1. In science class, Clare and Lin estimate the mass of eight different objects that actually weigh 2,000 grams each.

   Some summary statistics:

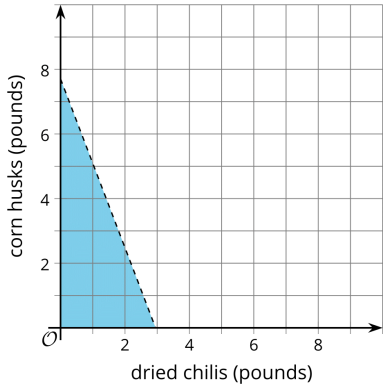
Clare	Lin
• mean: 2,000 grams	• mean: 2,000 grams
• MAD: 275 grams	• MAD: 225 grams
• median: 2,000 grams	• median: 1,950 grams
• IQR: 500 grams	• IQR: 350 grams

   Which student was better at estimating the mass of the objects? Explain your reasoning.

2. Elena is ordering dried chili peppers and corn husks for her cooking class. Chili peppers cost $16.95 per pound and corn husks cost $6.49 per pound.

   Elena spends less than $50 on d pounds of dried chili peppers and h pounds of corn husks.

   Here is a graph that represents this situation.

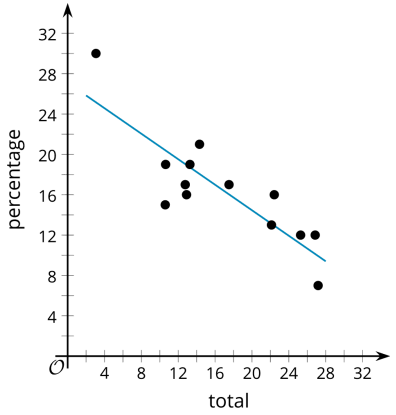


   a) Write an inequality that represents this situation.

   b) Can Elena purchase 2 pounds of dried chili peppers and 4 pounds of corn husks and spend less than $50? Explain your reasoning.

   c) Can Elena purchase 1.5 pounds of dried chili peppers and 3 pounds of corn husks and spend less than $50? Explain your reasoning.

3. At a restaurant, the total bill and the percentage of the bill left as a tip is represented in the scatter plot.

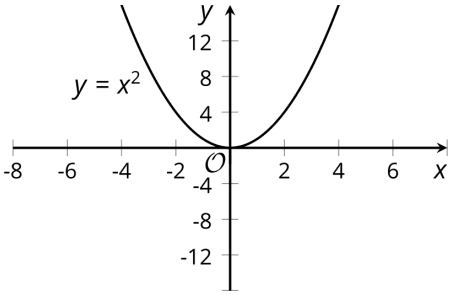


   The best fit line is represented by the equation $y = -0.632x + 27.1$, where x represents the total bill in dollars, and y represents the percentage of the bill left as a tip.

   a) What does the best fit line estimate for the percentage of the bill left as a tip when the bill is $15? Is this reasonable?

   b) What does the best fit line predict for the percentage of the bill left as a tip when the bill is $50? Is this reasonable?

4. Here is a graph that represents $y = x^2$.



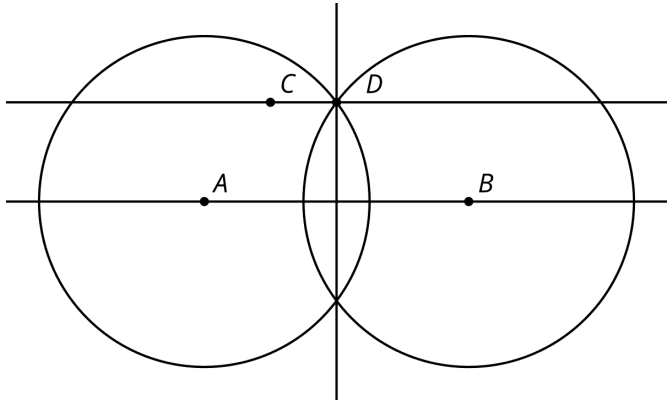
   a) Describe what would happen to the graph if the original equation was changed to:

      a. $y = \frac{1}{2}x^2$

      b. $y = x^2 - 8$

   b) Graph the equation $y = \frac{1}{2}x^2 - 8$ on the same coordinate plane as $y = x^2$.

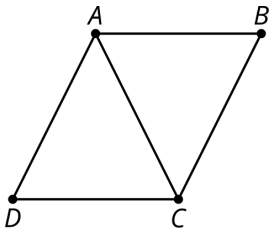
5. To construct a line passing through point *C* that is parallel to the line *AB*, Han constructed the perpendicular bisector of *AB* and then drew line *CD*.



Is *CD* guaranteed to be parallel to *AB*? Explain how you know.

6. Tyler has written an incorrect proof to show that quadrilateral *ABCD* is a parallelogram. He knows segments *AB* and *DC* are congruent. He also knows angles *ABC* and *ADC* are congruent. Find the mistake in his proof.

Segment *AC* is congruent to itself, so triangle *ABC* is congruent to triangle *ADC* by Side-Angle-Side Triangle Congruence Theorem. Since the triangles are congruent, so are the corresponding parts, and so angle *DAC* is congruent to *ACB*. In quadrilateral *ABCD*, *AB* is congruent to *CD* and *AD* is parallel to *CB*. Since *AD* is parallel to *CB*, alternate interior angles *DAC* and *BCA* are congruent. Since alternate interior angles are congruent, *AB* must be parallel to *CD*. Quadrilateral *ABCD* must be a parallelogram since both pairs of opposite sides are parallel.



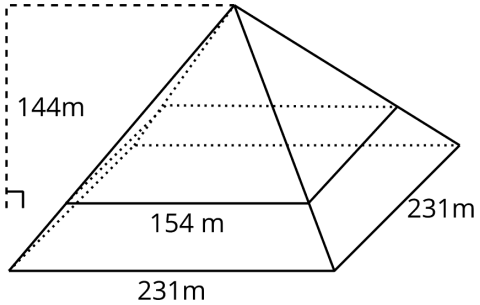
7. This stop sign is a regular octagon. It has side lengths of 12 inches. What is the area? What is the perimeter?

8. This water bottle has a base with area *B* square inches and a height of *h* inches. Tyler thinks the volume of the water bottle is *Bh*. Elena thinks the volume is less than *Bh*.

Do you agree with either of them? Explain your reasoning.

9. The Pyramid of Khufu in Giza, Egypt was the world's tallest free-standing structure for more than 3,500 years. Its original height was about 144 meters. Its base is approximately a square with a side length of 231 meters.

   The diagram shows a cross section created by dilating the base using the top of the pyramid as a center. The cross section has side length of 154 meters.



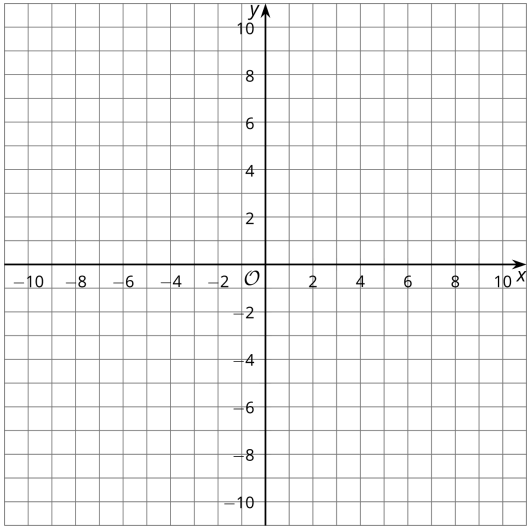
   a) What scale factor was used to create the cross section?

   b) What is the height of the cross section?

10. Suppose several solids are divided into thin slices, all in the same direction. For each set of slices, decide what kind of solid they came from.

   1. a set of similar rectangles, decreasing in size to a single point, ordered from greatest in size to smallest
   2. a set of congruent triangles
   3. a set of congruent squares
   4. a set of circles, decreasing in size to a single point, ordered from greatest in size to smallest

11. Graph the equations $(x + 1)^2 + (y - 1)^2 = 64$ and $y = 1$. Where do they intersect?



12. The table shows information from a survey about the resting heart rate in beats per minute (bpm), for 200 college students who are in the marching band and who are not in the marching band.

	below 80 bpm	**above 80 bpm**	**total**
in the marching band	56	28	84
not in the marching band	66	50	116
total	122	78	200

   a) Create a two-way table that shows the relative frequency for each of the values in the table relative to all 200 people in the survey.

   b) What is the probability that a person surveyed, selected at random, has a heart rate above 80 bpm or is in the marching band?

   c) What is the probability that a person surveyed, selected at random, has a heart rate below 80 bpm and is not in the marching band?

13. Open a blank spreadsheet. In A1, type 2 and enter.

    a) What should you type into cell A2 to generate the sequence 2, 4, 8, 16, 32, ... when you fill down the column?

    b) What should you type into cell A2 to generate the sequence 2, 4, 6, 8, 10, ... when you fill down the column?

14. Find the exact solution(s) to each of these equations, or explain why there is no solution.

    1. $x^2 = 49$
    2. $x^3 = 49$
    3. $x^2 = -49$
    4. $x^3 = -49$

15. Solve each quadratic equation with the method of your choice.

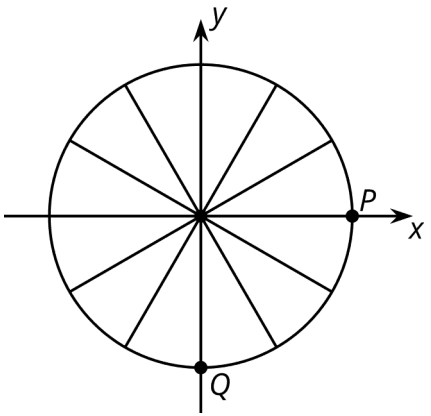
    1. $x^2 - 2x = -1$
    2. $x^2 + 8x + 14 = 23$
    3. $x^2 - 15 = 0$
    4. $7x^2 - 2x - 5 = 0$
    5. $2x^2 + 12x = 8$

16. The area covered by a lake is 11 square kilometers. It is decreasing exponentially at a rate of 2 percent each year and can be modeled by $A(t) = 11 \cdot (0.98)^t$.

    a) By what factor does the area decrease in 10 years?

    b) By what factor does the area decrease each month?

17. Here is a wheel with radius 1 foot.



a) List three different counterclockwise angles the wheel can rotate so that point P ends up at position Q.

b) How many feet does the wheel roll for each of these angles?

18. The function h given by $h(\theta) = 15 + 4\sin(\theta)$ models the height, in feet, at the tip of a windmill blade that has rotated through an angle θ.

a) What is the height of the windmill? Explain how you know.

b) What is the length of the windmill blade? Explain how you know.

19. Which of these statements describes a key distinction between an observational study and an experimental study?

A. Experimental studies are more representative of the larger population than observational studies.

B. Data is collected in experimental studies, but not in observational studies.

C. Observational studies try to answer a question, but experimental studies do not.

D. Experimental studies directly influence something to see its effect, but observational studies do not directly influence the subjects.

20. When Elena throws a shot put during track and field practice, it travels an average of 26 feet with a standard deviation of 3 feet, and the distribution of lengths is approximately normal. Approximately what percentage of her shots will travel less than 23 feet?