Name: ____ Date: ______________

Period: ________ **MB33 Regents Review: Additional Formulas (not given)** _________

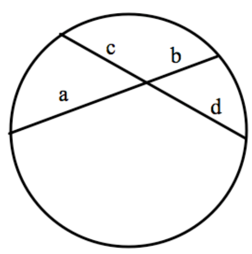
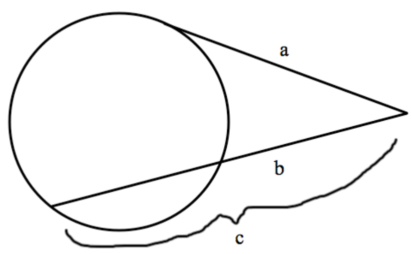
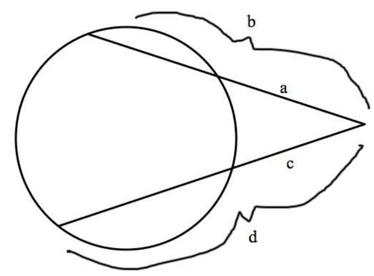
A.

Angle Measurement in Circles

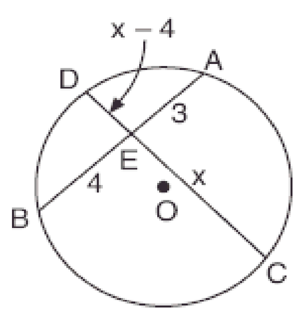
Location of Vertex of Angle	Measure of Angle Equals
Center of Circle	Measure of intercepted Arc
On Circle	One Half measure of intercepted Arc
Inside Circle	One Half sum of measures of the intercepted arcs
Outside Circle	One Half difference of measures of the intercepted arcs

B.

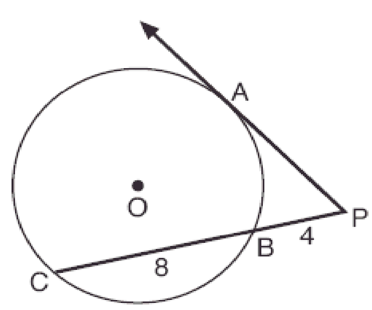
Chord, Tangent and Secant Relationships

		
$a \times b = c \times d$	$a^2 = b \times c$	$a \times b = c \times d$

1. In the accompanying diagram of circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E. If $AE = 3$, $EB = 4$, $CE = x$, and $ED = x - 4$, what is the value of x?



2. In the accompanying diagram, $\overrightarrow{PA}$ is tangent to circle O at A, $\overline{PBC}$ is a secant, $PB = 4$, and $BC = 8$.

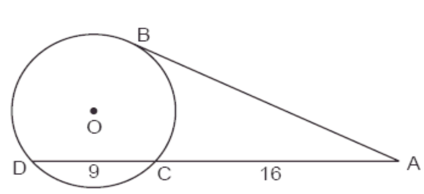


What is the length of $\overline{PA}$?

(1) $4\sqrt{6}$ (3) $4\sqrt{3}$

(2) $4\sqrt{2}$ (4) 4

3. In the accompanying diagram, $\overline{AB}$ is tangent to circle O at B. If $AC = 16$ and $CD = 9$, what is the length of $\overline{AB}$?



C.
Circumference, Area and Volume

Quantity	Formula
Circumference	$2\pi \times \text{Radius}$
Length of Arc intercepted by a central angle of n° or θ radians	$\frac{n}{360} \times \text{Circumference}$ *or* $\text{radius} \times \theta$
Area of Circle	$\pi \times (radius)^2$
Area of a Sector formed by a Central Angle of n°	$\frac{n}{360} \times \text{Area}$
Volume of a Rectangular Solid	$\text{Length} \times \text{Width} \times \text{Height}$

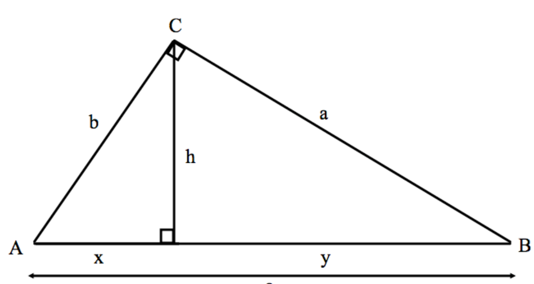
1. Denise is designing a storage box in the shape of a cube. Each side of the box has a length of 10 inches. She needs more room and decides to construct a larger box in the shape of a cube with a volume of 2,000 cubic inches. By how many inches, to the *nearest tenth,* should she *increase* the length of each side of the original box?

D.
Coordinate Formulas

Property of Segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$	Formula or Relationship
Slope	$\frac{y_2 - y_1}{x_2 - x_1}$
Midpoint	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
Length	$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Equation of Line: slope-intercept	$y = mx + b$, where m is the slope of the line and b is the y-intercept

1. Two circles whose equations are $(x-3)^2 + (y-5)^2 = 25$ and $(x-7)^2 + (y-5)^2 = 9$ intersect in two points. What is the equation of the line passing through these two points?

E.
Right Triangle Proportions

Altitude drawn to Hypotenuse	Proportions Formed
	$\frac{x}{h} = \frac{h}{y}$ $\frac{c}{a} = \frac{a}{y}$ $\frac{c}{b} = \frac{b}{x}$

F.
Quadratic Equations

Feature of $ax^2 + bx + c = 0 \quad (a \neq 0)$	Formula
Two Roots	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Sum of Roots	$-\frac{b}{a}$
Product of Roots	$\frac{c}{a}$

1. If $2 + i$ and $2 - i$ are the roots of the equation $x^2 - 4x + c = 0$, what is the value of c?

(1) -5
(2) 5
(3) -4
(4) 4

2. Write a quadratic equation such that the sum of its roots is -5 and the product of its roots is 6. What are the roots of this equation?

G.
Logarithm Laws

Name	Law
Product	$\log(xy) = \log x + \log y$
Quotient	$\log\left(\frac{x}{y}\right) = \log x - \log y$
Power	$\log\left(x^y\right) = y\log x$
Change of Base	$\log_b x = \frac{\log x}{\log b}$

1. The equation used to determine the time it takes a swinging pendulum to return to its starting point is $T = 2\pi\sqrt{\frac{\ell}{g}}$, where T represents time, in seconds, ℓ represents the length of the pendulum, in feet, and g equals 32 ft/sec^2. How is this equation expressed in logarithmic form?

(1) $\log T = \log 2 + \log \pi + \log \sqrt{\ell - 32}$

(2) $\log T = \log 2 + \log \pi + \frac{1}{2}\log \ell - \frac{1}{2}\log 32$

(3) $\log T = \log 2 + \log \pi + \frac{1}{2}\log \ell - \log 16$

(4) $\log T = 2 + \log \pi + \frac{1}{2}\log \ell - 16$

2. If $\log_2 a = \log_3 a$, what is the value of a?

(1) 1 (3) 3
(2) 2 (4) 4

3. If $\log_x 9 = -2$, what is the value of x?

(1) 81 (3) 3
(2) $\frac{1}{81}$ (4) $\frac{1}{3}$

H.
Tangent Identities

Angle Relationship	Identity
Sum of two Angles	$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$
Difference of two Angles	$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$
Double Angle	$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$
Half Angle	$\tan\frac{1}{2}A = \pm\sqrt{\frac{1-\cos A}{1+\cos A}}$

I.
Combinations and Counting

	Formula
The number of ways in which a subcommittee of r members can be selected from n members where $n \geq r$.	${}_nC_r = \frac{n!}{(n-r)! \times r!}$
Probability of r successes in n trials of a two-outcome experiment	${}_nC_r p^r (1-p)^{n-r}$, where p = probability of success
The kth term of $(x+y)^n$	${}_nC_{(k-1)} x^{n-(k-1)} y^{(k-1)}$

1. During a single day at radio station WMZH, the probability that a particular song is played is .38. Which expression represents the probability that this song will be played on *exactly* 5 days out of 7 days?

(1) ${}_7C_5(.38)^2(.62)^5$	(3) ${}_7P_5(.38)^5(.62)^2$
(2) ${}_7C_5(.38)^5(.62)^2$	(4) ${}_5C_2(.38)^5(.62)^2$

2. Mr. and Mrs. Doran have a genetic history such that the probability that a child being born to them with a certain trait is $\frac{1}{8}$. If they have four children, what is the probability that *exactly* three of their four children will have that trait?

3. Sean tells prospective clients that the probability of rain at the dive location is .2 each day. Which expression can be used to calculate the probability that it will rain on *exactly* 5 days of the 7 days at the dive location?

(1) ${}_7C_5(.2)^5(.8)^2$	(3) ${}_7C_5(.5)(.7)$
(2) ${}_7C_5(.2)^2(.8)^5$	(4) ${}_7C_2(.5)(.7)$

4. What is the coefficient of the fifth term in the expansion of $(x+1)^8$?

(1) 8	(3) 56
(2) 28	(4) 70

Key Facts

J. Types of Geometric Proofs

Congruent Triangles	Similar Triangles
Indirect Proofs	Coordinate Proofs

K. Algebraic Operations

Factoring Completely	Law of Exponents
FOIL/Distribute	Complex Fractions
Imaginary Numbers	Radicals
Inequalities	Solving Equations/Inequalities

L. Quadratic Equations and Inequalities

Discriminant determines the nature of the roots b^2-4ac	Roots are rational when b^2-4ac is a perfect square. Roots are irrational when b^2-4ac is positive and not a perfect . Roots are equal when b^2-4ac equals zero. Roots are imaginary when b^2-4ac is negative.
The graph of $y=ax^2+bx+c$ is a parabola.	The graph of $f(x)=ax^2+bx+c$ is a parabola.
The vertex (turning point) is at $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$ which is a maximum point when a < 0 and a minimum point when a > 0.	The axis of symmetry is the line whose equation is $x=-\frac{b}{2a}$.
The x-intercepts are the real roots of the equation.	The x-intercepts are the zeros of the equation.
If r_1 and r_2 are the roots of $ax^2+bx+c=0$, Where a > 0 and $r_1<r_2$ then:	$r_1<x<r_2$ is the solution set of $ax^2+bx+c<0$ $x<r_1$ or $x>r_2$ is the solution set of $ax^2+bx+c>0$

M. Functions and Transformations

Function is a set of ordered pairs but no two ordered pairs have the same *x*-value but different *y*-values.	- It is a function if it passes the Vertical Line Test - A function has an inverse if it passes the Horizontal Line Test - If a function has an inverse, it can be found by switching *x* and *y* and then solving for *y* in terms of *x*. -

Reflections and Transformation Rules	$r_{x-axis}(x,y)=(x,-y)$ $r_{y-axis}(x,y)=(-x,y)$ $r_{origin}(x,y)=(-x,-y)$ $r_{y=x}(x,y)=(y,x)$ $T_{h,k}(x,y)\rightarrow(x+h,y+k)$
Rotations and Dilation Rules	$R_{90^\circ}(x,y)=(-y,x)$ $R_{180^\circ}(x,y)=(-x,-y)$ $R_{270^\circ}(x,y)=(y,-x)$ $D_k(x,y)=(kx,ky)$, where $k\neq 0$

N. Inverse Variation and Hyperbolas

Variables x and y are inversely related if their product is constant.	If x and y are inversely related then $xy = k$ where $k\neq 0$
The graph of $xy = k$ is an equilateral hyperbola which consists of 2 disconnected branches that are asymptotic to the coordinate axes.	If $k > 0$, the branches are located in Quadrants I and III, if $k < 0$ then they are in Quadrants II and IV.

O. Exponential and Logarithmic Functions

Exponential Function	$y=b^x$ where b is different than 0 and 1, is an exponential function. It rises as x decreases when $b > 1$ and falls when $b < 1$.
Logarithmic Function	Is the inverse of the exponential function so $x=b^y$ is $y=\log_b x$ (b is a positive number different than 1)
Solving Exponential Equations	- When both sides of an exponential equation can be expressed as a power of the same base, make the exponents equal to each other - When they are not, isolate the variable by taking the log of each side. Use the change of base formula to find x.

P. Regression and Linear Correlation

Regressions	Depending on the line or curve that fits the data can be one of the following: - Linear Regression model $y=ax+b$ - Exponential Regression model $y=ab^x$ - Logarithmic Regression model $y=a\ln x+b$ - Power Regression model $y=ax^b$
Correlation Coefficient $\lvert r\rvert$ is close to 1, it fits closely to the data $\lvert r\rvert$ is close to 0, it doesn't fit the data and there is no linear correlation between the two variables	- Denoted by r, is a number from – 1 to 1 and represents the direction of the relationship between the variables - If $r > 0$ means as one variable increases, the other decreases. If $r < 0$ means as one variable increases, the other decreases.

Q. Summation Notation and Statistics

$\sum_{start\ value}^{end\ value}(terms)$	Sum of the enclosed terms. Takes on increments of 1 from the starting value to its ending value.
σ is the standard deviation. It reflects how spread out the data is from the mean $(\bar{x})$	When the data is normally distributed, it is a bell-shaped curve.

R. Angles, Radian Measures, Area

Radian Measure, Area	- Degree to Radian, multiply degree by $\frac{\pi}{180^\circ}$

	- Radian to Degree, multiply radian by $\frac{180^\circ}{\pi}$ - Area of a sector bounded by two radii and an arc opposite of a central angle of n° is $\frac{n}{360^\circ} \times \pi \times (radius)^2$
Trig Functions: Cosecant, Secant and Cotangent are reciprocal identities (flip the fraction)	<table><tr><td>x</td><td>$\sin x$</td><td>$\cos x$</td><td>$\tan x$</td></tr><tr><td>30°</td><td>$\frac{1}{2}$</td><td>$\frac{\sqrt{3}}{2}$</td><td>$\frac{\sqrt{3}}{3}$</td></tr><tr><td>45°</td><td>$\frac{\sqrt{2}}{2}$</td><td>$\frac{\sqrt{2}}{2}$</td><td>1</td></tr><tr><td>60°</td><td>$\frac{\sqrt{3}}{2}$</td><td>$\frac{1}{2}$</td><td>$\sqrt{3}$</td></tr></table>
The algebraic signs of the trig functions depend on the particular quadrant in which the terminal side of angle θ is located. (this includes reference angles)	Quadrant I: all functions are positive Quadrant II: $\sin x$ is positive others are negative Quadrant III: $\tan x$ is positive others are negative Quadrant IV: $\cos x$ is positive others are negative

S. Trig Functions and Graphs

Sine and Cosine Curves $y = a\sin bx$ and $y = a\cos bx$	The amplitude is $\|a\|$ and the period is $\left\|\frac{2\pi}{b}\right\|$ so the maximum height of each curve is $\|a\|$ and each graph is one full cycle as x varies from 0 radians to $\frac{2\pi}{b}$ radians.
Tangent Curve $y = \tan x$	Has no amplitude. Has vertical asymptotes at odd multiples of $\frac{\pi}{2}$ radians.

T. Trig Identities and Equations

Pythagorean Identities	Reciprocal Identities	Quotient Identities
$\sin^2 A + \cos^2 A = 1$ $\tan^2 A + 1 = \sec^2 A$ $\cot^2 A + 1 = \csc^2 A$	$\sin A = \frac{1}{\csc A}$ $\csc A = \frac{1}{\sin A}$ $\cos A = \frac{1}{\sec A}$ $\sec A = \frac{1}{\cos A}$ $\tan A = \frac{1}{\cot A}$ $\cot A = \frac{1}{\tan A}$	$\tan A = \frac{\sin A}{\cos A}$ $\cot A = \frac{\cos A}{\sin A}$

U. Formulas Given:
Area of a Triangle, Sum of Two Angles, Difference of Two Angles, Law of Sines, Law of Cosines, Double Angle, Half Angle…Normal Curve/Standard Deviation