U1 L0 Notes: Using Formulas and Order of Operations

Name: _____ HR: _____

Skills: Substitute given values into a formula and simplify using order of operations.

Problem-Solving Steps

1. Identify which formula matches the situation.
2. List each variable and its given value, with units.
3. Substitute the values into the formula. Keep parentheses around each substituted value.
4. Simplify using order of operations: parentheses/exponents → multiply/divide → add/subtract.
5. Write the final answer with the correct units.

Warm-Up: An Easy One to Start

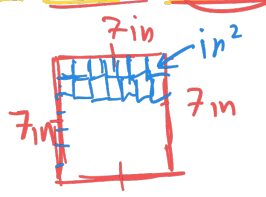
A square tile has a side length of 7 inches. Find the area of the tile.

$A = s^2$

Area = Side^2

$= 7^2 = 7 \cdot 7$

$= 49$



A

$7\text{in} \cdot 7\text{in}$ $\quad in \cdot in$

$= 49\ in^2$

A cone has a radius of 8 inches and a height of 6 inches. Determine its volume?

$V = \frac{1}{3}\pi r^2 h$ $\quad in \cdot in \cdot in$

$r = 8$ in

$h = 6$ in

$= \frac{1}{3}\pi (8)^2 (6)$

$\frac{1}{3} \cdot \frac{6}{1} = \frac{6}{3} = 2$

$2+2+2$

$= \frac{1}{3}\pi (64)(6) = \pi(64)(2)$

$= 128\pi \approx 402.12\ in^3$



Geometry Formulas to Know for the ACT

Heads up: unlike the SAT, the ACT does NOT give you a formula sheet on test day — these need to be memorized. Here are the most common ones.

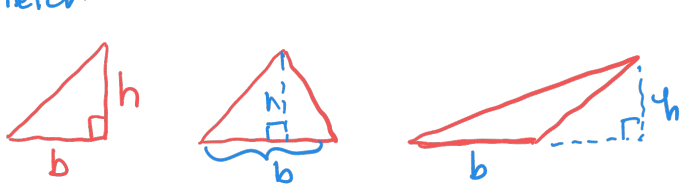
Rectangle



$A = lw$ $\quad P = 2l + 2w$

Area $\quad$ Perimeter

Triangle



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

Area

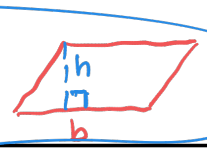
Circle



$A = \pi r^2$ $\quad C = 2\pi r$

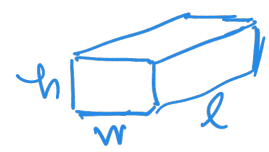
Area $\quad$ Circumference

~~***Parallelogram***~~



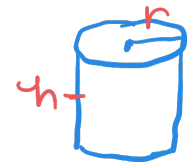
$A = bh$

Rectangular Prism



$V = lwh$

Cylinder



$V = \pi r^2 h$

Volume

Sphere



$V = \frac{4}{3}\pi r^3$

Volume

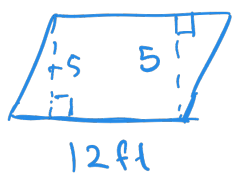
Cone



$V = \frac{1}{3}\pi r^2 h$

Example: Using a Formula from the List

A solar panel shaped like a parallelogram has a base of 12 feet and a height of 5 feet. Find the area of the panel.



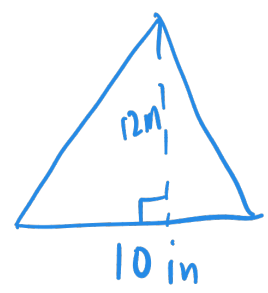
$A = bh$

$= 12_{ft} \cdot 5_{ft}$

$A = 60\ ft^2$

12
5
60

Determine the area of the triangle with base of 10 inches and a height of 12 inches.



$A = \frac{1}{2}bh$ $\quad in \quad in$

$= \frac{1}{2}(10)(12)$

$= 5(12)$

$= 60\ in^2$

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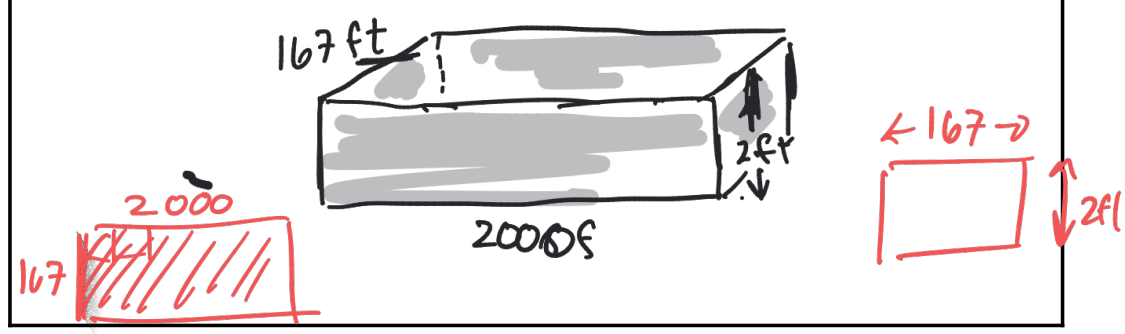
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Fun with Formulas: The Lincoln Memorial Reflecting Pool

This is the real reflecting pool on the National Mall in Washington, D.C.! It's about 2,028 ft long and 167 ft wide. Its depth actually varies from 18 in at the edges to 30 in in the center — to keep this a rectangular prism, we'll simplify using a flat average depth of 2 ft (and round the length to 2,000 ft for easier arithmetic), and keep the width at 167 feet.

Sketch the pool (label l, w, d):



Part A — Surface Area to Paint

The inside of the pool (the floor and 4 walls — no top) needs to be painted. Break it into pieces:

Floor: A = lw = $2000(167) = 334{,}000\ ft^2$

2 long walls: 2(l × d) = $2(2000 \cdot 2) = 8{,}000\ ft^2$

2 short walls: 2(w × d) = $2(167 \cdot 2) = 668\ ft^2$

Total surface area = $342{,}668\ ft^2$

Bonus — How Much Paint?

One gallon of pool paint covers 300 ft². How many gallons are needed?

$342{,}668 \div 300$

$342{,}668 ft^2 \cdot \frac{1\ can}{300 ft^2}$

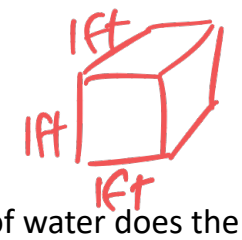
You can't buy part of a gallon, so round UP: 1143 gallons of pt

Part B — Volume of Water

$V = lwh$ ✓ $V = l \cdot w \cdot h$

V = $(2000)(167)(2)$ $ft \cdot ft \cdot ft$

$= 668{,}000\ ft^3$



Bonus — How Many Gallons?

1 ft³ ≈ 7.48 gallons. How many gallons of water does the pool hold?

$\frac{668000}{7.48} = 89{,}304$ gallons

Reality check: the real pool holds about 6.75 million gallons — our flat-depth model gets us in the right neighborhood, but the real pool is deeper toward the middle, so it holds more than our simplified rectangular version.

Bringing in π: Volume of a Sphere

Example: A Tennis Ball

A tennis ball has a radius of about 1.5 inches. Find its volume. Leave your answer in terms of π.

$\frac{4}{3} = 4 \div 3$

V = $\frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi(1.5)^3 = \pi\left[\frac{4}{3}(1.5)^3\right] = 4.5\pi = \frac{9}{2}\pi = 14.14$

Challenge: The Whole Earth!

Earth's radius is about 4,000 miles. Since 1 mile ≈ 63,360 inches, that's about 2.5×10^8 inches. Find Earth's volume in cubic inches.

That's why scientists use scientific notation!

You Try!

1. Cone Volume

An ice cream cone has a radius of 3 cm and a height of 4 cm. Find its volume. Leave your answer in terms of π.

$V = \frac{1}{3}\pi r^2 h$

2. Cylinder Label Area

A soup can has a radius of 2 inches and a height of 5 inches. Find the area of the label that wraps exactly once around the side (not the top or bottom). Leave your answer in terms of π.

$A = 2\pi r h$