## ACT \& SAT Math Formula \& Notes Sheet

## by Mario's Math Tutoring (YouTube Channel)

Distance: $\quad d=\sqrt{\left(x_{2}-x_{1}\right)^{2}+\left(y_{2}-y_{1}\right)^{2}}$
Midpoint: $\quad M=\left(\frac{x_{1}+x_{2}}{2}, \frac{y_{1}+y_{2}}{2}\right)$

Slope: $\quad \mathrm{m}=\frac{y_{2}-y_{1}}{x_{2}-x_{1}}$
Pythagorean Theorem: $\quad a^{2}+b^{2}=c^{2}$ (Common Pythagorean Triples: 3-4-5, 5-12-13, 8-15-17, 7-24-25 or multiples of these)
a


## SOH CAH TOA

$\sin \theta=\frac{\text { opposite side }}{\text { hypotenuse }}$
$\cos \theta=\frac{\text { adjacent side }}{\text { hypotenuse }}$
$\tan \theta=\frac{\text { opposite side }}{\text { adjacent side }} \quad \csc \theta=\frac{1}{\sin \theta}$
$\sec \theta=\frac{1}{\sec \theta}$

$$
\cot \theta=\frac{1}{\tan \theta}
$$

$\sin ^{2} \theta+\cos ^{2} \theta=1$
$\sin (90-\theta)=\cos \theta \quad \cos (90-\theta)=\sin \theta$

## Standard Form of the Equation of a Circle:

$(x-h)^{2}+(y-k)^{2}=r^{2}$
$(h, k)$ Center of the circle and $r$ is radius

## Equations of Parabolas:

$y=a x^{2}+b x+c$ remember $x=\frac{-b}{2 a}$ is the x -coordinate of vertex and is the axis of symmetry.
$y=a(x-h)^{2}+k$ vertex form $(\mathrm{h}, \mathrm{k})$ vertex
$y=a(x-p)(x-q)$ intercept form (p,0),(q,0) x-intercepts

## Expected Value:

$\sum_{i=1}^{n} x_{i} P\left(x_{i}\right)$
(Sum up the outcome of an event multiplied the probability of it happening for each possible outcome.)

Imaginary Numbers:

$$
\begin{aligned}
& i=\sqrt{-1} \\
& i^{2}=-1
\end{aligned}
$$

## Average(mean):

Average $=\frac{\text { Total }}{\# \text { Items }}$

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Probability:
$P=\frac{\# \text { Successes }}{\text { Total Possible Outcomes }}$

## Logs:

$\log _{b} x=n \quad$ is equivalent to $b^{n}=x$

Arc Length:
arc length $=\frac{\theta}{360}(2 \pi r)$

## Area of Sector:

area of sector $=\frac{\theta}{360}\left(\pi r^{2}\right)$


## Special Right Triangles:



Percent of Change $=\frac{\text { amount of change }}{\text { original amount }}$

## Rules of Exponents:

$x^{m} \cdot x^{n}=x^{m+n}$
$\frac{x^{m}}{x^{n}}=x^{m-n}$
$\left(x^{m}\right)^{n}=x^{m \cdot n}$
$x^{0}=1$
$x^{-m}=\frac{1}{x^{m}}$
$x^{m / n}=\sqrt[n]{x^{m}}$ or $(\sqrt[n]{x})^{m}$

## Quadratic Formula \& Discriminant:

If $a x^{2}+b x+c=0$ then
$x=\frac{-b \pm \sqrt{b^{2}-4 a c}}{2 a}$
if $b^{2}-4 a c>0$ then 2 real solutions
if $b^{2}-4 a c=0$ then 1 real solutions
if $b^{2}-4 a c<0$ then 0 real solutions, 2 imaginary

## Area of Circle:

$A=\pi r^{2}$

## Circumference of Circle:

$$
C=2 \pi r \text { or } C=\pi d
$$

Volume of Cylinder:
$V=\pi r^{2} h$
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## Other Topics helpful to know/study:

- Similar triangles
- Proportions
- Order of Operations (PEMDAS)
- Fractions \& Mixed Numbers
- Imaginary \& Complex Numbers
- Square Roots \& Radicals
- Greatest Common Factor (GCF)
- Least Common Multiple (LCM)
- Isosceles \& Equilateral Triangles
- Laws of Logic \& Conditional Statements
- Functions
- Inequalities \& Special Cases
- Foiling Binomials \& Factoring
- Equations of Lines $(\mathrm{y}=\mathrm{mx}+\mathrm{b})$
- Multiplication Counting Principle
- Perimeter \& Area Problems
- Writing Linear Combinations
- Scientific Notation
- Permutations, Combinations \& Factorials
- Systems of Equations
- Translating Sentences into Equations
- Absolute Value Equations \& Inequalities
- Quadrilaterals
- One to One Property of Exponents
- Circles \& Angles
- Law of Sines \& Law of Cosines
- Median, Mean, Mode, basic Statistics
- Angle Problems, Parallel lines cut by Transversal
- Rewriting Equations "in terms of"
- Piecewise Functions
- Unit Conversions
- Multiplying Matrices \& Basics of Matrices
- Unit Circle
- Direct Variation
- Extended Ratios
- Graphing Parabolas
- Percentages
- Types of Numbers (Rational, Irrational, etc.)
- Venn Diagrams
- Rationalizing Denominators
- Completing the Square
- Solving Radical Equations
- Graphing Lines \& Inequalities
- Polynomials - Zeros, Factors, Remainders
- Polynomial Long Division
- Rational Exponents
- Exponential Functions
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