

SIXTH GRADE MATHEMATICS

CHAPTER 10

AREA AND PERIMETER

TOPICS COVERED:

- ❖ Perimeter of Polygons
- ❖ Area of Parallelograms
- ❖ Area of Triangles
- ❖ Area of a Trapezoid
- ❖ Area of Irregular Figures

Perimeter	Square	$P = 4s$
	Rectangle	$P = 2l + 2w$

Circumference	Circle	$C = 2\pi r$ or $C = \pi d$
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Area	Square	$A = s^2$
	Rectangle	$A = lw$ or $A = bh$
	Parallelogram	$A = bh$
	Triangle	$A = \frac{bh}{2}$ or $A = \frac{1}{2}bh$
	Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$ or $A = \frac{(b_1 + b_2)h}{2}$
	Circle	$A = \pi r^2$

Volume	Cube	$V = s^3$
	Rectangular prism	$V = Bh$ or $V = lwh$

Pi $\pi \approx 3$

Customary – Length 1 mile = 1760 yards 1 yard = 3 feet 1 foot = 12 inches	Metric – Length 1 kilometer = 1000 meters 1 meter = 100 centimeters 1 centimeter = 10 millimeters
Customary – Volume/Capacity 1 pint = 2 cups 1 cup = 8 fluid ounces 1 quart = 2 pints 1 gallon = 4 quarts	Metric – Volume/Capacity 1 liter = 1000 milliliters
Customary – Mass/Weight 1 ton = 2,000 pounds 1 pound = 16 ounces	Metric – Mass/Weight 1 kilogram = 1000 grams 1 gram = 1000 milligrams
Time	
1 year = 12 months 1 week = 7 days 1 hour = 60 minutes	1 year = 52 weeks 1 day = 24 hours 1 minute = 60 seconds

AREA OF TRIANGLES and QUADRILATERALS

$$A = s^2$$

OR

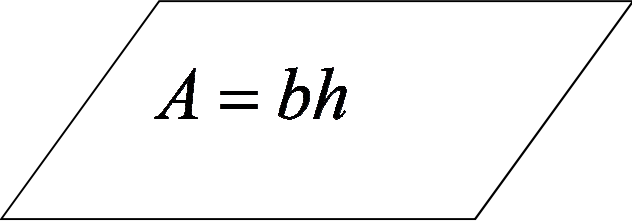
$$A = lw$$

Area of a square

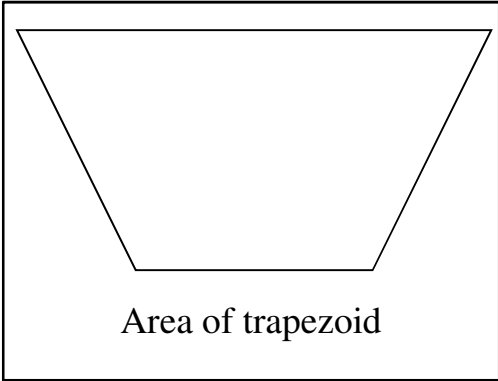
$$A = l \bullet w$$

$$A = b \bullet h$$

Area of a rectangle


$$A = bh$$

Area of a parallelogram

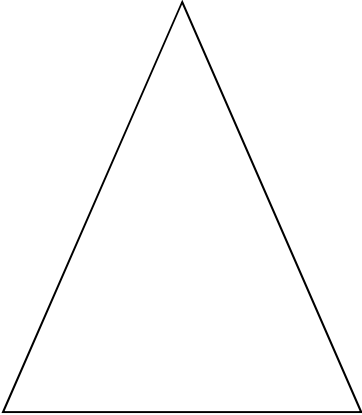


Area of trapezoid

$$A = \frac{1}{2}(b_1 + b_2)h$$

OR

$$A = \frac{(b_1 + b_2)h}{2}$$

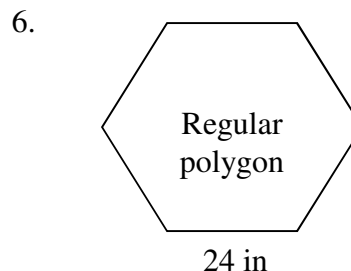
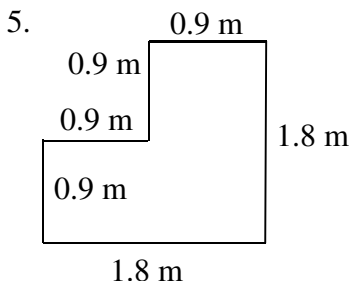
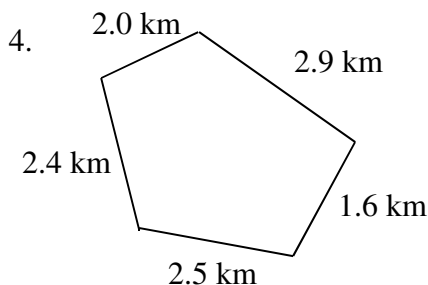
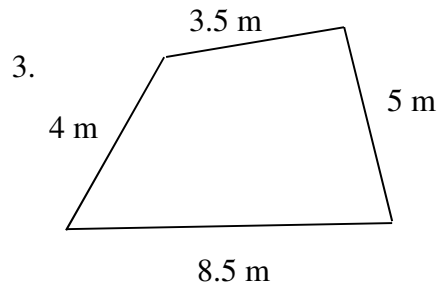
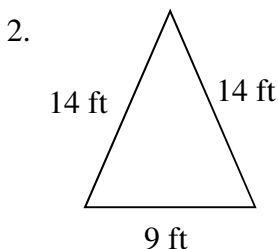
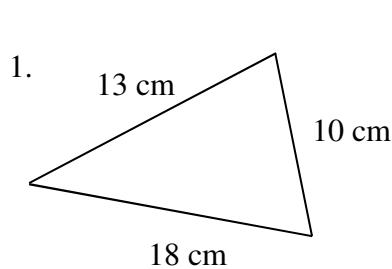


Area of triangle

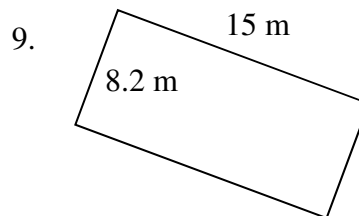
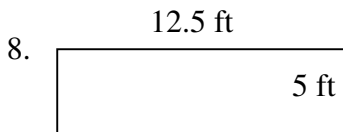
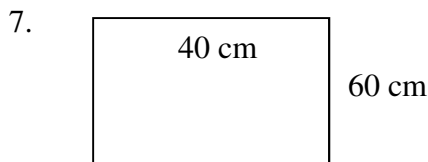
$$A = \frac{1}{2}bh \text{ OR } A = \frac{bh}{2}$$

Perimeter: The distance around the outside of a figure. *Per* means around. *Meter* means measure. Thus, the perimeter of a figure is the measure around it.

Classify each shape by giving the most specific name possible. Then find the perimeter of each figure.



Find the perimeter of each rectangle.



Find the perimeter of each rectangle.

10.	L = 48 mm W = 32 mm		11.	L = 6.2 km W = 4.7 km	
12.	L = 12 in. W = 12 in.				

13.	Find the perimeter of a sheet of typing paper 8.5 in. wide and 11 in. long.	
14.	How many feet of border are needed to go around a square bulletin board that is 4.5 ft. on each side?	
15.	Find the perimeter of your bedroom.	
16.	Find the perimeter of your house.	
17.	Find the perimeter of your backyard.	

Use either the STAAR formula chart to help answer the following problems.

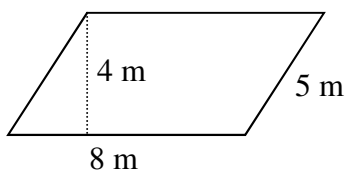
Show all work on separate paper including three steps for each problem: write the correct formula, fill in the numbers for the variables, and then solve the equation.

	Game	Shape	Dimensions	Perimeter	Area
1.	Racquetball	Rectangle	w = ft. l = 40 ft.		A = 800 sq. ft.
2.	NCAA basketball	Rectangle	w = 50 ft. l = 94 ft.		
3.	Ice hockey	Rectangle	w = 85 ft. l = ft.	P = 570 ft.	
4.	Volleyball	Rectangle	w = ft. l = 60 ft.		A = 1800 sq. ft.
5.	Lacrosse	Rectangle	w = 180 ft. l = 330 ft.		
6.	NCAA soccer	Rectangle	w = 225 ft. l = 360 ft.		
7.	Football	Rectangle	w = 160 ft. l = 360 ft.		
8.	Tennis	Rectangle	w = 36 ft. l = 78 ft.		
9.	Baseball infield diamond	Square	s = ft.		A = 8100 sq. ft.

10.	<p>Bloom's Nursery designed a plan for Mrs. Johnsen's flower bed, as shown in the shaded part of the grid below.</p> <div style="text-align: center;"> </div> <p>Each square on the grid represents 5 square feet. What will be the approximate area of the flower bed?</p> <p>A. 100 ft.² B. 80 ft.² C. 20 ft.² D. 16 ft.²</p>	
11.	<p>Mrs. Jones wants to paint a wall but not the door on the wall.</p> <div style="text-align: center;"> </div> <p>How many square feet of wall does Mrs. Jones need to paint?</p>	

Formula for the area of a parallelogram: $A = bh$

Example:



The height is measured straight up from the base. The height of this parallelogram is 4 m.

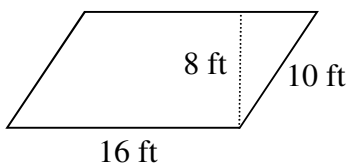
$$A = bh$$

$$A = 8 \cdot 4$$

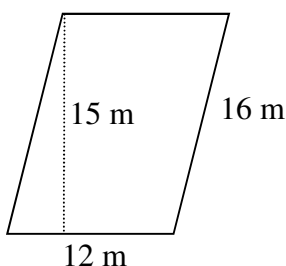
$$A = 32 \text{ m.}^2$$

Find the perimeter and the area of each parallelogram. For the area, show all steps.

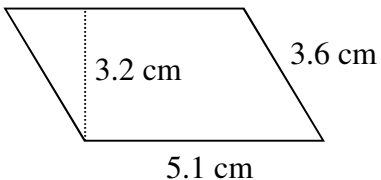
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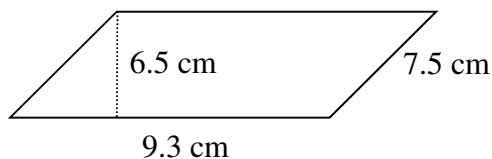
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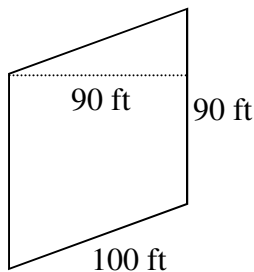
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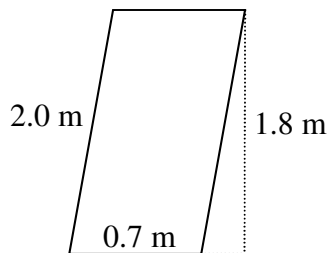
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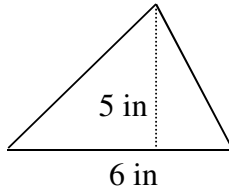
6.



7.	The base of a parallelogram is 10 in. The height is 2 in. more than half the base. Find the area.	
8.	The height of a parallelogram is 4.5 cm. The base is twice the height. What is the area?	
9.	The area of a parallelogram is 60 ft.^2 The height is 5 ft. How long is the base?	
10.	The area of a parallelogram is 275 cm.^2 The base is 25 cm. Find the height.	

Formula for the area of a triangle: $A = \frac{bh}{2}$ or $\frac{1}{2}bh$ (Half of the formula for a parallelogram.)

Example:



The height is measured straight up from the base. The height of this triangle is 5 in.

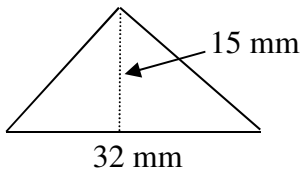
$$A = \frac{bh}{2}$$

$$A = \frac{6 \cdot 5}{2}$$

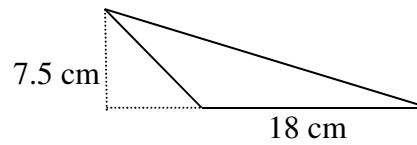
$$A = 15 \text{ in.}^2$$

Find the area of each triangle using the formula above. **Show all steps on a separate sheet of paper.**

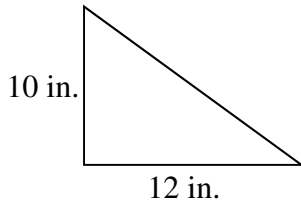
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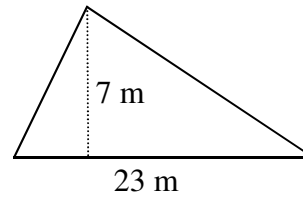
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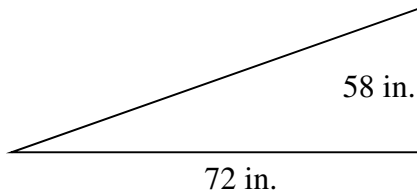
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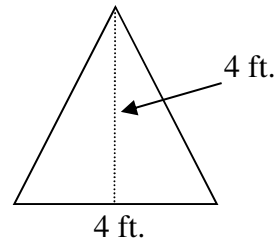
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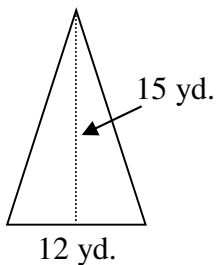
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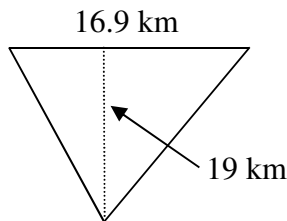
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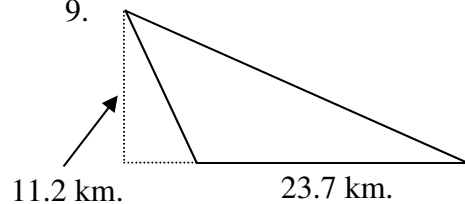
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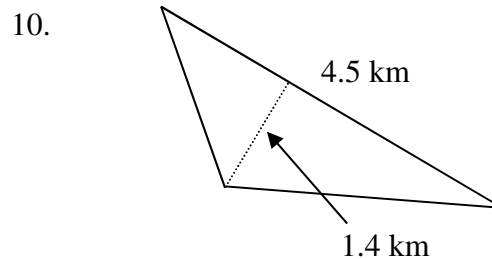
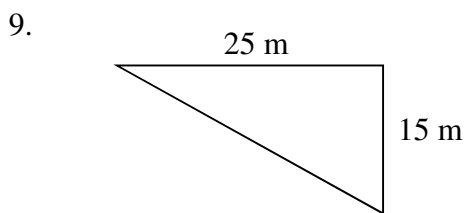
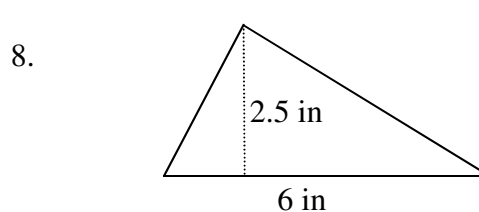
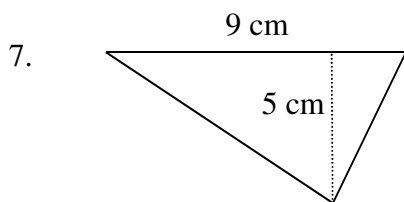
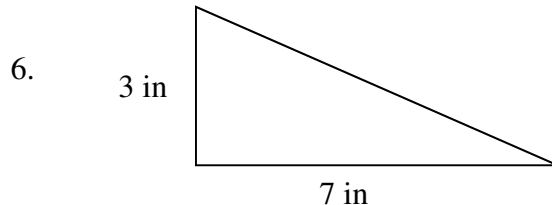
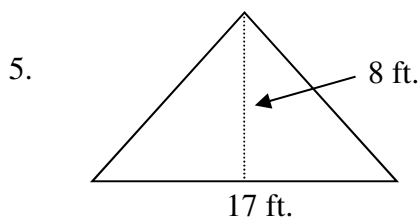
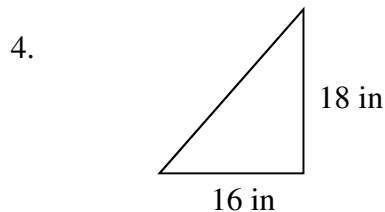
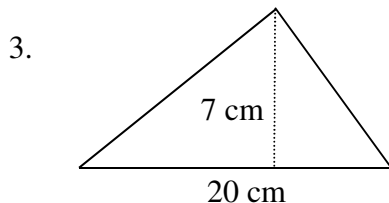
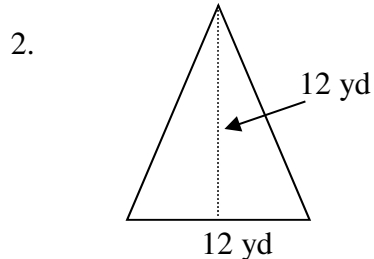
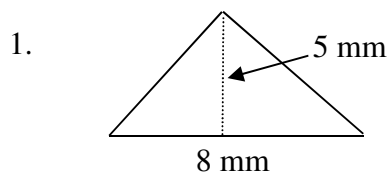
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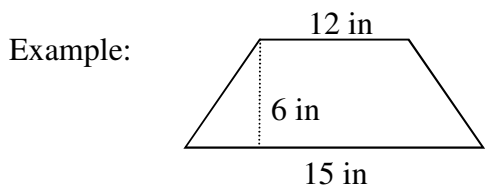
Find the area of each triangle using the appropriate formula. **Show all steps on a separate sheet of paper.**



11.	A triangular sail has a base of 5 m and a height of 10 m. If canvas costs \$18 a square meter, find the cost of canvas to make the sail.	
12.	A square dinner napkin 8 in. on each side is folded along its diagonal. Find the area of the folder napkin.	

A trapezoid is a quadrilateral with only one pair of parallel sides. For determining its area one can start with the formula for a parallelogram: $A = bh$. However with a trapezoid the top and bottom bases are different lengths. Thus, to find the area **average the two bases** and then multiply times the height.

Formula for the area of a trapezoid: $A = \frac{1}{2}(b_1 + b_2)h$ [$\frac{1}{2}(b_1 + b_2)$ is just the average of the two bases.]



$$A = \frac{1}{2}(b_1 + b_2)h$$

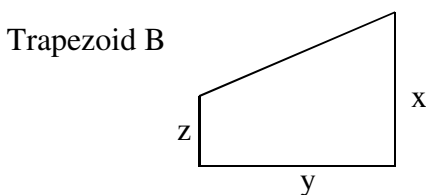
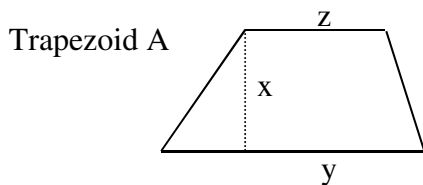
$$A = \frac{1}{2}(12 + 15)6$$

$$A = \frac{1}{2} \cdot (27) \cdot 6$$

$$A = 81 \text{ in.}^2$$

The two bases are always parallel to each other.

Find the area of each trapezoid using the formula above. **Show all steps on a separate sheet of paper.**



Trapezoid A

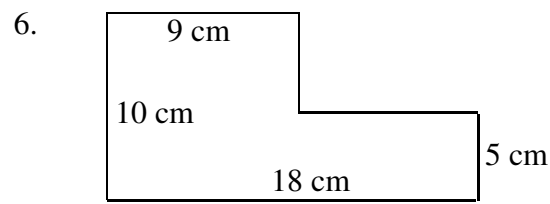
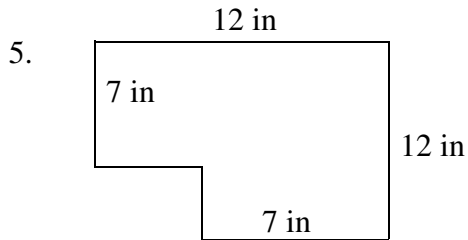
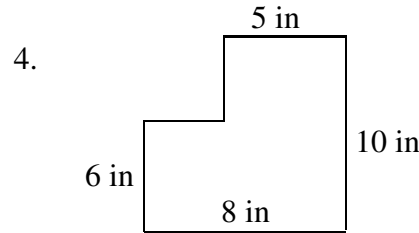
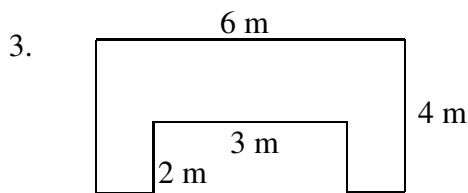
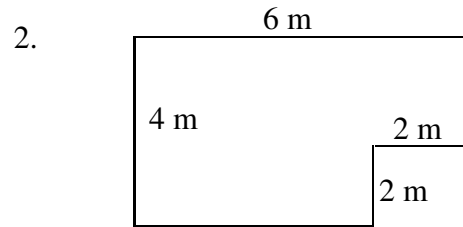
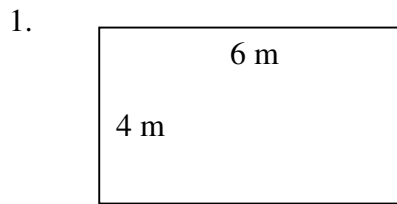
1.	$x=14 \text{ cm}, y=26.5 \text{ cm}, z=12 \text{ cm}$		2.	$x=4 \text{ cm}, y=10 \text{ cm}, z=5 \text{ cm}$	
3.	$x=40 \text{ m}, y=50 \text{ m}, z=20 \text{ m}$		4.	$x=7 \text{ ft}, y=15 \text{ ft}, z=7 \text{ ft}$	

Trapezoid B

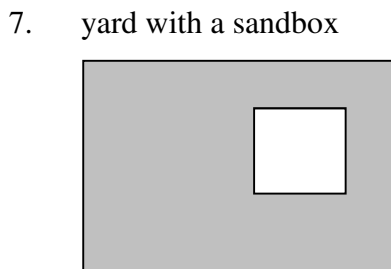
5.	$x=6 \text{ in}, y=16 \text{ in}, z=9 \text{ in}$		6.	$x=41 \text{ cm}, y=78 \text{ cm}, z=22 \text{ cm}$	
7.	$x=2.8 \text{ m}, y=2.5 \text{ m}, z=1.5 \text{ m}$		8.	$x=2\frac{1}{4} \text{ in}, y=12 \text{ in}, z=9\frac{3}{4} \text{ in}$	

9.	Cassie draws the following 4 figures.				
	List the shapes in order of area from greatest to least.				
10.	What happens to the area of a trapezoid if both bases are tripled?				
11.	What happens to the area of a trapezoid if both bases and the height are all divided by 3?				

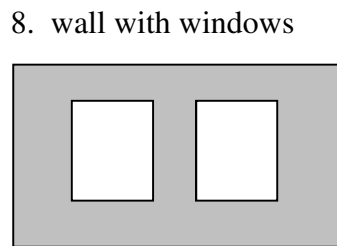
Find the area of each figure.



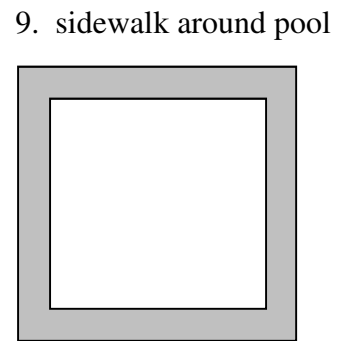
Find the area of the shaded region in each figure.



Yard – 15 ft by 20 ft
Sandbox – 6 ft by 7 ft



Wall – 8 ft by 16 ft
Each window – 5 ft by 4 ft



Sidewalk – 30 ft by 30 ft
Pool – 27 ft by 27 ft

10. A bedroom is 15 ft long and 12 ft wide. How much will it cost to carpet the room if carpeting costs \$22 per square yard? (1 yd = 3 ft)

11. A rose garden in the city park is rectangular and is 9 m wide. If the area of the rectangle is 144 m², what is the length of the garden?

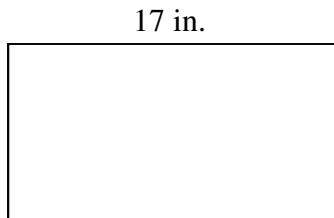
Use **graph paper** for all drawings and all work.

1. Draw a figure whose perimeter is 24 units.
2. Draw a different figure whose perimeter is also 24 units.
3. Draw a figure whose area is 24 square units.
4. Draw a different figure whose area is also 24 square units.
5. Make up a real world word problem in which you need to find the perimeter of any quadrilateral.
6. Make up a real world word problem in which you need to find the area of any quadrilateral.
7. Can two different figures have the same area but different perimeters? Explain your answer.
8. Your dog, Benji, needs a new play area. You are in charge of building a fence around the dog's play area so that he can't run away. You are given 80 feet of fencing to build your play area. Build two different play areas that you think would be suitable for a dog using all of the fencing. For each of your **SCALE** drawings:

- Calculate the perimeter
- Calculate the area
- Explain why/how you chose the shape for each play area

PART 2

9.



The perimeter of the rectangle is 62 in.
Find the length of each side.

10. Amanda bought 40 meters of fencing to make an enclosure for her dog, Sushi. If Amanda expects a rectangular enclosure, what is the largest area it can have? Explain your answer.
11. The width of a rectangle is 4.5 inches and its perimeter is 31 inches. What is the length of the rectangle?

PART 3

12. The club house is a rectangle that is 25 feet by 40 feet in size. The officers voted to put a 6-foot sidewalk all around the building, leaving a 2-foot space for plants between the building and the sidewalk. Give the perimeter of the outer edge of the sidewalk and the area of the sidewalk itself.
13. What is the area of each black and white piece if the whole square measures 20 cm on each side? What percent of the area of the large square is the small shaded square?

