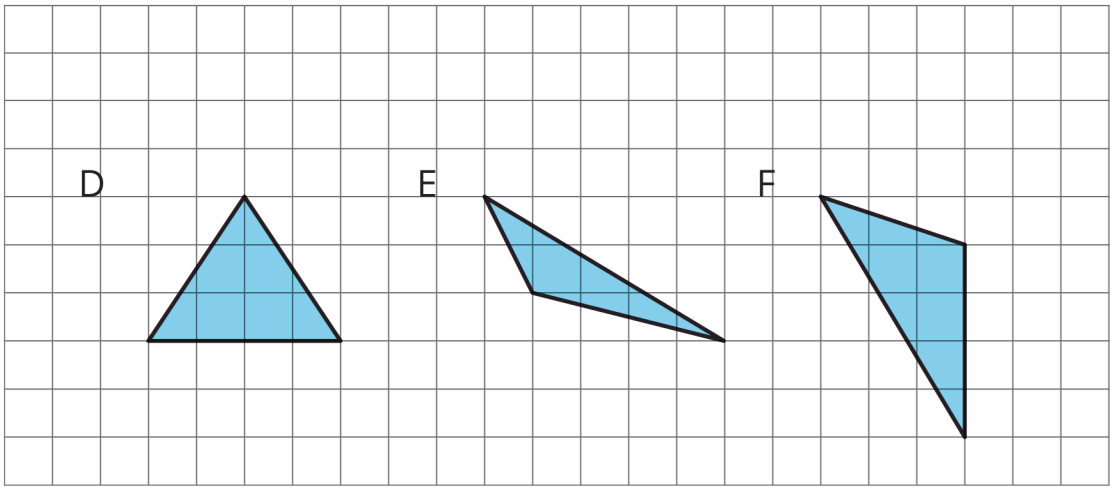
Illustrative Math Samples Form A

1. Draw an identical copy of each triangle such that the two copies together form a parallelogram. If you get stuck, consider using tracing paper. Three triangles labeled *D*, *E*, and *F*.



2. In a fruit basket there are 9 bananas, 4 apples, and 3 plums.

   a) The ratio of bananas to apples is ____ : ____.

   b) The ratio of plums to apples is ____ to ____.

   c) For every ____ apples, there are ____ plums.

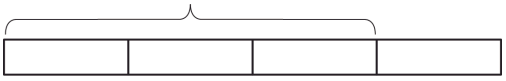
   d) For every 3 bananas there is one _____.

3. Hannah's family exchanged 300 dollars for 39,000 Icelandic Krona. While visiting her grandmother overseas, Hannah bought a pair of warm boots for 7,800 Krona. How many dollars did the boots cost?

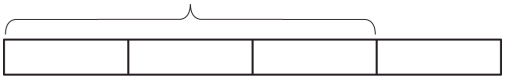
Krona	dollars
39,000	300
	30
	1
	3
7,800	

4. For each scenario, use the given tape diagram to help you answer the question. Mark up and label the diagrams as needed.

   a) Mai has picked 1 cup of strawberries for a cake, which is enough for $\frac{3}{4}$ of the cake. How many cups does she need for the whole cake?



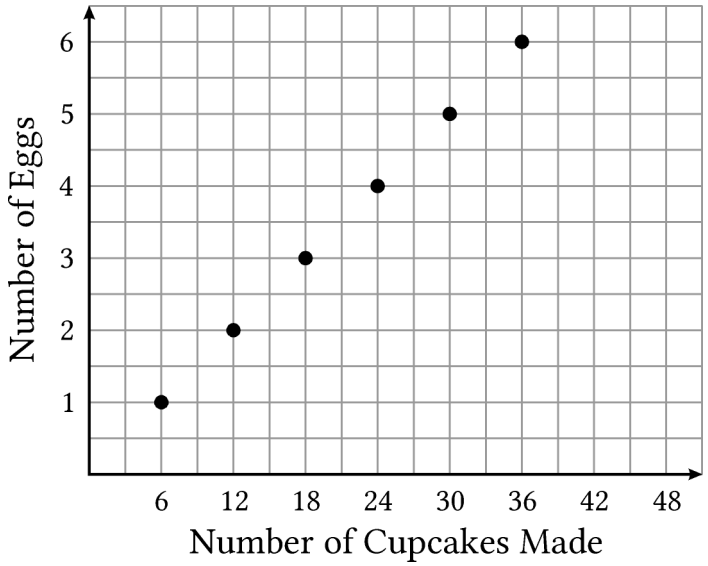
   b) Priya has picked $1\frac{1}{2}$ cups of raspberries, which is enough for $\frac{3}{4}$ of a cake. How many cups does she need for the whole cake?



5. A pool in the shape of a rectangular prism is being filled with water. The length and width of the pool is 24 feet and 15 feet. If the height of the water in the pool is $1\frac{1}{3}$ feet, what is the volume of the water in cubic feet?

6. A shopper paid $2.52 for 4.5 pounds of potatoes, $7.75 for 2.5 pounds of broccoli, and $2.45 for 2.5 pounds of pears. What is the unit price of each item she bought? Show your reasoning.

7. Here is a graph that shows some values for the number of eggs, e, required to make c cupcakes.



a) Complete the table so that the pair of numbers in each column represents the coordinates of a point on the graph.

e	1	2	3	4	5
c					

b) What does the point $(36, 6)$ mean in terms of the amount of eggs and number of cupcakes?

c) Write an equation that shows the amount of eggs in terms of the number of cupcakes.

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8. Select *all* expressions that are equivalent to 64.

- ❍ 2^6
- ❍ 2^8
- ❍ 4^3
- ❍ 8^2
- ❍ 16^4
- ❍ 32^2

9. a) Represent each of these temperatures in degrees Fahrenheit with a positive or negative number.
   - 5 degrees above zero
   - 3 degrees below zero
   - 6 degrees above zero
   - $2\frac{3}{4}$ degrees below zero

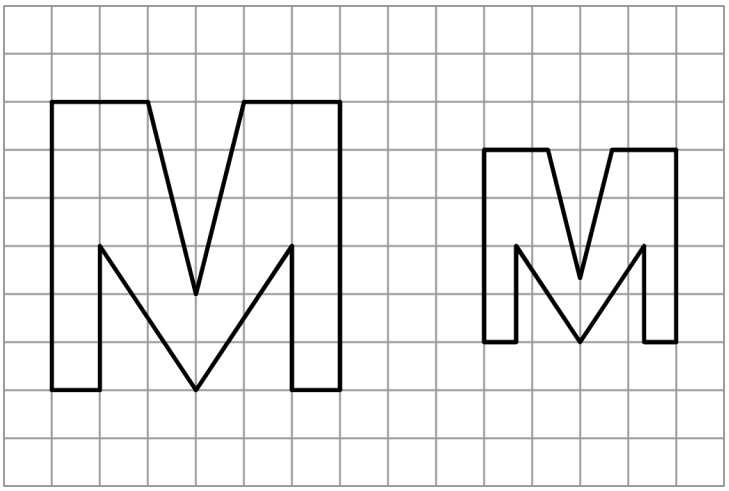
   b) Order the temperatures above from the coldest to the warmest.

10. An elephant can travel at a constant speed of 25 miles per hour, while a giraffe can travel at a constant speed of 16 miles in $\frac{1}{2}$ hour.

    a) Which animal runs faster? Explain your reasoning.

    b) How far can each animal run in 3 hours?

11. The second M-shaped polygon is a scaled copy of the first.



a) Show one pair of corresponding points and two pairs of corresponding sides in the original polygon and its copy. Consider using colored pencils to highlight corresponding parts or labeling some of the vertices.

b) What scale factor takes the original polygon to its smaller copy? Explain or show your reasoning.

12. The flag of Colombia is a rectangle that is 6 ft long with three horizontal strips.

- The top stripe is 2 ft tall and is yellow.
- The middle stripe is 1 ft tall and is blue.
- The bottom stripe is also 1 ft tall and is red.

a) Create a scale drawing of the Colombian flag with a scale of 1 cm to 2 ft.

b) Create a scale drawing of the Colombian flag with a scale of 2 cm to 1 ft.

13. A music store marks up the instruments it sells by 30%.

a) If the store bought a guitar for $45, what will be its store price?

b) If the price tag on a trumpet says $104, how much did the store pay for it?

c) If the store paid $75 for a clarinet and sold it for $100, did the store mark up the price by 30%?

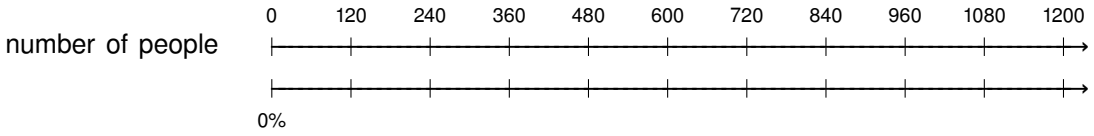
14. Lin and Noah are solving the equation $7(x + 2) = 91$.

Lin starts by using the distributive property. Noah starts by dividing each side by 7.

a) Show what Lin's and Noah's full solution methods might look like.

b) What is the same and what is different about their methods?

15. A small town had a population of 960 people last year. The population grew to 1200 people this year. By what percentage did the population grow?



16. Select *all* expressions that can be subtracted from $9x$ to result in the expression $3x + 5$.

- ❍ $-5 + 6x$
- ❍ $5 - 6x$
- ❍ $6x + 5$
- ❍ $6x - 5$
- ❍ $-6x + 5$

17. Two years ago, the price, in dollars, of a single story house was h.

a) Last year, the price of the house increased by 25%. Write an expression for the price of the house last year.

b) This year, the price of the house decreased by 10%. Write an expression for the price of the house this year.

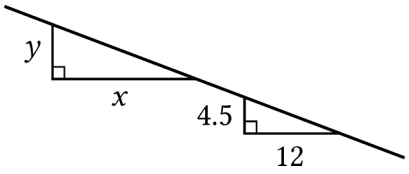
c) Is the price of the house this year the same as it was two years ago? Explain your reasoning.

18. For each set of angles, decide if there is a triangle whose angles have these measures in degrees:

If you get stuck, consider making a line segment. Then use a protractor to measure angles with the first two angle measures.

1. 10, 20, 30
2. 45, 90, 45
3. 40, 50, 90
4. 145, 20, 15
5. 90, 90, 90

19. The two triangles shown are similar. Find the value of $\frac{y}{x}$.



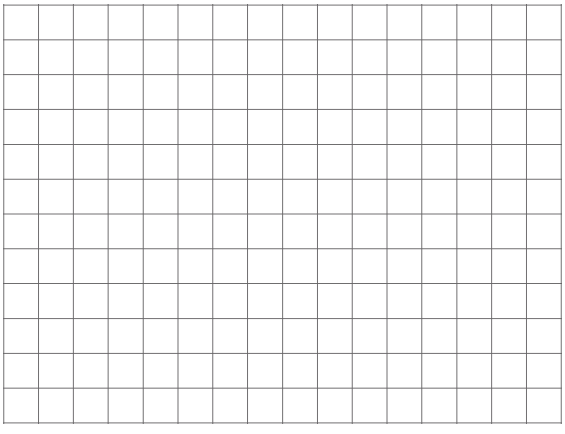
20. Cell phone Plan A costs \$70 per month and comes with a free \$500 phone. Cell phone Plan B costs \$50 per month but does not come with a phone. If you buy the \$500 phone and choose Plan B, how many months is it until your cost is the same as Plan A's?

21. The points with coordinates $(4, 8)$, $(2, 10)$, and $(5, 7)$ all lie on the line $2x + 2y = 24$.

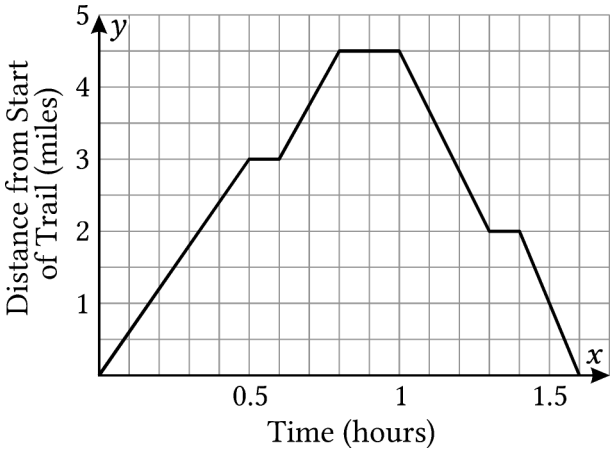
a) Create a graph, plot the points, and sketch the line.

b) What is the slope of the line you graphed?

c) What does this slope tell you about the relationship between lengths and widths of rectangles with perimeter 24?



22. This graph shows trip of a trail runner jogging along a hiking trail. The trail has markers every 0.25 mi showing the distance from the beginning of the trial.



a) When was the runner going the fastest?

b) Not counting when the runner stopped, when was the runner going the slowest?

c) During what times was the runner moving away from the beginning of the trail?

d) During what times was the runner moving back towards the beginning of the trail?

e) During what times did the runner stop?

23. Match each equation to the situation it describes. Explain what the constant of proportionality means in each equation.

(A) $y = 3x$	**(1)** A dump truck is hauling loads of dirt to a construction site. After 20 loads, there are 70 square feet of dirt.
(B) $\frac{1}{2}x = y$	**(2)** I am making a water and salt mixture that has 2 cups of salt for every 6 cups of water.
(C) $y = 3.5x$	**(3)** A store has a "4 for $10" sale on hats.
(D) $y = \frac{5}{2}x$	**(4)** For every 48 cookies I bake, my students get 24.

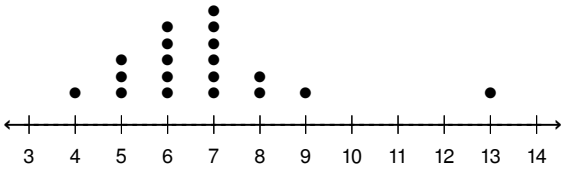
24. Lin's smart phone was fully charged when she started school at 8:00 am At 9:20 am , it was 90% charged, and at noon, it was 72% charged.

a) When do you think her battery will die?

b) Is battery life a function of time? If yes, is it a linear function? Explain your reasoning.

25. While conducting an inventory in their bicycle shop, the owner noticed the number of bicycles is 2 fewer than 10 times the number of tricycles. They also know there are 410 wheels on all the bicycles and tricycles in the store. Write and solve a system of equations to find the number of bicycles in the store.

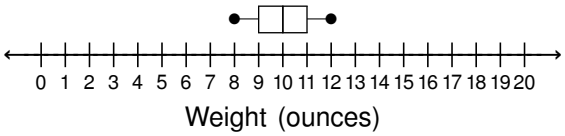
26. The dot plot displays the number of books read by students during the semester.



a) Which measure of center would you use given the shape of the distribution in the dot plot? Explain your reasoning.

b) Which measure of variability would you use? Explain your reasoning.

27. The box plot summarizes the weight, in ounces, of 100 grapefruit:



Which term best describes the shape of the distribution?

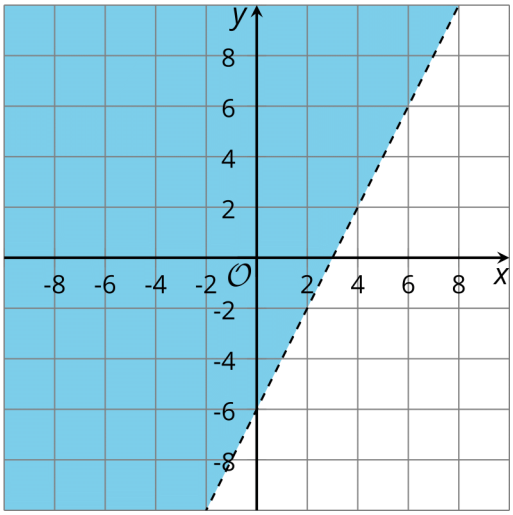
A. bell-shaped
B. uniform
C. skewed
D. symmetric

28. Andre and Elena are solving this system of equations: $\begin{cases} y = 3x \\ y = 9x - 30 \end{cases}$

- Andre's first step is to write: $3x = 9x - 30$
- Elena's first step is to create a new system: $\begin{cases} 3y = 9x \\ y = 9x - 30 \end{cases}$

Do you agree with either first step? Explain your reasoning.

29. Which inequality is represented by the graph?



A. $4x - 2y > 12$
B. $4x - 2y < 12$
C. $4x + 2y > 12$
D. $4x + 2y < 12$

30. A store sells notepads in packages of 24 and packages of 6. The organizers of a conference needs to prepare at least 200 notepads for the event.

a) Would they have enough notepads if they bought these quantities?

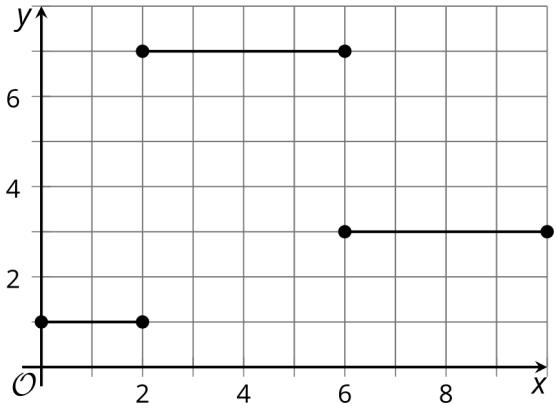
a. Seven packages of 24 and one package of 6

b. Five packages of 24 and fifteen packages of 6

b) Write an inequality to represent the relationship between the number of large and small packages of notepads and the number of notepads needed for the event.

c) Use graphing technology to graph the solution set to the inequality. Then, use the graph to name two other possible combinations of large and small packages of notepads that will meet the number of notepads needed for the event.

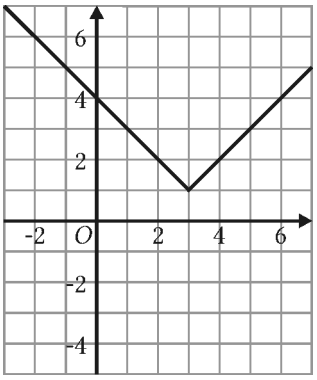
31. Is this a graph of a function? Explain your reasoning.



32. Function G is defined by the equation $G(x) = |x|$.

Function R is defined by the equation $R(x) = |x| + 2$.

Describe how the graph of function R relates to the graph of G, or sketch the graphs of the two functions to show their relationship.

33. 

a) Describe how the graph of $A(x) = |x|$ has to be shifted to match the given graph.

b) Write an equation for the function represented by the graph.

34. What are the solutions to the equation $2x^2 - 5x - 1 = 0$?

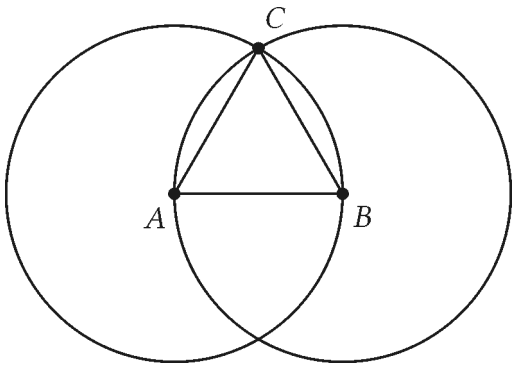
A. $x = \frac{-5 \pm \sqrt{17}}{4}$

B. $x = \frac{5 \pm \sqrt{17}}{4}$

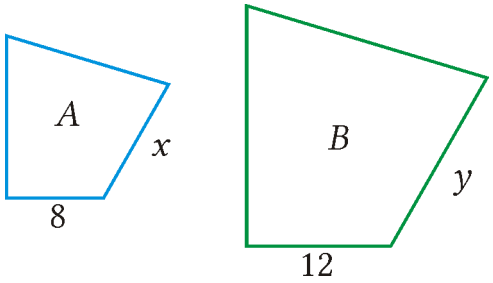
C. $x = \frac{-5 \pm \sqrt{33}}{4}$

D. $x = \frac{5 \pm \sqrt{33}}{4}$

35. This diagram is a straightedge and compass construction of an equilateral triangle ABC given side AB. Is it important that the circle with center A passes through B and that the circle with center B passes through A? Show or explain your reasoning.



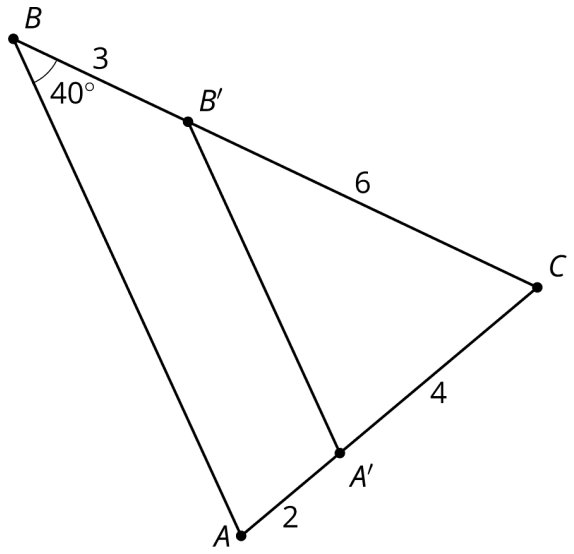
36. Polygon B is a scaled copy of Polygon A.



a) The value of x is 11, what is the value of y?

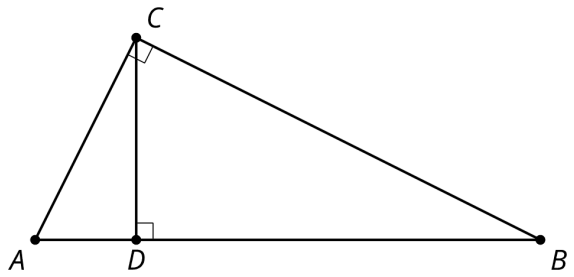
b) What is the scale factor?

37. What is the measure of angle $A'B'C$?



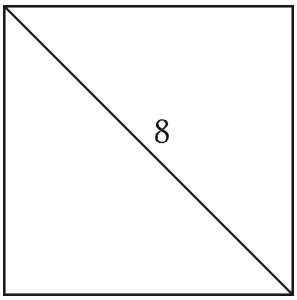
A. 20° B. 40° C. 60° D. 80°

38. In right triangle ABC, altitude CD is drawn to its hypotenuse. Select *all* triangles which must be similar to triangle ABC.



- ○ ABC
- ○ ACD
- ○ BCD
- ○ BDC
- ○ CAD
- ○ CBD

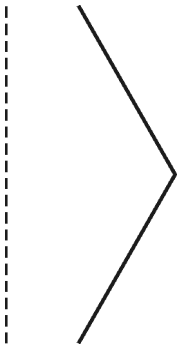
39. What is the length of the square's side?



A. 16 units B. $8\sqrt{2}$ units

C. $\frac{8}{\sqrt{2}}$ units D. 4 units

40. Sketch the solid of rotation formed by rotating the given two-dimensional figure using the dashed vertical line as an axis of rotation.

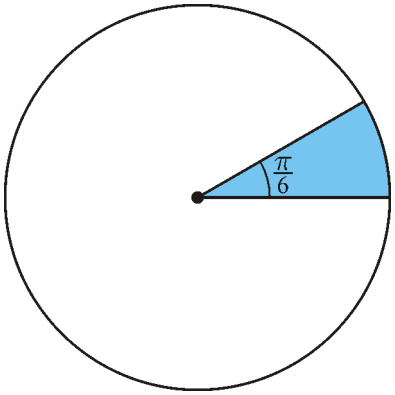


41. Identify whether each statement must be true, could possibly be true, or definitely can't be true.

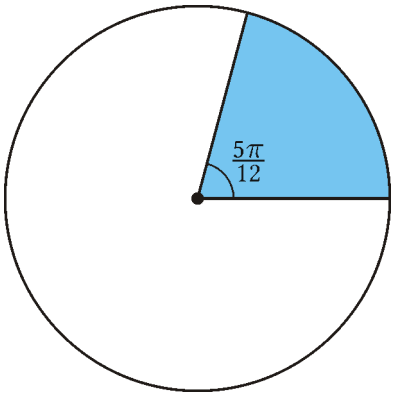
1. A diameter is a chord.
2. A radius is a chord.
3. A chord is a diameter.
4. A central angle measures 90°.

42. Each circle has a shaded sector with a central angle measured in radians. What fraction of the circle is each sector?

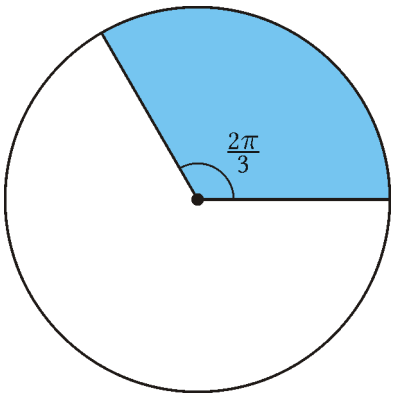
circle A



circle B



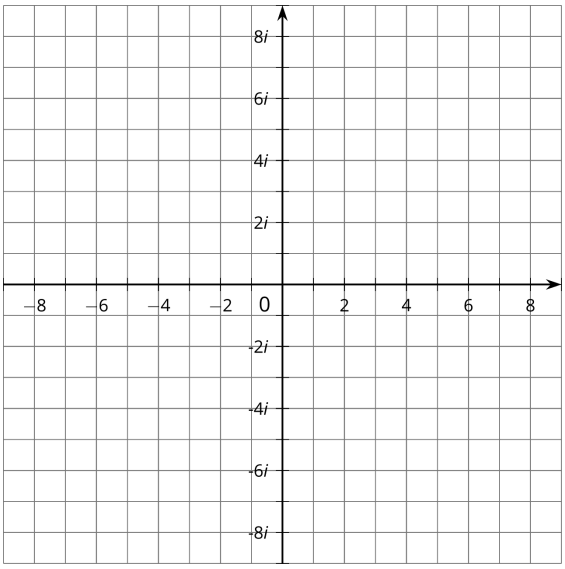
circle C



43. Select *all* of the words for which the probability of selecting the letter A at random is $\frac{1}{4}$.

- ❍ AARDVARK
- ❍ BALANCE
- ❍ FAIR
- ❍ LANDMARK
- ❍ SALAD

44. Write each expression in the form $a + bi$, where a and b are real numbers. Optionally, plot $3 + 2i$ in the complex plane. Then plot and label each of your answers.



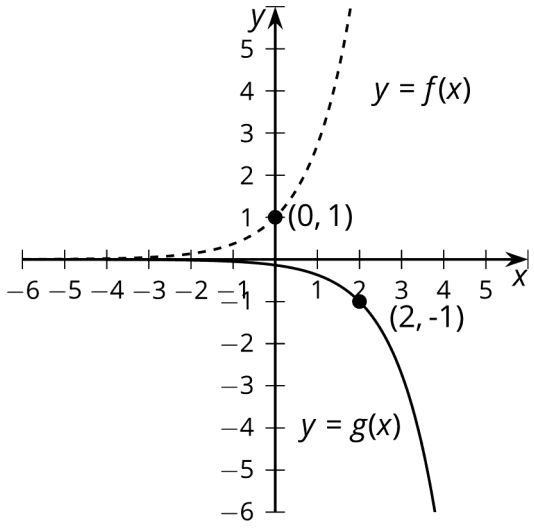
1. $2(3 + 2i)$
2. $i(3 + 2i)$
3. $-i(3 + 2i)$
4. $(3 - 2i)(3 + 2i)$

45. In 2000, an invasive plant species covered 0.2% of an island. For the 5 years that followed, the area covered by the plant tripled every year.

A student said, “That means that about half of the island’s area was covered by the plant in 2005!”

Do you agree with his statement? Explain your reasoning.

46. Here is a graph of $f(x) = e^x$ and a graph of g, which is a transformation of f. Write an equation for the function g.



47. These equations model the vertical position, in meters above the ground, of a point at the end of a wind turbine blade. For each function, indicate the height of the center of the turbine and the length of the turbine blade.

1. $y = 40\sin(\theta) + 80$
2. $y = 50\sin(\theta) + 90$
3. $y = 60\sin(\theta) + 120$

48. Each expression describes the vertical position, in feet off the ground, of a carriage on a Ferris wheel after t minutes. Which function describes the largest Ferris wheel?

A. $100\sin\left(\frac{2\pi t}{20}\right) + 110$

B. $100\sin\left(\frac{2\pi t}{30}\right) + 110$

C. $200\sin\left(\frac{2\pi t}{30}\right) + 210$

D. $250\sin\left(\frac{2\pi t}{20}\right) + 260$

49. Andre is in the band and he is conducting an experiment to determine if high school students find listening to classical music or listening to the sounds of the ocean more calming. He selects five students at random from the band to listen to classical music. He then selects five people at random from the swim team to listen to the sounds of the ocean. What is problematic about the way that Andre selected his groups?

50. Select *all* designs which describe an experimental study.

- ❍ 200 randomly selected students are asked the grade they received on their last math test.
- ❍ 25 students are asked if they studied more than one hour for a quiz. A different group of 25 students are asked if they missed any classes the week before a quiz. The quiz scores are recorded for both groups.
- ❍ 20 petunias in a greenhouse are watered daily and another 20 petunias in the same greenhouse are watered every other day. The growth of each plant is recorded over a period of one month.
- ❍ 100 people volunteer to exercise one hour per day for a month. Another 100 people volunteer to avoid exercise for a month. Each week, the resting heart rate of each person is recorded.
- ❍ 100 chickens are randomly selected from a flock. 50 of the chickens are weighed and the number of eggs they lay in a week are counted. The other 50 chickens have their body length measured and the number of eggs they lay in a week are counted. The ratio of weight to egg production and the ratio of length to egg production are recorded.