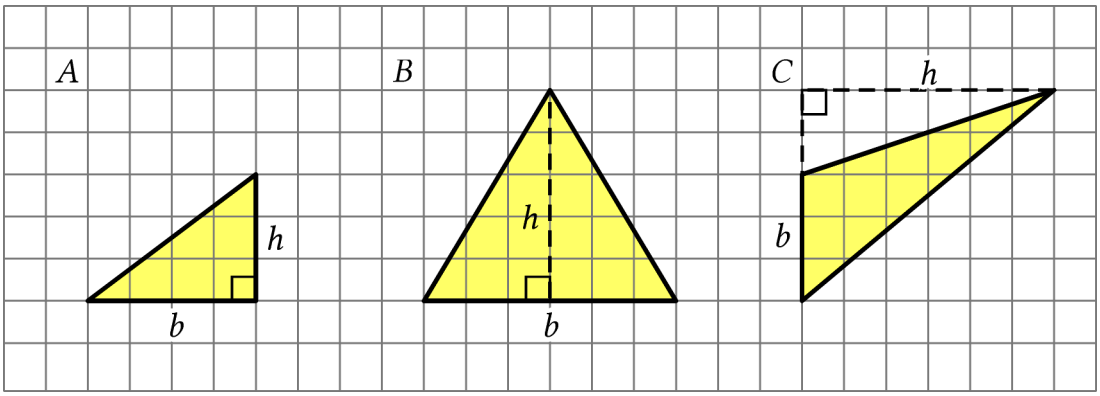
**Illustrative Math Samples Form B**

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 *A*, *B*, and *C*.




2. Brianna's softball coach brings a bag full of equipment to every practice. In the bag, there are 2 bats, 3 gloves, and 8 softballs.

   a) The ratio of softballs to gloves is _____ to _____.

   b) The ratio of bats to gloves is _____ : _____.

   c) For every _____ bats, there are _____ softballs.

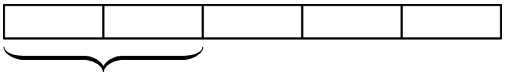
   d) For every 4 softballs there is one _____.

3. Priya's family exchanged 250 dollars for 4,250 pesos. Priya bought a sweater for 510 pesos. How many dollars did the sweater cost?

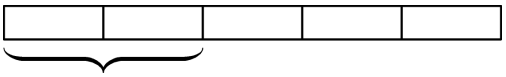
| pesos | dollars |
|---|---|
| 4,250 | 250 |
| | 25 |
| | 1 |
| | 3 |
| 510 | |

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

   a) Brianna has read 2 chapters of a book, which is $\frac{2}{5}$ of the book. How many chapters are in her book?



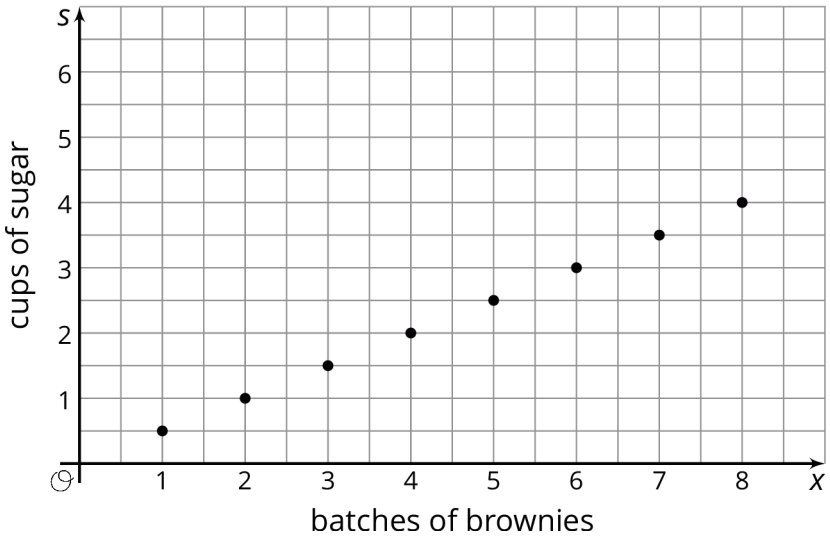
   b) Sophia has read $3\frac{3}{5}$ chapters of a different book, which also happens to be $\frac{2}{5}$ of a book. How many chapters are in her book?



5. A dictionary has front cover dimensions of 12 inches by 9 inches. If the thickness of the dictionary is $2\frac{1}{4}$ inches, what is the volume of the dictionary in cubic inches?

6. Kathir bought 3.5 pounds of apples for $4.34, 2.2 pounds of bananas for $1.43, and 2.7 pounds of peaches for $4.86. What is the unit price of each fruit he bought? Show your reasoning.

7. Here is a graph that shows some values for the number of cups of sugar, $s$, required to make $x$ batches of brownies.




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

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| $s$ | | | | | | | |

b) What does the point $(8, 4)$ mean in terms of the amount of sugar and number of batches of brownies?

c) Write an equation that shows the amount of sugar in terms of the number of batches.

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8. Select *all* expressions that are equivalent to 256

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

9. a) Represent each of these elevations in feet with a positive or negative number.
   - 100 feet above sea level
   - 50 feet below sea level
   - 225 feet above sea level
   - $86\frac{1}{2}$ feet below sea level

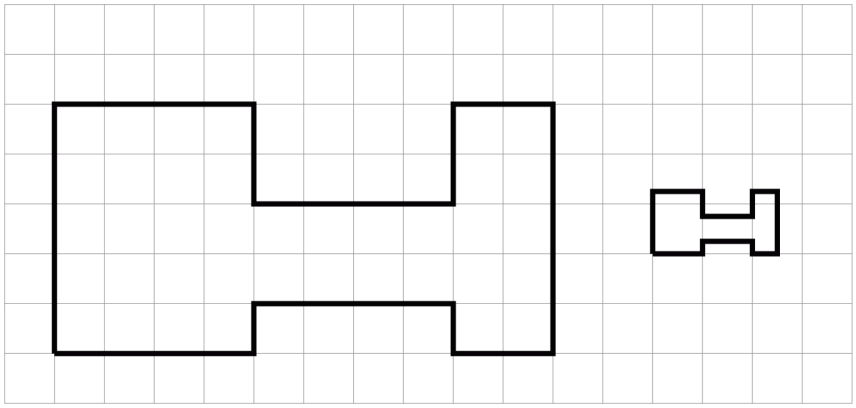
   b) Order the elevations above from furthest away from the center of the earth to the closest.

10. Mateo can shovel snow at a constant rate of 12 shovelfuls of snow per minute, while Mateo's brother can shovel snow at a constant rate of 8 shovelfuls per $\frac{1}{2}$ minute.

    a) Who can shovel snow faster? Explain your reasoning.

    b) How much can each person shovel in 50 minutes?

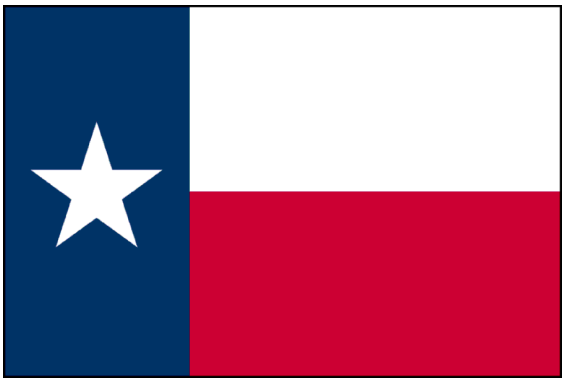
11. The second H-shaped polygon is a scaled copy of the first.



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 the state of Texas is a rectangle that is 6 ft long and 4 ft tall with three rectangles.



- The blue rectangle is 2 ft long and 4 ft tall.
- The white rectangle is 4 ft long and 2 ft tall.
- The red rectangle is the same size as the white rectangle.

a) Create a scale drawing of the flag of Texas with a scale of 1 cm to 2 ft. Don't worry about the scale of the white star.

b) Create a scale drawing of the flag of Texas with a scale of 3 cm to 1 ft. Don't worry about the scale of the white star.

13. A bicycle store marks up the instruments it sells by 40%.

a) If the store bought a road bike for $220, what will be its store price?

b) If the price tag on a mountain bike says $287, how much did the store pay for it?

c) If the store paid $170 for a clarinet and sold it for $245, did the store mark up the price by 40%?

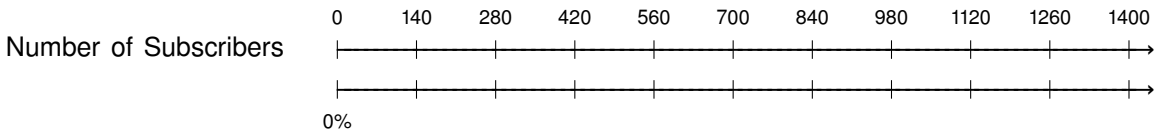
14. Dante and Taylor are solving the equation $76 = 4(x + 8)$.

Dante starts by dividing each side by 4. Taylor starts by using the distributive property.

a) Show what Dante's and Taylor's full solution methods might look like.

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

15. Dante's older brother runs a social media channel where he plays various video games. Last month, he had 840 subscribers. This month he has 1120 subscribers. By what percentage did his subscriber base grow?




16. Select *all* expressions that can be subtracted from $-5a$ to result in the expression $2a - 3$.

- ❍ $-3 + 7a$
- ❍ $3 - 7a$
- ❍ $7a + 3$
- ❍ $7a - 3$
- ❍ $-7a + 3$

17. Two months ago, the price, in dollars, of a cell phone was $c$.

a) Last month, the price of the phone increased by 10%. Write an expression for the price of the phone last month.

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

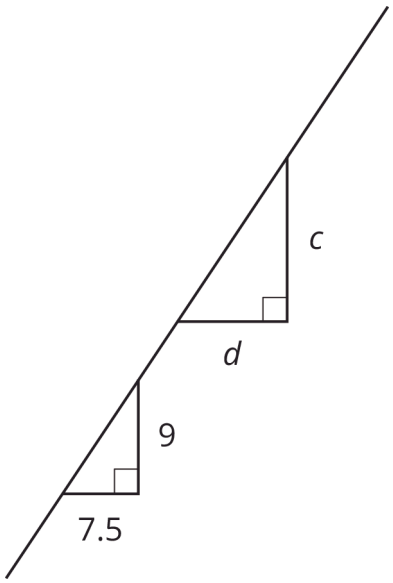
c) Is the price of the phone this month the same as it was two months ago? Explain your reasoning.

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. 60, 60, 60
2. 90, 90, 45
3. 30, 40, 50
4. 90, 45, 45
5. 120, 30, 30

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




20. Gym A costs \$30 per month with a one time sign-up fee of \$80. Gym B does not have a sign-up fee, but costs \$35 per month. When would the total cost of Gym A equal the total cost of Gym B?

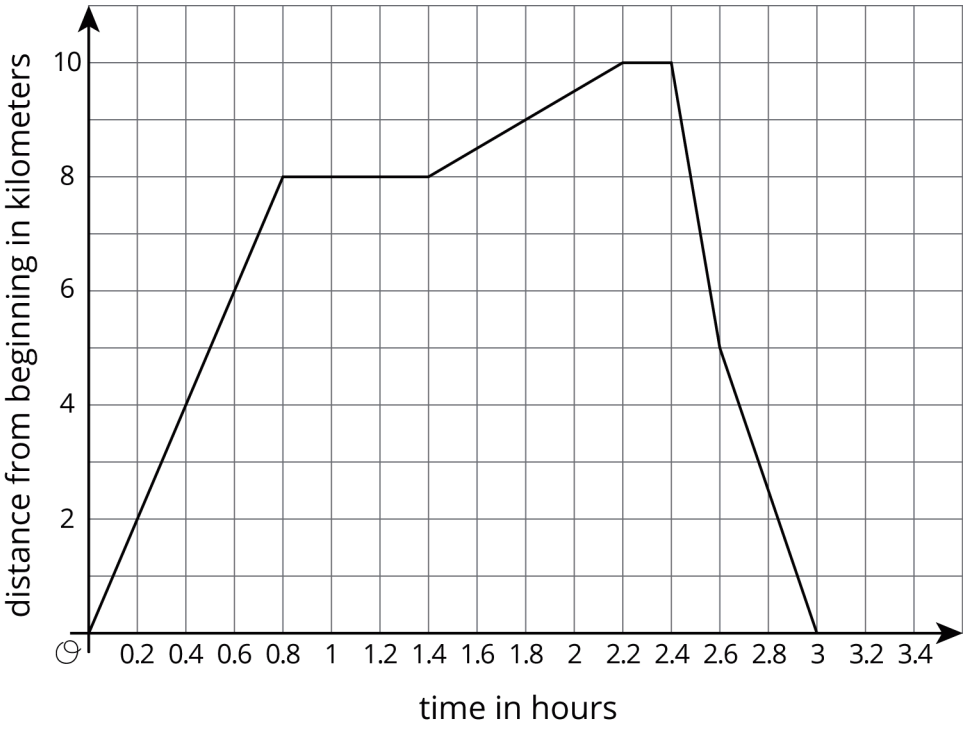
21. The points with coordinates $(2, 14)$, $(6, 10)$, and $(12, 4)$ all lie on the line $2x + 2y = 32$.

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 32?

22.




This graph shows a trip on a bike trail. The trail has markers every 0.5 km showing the distance from the beginning of the trail.

a) When was the bike rider going the fastest?

b) When was the bike rider going the slowest?

c) During what times was the rider going away from the beginning of the trail?

d) During what times was the rider going back towards the beginning of the trail?

e) During what times did the rider stop?

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

| | |
|---|---|
| **(A)** $y = \frac{3}{8}x$ | **(1)** An elementary school student sells lemonade for a quarter each cup. |
| **(B)** $\frac{1}{4}x = y$ | **(2)** For every quiz that a student turns in, the teacher has to grade 2 papers. |
| **(C)** $y = 2.25x$ | **(3)** My workout today was to jog 16 laps around the track, but I walked 6 of those laps. |
| **(D)** $y = 2x$ | **(4)** A store sells a pack of 4 shirts for $9. |

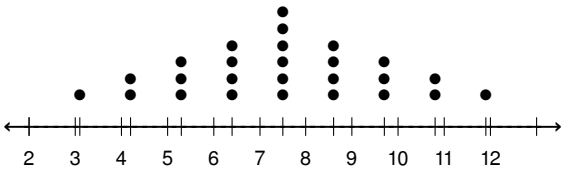
24. Brianna's older sister sets out on a road trip. She filled her car with gasoline at 7:00 am. At 9:30 am, the tank was 80% full, and at 1:00 pm, it was 55% full.

a) When do you think the tank will be empty?

b) Is the fuel remaining in the tank a function of time? If yes, is it a linear function? Explain your reasoning.

25. While taking inventory of the chickens and pigs on a farm, a farmer noticed the number of chickens is 5 more than 5 times the number of pigs. They also happen to know that combined, there are a total of 346 animal feet on the farm. Write and solve a system of equations to find the number of chickens on the farm.

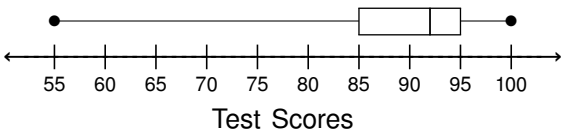
26. The dot plot displays the number of miles students in a class live from the school.




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 test scores for 100 students:




Which term best describes the shape of the distribution?

A. bell-shaped B. uniform

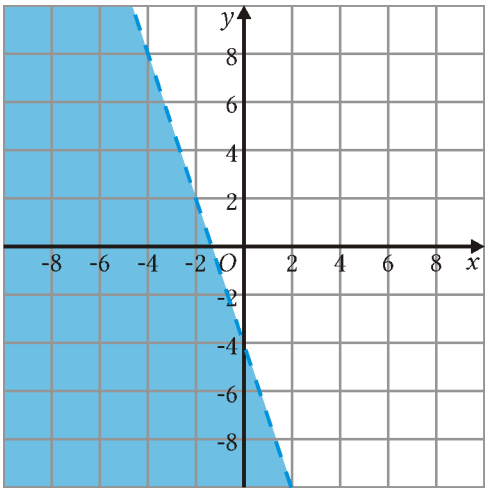
C. skewed D. symmetric

28. Cho and Erina are solving this system of equations: $\begin{cases} 4y = 3x \\ 4y = 8x - 20 \end{cases}$

- Cho's first step is to create a new system: $\begin{cases} y = 3x - 4 \\ y = 8x - 24 \end{cases}$
- Erina's first step is to write: $3x = 8x - 20$

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

29. Which inequality is represented by the graph?




A. $6x - 2y > -8$ B. $6x - 2y < -8$

C. $6x + 2y > -8$ D. $6x + 2y < -8$

30. Mateo needs to send 300 letters to thank the people who contributed to his fundraising efforts. He finds that envelopes are sold in packages of of 32 and packages of 8.

a) Would he have enough envelopes if he bought these quantities?

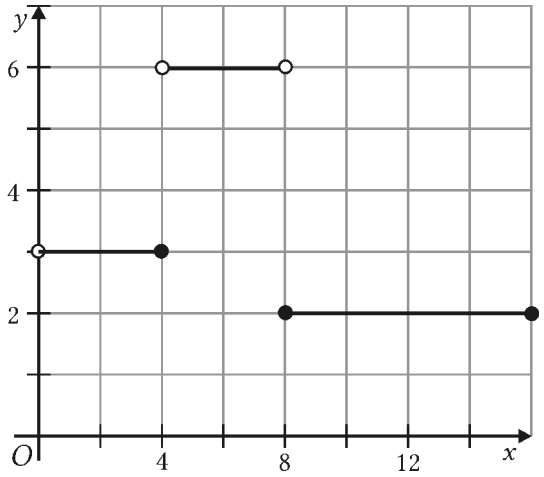
a. Eight packages of 32 and six packages of 8

b. Six packages of 32 and twelve packages of 8

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

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 envelopes that will meet the number of envelopes needed for the mailing.

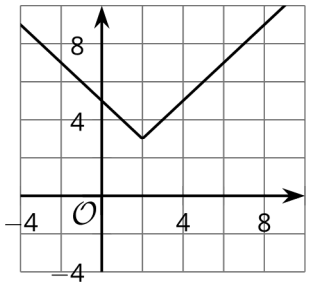
31. Is this a graph of a function? Explain your reasoning.




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

Function $T$ is defined by the equation $T(x) = |x| - 4$.

Describe how the graph of function $S$ relates to the graph of $T$, 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.

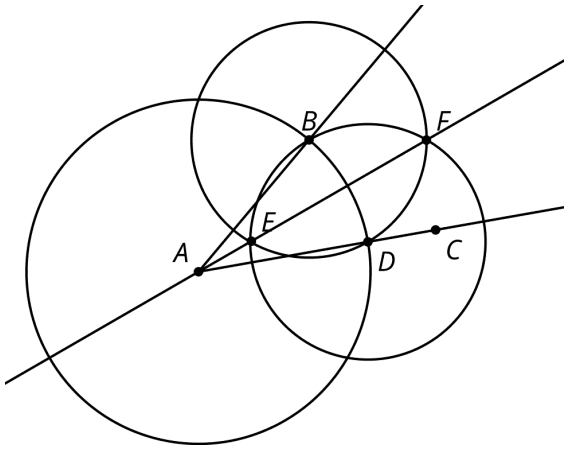
b) Write an equation for the function represented by the graph.

34. What are the solutions to the equation $3x^2 - 3x - 1 = 0$?

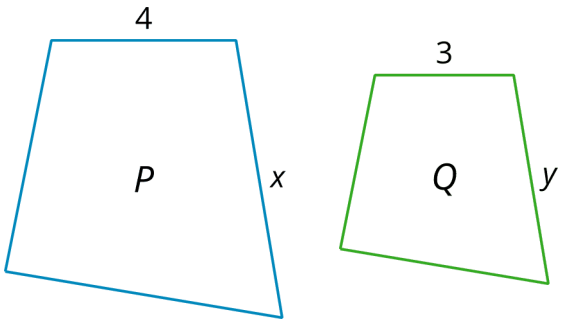
A. $x = \frac{3 \pm \sqrt{21}}{6}$ B. $x = \frac{-3 \pm \sqrt{21}}{6}$

C. $x = \frac{3 \pm \sqrt{-3}}{6}$ D. $x = \frac{-3 \pm \sqrt{-3}}{6}$

35. This diagram is a straightedge and compass construction. Is it important that the circle with center $B$ passes through $D$ and that the circle with center $D$ passes through $B$? Show or explain your reasoning.



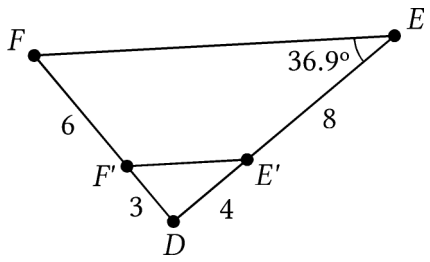
36. Polygon $Q$ is a scaled copy of Polygon $P$.




a) The value of $x$ is 6, what is the value of $y$?

b) What is the scale factor?

37. What is the measure of angle $DE'F'$?



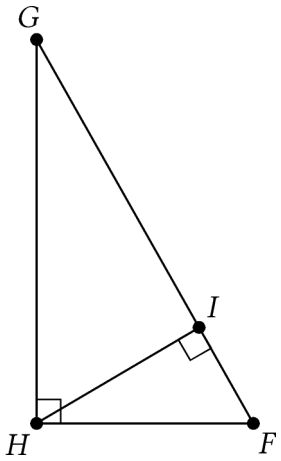

A. 36.9°

B. 53.1°

C. 73.8°

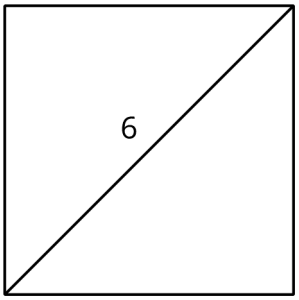
D. 110.7°

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




- ❍ *HFI*
- ❍ *HGI*
- ❍ *GHI*
- ❍ *GIH*
- ❍ *FHI*
- ❍ *FGH*

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



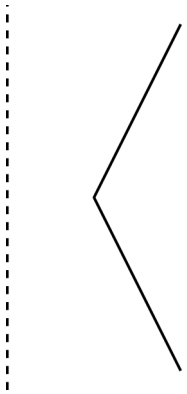

A. 3 units

B. $\frac{6}{\sqrt{2}}$ units

C. $6\sqrt{2}$ units

D. 12 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.

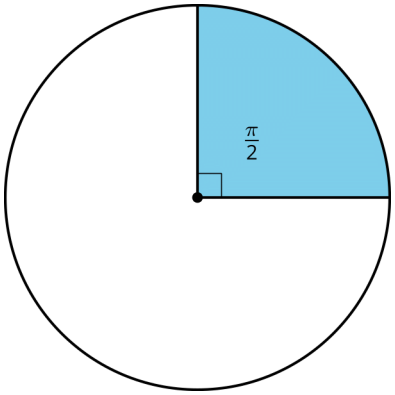


41. Identify whether each statement must be true, could possibly be true, or definitely cannot be true.

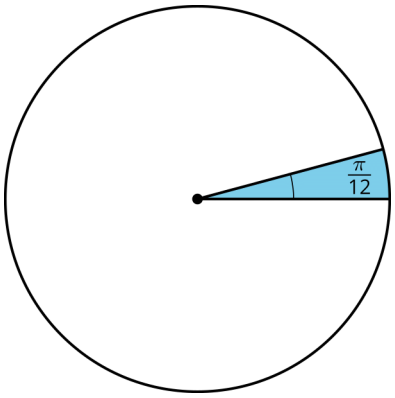
    1. A central angle measures 90°.
    2. A radius is a chord.
    3. A chord is a radius.
    4. A diameter is a chord.

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

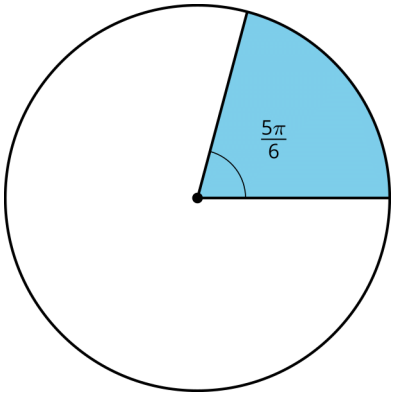
circle A




circle B



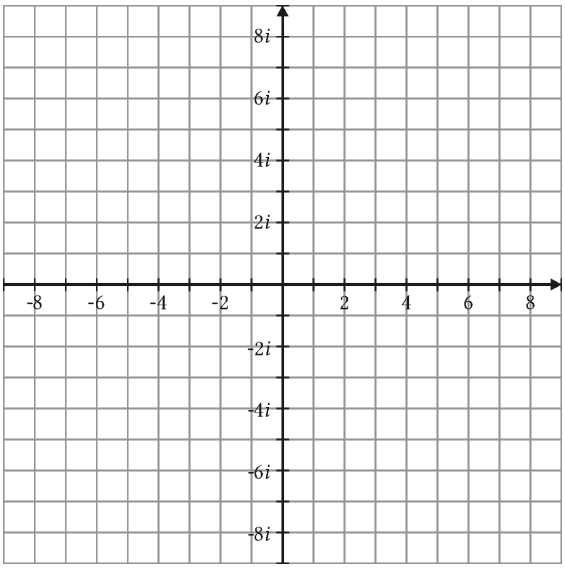

circle C



43. Select *all* of the words for which the probability of selecting the letter E at random is $\frac{1}{3}$.

- ❍ THE
- ❍ BEST
- ❍ SNEEZE
- ❍ FREES
- ❍ SPEECH

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



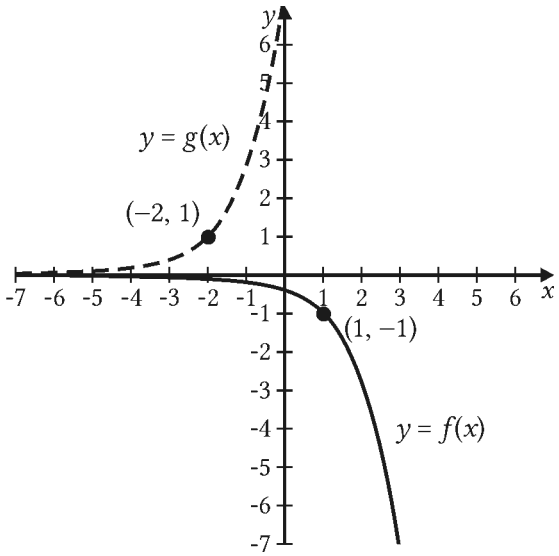

1. $2(2 + 3i)$
2. $i(2 + 3i)$
3. $-i(2 + 3i)$
4. $(2 - 3i)(2 + 3i)$

45. A series of population studies at the beginning of the decade indicated that a species of fish in a river was declining by a factor of $\frac{1}{9}$ each year.

A student said, "That shouldn't be a problem. There will still be over $\frac{8}{9}$ of the population in the future."

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 feet above the ground, of a point at the end of a windmill blade. For each function, indicate the height of the windmill and the length of the windmill blades.

1. $y = 5\sin(\theta) + 10$
2. $y = 8\sin(\theta) + 20$
3. $y = 4\sin(\theta) + 15$

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

A. $125\sin\left(\frac{2\pi t}{15}\right) + 130$

B. $100\sin\left(\frac{2\pi t}{20}\right) + 105$

C. $85\sin\left(\frac{2\pi t}{20}\right) + 90$

D. $85\sin\left(\frac{2\pi t}{15}\right) + 90$

49. Kathir is conducting an experiment for science class to determine if adding potassium to plants helps their rate of growth. He purchases five marigold plants similar to those growing along the school's sidewalks. He then adds fruit compost high in potassium to each plant each day. After a week, he measures the growth of his plants and the plants along the sidewalk and compares the results. What is problematic about the way that Kathir conducted his experiment?

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

- ❍ 100 randomly selected students are asked if they have their driver's license.
- ❍ 50 baseball players are selected to wear compression sleeves during practice and games and another 50 players are selected not to wear compression sleeves during practice and games. The number of visits to the athletic trainer is recorded for both groups.
- ❍ 50 athletes are asked if they stretch before practice. A different group of 50 athletes are asked if they drink more than 2 quarts of water on days they have practice. The results are recorded for both groups.
- ❍ 100 students taking chemistry are randomly selected. 50 of the students have their arm length and wrist circumference measured. The other 50 students have their foot length and head circumference measured. The ratio of arm length to wrist circumference and foot length to head circumference are recorded.
- ❍ 50 students volunteer to drink 2 quarts of water each day for a week. Another 50 students volunteer to drink 2 quarts of a sports drink each day for a week. Each day students record the number of hours they sleep.