Algebra Formulas

Log Formulas:

$\log_n(ab) = \log_n a + \log_n b$

$\log_n\left(\frac{a}{b}\right) = \log_n a - \log_n b$

$\log_n(a)^b = b \cdot \log_n a$

$\log_n n = 1 \qquad \ln e = 1$

$\log_n 1 = 0$

$\log_n a = b \Rightarrow n^b = a$

$\log_n a = \frac{\log a}{\log n} = \frac{\ln a}{\ln n}$

Interest Formulas:

$A = Pe^{rt}$ Compounded Continuously

$A = P\left(1 + \frac{r}{n}\right)^{nt}$ Compounded n times per year

$I = \Pr t$ Simple Interest

Linear Formulas:

$slope = \frac{y_2 - y_1}{x_2 - x_1}$

$y = mx + b$ Slope-Intercept Form

$y - y_1 = m(x - x_1)$ Point-Slope Form

**Perpendicular Lines = opposite reciprocal slopes. Ex: $m_1 = \frac{3}{4}$ Perp. slope = $-\frac{4}{3}$

**Parallel Lines = same exact slope

Ex: $m_1 = \frac{3}{4}$ Parallel slope = $\frac{3}{4}$

Quadratic Equations:

General Form: $y=ax^2+bx+c$

Vertex: $x = -\frac{b}{2a}$ Substitute x into original equation to find y-value

X-intercept: Solve quadratic Formula:

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ Written as: $(x, 0)$

Y-intercept: always c-value if in general form Written as: $(0, y)$

Standard Form: $y - k = a(x - h)^2$

Vertex: (h, k)

X-intercept: Substitute 0 for y and solve for x Written as: $(x, 0)$

Y-intercept: Substitute 0 for x and solve for y Written as: $(0, y)$

Sequences and Series:

Arithmetic Sequences

$a_n = a_1 + (n-1) \cdot d$

To Sum an arithmetic Sequence:

$s_n = \frac{n}{2}(a_1 + a_n)$ Or $s_n = \frac{n}{2}(2a_1 + (n-1) \cdot d)$

Geometric Sequences

$a_n = a_1 \cdot r^{n-1}$

To Sum a geometric Sequence:

$s_n = \frac{a_1(r^n - 1)}{r - 1}$ Or $s_{\text{infinite}} = \frac{a_1}{1 - r}$

Rational Equations

Ex. $y=\frac{2x+5}{x^2-4}$

Vertical Asymptote: set denominator = 0 and solve for x

Horizontal Asymptote:

- Degree of numerator > degree of denominator
  No Horizontal Asymptote
- Degree of numerator < degree of denominator
  y = 0
- Degree of numerator = degree of denominator
  y = Ratio of Num. to Den.

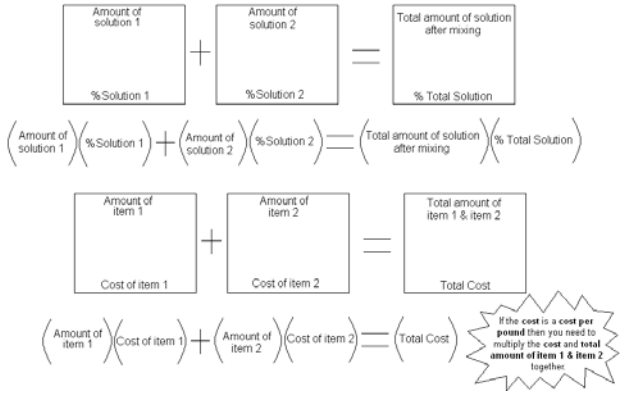
Domain: Opposite of the Vertical Asymptote
Ex. **VA**: x=4 **Domain**: x≠4 or All real numbers except when x=4

Range: Look on the graph, the range are the y-values that the graph includes

X-Intercept: Set y=0 and solve for x

Y-Intercept: Set x=0 and solve for y

Mixture Word Problems

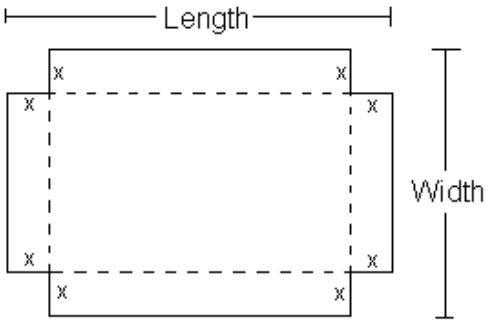


Profit Revenue Cost Problems

Revenue = (Price)(Quantity)
Cost = (Variable Cost)(Quantity) + Fixed Costs
Profit = Revenue – Cost

To Find Break-Even Amount
Set Profit = 0 (solve for x)
or
Revenue = Cost (solve for x)

Box Word Problems



Volume = (Length-2x)(Width-2x)(x)
$Area_{box}$ = (Length-2x)(Width-2x)
$Area_{material}$ = (Length)(Width)

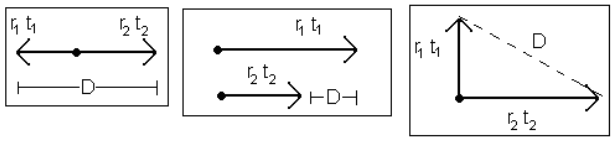
Working Together Word Problems

$$\frac{1}{\text{Time for person 1}}+\frac{1}{\text{Time for person 2}}=\frac{1}{\text{Time for working together}}$$

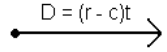
*multiply by common denominator to get rid of fractions.

Distance / Traveling Word Problems

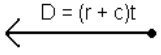
Distance = rate x time



$D = r_1t_1 + r_2t_2$ $D = r_1t_1 - r_2t_2$ $D = \sqrt{r_1t_1 + r_2t_2}$



Upstream (against wind)



Downstream (with wind)

r = speed of boat in still water
c = speed of current
t = time
D = distance