

EC Number

According to a September 27, 2017, newspaper article (Long and Jan 2017), the typical household net worth increased by 30% for African American households and by 46% for Hispanic households from 2013 to 2016.

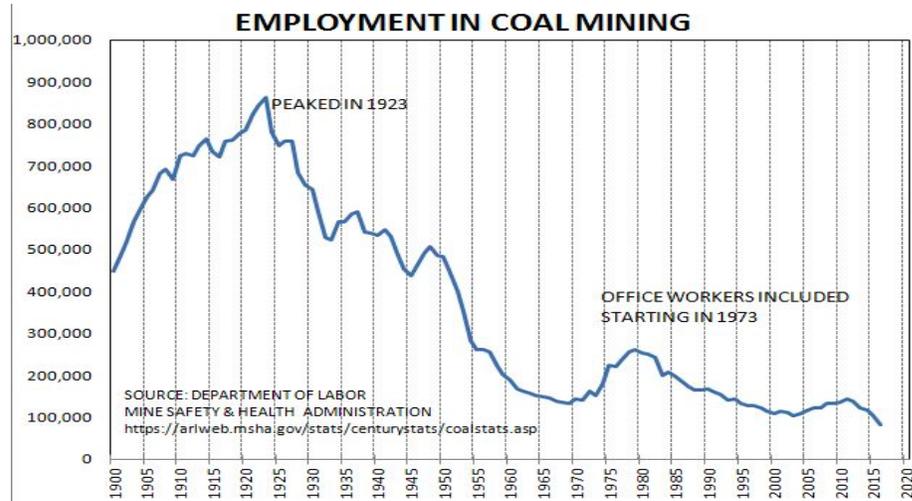
- (a) What questions should you ask to make sense of this information?
- (b) In 2013, a typical net worth was \$13,600 for African American households and \$14,200 for Hispanic households. What was the typical household net worth for each of these two groups in 2017?
- (c) The poverty level for a three-person household in 2017 was \$19,530, and the poverty level for a four-person household was \$20,000. How does the typical net worth of African American and Hispanic households in 2017 compare with the poverty levels?

EC in Algebra and Functions: Algebra

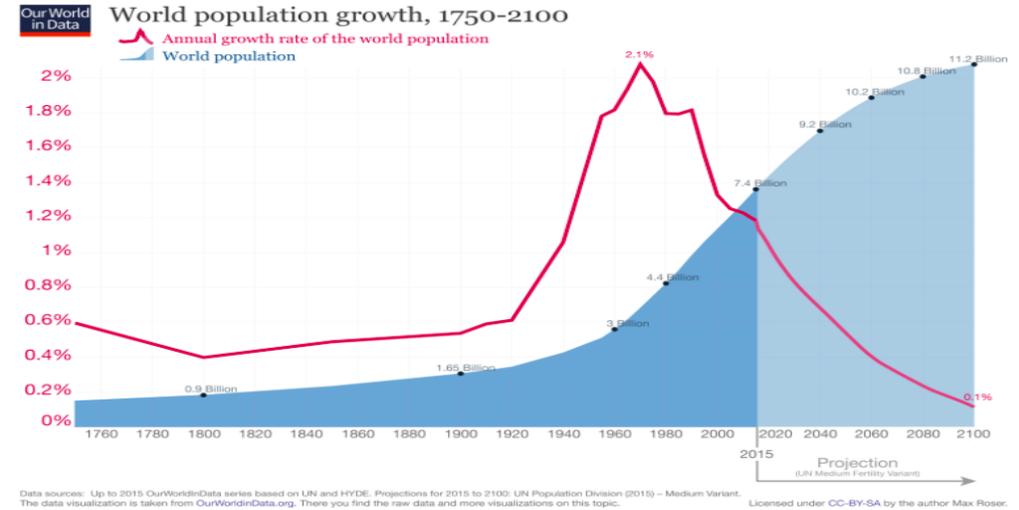
Suppose that you are given the equation $15x - 20y = 30$:

- (a) What are some things that you know about the equation?
- (b) Suppose that x is a really large number. Do you think that y will be really large as well? Explain why or why not.
- (c) Choose one of the following that you think is correct, and explain why you think it is correct:
 - (i) $x = 2$ will make the equation true.
 - (ii) As the value of x decreases, the value of $-20y$ increases.
 - (iii) For $x < 2$, $y > 0$.

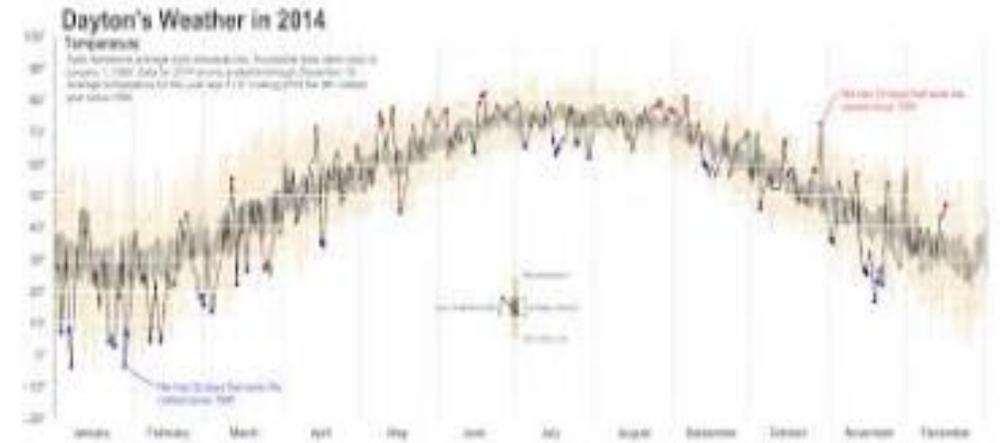
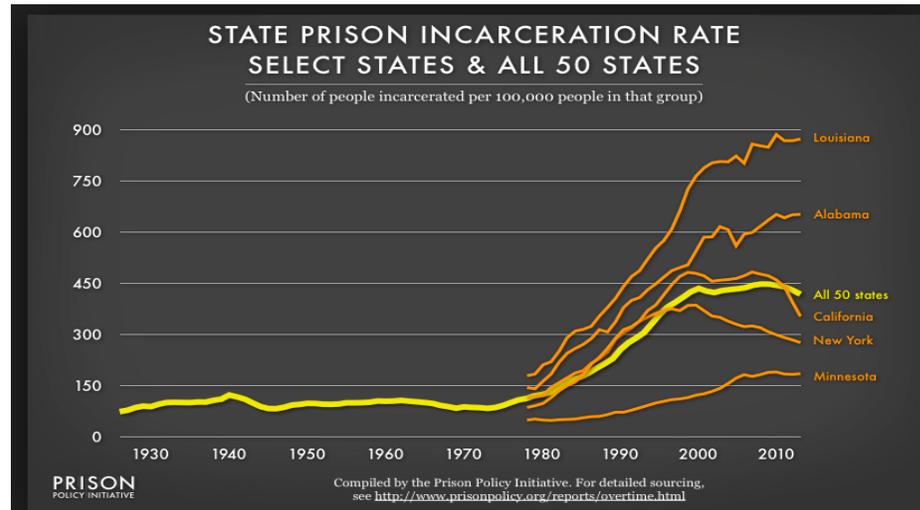
EC in Algebra and Functions: Functions



Write three sentences to tell the story described by the function in each of the graphs.



Data sources: Up to 2015 OurWorldInData series based on UN and HYDE. Projections for 2015 to 2100: UN Population Division (2015) - Medium Variant. The data visualization is taken from OurWorldInData.org. There you find the raw data and more visualizations on this topic. Licensed under CC-BY-SA by the author Max Roser.



EC Statistics and Probability: Quantitative Literacy

A newly purchased washing machine has a one-year warranty and an option to purchase an extended warranty for \$50. The extended warranty will cover the cost of all repairs for three additional years. Data from consumer magazines report that 10% of machines like the one purchased will require repairs costing an average of \$150 during the second, third, or fourth year of ownership. How might you use this information to inform a decision about purchasing the extended warranty? What other factors should you consider in thinking about the data?

EC Statistics and Probability: Statistical Inference

A German study compared 118 patients with a rare form of eye cancer called uveal melanoma with 475 healthy patients who do not have this eye cancer. Researchers were interested in investigating whether an association exists between cell phone usage and developing eye cancer. The patients' cell phone use was measured by using a questionnaire. On average, the eye cancer patients used cell phones more often than those who did not have eye cancer (Stang et al. 2001).

- (a) What are the potential confounding variables that might influence the outcomes of eye cancer development and cell phone usage?
- (b) Describe how this study could possibly be designed as a randomized experiment. Would it be practical to implement and carry out this experiment?

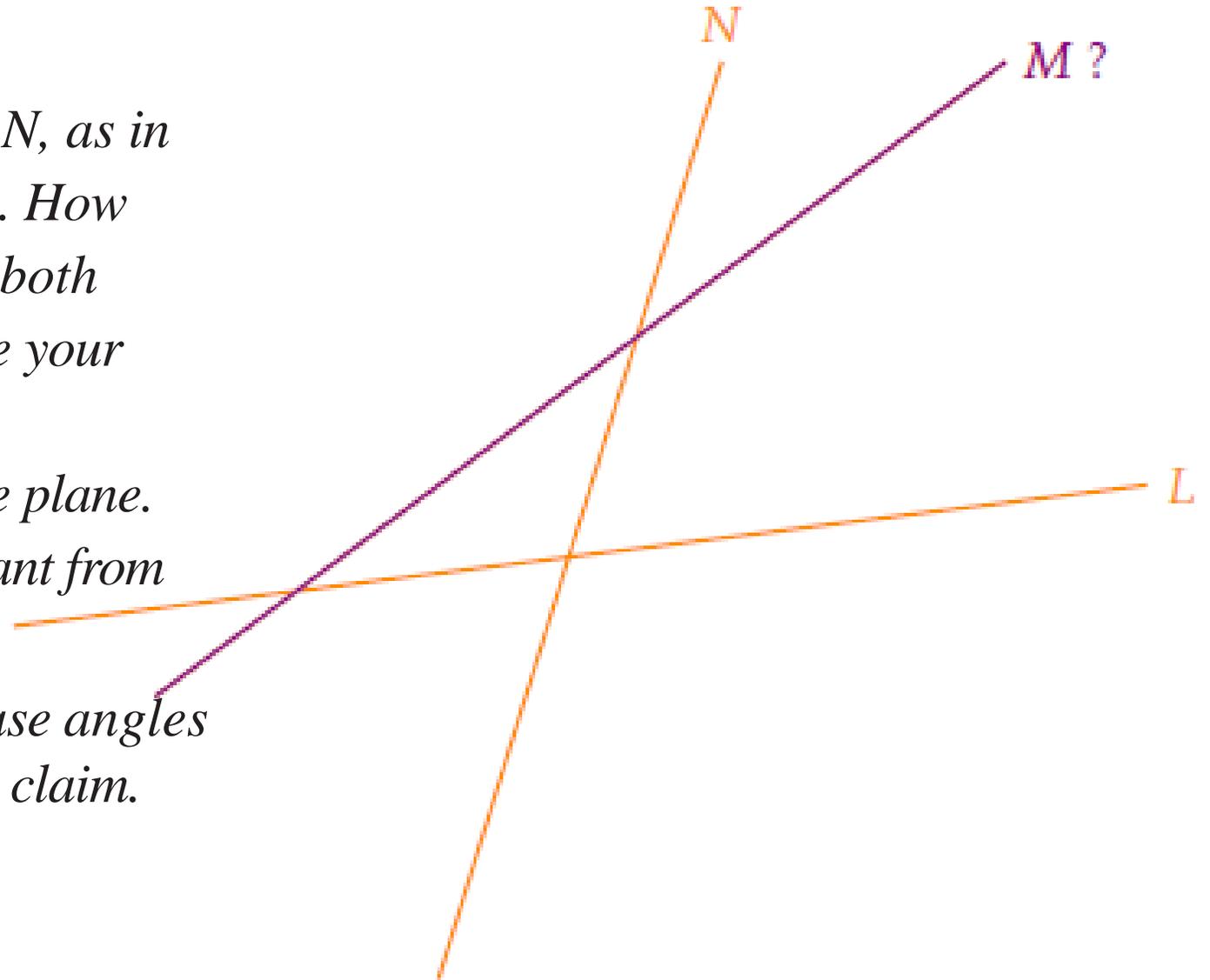
EC Geometry and Measurement: Measurement

Estimate the volume of the sack of onions.



EC Geometry and Measurement: Geometric Arguments, Reasoning, and Proof

- (a) *Let L be a line that intersects a line N , as in the figure, and let M be another line. How can M be arranged so that L and M both intersect N at the same angle? Prove your claim.*
- (b) *Let A and B be different points in the plane. What is the set of all points equidistant from A and B ? Prove your claim.*
- (c) *What is the relationship between base angles of an isosceles triangle? Prove your claim.*



EC Number

The equation $y = 3.5x + 20.8$ describes the relationship between the number of times that a cricket chirps and the temperature. Respond to the following:

What do you need to know to interpret the rate of change in the context of the chirps and temperature?

Soren looked up the data and found that the temperature was recorded in degrees Fahrenheit, the cricket chirps were measured every 15 seconds, and the number of chirps was used to predict the temperature. Sally said that for every increase of 1 cricket chirp per 15 seconds, the predicted temperature increases by about 3.5° Fahrenheit. Samee disagreed and said that for every increase of 3.5 cricket chirps per 15 seconds, the predicted temperature increases by about 1° Fahrenheit. Who is correct and why?

EC in Algebra and Functions: Algebra

You are planning an event and find an online calculator that helps you predict sales revenue for different ticket prices. The online calculator asks you to enter information about how many people attended the event in the past (200 people) and what the ticket price was (\$5.50). You try some different ticket prices, and the calculator generates the following table:

Ticket price	Revenue
\$7	\$1,295
\$10	\$1,550
\$15	\$1,575
\$18.50	\$1,295

(a) What could you do to find the ticket price that would yield the maximum possible revenue? What could you do to find the lowest ticket price that would give you \$1,400 in revenue?

(b) What assumptions are the online calculator making about how changes in the ticket price will change how many people attend the event?

The fine print on the website states,

“We used the formula $r(p) = (200 - 10(p - 5.50))(p)$ to calculate your results.”

You are curious about two things. You wonder what ticket price would give you the maximum revenue and what ticket price would be the lowest that you could use to get to your fundraising goal of \$1,400. But you aren't sure how to figure those things out from the formula on the website.

You put the formula from the website into the answer engine at Wolfram Alpha (wolframalpha.com), and it shows you these equivalent expressions:

$$-10x^2 + 255x + 0$$

$$-5x(2x - 51)$$

$$-10(x - 12.75)^2 + 1625.25$$

EC in Algebra and Functions: Connecting Algebra to Functions

Consider the two functions f and g whose graphs are pictured below.

- (a) What do you notice about the graphs of the functions f and g ? What questions might you want to ask about the functions f and g ?
- (b) Find a point on f and explain what $f(x) = y$ means.
- (c) Why is it useful to have one graph labeled f and the other g ?
- (d) Mark the points on the graphs of g and f

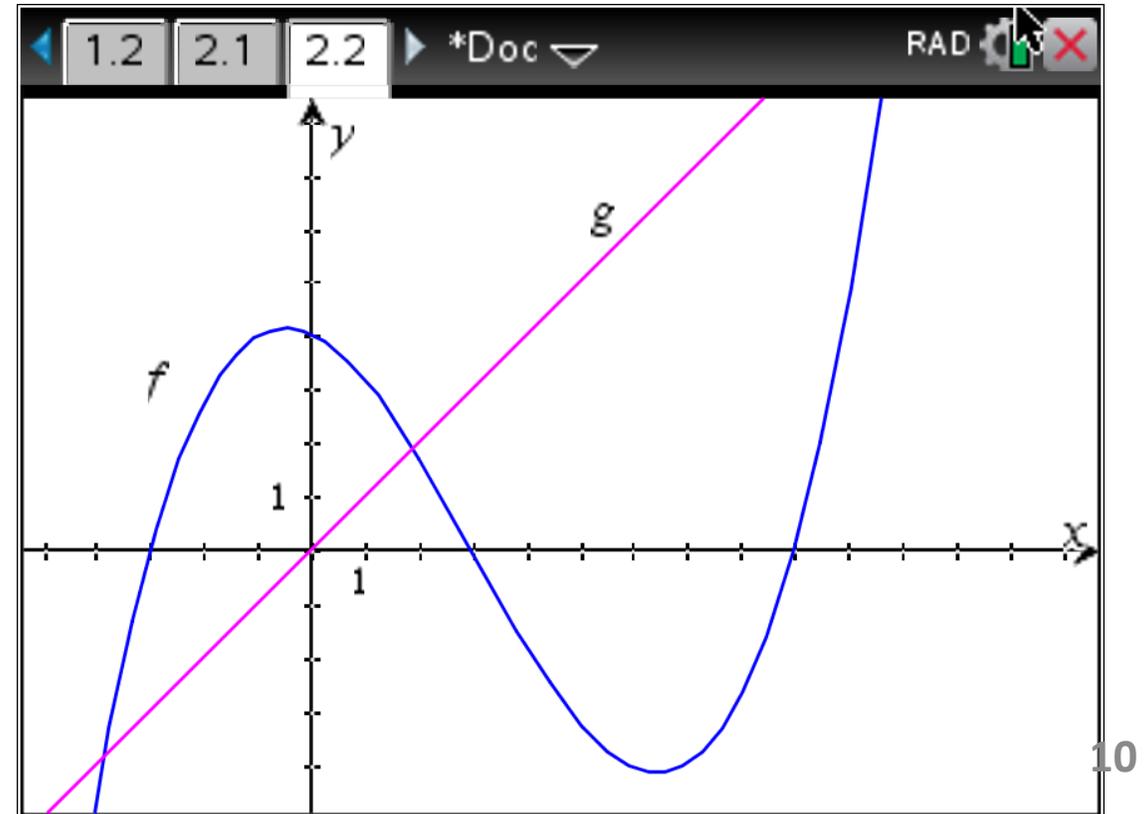
at which

(i) $f(0) = 4$

(ii) $f(-3) = f(3) = f(9) = 0$

(iii) $f(2) = g(2)$

(iv) $g(x) > f(x)$



EC Statistics and Probability: Probability

Table 5 gives the results of the data from a sample used in a clinical experimental trial. Use the data in the table to find the probabilities in (a)–(c):

- (a) The probability that a randomly selected person from the sample will have the disease
- (b) The probability that a randomly selected person from the sample who has the disease tests positive
- (c) The probability that a randomly selected person from the sample who has the disease tests negative

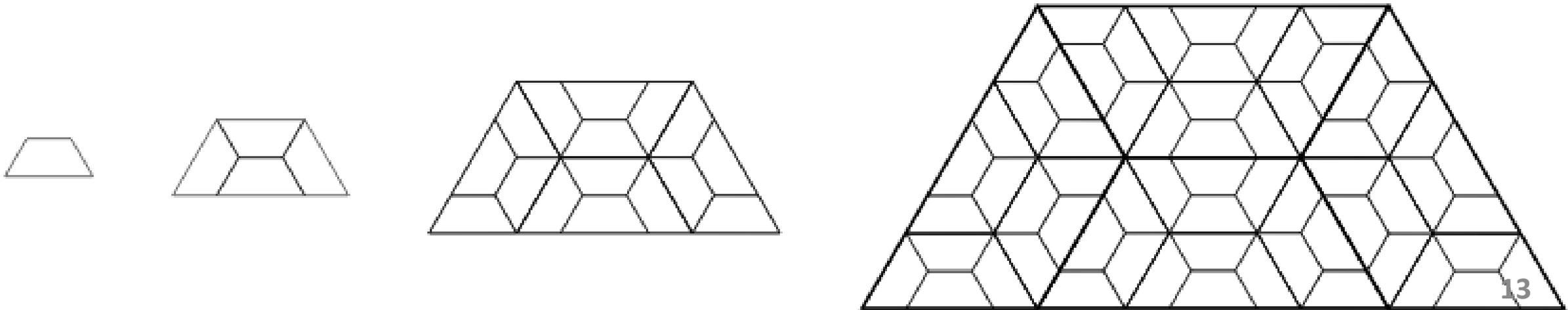
- (d) Do you think the clinical trial data present evidence justifying a very expensive test for the disease? Explain your thinking.

Table 5. Considering test results and disease

	Diseased	Not diseased	Totals
Test result positive	170	7,830	8,000
Test result negative	30	91,970	92,000
Totals	200	99,800	100,000 ₁₂

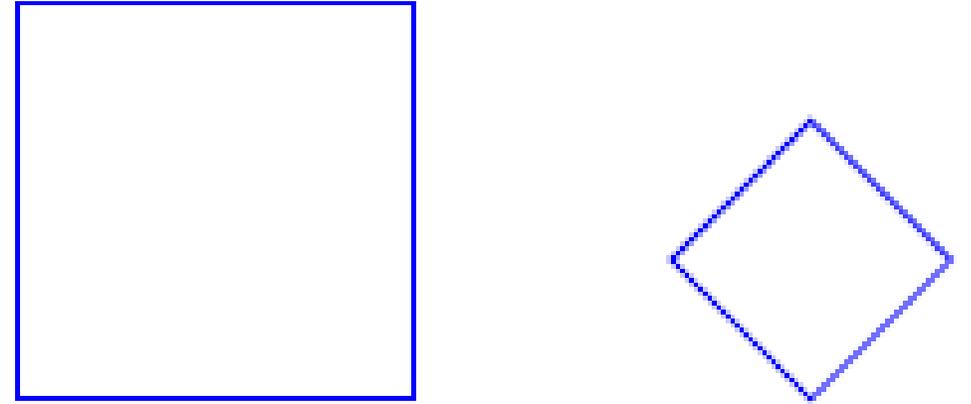
EC Geometry and Measurement: Measurement

The tilings are made of trapezoidal tiles. All the tiles are the same. How much larger is each tiling in the sequence than the preceding one, in terms of both side length and area? Given the trapezoid tilings in the figure, determine the proportions and angles of each trapezoid. Explain your reasoning.



EC Geometry and Measurement: Transformations

Find as many sequences of rigid motions and dilations as you can to send the larger square on the left in figure 6 to the smaller square on the right. (The length of the sides of the smaller square is half the length of the sides of the larger square.)



EC Geometry and Measurement: Solving Applied Problems and Modeling in Geometry

A linear irrigation system consists of a long water set on wheels that keep it above the level of plants. Nozzles are placed along the pipe, and each nozzle sprays water in a circular region. The entire system moves slowly down the field at a constant speed, watering the plants beneath as it moves. You have 300 feet of pipe and 6 nozzles available. The nozzles deliver a relatively uniform spray to a circular region 50 feet in radius. How far apart should the nozzles be placed to produce the most uniform distribution of water on a rectangular field 300 feet wide?

