

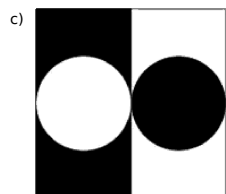
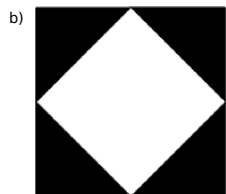
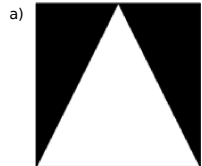
1.
 - a) Use all the digits 5, 7, and 2 to create different 3-digit numbers.
 - b) What is the greatest number you can make using all of the digits?
 - c) What is the smallest number you can make using all of the digits?

2. Below is a table showing addition of numbers from 1 through 5.

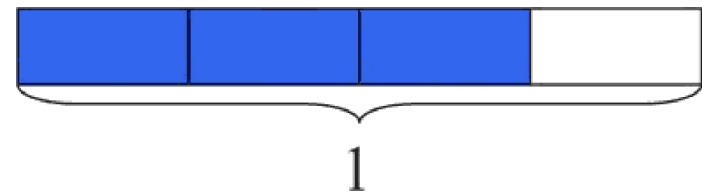
+	1	2	3	4	5
1	2	3	4	5	6
2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9
5	6	7	8	9	10

- a) In each column and each row of the table, even and odd numbers alternate. Explain why.
- b) Explain why the diagonal, from top left to bottom right, contains the even numbers 2, 4, 6, 8, and 10.
- c) Explain why all numbers in the other diagonal, from bottom left to top right, are 6's.

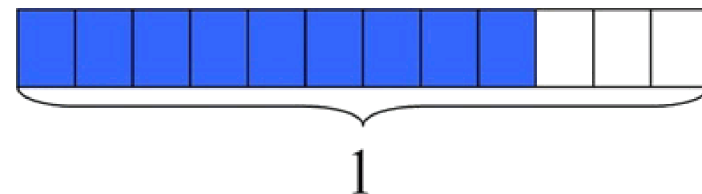
3. For each of the pictures, explain how you can see that half of the square is shaded:



4. a) The rectangle below has length 1. What fraction does the shaded part represent?

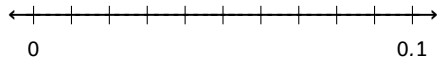


- b) The rectangle below has the same length as the rectangle above. What fraction does the shaded part represent?



- c) Use the pictures to explain why the two fractions represented above are equivalent.

5. Label all of the tick marks on the number line.

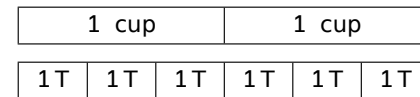


Plot and label each of the following numbers on the number line.

0.100
0.010
0.072
0.038

Which of these numbers is greatest? Which is least? How can you tell by looking at the number line?

6. Abigail mixed 2 cups of white paint with 6 tablespoons of blue paint. Which of the following statements describes this situation?



- a) There is 1 cup of white paint for every 3 tablespoons of blue paint.
b) The ratio of the number of cups of white paint to the number of tablespoons of blue paint is 1:3.
c) There are 3 tablespoons of blue paint per cup of white paint.
d) For each tablespoon of blue paint there are 3 cups of white paint.
e) Clara mixed 8 cups of flour with 2 pints of water to make papier-mâché paste. Describe the relationship between flour and water in the paste in at least four different ways.

7. Gianna is paid \$90 for 5 hours of work.

- a) At this rate, how much would Gianna make for 8 hours of work?
b) At this rate, how long would Gianna have to work to make \$60?

8. Anna enjoys dinner at a restaurant in Washington, D.C., where the sales tax on meals is 10%. She leaves a 15% tip on the price of her meal before the sales tax is added, and the tax is calculated on the pre-tip amount. She spends a total of \$27.50 for dinner. What is the cost of her dinner without tax or tip?

9. Four different stores are having a sale. The signs below show the discounts available at each of the four stores.

Two for the price of one	Buy one and get 25% off the second
Buy two and get 50% off the second one	Three for the price of two

- a) Which of these four different offers gives the biggest price reduction? Explain your reasoning clearly.
- b) Which of these four different offers gives the smallest price reduction? Explain your reasoning clearly.

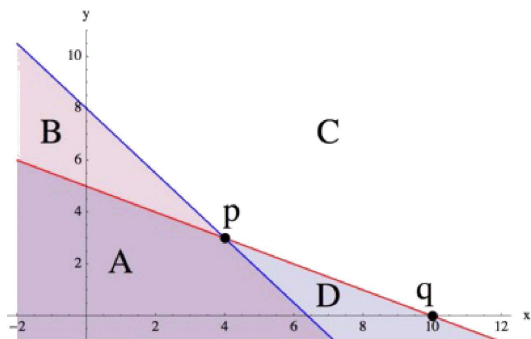
10. Ocean water freezes at about $-2\frac{1}{2}^{\circ}\text{C}$. Fresh water freezes at 0°C . Antifreeze, a liquid used in the radiators of cars, freezes at -64°C .

Imagine that the temperature has dropped to the freezing point for ocean water. How many degrees more must the temperature drop for the antifreeze to turn solid?

11. For a science project, Sammy observed a chipmunk and a squirrel stashing acorns in holes. The chipmunk hid 3 acorns in each of the holes it dug. The squirrel hid 4 acorns in each of the holes it dug. They each hid the same number of acorns, although the squirrel needed 4 fewer holes. How many acorns did the chipmunk hide?

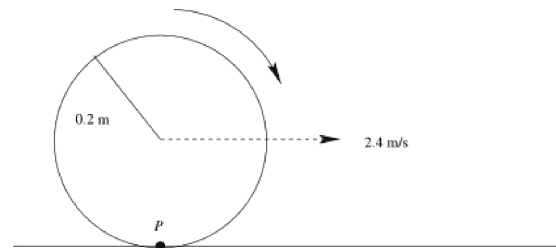
12. A fuel oil dealer buys 20,000 gallons of heating oil at \$2.65 per gallon and another 14,000 gallons at \$3.00 per gallon. (The oil is the same grade and quality, but the price varies due to the market.) He has a contract to sell up to 35,000 gallons of oil next month at \$3.25 per gallon, but wants to use as much cash as possible immediately for future investments. To raise cash, he can sell some of his oil to another distributor, who will pay \$2.75 per gallon now. How much investment money can the dealer raise now by selling oil and still be able to break even after selling the remainder next month?

13. Given below are the graphs of two lines, $y = -0.5x + 5$ and $y = -1.25x + 8$, and several regions and points are shown. Note that C is the region that appears completely white in the graph.



- For each region and each point, write a system of equations or inequalities, using the given two lines, that has the region or point as its solution set and explain the choice of \leq , \geq , or $=$ in each case. (You may assume that the line is part of each region.)
- The coordinates of a point within a region have to satisfy the corresponding system of inequalities. Verify this by picking a specific point in each region and showing that the coordinates of this point satisfy the corresponding system of inequalities for that region.
- In the previous part, we checked that specific coordinate points satisfied our inequalities for each region. Without picking any specific numbers, use the same idea to explain how you know that all points in the 3rd quadrant must satisfy the inequalities for region A.

14. A wheel of radius 0.2 meters begins to move along a flat surface so that the center of the wheel moves forward at a constant speed of 2.4 meters per second. At the moment the wheel begins to turn, a marked point P on the wheel is touching the flat surface.



- Write an algebraic expression for the function y that gives the height (in meters) of the point P , measured from the flat surface, as a function of t , the number of seconds after the wheel begins moving.
- Sketch a graph of the function y for $t > 0$. What do you notice about the graph? Explain your observations in terms of the real-world context given in this problem.
- We define the horizontal position of the point P to be the number of meters the point has traveled forward from its starting position, disregarding any vertical movement the point has made. Write an algebraic expression for the function x that gives the horizontal position (in meters) of the point P as a function of t , the number of seconds after the wheel begins moving.
- Sketch a graph of the function x for $t > 0$. Is there a time when the point P is moving backwards? Use your graph to justify your answer.

15. Oakland Coliseum, home of the Oakland Raiders, is capable of seating 63,026 fans. For each game, the amount of money that the Raiders' organization brings in as revenue is a function of the number of people, n , in attendance. If each ticket costs \$30.00, find the domain and range of this function.

16. The table below shows the temperature, T , in Tucson, Arizona t hours after midnight.

When does the temperature decrease the fastest: between midnight and 3 am or between 3 am and 4 am?

t (hours after midnight)	0	3	4
T (temp. in $^{\circ}\text{F}$)	85	76	70

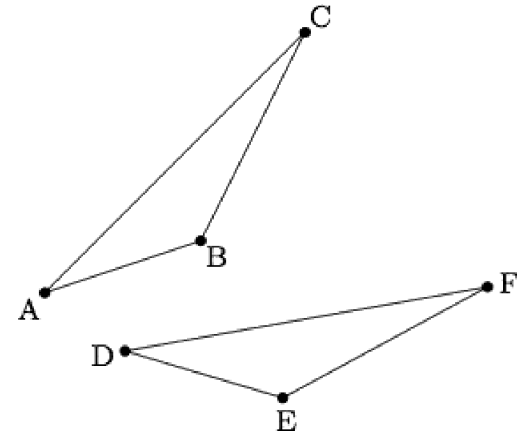
17. Carbon 14 is a form of carbon which decays exponentially over time. The amount of Carbon 14 contained in a preserved plant is modeled by the equation

$$f(t) = 10\left(\frac{1}{2}\right)^{ct}.$$

Time in this equation is measured in years from the moment when the plant dies ($t = 0$) and the amount of Carbon 14 remaining in the preserved plant is measured in micrograms (a microgram is one millionth of a gram). The number c in the exponential measures the exponential rate of decay of Carbon 14.

- How many micrograms of Carbon 14 are in the plant at the time it died?
- The best known estimate for the half-life of Carbon 14, that is the amount of time it takes for half of the Carbon 14 to decay, is 5730 ± 40 years. Use this information to calculate the range of possible values for the constant c in the equation for f .
- Use your answer from part (b) to find the range of years when there is one microgram remaining in the preserved plant.

18. Below is triangle ABC and a rotated image triangle DEF .



- Explain how to identify the center of rotation.
- Once you have found the center, how do you find the angle of rotation?

19. You have been hired by the owner of a local ice cream parlor to assist in his company's new venture. The company will soon sell its ice cream cones in the freezer section of local grocery stores. The manufacturing process requires that the ice cream cone be wrapped in a cone-shaped paper wrapper with a flat circular disc covering the top. The company wants to minimize the amount of paper that is wasted in the process of wrapping the cones. Use a real ice cream cone or the dimensions of a real ice cream cone to complete the following tasks.

- Sketch a wrapper like the one described above, using the actual size of your cone. Ignore any overlap required for assembly.
- Use your sketch to help you develop an equation the owner can use to calculate the surface area of a wrapper (including the lid) for another cone given its base had a radius of length, r , and a slant height, s .
- Using measurements of the radius of the base and slant height of your cone, and your equation from the previous step, find the surface area of your cone.
- The company has a large rectangular piece of paper that measures 100 cm by 150 cm. Estimate the maximum number of complete wrappers sized to fit your cone that could be cut from this one piece of paper. Explain your estimate.

20. Test scores on a statewide standardized test for a large population of students are normally distributed with mean = 9.44 and standard deviation = 1.75.

- Approximately what percentage of the scores are between 7.69 and 11.19?
- Certificates are given to students who score in the top 2.5% of those who took the test. Fred, a student who took the test, finds out that he earned a score of 13.1 on the test. He wonders if he should have received a certificate in the mail by now. He contacts the company that administers the test and asks if his score was high enough to earn a certificate.

Imagine that you work for this company that administers the test, and your supervisor (Chris) asks you to look into the matter. Complete the following note to Chris that *clearly states if Fred is to receive a certificate and includes a brief summary of your analysis that led you to that conclusion*. Assume that your supervisor, Chris, is familiar with z-scores, probabilities, normal curves, etc.

Chris:

Regarding your request about Fred's test score, ...