

## C: Solving Two-Step $\frac{ax}{b} + c = d$ Equations Continued

### Examples:

1. The amount of sleep needed by people 18 years old or <sup>younger</sup> can be modelled by the equation  $s = 10 - \frac{a}{6}$ ; where the amount of sleep in hours is  $s$ , and the age in years is  $a$ .

a) If 8h is the amount of sleep Kayla needs, how old is she likely to be?

$$s = 8$$

$$s = 10 - \frac{a}{6}$$

$$8 = 10 - \frac{a}{6}$$

isolate

Isolate the term with variable.

$$8 = 10 - \frac{a}{6}$$

"Get rid of 10"

$$-2 = -\frac{a}{6}$$

"Get rid of  $\div 6$ "

$$-2 \times 6 = -\frac{a}{6} \times 6$$

$$-12 = -a$$

$$\frac{-12}{-1} = \frac{-a}{-1}$$

"Get rid of -1"

$$12 = a$$

Kayla is likely 12 yrs. old.

b) Jill is 16. She gets 6h of sleep each night. Is this enough?

$$a = 16$$

$$s = 10 - \frac{a}{6}$$

$$= 10 - \frac{16}{6}$$

Substitute 16 in for  $a$ .

$$= 10 - 2.\bar{6}$$

Solve using BEDMAS

$$= 7.\bar{3} \text{ h.}$$

Jill is not getting enough sleep she should be sleeping  $7.\bar{3}$ h.

2. The cost of a concert ticket for a student is \$3 less than three quarters of the cost for an adult. The cost of a student ticket is \$6. Write and solve an equation to determine the cost of an adult ticket.

Use sentence to figure out operation

a - adult ticket  
s - student ticket

$$s = \underbrace{\$3 \text{ less}}_{-3} \text{ than } \underbrace{\text{three quarters an adult}}_{\frac{3}{4}a}$$

Re-write based on operations.

$$s = \frac{3}{4}a - 3$$

$$s = \frac{3a}{4} - 3$$

Solve.

$$s = \$6$$

$$6 = \frac{3a}{4} - 3$$

Isolate term with variable.

$$+3 \quad +3$$

$$9 = \frac{3a}{4}$$

Cross multiply.

$$\frac{9}{1} \times \frac{3a}{4}$$

$$36 = 3a$$

Divide by 3 to solve for a.

$$\frac{36}{3} = \frac{3a}{3}$$

$$\boxed{\$12 = a}$$

An adult ticket costs \$12.

3. T is air temperature in °C at an altitude of "h" metres, and t is the ground temp in °C.  $T = t - \frac{h}{150}$

a) If the ground temp is 18°C what is temperature at 6000m?

$$T = t - \frac{h}{150}$$

$$t = 18 ; h = 6000$$

$$= 18 - \frac{6000}{150}$$

Solve using BEDMAS.

$$= 18 - 40$$

$$\boxed{= -22^\circ\text{C}}$$

The temperature at 6000m is -22°C.

b) What is the altitude if the outside air temperature is  $-40^{\circ}\text{C}$ ?

$$T = t - \frac{h}{150} \quad t = 18^{\circ}\text{C} \text{ from part "a"}. \quad T = -40^{\circ}\text{C}$$

$$-40 = 18 - \frac{h}{150} \quad \text{Isolate term with variable.}$$

$$\begin{array}{r} -40 = 18 - \frac{h}{150} \\ -18 \quad -18 \end{array} \quad \text{"Get rid of 18"}$$

$$-58 = -\frac{h}{150} \quad \text{"Get rid of 150"}$$

$$-58 \times 150 = -\frac{h}{150} \times 150$$

$$-8700 = -h \quad \text{"Get rid of -1"}$$

$$\frac{-8700}{-1} = \frac{h}{1}$$

$8700\text{m} = h$  At 8700m the air temperature is  $-40^{\circ}\text{C}$ .

Assignment: Pg. 392 #12-17.

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