

# Mathematics & Literacy

RICE UNIVERSITY SCHOOL MATHEMATICS PROJECT

hourly  
wage \$ per hr

=

12 \$

÷

$2\frac{1}{2}$  hr

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Houston, Texas

# Mathematics & Literacy

Students can't **Do Algebra** if they ...

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Students can't **Do Algebra** if they ...

**1** can't read and write.



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Students can't **Do Algebra** if they ...

**1** can't read and write.



**2** aren't familiar with the basic mathematical models and their rules.

linear equation:

$$2x + 3 = 7$$

linear inequality:

$$x - 4 < 8$$

quadratic equation:

$$x^2 + 2x - 3 = 0$$

# Mathematics & Literacy

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**1** can't read and write.



**2** aren't familiar with the basic mathematical models and their rules.

linear equation:

$$2x + 3 = 7$$

linear inequality:

$$x - 4 < 8$$

quadratic equation:

$$x^2 + 2x - 3 = 0$$

**3** can't do unit analysis.

$$\frac{7 \text{ dollars}}{1 \text{ hour}} \cdot 4 \text{ hours} = 28 \text{ dollars}$$



# Mathematics & Literacy

You were baby-sitting for  $2\frac{1}{2}$  hours and got paid \$12. What was your hourly wage?

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You were baby-sitting for  $2\frac{1}{2}$  hours and got paid \$12. What was your hourly wage?

**Solution**

$$\begin{aligned}\frac{12}{2\frac{1}{2}} &= \frac{12}{\frac{5}{2}} \\ &= 12 \bullet \frac{2}{5} \\ &= \frac{24}{5} \\ &= \$4.80 \text{ per hr}\end{aligned}$$

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=

+

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×



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hourly  
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=

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$2\frac{1}{2}$  hr

# Mathematics & Literacy

**hourly  
wage**

$$= \frac{12}{2 \frac{1}{2}}$$

Write equation for hourly wage.

$$= \frac{12}{\frac{5}{2}}$$

Rewrite denominator as improper fraction.

$$= 12 \bullet \frac{2}{5}$$

To divide, multiply by reciprocal of denominator.

$$= \frac{24}{5}$$

Multiply fraction by whole number.

$$= \$4.80 \text{ per hr}$$

Rewrite fraction as a decimal and add units.

# Mathematics & Literacy

Cost of Meal (dollars)	Tip (dollars)	Total Cost (dollars)	=	+	-	×	÷
---------------------------	------------------	-------------------------	---	---	---	---	---

Amount earned (\$)	Hourly wage (\$ per hr)	Time worked (hrs)	=	+	-	×	÷
-----------------------	----------------------------	----------------------	---	---	---	---	---

# Mathematics & Literacy

cost of  
meal

\$

total  
cost

\$

tip

\$

=

+

-

÷

×

# Mathematics & Literacy

$$\begin{array}{|c|} \hline \text{cost of} \\ \text{meal} \quad \$ \\ \hline \end{array} + \begin{array}{|c|} \hline \text{tip} \quad \$ \\ \hline \end{array} = \begin{array}{|c|} \hline \text{total} \\ \text{cost} \quad \$ \\ \hline \end{array}$$

The cost of your meal in a restaurant is \$19.72. You want to give a tip of about 20%. What is your total cost?

# Mathematics & Literacy

$$\begin{array}{|c|} \hline \text{total} \\ \text{cost} \end{array} \$ \quad - \quad \begin{array}{|c|} \hline \text{cost of} \\ \text{meal} \end{array} \$ \quad = \quad \begin{array}{|c|} \hline \text{tip} \\ \end{array} \$$$

You are a food server. Your customer leaves you \$35.00 for a meal that cost \$27.54. How much is your tip?

# Mathematics & Literacy

$$\begin{array}{|c|} \hline \text{total} \\ \hline \text{cost} \end{array} \$ \quad - \quad \begin{array}{|c|} \hline \text{cost of} \\ \hline \text{meal} \end{array} \$ \quad = \quad \begin{array}{|c|} \hline \text{tip} \\ \hline \end{array} \$$$

You are a food server. Your customer leaves you \$35.00 for a meal that cost \$27.54. How much is your tip?

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You are a food server. Your customer leaves you \$35.00 for a meal that cost \$27.54. **Did you get a 20% tip?**

# Mathematics & Literacy

A jet pilot is flying from Los Angeles to Chicago at a speed of 500 miles per hour. When the plane is 600 miles from Chicago, an air traffic controller tells the pilot that it will be 2 hours before the plane can get clearance to land. The pilot knows the speed of the jet must be greater than 322 miles per hour or the jet will stall.

- a. At what speed would the jet have to fly to arrive in Chicago in 2 hours?
- b. Is it reasonable for the pilot to fly to Chicago at the reduced speed or must the pilot take some other action?



# Mathematics & Literacy

- a.** At what speed should a plane fly to go 600 miles in 2 hours?
- b.** The plane will stall if it flies at less than 322 miles per hour. Can it fly at the speed you found in part a?

# Mathematics & Literacy

- a. At what speed should a plane fly to go 600 miles in 2 hours?

# Mathematics & Literacy

a. At what speed should a plane fly to go 600 miles in 2 hours?

distance mi

=

speed  $\frac{\text{mi}}{\text{hr}}$

•

time hr

# Mathematics & Literacy

- a. At what speed should a plane fly to go 600 miles in 2 hours?

$$\text{distance mi} = \text{speed } \frac{\text{mi}}{\text{hr}} \cdot \text{time hr}$$

$$(600 \text{ mi}) = (x \frac{\text{mi}}{\text{hr}})(2 \text{ hr})$$

$$300 = x$$

The plane should fly 300 miles per hour.

# Mathematics & Literacy

- b.** The plane will stall if it flies at less than 322 miles per hour. Can it fly at the speed you found in part a?

## Answer

At 300 miles per hour the plane will stall. So, the pilot needs to take some other action, such as making the trip longer.



**What Are the Basic Math Models?**  
**What Are their Rules?**

# What Are the Basic Math Models?

## What Are their Rules?

Linear

$$2x + 4 = 7$$

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## What Are their Rules?

Linear  $2x + 4 = 7$

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Linear  $2x + 4 = 7$

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Cubic  $2x^3 + 7 = 23$

# What Are the Basic Math Models?

## What Are their Rules?

### ~~Polynomial~~

Linear	$2x + 4 = 7$
Quadratic	$x^2 + 3x - 7 = 0$
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# What Are the Basic Math Models?

## What Are their Rules?

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Cubic  $2x^3 + 7 = 23$

### Radical

Square Root  $\sqrt{x} = 9$

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### Radical

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### Rational

$$\frac{1}{x} = 4$$

$$\frac{2}{x} = \frac{x + 3}{x - 4}$$

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ALGEBRAIC MODELS

# What Are the Basic Math Models?

## What Are their Rules?

### ~~Exponential & Log~~

Exponential  $2^x = 8$

Logarithmic  $\log_2 x = 3$

# What Are the Basic Math Models?

## What Are their Rules?

### Exponential & Log

Exponential	$2^x = 8$
-------------	-----------

Logarithmic	$\log_2 x = 3$
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### Trigonometric

Tangent	$\tan x = 1$
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Sine	$\sin 2x = \frac{1}{2}$
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Cosine	$\cos x = 0$
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# What Are the Basic Math Models?

## What Are their Rules?

### Exponential & Log

Exponential  $2^x = 8$

Logarithmic  $\log_2 x = 3$

### Trigonometric

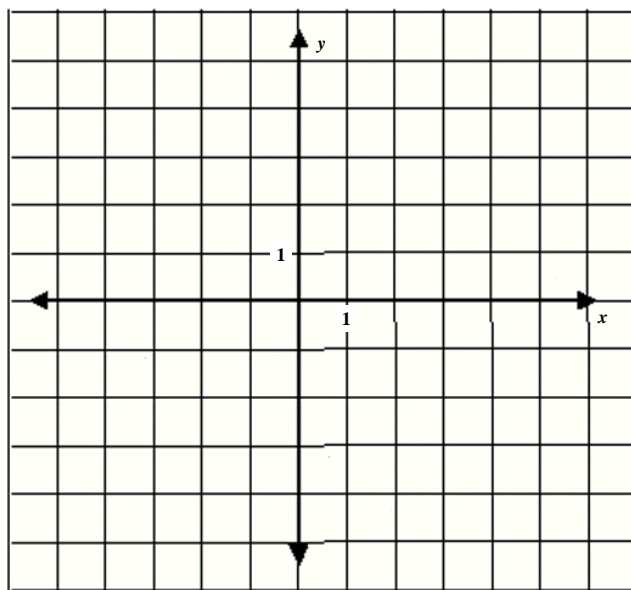
Tangent  $\tan x = 1$

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TRANSCENDENTAL MODELS



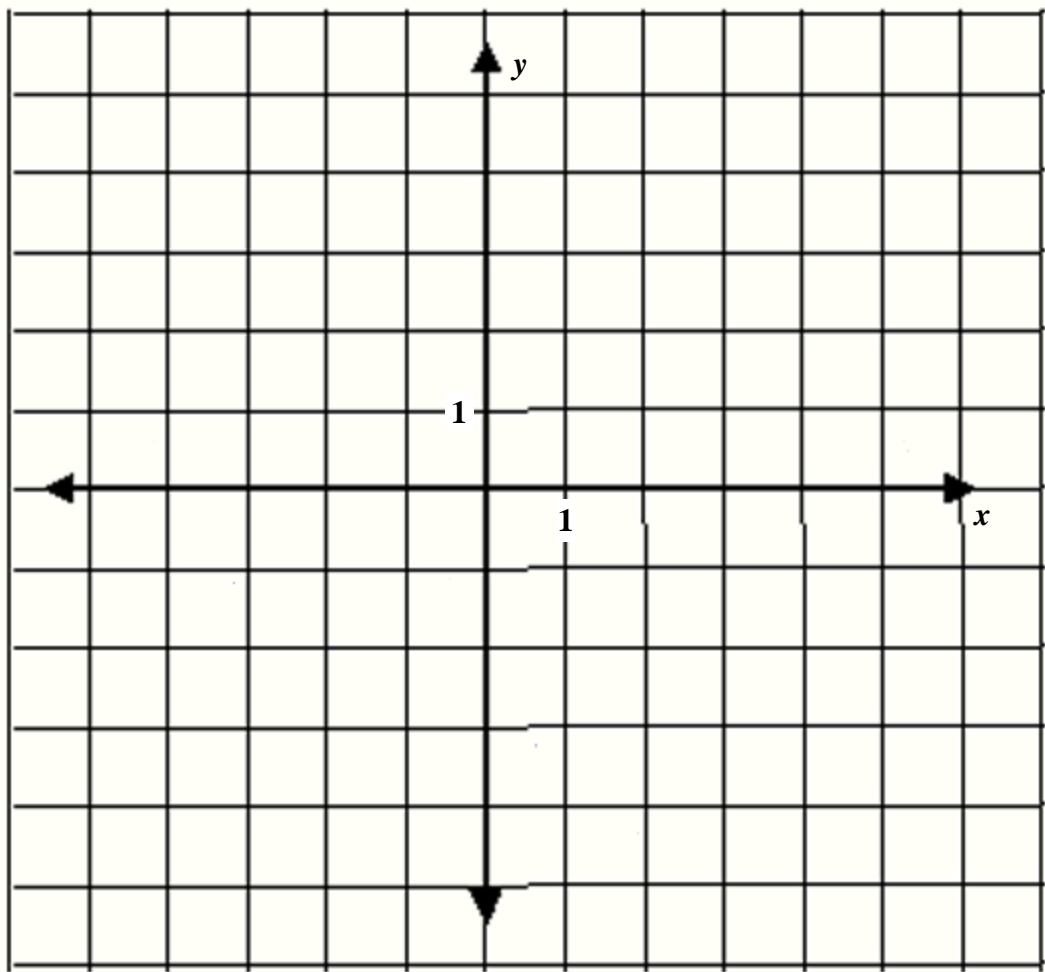


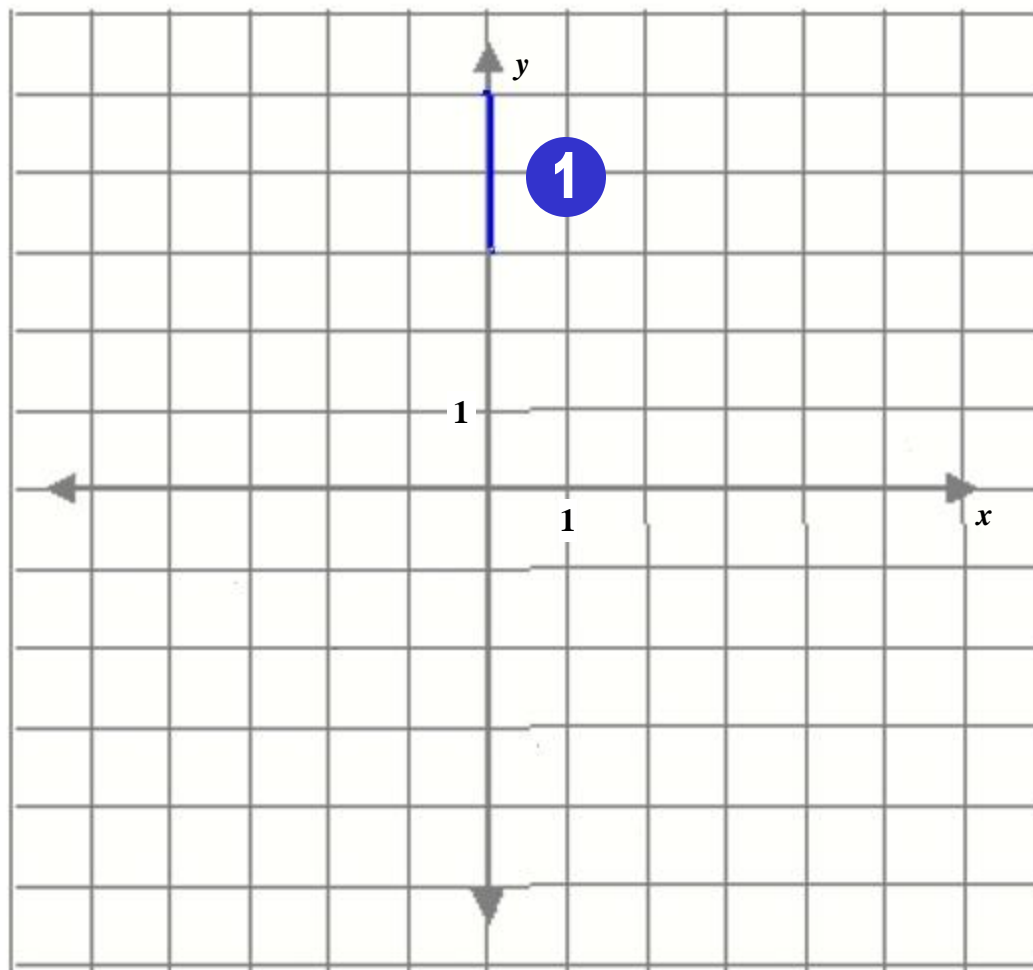
Relation	Domain or Range
1. $x = 0$ ,	$3 \leq y \leq 5$
2. $y = 5$ ,	$-2 \leq x \leq 0$
3. $x = -2$ ,	$1 \leq y \leq 5$
4. $y = 1$ ,	$-5 \leq x \leq -2$
5. $9y = 2x^3 + 21x^2 + 60x + 34$ ,	$-5 \leq x \leq -2$
6. $y = -x^2 - 2x - 2$ ,	$-2 \leq x \leq 0$
7. $y = -2x - 2$ ,	$0 \leq x \leq 1$
8. $2y = -x - 7$ ,	$1 \leq x \leq 3$
9. $y = -4x + 7$ ,	$2.5 \leq x \leq 3$
10. $3y = 2x - 14$ ,	$2.5 \leq x \leq 5.5$
11. $x = 5.5$ ,	$-1 \leq y \leq 0$
12. $y = -2x + 11$ ,	$5 \leq x \leq 5.5$
13. $x = 5$ ,	$1 \leq y \leq 2.5$
14. $18y = -2x^2 + 14x + 25$ ,	$2 \leq x \leq 5$
15. $4y = -x + 12$ ,	$0 \leq x \leq 2$

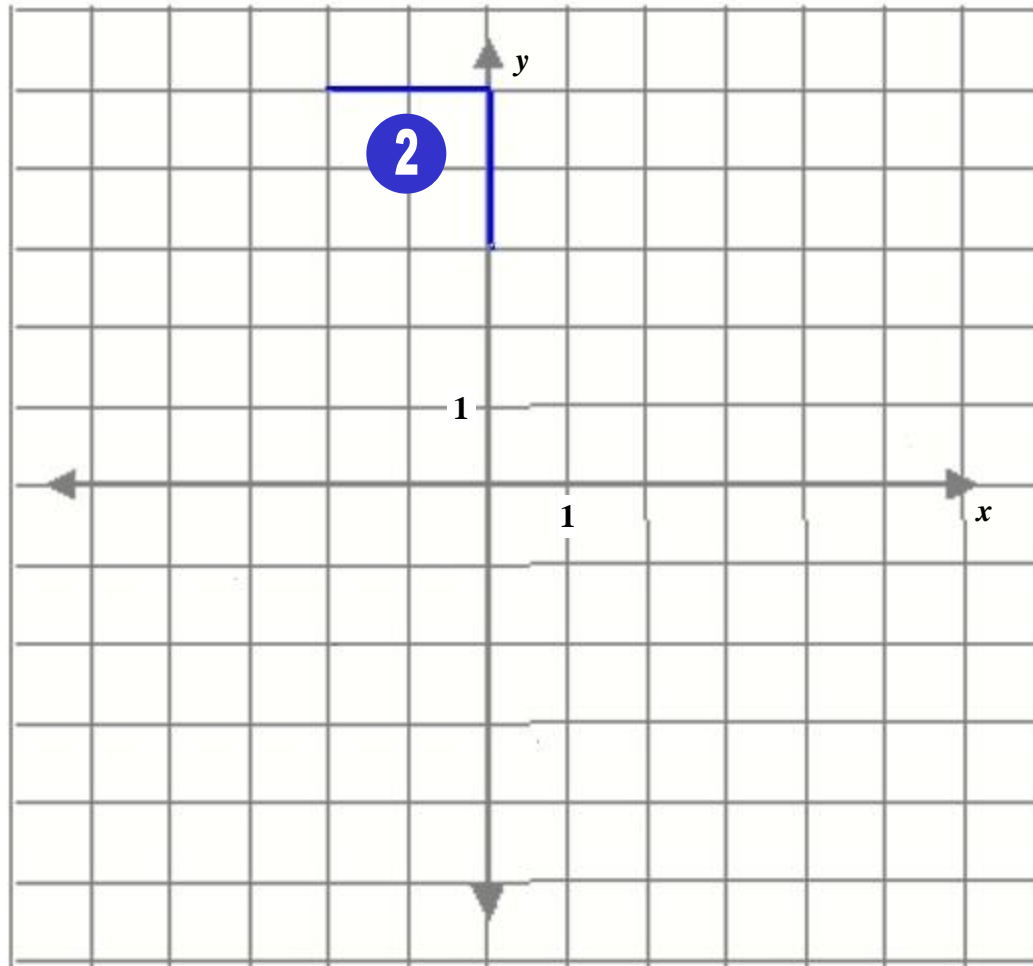
#### DIRECTIONS

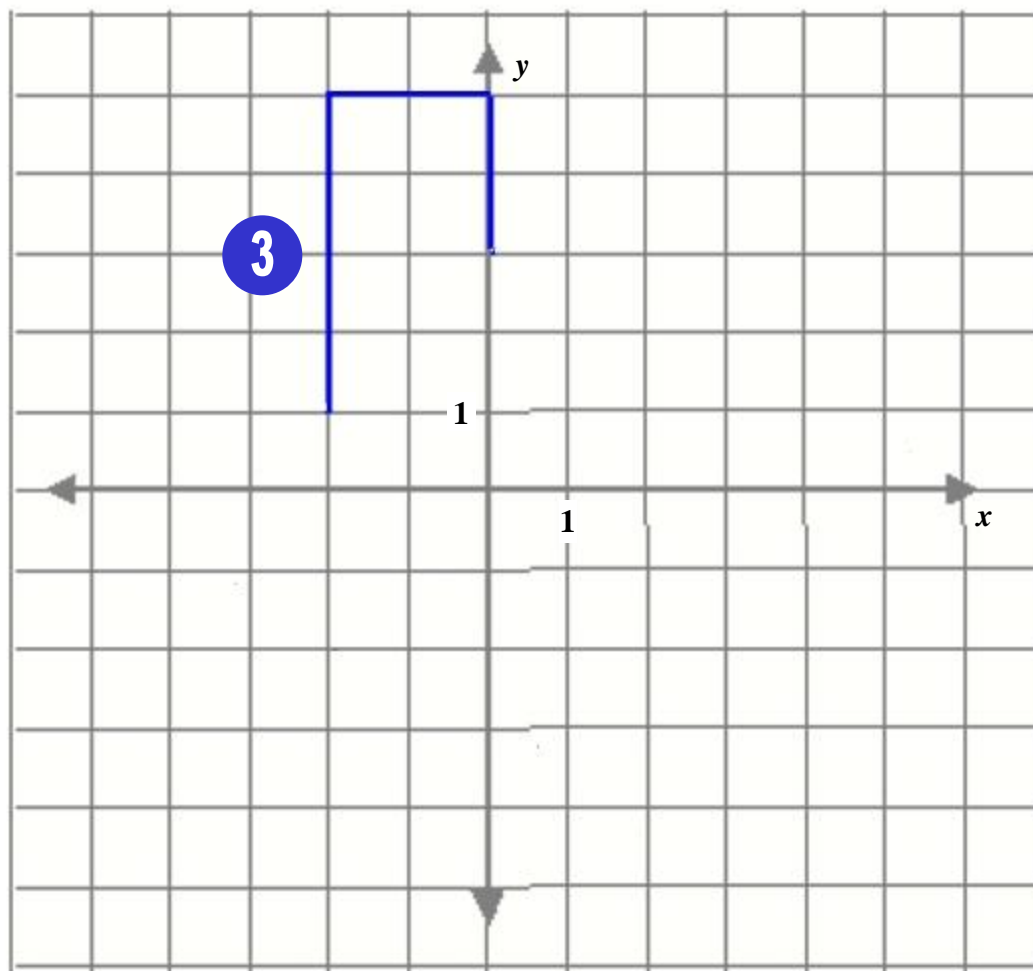
Sketch the graph of each function over its given domain.

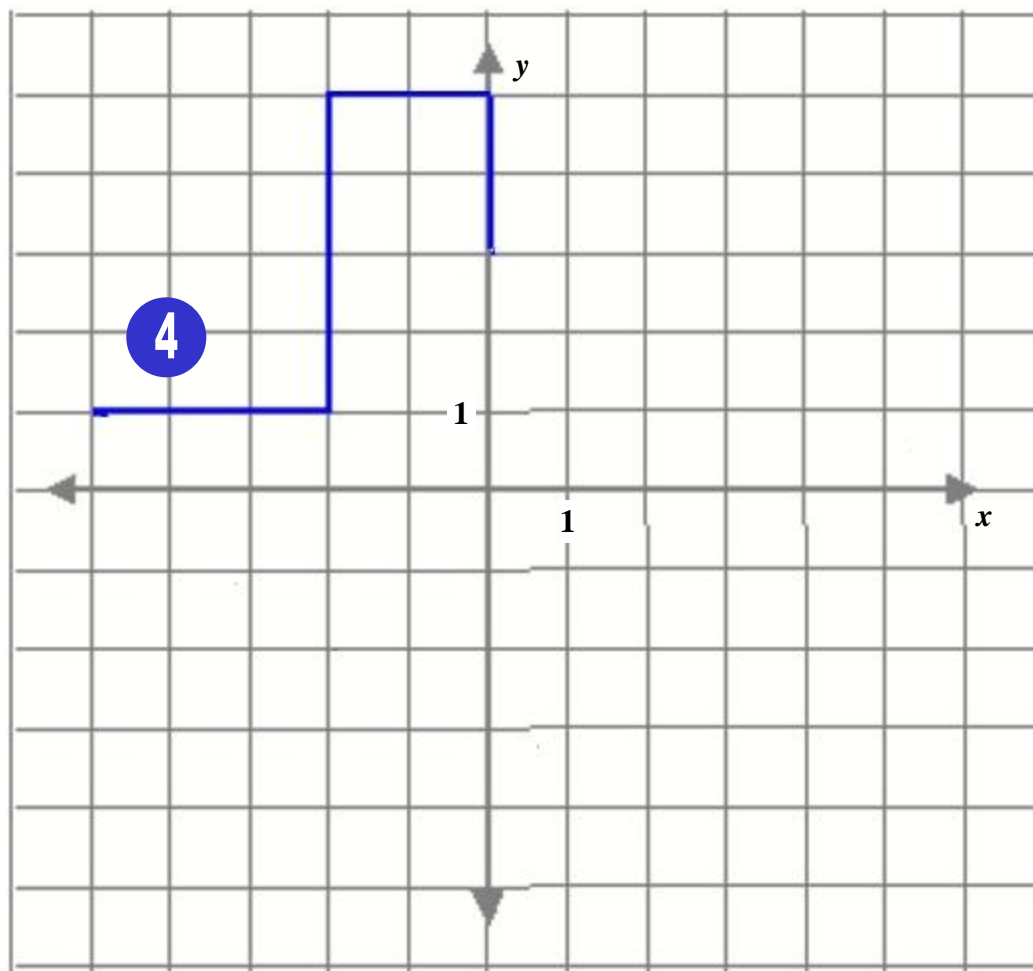
Identify the shape that is formed by the collection of all 15 graphs.

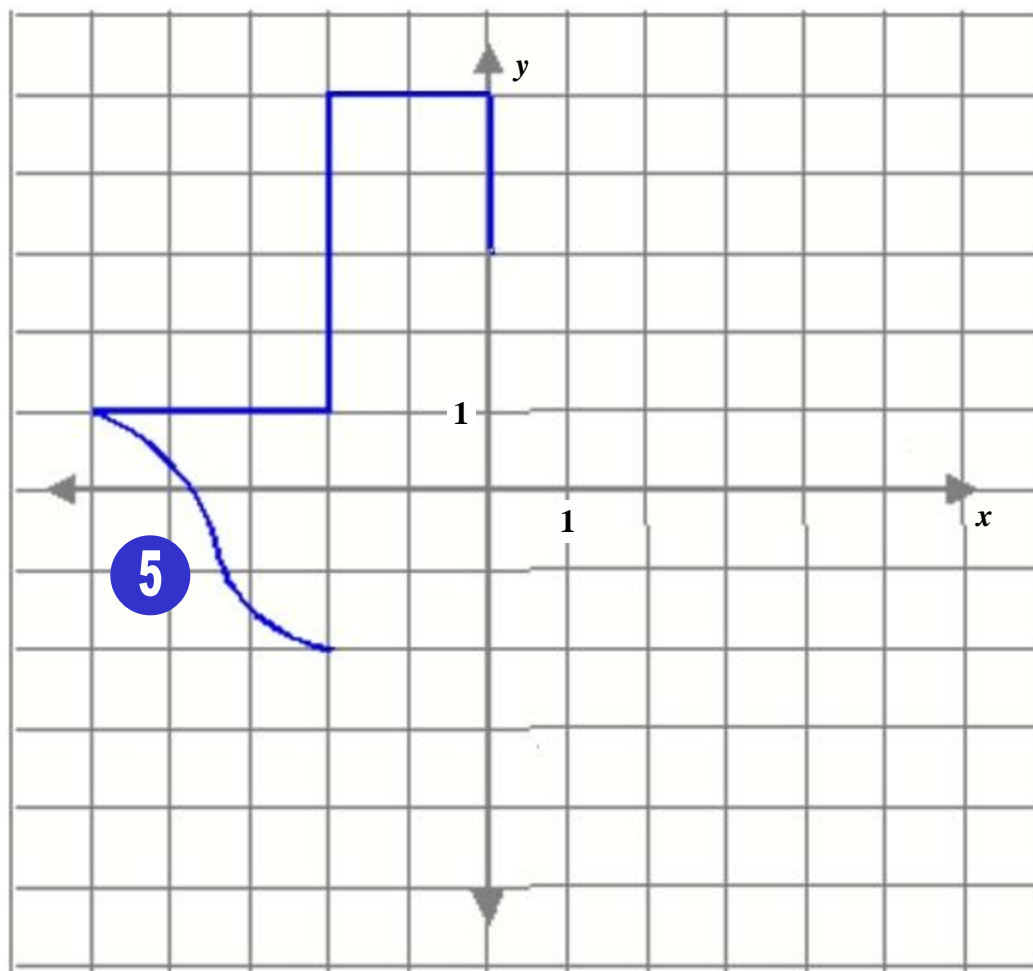


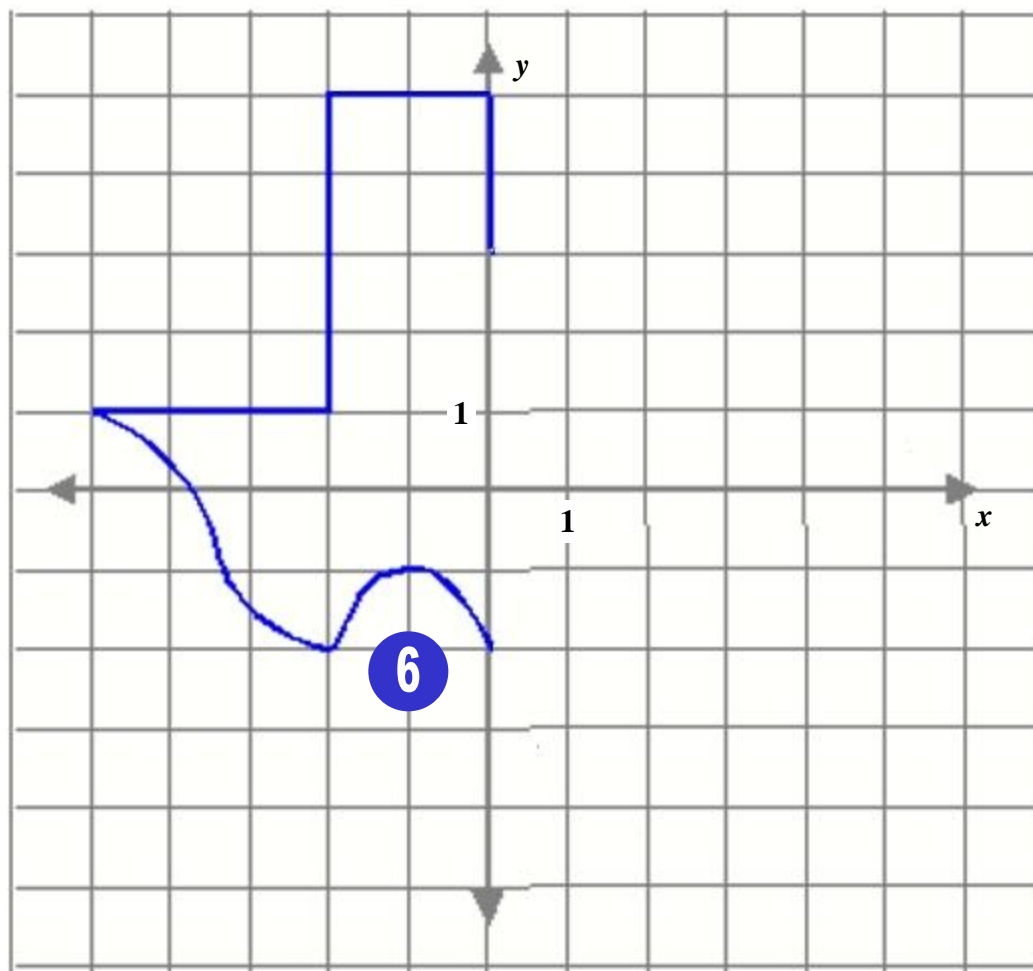




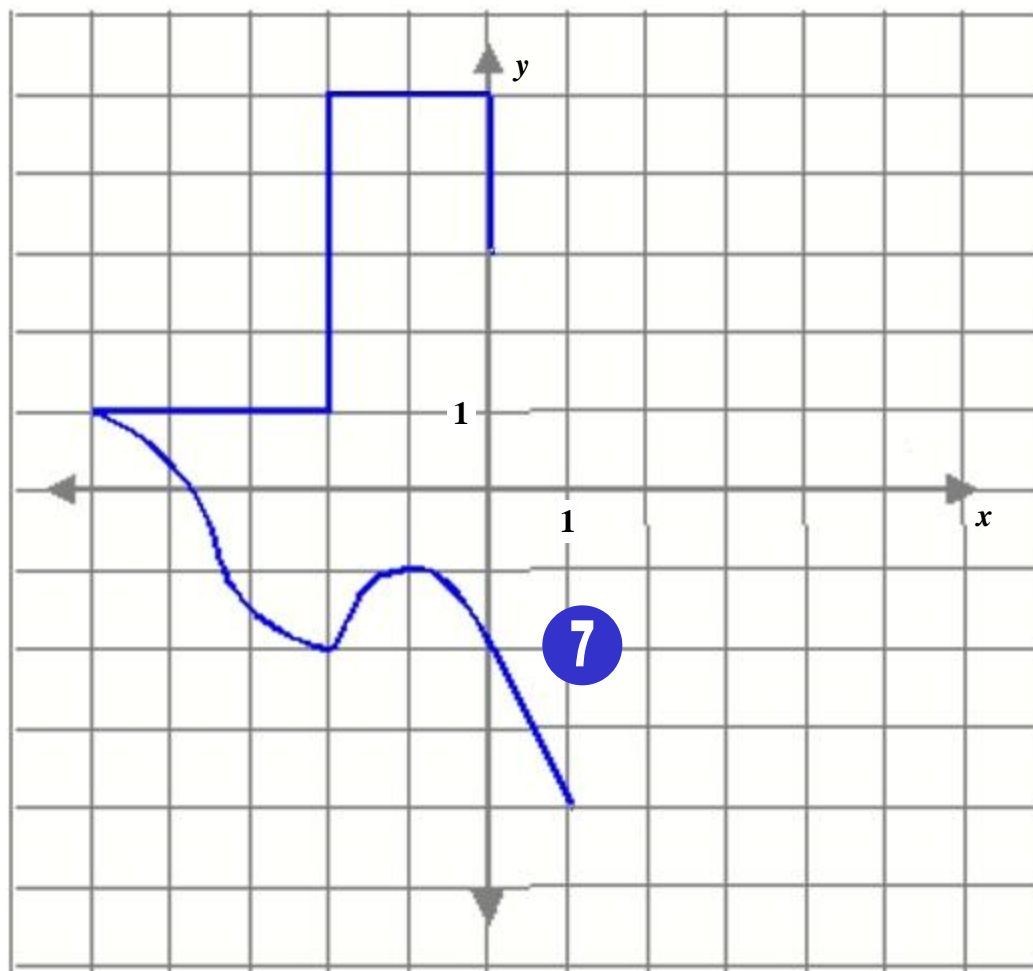


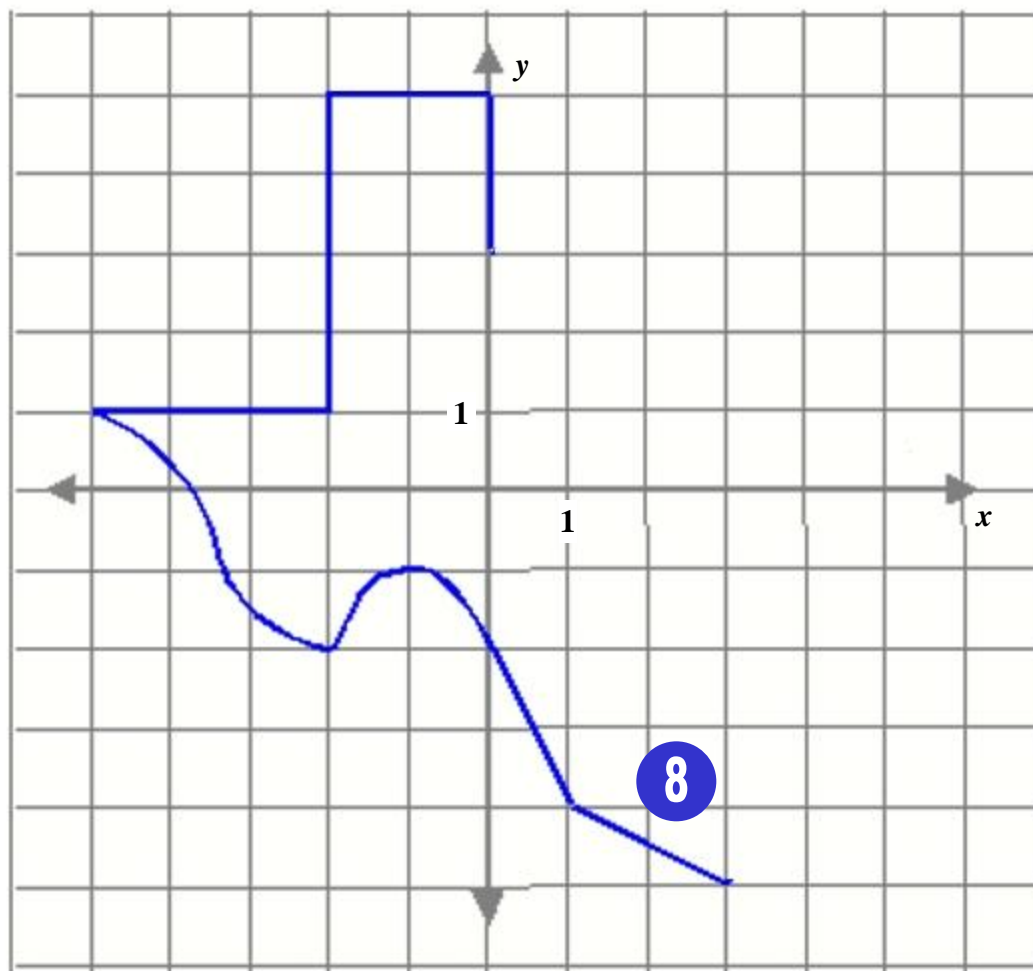


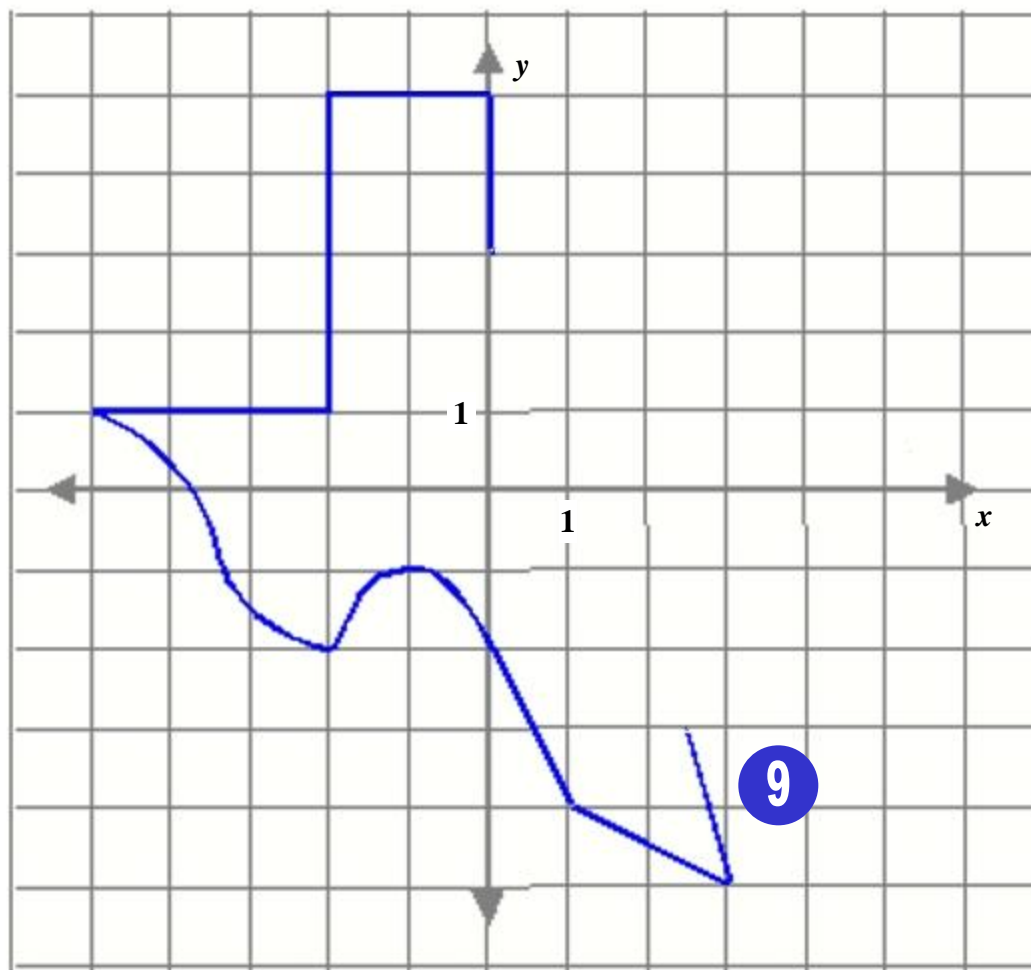


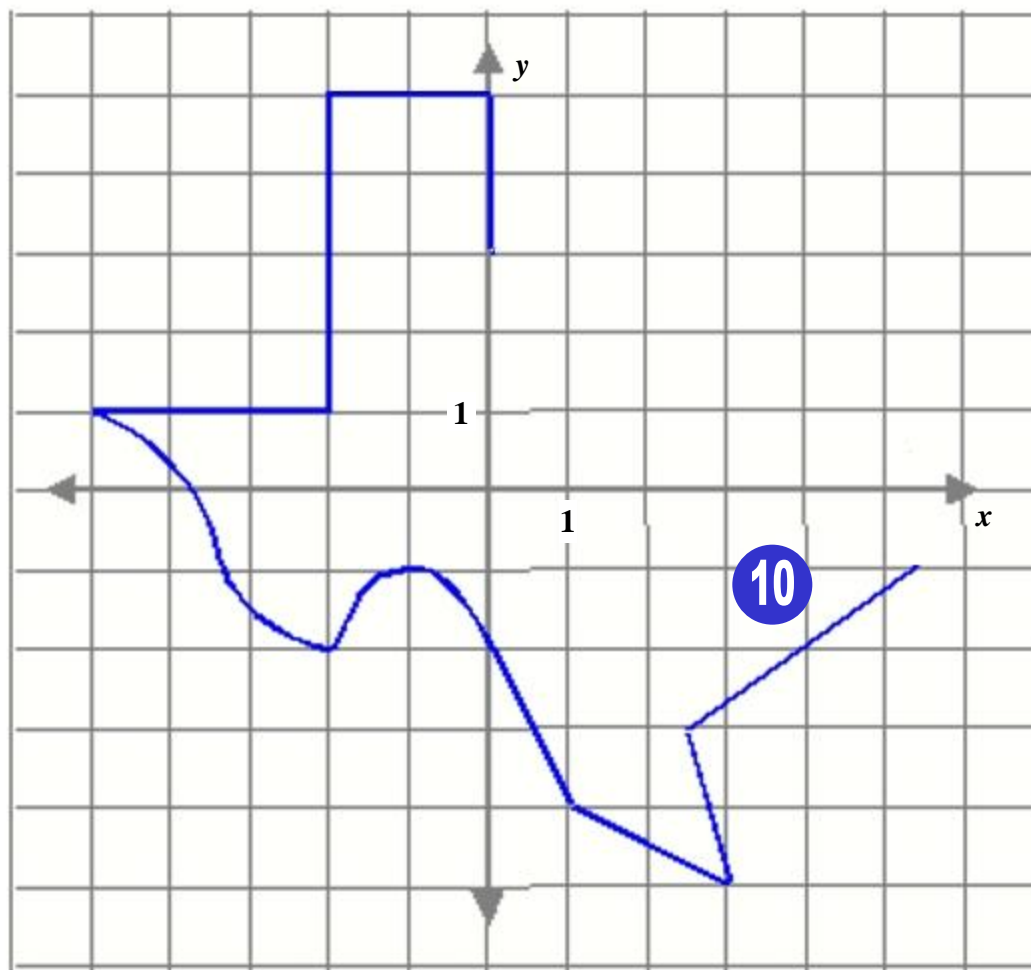


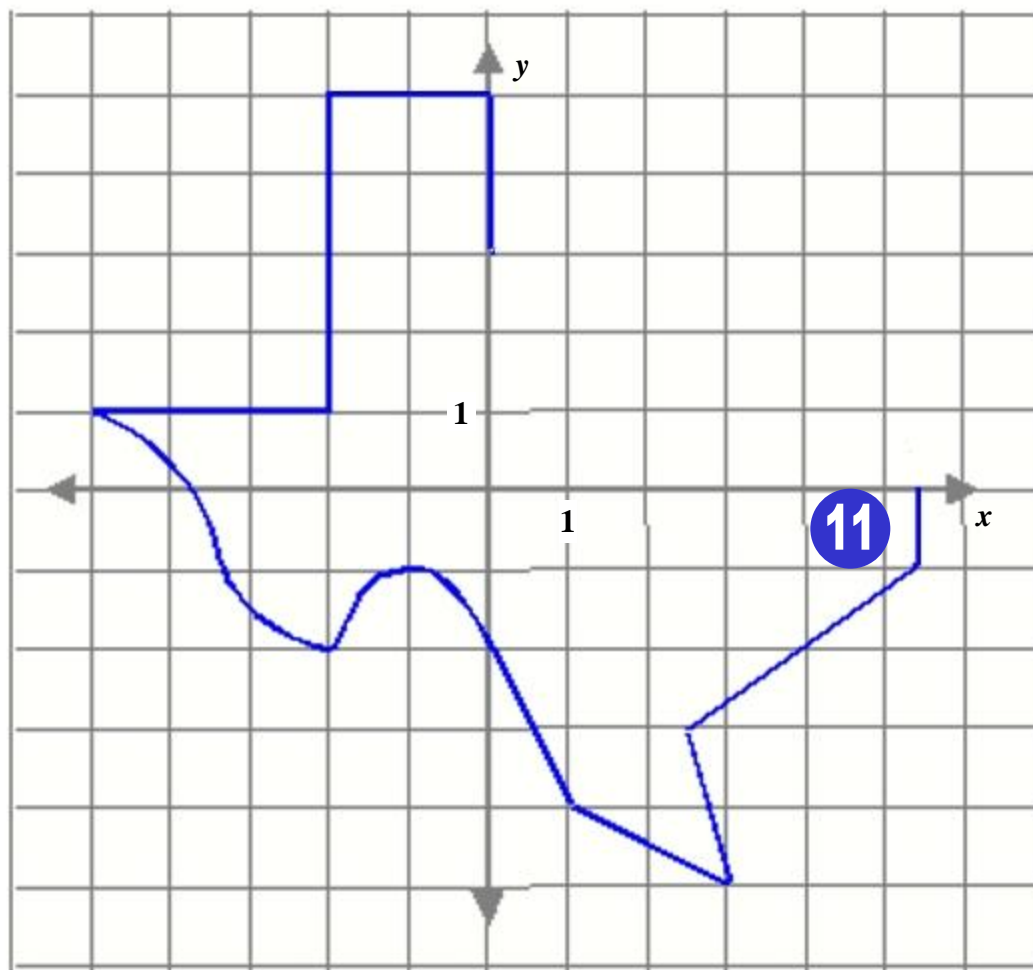


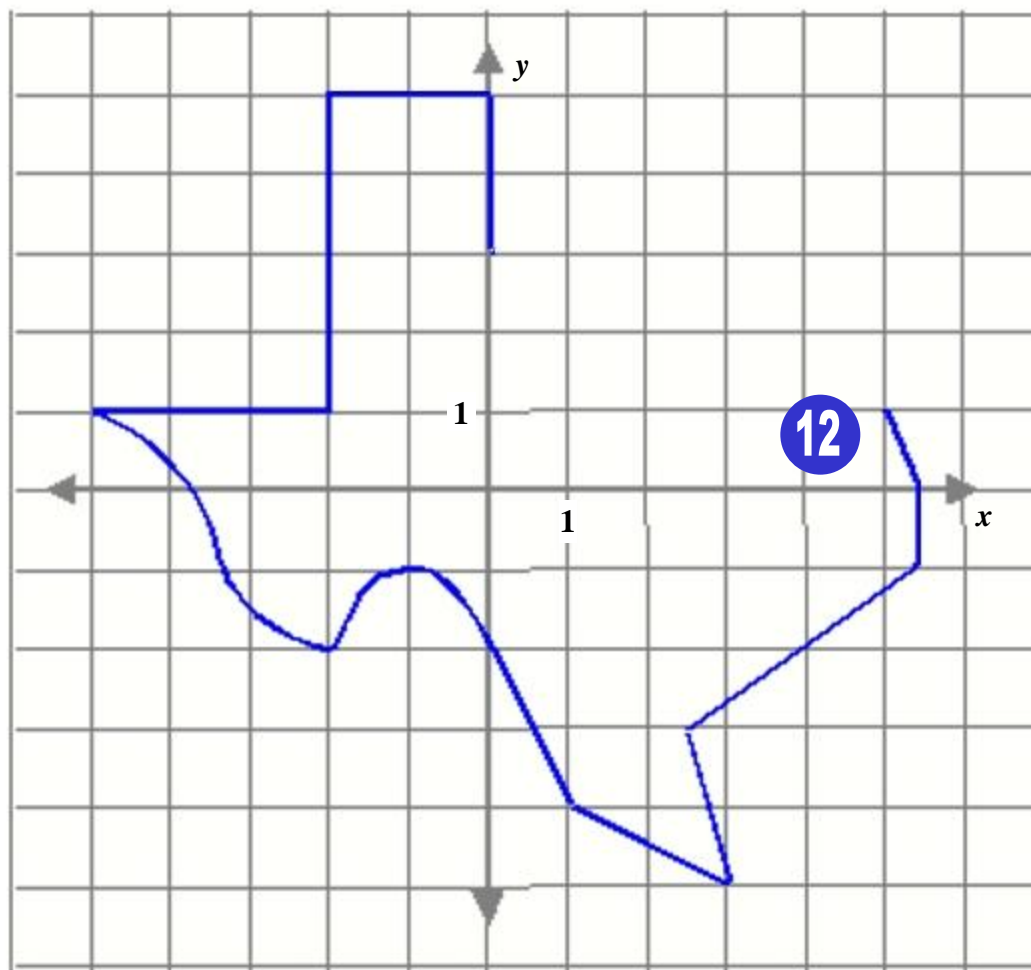


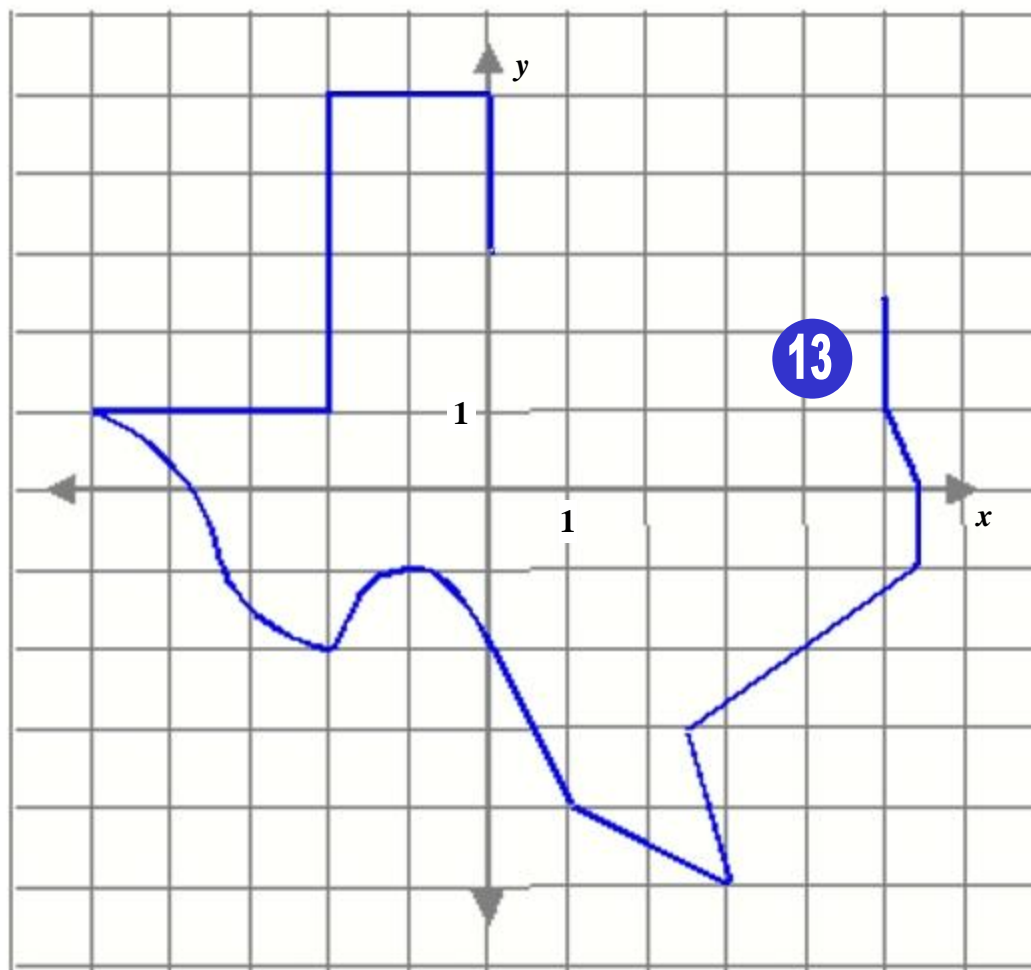


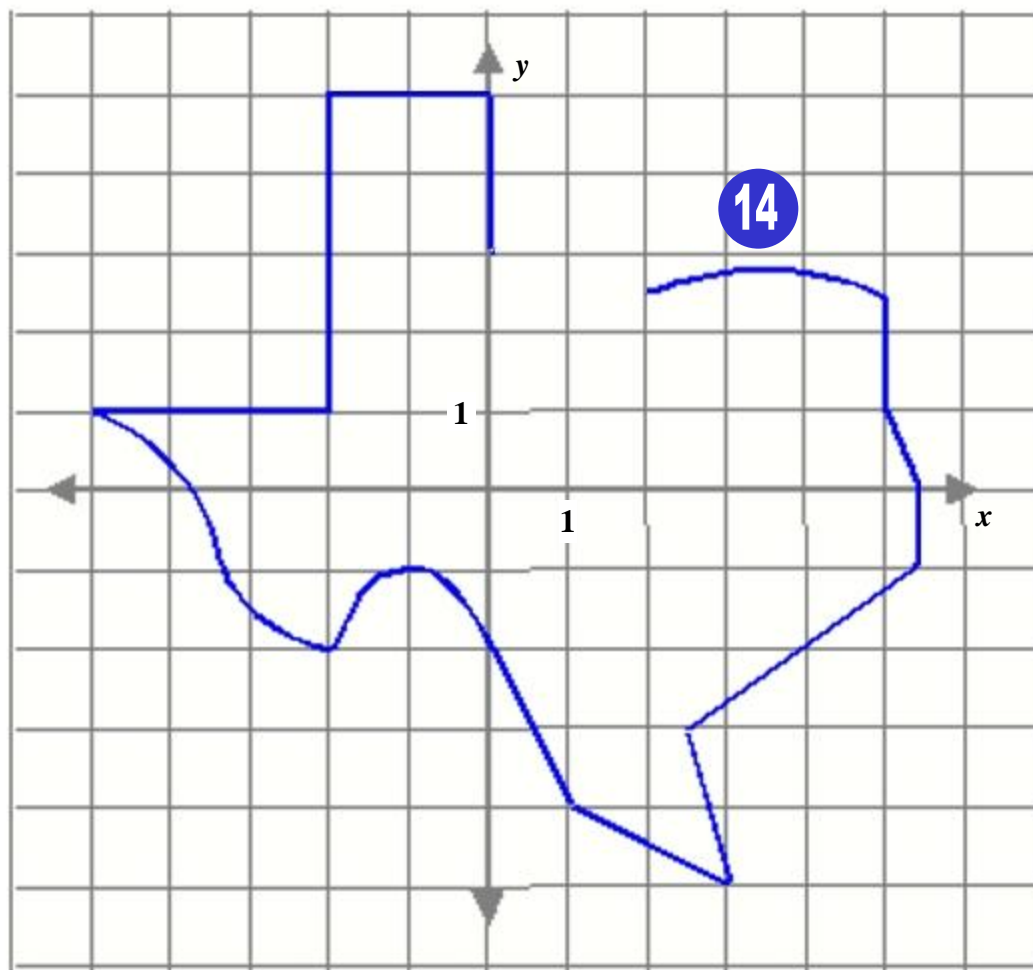




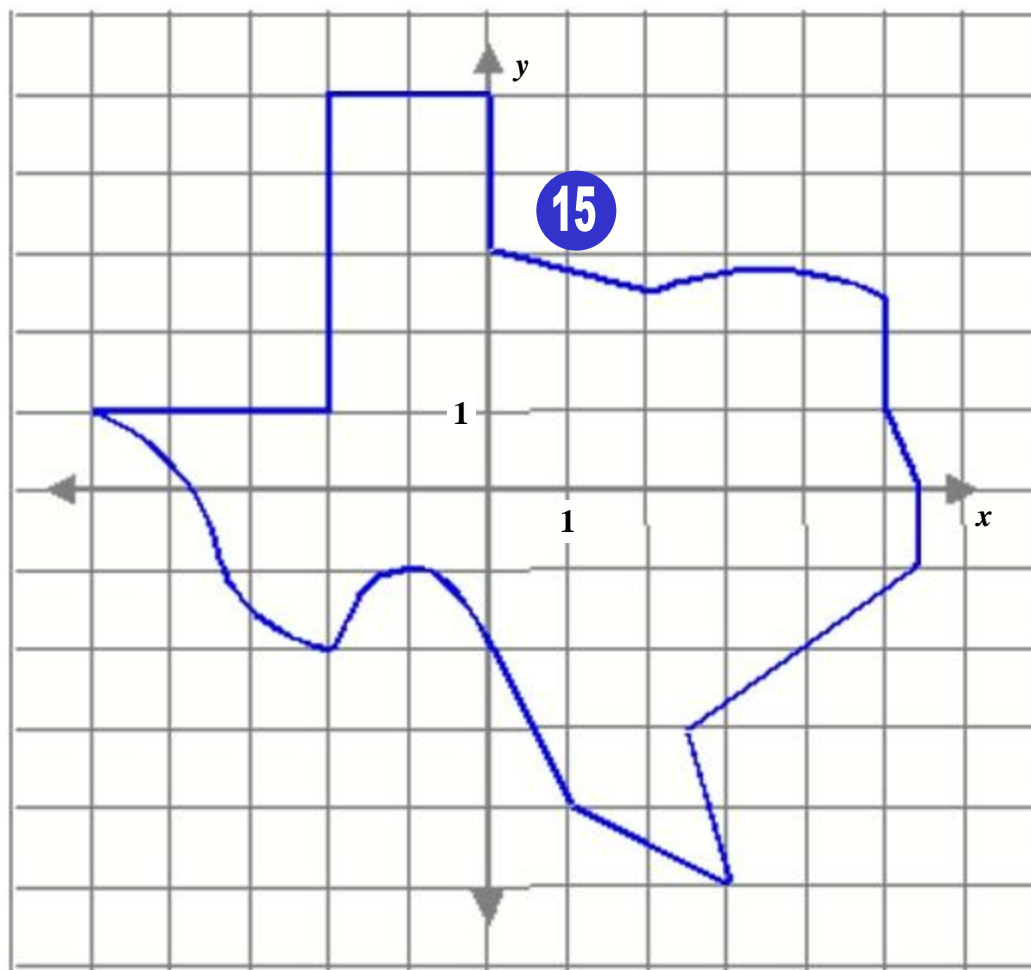


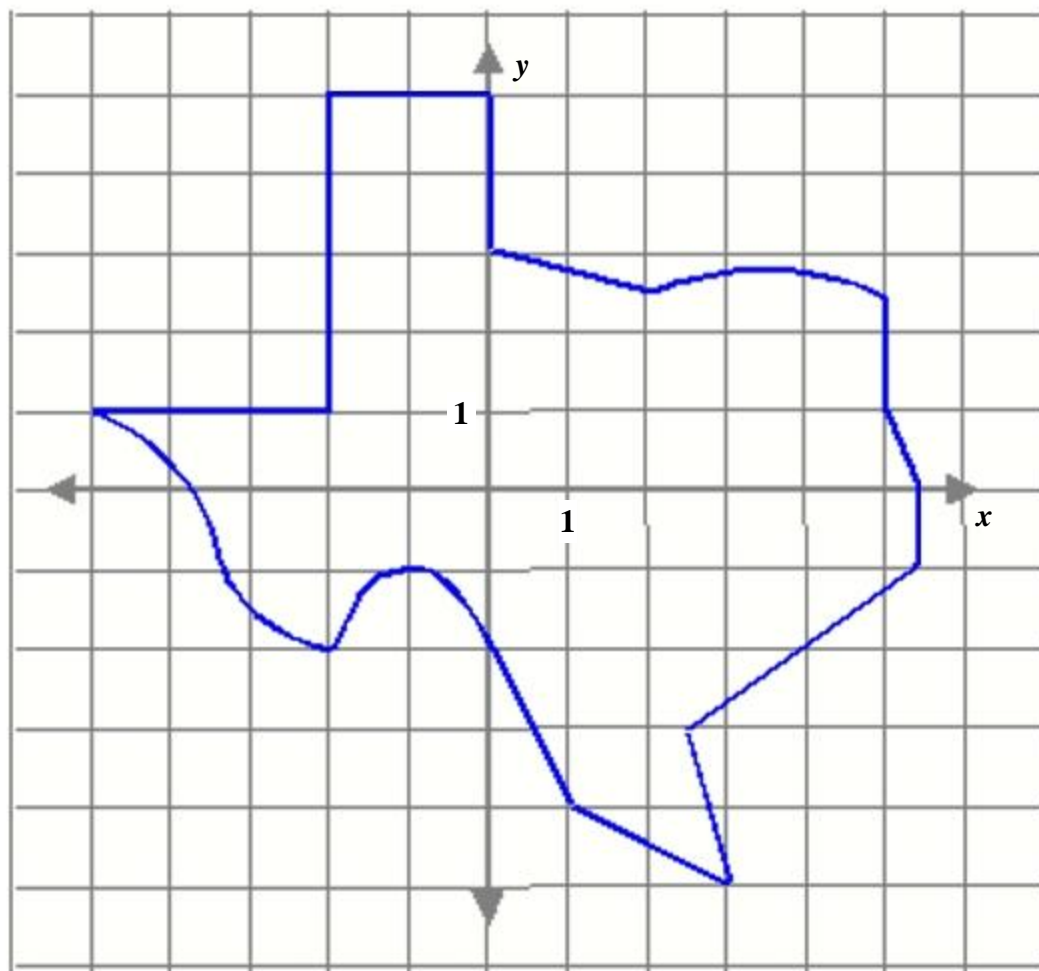


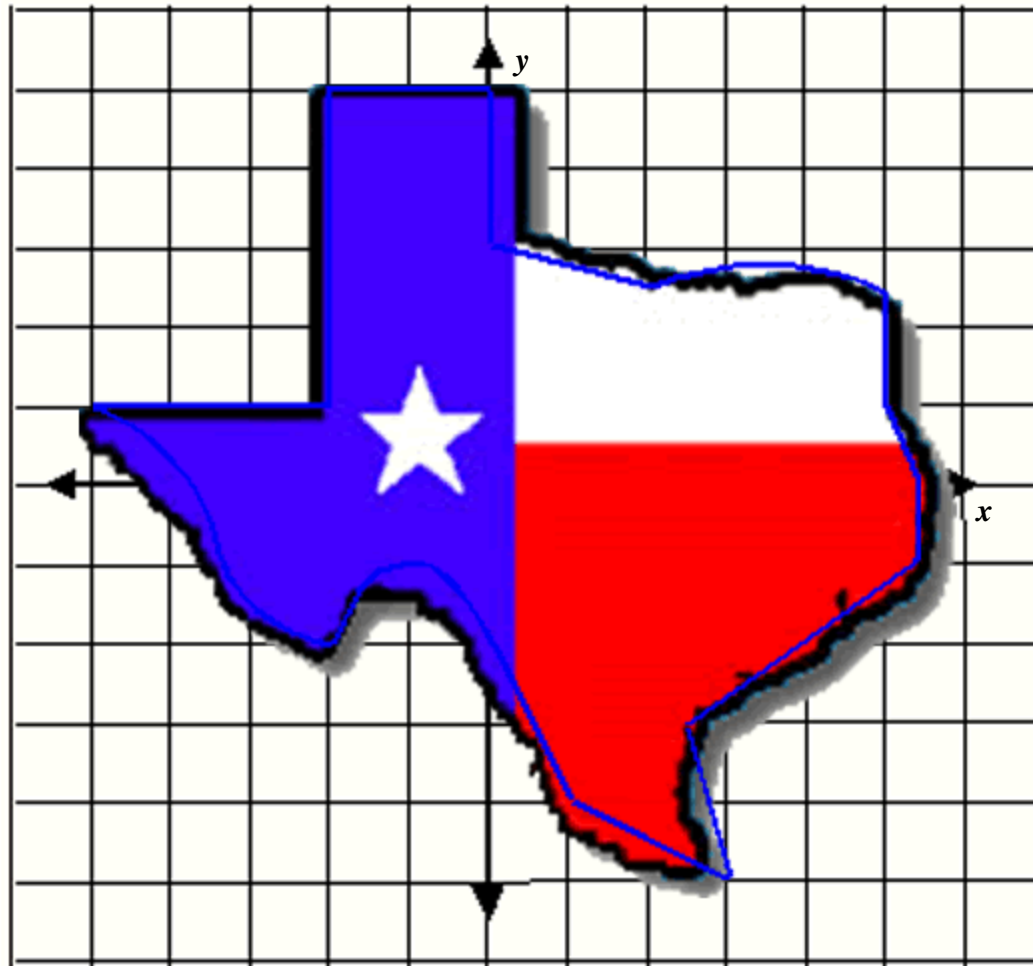


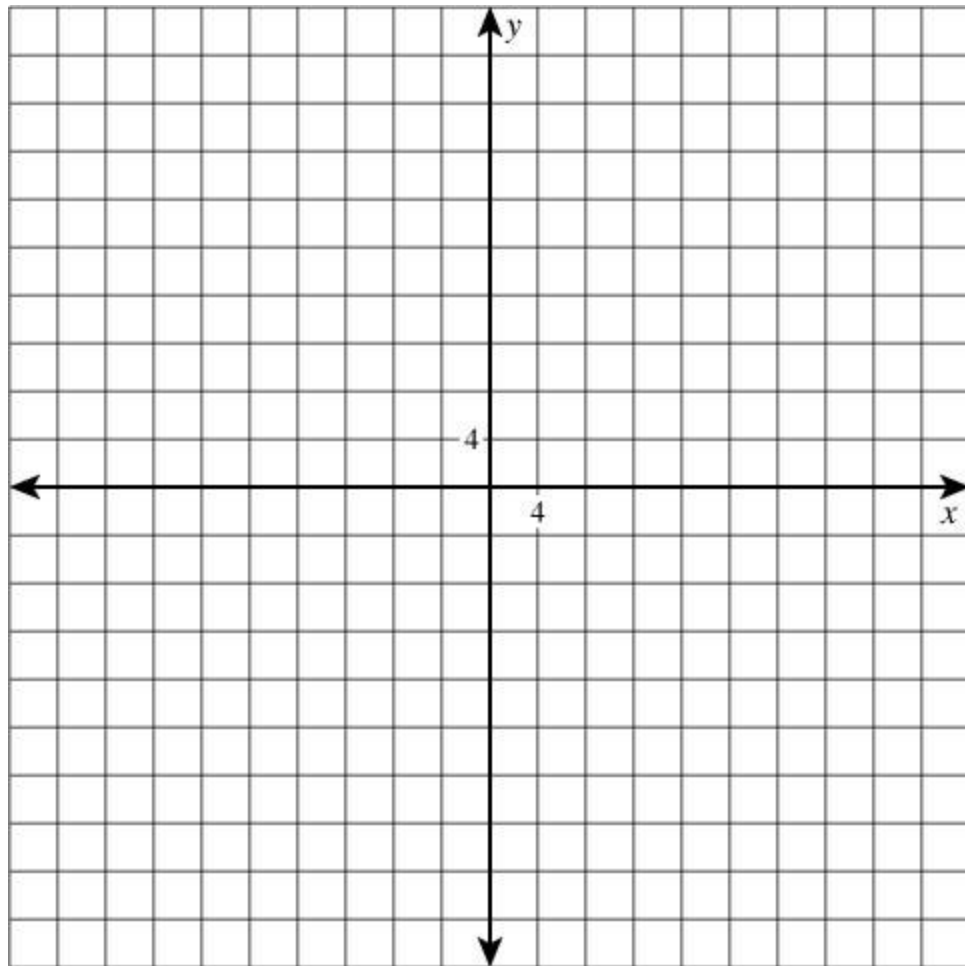


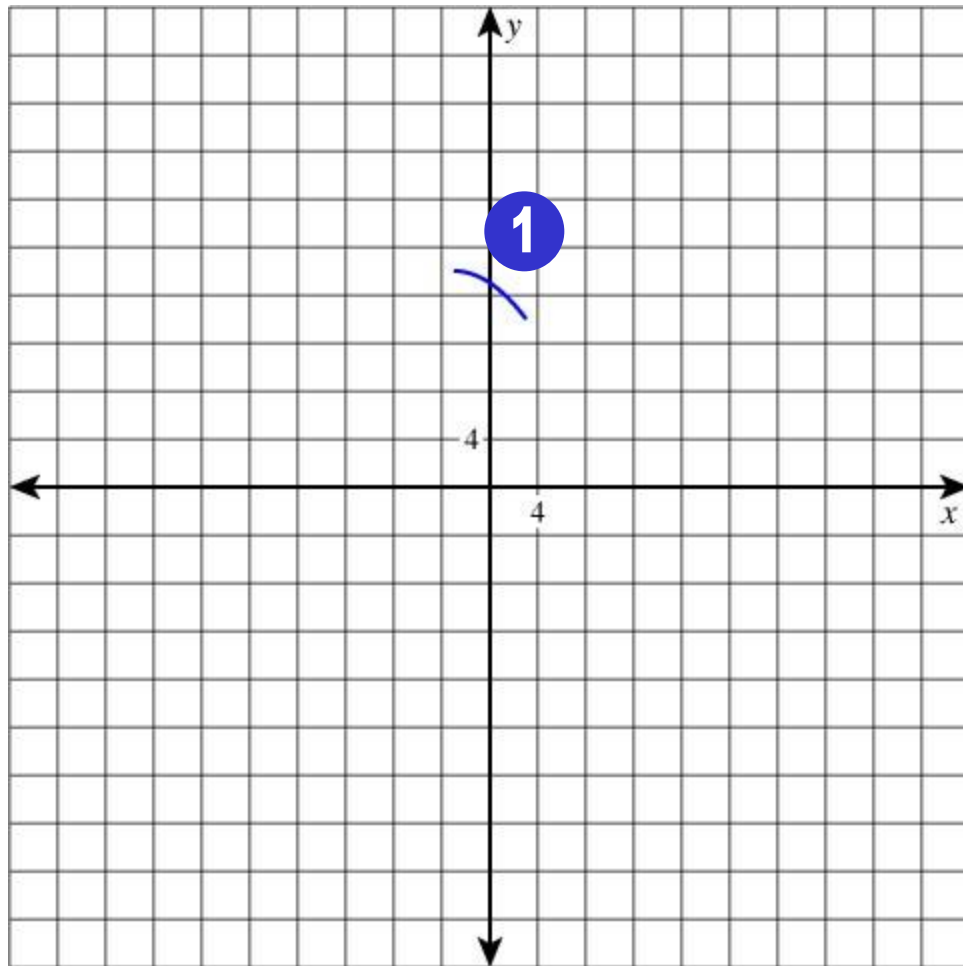


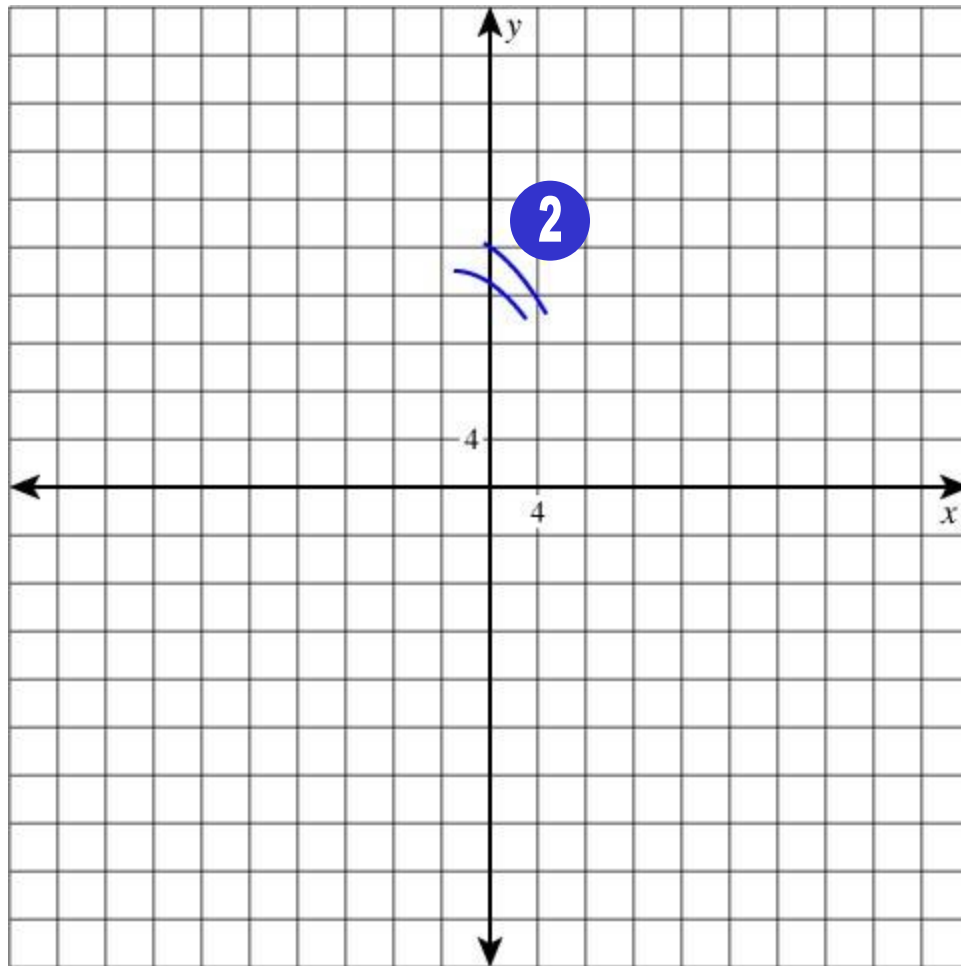


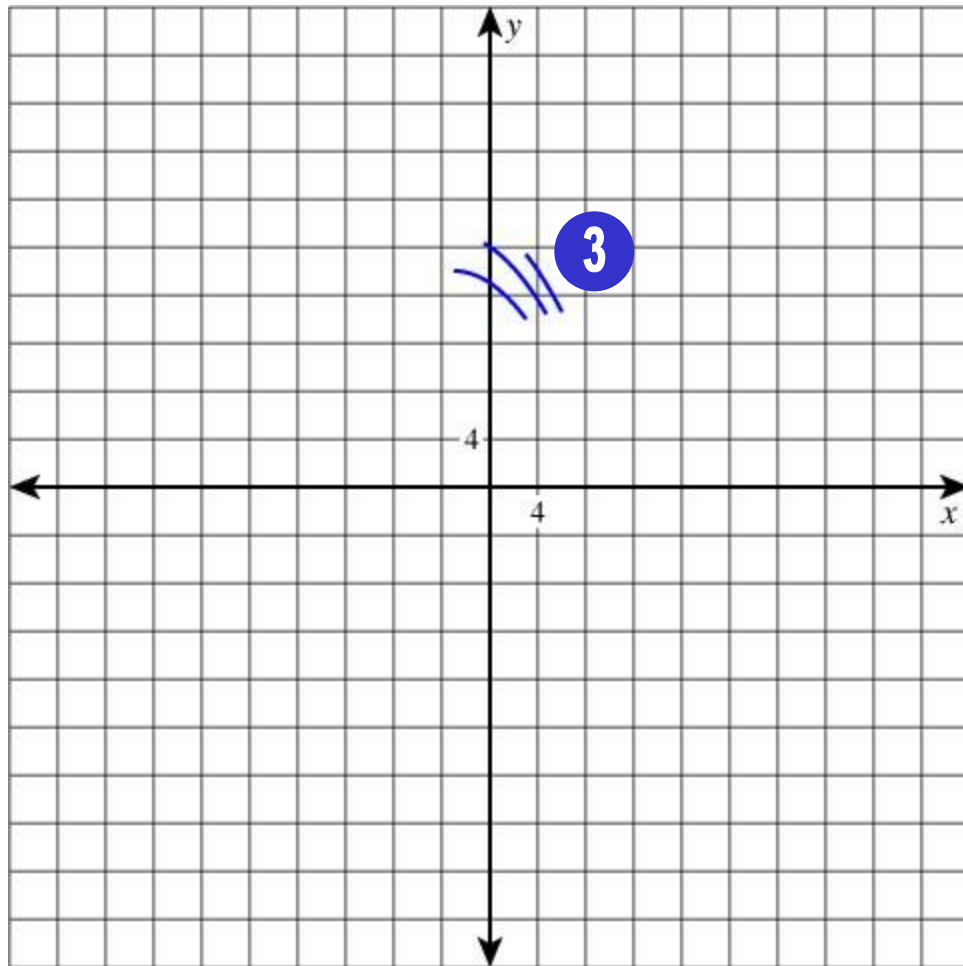


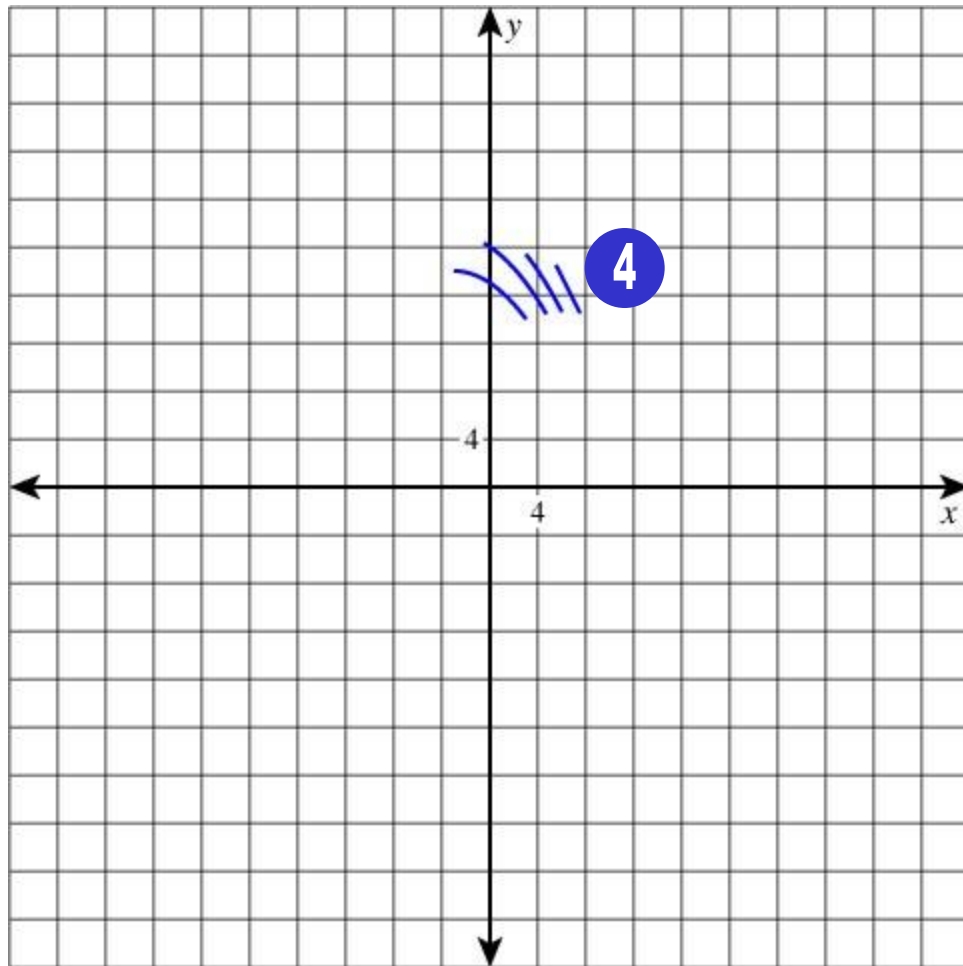




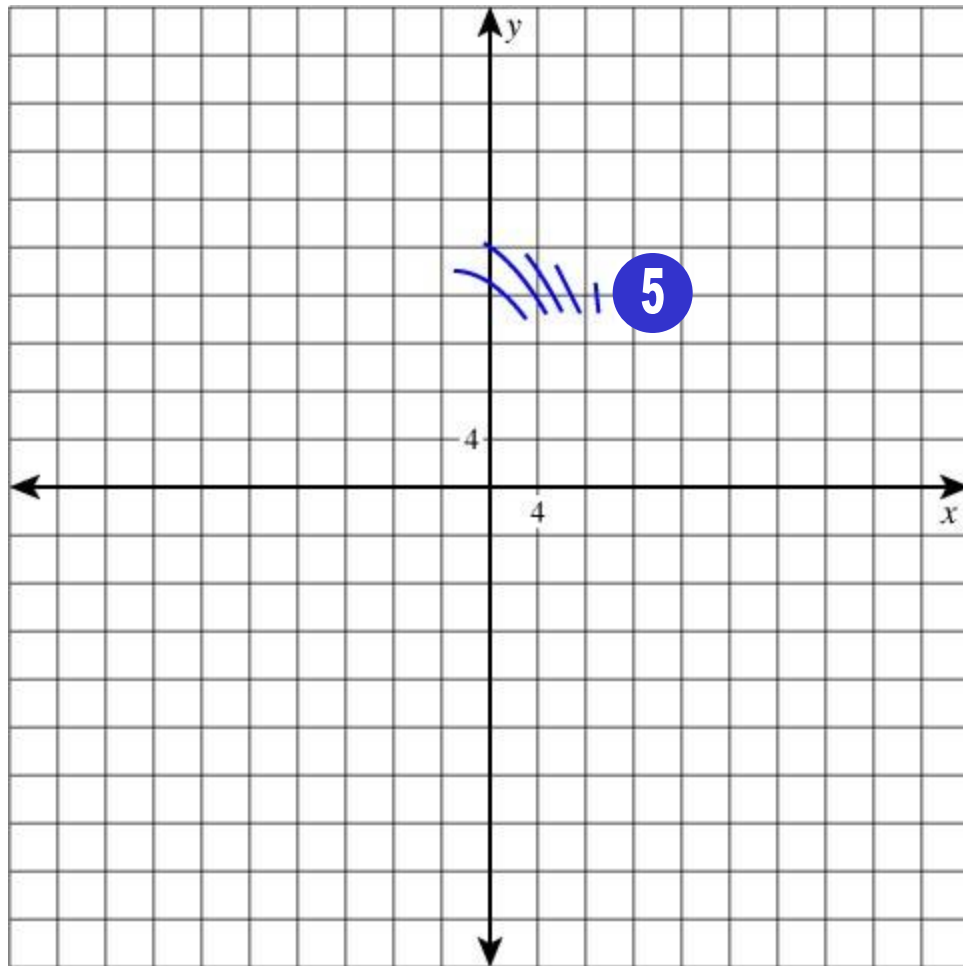


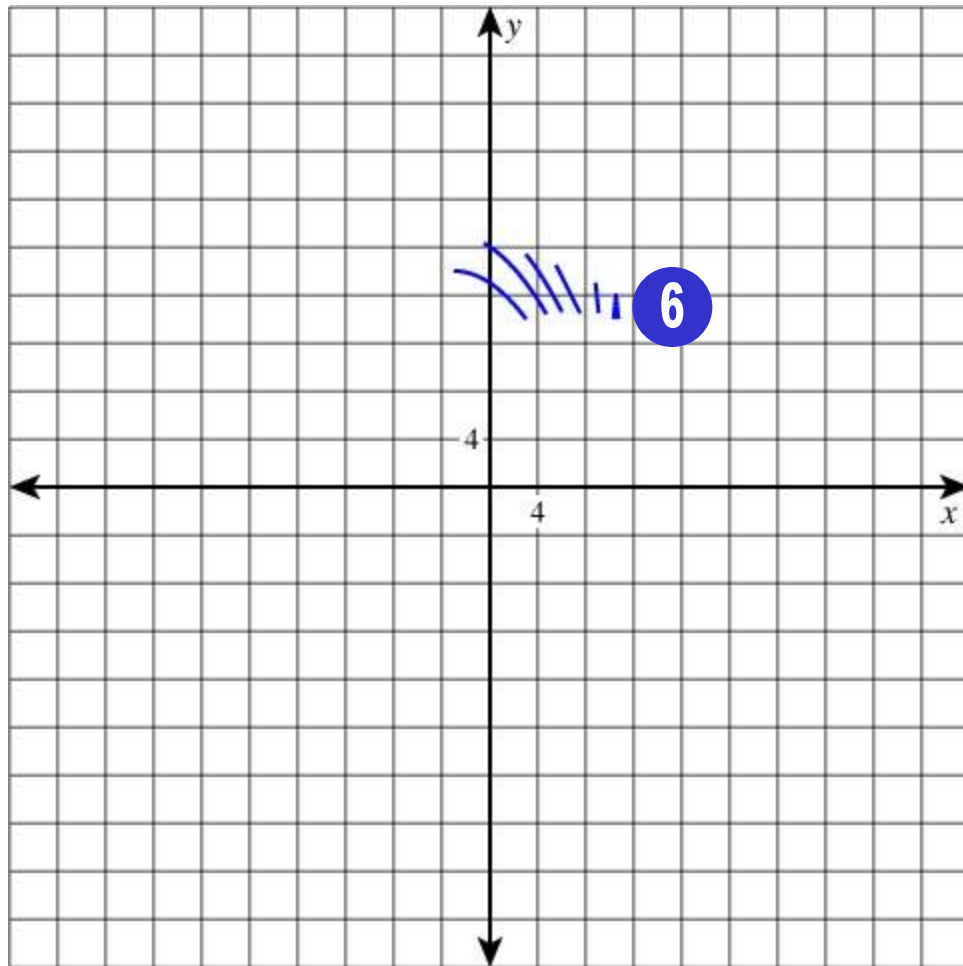


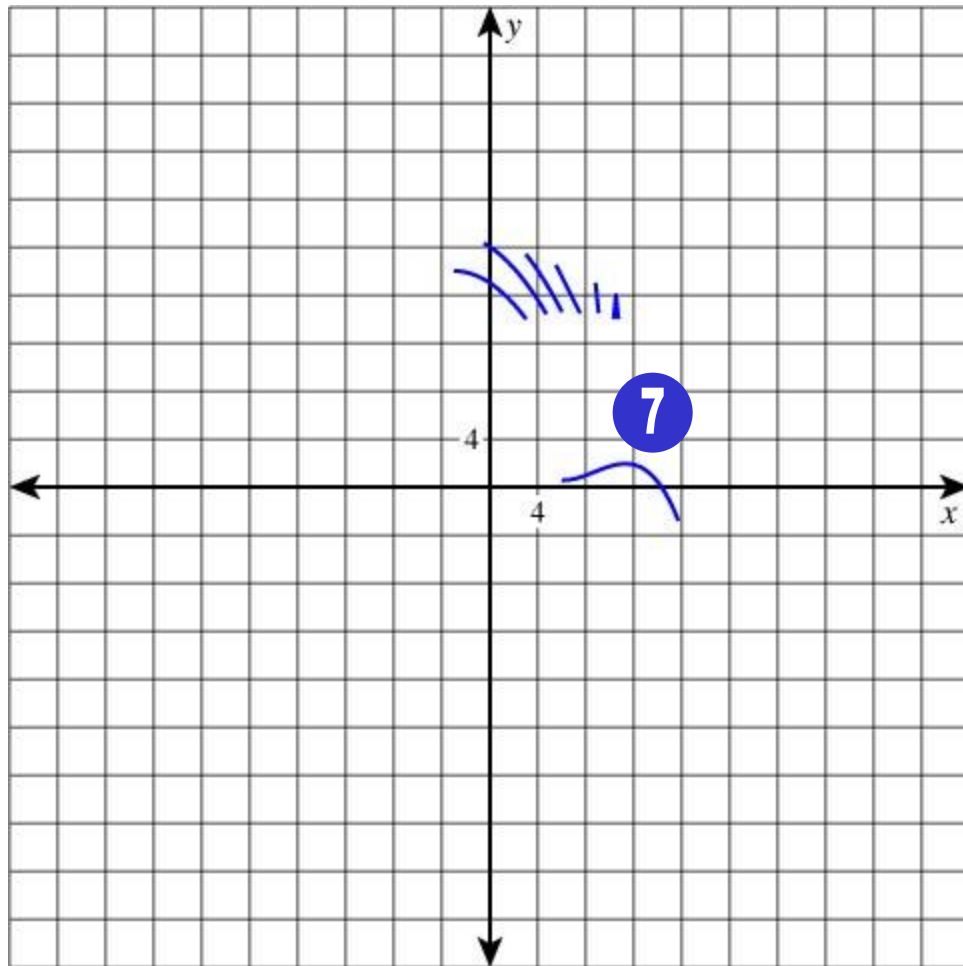


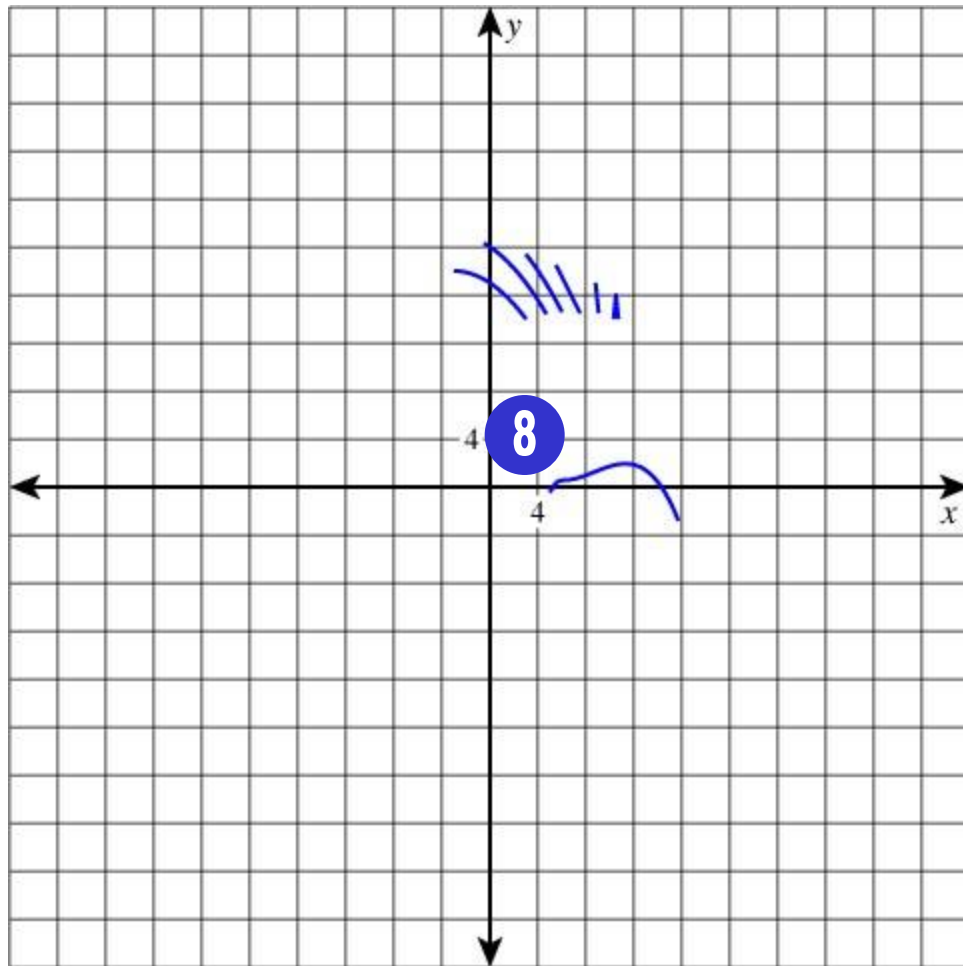


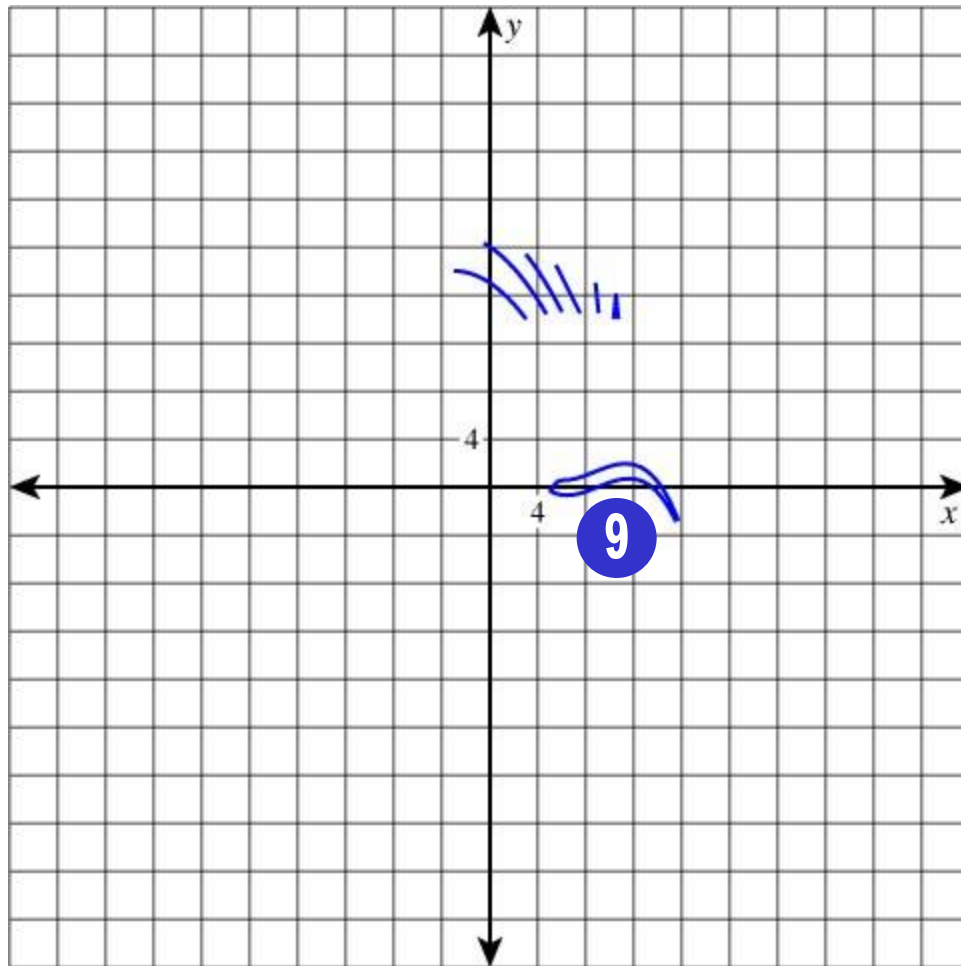


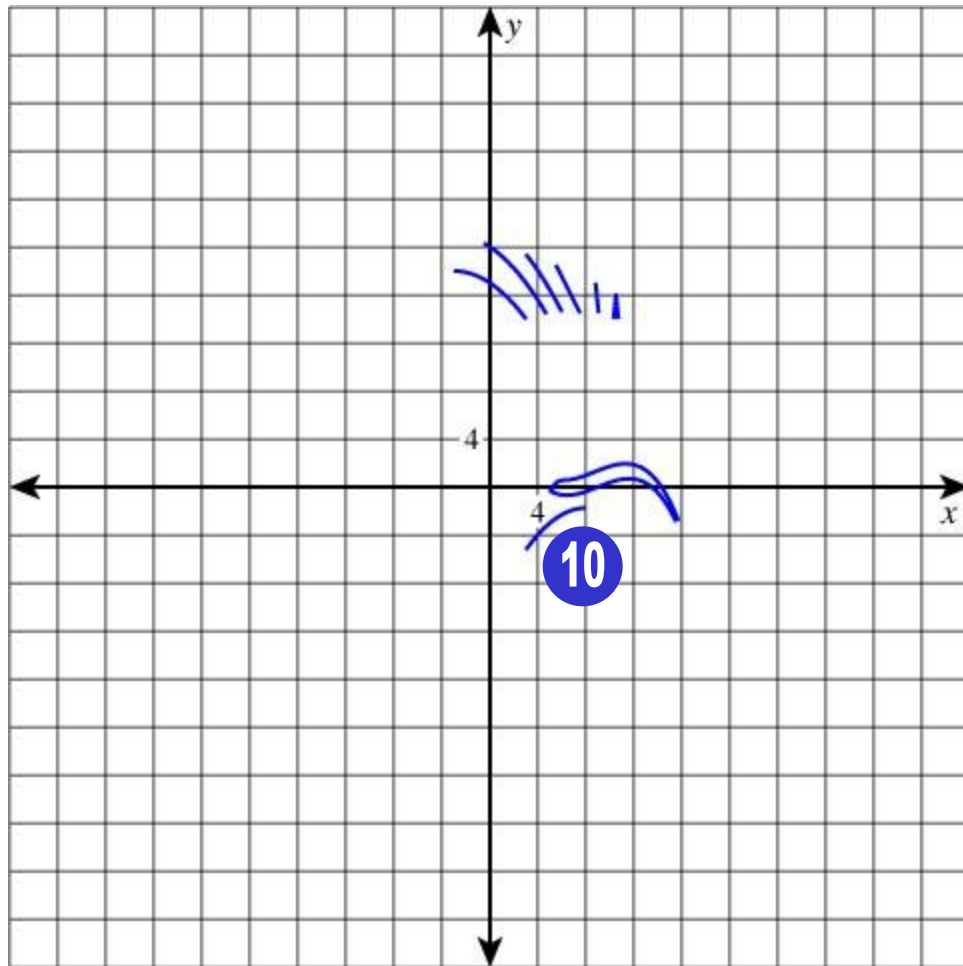


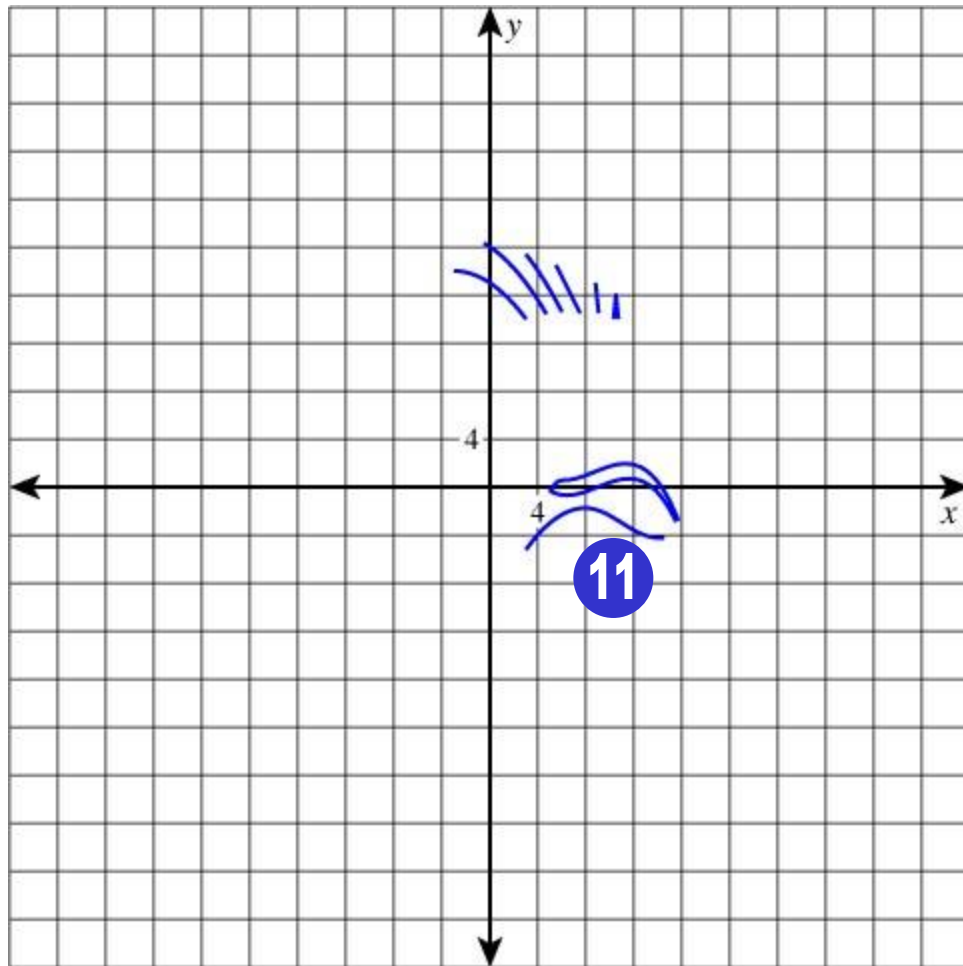


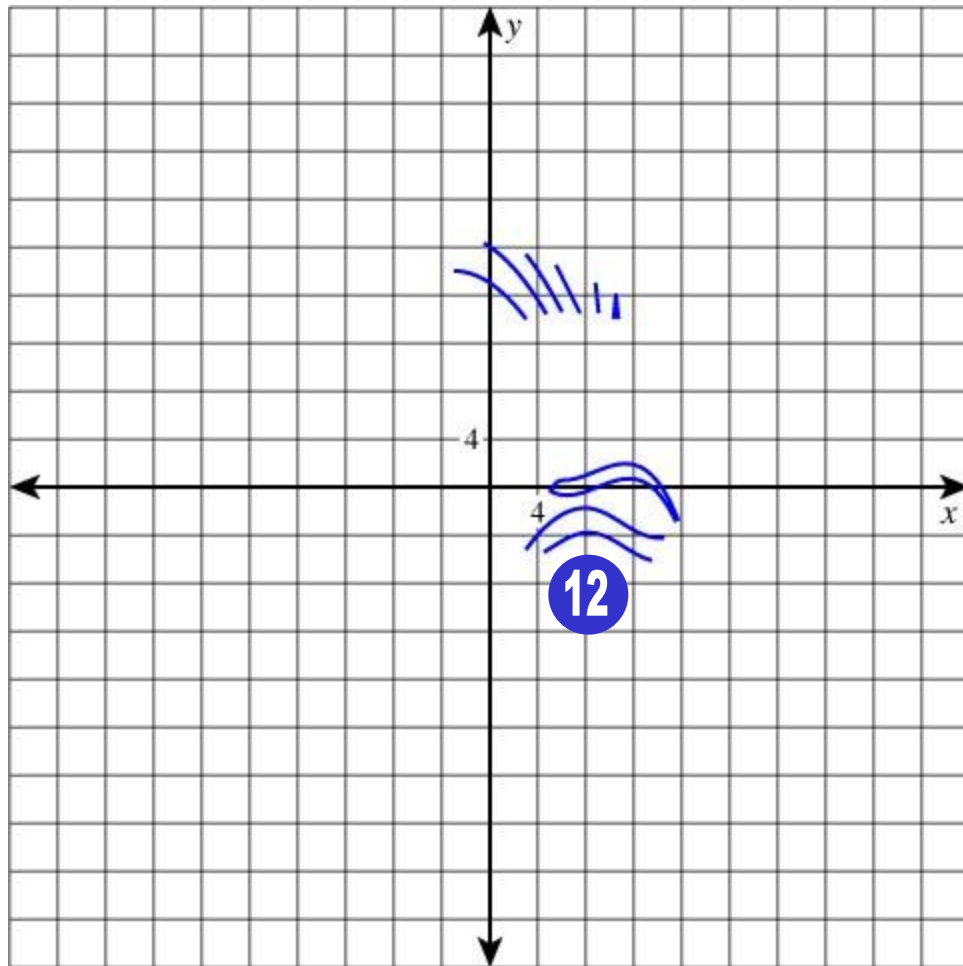




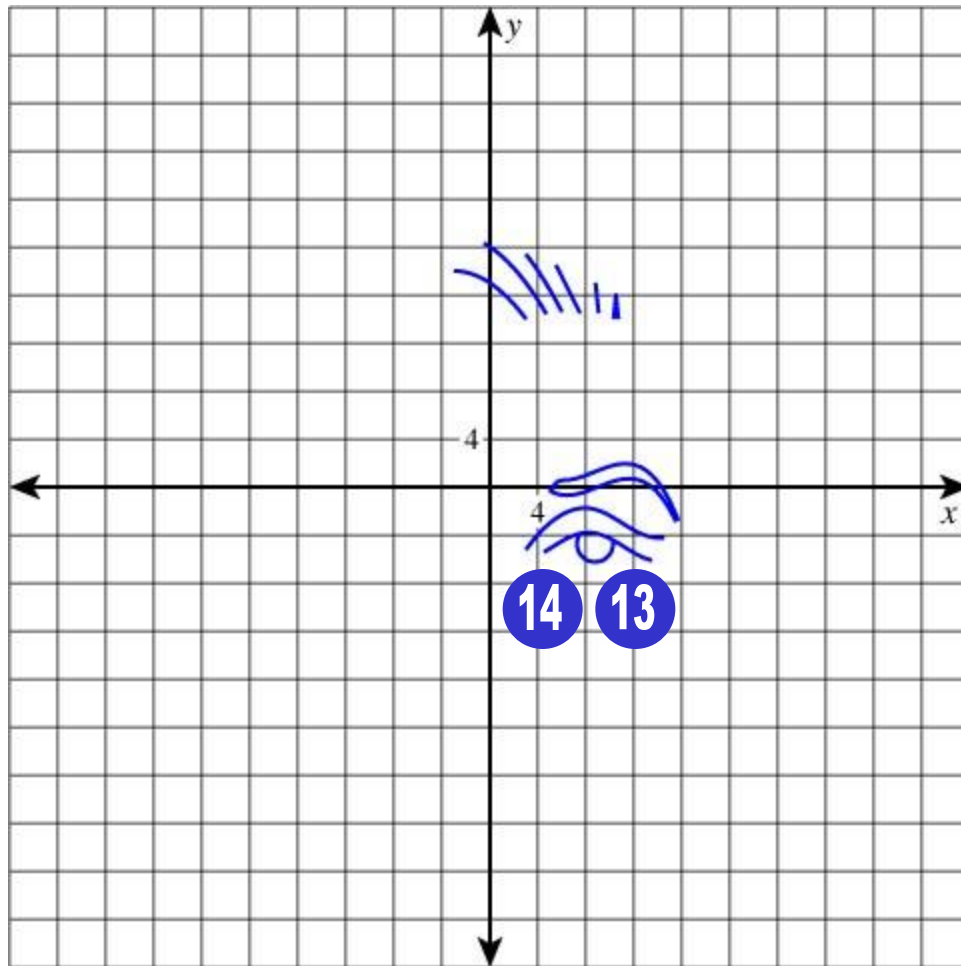


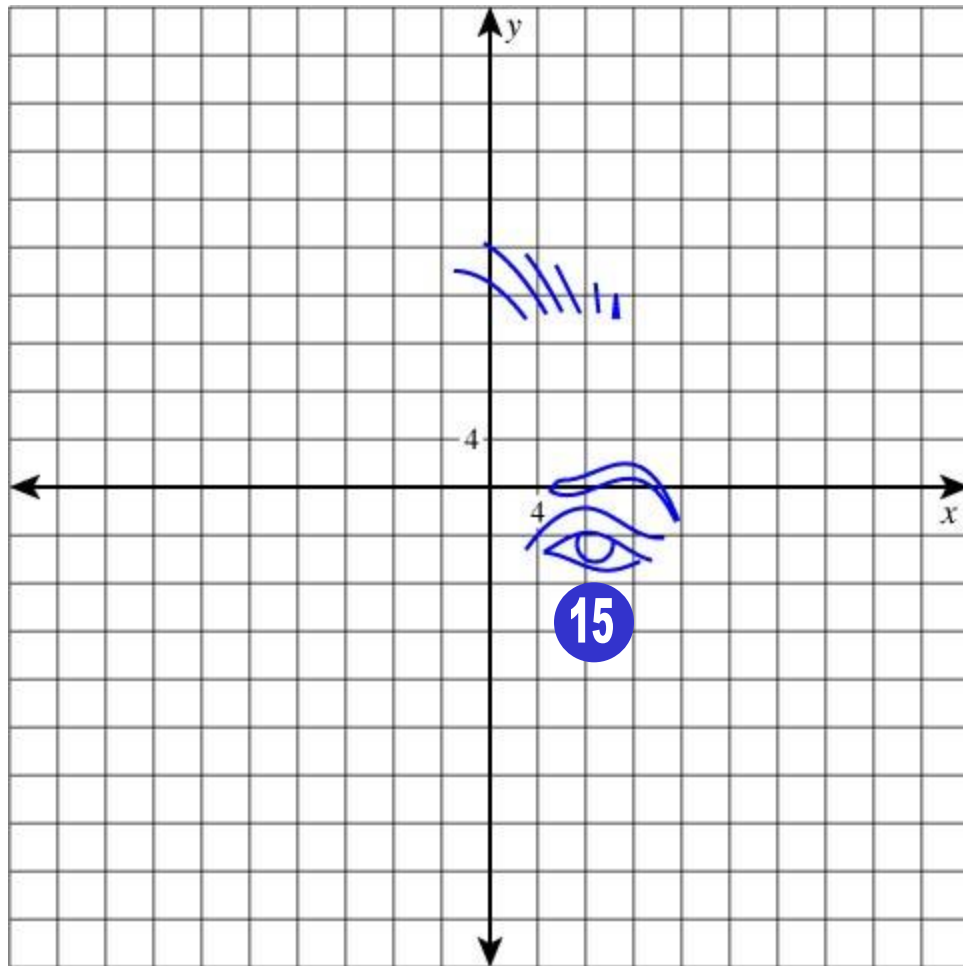


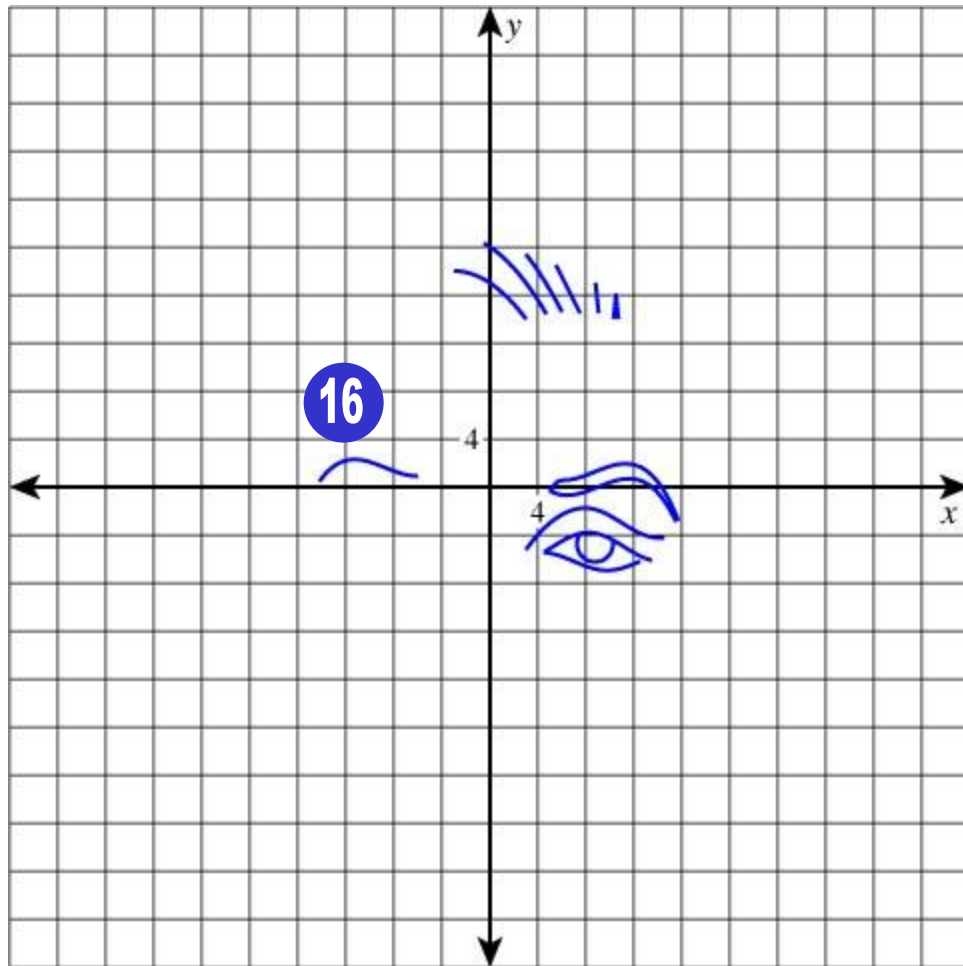


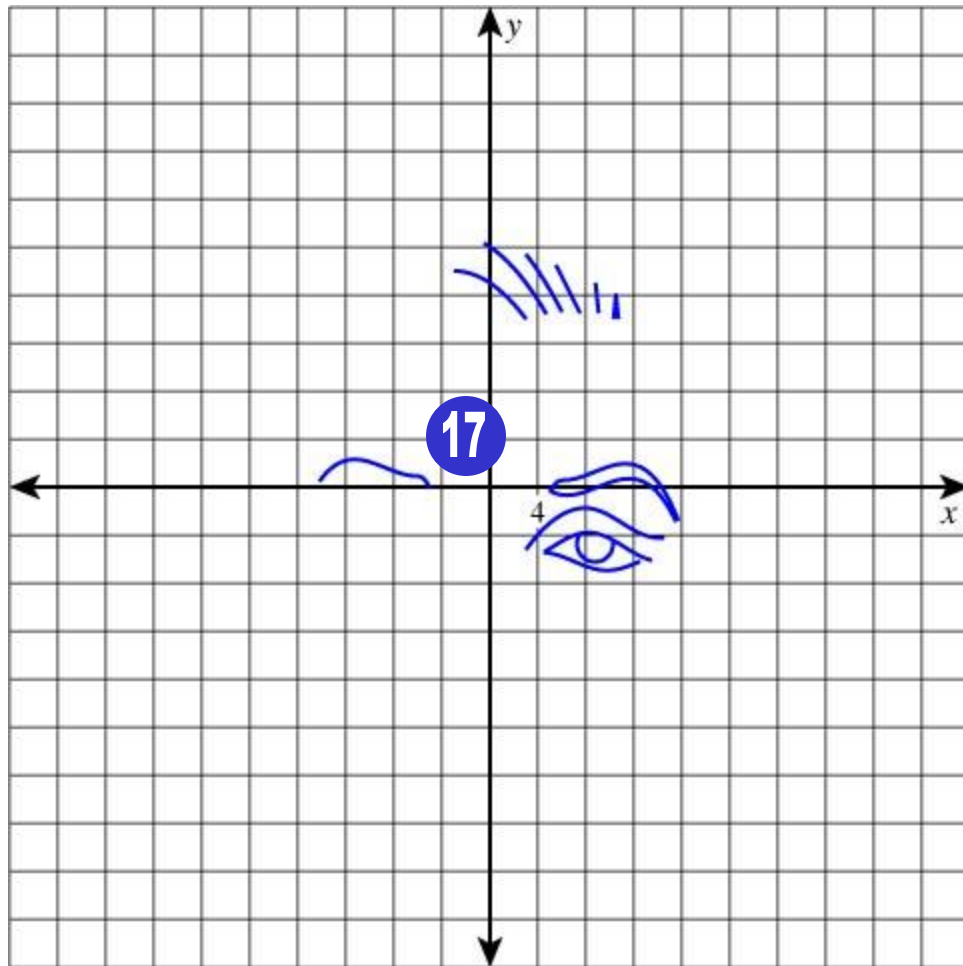


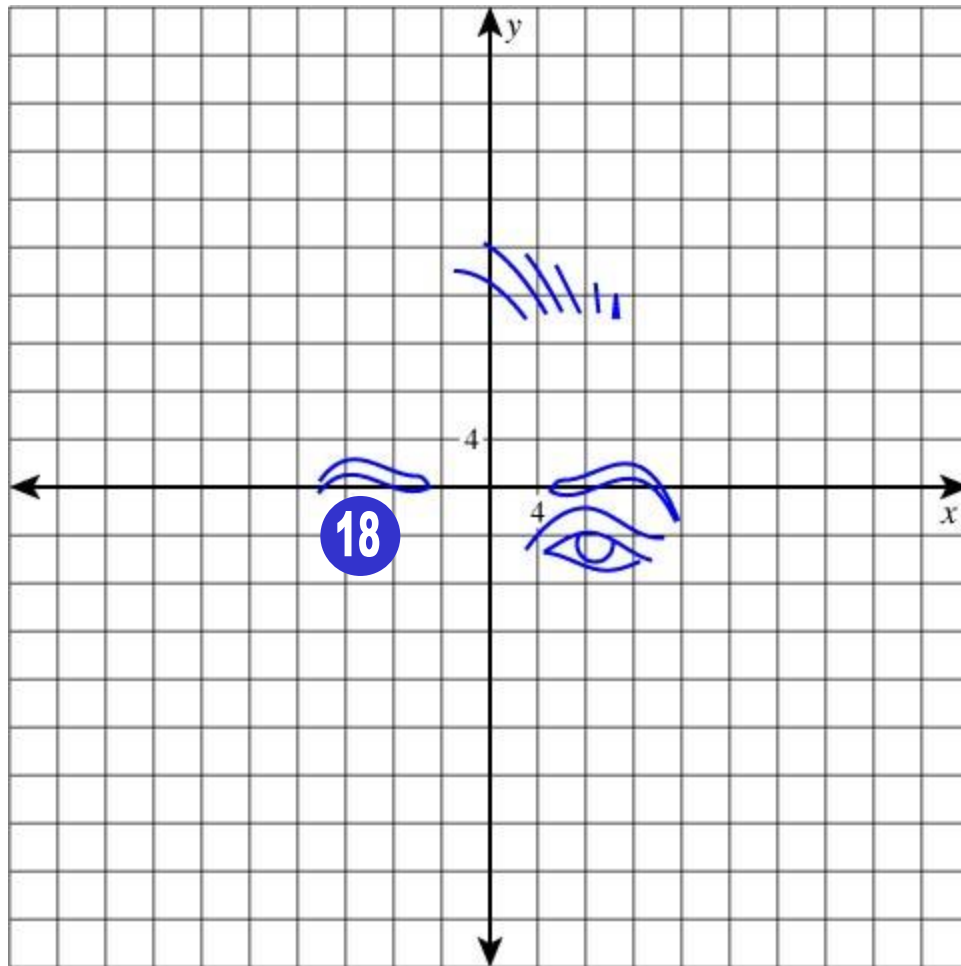


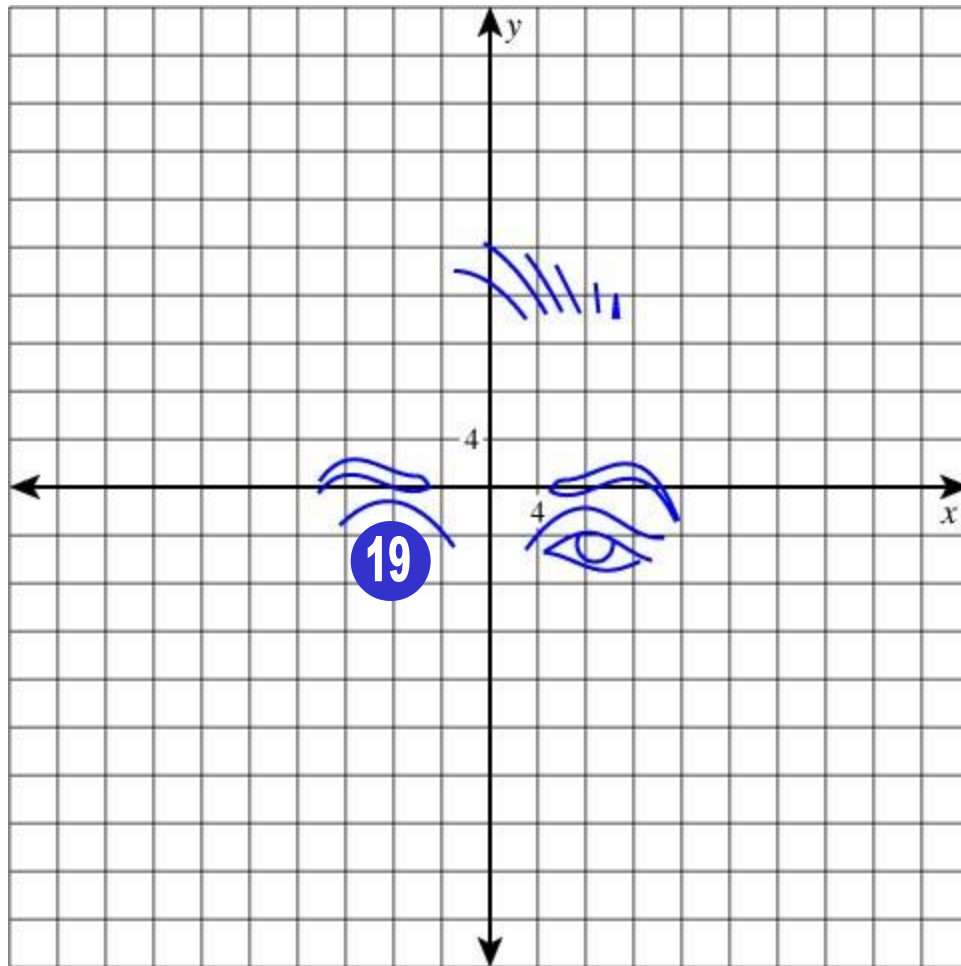


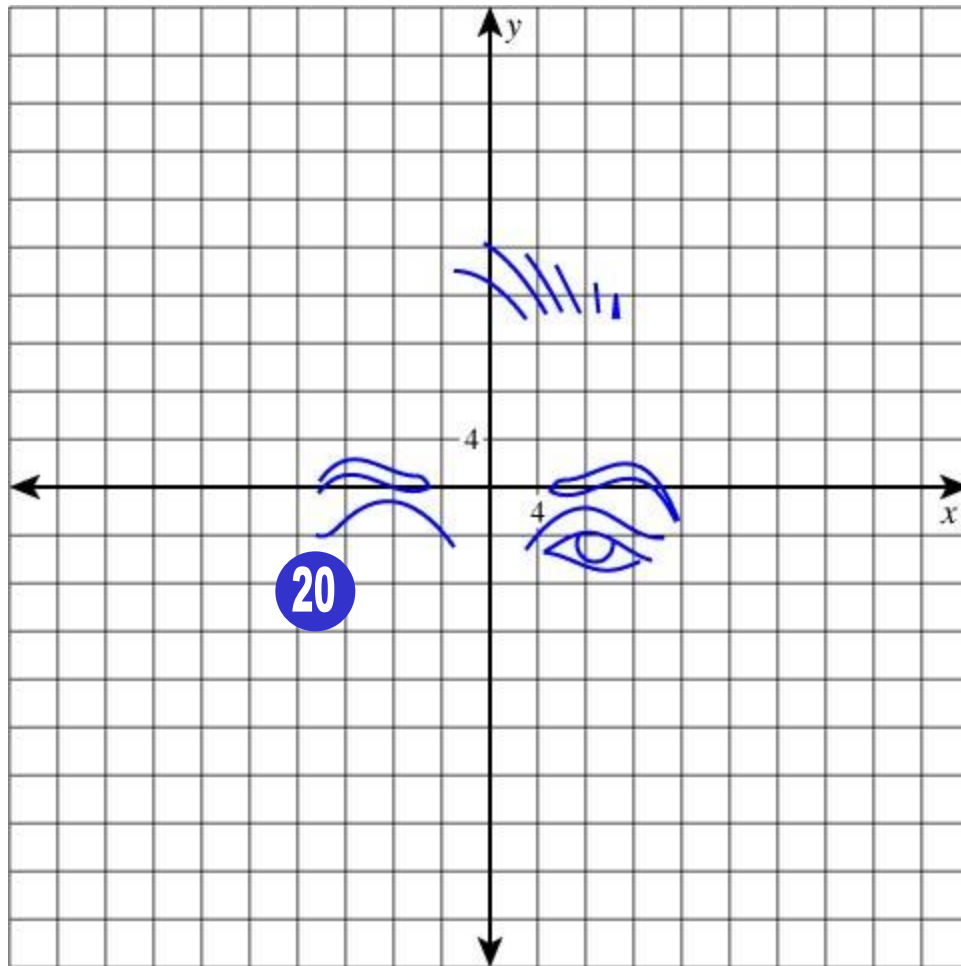


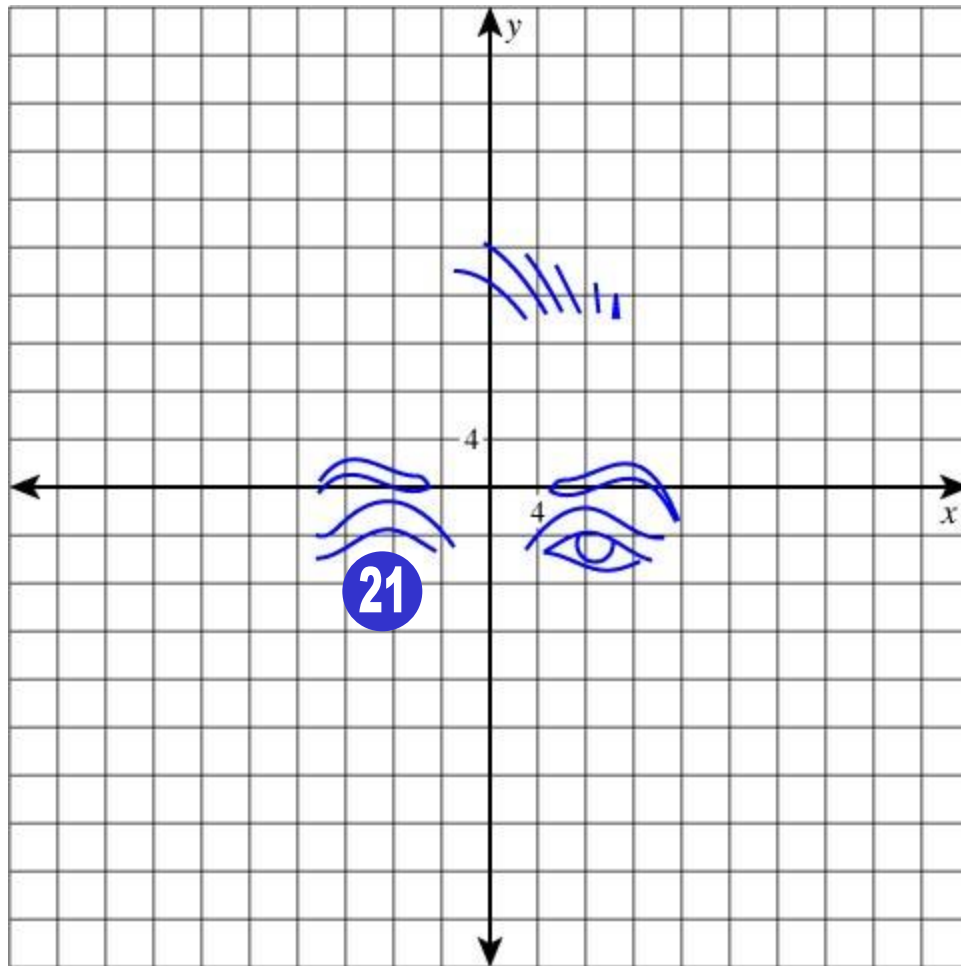




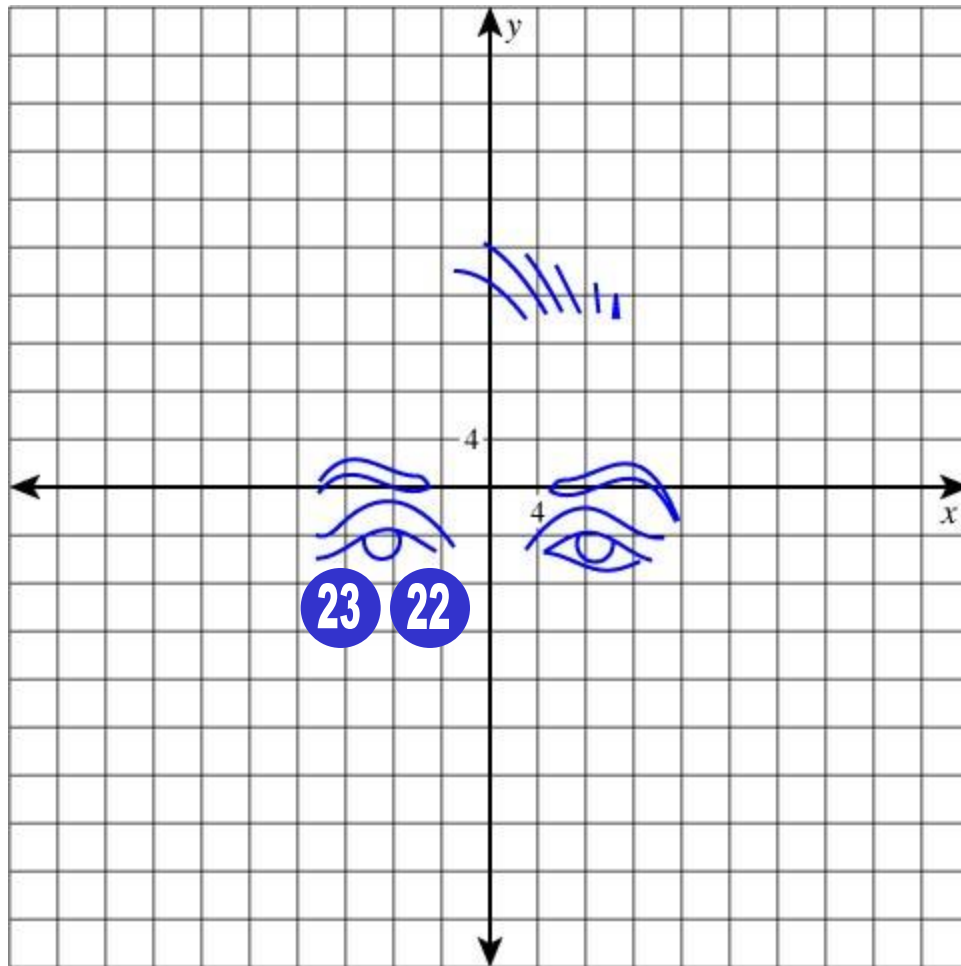


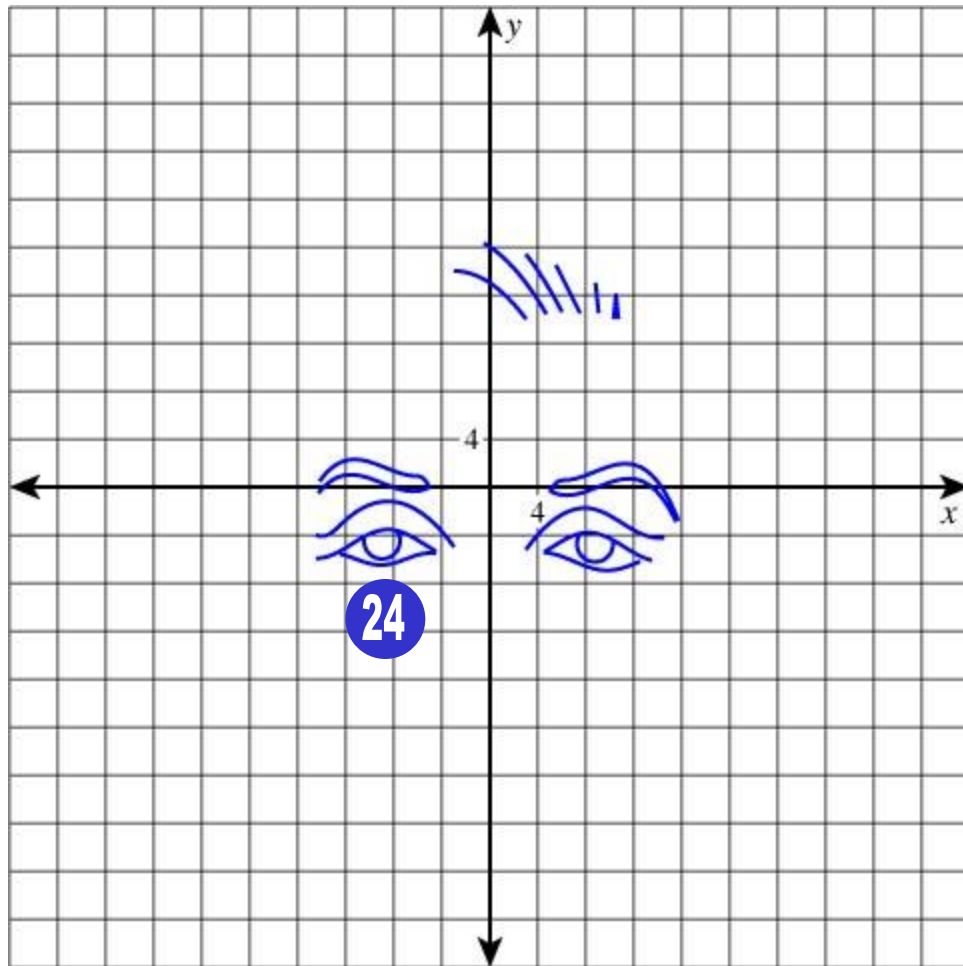


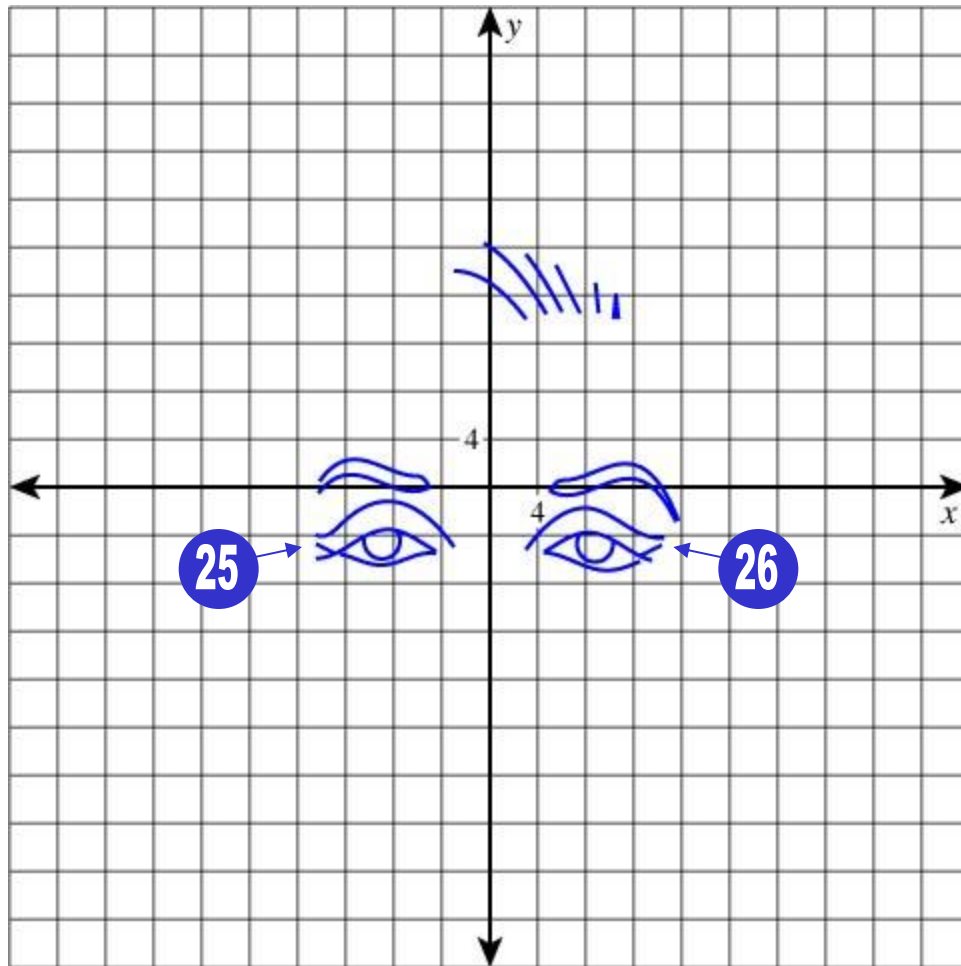


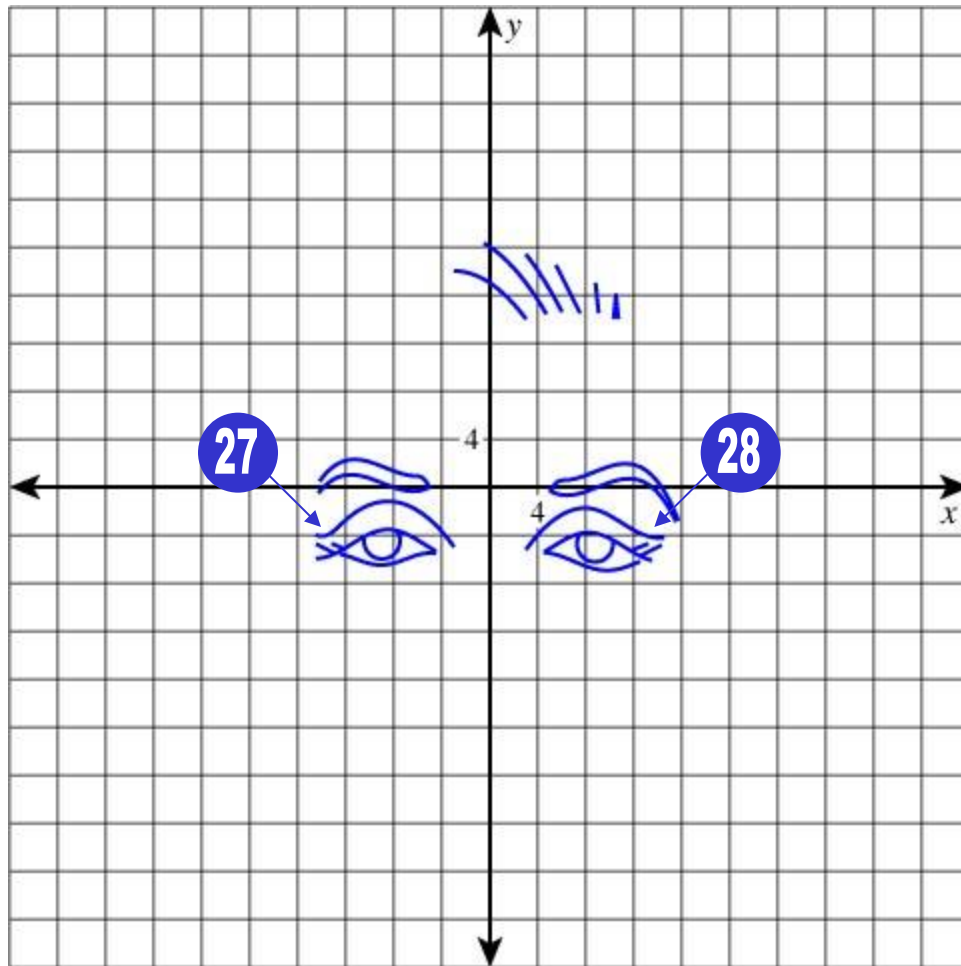


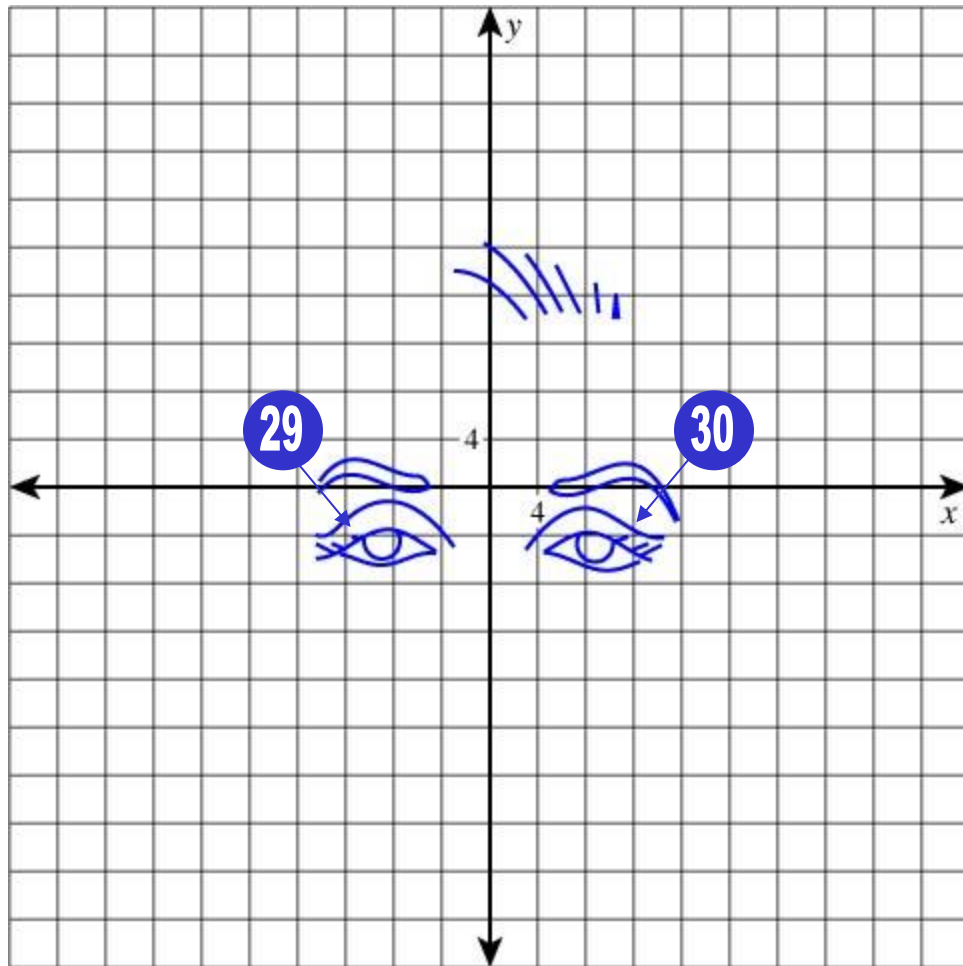


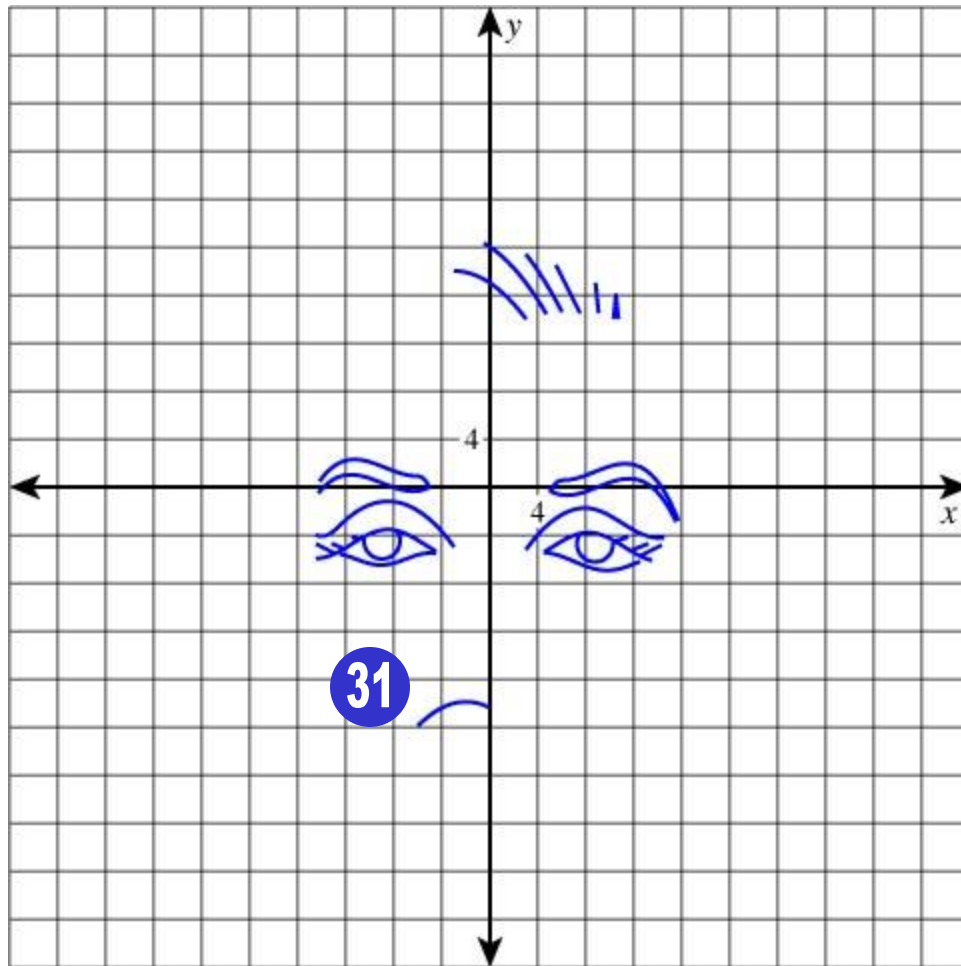


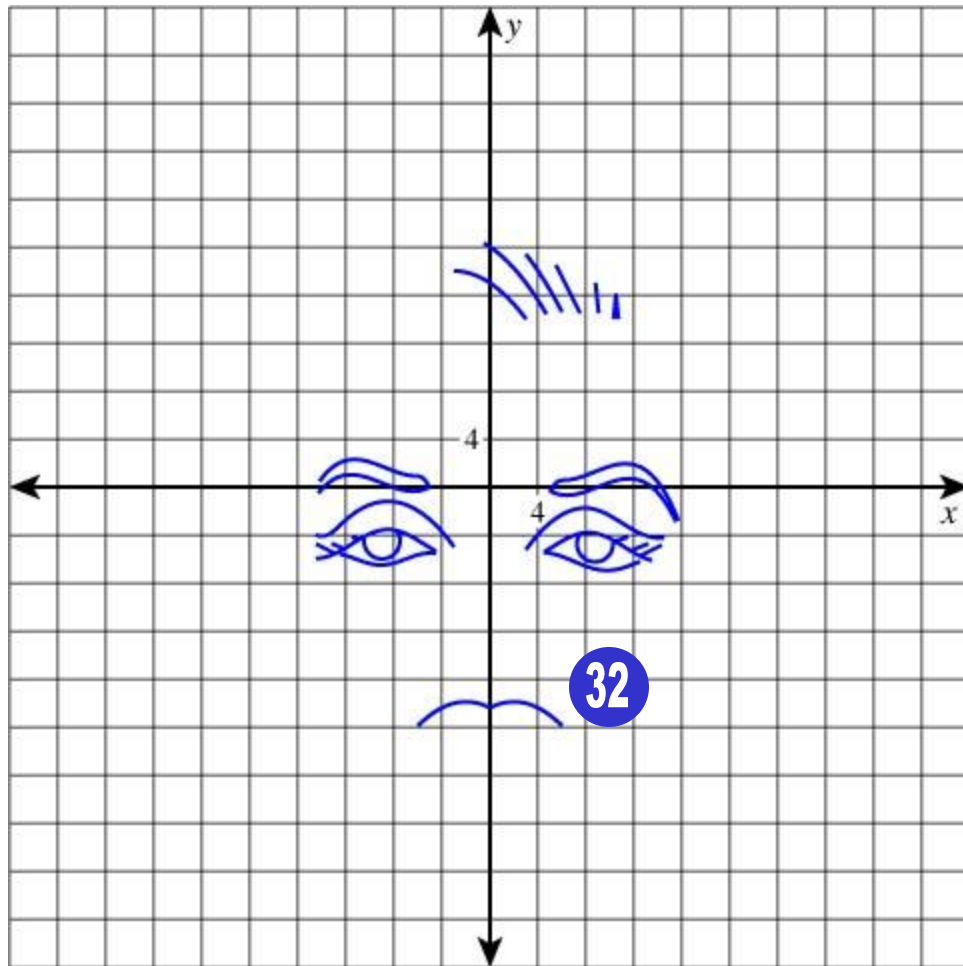


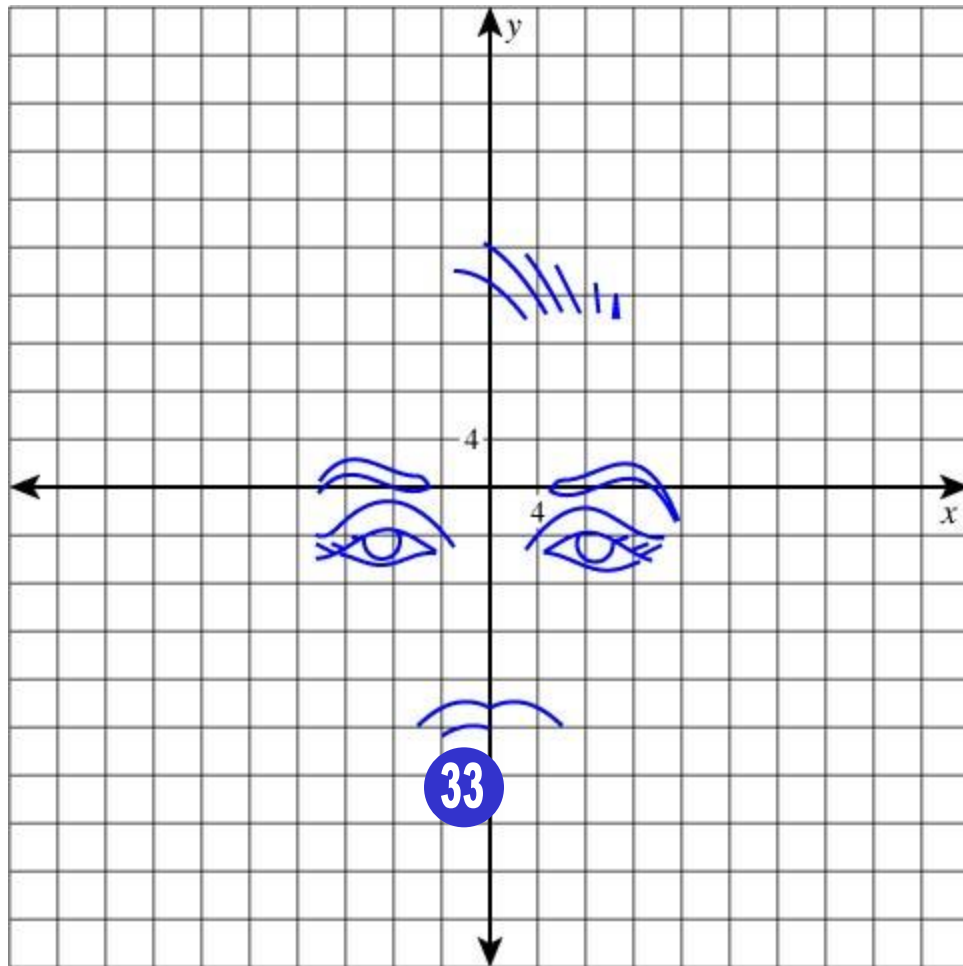




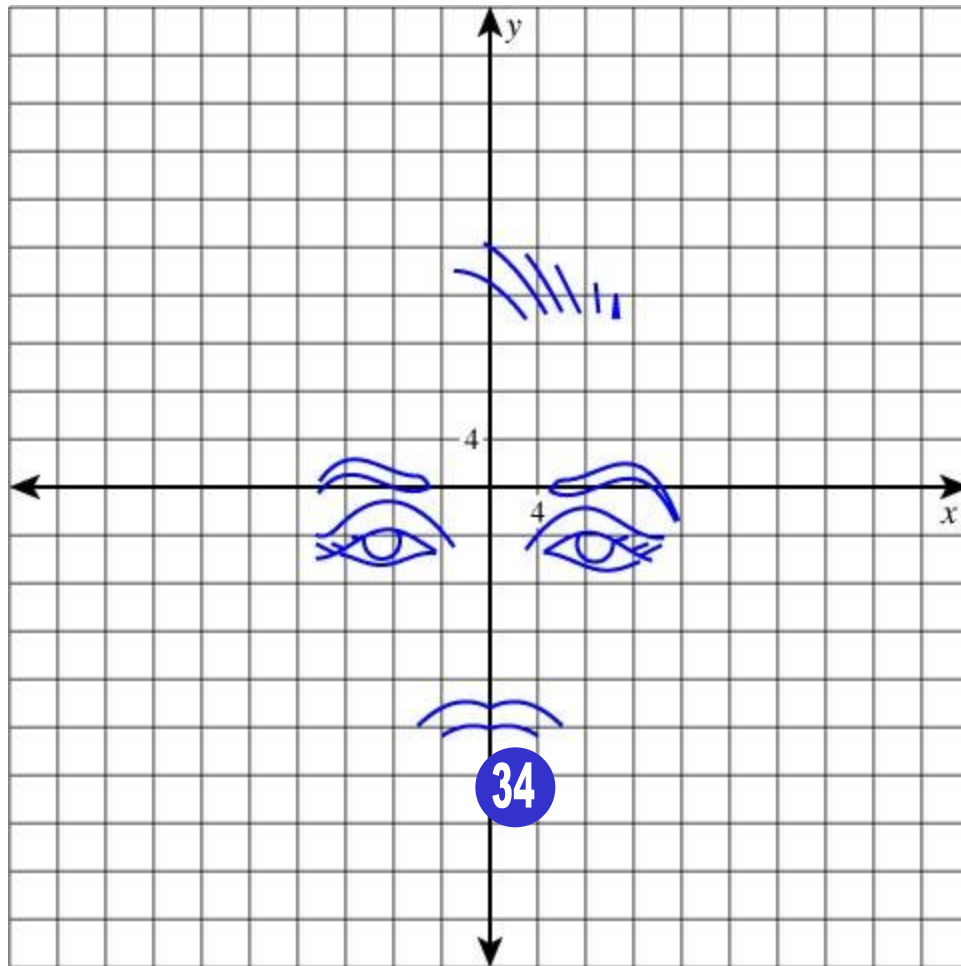


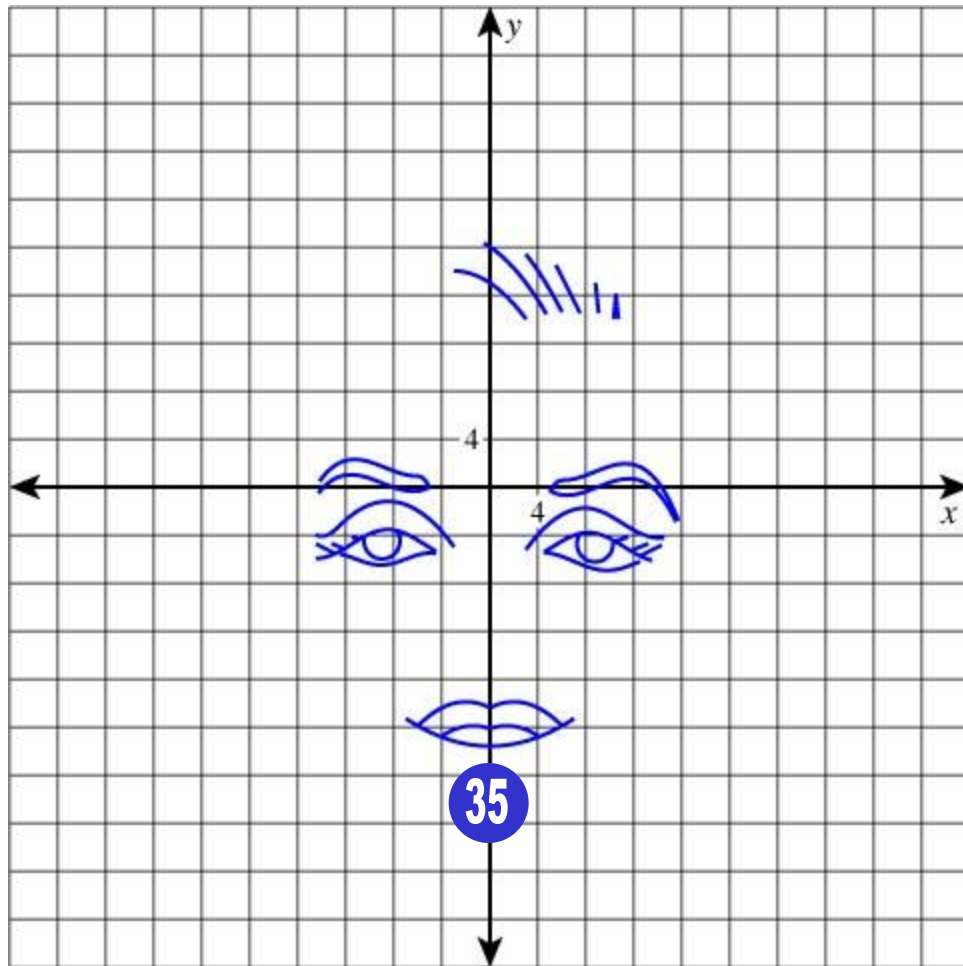


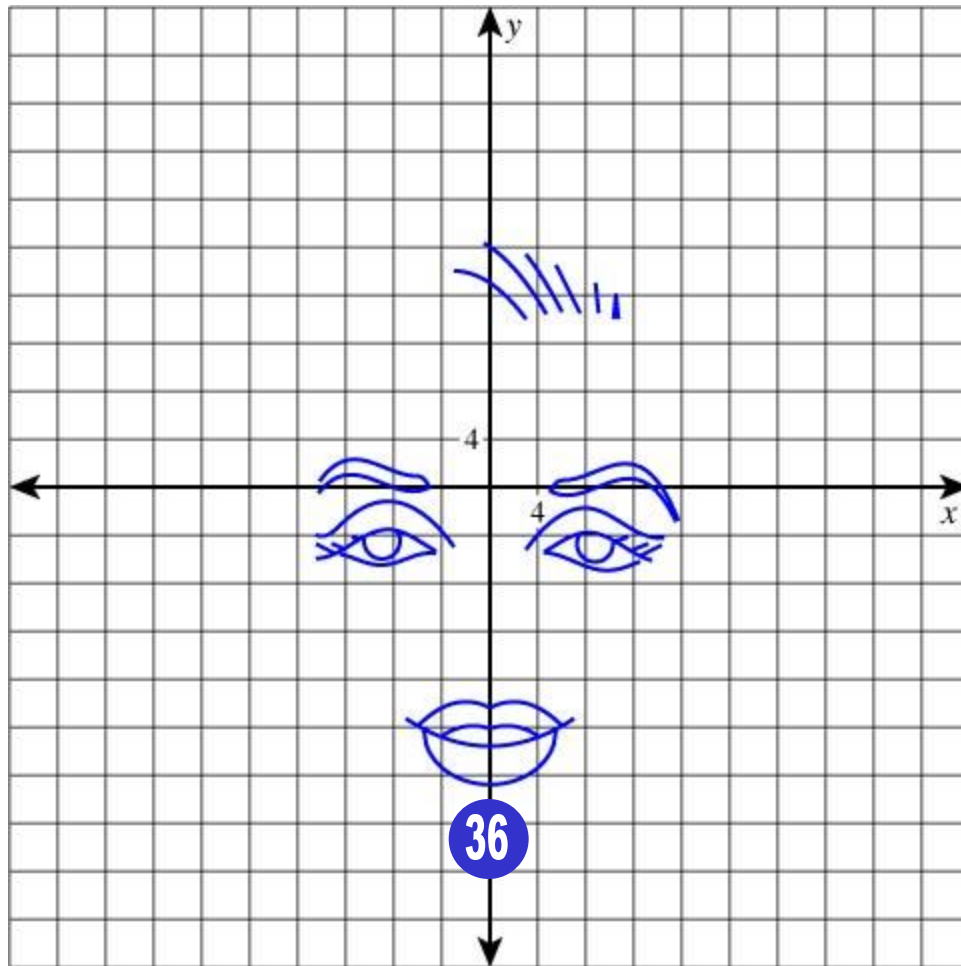


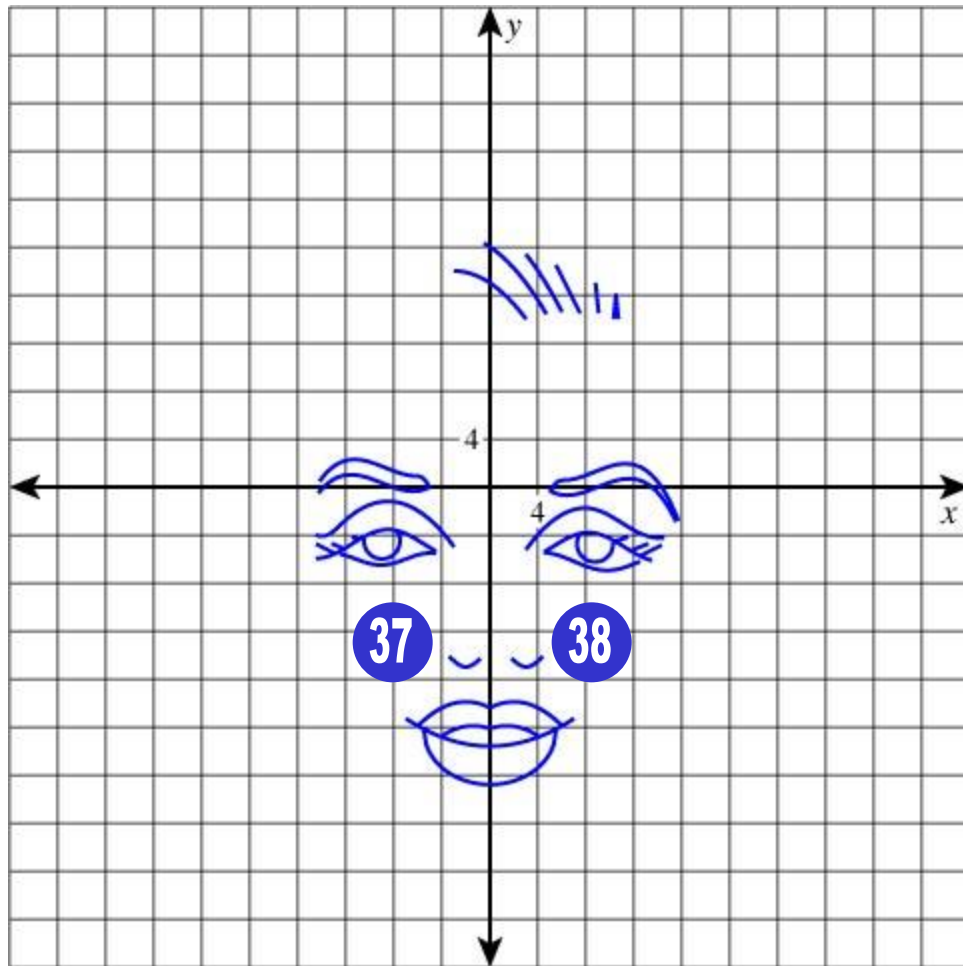


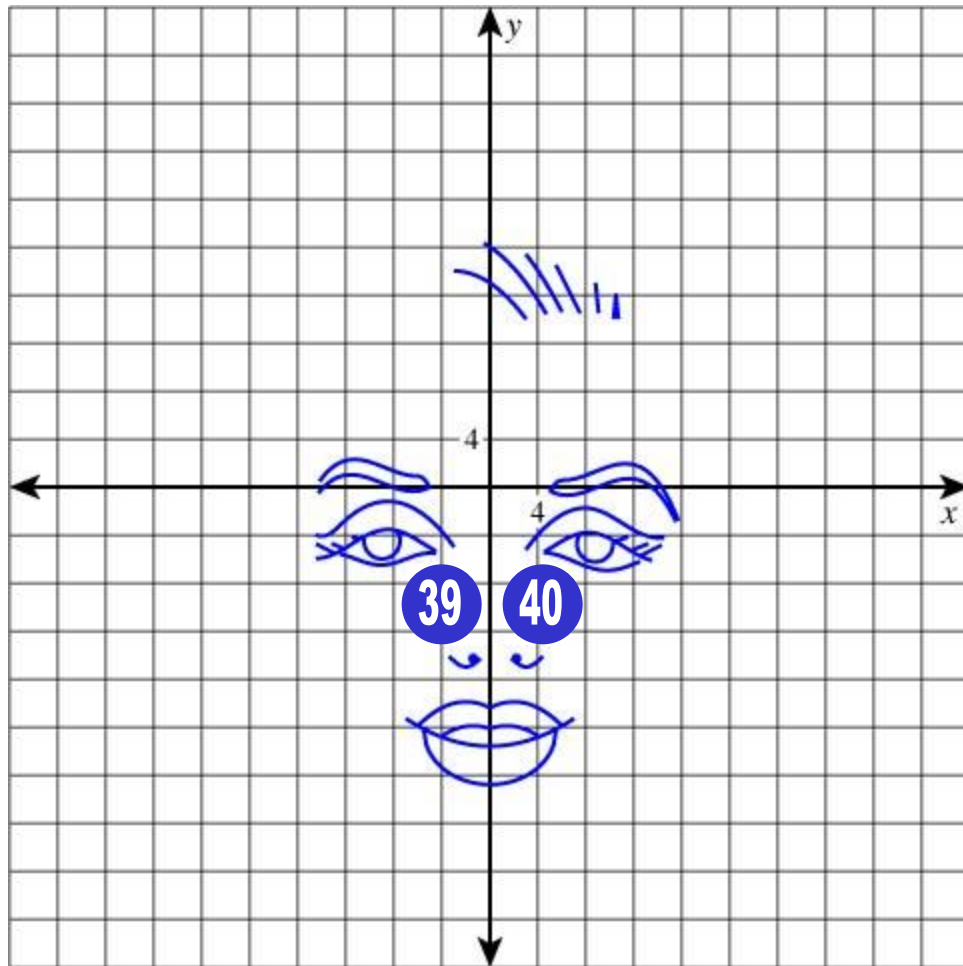


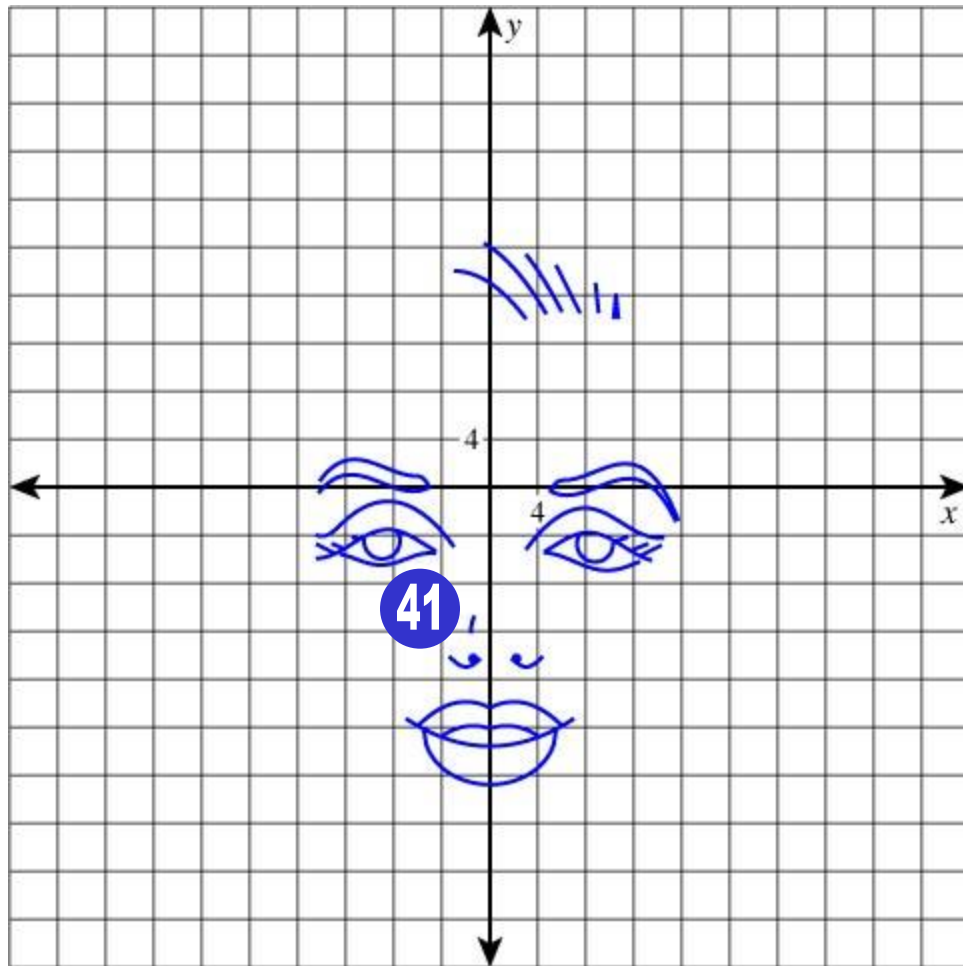


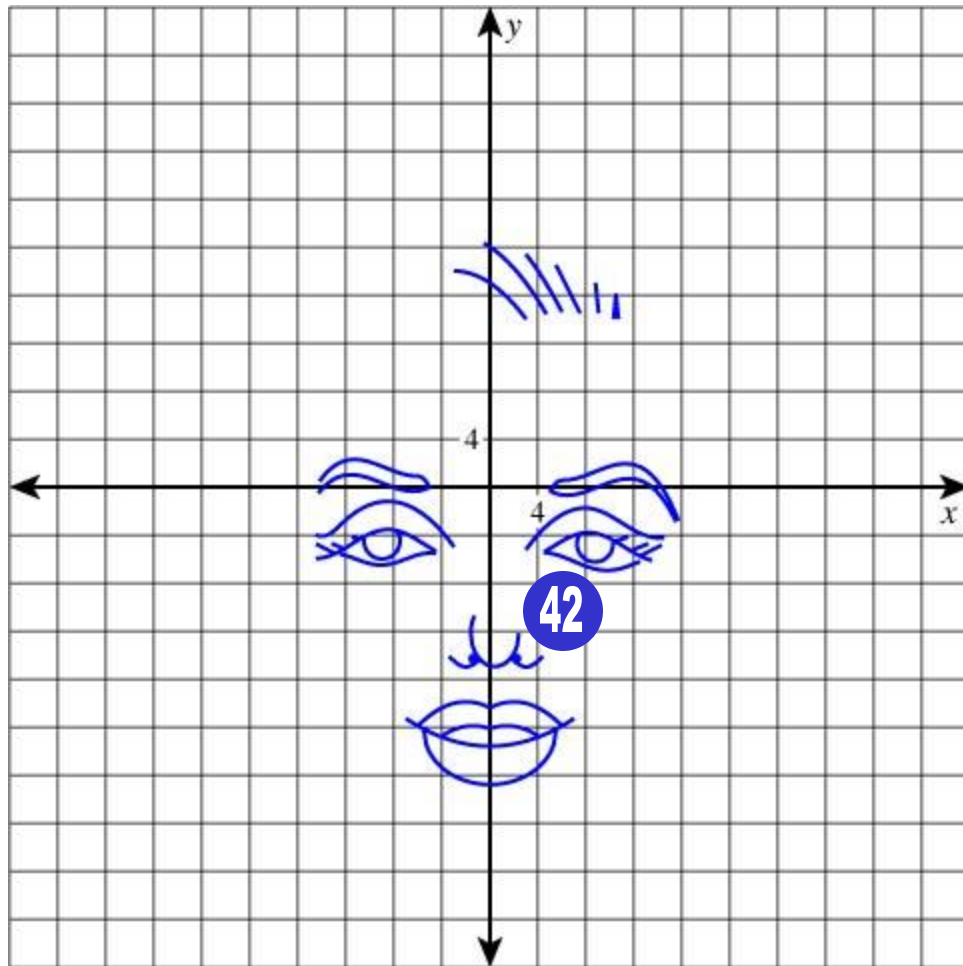


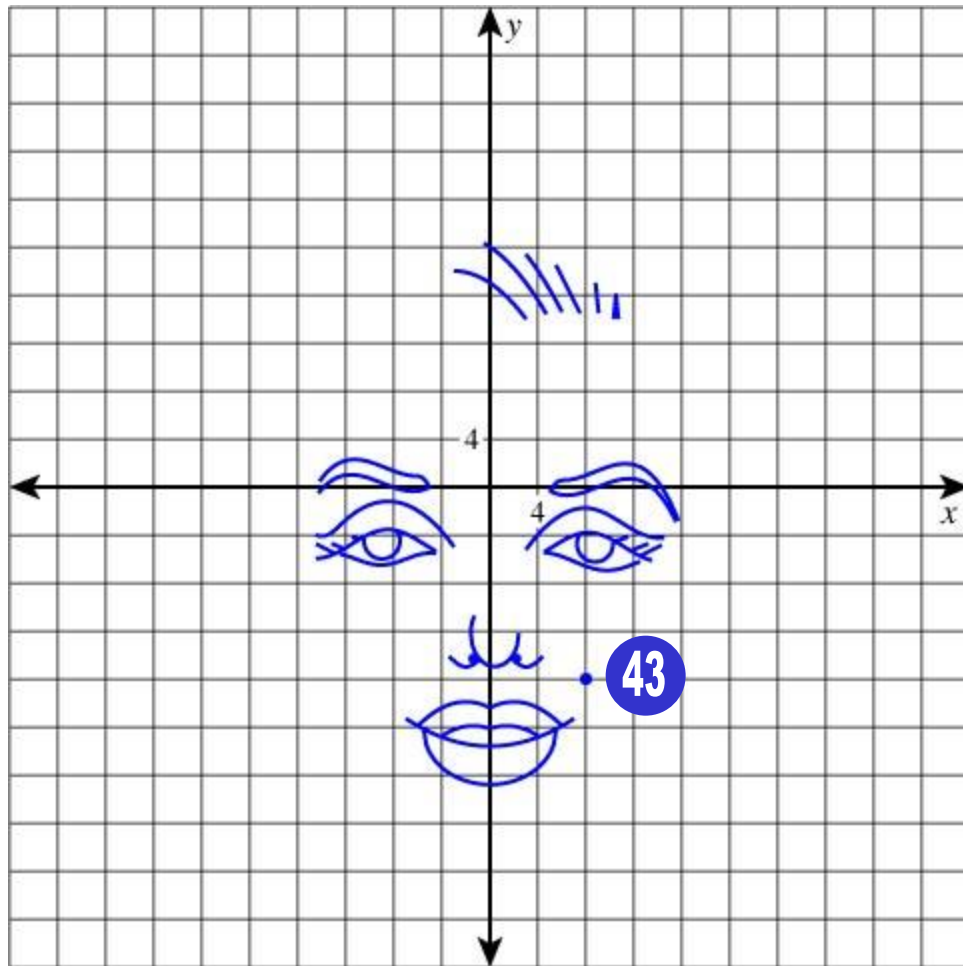




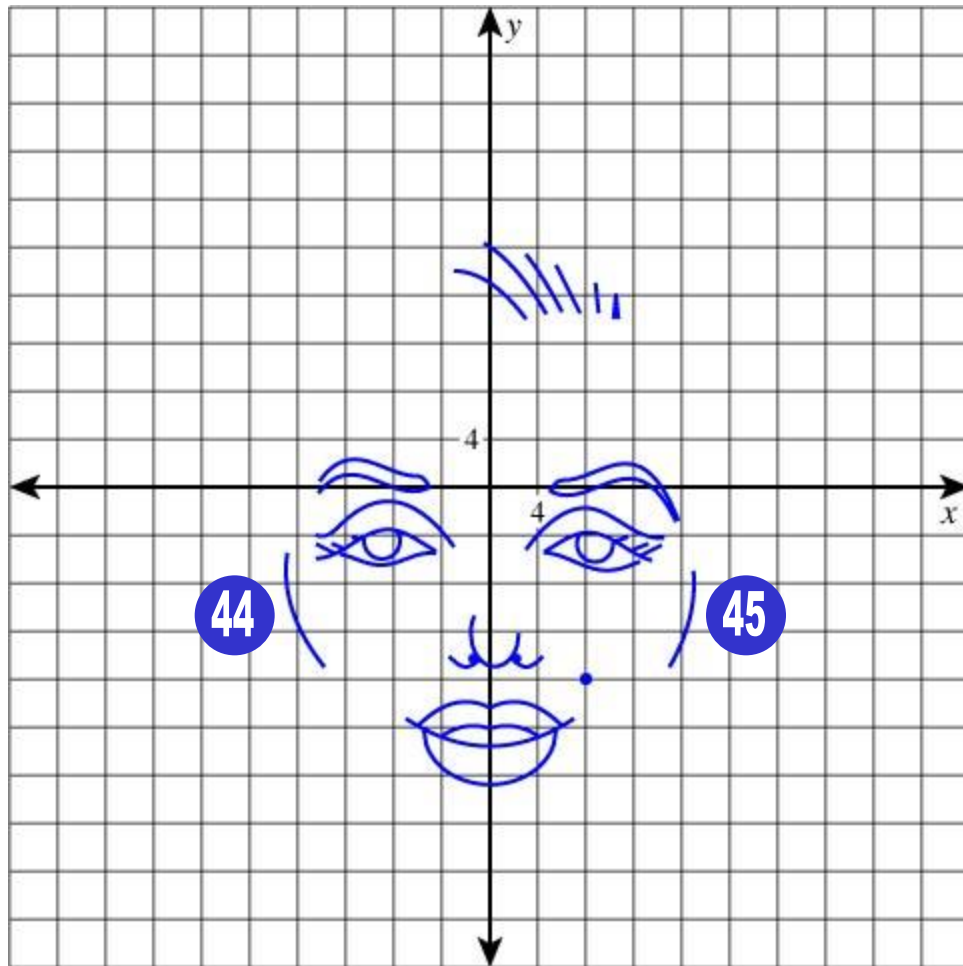


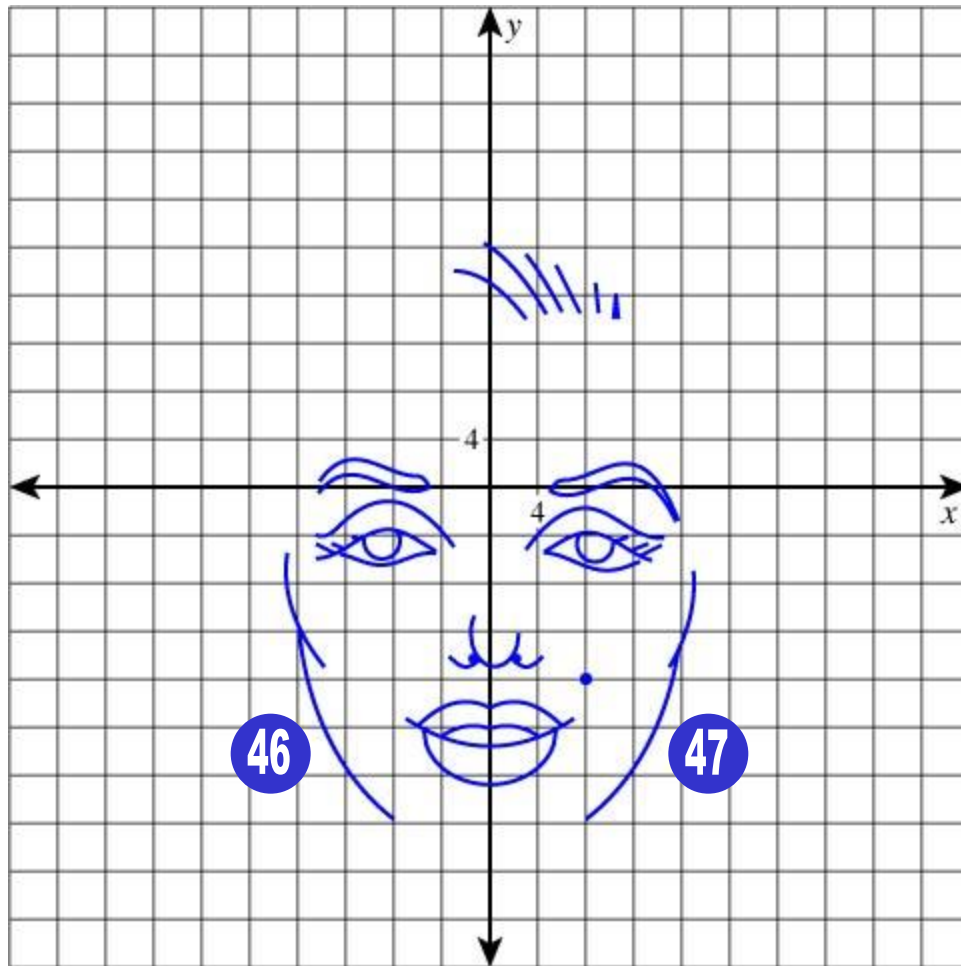


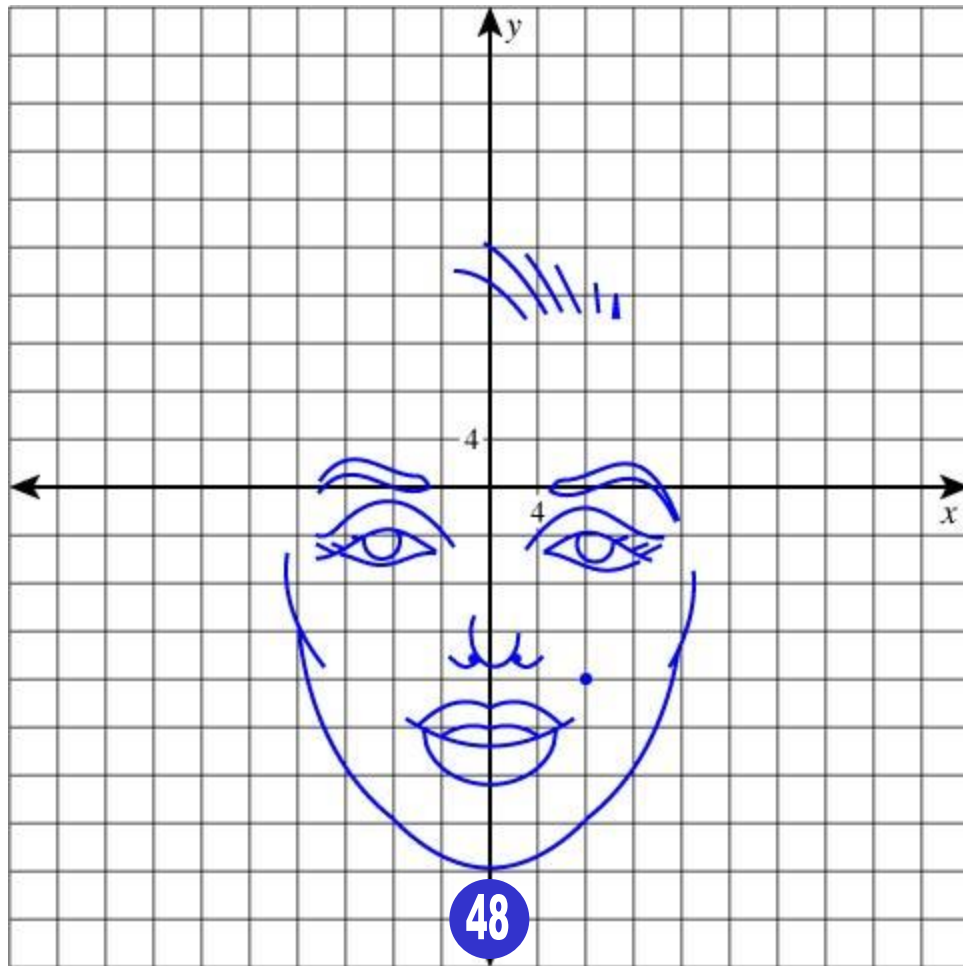


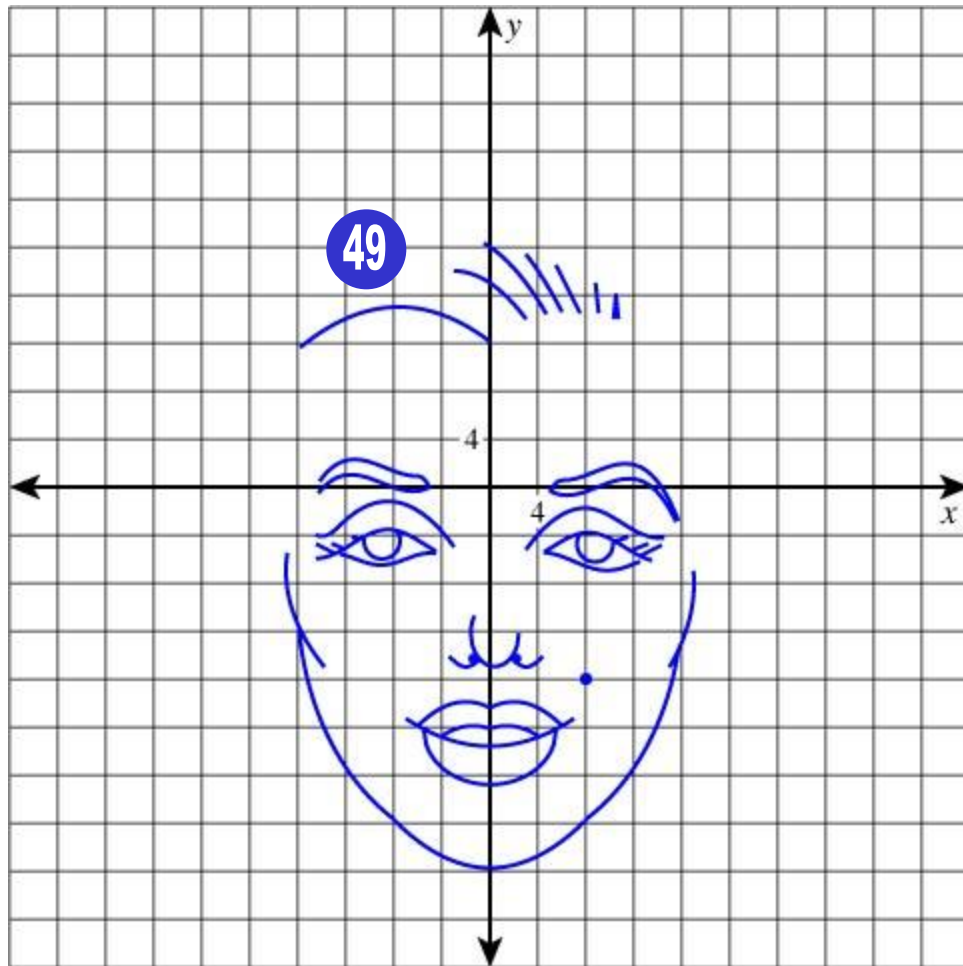


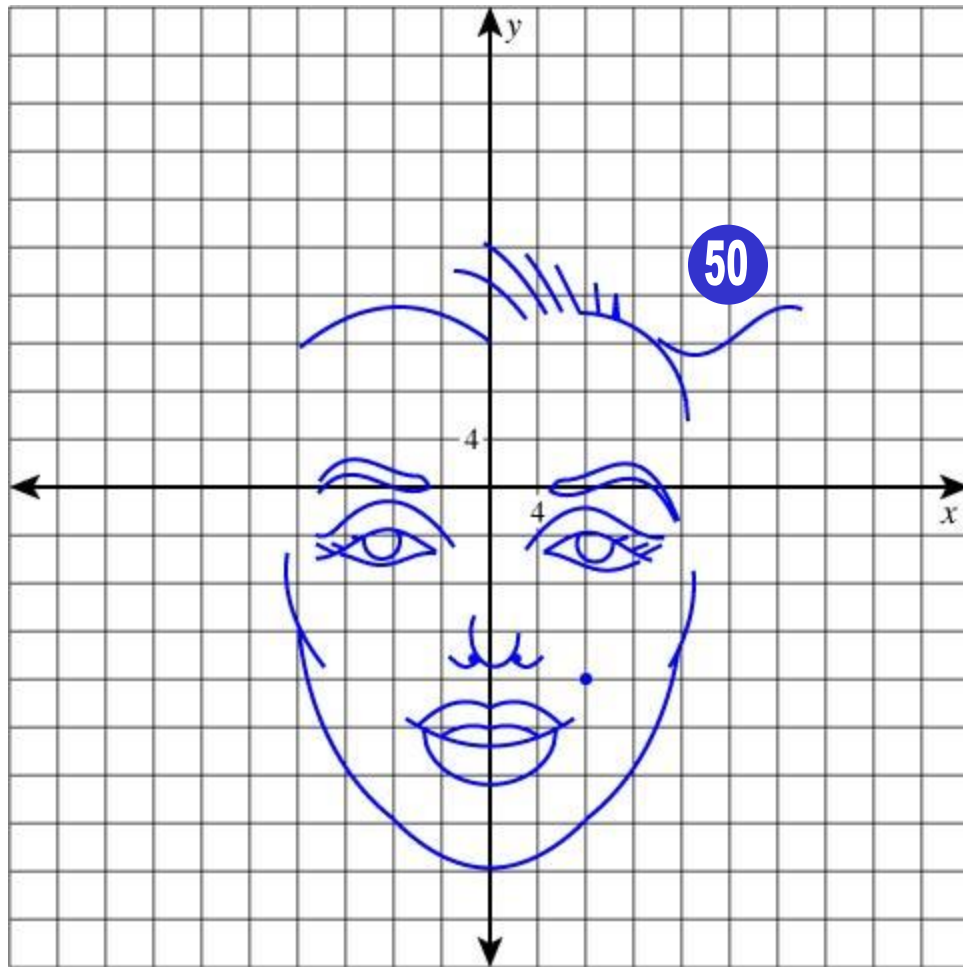


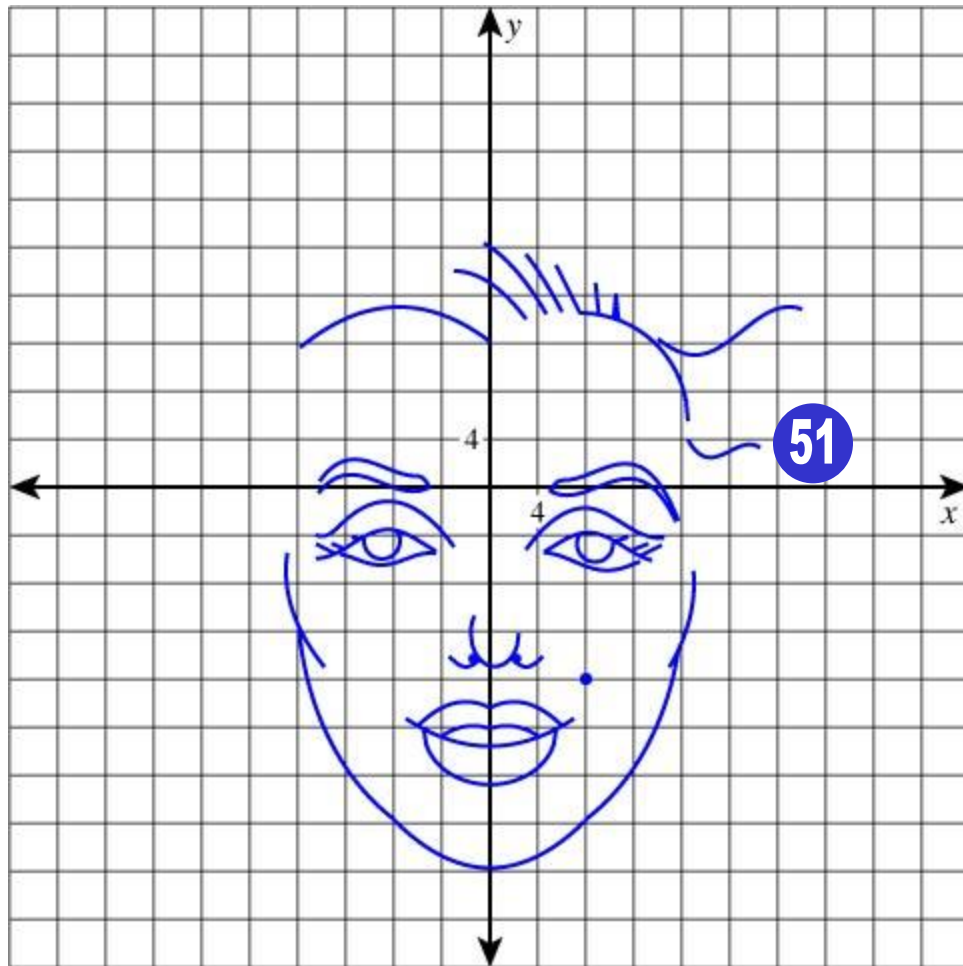


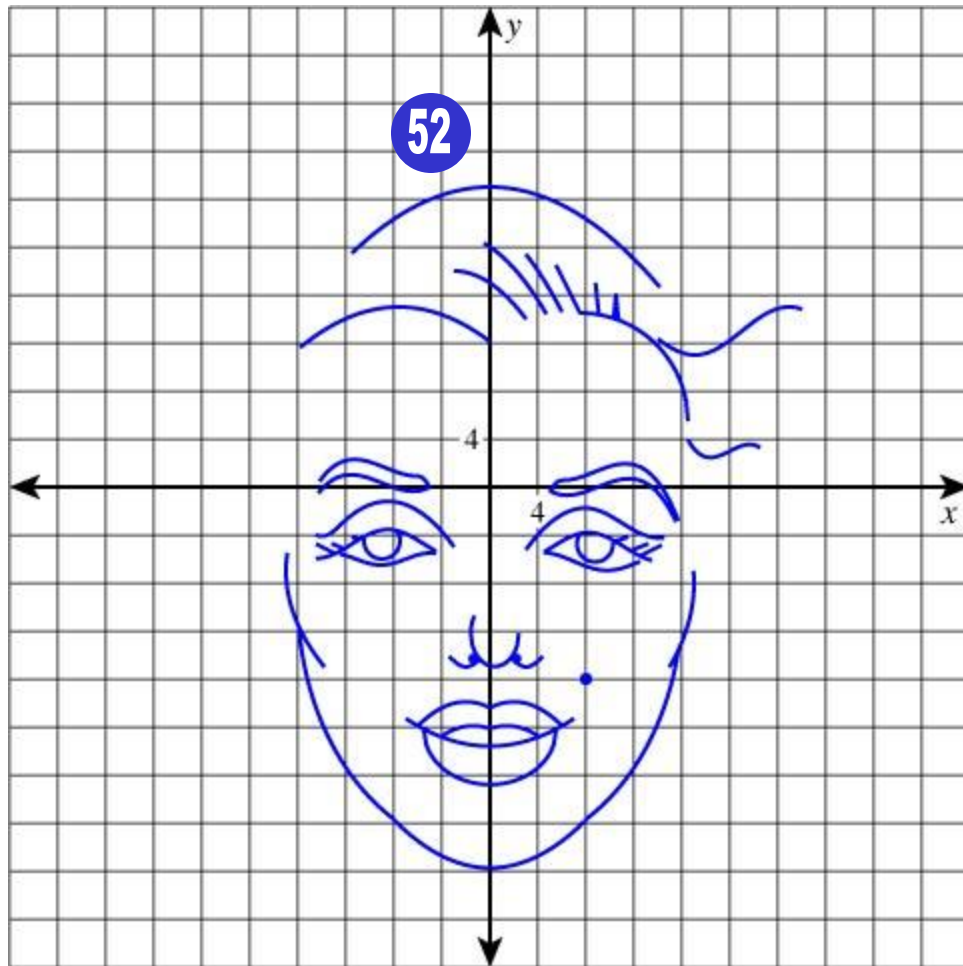


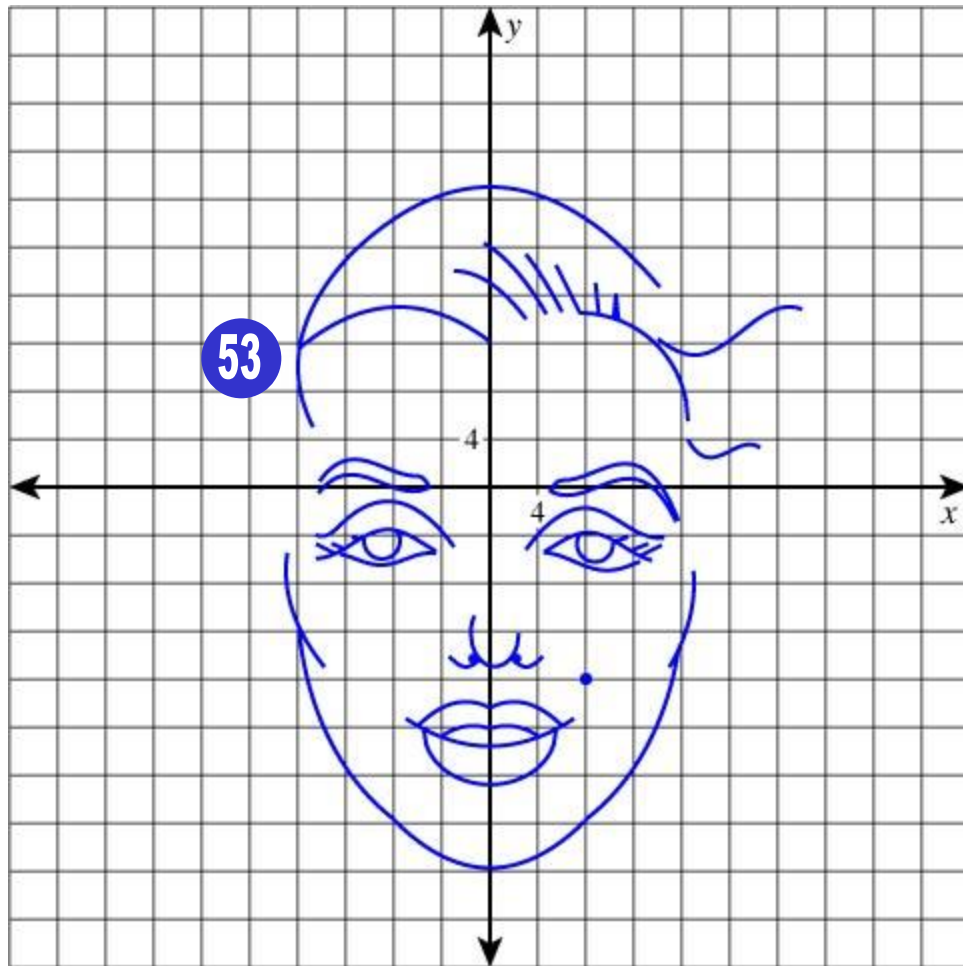




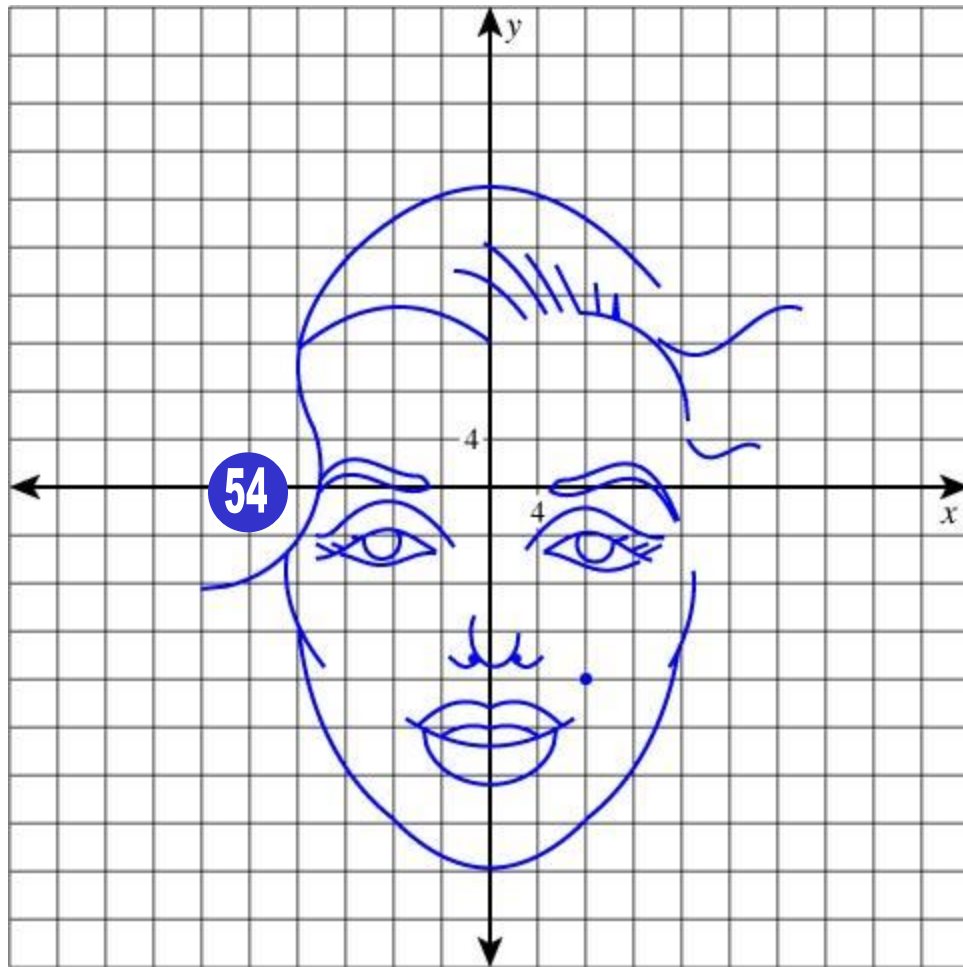


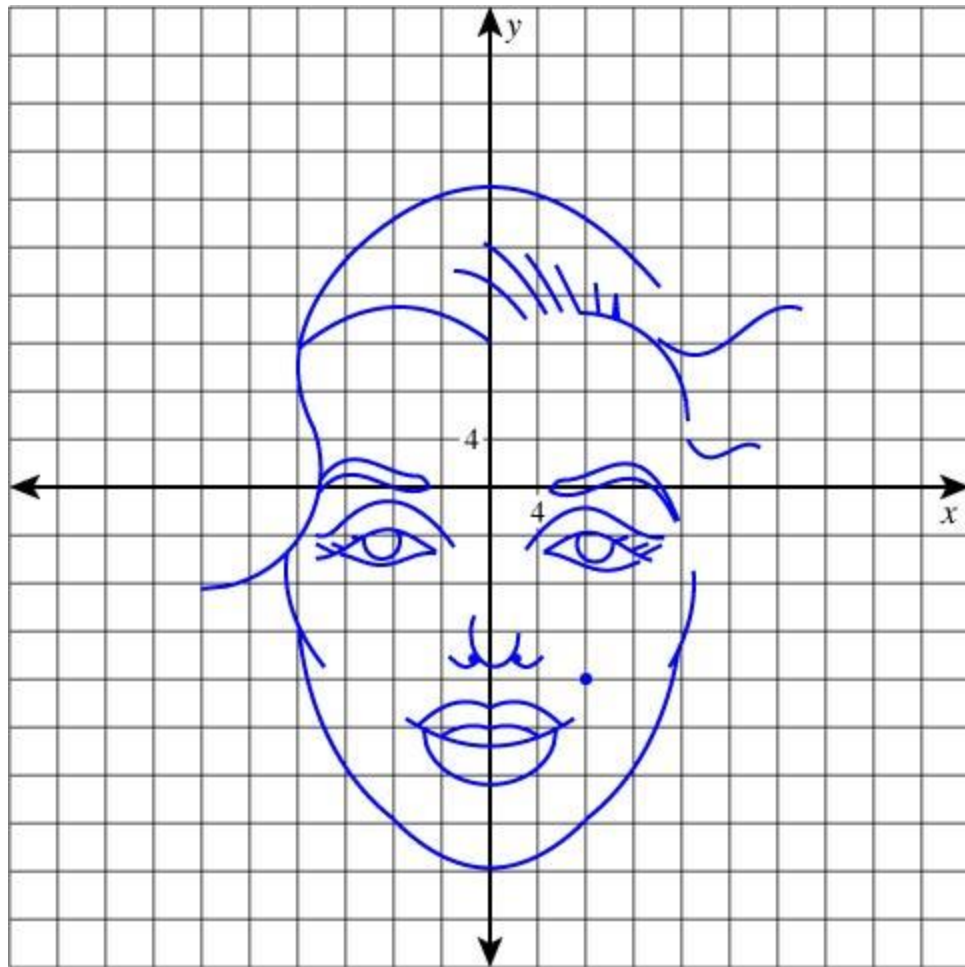


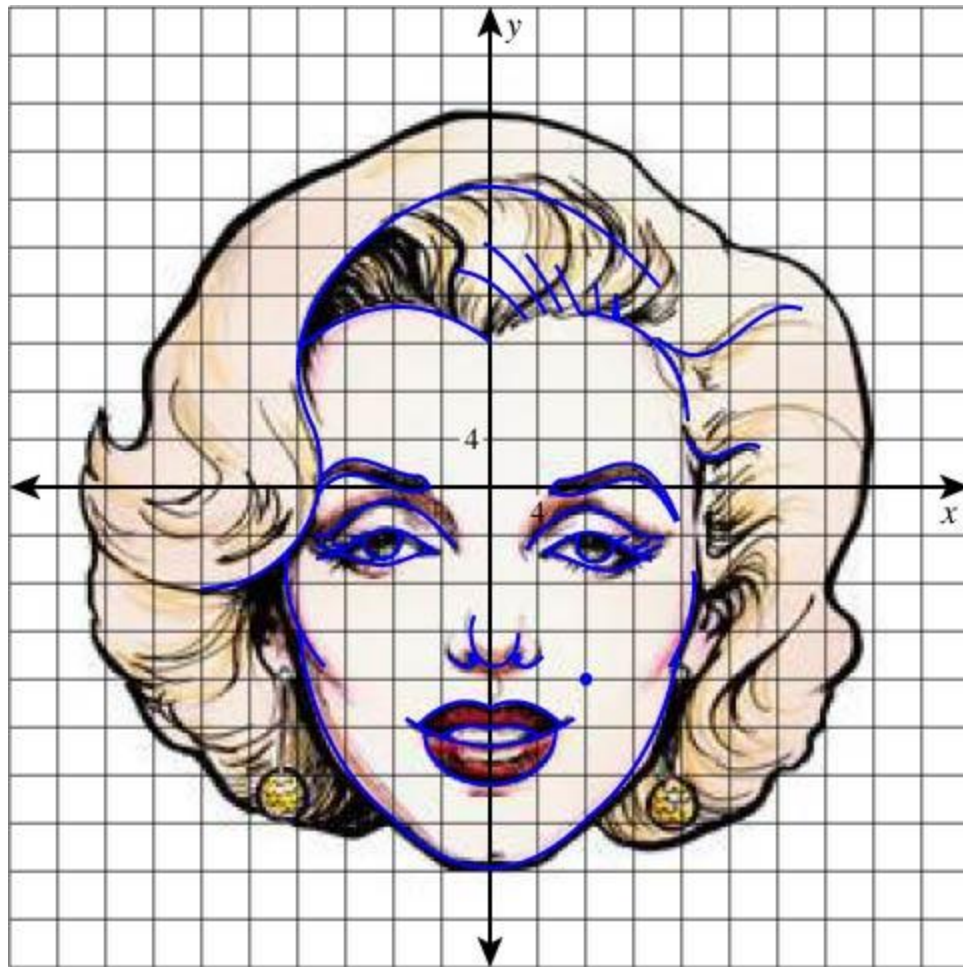












**You are traveling at a speed of 60 miles per hour. What is your speed in feet per second?**

**Solution**

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**Solution**

$$\frac{60 \text{ mi}}{1 \text{ hr}} = \frac{\text{ft}}{\text{sec}}$$

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$$\frac{60 \text{ mi}}{1 \text{ hr}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} = \frac{\text{ft}}{\text{sec}}$$



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$$\begin{aligned} \frac{\cancel{60} \text{ mi}}{\cancel{1} \text{ hr}} \cdot \frac{\cancel{1} \text{ hr}}{\cancel{60} \text{ min}} \cdot \frac{\cancel{1} \text{ min}}{60 \text{ sec}} \cdot \frac{5280 \text{ ft}}{\cancel{1} \text{ mi}} &= \frac{5280 \text{ ft}}{60 \text{ sec}} \\ &= \frac{88 \text{ ft}}{1 \text{ sec}} \end{aligned}$$

# Mathematics & Literacy

Students can't **Do Algebra** if they ...

**1** can't read and write.



**2** aren't familiar with the basic mathematical models and their rules.

linear equation:

$$2x + 3 = 7$$

linear inequality:

$$x - 4 < 8$$

quadratic equation:

$$x^2 + 2x - 3 = 0$$

**3** can't do unit analysis.

$$\frac{7 \text{ dollars}}{1 \text{ hour}} \cdot 4 \text{ hours} = 28 \text{ dollars}$$

