Using Formulas to Solve Problems

A formula is a mathematical equation that relates two or more variables representing real-world quantities.

Problems in landscaping, construction, and design often involve the use of geometric formulas. The measurements substituted into these formulas must be in the same units.

Example 1: A person's maximum desirable pulse rate, m beats per minute, can be found from the formula, m=220-a if a, the person's age, is known. Find the maximum desirable pulse rate for a person of age 37.

Ans: $a = 37$

Substitute $a=37$ into $m = 220-a$

$m = 220-37$

$= 183$

∴ The maximum desirable pulse rate for a person of age 37 is 183 beats per minute.

Organization is an important part of solving multi-step problems. So, planning and organizing your solutions is key to solving multi-step problems.

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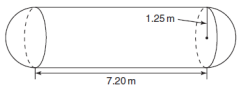
Example 2 (Pg 347: #9): A fuel storage tank consists of a cylinder with radius 1.25 m and length 7.20 m, with hemispheres of radius 1.25 m at each end.



a) Determine the surface area of the tank. Use the formula $SA = 4\pi r^2 + 2\pi rl$, where SA is the surface area of the tank, r is its radius, and l is the length of the cylinder.

b) Determine the cost to cover the tank with 2 coats of paint. One can of paint costs $34.99 and covers an area of 29 m^2.

Ans: a) Given: $r = 1.25$ m, $l = 7.20$ m

Substitute $r = 1.25$ and 7.20 into ②

$S.A._{tank} = 4\pi r^2 + 2\pi rl$

$= 4\pi(1.25)^2 + 2\pi(1.25)(7.20)$

$= 6.25\pi + 18\pi$

$= 24.25\pi$

$\doteq 76.2$

∴ The surface area of the tank is approximately 76.2 m^2.

b) Surface area to be painted $= 2 \times S.A._{tank}$

$= 2 \times 76.2$

$= 152.4$

So, the surface area to be painted is 152.4 m^2.

Next, find the number of cans needed.

$\text{Number of cans} = \frac{152.4}{29}$

$\doteq 5.3$

So, we need 6 cans of paint.

- Finally, find the cost.

Cost = (Number of cans) × (price per can)

$= 6 \times 34.99$

$= 209.94$

∴ It will cost $209.94 to cover the tank with two coats of paint.

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Example 3: Devin is now twice as old as his dog. In 6 years he will be 4 times as old as his dog. How old is Devin? How old is his dog?

Ans: Let x represent Devin's age and let y represent his dog's age.

$\begin{cases} x = 2y \quad \cdots ① \\ x+6 = 4y \quad \cdots ② \end{cases}$ solve the system of equations

- Sub. $x = 2y$ into ②

$2y + 6 = 4y$ ← solve for y

$6 = 4y - 2y$

$6 = 2y$

$\frac{6}{2} = \frac{2y}{2}$

$y = 3$

dog 3 years old, Devin is 6 yo

- Next, substitute $y = 3$ in ① or ② to find x

$x = 2y$

$= 2 \times 3$

$= 6$

∴ Devin is 6 years old and his dog is 3 years old.

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