Today:
• We are going to look over our volume and surface area formulas
• We are also going to do an example of a cone
• Then we are going to work on our flip charts!
Project: Measurement Flip Chart

How to make your flip chart:
1. You need 3 sheets of paper
2. Lay the 3 sheets on top of one another and fold (watch demonstration)
3. Put 3 staples on the top (watch demonstration)

Your flip chart will contain the following:

Top Page: Title Page "Measurement Flip Chart"
Page 1: Perimeter/Area of a composite object
Page 2: Cone
Page 3: Rectangular Prism \( V = l \times w \times h \)
Page 4: Rectangular Pyramid
Page 5: Sphere, Cylinder

- Your diagrams must be very neat (use ruler where necessary and draw pictures in pencil first!). Make sure to properly label your diagrams.
- Your writing must also be as neat as possible!
- There should be an example included for each object

Your flip chart will be marked as follows:

- Overall appearance/Effort/Neatness /10

- Page One:
  - Diagram /2
  - Formulas /3
  - Example /3 /8

- Pages Two to Five:
  - Diagrams (each worth two) /8
  - Formulas (each worth one) /8
  - Examples (each worth one) /8 /24

  (one diagram, surface area AND volume formula, and 2 examples per page!)

Total Value /42
When finding surface area of any 3D object, all you need to do is find the area of each face of the object and then add them all together!

When finding the surface area of an object, you can either use a model, sketch a diagram, or visualize the object. For all options, you will need to be able to calculate the answer.

Definitions:
1. "Faces" are the sides of the object.
   - for example, a rectangular prism, has 6 faces.
     -3 pairs of rectangles

2. A Composite Object is an object composed of 2 or more objects.

Area Formulas
To find area:

Area of a rectangle = length \times width (l \times w)

Area of a triangle = \frac{\text{base} \times \text{height}}{2}

Area of a circle = \pi r^2
**LETS REVIEW**

Perimeter and Area

- **Perimeter of a Square**: \( P = 4s \)
- **Area of a Square**: \( A = s^2 \)
- **Perimeter of a Rectangle**: \( P = 2L + 2W \)
- **Area of a Rectangle**: \( A = LW \) or \( Bh \)

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**LETS REVIEW**

- **Perimeter of a Parallelogram**: \( P = 2b + 2s \)
- **Area of a Parallelogram**: \( A = bh \)
- **Perimeter of a Triangle**: \( P = s + s + s \)
- **Area of a Triangle**: \( A = \frac{bh}{2} \)
**LETS REVIEW**

- **Perimeter of a Trapezoid**  
  \[ P = s + s + s + s \]

- **Area of a Trapezoid**  
  \[ A = \frac{h(a + b)}{2} \]

- **Circumference of a Circle**  
  \[ C = \pi d \]
  or  
  \[ C = 2\pi r \]

- **Area of a Circle**  
  \[ A = \pi r^2 \]

\[ \pi \approx 3.14 \]

\[ r = \frac{d}{2} \]

**LETS REVIEW**

**Surface Area**

- **Surface area of a Rectangular Prism**
  \[ V = lwh \]

- **Surface Area of a Triangular Prism**
  Total Surface Area  
  = Bottom + 2(Ends) + Front + Back

- **Surface Area of a Pyramid**
  Total Surface Area  
  = Bottom + 4(sides)

- **Surface Area of a Cone**
  Total Surface Area  
  = Circle + curved surface  
  = \( \pi r^2 + \pi rS \)
\[ c^2 = a^2 + b^2 \\
= 5^2 + 9^2 \\
= 25 + 81 \\
= 106 \\
= 10.3 \, \text{m} \]

\[ \text{SA} = \pi r^2 + \pi rs \\
= (3.14)(5)^2 + (3.14)(5)(10.3) \\
= 78.5 + 161.71 \\
= 240.2 \, \text{m}^2 \]

\[ V = \frac{\pi r^2 h}{3} = \frac{(3.14)(5)^2(9)}{3} \\
= 235.5 \, \text{m}^3 \]

**LET'S REVIEW**

<table>
<thead>
<tr>
<th>Surface area of Cylinder</th>
<th>Total Surface Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 2(circles) + curved surface</td>
<td></td>
</tr>
<tr>
<td>= 2(( \pi r^2 )) + ( \pi dh )</td>
<td></td>
</tr>
</tbody>
</table>
## Volume

<table>
<thead>
<tr>
<th>Shape</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume of Rectangular Prism</td>
<td>( V = \text{Area of base} \times \text{height} )  ( V = lwh )</td>
</tr>
<tr>
<td>Volume of Triangular Prism</td>
<td>( V = \frac{bh}{2} ) (h)</td>
</tr>
<tr>
<td>Volume of Pyramid</td>
<td>( V = \frac{1}{3} \text{Area of base} \times \text{height} )</td>
</tr>
<tr>
<td>Volume of Cone</td>
<td>( V = \frac{1}{3} \text{Volume of cylinder} )  ( V = \frac{1}{3} \pi r^2 h )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shape</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume of Cylinder</td>
<td>( V = \text{Area of base} \times \text{height} )  ( V = \pi r^2 h )</td>
</tr>
<tr>
<td>Volume of Sphere</td>
<td>( V = \frac{4}{3} \pi r^3 )</td>
</tr>
</tbody>
</table>
Practice

\[ V = l \cdot w \cdot h \]

\[ h = 8 \text{ cm} \]

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

\[ \text{area} = \_ \text{ cm}^2 \]

Practice

\[ \text{SA} \]

Bottom + Top

\[ l \times w \times 2 \]

\[ \frac{1}{2} \times b \times 2 \]

ends

Front + Back
Practice

Problem:

Given a pyramid with base dimensions 10 ft by 4.5 ft, height 9 ft, and slant height 5 ft.

Part 1: Volume

- Formula: \( V = \frac{1}{3} \times \text{base area} \times \text{height} \)
- Base area: \( (10 \times 4.5) \times 9 = 405 \) ft\(^2\)
- Volume: \( \frac{405 \times 9}{3} = 135 \) ft\(^3\)

Part 2: Surface Area

- Slant height (s): \( \sqrt{9^2 + 5^2} = \sqrt{81 + 25} = \sqrt{106} = 10.3 \) ft
- Sides: \( A = \frac{1}{2} \times 10 \times 5 \times 2 = 50 \) ft\(^2\)
- Bottom: \( A = 10 \times 4.5 = 45 \) ft\(^2\)
- Front + Back: \( A = \frac{1}{2} \times 10 \times 9.3 = 46.5 \) ft\(^2\)

Total Surface Area: \( 50 + 45 + 46.5 = 184.5 \) ft\(^2\)

Part 3: Right Triangles

- Height of the pyramid: \( a = \sqrt{4.5^2 + 9^2} = \sqrt{20.25 + 81} = \sqrt{101.25} = 10.1 \) ft

- Height of the right triangle: \( \text{height} = 9.3 \) ft

- Base of the right triangle: \( b = \sqrt{21} = 4.5 \) ft

- Hypotenuse: \( c = \sqrt{4.5^2 + 9^2} = \sqrt{20.25 + 81} = \sqrt{101.25} = 10.1 \) ft
Practice

\[ V = \pi r^2 h \]
\[ = (3.14)(5.1)^2(14) \]
\[ = 1143.4 \text{ in}^3 \]

S.A. = \[2\pi r^2 + 2\pi rh\]
\[= 2(3.14)(5.1)^2 + 2(3.14)(5.1)(14)\]
\[= 163.3 + 448.4\]
\[= 611.7 \text{ in}^2\]

Practice

\[ V = \pi r^2 h \]
\[= (3.14)(5.1)^2(14) \]
\[= 1143.4 \text{ in}^3 \]

S.A. = \[2\pi r^2 + 2\pi rh\]
\[= 2(3.14)(5.1)^2 + 2(3.14)(5.1)(14)\]
\[= 163.3 + 448.4\]
\[= 611.7 \text{ in}^2\]
Practice

\[
V = \frac{4 \pi r^3}{3} = \frac{4(3.14)(5)^3}{3} = \frac{1570}{3} = 523.3 \text{ mm}^3
\]

\[
S.A. = 4 \pi r^2 = 4(3.14)(5)^2 = 314 \text{ mm}^2
\]
Surface area and Volume formulas

Lateral Area of a cone: \( A_L = \pi rs \)

Cone

Surface area of a cylinder: \( SA = 2\pi r^2 + 2\pi rh \)

Cylinder

Surface area of a cube: \( SA = 6l^2 \)

Cube

Volume of a pyramid: \( V = \frac{1}{3} lwh \)

Pyramid

Volume of a cone: \( V = \frac{1}{3} \pi r^2 h \)

Cone

Volume of a sphere: \( V = \frac{4}{3} \pi r^3 \)

Sphere

Surface area of a sphere: \( SA = 4\pi r^2 \)

Sphere

Lateral area of a cone: \( A_L = \pi rs \)

Cone

Adjacent angles are supplementary.

\[ a^2 + b^2 = c^2 \]

\[ 3^2 + 11^2 = 9 + 121 = \sqrt{130} = 11.4 \]
Pop Quiz

#1 Convert the following:
   a. 12 km into mm
   b. 26 in into ft with in
   c. 0.34 cm into hm
   d. 8.5 yards into m
   e. 348 miles into km

#2 Find the Perimeter and Area

#3 Find the Volume and Surface Area
Pop Quiz

#1 Convert the following:

a. 12 km into mm
b. 26 in into ft with in

c. 0.34 cm into hm
d. 8.5 yards into m
e. 348 miles into km

#2 Find the Perimeter and Area

#3 Find the Volume and Surface Area

We are going to go over the answers to the pop quiz that we had Tuesday.

High From Shawn

#1 Convert the following:

a. 12 km = 12000000 mm
b. 2 ft 2 in

c. 0.0000034 hm
d. 8.5 yds * \frac{0.9144 m}{1 yd} = 7.77 m

e. 348 mi * \frac{1.6093 km}{1 mi} = 560 km
#2 Find the Perimeter and Area

\[ C = 2\pi r \]
\[ = 2 \times (3.14)(2.5) \]
\[ = 15.7 \text{ ft} \]

\[ P = 12 + 7.8 + 18 + 7.9 + 45.7 \text{ ft} \]

1. \[ A = \pi r^2 \]
   \[ = (3.14)(2.5)^2 \]
   \[ = 19.625 \text{ ft}^2 \]

2. \[ A = lw \]
   \[ = 12 \times 3.2 \]
   \[ = 38.4 \text{ ft}^2 \]

3. \[ A = bh \]
   \[ = 6 \times 5 \]
   \[ = 30 \text{ ft}^2 \]

Total \[ = 84.8 \text{ ft}^2 \]

#3 Find the Volume and Surface Area

\[ SA = \pi r^2 + \pi r s \]
\[ = (3.14)(2)^2 + (3.14)(2)(7.3) \]
\[ = 12.56 + 45.84 \]
\[ = 58.4 \text{ ft}^2 \]

\[ c^2 = a^2 + b^2 \]
\[ = 7^2 + 2^2 \]
\[ = 49 + 4 \]
\[ = \sqrt{53} \approx 7.3 \text{ ft} \]

\[ V = \frac{1}{3} \pi r^2 h \]
\[ = \frac{1}{3} (3.14)(2)^2(7) \]
\[ = 29.3 \text{ ft}^3 \]
Example 3: Determining the Surface Area of a Right Cone

\[ SA = \pi rs + \pi r^2 \]

Cylinders

Example 1

A cannery has redesigned the size of the can for its canned herring. The diameter of the new can is 4” and its height is 5.5”. How much tin will be needed to construct one can?

\[ SA = 2\pi r^2 + 2\pi rh \]
\[ = 2(3.14)(2)^2 + 2(3.14)(2)(5.5) \]
\[ = 25.12 + 69.08 \]
\[ = 94.2 \text{ in}^2 \]
Practice Questions:

1. Jennifer must make a conical funnel out of sheet metal. If the funnel is 9 inches tall, has a slant height of 10.7 inches, and has a radius of 5.8 inches at the top, what is the surface area of the sheet metal in square feet?

   \[ \text{CONE} \]
   \[
   \text{SA} = \pi r^2 + \pi r s \\
   \text{SA} = (3.14)(5.8)^2(0.89) \\
   \text{SA} = 13.4 \text{ ft}^2
   \]

2. Genevieve plans to apply two coats of paint to the walls of her garden shed. The shed is 8 feet long by 6 feet wide by 7 feet tall. If there are 3 windows that are 2 feet by 18 inches each, what will be the total area she paints?

   \[ \text{length} = 8 \text{ ft} \]
   \[ \text{width} = 6 \text{ ft} \]
   \[ \text{height} = 7 \text{ ft} \]
   \[ \text{Total} = \frac{112 + 84 - 9}{2} = 87 \text{ ft}^2 \]
   \[ = 374 \text{ ft}^2 \]
3. Sheet metal costs $54.25/yd². How much will it cost Hamish to cover a conical roof if it has a radius of 2.2 yards and a slant height of 3.5 yards?

\[
\text{SA} = \pi r^2 + \pi rs = (3.14)(2.2)^2(3.5) = 24.2 \text{ yd}^2 \times $54.25 = $1312.85
\]

4. A fish tank is a rectangular prism that is 30 inches long, 24 inches deep, and 18 inches high. How much water will it hold:
   a) in cubic inches?
   b) in cubic feet?

\[
a) \ V = l \times w \times h = 30 \times 24 \times 18 = 12960 \text{ in}^3
\]

\[
b) \ V = l \times w \times h = 2.5 \times 2 \times 1.5 = 7.5 \text{ ft}^3
\]
5. Will the contents of a box that is 3 inches by 4 inches by 6 inches fit into a cube with sides of 4 inches?

\[ V = l \times w \times h \]
\[ = 3 \times 4 \times 6 \]
\[ = 72 \text{ in}^3 \]

\[ V = l \times w \times h \]
\[ = 4 \times 4 \times 4 \]
\[ = 64 \text{ in}^3 \]

\[ \text{Hi/Bye} \]
\[ \text{Mrs. Belyra} \]

\[ \text{NO} \]

6. A driveway is 36 ft long and 10 ft wide, and will be covered in gravel that is 2 in deep. How many cubic yards of gravel will be needed?

\[ l = 36 \text{ ft} \div 3 = 12 \text{ yd} \]
\[ w = 10 \text{ ft} \div 3 = 3.3 \text{ yd} \]
\[ h = 2 \text{ in} \div 12 \div 3 = 0.05 \text{ yd} \]

\[ V = l \times w \times h \]
\[ = 12 \times 3.3 \times 0.05 \]
\[ = 1.98 \text{ yd}^3 \]
\[
238 \text{ hm} \rightarrow \text{ cm} \quad 60 \text{ L} \rightarrow \text{ mL}
\]
\[
2380000 \text{ cm} \quad 600000 \text{ mL}
\]
\[
0.58 \text{ dm} \rightarrow \text{ Km} \quad 5689 \text{ cg} \rightarrow \text{ dag}
\]
\[
0.000058 \text{ Km} \quad 5.689 \text{ dag}
\]

\[
\frac{26.3 \text{ yd}}{1 \text{ yd}} \times \frac{0.9144 \text{ m}}{1} = \text{ m}
\]

\[
26.3 \text{ yd} = ? \text{ m}
\]