Lesson: Rearranging Formulas

Example 1

A = L x w, solve for L

$$\frac{A}{w} = \frac{L \times \cancel{w}}{\cancel{w}}$$

$$\frac{A}{w} = L$$

Example 2

P = 2L + 2w, solve for w

$$P - 2L = 2w$$

$$\frac{P-2L}{2} = \frac{\cancel{2}w}{\cancel{2}}$$

$$\frac{P-2L}{2} = w$$

Example 3

C = 2πr, solve for r

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

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

Example 4

y = mx + b, solve for m

$$y - b = mx$$

$$\frac{y-b}{x} = \frac{m\cancel{x}}{\cancel{x}}$$

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

Example 5

A = s^2, solve for s

Square root both sides

$$\sqrt{A} = \sqrt{s^{\cancel{2}}}$$

$$\sqrt{A} = s$$

or

$$s = \sqrt{A}$$

Practice: Rearranging Formulas

Substitute, then solve for the unknown variable:

a. y = mx + b; y = 10, m = 3, b = 4

$$10 = 3x + 4$$

$$10 - 4 = 3x$$

$$6 = 3x$$

$$\frac{6}{3} = \frac{\cancel{3}x}{\cancel{3}}$$

$$2 = x \quad \text{or} \quad \boxed{x = 2}$$

b. I = Prt; I = $30, P = $1000, t=0.5years

$$30 = 1000 \times r \times 0.5$$

$$30 = 500 \times r$$

$$\frac{30}{500} = \frac{\cancel{500} \times r}{\cancel{500}}$$

$$0.06 = r \quad \text{or} \quad \boxed{r = 0.06}$$

c. P = 2(l+w); P = 100m, l=30m

$100 = 2(30+w)$
$100 = 60+2w$
$100-60 = 2w$
$40 = 2w$
$\frac{40}{2} = w$
$\boxed{w = 20m}$

d. S = $\frac{d}{t}$; S=120km/h, t=4h

$120 = \frac{d}{4}$ → $120 \cdot 4 = d$
$\boxed{d = 480km}$

Rearrange each formula for the indicated variable.

e. y = mx + b, solve for x

$\frac{y-b}{m} = \frac{\cancel{m}x}{\cancel{m}}$
$\boxed{\frac{y-b}{m} = x}$

f. I = Prt, solve for r

$\frac{I}{Pt} = r$ or $\boxed{r = \frac{I}{Pt}}$

g. S = $\frac{d}{t}$, solve for d

$S \cdot t = d$ or $\boxed{d = S \cdot t}$

h. P = 2(l+w), solve for l

$P = 2L + 2w$
$P - 2w = 2L$
$\frac{P-2w}{2} = \frac{\cancel{2}L}{\cancel{2}}$
$\boxed{L = \frac{P-2w}{2}}$

i. $x^2 + y^2 = r^2$, solve for x

square root both sides
$x^2 = r^2 - y^2$
$\sqrt{x^2} = \sqrt{r^2 - y^2}$
$\boxed{x = r - y}$

j. A = P(1 + rt), solve for r

$A = P + Prt$
$A - P = Prt$
$\frac{A-P}{P \cdot t} = \frac{Prt}{P \cdot t}$
$\boxed{r = \frac{A-P}{P \cdot t}}$

k. It is not safe for an adult to surpass her or his maximum heart rate. This maximum heart rate, M, in beats per minute (bpm), is modeled by the equation M=230 – 1.2A, where A is the age of the adult in years.

Rearrange to solve for A.

$M = 230 - 1.2A$
$M + 1.2A = 230$
$1.2A = 230 - M$
$\frac{\cancel{1.2}A}{\cancel{1.2}} = \frac{230 - M}{1.2}$
$\boxed{A = \frac{230-M}{1.2}}$

At what age should a person's maximum exercising heart rate be 194 bpm? 134 bpm?

$A = \frac{230-194}{1.2}$
$A = \frac{36}{1.2}$
A = 30 years old

$A = \frac{230-134}{1.2}$
$A = \frac{96}{1.2}$
A = 80 years old

l. The cost, C, in dollars, of producing a school yearbook is given by the formula C=S+4n, where S is the setup cost, and n is the number of yearbooks printed.

Solve the formula for n.

$C = S + 4n$
$C - S = 4n$
$\frac{C-S}{4} = \frac{\cancel{4}n}{\cancel{4}}$
$\frac{C-S}{4} = n$

If the set-up cost is $925, how many yearbooks can be printed? If C=$1500?

$n = \frac{C-S}{4}$
$n = \frac{1500-925}{4}$
$n = 143$

ANSWERS: a) x=2, b) r=0.06 (6%), w=20m, d) d=480km, e) x= $\frac{y-b}{m}$, f) r= $\frac{I}{Pt}$, g) d=st, h) l = $\frac{p-2w}{2}$, i) x= r – y,

j) r= $\frac{A-P}{Pt}$, k) A= $\frac{M-230}{-1.2}$:30yrs:80yrs, l) n= $\frac{C-S}{4}$:143 yearbooks