Grade 6 – Math – Week 9
Day 1 – Volume and Surface Area of Rectangular Prisms

Warm-Up 1:
Decide if volume or area best describes each situation.

<table>
<thead>
<tr>
<th>The amount of paint used to paint a wall.</th>
<th>Volume or Area?</th>
</tr>
</thead>
<tbody>
<tr>
<td>The amount of water that fills a swimming pool.</td>
<td>Volume or Area?</td>
</tr>
<tr>
<td>The amount of cake batter that fits in a cake pan.</td>
<td>Volume or Area?</td>
</tr>
<tr>
<td>The size of a new carpet.</td>
<td>Volume or Area?</td>
</tr>
</tbody>
</table>

Guided Notes – Volume of Rectangular Prisms

Volume:
the measure of the amount of space a 2-d figure occupies.

Volume is measured in cubic units.
A unit cube is a cube with an edge length of one unit.
The volume of a rectangular prism is the product of the length, width and height.
The formula for volume of a rectangular prism is: \( V = l \times w \times h \)
The formula for volume of a cube is: \( V = s^3 \)
Find the volume of each prism.

Practice – Volume of Rectangular Prisms

What is the volume of a cube with a side length of 10 cm?

Use the formula:

\[ V = s^3 \text{ or } V = s \cdot s \cdot s \]
\[ V = 10 \cdot 10 \cdot 10 \]
\[ V = 100 \cdot 10 \]
\[ V = 1,000 \text{ cm}^3 \]

What is the volume of a rectangular prism with a length of 7m, a width of 12m and a height of 15m?

Use the Formula:

\[ V = l \cdot w \cdot h \]
\[ V = 7 \cdot 12 \cdot 15 \]
\[ V = 84 \cdot 15 \]
\[ V = 1,260 \text{ m}^3 \]
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**Activity 1 – Use the formula: \( V = lwh \)**

<table>
<thead>
<tr>
<th>1. What is the volume of a rectangular prism with a length of 12 in, a width of 26 in and a height of 4 in?</th>
<th>2. Find the volume of the figure below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Find the volume of the figure below:</td>
<td>4. Find the volume of the figure below:</td>
</tr>
<tr>
<td>5. What is the volume of a rectangular prism with a length of 8 in, a width of 10 in and a height of 5 in?</td>
<td>6. What is the volume of a rectangular prism with a length of 4 in, a width of 5 in and a height of 6 in?</td>
</tr>
</tbody>
</table>

7. Evelyn got a new fish tank for her birthday. The height of the fish tank is 3 feet, the width is 2 feet and the length is 8 feet. What is the volume of her fish tank?

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**Surface Area of Rectangular Prisms**

**IMPORTANT VOCABULARY:**

- **Surface Area:** The sum of the areas of all of the faces of a 3-D figure.
- **Rectangular Prism:** A 3-dimensional solid shape which has 6 faces that are rectangles.
- **Net:** A 3-dimensional representation of a 2-dimensional figure.
1. You can use nets to help you find **surface area**
2. To find surface area, find the **area** of each face.
3. Then **add** the areas together.
4. Find the surface area of the rectangular prism below:

   ![Diagram of a rectangular prism]

   - Side: A
   - Area: 10 cm$^2$
   - Side: B
   - Area: 15 cm$^2$
   - Side: C
   - Area: 10 cm$^2$
   - Side: D
   - Area: 15 cm$^2$
   - Side: E
   - Area: 6 cm$^2$
   - Side: F
   - Area: 6 cm$^2$

   **Surface area:** 62 cm$^2$

5. You can also use the formula **$SA = 2(lw+lh+wh)$** to find area of a rectangular prism.
6. The formula to find surface area of a cube is: **$SA = 6s^2$**

**Guided Practice:**

**1. Find the Surface Area using the following formula**

   
   $SA = 2(length \cdot width \cdot height)$

   ![Diagram of a rectangular prism with dimensions]

   
   $SA = 2(10 \cdot 3 \cdot 4)$
   $SA = 2(30 \cdot 4)$
   $SA = 2(120)$
   $SA = 240 \text{ mm}^3$

**2. Find the Surface Area using the following formula**

   
   $SA = 6s^2 \text{ or } SA = 6 \cdot s \cdot s$

   ![Diagram of a cube with dimensions]

   
   $SA = 6s^2$
   $SA = 6 \cdot 5 \cdot 5$
   $SA = 30 \cdot 5$
   $SA = 150 \text{ m}^3$
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Activity 2:

1. Find the surface area of the figure below:

![Figure 1](image1)

2. Find the surface area of the figure below:

![Figure 2](image2)

3. Find the surface area of the figure below:

![Figure 3](image3)

4. Find the surface area of the figure below:

![Figure 4](image4)

5. James is wrapping a birthday gift for his mom. The box has a length of 4 feet, a width of 3 feet and a height of 1 foot. What is the exact amount of wrapping paper that he needs to cover the gift? Show your work.

5m

15m

11m

20 mm

7 mm

7 mm

4m

5m

5m

7m

5m

5m

7m

7m

5m

5m

5m

6m

6m

6m

5m
Surface Area of Pyramids and Triangular Pyramids

Types of Pyramids:

- A pyramid with a triangular base is called a **Triangular Pyramid**.
- A pyramid with a square base is called a **square base**.
- Pyramids are named after their base shape.
- To find Surface Area, find the area of each side and then add the areas.
- To find the area of a triangle, use the formula \( A = \frac{1}{2}bh \).

Find the Surface Area of the Triangular Pyramid below:

**Step 1:** Area of 1 Triangle (Note: All triangles pictured have the same area!)

\[
A = \frac{1}{2} \cdot 5 \cdot 7 = 17.5 \text{ cm}^2
\]

**Step 2:** Count the triangles (4) and ADD the area 4 times or multiply the area by 4.

- Side A: 17.5
- Side B: 17.5
- Side C: 17.5
- Side D: 17.5

\[ \text{SA} = 70 \text{ cm}^2 \]
Find the Surface Area of the Square Base Pyramid:

How many triangles are there? _____
How many squares are there? _____

**Step 1 – Find the area of the triangle.**

\[
A = \frac{1}{2}bh
\]

\[
A = \frac{1}{2} \cdot 15 \cdot 13
\]

\[
A = 7.5 \cdot 7
\]

\[
A = 52.5 \text{ cm}^2
\]

**Step 2 – Find the area of the square.**

\[
A = s^2
\]

\[
A = 15 \cdot 15
\]

\[
A = 225 \text{ cm}^2
\]

**Step 3 – Add the areas to find the surface area of the pyramid.**

\[
52.5 + 52.5 + 52.5 + 52.5 + 225
\]

\[
4 \text{ Triangles} + 1 \text{ Square} = 435 \text{ cm}^2
\]

**Think about it!!** What is the difference between a *Square Base Pyramid* and a *Triangular Pyramid*?

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Activity 3: Find the Surface Area

1. Find the surface area of the equilateral triangular pyramid below:

2. Find the surface area of the square pyramid below:

3. Find the surface area of the equilateral triangular pyramid below:

4. Find the surface area of the square pyramid below:
Warm-Up 3:

Find the area of each figure.

Guided Notes:

Volume is the measure of the amount of space a 3-D figure occupies. A pyramid is a 3-D figure with a polygon base and triangular sides that meet at a point.

A pyramid is named by the shape of its base.

Volume is measured in cubic units. Example: $\text{in}^3$

To find the volume of a pyramid, multiply $1/3$ by the area of the base and the height.

The height of a pyramid is the perpendicular distance from the vertex to the base.

To find the volume of any prism, use the formula:

$$V = \frac{1}{3} Bh$$
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Guided Practice – Find the Volume of the pyramid.

Formula – \( V = \frac{1}{3} Bh \)

Step 1: Find the area of the base to find B.
\[
A = s^2
\]
\[
A = 4 \cdot 4
\]
\[
A = 16 \text{ in}^2
\]

Step 2: Substitute the values in the formula.
\[
V = \frac{1}{3} Bh
\]
\[
V = \frac{1}{3} \cdot 16 \cdot 7
\]

Step 3: Evaluate.
\[
V = \frac{1}{3} \cdot 16 \cdot 7
\]
\[
V = 37.3 \text{ in}^3
\]

Activity 4 – Find the Volume using the formula \( V = \frac{1}{3} Bh \)

1. Find the volume of the figure below:
2. Find the volume of the figure below:
3. Find the volume of the figure below:

4. Find the volume of the figure below: