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Math 7 Notes on Manipulating Formulas

Sometimes in math we need to manipulate (change) a formula so that we can solve for a different variable (unknown).

Example: $Vol = (A \text{ of } B) \cdot H$

this equation works great if we are trying to solve for Vol, but what happens if we want to find H=?

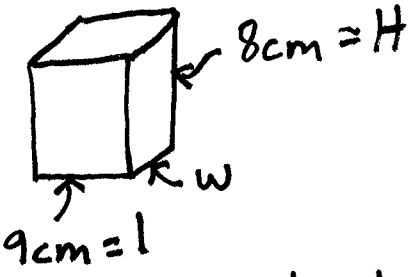
Furthermore: $Vol = \pi \cdot r \cdot r \cdot H$

What if we were trying to solve for r=?

Solution

In math we do what is called manipulating (change) the formulas so that we rearrage it to get the variable (unknown) that we want. There are two rules for this.

1) Simplify = do opposite to reduce to 1
2) What you do to one side, you must do to the other

Ex 

$Vol = 288cm^3$

We want to calculate $w = ?$ We do not have a formula for $w =$, but we do have

$Vol = (A\ of\ B) \cdot H$ work from this

① $Vol = (A\ of\ R) \cdot H$ base is a rectangle

② $Vol = w \cdot l \cdot H$ formula for rectangle

* we want $w =$, so think, what is l and H doing, answer multiplying so do opposite = divide and what you do to one side must do to other

So

becomes $\frac{1}{1} = 1$

③ $\frac{Vol}{l \cdot H} = w \cdot \frac{l}{l} \cdot \frac{H}{H}$

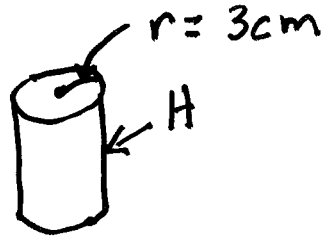
④ $\frac{Vol}{l \cdot H} = w$ now substitute in values given

$\frac{288cm^3}{9cm \cdot 8cm} = w$

$\frac{288cm^3}{72cm^2} = w$ $W = 4\ cm$

$4cm = w$

ex)



$Vol \approx 310.86 cm^3$

$Vol = (A\ of\ B) \cdot H$

① $Vol = (A\ of\ C) \cdot H$

② $Vol = \pi \cdot r \cdot r \cdot H$

③ $\frac{Vol}{\pi \cdot r \cdot r} = \frac{\pi}{\pi} \cdot \frac{r}{r} \cdot \frac{r}{r} \cdot H$

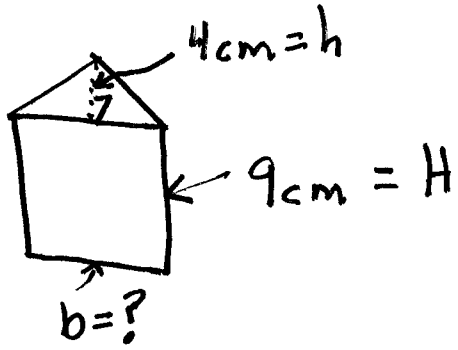
④ $\frac{Vol}{\pi \cdot r \cdot r} = H$

$\frac{310.86 cm^3}{3.14 \cdot 3cm \cdot 3cm} = H$

$\frac{310.86 cm^3}{28.26 cm^2} = H$

$11 cm = H$

ex)



$Vol = 216cm^3$

$Vol = (A\ of\ B) \cdot H$

$Vol = (A\ of\ T) \cdot H$

$Vol = b \cdot h \div 2 \cdot H$

$$\frac{\times 2\ Vol}{h \cdot H} = \frac{b \cdot h \div 2 \cdot H}{h \times 2\ H}$$

$$\frac{2 \times Vol}{h \cdot H} = b$$

$$\frac{2 \times 216\,cm^3}{4cm \cdot 9cm} = b$$

$$\frac{432\,cm^3}{36cm} = b$$

$$12\,cm = b$$

* I suggest you research using the internet some videos (grade 7 level) on the topic of manipulating/changing formulas to solve for variables/unknowns