

Trapezoid	Length of Left-Hand Side (in inches)	Length of Right-Hand Side (in inches)	Area of Trapezoid (in square inches)
T_3	$f(3) = (3)^2 = 9$	$f(4) = (4)^2 = 16$	$A_3 = \frac{1}{2}(9+16)(1) = \frac{25}{2}$
T_4	$f(4) = (4)^2 = 16$	$f(5) = (5)^2 = 25$	$A_4 = \frac{1}{2}(16+25)(1) = \frac{41}{2}$

The Total Area of the Four Trapezoids:

$$\frac{5 \text{ in.}^2}{2} + \frac{13 \text{ in.}^2}{2} + \frac{25 \text{ in.}^2}{2} + \frac{41 \text{ in.}^2}{2} = \frac{84 \text{ in.}^2}{2} = 42 \text{ in.}^2$$

Thus, the approximate area under the curve is 42 square inches.

If we divided the area under the curve in the previous example into more and more and more trapezoids, we would get a better and better approximation for the area. This is exactly the foundation for integral calculus, but the details will have to wait for another math course on another day.

Skill Check Answers

1. 7 ft × 12 ft and 9 ft × 40 ft 2. Area = 78.5 in.²; Circumference = 31.4 in.

9.1 Exercises

✓ CONCEPT CHECK

- The perimeter of a circle is called its _____.
- A trapezoid is a quadrilateral that has exactly one pair of _____ sides.
- A _____ is a pattern made of one or more geometric shapes so that there are no gaps or overlaps.
- True or False: The formulas for the perimeter and area of a rectangle can be used to find the perimeter and area of a square.

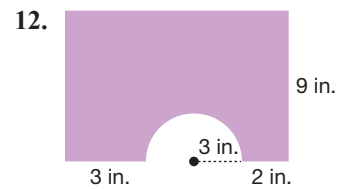
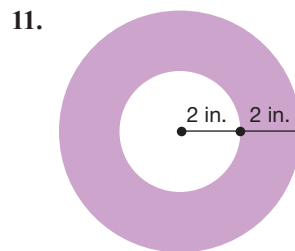
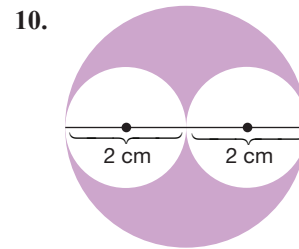
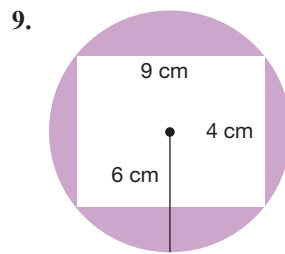
🔑 APPLICATIONS

Round your answer to the nearest tenth, if necessary.

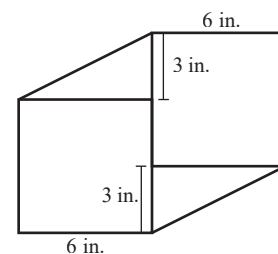
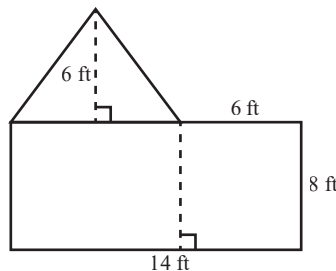
- A rectangular pane of antique glass has dimensions of 25 inches by 48 inches. If glass sells for \$0.50 per square inch, how much will each window cost?
- Carpet Pro sells carpet for \$1.50 per square foot. If you wish to carpet a room that measures 16 feet by 25 feet, how much will the carpet cost?

7. A 25-lb bag of grass seed will cover 1200 square feet. If your lawn is in the shape of a rectangle and measures 205 feet by 145 feet, how many bags of grass seed will you need to cover the lawn?
8. Devon wants to paint an accent wall in his condo. The wall measures 12 feet long and 8 feet high. If a quart of paint covers 100 square feet, will one quart be enough to paint the wall?

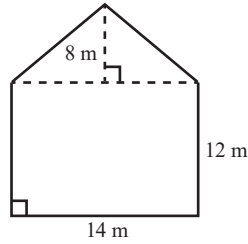
Find the area of the shaded region in each figure. Round your answer to the nearest hundredth, if necessary.



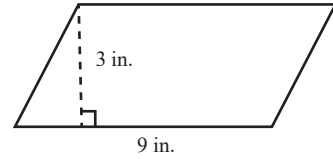
13. A swimming pool is in the shape of the following figure. The homeowner wishes to create a canvas cover for the pool. How many square feet of canvas would be required to make a cover for the pool?
14. A homeowner wants to create a canvas cover for the pool that is the shape of the following figure. How many square feet of canvas would be needed to cover the pool?
15. Gilbert is making a glass art project that requires two squares and two right triangles as shown. If the glass cost \$0.24 per square inch, how much will the glass for the project cost?



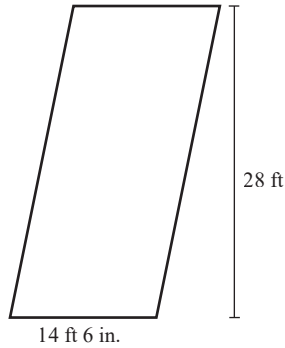
16. Shira needs to buy new siding for one end of her house, which is shown in the following figure. How many square meters of siding will she need?



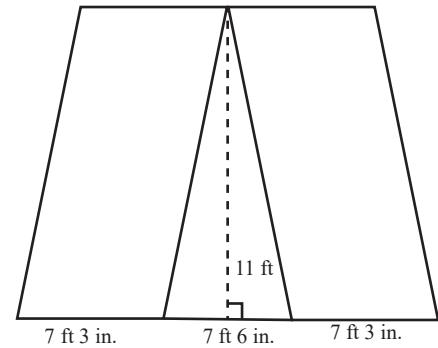
17. Micah is tiling his bathroom with parallelogram-shaped tiles as shown in the following figure. If the bathroom is 8 feet by 9 feet, how many boxes of tiles will he need if each box contains 26 tiles?



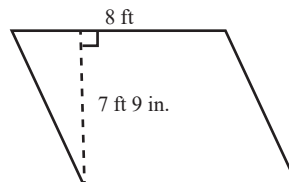
18. Each campsite at Lake Montgomery is in the shape of a parallelogram, as shown in the figure below, and there are 22 camp sites. Every spring, the department of recreation covers all 22 sites with pine straw. If one bail of pine straw will cover about 45 square feet, how many bails of pine straw will it take to cover all 22 sites?



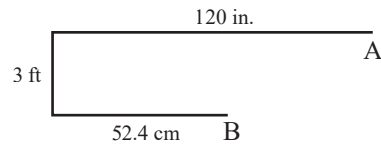
19. Jackson is making a flower bed that will have a triangular portion in the middle and two parallelogram-shaped portions on either side, as shown in the figure. The parallelograms will be filled with shrubs, and each requires a minimum of 4 square feet. The triangle will be filled with flowers and each flower will need a minimum of 0.25 square feet. How many shrubs and how many flowers can Jackson put in the flower bed?



20. The Internal Revenue Service allows qualifying taxpayers to claim a home office on their taxes for any area of their home that they use for business purposes. Taxpayers are allowed to claim \$5 per square foot for business use, with a maximum of 300 square feet. The Hills meet the requirements to deduct their home office space on their taxes. Calculate the amount they are allowed to deduct based on their home measurements.



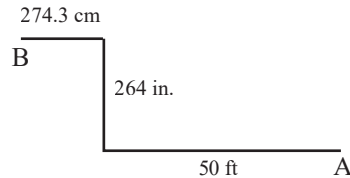
21. Members of a robotics club are tasked with moving their robot from point A to point B. The robot understands the following commands.



- Rotate wheels forward x number of rotations.
- Rotate wheels backward x number of rotations.
- Turn 90° left.
- Turn 90° right.

If the wheels of the robot have a 3-inch radius, determine the sequence of commands that the robot should be given.

22. Members of a robotics club are tasked with moving their robot from point A to point B. The robot understands the following commands.

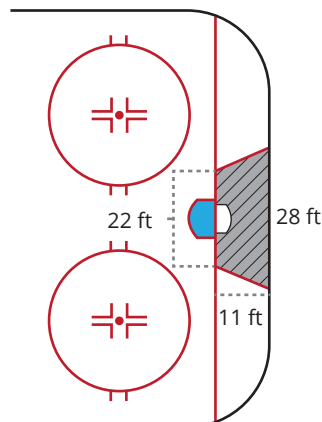


- Rotate wheels forward x number of rotations.
- Rotate wheels backward x number of rotations.
- Turn 90° left.
- Turn 90° right.

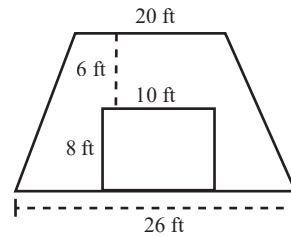
If the wheels of the robot have a diameter of 12 cm, determine the sequence of commands that the robot should be given.

23. Farah rode her bike from point A to point B. If it took her bike’s wheels exactly 8 rotations, and if the distance between the two points is 54.5 feet, what is the radius of Farah’s tires in inches?

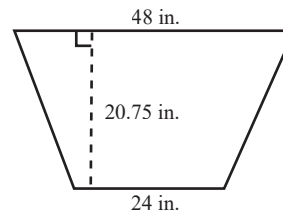
24. In hockey, “the trapezoid” is the trapezoidal area behind the goal, as shown in the following figure, where the goalie is legally allowed to play the puck. What is the area of the trapezoid?



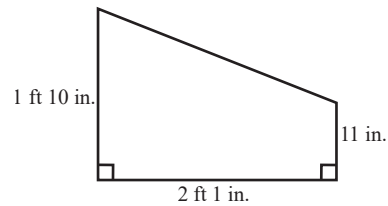
25. Bart built a workshop in the shape of a trapezoid as shown. Find the cost of the siding needed for the front of the shop if the siding cost \$2.65 per square foot. The garage door should not be included.



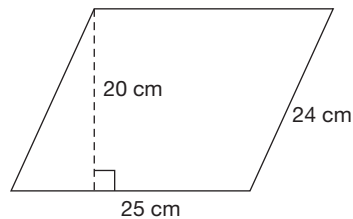
26. Luis is making trapezoidal tables for the preschool at his church. He plans to make 6 of them and will cover each table with laminate. If the laminate cost \$23 per square foot, how much will the laminate for the 6 tables cost?



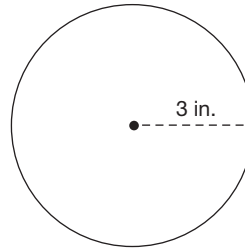
27. The trapezoidal window shown got broken during a storm. Find the cost if the replacement glass costs \$12.97 per square foot.



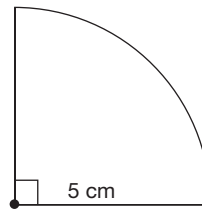
28. Find the perimeter and area of the floor tile represented by the parallelogram.



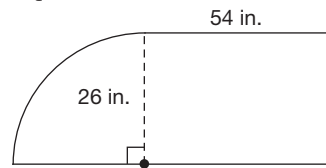
29. The side view of a wheel for a skate is shown. What is the circumference of the wheel? How many square inches of paint are required to paint the wheel?



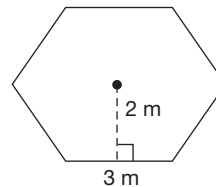
30. A piece of cake has the shape of the following figure. What is the area of the top of the cake slice?



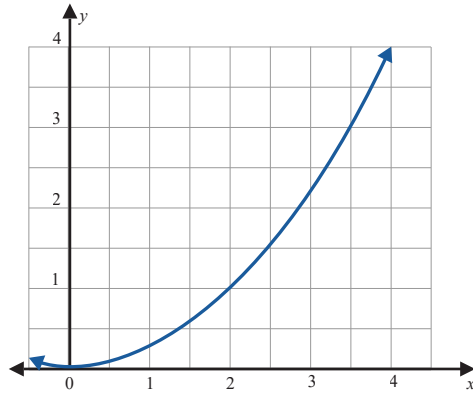
31. A window in the shape of the following figure is needed for a new home. If glass costs \$0.85 per square foot, how much will the window cost?



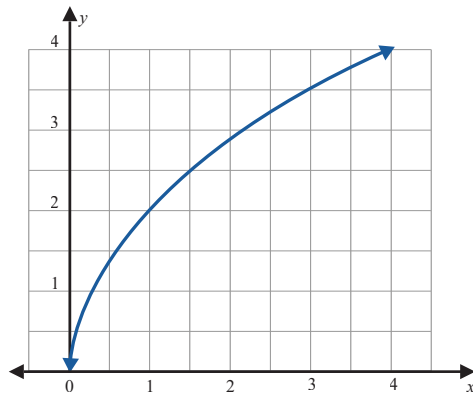
32. A rectangular piece of land has dimensions 1200 ft by 850 ft. Find the amount of fencing needed to construct a fence around the perimeter of this piece of land. Also find the area of the land to be enclosed.
33. A hot tub will have the footprint of a regular polygon, shown in the following figure. If your builder wishes to cover the area under the hot tub with plastic, how many square meters of plastic are needed?



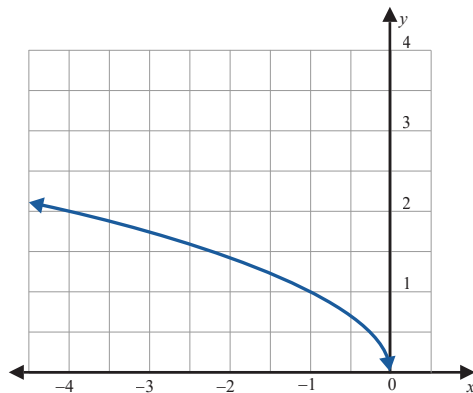
34. The graph of the function $y = \frac{1}{4}x^2$ is shown, where x and y are both measured in centimeters. Approximate the area under the curve between $x = 2$ and $x = 4$.



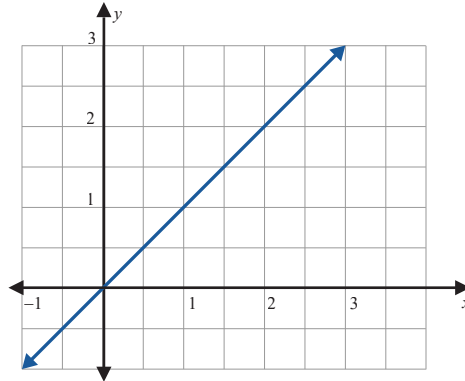
35. The graph of the function $y = 2\sqrt{x}$ is shown, where x and y are both measured in inches. Approximate the area under the curve between $x = 1$ and $x = 4$.



36. The graph of the function $y = \sqrt{-x}$ is shown, where x and y are both measured in centimeters. Approximate the area under the curve between $x = -1$ and $x = -4$.



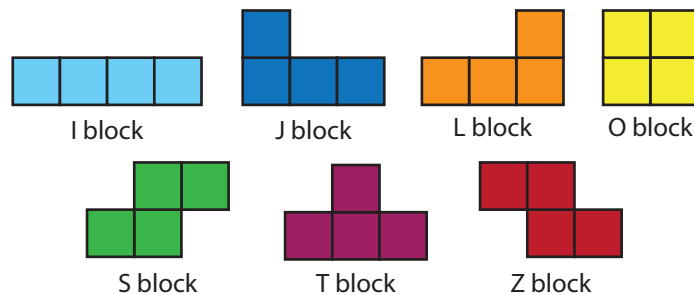
37. The graph of the function $y = x$ is shown, where x and y are both measured in meters. Find the area under the curve between $x = 1$ and $x = 3$.



9.1 PROJECT

TETRIS-ROBOTICS

Have you ever played the game Tetris? Tetris is a tile-matching video game that was created by Alexey Pajitnov in 1984. The game has seven different pieces, called tetriminos.



Suppose a science club is programming a robot to play a modified game of Tetris. In their game, each square that makes up a tetrimino has a side of 10 inches. For example, the O block, which is 2 squares wide by 2 squares tall, would be 20 inches wide and 20 inches tall while the dimensions of the I block would be 40 inches wide by 10 inches tall. The corresponding playfield is 10 squares wide by 16 squares tall. In this project, you will create a sequence of commands for a robot to navigate a specific path to place a tetrimino in the playfield.

The robot's wheels are 3 inches in diameter, and the robot understands the following commands:

- Rotate wheels forward n rotations, where n is a positive real number.
- Rotate wheels backward n rotations, where n is a positive real number.
- Turn 90° left.
- Turn 90° right.