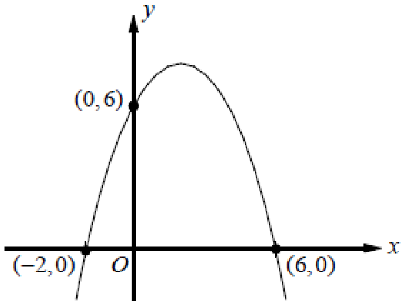
Practice Test
Quadratic Functions

1



The graph of the quadratic function above shows two x-intercepts and a y-intercept. Which of the following equations represents the graph of the quadratic function above?

A) $y=-\frac{1}{2}(x-1)^2+9$

B) $y=-\frac{1}{2}(x-2)^2+8$

C) $y=-\frac{1}{2}(x-2)^2+9$

D) $y=-\frac{1}{2}(x-3)^2+8$

2

If $(x+y)^2=324$ and $(x-y)^2=16$, what is the value of xy?

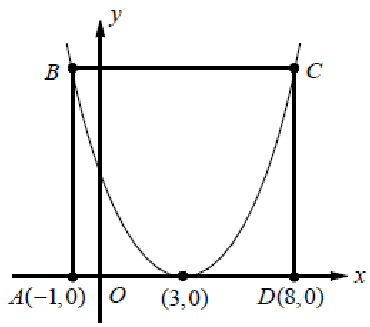
A) 33

B) 55

C) 77

D) 99

3



In the figure above, the vertex of the graph of the quadratic function is at $(3,0)$. The points B and C lie on the parabola. If $ABCD$ is a rectangle with perimeter 38, which of the following represents the equation of the parabola?

A) $y=\frac{2}{5}(x-3)^2$

B) $y=\frac{5}{8}(x-3)^2$

C) $y=\frac{3}{4}(x-3)^2$

D) $y=\frac{7}{8}(x-3)^2$

4

If $(ax+b)(2x-5)=12x^2+kx-10$ for all values of x, what is the value of k?

A) −26

B) −10

C) 24

D) 32

Questions 5-8 refer to the following information.

$$h = -\frac{1}{2}gt^2 + v_0t + h_0$$

The equation above describes the motion of an object thrown upward into the air. In the equation, g is the acceleration due to gravity (9.8m/s^2), t is the time elapsed since the object was thrown upward, v_0 is the initial speed of the object, h_0 is the initial height from which the object was thrown, and h is the height of the object above the ground t seconds after the object was thrown.

5

Which of the following equations represents the motion of the object, if the object was thrown upward from 40 meters above the ground with an initial speed of 35 meters per second (m/s)?

A) $h = -9.8t^2 + 40t + 35$

B) $h = -9.8t^2 + 35t + 40$

C) $h = -4.9t^2 + 40t + 35$

D) $h = -4.9t^2 + 35t + 40$

6

How many seconds will it take the object to reach its maximum height? (hint: The function has a maximum point at $t = -\frac{b}{2a}$.)

A) $\frac{15}{7}$

B) $\frac{20}{7}$

C) $\frac{25}{7}$

D) $\frac{30}{7}$

7

What is the maximum height from the ground the object will reach, to the nearest meter?

A) 103

B) 112

C) 125

D) 133

8

How long will it take the object to hit the ground, to the nearest second? (hint: Height of the object is zero when the object hits the ground.)

A) 7

B) 8

C) 9

D) 10

9

$$h = -16t^2 + h_0$$

The equation above describes the height of an object t seconds after it dropped from a height of h_0 feet above the ground. If a hiker dropped a water bottle from a cliff 150 feet above the ground, how many seconds will it take to hit the ground? (Round your answer to the nearest second.)

A) 2

B) 3

C) 4

D) 5

Answers
Quadratic Functions

1. B

The x-coordinate of the vertex is the average of the x-intercepts. Thus the x-coordinate of the vertex is $x = \frac{-2+6}{2} = 2$. The vertex form of the parabola can be written as $y = a(x-2)^2 + k$.
Choices A and D are incorrect because the x-coordinate of the vertex is not 2.
Also, the parabola passes through $(0,6)$.
Check choices B and C.

B) $y = -\frac{1}{2}(x-2)^2 + 8$

$6 = -\frac{1}{2}(0-2)^2 + 8$ Correct.

C) $y = -\frac{1}{2}(x-2)^2 + 9$

$6 = -\frac{1}{2}(0-2)^2 + 9$ Not correct.

Choice B is correct.

2. C

$(x+y)^2 = 324 \Rightarrow x^2 + 2xy + y^2 = 324$
$x^2 + y^2 = 324 - 2xy$
$(x-y)^2 = 16 \Rightarrow x^2 - 2xy + y^2 = 16$
$\Rightarrow x^2 + y^2 = 16 + 2xy$
Substituting $16 + 2xy$ for $x^2 + y^2$ in the equation $x^2 + y^2 = 324 - 2xy$ yields
$16 + 2xy = 324 - 2xy$.
Solving this equation for xy yields $xy = 77$.

3. A

From the graph we read the length of AD, which is 9. Let the length of $CD = w$.
Perimeter of rectangle $ABCD$ is 38.
$2 \cdot 9 + 2w = 38 \Rightarrow 2w = 20 \Rightarrow w = 10$
Therefore, the coordinates of B are $(-1,10)$ and the coordinates of C are $(8,10)$.
The equation of the parabola can be written in vertex form as $y = a(x-3)^2$.
Now substitute 8 for x and 10 for y in the equation. $10 = a(8-3)^2$. Solving for a gives $a = \frac{10}{25} = \frac{2}{5}$. Choice A is correct.

4. A

$(ax+b)(2x-5) = 12x^2 + kx - 10$

FOIL the left side of the equation.
$2ax^2 + (-5a+2b)x - 5b = 12x^2 + kx - 10$

By the definition of equal polynomials, $2a = 12$, $-5a + 2b = k$, and $5b = 10$. Thus, $a = 6$ and $b = 2$, and $k = -5a + 2b = -5(6) + 2(2) = -26$.

5. D

$h = -\frac{1}{2}gt^2 + v_0 t + h_0$
In the equation, $g = 9.8$, initial height $h_0 = 40$, and initial speed $v_0 = 35$. Therefore, the equation of the motion is $h = -\frac{1}{2}(9.8)t^2 + 35t + 40$.
Choice D is correct.

6. C

In the quadratic equation, $y = ax^2 + bx + c$, the x-coordinate of the maximum or minimum point is at $x = -\frac{b}{2a}$.
Therefore, the object reaches its maximum height when $t = -\frac{35}{2(-4.9)} = \frac{25}{7}$.

7. A

The object reaches to its maximum height when $t = \frac{25}{7}$. So substitute $t = \frac{25}{7}$ in the equation.

$h = -4.9(\frac{25}{7})^2 + 35(\frac{25}{7}) + 40 = 102.5$

To the nearest meter, the object reaches a maximum height of 103 meters.

Height of the object is zero when the object hits the ground.

$0 = -4.9t^2 + 35t + 40$

Use quadratic formula to solve for t.

$$t = \frac{-35 \pm \sqrt{35^2 - 4(-4.9)(40)}}{2(-4.9)}$$

$$= \frac{-35 \pm \sqrt{2009}}{-9.8} \approx \frac{-35 \pm 44.82}{-9.8}$$

Solving for t gives $t \approx -1$ or $t \approx 8.1$.
Since time cannot be negative, the object hits the ground about 8 seconds after it was thrown.

9. B

When an object hits the ground, $h = 0$.
$h_0 = 150$ is given.

$0 = -16t^2 + 150$	Substitution
$16t^2 = 150$	Add $16t^2$ to each side.
$t^2 = \frac{150}{16}$	Divide each side by 16.
$t = \sqrt{\frac{150}{16}} \approx 3.06$	