

# Math Properties

## Additive Identity

- $x+0=x$

## Additive Inverse

- $x+(-x)=0$

## Additive Property of Equality

- $x=2 \therefore 2+5=x+5$

## Angle Sum and Difference Identities

- $\sin(x+y)=\sin(x)\cos(y)+\cos(x)\sin(y)$
- $\sin(x-y)=\sin(x)\cos(y)-\cos(x)\sin(y)$
- $\cos(x+y)=\cos(x)\cos(y)-\sin(x)\sin(y)$
- $\cos(x-y)=\cos(x)\cos(y)+\sin(x)\sin(y)$

## Associative Property

- $x+(y+z)=(x+y)+z$
- $x(yz)=(xy)z$
- $2(3x)=(2*3)x=6x$

## Commutative Property

- $x+y=y+x$
- $x*y=y*x$

## Cosine Rule

- $c^2=a^2+b^2-2ab*\cos(C)$

## Double-Angle Identities

- $\sin(2x)=\sin(x)\cos(x)$
- $\cos(2x)=\cos^2(x)-\sin^2(x)=1-2\sin^2(x)=2\cos^2(x)-1$
- $\tan(2x)=2\tan(x)\div(1-\tan^2(x))$

## Distributive Property

- $x(y+z)=xy+xz$
- $4(x-2)=4x-8$

## Half-Angle Identities

- $\sin^2(x)=\frac{1}{2}[1-\cos(2x)]$
- $\sin(x\div 2)=\pm\sqrt{([1-\cos(x)]\div 2)}$
- $\cos^2(x)=\frac{1}{2}[1+\cos(2x)]$
- $\tan(x\div 2)=(1-\cos(x))\div\sin(x)=\sin(x)\div(1+\cos(x))$

## Law of Cosines

- Angle= $\cos(C)=(a^2+b^2-c^2)\div 2ab$
- Side= $c^2=a^2+b^2-2ab*\cos(C)$

## Law of Sines

- Angle= $\sin(a)\div A=\sin(b)\div B=\sin(c)\div C$
- Side= $\sin(A)\div a=\sin(B)\div b=\sin(C)\div c$

## Law of Tangents

- $(a-b)\div(a+b)=\tan(\frac{1}{2}(A-B))\div\tan(\frac{1}{2}(A+B))$

## Logarithm Rules

- $\log_b(1)=0$
- $\log_b(b)=1$
- $\log_b(b^x)=x$
- $\log_b(b^2)=2$
- $b^{(\log_b x)}=x$
- $\log_x(b)=1\div\log_b(x)$

- $\log_b(xy)=\log_b(x)+\log_b(y)$
- $\log_b(x\div y)=\log_b(x)-\log_b(y)$
- $\log_b(x^y)=y*\log_b(x)$
- $\log_b(x)=\log_{10}(x)\div\log_{10}(b)$

## Multiplicative Identity

- $x*y=x$
- $x*1=x$
- $(\frac{2}{3})(\frac{3}{2})+(\frac{5}{5})(\frac{4}{3})=\frac{6}{15}+\frac{20}{15}$

## Multiplicative Inverse

- $(\frac{2}{3})(\frac{3}{2})=1$

## Multiplicative Property of Equality

- $4x=8 \therefore x=2$
- $-x=14 \therefore x=-14$

## Negative Exponents

- $x^{-y}=\frac{1}{x^y}$

## Power of a Power Property

- $(x^y)^z=x^{yz}$

## Power of a Product Property

- $x^2y^2=(xy)^2$

## Power of a Quotient Property

- $z^x\div y^x=(z\div y)^x$

## Product of Powers Property

- $x^y x^z=x^{(y+z)}$
- $7^{2*7^6}=7^{(2+6)}=7^8$

## Product Property of Square Roots

- $\sqrt{x}*\sqrt{y}=\sqrt{(xy)}$

## Quotient of Powers Property

- $(x^z)\div(x^y)=x^{(z-y)}$

## Quotient Property of Square Roots

- $\sqrt{x}\div\sqrt{y}=\sqrt{(x\div y)}$

## Rational Exponents

- $x^{(1\div 2)}=\sqrt{x}$
- $x^{(y\div 2)}=\sqrt{(x^y)}=(\sqrt{x})^y$
- $x^{(1\div 3)}=\sqrt[3]{x}$
- $x^{(y\div 3)}=\sqrt[3]{(x^y)}=(\sqrt[3]{x})^y$

## Reflexive Property

- $xy=xz$
- $x=x$

## Substitution Property

- If  $2(x+y)=3z$  &  $x+y=9 \Rightarrow 2(9)=3z$
- If  $x=3$  &  $y=-4 \Rightarrow xy=-12$

## Subtraction Property

- If  $x<y \Rightarrow (x-z)<(y-z)$

## Symmetric Property

- $x=y \Rightarrow y=x$

## Transitive Property

- If  $x=y$  &  $y=z \Rightarrow x=z$
- If  $3x+2=y$  &  $y=8 \Rightarrow 3x+2=8$

## Trichotomy Law

- If  $x\neq y$  &  $x\neq y \therefore x>y$
- If  $x=y \therefore x\neq y$

## Trigonometry Rules

- $\cos^2(x)=\cos^2(x)=\cos(x)^2$
- $\sin(-x)=-\sin(x)=-1\div\csc(x)$
- $\csc(-x)=-\csc(x)=|\sqrt{1}+\cot(-x)|$

- $\cos(-x)=\cos(x)=1\div\sec(x)$
- $\sec(-x)=\sec(x)=|\sqrt{1}+\tan(x)|$
- $\tan(-x)=-\tan(x)=-1\div\cot(x)$
- $\cot(-x)=-\cot(x)=-1\div\tan(x)$
- $\sin^2(x)=0.5-(0.5\cos(2x))$
- $\cos^2(x)=0.5+(0.5\cos(2x))$
- $\tan(2x)=2\tan(x)\div(1-\tan^2(x))$
- If  $\sin(x)=y \Rightarrow x=\sin^{-1}(y)$
- $\sin(2x)=2\sin(x)*\cos(x)$
- $\sin(x)^2+\cos(x)^2=1$
- $1+\tan(x)^2=\sec(x)^2$
- $1+\cot(x)^2=\csc(x)^2$

## Zero Exponents

- $a^0=1$
- $0^0=\infty$

## Zero-Product Property

- $(x-3)(x+4)=0 \therefore x=3 \parallel x=-4$