Substitution & Order of Operations — Formula Practice

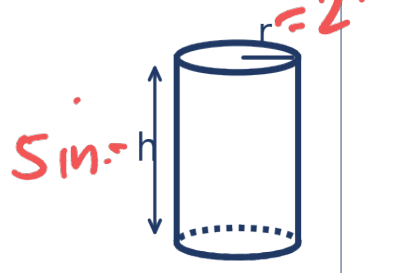
Name: KEY HR: _____

Directions: Substitute the given values into each formula, then simplify using order of operations. No calculator — numbers are chosen to work out cleanly by hand. Show your substitution step before you simplify.

1. A cylindrical drinking cup has a radius of 2 inches and is filled with water to a height of 5 inches. Find the volume of water in the cup. Leave your answer in terms of π. Include units.

$V = \pi r^2 h$

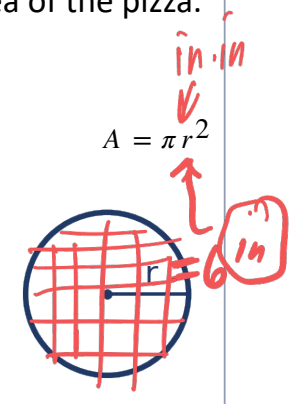
$V = \pi r^2 h$
$= \pi (2)^2 (5)$
$= \pi (4 \cdot 5)$
$= 20\pi \text{ in}^3$



Answer: $20\pi \text{ in}^3$

2. A circular pizza has a radius of 6 inches. Find the area of the pizza. Leave your answer in terms of π. Include units.

$A = \pi r^2$
$A = \pi (6)^2$
$= \pi \cdot 36$
$= 36\pi$



Answer: $36\pi \text{ in}^2$ $\sim 113 \text{ in}^2$

3. A bedroom floor measures 12 feet long and 9 feet wide. Find the area of the floor. Include units.

$A = lw$



Answer: 108 ft^2

4. A rectangular garden is 15 meters long and 8 meters wide. Find how much fencing is needed to enclose the garden. Include units.

$P = 2l + 2w$

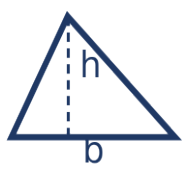


Answer: $P = 46 \text{ m}$

5. A triangular sail has a base of 10 feet and a height of 6 feet. Find the area of the sail. Include units.

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

$\frac{1}{2}(10)(6)$
$5 \cdot 6$

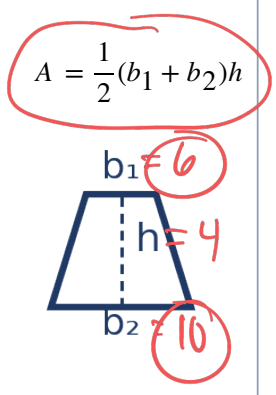


Answer: $A = 30 \text{ ft}^2$

6. A trapezoid-shaped garden bed has parallel sides of 6 yards and 10 yards, and a height of 4 yards. Find the area of the garden bed. Include units.

$A = \frac{1}{2}(b_1 + b_2)h$

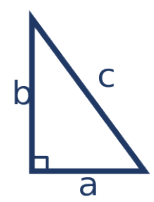
$A = \frac{1}{2}(6 + 10)\,4$
$= \frac{1}{2}(16)(4)$
$= 8 \cdot 4$
32 yds^2



Answer: 32 yds^2

7. A ladder leans against a wall. The base of the ladder is 9 feet from the wall, and it reaches 12 feet up the wall. Find the length of the ladder.

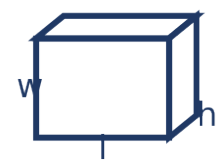
$c = \sqrt{a^2 + b^2}$



Answer: 15 feet

8. A shipping box measures 4 inches long, 3 inches wide, and 6 inches tall. Find the volume of the box. Include units.

$V = lwh$



Answer: 72 in^3

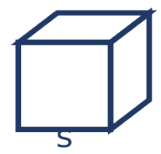
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9. A cube-shaped gift box has sides of 5 centimeters. Find the total surface area of the box (all six faces). Include units.

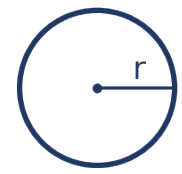
$$SA = 6s^2$$



Answer: 150 cm²

10. A bicycle wheel has a radius of 7 inches. Find the circumference of the wheel. Leave your answer in terms of π. Include units.

$$C = 2\pi r$$



Answer: 14π in

11. Maria deposits $800 into a savings account that earns simple interest at an annual rate of 5% (r = 0.05). Find the interest earned after 2 years. Include units.

$$I = Prt$$

I = interest earned ($); P = principal, the initial amount deposited ($); r = annual interest rate (as a decimal); t = time (years)

I = 800(.05)(2)

= 800(.1)

Answer: $80

12. A family drives at an average speed of 60 miles per hour for 3.5 hours. Find the total distance traveled. Include units.

$$d = rt$$

d = distance traveled; r = rate the object travels at (speed); t = amount of time traveled

Answer: 210 miles

13. A metal block has a mass of 54 grams and a volume of 6 cubic centimeters. Find the density of the metal. Include units.

$$D = \frac{m}{v}$$

D = density; m = mass; v = volume

Answer: 9 grams/cm³

14. The temperature outside is 25°C. Convert the temperature to degrees Fahrenheit. Include units.

$$F = \frac{9}{5}C + 32$$

F = temperature in degrees Fahrenheit; C = temperature in degrees Celsius

Answer: 77°F

15. An electrical circuit has a current of 4 amps and a resistance of 12 ohms. Use Ohm's Law to find the voltage. Include units.

$$V = IR$$

V = voltage (volts); I = current (amps); R = resistance (ohms)

5E11 5×10¹¹ 1,000,000 10·10·10·10·10·10

$1 × 10⁶

$1 × 10⁹

Answer: V = 48 volts

16. A 6-kilogram object is moving at a speed of 4 meters per second. Find its kinetic energy. Include units.

$$KE = \frac{1}{2}mv^2$$

½(6)(4)²

KE = kinetic energy (joules); m = mass (kilograms); v = velocity (meters per second)

Answer: 48 Joules

17. Find the gravitational force between two objects with masses 5×10^{10} kg and 4×10^{10} kg, whose centers are 2×10^{3} m apart. Use $G \approx 6.7\times10^{-11}$ N·m²/kg². Include units. (Calculator)

$$F = \frac{Gm_1m_2}{r^2}$$

F = gravitational force (newtons); G = gravitational constant ≈ 6.7×10^{-11} N·m²/kg²; m_1, m_2 = the masses of the two objects (kg); r = distance between their centers (m)

5×10¹⁰ ← five times 10 to the 10th power

5E10

2×10³ = 2000

2×1000 = 2000

Answer: 33,500 Newtons

18. A stone is thrown straight up from a cliff with an initial speed of 10 m/s. The cliff is 15 meters high. Using g ≈ 10 m/s² (a whole-number model), the stone's height is $y = -5t^2 + 10t + 15$. Setting y = 0 and rearranging gives $0 = 5t^2 - 10t - 15$, in the form $0 = at^2 + bt + c$. Use the formula shown below to find how long it takes the stone to hit the ground.

$$t = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

t = time (seconds); a, b, c = the coefficients from $0 = at^2 + bt + c$ above (here a = 5, b = −10, c = −15)

Answer: t = 3