

ACT Fact Sheet ... Algebra

Arithmetic and Algebra

Properties of Exponents and Radicals

$$a^n \cdot a^m = a^{n+m}$$

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

$$(a^n)^m = a^{nm}$$

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

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

$$a^{-n} = \frac{1}{a^n}$$

$$\frac{1}{a^{-n}} = a^n$$

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

$$\sqrt[n]{a} = a^{\frac{1}{n}}$$

$$\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$$

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

$$\sqrt[n]{a^m} = a^{\frac{m}{n}}$$

Generic Formulas

Quadratic Formula: For $ax^2 + bx + c = 0$, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Arithmetic Mean: $\frac{\text{Sum of Terms}}{\text{Number of Terms}}$

Event Probability: $\frac{\text{Desired Outcomes}}{\text{Possible Outcomes}}$

Distance: $\text{Distance} = \text{Rate} \cdot \text{Time}$

Percent Growth/Decay: $\text{Original}(1 \pm r_1)(1 \pm r_2) \dots$

Percent Change: $\frac{\text{New} - \text{Old}}{\text{Old}} \cdot 100\%$

In Percent Growth or Decay, r_1, r_2, \dots are the percents an amount is being changed by each year, month, etc.

Arithmetic Sequence/Series

Common Difference: $d = a_{n+1} - a_n$

Find the n^{th} term: $a_n = a_1 + (n - 1)d$

Sum the first n terms: $S_n = \frac{n}{2}(a_1 + a_n)$

Geometric Sequence/Series

Common Ratio: $r = \frac{a_{n+1}}{a_n}$

Find the n^{th} term: $a_n = a_1 r^{n-1}$

Sum the first n terms: $S_n = a_1 \left(\frac{1 - r^n}{1 - r}\right)$

Counting and Ordering

Combination (Order Doesn't Matter): ${}_n C_r = \frac{n!}{r!(n-r)!}$

Permutation (Order Does Matter): ${}_n P_r = \frac{n!}{(n-r)!}$

Remember, n is the number of choices you have, and r is how many you are going to choose.

Properties of Logarithms

$$\log_a a^x = x$$

$$x \log_a y = \log_a y^x$$

$$\log_a x + \log_a y = \log_a (xy)$$

$$\log_a x - \log_a y = \log_a \left(\frac{x}{y}\right)$$