Review for the Praxis Mathematics: Content Knowledge (0061)

The review of the Mathematics CK in this *CliffsTestPrep* book is designed around the 10 content categories that are assessed on the test: Algebra and Number Theory, Measurement, Geometry, Trigonometry, Functions, Calculus, Data Analysis and Statistics, Probability, Matrix Algebra, and Discrete Mathematics. Each content category is defined by a list of specific knowledge and skills. The review for each content category will discuss the key ideas and formulas that are most important for you to know for the Mathematics CK. Mathematical notation, definitions, and formulas like those that will be provided for you when you take the official exam are included on the following three pages.

Notation, Definitions, and Formulas

NOTATION

(a, b)	$\{x: a < x < b\}$
$[a, b)$	$\{x: a \leq x < b\}$
$(a, b]$	$\{x: a < x \leq b\}$
$[a, b]$	$\{x: a \leq x \leq b\}$
$\gcd(m, n)$	greatest common divisor of two integers m and n
$\text{lcm}(m, n)$	least common multiple of two integers m and n
$[x]$	greatest integer m such that $m \leq x$
$m \equiv k (\text{mod } n)$	m and k are congruent modulo n (m and k have the same remainder when divided by n, or equivalently, $m - k$ is a multiple of n)
f^{-1}	inverse of an invertible function f; (not to be read as $\frac{1}{f}$)
$\lim_{x \to a^+} f(x)$	right-hand limit of $f(x)$; limit (if it exists) of $f(x)$ as x approaches a from the right
$\lim_{x \to a^-} f(x)$	left-hand limit of $f(x)$; limit (if it exists) of $f(x)$ as x approaches a from the left
$\varnothing$	the empty set
$x \in S$	x is an element of set S
$S \subset T$	set S is a proper subset of set T
$S \subseteq T$	either set S is a proper subset of set T or $S = T$
$S \cup T$	union of sets S and T
$S \cap T$	intersection of sets S and T

DEFINITIONS

DISCRETE MATHEMATICS

A relation $\Re$ on a set S is

reflexive if $x \Re x$ for all $x \in S$
symmetric if $x \Re y \Rightarrow y \Re x$ for all $x, y \in S$
transitive if ($x \Re y$ and $y \Re z$) $\Rightarrow x \Re z$ for all $x, y, z \in S$
antisymmetric if ($x \Re y$ and $y \Re x$) $\Rightarrow x = y$ for all $x, y \in S$

An equivalence relation is a reflexive, symmetric, and transitive relation.

FORMULAS

Addition

$$\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$$

$$\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$$

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}$$

Half-Angle (sign depends on the quadrant of $\frac{\theta}{2}$)

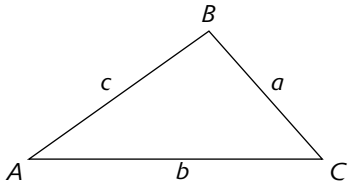
$$\sin\frac{\theta}{2} = \pm\sqrt{\frac{1-\cos\theta}{2}}; \qquad \cos\frac{\theta}{2} = \pm\sqrt{\frac{1+\cos\theta}{2}}$$

Range of Inverse Trigonometric Functions

$\sin^{-1}x$ $[-\pi/2, \pi/2]$; $\cos^{-1}x$ $[0, \pi]$; $\tan^{-1}x$ $(-\pi/2, \pi/2)$

Law of Sines $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

Law of Cosines $c^2 = a^2 + b^2 - 2ab(\cos C)$



De Moivre's Theorem $(\cos\theta + i\sin\theta)^k = \cos(k\theta) + i\sin(k\theta)$

Coordinate Transformation

Rectangular (x, y) to polar (r, θ) $r^2 = x^2 + y^2$; $\tan\theta = \frac{y}{x}$ if $x \neq 0$

Polar (r, θ) to rectangular (x, y) $x = r\cos\theta$; $y = r\sin\theta$

Distance from point (x_1, y_1) to line $Ax + By + C = 0$ $d = \frac{|Ax_1 + By_1 + C|}{\sqrt{A^2 + B^2}}$

Volume

Sphere: radius r $V = \frac{4}{3}\pi r^3$

Right circular cone: height h, base of radius r $V = \frac{1}{3}\pi r^2 h$

Right circular cylinder: height h, base of radius r $V = \pi r^2 h$

Pyramid: height h, base of area B $V = \frac{1}{3}Bh$

Right Prism: height h, base of area B $V = Bh$

Surface Area

Sphere: radius r $A = 4\pi r^2$

Right circular cone: lateral surface area with radius r, slant height s $A = \pi rs$

Differentiation

$(f(x)g(x))' = f'(x)g(x) + f(x)g'(x)$ $(f(g(x)))' = f'(g(x))\, g'(x)$

$$\left(\frac{f(x)}{g(x)}\right)' = \frac{f'(x)\,g(x) - f(x)\,g'(x)}{\left(g(x)\right)^2} \text{ if } g(x) \neq 0$$

Integration by Parts $\int u\, dv = uv - \int v\, du$

While you are practicing for the Mathematics CK, make sure that you become very familiar with the information that is given to you on the Notation, Definitions, and Formulas pages that are included in this chapter and at the beginning of the Mathematics CK test booklet. You will need to know other common mathematical formulas that are not listed on the Notation, Definitions, and Formulas pages, such as the three formulas given here.

Simple Interest Formula $I = Prt$, where I = simple interest earned, P = principal invested or present value of investment, r = annual simple interest rate, and t = time in years.

Compound Interest Formula $P = P_0(1 + \frac{r}{n})^{nt}$, where P is the total value of an initial investment of P_0 for t years at an annual rate r, compounded n times per year.

Distance Formula $d = rt$, where d = distance traveled, r = (uniform) rate of speed, and t = time.

In addition, you will need to know other familiar formulas relevant to the content categories, such as the formulas for the area and perimeter of common geometric shapes. Those formulas that are most important for you to know are given in the reviews for the content categories.

Since the test administrator will not clear the memory of your calculator before the test starts, if a common formula is particularly difficult for you to remember correctly, you should program the formula into your graphing calculator. This strategy is a good one because then you know the formula is correct, and, also, you will save time when evaluating the formula for specific values.