

## Bell work

IXL

J.3, J.4, C.7, E.1, E.4

## 2.2 SOLVING FOR A VARIABLE

ESSENTIAL QUESTION: HOW DO YOU REWRITE FORMULAS AND LITERAL EQUATIONS?

CED.A.4 - REARRANGE FORMULAS TO HIGHLIGHT A QUANTITY OF INTEREST, USING THE SAME REASONING AS IN SOLVING AN EQUATION

STUDENTS WILL EXPLAIN TO A PARTNER HOW TO SOLVE AN EQUATION FOR A SPECIFIED VARIABLE.

### VOCAB

**Literal Equations** - equations that contain two or more variables

By using inverse operations and the properties of equality, a formula can be rearranged so any variable in the formula can be isolated. It is no different than how equations are solved by using inverse operations and the properties of equality.

Literal "letter" equations: an equation that uses more than one letter as a variable.

- ✦  $D=rt$
- ✦  $A=bh$
- ✦  $C=\pi d$
- ✦  $I=prt$

You can solve the equation for any of the variables.

### In table partners...

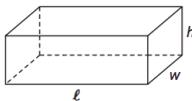
Solve the equation,  $42 = 6x$

Be able to explain how and why you did each step.

### Volume of a prism

~~$V = lwh$~~

This formula can be rearranged to isolate any variable.



Isolate the variable h

$$\frac{V}{lw} = \frac{lwh}{lw} \quad h = \frac{V}{lw}$$

Isolate the variable l

~~$V = l \cdot w \cdot h$~~ 

$$\frac{V}{wh} = \frac{l \cdot w \cdot h}{wh} \quad l = \frac{V}{wh}$$

### Explain 1 Rearranging Scientific Formulas

Use inverse operations to isolate the unknown variable in a scientific formula.

The formula for density is  $D = \frac{m}{v}$ . Lead has a very high density of 11,340 kg/m<sup>3</sup>. Plastic foam has a very low density of 75 kg/m<sup>3</sup>. The formula for density can be rearranged to solve for V, volume or m, mass.

A sinker on a fishing line is made of lead and has a volume of 0.000015 m<sup>3</sup>. What is the mass of the sinker?

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

$$m = DV$$

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

$$m = 11340 (0.000015)$$

$$m = 0.1701 \text{ kg}$$

The design for a life preserver requires 0.3 kilogram of plastic foam to provide proper buoyancy. What is the volume of the plastic foam required?

Handwritten solution for the volume of plastic foam:

$$V = \frac{0.3 \text{ Kg}}{75 \text{ Kg/m}^3}$$

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

$$V \cdot D = \frac{m}{\cancel{D}} \cdot \cancel{D}$$

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

The final answer is circled:  $0.004 \text{ m}^3$

For altitudes up to 36,000 feet, the relationship between ground temperature and atmospheric temperature can be described by the formula  $t = -0.0035a + g$ , in which  $t$  is the atmospheric temperature in degrees Fahrenheit,  $a$  is the altitude, in feet, at which the atmospheric temperature is measured, and  $g$  is the ground temperature in degrees Fahrenheit. Determine the altitude in feet when  $t$  is  $-27.5^\circ\text{F}$  and  $g$  is  $60^\circ\text{F}$ .

**Explain 2 Rearranging Literal Equations**

Using inverse operations to rearrange literal equations can be applied to any formula. The interest formula,  $I = prt$ , is another example of a literal equation. In the formula,  $I$  represents interest,  $p$  the principal or the initial amount to which interest will be applied,  $r$  the rate at which interest will be paid, and  $t$  is the time in years.

Find the number of years used in the calculation of a \$1000 loan at an interest rate of 5% with interest totaling \$600.

Handwritten solution for the interest problem:

$$t = \frac{I}{PR} = \frac{600}{(1000)(0.05)} = 12 \text{ yrs}$$

Determine the interest rate for a \$2000 loan that will be paid off in 4 years with interest totaling \$640.

The formula  $y = mx + b$  is the slope-intercept form of the equation of a line. Solve the equation for  $m$ .

## 2.3 Homework

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