North Penn School District

Elementary Math Parent Letter

Grade 6

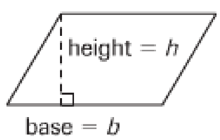
Unit 4 – Chapter 10: Area

<u>Examples for each lesson:</u>

Lesson 10.1

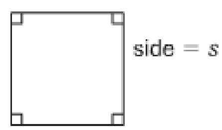
Algebra • Area of Parallelograms

The formula for the area of a parallelogram is the product of the base and height.



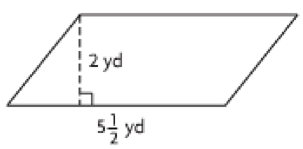
$A = bh$

The formula for the area of a square is the square of one of its sides.



$A = s^2$

Find the area.



Step 1 Identify the figure. The figure is a parallelogram, so use the formula $A = bh$.

Step 2 Substitute $5\frac{1}{2}$ for b and 2 for h. $A = 5\frac{1}{2} \times 2$

Step 3 Multiply. $A = 5\frac{1}{2} \times 2 = \frac{11}{2} \times \frac{2}{1} = 11$

So, the area of the parallelogram is 11 yd^2.

Lesson 10.2

Explore Area of Triangles

You can use grid paper to find a relationship between the areas of triangles and rectangles.

Step 1 On grid paper, draw a rectangle with a base of 8 units and a height of 6 units. Find and record the area of the rectangle.

$A =$ 48 square units

Step 2 Cut out the rectangle.

Step 3 Draw a diagonal from the bottom left corner up to the top right corner.

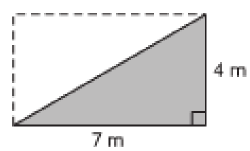
Step 4 Cut the rectangle along the diagonal.

You have made 2 triangles.

- Are the triangles congruent? yes
- How does the area of one triangle compare to the area of the rectangle?

The area of the triangle is half the area of the rectangle.

If l is the length and w is the width, you can use a rectangle to find the area of a triangle.



Find the area of the triangle.

Area of rectangle: $A = lw = 7 \times 4 = 28\ m^2$

Area of triangle: $A = \frac{1}{2} \times$ area of rectangle $= \frac{1}{2} \times 28 = 14\ m^2$

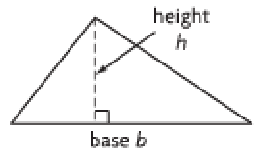
So, the area is 14 square meters.

More information on this strategy is available on Animated Math Model #31.

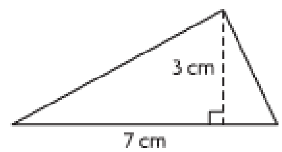
Lesson 10.3

Algebra • Area of Triangles

To find the area of a triangle, use the formula
$A = \frac{1}{2} \times \text{base} \times \text{height}$.



Find the area of the triangle.



Step 1 Write the formula. $A = \frac{1}{2} bh$

Step 2 Rewrite the formula.
Substitute the base and height measurements for *b* and *h*. $A = \frac{1}{2} \times 7 \times 3$

Step 3 Simplify by multiplying. $A = \frac{1}{2} \times 21$

$A = 10.5$

Step 4 Use the appropriate units. $A = 10.5 \text{ cm}^2$

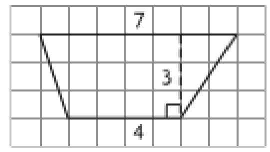
More information on this strategy is available on Animated Math Models #31, 32.

Lesson 10.4

Explore Area of Trapezoids

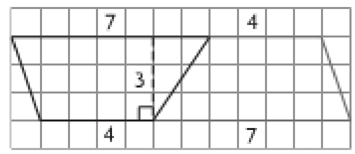
Show the relationship between the areas of trapezoids and parallelograms.

Step 1 On grid paper, draw two copies of the trapezoid. Count the grid squares to make your trapezoid match this one.



Step 2 Cut out the trapezoids.

Step 3 Turn one trapezoid until the two trapezoids form a parallelogram.



Step 4 Find the length of the base of the parallelogram. Add the lengths of one shorter trapezoid base and one longer trapezoid base.

$4 + 7 = 11$ units

Step 5 Find the area of the parallelogram. Use the formula $A = bh$.

$A = 11 \times 3 = 33$ square units

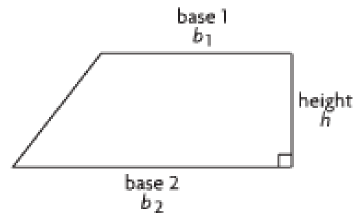
Step 6 The parallelogram is made of two congruent trapezoids. So, divide by 2 to find the area of one trapezoid.

$33 \div 2 = 16.5$ square units

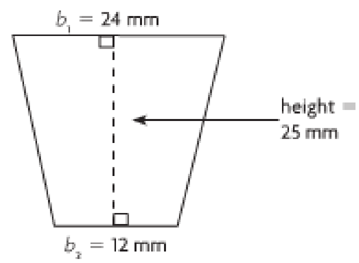
Lesson 10.5

Algebra • Area of Trapezoids

To find the area of a trapezoid, use the formula
Area $= \frac{1}{2} \times (\text{base}_1 + \text{base}_2) \times \text{height}$.



Find the area of the trapezoid.



Step 1 Write the formula to find the area. $A = \frac{1}{2}(b_1 + b_2)h$

Step 2 Replace the variable b_1 with 24, b_2 with 12, and h with 25. $A = \frac{1}{2} \times (24 + 12) \times 25$

Step 3 Use the order of operations to simplify. $A = \frac{1}{2} \times 36 \times 25$

$A = 18 \times 25$

$A = 450$

Step 4 Use the appropriate units. $A = 450\ \text{mm}^2$

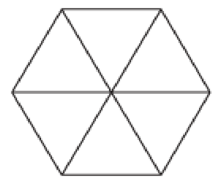
More information on this strategy is available on Animated Math Models #33.

Lesson 10.6

Area of Regular Polygons

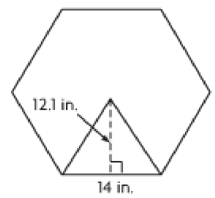
In a regular polygon, all sides have the same length and all angles have the same measure. To find the area of a regular polygon, divide it into triangles.

Step 1 Draw line segments from each vertex to the center of the regular polygon.



Step 2 Examine the figure.

The line segments divide the polygon into congruent triangles. This polygon is a hexagon. A hexagon has 6 sides, so there are 6 triangles.



Step 3 Find the area of one triangle. Use the formula $A = \frac{1}{2}bh$.

The base of the triangle (or one side of the hexagon) is 14 in. The height of the triangle is 12.1 in.

$A = \frac{1}{2} \times 14 \times 12.1 = \frac{1}{2} \times 169.4 = 84.7 \text{ in.}^2$

Step 4 Multiply by 6, because there are 6 triangles.

$84.7 \times 6 = 508.2$

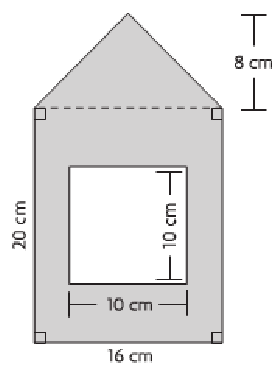
So, the area of the regular hexagon is 508.2 square inches.

Lesson 10.7

Composite Figures

A **composite figure** is made up of two or more simpler figures, such as triangles and quadrilaterals.

The composite figure shows the front view of a bird house. Complete Steps 1–4 to find the area of the shaded region.



Step 1 Find the area of the rectangle.

$A = lw = 16 \times$ ________ $=$ ________ cm²

Step 2 Find the area of the triangle.

$A = \frac{1}{2}bh = \frac{1}{2} \times$ ________ $\times$ ________

$= \frac{1}{\cancel{2}_{1}} \times \frac{\overset{8}{\cancel{16}}}{1} \times$ ________ $=$ ________ cm²

Step 3 Find the area of the square.

$A = s^2 = ($______$)^2$

$=$ ________ cm²

Step 4 Add the areas of the rectangle and triangle. Then subtract the area of the square.

Shaded area = ________ + ________ − ________ = ________ cm²

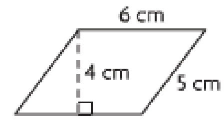
So, the area of the shaded region is ________ cm².

More information on this strategy is available on Animated Math Model #32.

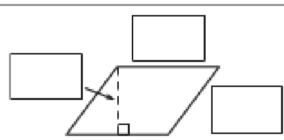
Lesson 10.8

Problem Solving • Changing Dimensions

Amy is sewing a quilt out of fabric pieces shaped like parallelograms. The smallest of the parallelograms is shown at the right. The dimensions of another parallelogram she is using can be found by multiplying the dimensions of the smallest parallelogram by 3. How do the areas of the parallelograms compare?



Read the Problem		
What do I need to find?	**What information do I need to use?**	**How will I use the information?**
I need to find ________ ________ ________ ________ ________.	I need to use ________ ________ ________ ________ ________.	I can draw a sketch of each ________ and calculate the ________. Then I can ________ ________.

Solve the Problem		
Sketch	**Multiplier**	**Area**
	none	$A = 6 \times$ ____ $=$ ____ cm^2
	3	$A =$ ____ $\times$ ____ $=$ ________ cm^2

When the dimensions are multiplied by 3, the area is multiplied by ____.

Lesson 10.9

Figures on the Coordinate Plane

The vertices of a parallelogram are *A*($^{-}2$, 2), *B*($^{-}3$, 5), *C*(4, 5), and *D*(5, 2). Graph the parallelogram and find the length of side *AD*.

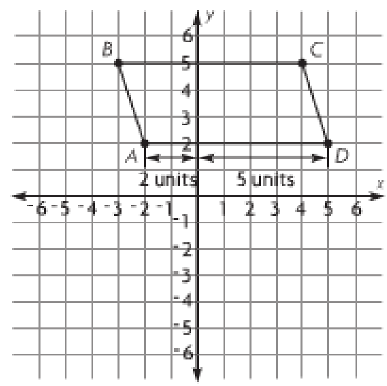
Step 1 Draw the parallelogram on the coordinate plane. Plot the points and then connect the points with straight lines.

Step 2 Find the length of side *AD*.

Horizontal distance of *A* from 0: $|^{-}2| = 2$
Horizontal distance of *D* from 0: $|5| = 5$

Points *A* and *D* are in different quadrants, so add to find the distance from *A* to *D*.
$2 + 5 = 7$ units

So, the length of side *AD* is 7 units.



__Vocabulary__

Area – the number of square units needed to cover an object without any gaps or overlaps

Composite figure – a figure made up of two or more simpler figures, such as triangles and quadrilaterals

Congruent – having the same shape and size

Parallelogram – a quadrilateral whose opposite sides are parallel and congruent

Regular polygon – a polygon in which all sides are congruent and all angles are congruent

Trapezoid – a quadrilateral with exactly one pair of parallel sides

Acute triangle – a triangle that has three acute angles

Obtuse triangle – a triangle that has one obtuse angle

Right triangle – a triangle that has a right angle