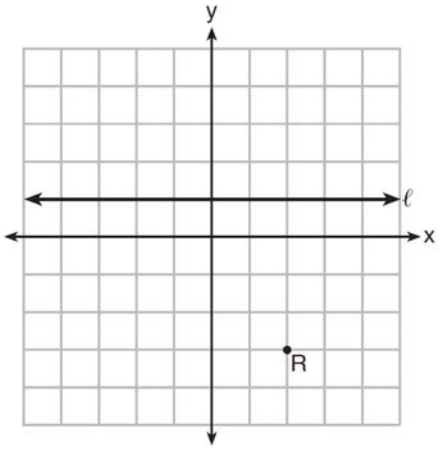
G.GPE.A.2: Graphing Quadratic Functions

1 Which equation represents the set of points equidistant from line ℓ and point R shown on the graph below?



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

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

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

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

2 Which equation represents a parabola with the focus at $(0,-1)$ and the directrix of $y = 1$?

1) $x^2 = -8y$

2) $x^2 = -4y$

3) $x^2 = 8y$

4) $x^2 = 4y$

3 If the focus of a parabola is $(0,6)$ and the directrix is $y = 4$, what is an equation for the parabola?

1) $y^2 = 4(x-5)$

2) $x^2 = 4(y-5)$

3) $y^2 = 8(x-5)$

4) $x^2 = 8(y-6)$

4 Which equation represents a parabola with a focus of $(0,4)$ and a directrix of $y = 2$?

1) $y = x^2 + 3$

2) $y = -x^2 + 1$

3) $y = \frac{x^2}{2} + 3$

4) $y = \frac{x^2}{4} + 3$

5 A parabola has its focus at $(1,2)$ and its directrix is $y = -2$. The equation of this parabola could be

1) $y = 8(x+1)^2$

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

3) $y = 8(x-1)^2$

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

6 The equation of the parabola that has its focus at the point $(-3,2)$ and directrix at $y = 0$ is

1) $y = \frac{1}{4}(x+3)^2 + 1$
2) $y = \frac{1}{4}(x-3)^2 + 1$
3) $y = \frac{1}{8}(x+3)^2 + 1$
4) $y = \frac{1}{8}(x-3)^2 + 1$

7 Which equation represents the equation of the parabola with focus $(-3,3)$ and directrix $y = 7$?

1) $y = \frac{1}{8}(x+3)^2 - 5$
2) $y = \frac{1}{8}(x-3)^2 + 5$
3) $y = -\frac{1}{8}(x+3)^2 + 5$
4) $y = -\frac{1}{8}(x-3)^2 + 5$

8 Which equation represents a parabola with a focus of $(4,-3)$ and directrix of $y = 1$?

1) $(x-1)^2 = 4(y+3)$
2) $(x-1)^2 = -8(y-3)$
3) $(x+4)^2 = 4(y-3)$
4) $(x-4)^2 = -8(y+1)$

9 A parabola that has a vertex at $(2,1)$ and a focus of $(2,-3)$ has an equation of

1) $y = \frac{1}{16}(x-2)^2 + 1$
2) $y = -\frac{1}{16}(x+2)^2 - 1$
3) $y = -\frac{1}{16}(x-2)^2 + 1$
4) $y = -\frac{1}{16}(x-2)^2 - 3$

10 Which equation represents a parabola with a focus of $(-2,5)$ and a directrix of $y = 9$?

1) $(y-7)^2 = 8(x+2)$
2) $(y-7)^2 = -8(x+2)$
3) $(x+2)^2 = 8(y-7)$
4) $(x+2)^2 = -8(y-7)$

11 What is the equation of the directrix for the parabola $-8(y-3) = (x+4)^2$?

1) $y = 5$
2) $y = 1$
3) $y = -2$
4) $y = -6$

12 A parabola has a directrix of $y = 3$ and a vertex at $(2,1)$. Which ordered pair is the focus of the parabola?

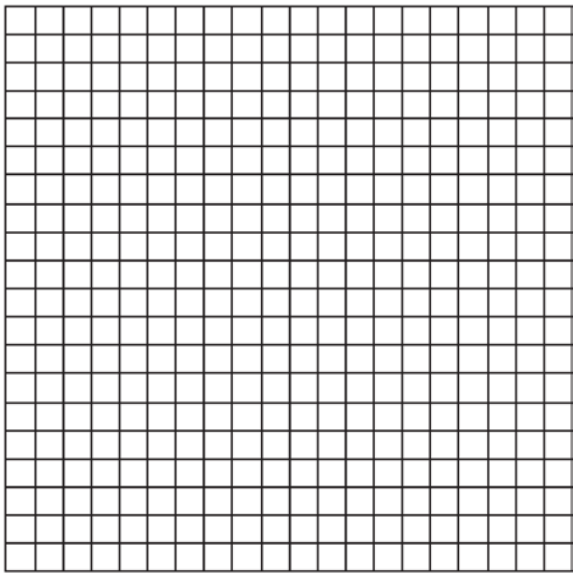
1) $(2,-1)$
2) $(2,0)$
3) $(2,2)$
4) $(2,5)$

13 The parabola described by the equation $y = \frac{1}{12}(x-2)^2 + 2$ has the directrix at $y = -1$. The focus of the parabola is
1) $(2,-1)$
2) $(2,2)$
3) $(2,3)$
4) $(2,5)$

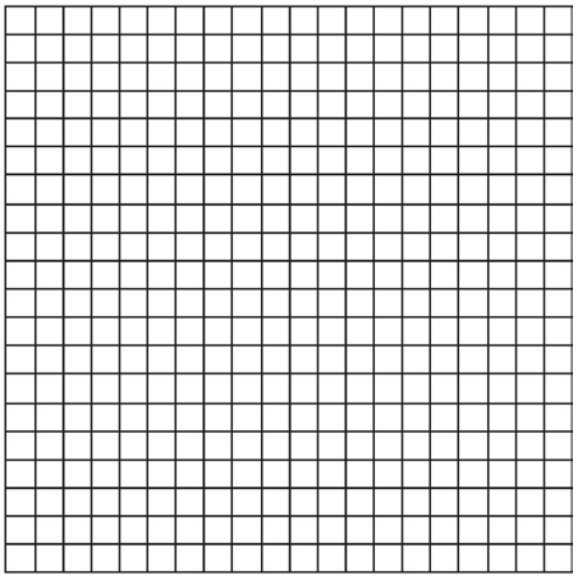
14 The directrix of the parabola $12(y+3) = (x-4)^2$ has the equation $y = -6$. Find the coordinates of the focus of the parabola.

15 Consider the parabola given by $y = \frac{1}{4}x^2 + x + 8$ with vertex $(-2,7)$ and focus $(-2,8)$. Use this information to explain how to determine the equation of the directrix.

16 The parabola $y = -\frac{1}{20}(x-3)^2 + 6$ has its focus at $(3,1)$. Determine and state the equation of the directrix. (The use of the grid below is optional.)



17 Determine an equation for the parabola with focus $(4,-1)$ and directrix $y = -5$. (Use of the grid below is optional.)



G.GPE.A.2: Graphing Quadratic Functions
Answer Section

1 ANS: 4

The vertex is $(2,-1)$ and $p = 2$. $y = -\frac{1}{4(2)}(x-2)^2 - 1$

REF: 081619aii

2 ANS: 2

The vertex of the parabola is $(0,0)$. The distance, p, between the vertex and the focus or the vertex and the directrix is 1. $y = \frac{-1}{4p}(x-h)^2 + k$

$$y = \frac{-1}{4(1)}(x-0)^2 + 0$$

$$y = -\frac{1}{4}x^2$$

REF: 081706aii

3 ANS: 2

Since the distance from the focus to the directrix is 2, $p = 1$ and the vertex of the parabola is $(0,5)$.

$$y = \frac{1}{4p}(x-h)^2 + k$$

$$y = \frac{1}{4(1)}(x-0)^2 + 5$$

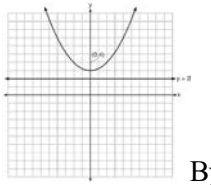
$$y = \frac{1}{4}x^2 + 5$$

$$y - 5 = \frac{1}{4}x^2$$

$$4(y-5) = x^2$$

REF: 062323aii

4 ANS: 4



A parabola with a focus of $(0,4)$ and a directrix of $y = 2$ is sketched as follows: By inspection, it is determined that the vertex of the parabola is $(0,3)$. It is also evident that the distance, p, between the vertex and the focus is 1. It is possible to use the formula $(x-h)^2 = 4p(y-k)$ to derive the equation of the parabola as follows: $(x-0)^2 = 4(1)(y-3)$

$$x^2 = 4y - 12$$

$$x^2 + 12 = 4y$$

$$\frac{x^2}{4} + 3 = y$$

or A point (x,y) on the parabola must be the same distance from the focus as it is from the directrix. For any such point (x,y), the distance to the focus is $\sqrt{(x-0)^2 + (y-4)^2}$ and the distance to the directrix is $y - 2$. Setting this equal leads to: $x^2 + y^2 - 8y + 16 = y^2 - 4y + 4$

$$x^2 + 16 = 4y + 4$$

$$\frac{x^2}{4} + 3 = y$$

REF: spr1502aii

5 ANS: 4

The vertex is $(1,0)$ and $p = 2$. $y = \frac{1}{4(2)}(x-1)^2 + 0$

REF: 061717aii

6 ANS: 1

Distance from the focus to the directrix is 2, so $p = 1$. Vertex is $(-3,1)$. $y = \frac{1}{4(1)}(x+3)^2 + 1$

REF: 012409aii

7 ANS: 3

The vertex is $(-3,5)$ and $p = 2$. $y = \frac{-1}{4(2)}(x+3)^2 + 5$

REF: 011914aii

8 ANS: 4
The distance between the focus and directrix is $1 - -3 = 4$. p is half this distance, or 2. The vertex of the parabola is $(4,-1)$. Since the directrix is above the focus, the parabola faces downward.

$$y = -\frac{1}{4p}(x-h)^2 + k$$

$$y = -\frac{1}{4(2)}(x-4)^2 - 1$$

$$y + 1 = -\frac{1}{8}(x-4)^2$$

REF: 012322aii

9 ANS: 3
The distance from the vertex to the focus, p, is 4. Since the focus is below the vertex, p is negative.
$y = -\frac{1}{4(4)}(x-2)^2 + 1$

REF: 082212aii

10 ANS: 4
$\frac{5+9}{2} = 7$, vertex: $(-2,7)$; $p = 7 - 9 = -2$, $y = \frac{1}{4(-2)}(x+2)^2 + 7$

$$y - 7 = \frac{1}{-8}(x+2)^2$$

$$-8(y-7) = (x+2)^2$$

REF: 061821aii

11 ANS: 1
In vertex form, the parabola is $y = -\frac{1}{4(2)}(x+4)^2 + 3$. The vertex is $(-4,3)$ and $p = 2$. $3 + 2 = 5$

REF: 011816aii

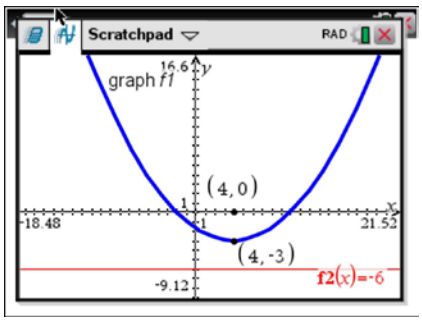
12 ANS: 1
The vertical distance from the directrix to the vertex, p, is 2. The vertical distance from the vertex to the focus must also be 2.

REF: 062213aii

13 ANS: 4
The vertex is $(2,2)$ and $p = 3$. $3 + 2 = 5$

REF: 081823aii

14 ANS:



The vertex of the parabola is $(4,-3)$. The x-coordinate of the focus and the vertex is the same. Since the distance from the vertex to the directrix is 3, the distance from the vertex to the focus is 3, so the y-coordinate of the focus is 0. The coordinates of the focus are $(4,0)$.

REF: 061630aii

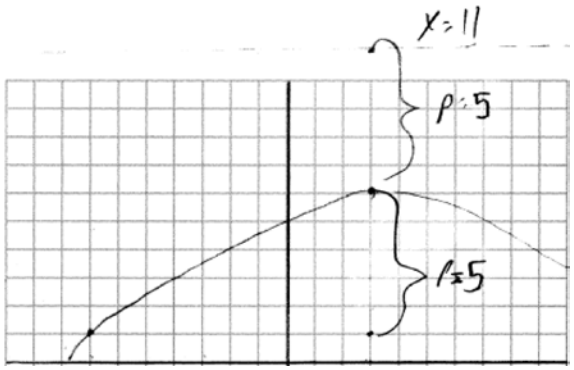
15 ANS:

p is the distance from the focus to the vertex: $8-7=1$. p is the distance from the directrix to the vertex: $1=7-d$. $y=6$

$d=6$

REF: 082330aii

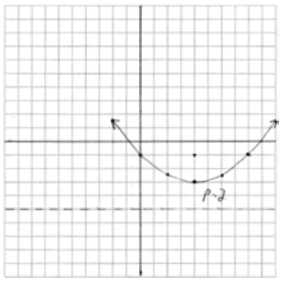
16 ANS:



vertex $(3,6)$, focus $(3,1)$, $p=5$, directrix $y=6+5=11$

REF: 012028aii

17 ANS:

$y=\frac{1}{4(2)}(x-4)^2-3$  $y=\frac{-1+-5}{2}=-3$. The vertex is $(4,-3)$ and $p=2$.

REF: 061935aii