

# Algebra

## Properties of Real Numbers

Commutative:  $a + b = b + a$ ;  $ab = ba$

Associative:  $a + (b + c) = (a + b) + c$ ;  
 $a(bc) = (ab)c$

Distributive:  $a(b + c) = ab + ac$

Additive Identity:  $a + 0 = 0 + a = a$

Multiplicative Identity:  $a \cdot 1 = 1 \cdot a = a$

Additive Inverse:  $-a + a = a + (-a) = 0$

Multiplicative Inverse:  $a \cdot \frac{1}{a} = 1, a \neq 0$

## Fractions

$$\frac{a}{b} \pm \frac{c}{b} = \frac{(a \pm c)}{b}$$

$$\frac{a}{b} \pm \frac{c}{d} = \frac{ad \pm bc}{bd}$$

$$\frac{ab}{ac} = \frac{b}{c} \quad \text{Where } a \text{ and } c \neq 0$$

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$$

$$\frac{a}{b} \div \frac{c}{d} = \frac{ad}{bc}$$

## Exponents and Radicals

$$a^m \cdot a^n = a^{m+n} \quad a^{-n} = \frac{1}{a^n}$$

$$(a^m)^n = a^{mn} \quad a^0 = 1; 7^0 = 1$$

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m} \quad 8^{2/3} = (\sqrt[3]{8})^2 = (2)^2 = 4$$

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$(ab)^m = a^m b^m$$

## Factoring

$$a^2 - b^2 = (a + b)(a - b)$$

*difference of perfect squares*

$$a^2 + 2ab + b^2 = (a+b)^2$$

$$a^2 - 2ab + b^2 = (a-b)^2$$

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

$$a^3b - ab = ab(a^2 - 1) = ab(a + 1)(a - 1)$$

## Changing Fractions to Decimals to Percents

1	1.0	100%
3/4	.75	75%
2/3	.667	66.7%
1/2	.50	50%
1/3	.333	33.3%
1/4	.25	25%
1/5	.20	20%
1/6	.167	16.7%
1/7	.142	14.2%
1/8	.125	12.5%
1/9	.111	11.1%
1/10	.10	10%

To change a fraction  $\frac{\text{(numerator)}}{\text{(denominator)}}$  to a decimal, divide the denominator into the numerator.

To change a decimal to a percent, move the decimal point two (2) places to the right and add the percent sign (%)