U3D7_T - Modeling with Formulas

Sunday, March 4, 2018 8:14 PM

U3D7_T - Modeling ...

U3D7 Warm Up: QUIZ then...

Solve. $\frac{2}{3}(3x-1)=\frac{(2-x)}{2}$

Unit 3 - Equations

Day 7 - Modelling with Formulas

Example 1: A ship disappears over the horizon due to the curvature of the earth. The higher you are above the earth, the farther away the horizon appears. The relationship between how high you are and how far you can see is given by the formula, where h is your height in metres, above the ground and d is the distance in kilometres to the horizon. $d = 2\sqrt{3.2h}$

a) How far can you see from the CN Tower's 360 degree Restaurant (351m above the ground)? $h = 351$

$d = 2\sqrt{3.2(351)}$

$d \doteq 67.0$

∴ you can see about 67 km

On your calc.

√ 4 = Ans 2

OR

4 √ Ans. 2

2 × √ (3.2 × 351) =

3.2 × 351 = √ × 2 =

b) How high would you have to go for the horizon to appear to be 100 km away?

$d = 100$

Method 1: Substitute and then Rearrange

$d = 2\sqrt{3.2h}$

$2\sqrt{3.2h} = 100$

$\frac{2\sqrt{3.2h}}{2} = \frac{100}{2}$

$\sqrt{3.2h} = 50$

$(\sqrt{3.2h})^2 = (50)^2$

* the opposite of $\sqrt{}$ is 'squaring' so square both sides

$3.2h = 2500$

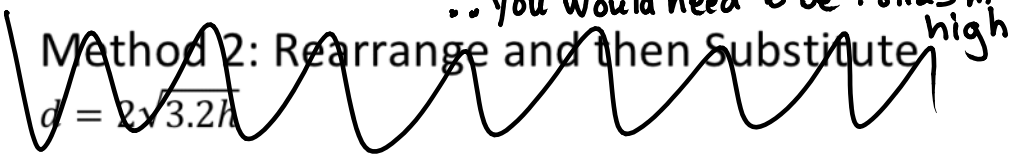
$\frac{3.2h}{3.2} = \frac{2500}{3.2}$

$h = 781.25$

∴ you would need to be 781.25 m high

Method 2: Rearrange and then Substitute

$d = 2\sqrt{3.2h}$



Example 2: Rearrange the following equations for the indicated variable:

a) Given the equation $d = a + b$, express a in terms of b and d

* means isolate 'a' (get 'a' by itself).

$$a + b = d$$

$$a + b - b = d - b$$

$$\boxed{a = d - b}$$

b) Rearrange $C = 2\pi r$ to isolate r

$$\frac{2\pi r}{2\pi} = \frac{C}{2\pi}$$

$$r = \frac{C}{2\pi}$$

Rearranging an equation with more than one step.

Example 3: The equation of a line relates y to x, m, and b: y = mx + b. Rearrange this equation to express x in terms of y, m and b.

$$mx + b = y$$
$$mx + b - b = y - b$$
$$mx = y - b$$
$$\frac{mx}{m} = \frac{y-b}{m}$$
$$x = \frac{y-b}{m}$$

** Note we'll talk more about the significance of m and b in this equation in a later chapter!!!

Steps:

1. Isolate the variable term
2. Isolate the variable

Example 4: The kinetic energy of an object depends on its mass and how it is moving and can be modelled by the formula: $E = \frac{1}{2}mv^2$, where E is the kinetic energy, in joules, m is the mass, in kilograms, and v is the speed, in metres per second. If the mass of an object is 25 kilograms and it has a kinetic energy of 125 joules, what is the object's velocity?

$E = 125 \quad m = 25 \quad v = ?$

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

$\frac{1}{2}(25)v^2 = (125)$

$\frac{2}{25} \times \frac{25}{2}v^2 = 125 \times \frac{2}{25}$ ÷ $\frac{25}{2}$ is the same as $\times \frac{2}{25}$

$v^2 = \frac{125}{1} \times \frac{2}{25}$

$v^2 = 10$

$v = \pm\sqrt{10}$

$(-2)^2 = 4$

$(2)^2 = 4$

∴ the velocity is $\sqrt{10}$ m/s OR $-\sqrt{10}$ m/s.

U3D7 Practice: Pg. 215-219 #1-3, 6-8, 10-12, 15, 16a

Challenge: Page 219 #18, 19