Area and Perimeter
When teaching area and perimeter, students need to understand the difference between the two concepts and use their calculations to solve problems. These are typically multi-step word problems. **It is important to have students follow steps to answer multi-step problems, to achieve the desired result.**

ERRORS: Common errors for students are to not use formulas when calculating area or perimeter, so they confuse the two concepts.

Perimeter is the distance around the outside of a figure. It is helpful to relate perimeter to a fence around a yard, or a frame around a picture. Perimeter has been taught as adding up all of the sides. \( P = S_1 + S_2 + S_3 + S_4 \), Now students evolve to \( P = 2(S_1) + 2(S_2) \). When they start to see the multiplication in the formula, they confuse it with area.

Area is everything inside a figure. It is helpful to relate area with the carpet that covers the floor, or the tiles in your classroom. Students get confused not using all sides of the figure. If you show them that by starting on one side of the room, the tiles go all the way across the room, which gives one value to use in the formula. Then you can show them the adjacent wall and how those tiles go all the way across the room. This way, students relate that they only need a length and width to compute area. All area answers have to have squared units (squares covering a floor) or the answer is incorrect.

Volume and surface area were introduced in 5th grade. 7th grade standards do not contain volume and surface area, but if time allows, it would be a good idea to extend these concepts. 7th graders may see some type of volume with formula provided, or as part of another concept area like distributive, associative or commutative property.
First, students need to find the area of the trapezoid.
\[ A = \frac{1}{2}(B_1 + B_2)h \]
\[ A = \frac{1}{2}(10 + 6)8 \]
\[ A = \frac{1}{2}(16)8 \]
\[ A = (8)8 \]
\[ A = 64 \text{ ft}^2 \]

Next, if each seed packet covers an area of 6 square feet, students need to divide 64 ft\(^2\) by 6. 64 \(\div\) 6 = 10 with a remainder of 4. Students need to infer that they cannot buy part of a package of seeds so they will need 11 packets of seeds to cover the area. If they only buy 10 packages, they will not cover the entire area.
Teacher
Sample:

1. A pest control company was hired to spray the lawn represented by the shaded region shown below.

![Diagram of a lawn with a shaded area]

What was the area in square feet that was sprayed?

- A  19,280 ft²
- B  20,000 ft²
- C  37,680 ft²
- D  17,680 ft²

2. What is the perimeter of the following figure:

![Diagram of a figure with dimensions]
Each tile above measures 30 in by 30 in. What is the perimeter and area in feet of this rectangle? Make a new rectangle with the same perimeter but different area and give the length and width using the same size tiles.
Teacher
Sample Answers:

1. A pest control company was hired to spray the lawn represented by the shaded region shown below.

![Diagram of a lawn with a house, garage, and shaded region]

What was the area in square feet that was sprayed?

- A 19,280 ft²
- B 20,000 ft²
- C 37,680 ft²
- D 17,680 ft²

The answer is D. Students need to find the area of the whole which is 100x200=20,000 ft². Then subtract the area of the house and garage because they do not fertilize them. 20,000-2320=17,680 ft².

2. What is the perimeter of the following figure:

![Diagram of a figure with a circular and rectangular section]
Students need to realize they have a rectangle and two semicircles. If you put the two semicircles together, you have a whole circle. To find the perimeter of the rectangle:

\[ P = S1 + S2 = 8 + 8 = 16 \text{ ft} \]

Perimeter of a circle is the circumference. \( C = 2\pi r \) or \( C = \pi d \), in this case it is number is given as diameter so \( C = 4\pi = 12.56 \) + the perimeter of the rectangle = 28.56 ft. Make sure students do not include the width of the rectangle. It is used for the circumference and is not part of the perimeter.

3.

Each tile above measures 30 in by 30 in. What is the perimeter and area in feet of this rectangle? Make a new rectangle with the same perimeter but different area and give the length and width using the same size tiles.

Perimeter: \( 4(30) + 5(30) + 4(30) + 5(30) = 540 \text{ inches} \) divide by 12 = 45 ft

Or: There are 18 sides at 30 in each = 540/12 = 45 feet

Area: There are four tiles on the length of this rectangle. \( 4 \times 30 = 120 \text{ inches} \) Divide 120 by 12 to convert inches to feet and the length is 10 feet. The width is five tiles. \( 5 \times 30 = 150 \)

\( 150/12 = 12 \text{ feet} \) with 6 inches left which makes 12 \( \frac{1}{2} \) ft\(^2\).

To make a new rectangle with the same perimeter, students know they have 18 sides so they can use this number to find a new perimeter. If \( 2(4) + 2(5) = 18 \) so does \( 2(6) + 2(3) \) So the new area will be \( 6(30) \times 3(30) = 270 \text{ in}/12 = 22\frac{1}{2} \text{ ft}^2 \)
Student Practice

1. A park has a square area of 225 feet, what is the perimeter of the park?

2. The manager of a construction company wants a new, larger sign with dimensions that are three times the length and three times the width of the original sign shown below.

   ![Original Sign]
   
   **ROCKHOUND Construction Company**

   A. How many times greater will the area of the new sign be compared to the area of the original sign? Use words, numbers, or diagrams to justify your answer.

   B. The manager wants to put decorative trim around the new sign. How many times greater will the perimeter of the new sign be compared to the perimeter of the original sign? Use words, numbers, or diagrams to justify your answer.

Student Practice

1. A park has a square area of 225 feet, what is the perimeter of the park?

2. The model below can be used to represent the area of a square with a side length of \( \sqrt{225} \) units.

   ![Model]

   What is another way to represent the side length of this square?

   - A. 125
   - B. 5
   - C. \( \sqrt{125} \)
   - D. \( \sqrt{6} \)
3. Fred wants to carpet his bedroom that measures 12 ft by 15 ft. The carpet costs $25 per square yard. How much will it cost Fred to carpet his bedroom? In the space provided, use words, numbers, or pictures to explain your answer.

4. If dimensions of a triangle are 2 times bigger, how does the area of the triangle change? Use words, numbers, or pictures to explain your answer.

5. Tammy needs to rent an office building. He needs 10,000 square feet of space. If Tammy found a building to rent that is 81 feet by 102 feet, is this building large enough to meet Fred’s building needs?
The manager of a construction company wants a new, larger sign with dimensions that are three times the length and three times the width of the original sign shown below.

A. How many times greater will the area of the new sign be compared to the area of the original sign? Use words, numbers, or diagrams to justify your answer.

B. The manager wants to put decorative trim around the new sign. How many times greater will the perimeter of the new sign be compared to the perimeter of the original sign? Use words, numbers, or diagrams to justify your answer.

A. Students need to find the area of the original sign and then the area of the new sign when they make each dimension 3 times bigger. The new dimensions are 30ft by 12ft, so area is 360ft². Original sign is 4x10=40ft². That means, the area of the new sign is 9 times larger than the original. (3x3=9)

B. Original perimeter is 2(4)+2(10)=28 ft. New sign is p=2(12)+2(30)=84 ft. 84÷28=3 perimeter is 3 times larger because you are not multiplying.

1. A park has a square area of 225 feet, what is the perimeter of the park?

The students need to understand they are doing the square root of 225 which is 15. Each side of a square park is the same so 4(15)=60 feet
Again, students are looking for the square root of 25=5. Answer is B

3. Fred wants to carpet his bedroom that measures 12 ft by 15 ft. The carpet costs $25 per square yard. How much will it cost Fred to carpet his bedroom? In the space provided, use words, numbers, or pictures to explain your answer.

The area of the room is 12x15=180 ft².
The carpet price is in YARDS, 3 ft in 1 yd so 3x3=9 so, 9sq ft =1sq yd
180 ÷ 9 =20 yds²  20 x $25 = $500 to carpet the room
It would be helpful to encourage the students to draw a picture. 3. Fred wants to carpet his bedroom that measures 12 ft by 15 ft. The carpet costs $25 per square yard. How much will it cost Fred to carpet his bedroom? In the space provided, use words, numbers, or pictures to explain your answer.

4. If dimensions of a triangle are 2 times bigger, how does the area of the triangle change? Use words, numbers, or pictures to explain your answer.
   Students may use any figures to compute this answer as long as they double their figures, and recognize this is a triangle and use the correct formula.
   Triangle length is 2 and height is 4 2x4/2=4 area
   New triangle length is 4 and height is 8 4x8/2=16 area
   The area is 4 times larger than the original area. If each side is 2 times larger, 2 x 2 is 4 times as large
5. Tammy needs to rent an office building. He needs 10,000 square feet of space. If Tammy found a building to rent that is 81 feet by 102 feet, is this building large enough to meet Tammy’s building needs?

81 \times 120 = 9,720 \text{ ft}^2 \text{ this figure is not large enough for Tammy’s needs}