

The y-intercept of Quadratic is  $(0, -46)$

e) Sketch the graph representing the Quadratic.



7 Consider the triangle.



a Express the perimeter of the triangle with variables.

$$\begin{aligned}\text{perimeter} &= \text{sum of sides} \\ &= (x+3) + (2x-5) + (3x-10) \\ &= x+3+2x-5+3x-10 \\ &= x+2x+3x+3-5-10 \\ &= 6x-12\end{aligned}$$

b If the perimeter is 18, what are the values for the lengths of a, b & c.

$$\begin{array}{r}6x - 12 = 18 \\ + 12 = +12 \\ \hline 6x = 30 \\ x = 5\end{array}$$

$$\begin{aligned}\text{side } a &: (5)+3 = 8 \\ \text{side } b &: 2(5)-5 = 5 \\ \text{side } c &: 3(5)-10 = 5\end{aligned}$$

8 Determine whether each of the mathematical statements are TRUE or FALSE. If its false, in the space below show the correct statement.

Mathematical Statement	TRUE	FALSE
$(-4i)(5i) = 20$	X	
$(7-6i)(-8+3i) = 38-69i$		X
$(8-3i)^2 = 55+48i$		X
$-6i(8-6i)(-8-8i) = -96+672i$	X	

$$(-4i)(5i) = -20i^2 = -20(-1) = 20$$

$$\begin{aligned} (7-6i)(-8+3i) &= -56 - 21i + 48i - 18i^2 \\ &= -56 + 27i - 18i^2 \\ &= -56 + 27i - 18(-1) \\ &= -56 + 27i + 18 \\ &= -38 + 27i \end{aligned}$$

$$\begin{aligned} (8-3i)^2 &= (8-3i)(8-3i) = 64 - 24i - 24i + 9i^2 \\ &= 64 - 48i + 9i^2 \\ &= 64 - 48i + 9(-1) \\ &= 64 - 48i - 9 \\ &= 55 - 48i \end{aligned}$$

$$\begin{aligned} -6i(8-6i)(-8-8i) &= (-48i+36i^2)(-8-8i) \\ &= -384i - 384i^2 - 288i^2 - 288i^3 \\ &= -384i - 672i^2 - 288i^3 \\ &= -384i - 672(-1) - 288(-i) \\ &= -384i + 672 + 288i \\ &= -96i + 672i \end{aligned}$$