MSAD 15

Charging Ahead with Patriot Pride!

Gray New-Gloucester High School

Mathematics Formula Booklet

what part of

$$
\begin{aligned}
&(1+e_4)\left[\frac{D}{Dt}\overline{w'^i\left(\frac{T'}{\bar{T}}\right)^2}+\overline{w'^\alpha\left(\frac{T'}{\bar{T}}\right)^2}\nabla_\alpha \tilde{u}^i-\alpha\overline{\left(\frac{T'}{\bar{T}}\right)^3}g^{i\alpha}\left(\nabla_\alpha \bar{\Phi}+\frac{D\tilde{u}_\alpha}{Dt}\right)\right]-2f(t)\overline{w'^i\left(\frac{T'}{\bar{T}}\right)^2}-2\overline{w'^iw'^\alpha\frac{T'}{\bar{T}}}D_\alpha \\
&\quad+\frac{1}{(1+e_4)C_p^2}\overline{w'^iw'^\alpha}\nabla_\alpha\left[(1+e_4)^2C_p^2\overline{\left(\frac{T'}{\bar{T}}\right)^2}\right]+\frac{2}{C_p}\overline{w'^\alpha\frac{T'}{\bar{T}}}\nabla_\alpha\left[(1+e_4)C_p\overline{w'^i\frac{T'}{\bar{T}}}\right]+\frac{2}{\bar{\rho}}\overline{w'^i\left(\frac{T'}{\bar{T}}\right)^2\nabla_\alpha(\rho u'^\alpha)} \\
&\qquad=\frac{1}{\bar{\rho}}\overline{\left(\frac{T'}{\bar{T}}\right)^2\nabla_\alpha\sigma^{i\alpha}(u')}+\frac{2}{\bar{\rho}\bar{T}C_p}\overline{w'^i\frac{T'}{\bar{T}}\left[\sigma^{\alpha\beta}(u')\nabla_\alpha u'_\beta-\overline{\sigma^{\alpha\beta}(u')\nabla_\alpha u'_\beta}-\nabla_\alpha F_r'^\alpha\right]}=-\epsilon_3^i\,, \\
&(1+e_4)\frac{D}{Dt}\overline{\left(\frac{T'}{\bar{T}}\right)^3}-3f(t)\overline{\left(\frac{T'}{\bar{T}}\right)^3}-3\overline{w'^\alpha\left(\frac{T'}{\bar{T}}\right)^2}D_\alpha+\frac{3}{(1+e_4)C_p^2}\overline{w'^\alpha\frac{T'}{\bar{T}}}\nabla_\alpha\left[(1+e_4)^2C_p^2\overline{\left(\frac{T'}{\bar{T}}\right)^2}\right] \\
&\quad+\frac{2}{\bar{\rho}}\overline{\left(\frac{T'}{\bar{T}}\right)^3\nabla_\alpha(\rho u'^\alpha)}+\frac{3}{\bar{\rho}\bar{T}C_p}\overline{\left(\frac{T'}{\bar{T}}\right)^2\left[P'\nabla_\alpha w'^\alpha-\overline{P'\nabla_\alpha w'^\alpha}-\nabla_\alpha(P'_g w'^\alpha-\overline{P'_g w'^\alpha})-\frac{DP'_g}{Dt}\right]} \\
&\qquad=\frac{3}{\bar{\rho}\bar{T}C_p}\overline{\left(\frac{T'}{\bar{T}}\right)^2\left[\sigma^{\alpha\beta}(u')\nabla_\alpha u'_\beta-\overline{\sigma^{\alpha\beta}(u')\nabla_\alpha u'_\beta}-\nabla_\alpha F_r'^\alpha\right]}=-\epsilon_3\,.
\end{aligned}
$$

do you not understand?

Name ____________________

Foundations

Slope (Gradient)

$$m = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$$

Algebra

Percent change

$$\frac{\textbf{Final value - Initial value}}{\textbf{Initial value}} \bullet 100$$

Linear Equations

$y = mx + b$
$Ax + By = C$
$y - y_1 = m(x - x_1)$

Law of exponents

$b^m \bullet b^n = b^{m+n}$

$(b^m)^n = b^{m \bullet n}$

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

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

Growth/decay function

$y = ab^x$
$y = ab^{x-h} + k$

Growth/decay model

$y = a(1 \pm r)^t$

Compound interest

$A = P(1 + {}^r/_n)^{nt.}$

Continuously compounded interest

$A = Pe^{rt}$

Scientific notation

$a \times 10^n$, *where* $1 \leq a < 10$

Natural base exponential function

$y = ae^{rx}$
$y = ae^{rx-h} + k$

Logarithm $\log_b y = x \iff b^x = y$

inverses

$g(f(x)) = \log_b b^x = x$

$f(g(x)) = b^{\log_b x} = x$

$\log_e x = \ln x$

properties

product $\log_b mn = \log_b m + \log_b n$

quotient $\log_b \frac{m}{n} = \log_b m - \log_b n$

power $\log_b m^n = n \log_b m$

change of base $\log_c a = \frac{\log a}{\log c}$

$\log_c a = \frac{\ln a}{\ln c}$

Sequences

n^{th} term of an arithmetic $u_n = u_1 + (n-1)d$

sum of n terms of an arithmetic $S_n = \frac{n}{2}(2u_1 + (n-1)d) = \frac{n}{2}(u_1 + u_n)$

n^{th} term of a geometric $u_n = u_1 r^{n-1}$

sum of n terms of a finite geometric $S_n = \frac{u_1(r^n - 1)}{r-1} = \frac{u_1(1-r^n)}{1-r} \quad r \neq 1$

sum of an infinite geometric $S_\infty = \frac{u_1}{1-r} \quad |r| < 1$

Quadratic $f(x) = ax^2 + bx + c$

axis of symmetry $x = -\frac{b}{2a}$

discriminant $b^2 - 4ac$

solutions $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

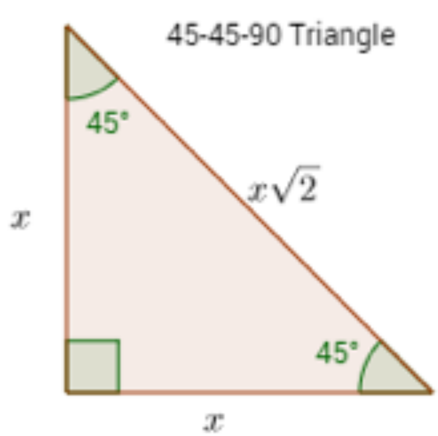
Geometry

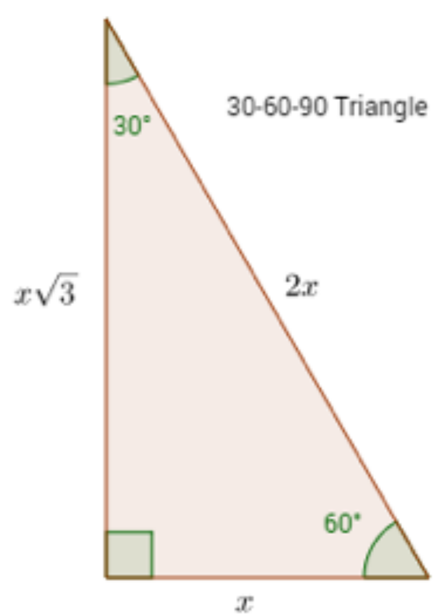
Midpoint formula $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

Distance formula $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Pythagorean theorem $a^2 + b^2 = c^2$

Special Right triangles





Polygons

Sum of the measures of the interior angles of a convex *n*-gon	$S_i = (n - 2) \bullet 180$
Sum of the measures of the exterior angles of a convex *n*-gon	$S_e = 360^o$
Area of a parallelogram	$A = b \bullet h$
Area of a triangle	$A = \frac{1}{2}(b \bullet h)$
Area of a trapezium	$A = \frac{1}{2}(a + b)h$
Area of a circle	$A = \pi r^2$
Circumference of a circle	$C = 2\pi r$
Volume of a Pyramid	$V = \frac{1}{3}(\text{area of base} \bullet \text{vertical height})$
Volume of a cuboid (rectangular prism)	$V = l \bullet w \bullet h$
Volume of a cylinder	$V = \pi r^2 h$
Area of the curved surface of a cylinder	$A = 2\pi rh$

Volume of a sphere $$V = \frac{4}{3}\pi r^3$$

Volume of a cone $$V = \frac{1}{3}\pi r^2 h$$

Right Triangle Trigonometry

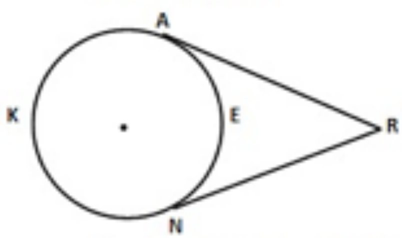
$$\sin A = \frac{\text{opp}}{\text{hyp}}$$

$$\cos A = \frac{\text{adj}}{\text{hyp}}$$

$$\tan A = \frac{\text{opp}}{\text{adj}}$$

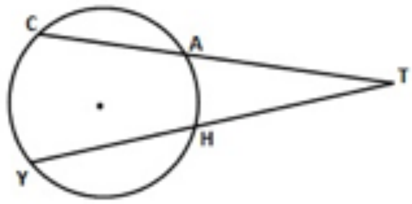
Angle relationships in Circles

Two Tangents



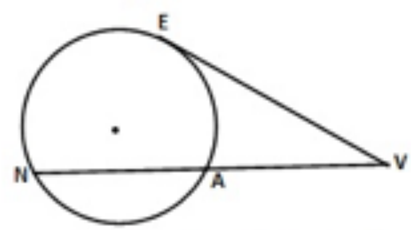
$$m\angle ARN = \frac{1}{2}(m\widehat{NKA} - m\widehat{AEN})$$

Two Secants

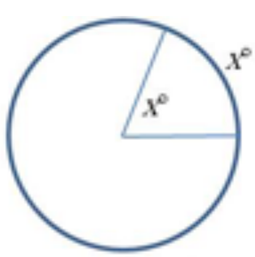


$$m\angle ATH = \frac{1}{2}(m\widehat{CY} - m\widehat{AH})$$

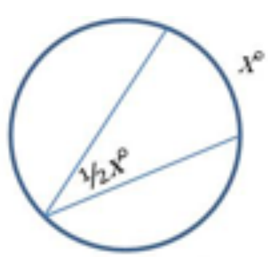
Tangent and Secant



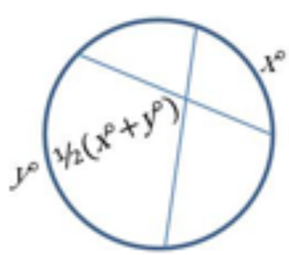
$$m\angle EVA = \frac{1}{2}(m\widehat{EN} - m\widehat{EA})$$



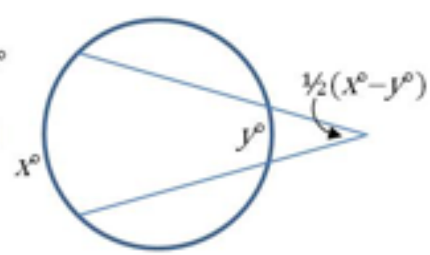
Central angle



Inscribed angle



Internal angle



External angle

Pre-calculus

Length of an arc $s = \theta r$

Area of a sector $A = \frac{1}{2}\theta r^2$

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

Pythagorean identity $\cos^2\theta + \sin^2\theta = 1$

Double angle formula

$$\sin 2\theta = 2\sin\theta\cos\theta$$
$$\cos 2\theta = \cos^2\theta - \sin^2\theta = 2\cos^2\theta - 1$$
$$= 1 - 2\sin^2\theta$$

Cosine rule

$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

Sine rule

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

Area of a triangle $A = \frac{1}{2}ab\sin C$

Heron's Area Formula

$$\text{area} = \sqrt{s(s-a)(s-b)(s-c)}$$
$$s = \frac{a+b+c}{2}$$

Statistics

Descriptive

Mean $\bar{x} = \frac{\Sigma x}{n}$

Standard deviation $s = \sqrt{\frac{\Sigma\left(x - \bar{x}\right)^2}{n - 1}}$

Variance $= s^2$

Probability of an event A $P\left(A\right) = \frac{n\left(A\right)}{n\left(U\right)}$

Complementary events $P\left(A\right) + P\left(A'\right) = 1$

Combined events $P\left(A \cup B\right) = P\left(A\right) + P\left(B\right) - P\left(A \cap B\right)$

Mutually exclusive events $P\left(A \cup B\right) = P\left(A\right) + P\left(B\right)$

Conditional probability $P\left(A \cap B\right) = P\left(A\right)P\left(B \middle| A\right)$

Independent events $P\left(A \cap B\right) = P\left(A\right)P\left(B\right)$

z**-score** $z = \frac{x - \mu}{\sigma}$