ALGEBRA 2 B – FORMULAS

Properties of Exponents

For any nonzero number a and any integers m and n,

$a^0 = 1$ $\qquad (ab)^n = a^n b^n$

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

$a^{-n} = \frac{1}{a^n}$ $\qquad (a^m)^n = a^{mn}$

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

$a^{\frac{1}{n}} = \sqrt[n]{a}$ and $a^{\frac{m}{n}} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$.

Combining Radical Expressions: Products

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers, then $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$.

Combining Radical Expressions: Quotients

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers and $b \neq 0$,

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

Direct Variation

$y = kx$ or $\frac{y}{x} = k$, where $k \neq 0$.

Inverse Variation

$xy = k$, $y = \frac{k}{x}$, or $x = \frac{k}{y}$, where $k \neq 0$.

Arithmetic Sequence

A recursive definition for an arithmetic sequence with a starting value a and a common difference d has two parts:

$a_1 = a$: initial condition

$a_{n+1} = a_n + d$, for $n \geq 1$: recursive formula

An explicit definition for this sequence is the formula:

$a_n = a + (n - 1)d$ for $n \geq 1$.

Geometric Sequence

A recursive definition for a geometric sequence with a starting value a and a common ratio r has two parts:

$a_1 = a$: initial condition

$a_{n+1} = a_n \cdot r$, for $n \geq 1$: recursive formula

An explicit definition for this sequence is the formula:

$a_n = ar^{n-1}$, for $n \geq 1$.

Sum of a Finite Arithmetic Series

The sum S_n of a finite arithmetic series

$a_1 + a_2 + a_3 + \cdots + a_n$ is $S_n = \frac{n}{2}(a_1 + a_n)$

where a_1 is the first term, a_n is the nth term, and n is the number of terms.

Sum of a Finite Geometric Series

The sum S_n of a finite geometric series

$a_1 + a_1r + a_1r^2 + \cdots + a_1r^{n-1}$ is $S_n = \frac{a_1(1 - r^n)}{1 - r}$

where a_1 is the first term, r is the common ratio, and n is the number of terms.

Sum of an Infinite Geometric Series

An infinite geometric series with $|r| < 1$ converges to the sum S given by the following formula:

$S = \frac{a_1}{1 - r}$.

Fundamental Counting Principle

If event M can occur in m ways and is followed by event N that can occur in n ways, then event M followed by event N can occur in $m \cdot n$ ways.

Number of Permutations

The number of permutations of n items of a set arranged r items at a time is

${}_nP_r = \frac{n!}{(n - r)!}$ for $0 \leq r \leq n$.

Number of Combinations

The number of combinations of n items of a set chosen r items at a time is

${}_nC_r = \frac{n!}{r!(n - r)!}$ for $0 \leq r \leq n$.

Probability of *A* and *B*

If A and B are independent events, then
$P(A \text{ and } B) = P(A) \cdot P(B)$.

Probability of *A* or *B*

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
If A and B are mutually exclusive events, then
$P(A \text{ or } B) = P(A) + P(B)$.

Conditional Probability

For any two events A and B with $P(A) \neq 0$, the probability of event B, given event A, is:

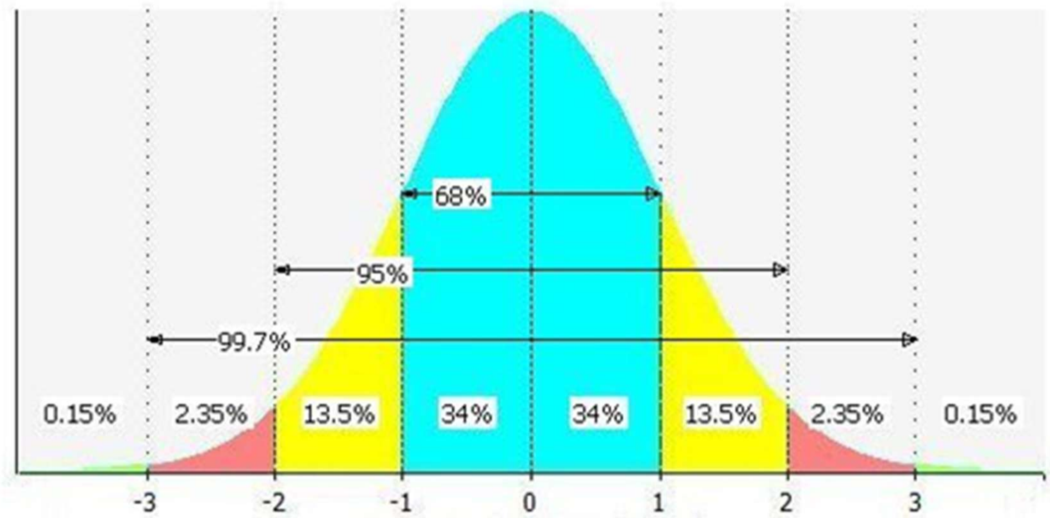
$P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$

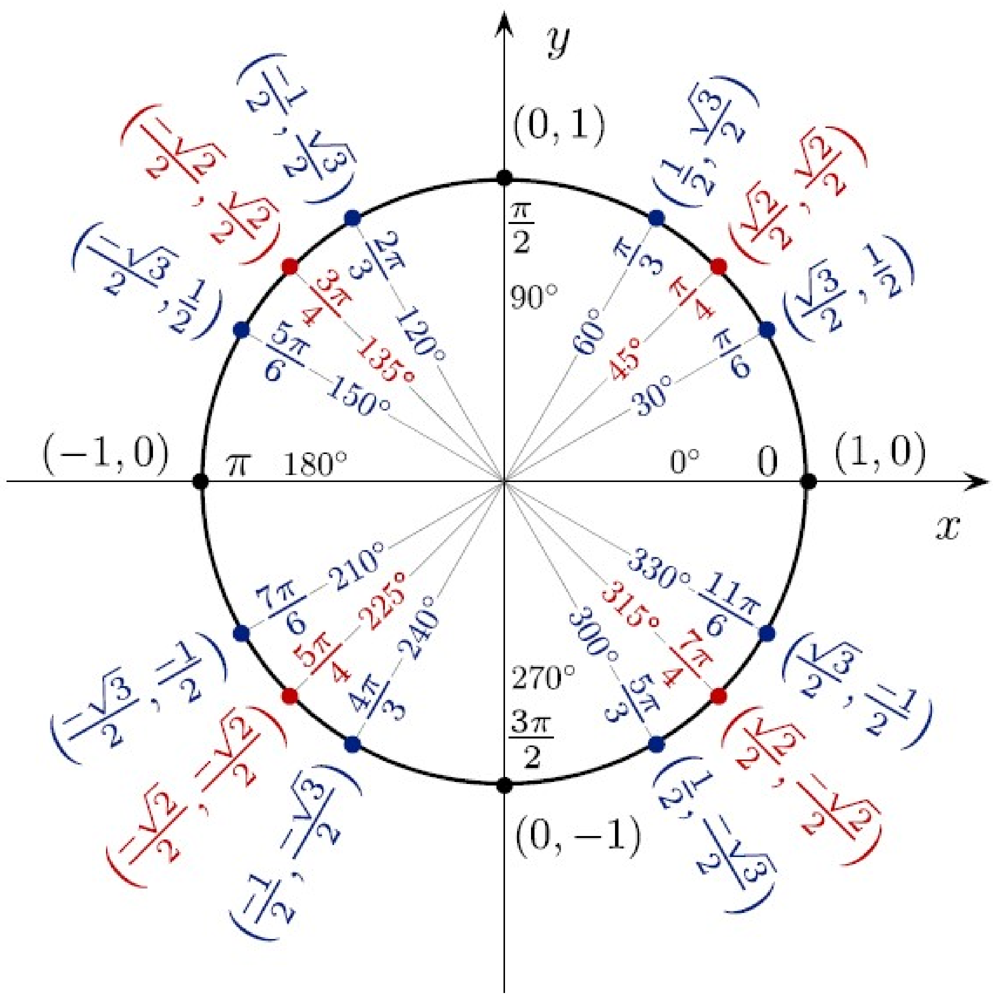
Binomial Theorem Using Combinations

For every positive integer n, use the combinations formula ${}_nC_r$ to expand $(a + b)^n$:

$$(a + b)^n = {}_nC_0a^n + {}_nC_1a^{n-1}b + {}_nC_2a^{n-2}b^2 + \cdots + {}_nC_{n-1}ab^{n-1} + {}_nC_nb^n$$

% of Data in Regions of Any Normal Distribution





Convert Between Radians and Degrees

Use the proportion $\frac{d°}{180°} = \frac{r \text{ radians}}{\pi \text{ radians}}$ to convert between radians and degrees.

To convert degrees to radians, multiply by $\frac{\pi \text{ radians}}{180°}$.

To convert radians to degrees, multiply by $\frac{180°}{\pi \text{ radians}}$.

Length of an Intercepted Arc

For a circle of radius r and a central angle of measure θ (in radians), the length s of the intercepted arc is $s = r\theta$.

Basic Identities

Reciprocal Identities:

$\csc\theta = \frac{1}{\sin\theta}$ $\sec\theta = \frac{1}{\cos\theta}$ $\tan\theta = \frac{1}{\cot\theta}$

$\sin\theta = \frac{1}{\csc\theta}$ $\cos\theta = \frac{1}{\sin\theta}$ $\cot\theta = \frac{1}{\tan\theta}$

Tangent Identity:

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

Cotangent Identity:

$\cot\theta = \frac{\cos\theta}{\sin\theta}$

Pythagorean Identities

$\cos^2\theta + \sin^2\theta = 1$ $1 + \tan^2\theta = \sec^2\theta$ $\cot^2\theta + 1 = \csc^2\theta$