Lesson: Rearranging Formulas

Example 1

\[ A = L \times w, \] solve for \( L \)

\[ \frac{A}{w} = \frac{L}{w} \]

Example 2

\[ P = 2L + 2w, \] solve for \( w \)

\[ \frac{P - 2L}{2} = \frac{2w}{2} \]

\[ \frac{P - 2L}{2} = w \]

Example 3

\[ C = 2\pi r, \] solve for \( r \)

\[ \frac{C}{2\pi} = \frac{r}{2\pi} \]

\[ \frac{C}{2\pi} = r \]

Example 4

\[ y = mx + b, \] solve for \( m \)

\[ y - b = mx \]

\[ \frac{y - b}{x} = \frac{mx}{x} \]

\[ \frac{y - b}{x} = m \]

Example 5

\[ A = s^2, \] solve for \( s \)

Square root both sides

\[ \sqrt{A} = \sqrt{s^2} \]

\[ \sqrt{A} = s \]

\[ s = \sqrt{A} \]

Practice: Rearranging Formulas

Substitute, then solve for the unknown variable:

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

\[ 10 = 3x + 4 \]

\[ 10 - 4 = 3x \]

\[ 6 = 3x \]

\[ \frac{6}{3} = \frac{3x}{3} \]

\[ 2 = x \] or \( x = 2 \)

b. \( I = Prt; I = 30, P = 1000, t = 0.5 \) years

\[ 30 = 1000 \times r \times 0.5 \]

\[ 30 = 500r \]

\[ \frac{30}{500} = \frac{500r}{500} \]

\[ 0.06 = r \] or \( r = 0.06 \)
Rearrange each formula for the indicated variable.

e. \( y = mx + b \), solve for \( x \)
\[
\frac{y-b}{m} = x
\]

f. \( I = Prt \), solve for \( r \)
\[
\frac{I}{Pt} = r \quad \text{or} \quad r = \frac{I}{Pt}
\]

g. \( S = \frac{d}{t} \), solve for \( d \)
\[
S \cdot t = d \quad \text{or} \quad d = S \cdot t
\]

h. \( P = 2(l+w) \), solve for \( l \)
\[
\frac{P-2w}{2} = l
\]

i. \( x^2 + y^2 = r^2 \), solve for \( x \)
\[
\sqrt{x^2} = \sqrt{r^2 - y^2} \quad \text{or} \quad x = r - y
\]

j. \( A = P(1 + rt) \), solve for \( r \)
\[
\frac{A - P}{P \cdot t} = r
\]

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 \( A \).
\[
M = 230 - 1.2A \\
M + 1.2A = 230 \\
1.2A = 230 - M \\
A = \frac{230 - M}{1.2}
\]

At what age should a person’s maximum exercising heart rate be 194 bpm? 134 bpm?
\[
A = \frac{230 - 194}{1.2} = 36 \quad \text{or} \quad A = \frac{230 - 134}{1.2} = 96
\]

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 \( n \).
\[
C - S = 4n \\
\frac{C - S}{4} = n
\]

If the set-up cost is $925, how many yearbooks can be printed? If \( C = $1500? \)
\[
n = \frac{C - S}{4} = \frac{1500 - 925}{4} = 143
\]

ANSWERS: a) \( x = 2 \), b) \( r = 0.06 \) (6%), c) \( w = 20 \) m, d) \( d = 480 \) km, 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) \( A = \frac{M - 230}{-1.2} \) :30 yrs:80 yrs, l) \( n = \frac{C - S}{4} :143 \) yearbooks