

**Topic:** Simple equations with subscripts

**Question:** In chemistry we learn that under certain conditions the pressure and volume of a gas are related according to the equation  $P_1V_1 - P_2V_2 = 0$ .

$P_1$  and  $V_1$  are the original pressure and volume.

$P_2$  and  $V_2$  are the new pressure and volume.

The original pressure is 1.2, and the original volume is 150.

If the new pressure is 36, what is the new volume?

**Answer choices:**

- A     0.200
- B     0.288
- C     3.47
- D     5.00



**Solution: D**

We're starting with

$$P_1 = 1.2 \text{ and } V_1 = 150$$

$$P_2 = 36 \text{ and } V_2 = ?$$

Substitute these values into the equation.

$$P_1 V_1 - P_2 V_2 = 0$$

$$1.2 \cdot 150 - 36 \cdot V_2 = 0$$

Add  $36 \cdot V_2$  to both sides.

$$1.2 \cdot 150 = 36 \cdot V_2$$

Divide both sides by 36.

$$\frac{1.2 \cdot 150}{36} = V_2$$

$$5.00 = V_2$$



**Topic:** Simple equations with subscripts

**Question:** Suppose a car travels at a constant speed of 60 mph for 135 miles, then speeds up and travels at a new constant speed for another 216 miles. If the total time for the trip is 5.25 hours, how fast does the car go during the second part of the trip?

Use this equation:

$$\frac{d_1}{v_1} + \frac{d_2}{v_2} = t$$

$d_1$  and  $d_2$  are the first distance and the second distance.

$v_1$  and  $v_2$  are the first speed and the second speed.

$t$  is the time for the trip.

**Answer choices:**

- A 70 mph
- B 72 mph
- C 74 mph
- D 76 mph



**Solution: B**

We're starting with

$$d_1 = 135 \text{ and } d_2 = 216$$

$$v_1 = 60 \text{ and } v_2 = ?$$

$$t = 5.25$$

Plug these values into the equation.

$$\frac{d_1}{v_1} + \frac{d_2}{v_2} = t$$

$$\frac{135}{60} + \frac{216}{v_2} = 5.25$$

$$\frac{216}{v_2} = 5.25 - \frac{135}{60}$$

$$\frac{216}{v_2} = 5.25 - 2.25$$

$$\frac{216}{v_2} = 3.00$$

$$216 = 3.00v_2$$

$$\frac{216}{3.00} = v_2$$

$$72 = v_2$$



**Topic:** Simple equations with subscripts

**Question:** A house has three grassy yards. The dimensions of the front yard are  $l_f = 50$  ft by  $w_f = 22$  ft. The side yard is  $l_s = 40$  ft by  $w_s = 12$  ft, and the back yard is  $l_b = 50$  ft by an unknown  $w_b$ . If the total grassy area is 3,180  $\text{ft}^2$ , what is the width of the back yard? Use the given equation for total area.

$$A = l_f w_f + l_s w_s + l_b w_b$$

**Answer choices:**

- A     32 ft
- B     51.2 ft
- C     76 ft
- D     95.2 ft



**Solution: A**

Plugging everything we've been given into the formula for total area gives

$$A = l_f w_f + l_s w_s + l_b w_b$$

$$3,180 = 50 \cdot 22 + 40 \cdot 12 + 50 \cdot w_b$$

$$3,180 = 1,100 + 480 + 50w_b$$

$$3,180 = 1,580 + 50w_b$$

Subtract 1,580 from both sides.

$$3,180 - 1,580 = 1,580 - 1,580 + 50w_b$$

$$1,600 = 50w_b$$

Divide both sides by 50.

$$\frac{1,600}{50} = w_b$$

$$32 = w_b$$

