UNIT 9  2015-16

ANGLE RELATIONSHIPS, AREA, AND PERIMETER/CIRCUMFERENCE

SURFACE AREA AND VOLUME

CCM6+7+

Name: ____________________

Math Teacher:______________

Projected Test Date:______

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<tr>
<td><strong>area</strong></td>
<td>the amount of space inside a figure</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>area of a circle</td>
<td>the number of square units contained within a circle, the area of a circle can be found using ( A = \pi r^2 ) and the units will be squared</td>
</tr>
<tr>
<td>area of a parallelogram</td>
<td>( A = b \times h )</td>
</tr>
<tr>
<td>area of a rectangle</td>
<td>( A = l \times w )</td>
</tr>
<tr>
<td>area of a trapezoid</td>
<td>( A = \frac{1}{2}(b_1 + b_2)h )</td>
</tr>
<tr>
<td>area of a triangle</td>
<td>( A = \frac{1}{2} \times b \times h )</td>
</tr>
<tr>
<td>center</td>
<td>the point inside a circle that is the same distance from all points on the circle</td>
</tr>
<tr>
<td>chord</td>
<td>a line segment with both endpoints on the circle</td>
</tr>
<tr>
<td>circle</td>
<td>the set of all points in a plane that are the same distance from a given point called the center</td>
</tr>
<tr>
<td>circumference</td>
<td>the distance around a circle; circumference can be found using the following formulas ( C = \pi d ) if given the diameter or ( C = 2\pi r ) if given the radius</td>
</tr>
<tr>
<td>cone</td>
<td>a pyramid with a circular cross section</td>
</tr>
<tr>
<td>cross-section</td>
<td>the two-dimensional face that is the result of a three-dimensional shape being intersected by a plane.</td>
</tr>
<tr>
<td>cylinder</td>
<td>a 3-D figure with two circular ends</td>
</tr>
<tr>
<td>diameter</td>
<td>a line segment that passes through the center of a circle and has endpoints on the circle, or the length of that segment</td>
</tr>
<tr>
<td>edge</td>
<td>the line segment along which two faces of a polyhedron intersect</td>
</tr>
<tr>
<td>face</td>
<td>a flat surface of a polyhedron (a 3D figure)</td>
</tr>
<tr>
<td>hypotenuse</td>
<td>the longest side of a right triangle</td>
</tr>
<tr>
<td>net</td>
<td>an arrangement of two-dimensional figures that can be folded to form a polyhedron (3-D figure); what you get if you “unfold” a shape</td>
</tr>
<tr>
<td>parallelogram</td>
<td>a four sided figure with opposite sides that are equal and parallel</td>
</tr>
<tr>
<td>perimeter</td>
<td>the measure around an object</td>
</tr>
<tr>
<td>pi</td>
<td>the ratio of the circumference of a circle to the length of its diameter; ( \pi \approx 3.14 ) or ( \frac{22}{7} )</td>
</tr>
<tr>
<td>polygon</td>
<td>a closed plane figure formed by 3 or more line segments that intersect only at their endpoints.</td>
</tr>
<tr>
<td>polyhedron</td>
<td>three-dimensional figure whose surfaces, or faces, are all polygons</td>
</tr>
<tr>
<td>prism</td>
<td>a three dimensional figure with two parallel bases that are congruent polygons, and lateral faces that are parallelograms. A prism is named for the shape of its base.</td>
</tr>
<tr>
<td>pyramid</td>
<td>a polyhedron that has a polygon base and triangular lateral faces</td>
</tr>
<tr>
<td>radius</td>
<td>a line segment with one endpoint at the center of a circle and the other endpoint on the circle, or the length of that segment</td>
</tr>
<tr>
<td>rectangle</td>
<td>a parallelogram with four right angles</td>
</tr>
<tr>
<td>rectangular prism</td>
<td>3D figure where 6 faces are rectangles</td>
</tr>
<tr>
<td>regular polygon</td>
<td>a figure that has all equivalent sides and angles.</td>
</tr>
<tr>
<td>rhombus</td>
<td>a parallelogram with four congruent sides</td>
</tr>
<tr>
<td>sphere</td>
<td>a perfectly round 3-D figure</td>
</tr>
<tr>
<td>square</td>
<td>a parallelogram with four right angles and four congruent sides</td>
</tr>
<tr>
<td>surface area</td>
<td>the sum of the area of the faces of a 3D figure</td>
</tr>
<tr>
<td>trapezoid</td>
<td>a quadrilateral with exactly one pair of parallel sides</td>
</tr>
<tr>
<td>triangle</td>
<td>a 3-sided polygon</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>triangular prism</td>
<td>a prism with bases that are triangles.</td>
</tr>
<tr>
<td>vertices</td>
<td>a point where three or more edges intersect; the “corners”</td>
</tr>
<tr>
<td>volume</td>
<td>the number of cubic units needed to fill a given space</td>
</tr>
</tbody>
</table>

**Perimeter and Area**

**WARMUP:** Answer the two questions and fill in the chart below. *Complete this page and the next two.*

Mr. Bill’s backyard is in the shape of a rectangle. It took him 600 feet of fence to enclose his back yard. If the length of the yard is twice as long as the width, what are the dimensions of Mr. Bill’s yard?

The Brown family has a square back yard with an area of 25 meters squared. They need to put a fence around it for their dog. How long will the fence be?

Fill in anything you know:

<table>
<thead>
<tr>
<th>SHAPE</th>
<th>How to find perimeter</th>
<th>How to find area</th>
</tr>
</thead>
<tbody>
<tr>
<td>square</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rectangle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>triangle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>parallelogram</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Identify the Type For Each Regular Polygon.

1) Type: 

2) Type: 

3) Type: 

4) Type: 

5) Type: 

6) Type: 

7) Type: 

8) Type: 

9) Type: 

10) Type: 

11) Type: 

12) Type: 

Math-Aids.Com
PERIMETER REVIEW

<table>
<thead>
<tr>
<th></th>
<th>What is it?</th>
<th>How do I calculate it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERIMETER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AREA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Find the Perimeter of each shape below.

Find the length of the missing side if given the Perimeter of the whole shape.

If the perimeter of a regular hexagon is 30cm, what is the length of one side?

What is the length of side B? ____________
Explain how you found the length of side B.
________________________________________
________________________________________

What is the length of side A? ____________
Explain how you found the length of side A.
________________________________________
________________________________________

What is the perimeter of the shape? _________
Perimeter

Finding The Length Of An Unknown Side

Perimeter is found by adding the distance of all sides of a shape. With a rectangle, the following formula can be used to find the perimeter.

\[ P = 2l + 2w \]

or

\[ P = 2l + 2w \]

If only two sides of the rectangle are given and they are the length and the width, we can use the formula stated above.

Sometimes the perimeter of a rectangle will be given and you will have to find the length of one of the missing sides.

For example, what is the width of a rectangle that has a length of 20 cm and a perimeter of 56 cm?

Because the values of the perimeter and the length were given, we substitute these known values in for the “P” and the “L” of the equation \( P = 2L + 2W \) and solve for “W” because that is what we are looking for.

\[
\begin{align*}
56 &= 2(20) + 2w \\
56 &= 40 + 2w \\
16 &= 2w \\
\frac{16}{2} &= \frac{2w}{2} \\
w &= 8 \text{ cm}
\end{align*}
\]

Directions: For each rectangle, write the perimeter equation. Substitute the given variables and solve for the unknown side.

1) \[
\begin{align*}
P &= 16 \text{ in.} \\
3.5 \text{ in.}
\end{align*}
\]

2) \[
\begin{align*}
P &= 3.6 \text{ cm} \\
1.6 \text{ cm}
\end{align*}
\]

3) \[
\begin{align*}
P &= 128 \text{ ft.} \\
30 \text{ ft.}
\end{align*}
\]

4) \[
\begin{align*}
P &= 19 \text{ in.} \\
6.5 \text{ in.}
\end{align*}
\]

5) \[
\begin{align*}
P &= 218 \text{ ft.} \\
24 \text{ ft.}
\end{align*}
\]

6) \[
\begin{align*}
P &= 61.2 \text{ cm} \\
20.4 \text{ cm}
\end{align*}
\]

7) \[
\begin{align*}
P &= 140 \text{ in.} \\
14 \text{ in.}
\end{align*}
\]

8) \[
\begin{align*}
P &= 18.4 \text{ ft.} \\
2.3 \text{ in.}
\end{align*}
\]

9) \[
\begin{align*}
P &= 23 \text{ ft.} \\
4.5 \text{ ft.}
\end{align*}
\]

ID# 0102
Formulas of 2D shapes

Area of a square or rectangle: \( A = \) ______________________

On your calculator, hit APPS and AreaForm.
Choose 1: DEFINITIONS & FORMULAS
For each shape (Parallelogram, Triangle, Trapezoid) hit WINDOW to see the AREA formula and keep hitting GRAPH to see WHY?
Record what you learned:

PARALLELOGRAM:

TRIANGLE:

TRAPEZOID:
Area and Perimeter of Triangles, Parallelograms and Trapezoids - Independent Practice Worksheet

Complete all the problems.

1. Find the area and perimeter of parallelogram.

![Parallelogram Diagram]

2. Find the area and perimeter of trapezium.

![Trapezium Diagram]

3. Find the area and perimeter of triangle.

![Triangle Diagram]

4. Find the area and perimeter of parallelogram.

![Parallelogram Diagram]

Tons of Free Math Worksheets at: © www.mathworksheetsland.com
5. Find the area and perimeter of trapezium.

6. Find the area and perimeter of triangle.

7. Find the area and perimeter of parallelogram.

8. Find the area and perimeter of trapezium.
9. Find the area and perimeter of triangle.

10. Find the area and perimeter of parallelogram.
Why Was Igor Unhappy About His Spelling Test Even Though He Got Everything Right?

Give both the perimeter and area of each figure. Find the correct unit of measure for each answer you choose, then circle the number-letter next to it. Write the letter in the matching numbered box at the bottom of the page.

- 1. Square with sides of 10 cm.
- 2. Rectangle with sides of 13 cm and 10 cm.
- 3. Triangle with sides of 11 m and 9 m.
- 4. Triangle with sides of 6 in and 8 in.
- 5. Triangle with sides of 20 cm and 16 cm.
- 6. Triangle with sides of 30 ft and 50 ft.
- 7. Triangle with sides of 8 in and 5 cm.
- 8. Triangle with sides of 4.7 m and 2.8 m.
- 9. Triangle with sides of 9 in and 7 in.
- 10. Right triangle with sides of 8 m, 15 m, and 17 m.
- 11. Square with sides measuring 12 in.
- 12. Right triangle with sides of 14 in.

Perimeters

| 100 | 94 | 40 | 74 | 34 | 48 | 166 | 49 | 80 |
| 0.1 | 4-M | 144 | 203 | 25-A | 25-F | 78 | 5-A | 7-H |
| 51 | 32-8 | 19-D | 28-D | 5-1 | 1,500 | 2-E | 20-A | 7-A |
| 9.4 | 40 | 3,26 | 130 | 50 | 1,500 | 2-E | 20-A | 7-A |
| 4.6 | 12-L | 17-E | 18-S | 67 | 24 | 38 | 10-1 | 95 |
| 6 | 34 | 21 | 130 | 10-1 | 95 | 24 | 38 | 10-1 |
| 64 | 30-0 | 29-R | 136 | 130 | 28-D | 5-1 | 1,500 | 2-E |

Areas

| 58 | 34 | 24 | 300 | 60 | 21 | 21-S | 24 | 25-W | 100 |
| 13-L | 17-E | 18-S | 67 | 10-1 | 95 | 24 | 38 | 10-1 | 95 |
| 24-A | 24-A | 24-A | 24-A | 24-A | 24-A | 24-A | 24-A | 24-A | 24-A |
| 24-A | 24-A | 24-A | 24-A | 24-A | 24-A | 24-A | 24-A | 24-A | 24-A |
Area of Composite Shapes

WARMUP:

What do we do if the shapes are MIXED? Mixed shapes are called “COMPOSITE” shapes. To find the area you have to ____________________________ ____________________________ ____________________________.

Find the area of the irregular polygon below. Measurements have been provided for you this time.

Find the area of the polygon.

Practice…DRAW IT!

1. Find the area of a right triangle with a base length of three units, a height of four units, and a hypotenuse of 5.
   HINT: the hypotenuse is always the biggest side and isn’t part of the right angle.
2. Find the area of the trapezoid shown below.

![Trapezoid Diagram]

3. A rectangle measures 3 inches by 4 inches. If the lengths of each side double, what is the effect on the area?

4. The lengths of the sides of a bulletin board are 4 feet by 3 feet. How many index cards measuring 4 inches by 6 inches would be needed to cover the board?

5. The sixth grade class at Hernandez School is building a giant wooden H for their school. The “H” will be 10 feet tall and 10 feet wide and the thickness of the block letter will be 2.5 feet.
   1. How large will the H be if measured in square feet?
   2. The truck that will be used to bring the wood from the lumberyard to the school can only hold a piece of wood that is 60 inches by 60 inches. What pieces of wood (how many and which dimensions) will need to be bought to complete the project?

![Diagram]

6. A border that is 2 ft wide surrounds a rectangular flowerbed 3 ft by 4 ft. What is the area of the border?
# Decomposing Polygons to Find Area

Directions: Decompose each polygon into rectangles and triangles to find the area.

1. Section the shape into rectangles and/or triangles.
2. Find the area of each rectangle and triangle.
3. Find the total area of the polygon.

<table>
<thead>
<tr>
<th>1.</th>
<th>Work Space</th>
<th>2.</th>
<th>Work Space</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Polygon 1" /></td>
<td>Total Area=</td>
<td><img src="image2.png" alt="Polygon 2" /></td>
<td>Total Area=</td>
</tr>
<tr>
<td>Section into rectangles or triangles.</td>
<td></td>
<td>Section into rectangles or triangles.</td>
<td></td>
</tr>
</tbody>
</table>

|----|------------|----|-
| ![Polygon 3](image3.png) | Total Area= | ![Polygon 4](image4.png) | |
| Section into rectangles or rectangles | | | |

5. Create your own polygon. You will need to be able to divide your polygon into at least 3 triangles and/or rectangles. Solve.

<table>
<thead>
<tr>
<th>5.</th>
<th>Work Space</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5.png" alt="Polygon 5" /></td>
<td>Total Area=</td>
</tr>
</tbody>
</table>

(Still Homework Day 3)
Area Of Combined Shapes

Directions: Find the area of each of the figures shown. For each problem, find the area of each shape separately and add the area of each shape together.

1) 

2) 

3) 

4) 

5) 

12 in. 

8 in. 

16 in. 

4 in. 

3 in. 

5 in. 

20 in. 

10 in. 

1.5 in. 

8 in. 

20 in.
Area Formulas and Parts of Equations/Expressions

Find the area of each polygon.

1. For the first polygon:
   - Base: 17 cm
   - Height: 6 cm
   - Area = \frac{1}{2} \times 17 \times 6 = 51 \text{ cm}^2

2. For the second polygon:
   - Base: 15 in
   - Height: 8 in
   - Area = \frac{1}{2} \times 15 \times 8 = 60 \text{ in}^2

3. For the third polygon:
   - Base: 12 cm
   - Height: 9 cm
   - Area = \frac{1}{2} \times 12 \times 9 = 54 \text{ cm}^2

1 Grade Math Day 95
Circles
Name: ____________________________

**Stringing it all Together Student Worksheet**

1. Label the following on your circle:
   a. Center point A
   b. Radius $\overline{AB}$
   c. Diameter $\overline{CD}$
   d. Chord $\overline{EF}$

2. Using your ruler, measure and record each of the following to the nearest cm.
   Radius $\overline{AB} = ____$ cm
   Diameter $\overline{CD} = ____$ cm

3. Examine the lengths of the radius and diameter. Write two relationships that you see.
   
   Relationship 1:
   ____________________________________________________________
   ____________________________________________________________
   
   Relationship 2:
   ____________________________________________________________
   ____________________________________________________________
THE BASICS of CIRCLES

Circumference = The distance ______________ a circle.

Formula: \( C = \pi \cdot r \)

Area = The space ______________ a circle.

- Use a TI-73 and go to APPS and choose AreaForm.
- Press any key twice to get to the main menu.
- Choose 1: Definitions and Formulas
- Choose 6: Circle
- When it finishes defining a circle, hit the WINDOW key for “AREA”.
- Hit GRAPH for “Why?”.
- Keep hitting GRAPH for “Why?” to see the reason for the formula.
- What shape did they make out of a circle? _______________________
- What is the area formula of that shape? _______________________
- Draw your discovery here. Label the dimensions!

\[
A = \text{Length} \cdot \text{Width} \cdot \text{Height}
\]

Now, practice!
<table>
<thead>
<tr>
<th>CIRCLE</th>
<th>Radius</th>
<th>Diameter</th>
<th>Circumference</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Circle 1" /></td>
<td>8&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image2.png" alt="Circle 2" /></td>
<td>2 in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image3.png" alt="Circle 3" /></td>
<td>12 in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image4.png" alt="Circle 4" /></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. The seventh grade class is building a mini-golf game for the school carnival. The end of the putting green will be a circle. If the circle is 10 feet in diameter, how many square feet of grass carpet will they need to buy to cover the circle? How might someone communicate this information to the salesperson to make sure he receives a piece of carpet that is the correct size? Use 3.14 for pi.

2. If a circle is cut from a square piece of plywood, how much plywood would be left over?

3. What is the perimeter of the inside of the track?
Problem Solving

Remember $\pi \approx 3.14$ or $\pi \approx \frac{22}{7}$

1. A coffee cup has a diameter of $3 \frac{1}{2}$ inches. What is its circumference?

2. A circle has a diameter of $4 \frac{3}{10}$ inches. What is the circumference? Round your answer to the nearest tenth.

3. What is the area of the circle if its radius is 2 cm?

4. What is the area of a circle that has a diameter of 6 cm?

5. If the area of a circle is 200.96 m$^2$, then what is its diameter?
Notes – 2D Irregular Figures

Find the area of the shaded region of each of the following figures.

1. A square with side length 8 in. minus a square with side length 4 in.

2. A rectangle with length 13 m and width 7 m, with a semicircle cut out from one of the sides with radius 5 m.

3. A triangle with base 3 in., height 9 in., and a semicircle cut out from one of the sides with diameter 4 in.
## Shape within a Shape (with Circles)

**SET UP YOUR WORK HERE...**But use a CALCULATOR to solve! Answer choices are on p. 41.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1)</strong></td>
<td>Jason and his brother purchased a round rug to lay in their living room. The living room is 13 ft x 11 ft, and the rug is 4 feet in diameter. What is the area of the room <strong>NOT</strong> covered by the rug?</td>
</tr>
<tr>
<td><strong>2)</strong></td>
<td>What is the area of the shaded region if the length of this square is 2.2 cm?</td>
</tr>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td><strong>3)</strong></td>
<td>The room for the wedding is 30 ft by 32 ft. There are 5 round tables for guests. Each table has a diameter of 6 ft. What is the area of room that is available for dancing and walking?</td>
</tr>
<tr>
<td><strong>4)</strong></td>
<td>What is the area of the shaded region if the radius of this circle is 3.4 in?</td>
</tr>
<tr>
<td><img src="image2.png" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td><strong>5)</strong></td>
<td>Rachel put her coffee table on top of a circular rug. The circular rug has a</td>
</tr>
<tr>
<td><strong>6)</strong></td>
<td></td>
</tr>
</tbody>
</table>
diameter of 4 feet. The round coffee table has a diameter of 3 feet. How much of the rug is NOT covered by the coffee table?

<p>| 7) | The triangle’s base is 2.5 cm and is equal to the radius of the circle. What is the area of the shaded region? |
| A circular table with a diameter of 4 feet has four circular place mats on it, each with a diameter of 6 inches. What is the area of the table in inches, NOT covered with place mats? |
| 8) | What is the area of the shaded region if the radius of the circle is 10.4 ft? |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9)</td>
<td>Calculate the area of the shaded section in the picture below:</td>
</tr>
<tr>
<td></td>
<td>15 cm</td>
</tr>
<tr>
<td></td>
<td>9 cm</td>
</tr>
<tr>
<td></td>
<td>4 cm</td>
</tr>
<tr>
<td>10)</td>
<td>Mary’s father put a garden in their backyard that had an area of 5 ft. by 9 ft. He put a sidewalk around the garden that had an area of 7 ft. by 12 ft. What is the area of the sidewalk around the garden?</td>
</tr>
<tr>
<td></td>
<td>12 yd</td>
</tr>
<tr>
<td></td>
<td>The dimensions of the inner polygon are 3 yd. by 9 yd.</td>
</tr>
<tr>
<td>11)</td>
<td>Calculate the area of the shaded section in the picture below:</td>
</tr>
<tr>
<td></td>
<td>12 yd</td>
</tr>
<tr>
<td></td>
<td>18 yd.</td>
</tr>
<tr>
<td>12)</td>
<td>The area of a local school is 3,844 sq. meters. When they built the school they put a sidewalk around the school. The dimensions of the rectangle formed by the outer edge of the sidewalk are 72 meters by 70 meters. What is the area of the space between the school and sidewalk?</td>
</tr>
</tbody>
</table>
13) Calculate the area of the shaded section in the picture below:

The dimensions of the inner polygon are 8cm by 5 cm

14) Bob built his very own lemonade stand in front of his house. His lemonade stand was 8 feet by 12 feet. He decided that he needed to make it look nicer by planting flowers all the way around the stand. The area of the rectangle formed around the planted flowers was 130 sq. feet. How much space was there between his lemonade stand and the flowers?

15) Calculate the area of the shaded section in the picture below:

The dimensions of the inner polygon are 3ft by 6 ft

16) Regulation NCAA basketball courts have dimensions of 50 feet by 94 feet. There are chairs around the entire court that make up an area of 56 feet by 100 feet. How much space is there just for the chairs?

ANSWERS for SHAPE WITHIN A SHAPE:

<table>
<thead>
<tr>
<th>900 sq ft</th>
<th>34 sq ft</th>
<th>92 sq cm</th>
<th>189 sq yd</th>
</tr>
</thead>
<tbody>
<tr>
<td>39 sq ft</td>
<td>162 sq. ft</td>
<td>1196 sq. m</td>
<td>5.495 sq. ft</td>
</tr>
<tr>
<td>216.32 sq ft</td>
<td>1695.6 sq in</td>
<td>818.7 sq. ft</td>
<td>9.9416 sq in</td>
</tr>
<tr>
<td>3.7994 sq. cm</td>
<td>130.44 sq. ft</td>
<td>16.5 sq. cm</td>
<td>99 sq cm</td>
</tr>
</tbody>
</table>
Graph figure PQRS: P(-4, 3), Q(10, 3), R(10, -3), S(-4, -3).

Determine the area and perimeter of the figure.

Give the coordinates of a figure that has a perimeter half that of figure PQRS.

Give the coordinates of a triangle that has an area half that of figure PQRS.

Graph rectangle MNOP:
M(4, -3), N(10, -3), O(4, -7), P(10, -7).

Determine the perimeter and area of the figure. Give the coordinates for rectangleQRST that has the same area, but a different perimeter.

Graph triangle ABC: A(4,9), B(1,3), C(8,3).
Determine the area of the triangle. Give the coordinates for a triangle DEF that has an area twice that of triangle ABC.
FINDING AREA USING THE COORDINATE PLANE

Directions: Read each of the following problems and use the Cartesian coordinate plane on the next page to answer each of the following questions.

1) Plot the following ordered pairs. What is the area of the resulting shape?
   (3,3) (8,3) (8,7)

2) Plot the following ordered pairs and connect the points in the order listed below. Calculate the area of the resulting quadrilateral.
   (-8,-2) (2,-2) (4,-5) (-6,-5)

3) Plot the following ordered pairs and connect the points in the order given. Calculate the area of the resulting polygon.
   (-13,2) (-13,7) (-10,11) (-6,7) (-6,2)

4) Plot the following ordered pairs and find the area of the resulting triangle.
   (0,10) (4,14) (8,10)

5) Plot the following ordered pairs and connect the points in the order given. Calculate the area of the resulting polygon.
   (-5,-18) (-5,-12) (-2,-12) (-2,-9) (4,-9) (4,-18)

6) Plot the following ordered pairs and connect the points in the order given. Calculate the area of the resulting polygon.
   (6,-7) (8,-5) (10,-7) (12,-5) (14,-7) (10,-15)

7) Plot the following ordered pairs and connect the points in the order given. Calculate the area of the resulting polygon.
   (-12,13) (-12,18) (-4,18) (-4,13) (-8,16)

8) Plot the following ordered pairs and find the area of the resulting shape.
   (-14,-8) (-4,-8) (-14,-18)
On the graph below, graph point A(-2, 3) as the center of a circle with a radius of 4. Find the area and circumference of the circle.
### 3D Geometry Introduction

<table>
<thead>
<tr>
<th>Name</th>
<th># Vertices</th>
<th># Edges</th>
<th># Faces</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

**Draw the net for the shape.**

- 5 cm
- 13 cm
- 23 mm
- 23 mm
- 15 yd
- 11 yd
- 11 yd
- 9 in
- 6 in
- 8 m
- 6 m
- 8 in
- 8 in
- 33 cm
- 5 cm
- 65 cm
- 75 cm

**Draw the shape that this net will make.**

- Star
- Tetrahedron
- Octahedron
- Cylinder
- Pyramid
- Cube
Classifying Solids

Classify each solid. If it is a polyhedron, tell how many vertices, edges, and faces it has.

1. ________________  2. ________________  3. ________________
   \( V: \quad E: \quad F: \quad \)
\[
\begin{align*}
\text{cone} & \quad \text{cylinder} & \quad \text{pyramid} \\
\end{align*}
\]

4. ________________  5. ________________  6. ________________
   \( V: \quad E: \quad F: \quad \)
\[
\begin{align*}
\text{cube} & \quad \text{sphere} & \quad \text{rectangular prism} \\
\end{align*}
\]

Draw an example of each.


Classify each group of figures.

10. ________________  11. ________________  12. ________________
3-Dimensional Figures and Nets Practice

Name each 3-D figure and count the number of faces. Then, draw the nets for each figure.

1. 

2. 

3. 

4. 
Match each cross section with the appropriate 3-D figure.

5. 

6. 

7. 

Write the definition of the following:

8.) Net:

9.) 3-Dimensional Figure:

10.) Cross-Section:
352. Below are three cross sections of a pyramid with a square base. Color or shade in the cross sections and then name the shape of the cross section.

SHAPE OF THE PYRAMID BASE:

SHAPE OF ANY CROSS SECTION THAT IS CUT PARALLEL TO THE BASE:

352. Below each figure, draw the shape that you think would be created if the dotted line represents a cut that a plane made through the figure.

352. Below each cylinder, draw the shape that you think would be created if the dotted line represents a plane that cuts through the figure.
352. Below each cone, draw the shape that you think would be created if the dotted line represents a plane that cuts through the figure.

Complete the following statement:

When slicing a cross section that is parallel to the base, the cross section shape will always

__________________________________________________________.
Using the cube above, describe what the shape of the cross-section would look like if the plane that cuts it goes through the given points.

1. Through points: J, M, H
2. Through points: P, K, M
3. Through points: E, C, K, P
4. Through points: C, D, A, F
5. Through points: M, H, E

7. No matter what the original 3D figure, if you cut with a plane parallel to the base your cross section will always be ________________________________.
SURFACE AREA is ______________________________________________________________________.

A Student Friendly Model of Finding Surface Area of a Rectangular Prism

Once students have completed Exploring 3-D Rectangular Prisms, it may be helpful to introduce a way to find surface area of rectangular prisms that may help visual learners. If these were the dimensions of a rectangular prism, have students make a “smiley face”

4 x 12 x 8

Each connector can be used to find the surface area of the rectangular prism:

4 x 12

12 x 8

4 x 8

Since students should have established that there will be two identical faces for each set of dimensions, they can set up finding the surface area as follows:

4 x 12 = 48 x 2 = 96

12 x 8 = 96 x 2 = 192

4 x 8 = 32 x 2 = 64

352 square units
Finding Surface Area of Rectangular Prisms

Find the surface area of the following prisms. Be sure to show all steps and work to support your final answers.

1.  
   ![Prism 1](image)

2.  
   ![Prism 2](image)

3.  
   ![Prism 3](image)

4.  
   ![Prism 4](image)
Exploring Surface Area

Find the area of each net. Classify the solid.

1. SA: __________  
   ![Diagram 1]

2. SA: __________
   ![Diagram 2]

3. SA: __________
   ![Diagram 3]

State the number of faces. Then classify each face and find the total surface area.

4. ____________
   SA: __________
   ![Diagram 4]

5. ____________
   SA: __________
   ![Diagram 5]

6. ____________
   SA: __________
   ![Diagram 6]

7. ____________
   SA: __________
   ![Diagram 7]

8. ____________
   SA: __________
   ![Diagram 8]

9. ____________
   SA: __________
   ![Diagram 9]

10. A box of shredded wheat cereal measures 7 in. by $9 \frac{1}{2}$ in. by $2\frac{1}{4}$ in. How much cardboard was used to make the box? (Assume there is no overlap.)
    ____________
Surface Area Formulas

Find the surface area.

1. \[ \text{11 in.} \times \text{11 in.} \times \text{11 in.} \]
2. \[ \text{5 cm} \times \text{13 cm} \]
3. \[ \text{15 yd} \times \text{11 yd} \times \text{11 yd} \]
4. \[ \text{23 mm} \times \text{23 mm} \times \text{23 mm} \]
5. \[ \text{6 ft} \times \text{5 ft} \times \text{9 ft} \]
6. \[ \text{8 m} \times \text{8 m} \times \text{8 m} \]
7. \[ \text{5} \frac{1}{2} \text{ in.} \times \text{5} \frac{1}{2} \text{ in.} \times \text{5} \frac{1}{2} \text{ in.} \]
8. \[ \text{21 cm} \times \text{37 cm} \times \text{6 cm} \]
9. \[ \text{6 yd} \times \text{6 yd} \times \text{16 yd} \]
10. \[ \text{42 m} \times \text{42 m} \times \text{42 m} \]
11. \[ \text{4 ft} \times \text{2 ft} \times \text{1 ft} \]
12. \[ \text{2.3 m} \times \text{2.3 m} \times \text{4.1 m} \]
13. \[ \text{13 in.} \times \text{13 in.} \times \text{13 in.} \]
14. \[ \text{5.0 cm} \times \text{18.0 cm} \times \text{10.5 cm} \]
15. \[ \text{7} \frac{1}{4} \text{ in.} \times \text{7} \frac{1}{4} \text{ in.} \times \text{7} \frac{1}{4} \text{ in.} \]
16. \[ \text{3.4 mm} \times \text{3.4 mm} \times \text{3.4 mm} \]

Find the surface area of each rectangular prism.

17. \( l = 9 \text{ ft}, w = 8 \text{ ft}, h = 2 \text{ ft} \)
   \[ \text{SA} = \]  

18. \( l = 14 \text{ cm}, w = 11 \text{ cm}, h = 19 \text{ cm} \)
   \[ \text{SA} = \]  

19. \( l = 3 \frac{1}{2} \text{ in.}, w = 2 \frac{1}{2} \text{ in.}, h = 4 \frac{1}{2} \text{ in.} \)
   \[ \text{SA} = \]  

20. \( l = 6.1 \text{ m}, w = 4.4 \text{ m}, h = 5.5 \text{ m} \)
   \[ \text{SA} = \]  

21. A music company wants to design a cardboard box for mailing a 2-CD set measuring 14.2 cm by 12.4 cm by 2.5 cm. What is the least amount of cardboard that can be used for the box? ________

130 Use with pages 588–592.
Wrapping Up Surface Area

Find the surface area of each three-dimensional figure. Show all steps and work to support your answers.
If the length, width, and height of a rectangular prism are 4 yards, 8 yards, and 11 yards respectively, what would be the surface area?
How Do YOU think you would find the Surface area of a cylinder?

1) Draw a net. Let’s say the radius of the circle is 10 cm and the height of the cylinder is 20 cm.

2) Find the area of the circles.

3) The rest of the net is a big rectangle...what are the dimensions? L = _______ W = _______

What is the area of the rectangle?

TOTAL SURFACE AREA = ______________________ cm²

FORMULA FOR SA of a cylinder:
Surface Area Patterns

Find the surface area of the following cylinders:

Surface Area = \(2\pi r^2 + 2\pi rh\)

Set 1 - Doubling

Cylinder 1

\[
\begin{align*}
r &= 2 \text{ cm.} \\
h &= 3 \text{ cm.}
\end{align*}
\]

S = ________

Cylinder 2

\[
\begin{align*}
r &= 4 \text{ cm.} \\
h &= 6 \text{ cm.}
\end{align*}
\]

S = ________

Cylinder 3

\[
\begin{align*}
r &= 8 \text{ cm} \\
h &= 12 \text{ cm.}
\end{align*}
\]

S = ________

What pattern is produced in the surface area as the radius and height of the cylinders in Set 1 are doubled? Explain your answer.

What would the surface area be of a fourth cylinder in Set 1?

Set 2 - Tripling

Cylinder 1

\[
\begin{align*}
r &= 2 \text{ cm.} \\
h &= 3 \text{ cm.}
\end{align*}
\]

S = ________

Cylinder 2

\[
\begin{align*}
r &= 6 \text{ cm.} \\
h &= 9 \text{ cm.}
\end{align*}
\]

S = ________

Cylinder 3

\[
\begin{align*}
r &= 18 \text{ cm} \\
h &= 27 \text{ cm.}
\end{align*}
\]

S = ________

What pattern is produced in the surface area as the radius and height of the cylinders in Set 2 are tripled? Explain your answer.

What would the surface area be of a fourth cylinder in Set 2?
Breaking Down Volume

Now that you know how to find volume of a rectangular prism, let’s break down what we are really doing. This will help us with future prisms.

1. Begin by looking at the specific dimensions of this rectangular prism.
   a) What are the dimensions of the base?
   b) How many 1 cm. cubes would it take to cover the base?
   c) How many layers of 1 cm. cubes would it take to fill the prism?
   d) Using your answers from parts b and c, find the volume of the prism. In other words, how many 1 cm. cubes will it take to fill the rectangular prism?

2. Now consider this rectangular prism:
   a) What are the dimensions of the base of this rectangular prism?
   b) How many 1 cm. cubes would it take to cover the base?
   c) How many layers of 1 cm. cubes would it take to fill the prism?
   d) Using your answers from parts b and c, find the volume of the prism. In other words, how many 1 cm. cubes will it take to fill the rectangular prism?

3. So when we find volume of a rectangular prism, we multiply the length by the width and then by the height. Using what you found above, explain why it works.

\[ V = Bh \]

For ALL SHAPES: \( V = Bh \) or very close to it

where \( B \) is the area of the base shape and \( h \) is the height of the 3-D figure
Volume of Cylinders:

Volume of Pointy Shapes:
Cones: https://www.youtube.com/watch?v=QnVr_x7c79w

Pyramids: https://www.youtube.com/watch?v=BjbilpBaA-U

So Pointy Shapes are \( V = \text{_______________} \cdot Bh \)

Volume of Spheres:
https://www.youtube.com/watch?v=aLyQddyY8ik

Volume of a Sphere = _________________
Find the Volume of each shape below.

- Cylinder
  - Diameter = 10 ft
  - Height = 21 ft

- Cone
  - Slant height = 20 ft
  - Base radius = 12 ft

- Pyramid
  - Height = 280 ft
  - Base side = 356 ft
  - Other base side = 418 ft
  - Other base side = 440 ft

- Sphere
  - Radius = 14 cm
Volume Worksheet 1
Find the VOLUME of each of the following Solids

Rectangular Solid

\[
\text{H = 2 ft, W = 8 feet, L = 5 ft.}
\]

1) FORMULA:

\[\text{VOLUME =} \]

Cube

\[
\text{S = 12 cm}
\]

2) FORMULA:

\[\text{VOLUME =} \]

Cylinder

\[
\text{h = 8 in, } r = 3 \text{ in}
\]

3) FORMULA:

\[\text{VOLUME =} \]

Cone

\[
\text{h = 24 cm, } d = 18 \text{ cm}
\]

4) FORMULA:

\[\text{VOLUME =} \]

Sphere

\[
\text{d = 8 in}
\]

5) FORMULA:

\[\text{VOLUME =} \]

Square Pyramid

\[
\text{L = 8, h = 10}
\]

6) Formula: \( V = \frac{1}{3} \times \text{(Area of Base)} \times \text{height} \)

\[\text{VOLUME =} \]
FRACTIONAL EDGE LENGTHS...

Problem

A right rectangular prism has edges of $1 \frac{1}{4}''$, 1” and $1 \frac{1}{2}''$. How many cubes with side lengths of $\frac{1}{4}$ would be needed to fill the prism? What is the volume of the prism?

Fractional Volume Word Problems Part I

1. A right rectangular prism has edges of, $2 \frac{1}{4}$ in, 2 in and $1 \frac{1}{2}$ in. How many cubes with lengths of $\frac{1}{4}$ in would be needed to fill the prism? What is the volume?

2. Find the volume of a rectangular prism with dimensions $1 \frac{1}{2}$ in, $1 \frac{1}{2}$ in and $2 \frac{1}{2}$ in. How many cubes with lengths of $\frac{1}{2}$ in would be needed to fill the prism?

3. A follower box is 3 feet long, $1 \frac{3}{4}$ feet wide, and $\frac{1}{2}$ feet deep. How many cubic feet of dirt can it hold?
4. Draw a diagram to match the rectangular prism whose length is $5\frac{1}{2}$ in, width is 4 in and height is $4\frac{1}{2}$ in.

5. Use centimeter grid papers to build a rectangular prism with the volume of 24 cubic units. At least one of the side lengths of the prism is a fractional unit. What are the dimensions of the rectangular prisms you built? What is the surface area of the prism?

6. Mr. White is trying to store boxes in a storage room with length of 8 yd, width of 5 yd and height of 2 yd. How many boxes can fit in this space if each is box is $2\frac{3}{4}$ feet long, $1\frac{1}{2}$ feet wide and 1 foot deep?
Surface Area & Volume – Word Problems

1. A classroom has the dimensions shown. Find:
   (a) the area of the floor
   (b) the volume of the room
   (c) the total area of the four walls.

2. If 1 cm³ of iron has a mass of 7.52 g, what is the mass of an iron bar of rectangular cross section with the dimensions shown?

3. If one guppy requires 5 L of water to live happily, what is the maximum number of guppies that should be kept in this aquarium?

4. The excavation for a house and the trucks to carry away the material have the dimensions shown. About how many level truck loads are necessary to remove all the dirt?

5. If a cone has a volume of \(24\pi\) in³, what is a set of possible dimensions? (radius and height)
6. A soft drink can has a diameter of 6 cm and a height of 11.5 cm.

(a) What is its volume?

(b) What is its surface area?

7. A lawn roller is 1 m wide and 80 cm high. What area is covered in each revolution?

8. A section of concrete pipe 30 m long has an inside diameter of 1.2 m and an outside diameter of 1.8 m. What is the volume of concrete in this section of pipe?

9. A rectangular strip of aluminum, 30 cm long and 10 cm wide, is rolled into the form of a cylinder. Which would have the greater volume, a cylinder 10 cm high with circumference of 30 cm or a cylinder 30 cm high with circumference of 10 cm?
UNIT 9 STUDY GUIDE

PERIMETER AND AREA...Tell how to calculate the following. Write the formula if there is a formula!

1. Perimeter—
2. Area of a square—
3. Area of a rectangle—
4. Area of a parallelogram—
5. Area of a triangle—

What is different about the triangle formula? How will you remember this?

6. Area of mixed shapes—what do you do? What is tricky?

II. Area and Perimeter/Circumference of polygons, circles, mixed shapes, and inscribed shapes.

7. 

8.

9.

10.

11.

12.

13. Find the area of the rectangle if the perimeter of this rectangle is 80.
**WORD PROBLEMS and FORMULAS**

14) The perimeter of a rectangle is 12. Determine a possible length and width, then calculate a possible area for that rectangle.

15) A rectangular photo is 5 inches long and 2 inches wide. Jimmy wants to enlarge the photo by doubling its length and width. How many inches of wood will he need to make a frame for the enlarged photo?

16) A figure is formed by a square and a triangle. Its total area is 32.5 m². The area of the triangle is 7.5 m². What is the length of each side of the square?
   a) 5 meters   b) 25 meters   c) 15 meters   d) 16.25 meters

17) A rectangle is formed by two congruent right triangles. The area of each triangle is 6 in². If each side of the rectangle is a whole number of inches, which of these could NOT be its perimeter?
   a) 26 inches   b) 24 inches   c) 16 inches   d) 14 inches

18) The volume of a cube is found with the formula \( V = s^3 \) where the side length is represented by \( s \). If the side length is 1 \( \frac{1}{2} \) inches, what is the volume of the cube?

19) The perimeter of a rectangle is 20 ft². If the length is 5 ft, what is the AREA of the rectangle?
For each problem:

- Plot the ordered pairs in the coordinate plane given
- Find the perimeter of the figure
- Find the area of the figure
- Find the distance between each point by using the absolute value method.

20. \( G (-4, 5) \) \( H (5, 5) \)
    \( I (-4, -5) \) \( J (5, -5) \)

Perimeter of GHIJ:__________

Area of GHIJ:__________
21. This figure is a four sided polygon. Before finding the area and perimeter find the missing point.

\[ R (-2, 2) \quad S (4, 2) \quad T (, ) \quad U (-2, -3) \]

Perimeter of RSTU:________

Area of RSTU:________

What was the fourth vertex?

How did you find the length for each side of the figure?

Find the area of the shaded region for each figure below.

22.

23.
24. Find the Area and Perimeter.

25. 24 ft 24 ft

26. Find the Area and Perimeter.

18 22 m 10 8
Name: ____________________________  Score: ____________________________

**Surface Area - Square Pyramid**

**Example:**

Surface area = base area + \( \frac{1}{2} \) x perimeter x slant height

Base area = side x side = 6 x 6 = 36 cm\(^2\)
Perimeter = 4 x side = 4 x 6 = 24 cm
Surface area = 36 + \( \frac{1}{2} \) x 24 x 10
\( = 156 \text{ cm}^2 \)

Find the surface area of each square pyramid.

1)  

Surface Area = ______________

2)  

Surface Area = ______________

3)  

Surface Area = ______________

4)  

Surface Area = ______________

5)  

Surface Area = ______________

6)  

Surface Area = ______________
Sports Trivia

Who won the first World Series in 1903? To find out, find the surface areas of the following figures at the bottom of the page and put the corresponding letter above each answer.

S.  D.  N.
\[ 6 \text{ cm} \times 9 \text{ cm} \times 16 \text{ cm} \]

O.  O.  O.
\[ 3.8 \text{ cm} \times 9 \text{ cm} \times 1.5 \text{ cm} \]

E.  S.  B.
\[ 12 \text{ cm} \times 12 \text{ cm} \times 5.4 \text{ cm} \]

R.  X.  T.
\[ 3.3 \text{ cm} \times 2.5 \text{ cm} \times 3 \text{ cm} \]

Surface Area

- S: \(29.04 \text{ cm}^2\)
- D: \(105 \text{ cm}^2\)
- N: \(588 \text{ cm}^2\)
- O: \(253 \text{ cm}^2\)
- E: \(854.08 \text{ cm}^2\)
- B: \(-301.44 \text{ cm}^2\)
- R: \(65.34 \text{ cm}^2\)
- X: \(678.24 \text{ cm}^2\)
- T: \(150 \text{ cm}^2\)
- S: \(337.32 \text{ cm}^2\)
- B: \(86.64 \text{ cm}^2\)
- T: \(86.35 \text{ cm}^2\)
Find the exact volume of each shape.

1) Volume = ______

2) Volume = ______

3) Volume = ______

4) Volume = ______

5) Volume = ______

6) Volume = ______

7) Volume = ______

8) Volume = ______

9) Volume = ______