Fractions, Decimals, and Percentages

1. Fraction $= \dfrac{Part}{whole}$

2. Percent $= \dfrac{part}{100}$

3. Percent Increase or Decrease $= \dfrac{Increase}{old}$ x 100 %

4. Simple Interest: $A = P(1 + rt)$

5. Interest Compound Annually : $A = P(1 + r)^t$

6. Interest Compounded n times per year: $A = P(1 + \dfrac{r}{n})^{nt}$

Geometry

1. Area of a Circle $= \pi r^2$
2. Circumference of a Circle $= 2\pi r$
3. Volume of a Sphere $= \dfrac{4}{3}\pi r^3$
4. Area of a Square $= s^2$
5. Perimeter of a square $= 4s$
6. Area of a rectangle $= l \times w$
7. Perimeter of a rectangle $= 2l + 2w$
8. Area of a Triangle $= \dfrac{1}{2}bh$
9. Perimeter of a triangle $=$ Sum of all sides
10. Pythagorean Theorem $= a^2 + b^2 = c^2$
11. Volume of a Cylinder $= \pi r^2 h$
12. Volume of a Cone $= V = \dfrac{1}{3}\pi r^2 h$
13. Volume of a Rectangular Prism (Box) $= V = lWH$

Special Right Triangle
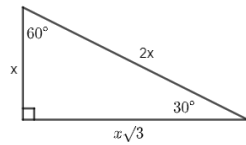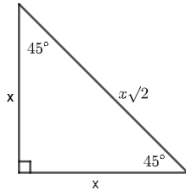
Exponents & Roots

1. Multiplication Rule for Exponents : $a^b \cdot a^c = a^{b+c}$

2. Division Rule for Exponents : $\dfrac{a^b}{a^c} = a^{b-c}$

3. Power Rule for Exponents : $(a^b)^c = a^{bc}$

4. Negative Exponents : $a^{-b} = \dfrac{1}{a^b}$

Square Roots

To Square a number = 6^2 = 36

Square root = $\sqrt{36}$ = 6

Memorize : $\sqrt{2}$ = 1.4

$\sqrt{3}$ = 1.7

Cube Roots

To Cube a number = 2^3 = 8

Cube root = $\sqrt[3]{8}$ = 2

Data Analysis & Statics

Counting principle	If there are m ways to complete the first and n ways to complete the second, then there are m*n ways to complete the two of them
Probability	$\dfrac{\text{number of favourable outcomes}}{\text{number of possible outcomes}}$
Average	Average $= \dfrac{sum}{n}$

Trigonometry

1. $Sin = \dfrac{opp}{hyp}$
2. $Cos = \dfrac{adj}{hyp}$
3. $\tan = \dfrac{opp}{adj}$
4. $360^0 = 2\pi$ radians

Sin(x)=cos(90-x) The sine of an $\angle$ is equal to the cosine of its complement

Parabolas

1. Standard Form : $f(x) = ax^2 + bx + c$

    Vertex $= \left(-\dfrac{b}{2a}, f\left(-\dfrac{b}{2a} \right) \right)$

    Y – intercept $= c$

    X – intercepts $= \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

    Sum of solutions $= \dfrac{-b}{a}$

    Discriminant = 2 b ac −4 ; Pos=2 real roots Zero= 1 real root; Neg=2 imaginary roots
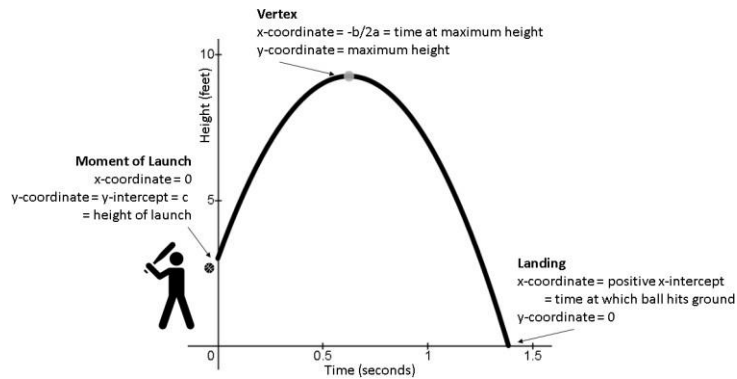
2. Factored Form : $f(x) = a(x-m)(x-n)$

    X – intercepts are m and n

$$X - \text{coordinate of vertex} = \frac{m+n}{2}$$

3. Vertex Form : $f(x) = a(x-h)^2 + k$

   Vertex = (h,k)

4. Difference of squares : $a^2 - b^2 = (a+b)(a-b)$
5. Perfect Square Trinomial : $a^2 + 2ab + b^2 = (a+b)^2$ & $a^2 - 2ab + b^2 = (a-b)^2$
6. Completing the square : $x^2 + bx + \left(\frac{b}{2}\right)^2 = \left(x + \frac{b}{2}\right)^2$

Polygons

1. Area of a trapezoid : $\frac{1}{2}(b_1 + b_2)h$
2. One interior angle of a regular polygon : $\frac{180\,(n-2)}{n}$
3. Sum of the interior angles : 18-(n-2)
4. Sum of exterior angles : 360^0

Properties of Parallelogram

1. Opp sides are ‖ and ≅
2. Opp ∠'s are ≅
3. Consec ∠'s are supplementary
4. Each diagonal forms a pair of ≅ Δ's
5. Diagonals bisect each other
   - If they are ≅ it is a rectangle
   - If they are ⊥ it is a rhombu

6. Area = base * height

Graphing Lines

1. Slope Formula : m = $\dfrac{y_2 - y_1}{x_2 - x_1}$
2. Slope of horizontal line = 0
3. Slope of vertical line = undefined
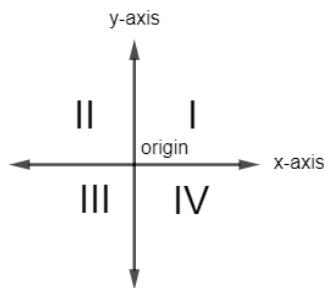
4. Standard Form : Ax + By = C
5. Slope – Intercept Form : y = mx +b
6. Point-Slope Form : y – y_1 = m(x-x_1)
7. Distance Formula : d = $\sqrt{(x_2 - x_1)^2 + (y_1 - y_1)^2}$
8. Midpoint Formula : M = $\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$
9. Parallel lines : equal slopes
10. ⊥ Lines slopes are opposite reciprocals

Angles

1. Vertical ∠' s are ≅
2. ∠'s that form a linear pair are supplementary (add up to 180°)
3. ∠' s that form a circle add up to 360°
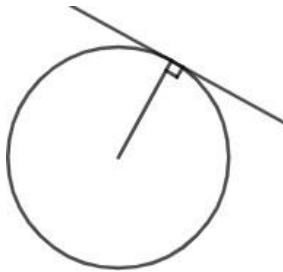4. When ∥ lines are cut by a transversal, all acute ∠' s are ≅ and all obtuse ∠' s are ≅

Triangles

The three ∠' s of a Δ add up to 180°
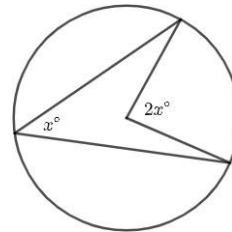An exterior ∠ is equal to the sum of the two remote interior ∠' s

Pythagorean Triples: 3-4-5 and 5-12-13
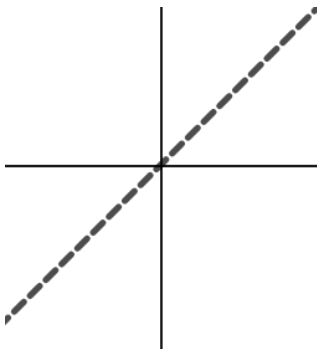
Circles

A radius and tangent make a right ∠

A central ∠ is double the inscribed ∠

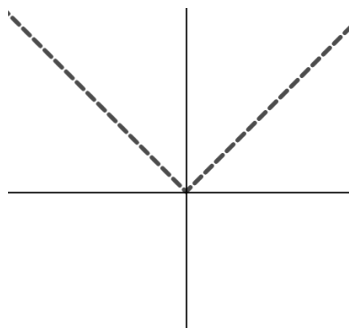$$\frac{x}{360} = \frac{arc}{circumference} \quad \text{and} \quad \frac{x}{360} = \frac{sector}{area\_of\_circle} \quad \text{where x = central angle}$$

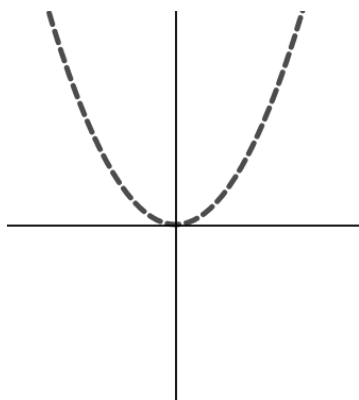Formula for a Circle $(x-h)^2 + (y-k)^2 = r^2$, where (h,k) is the center and r is the radius
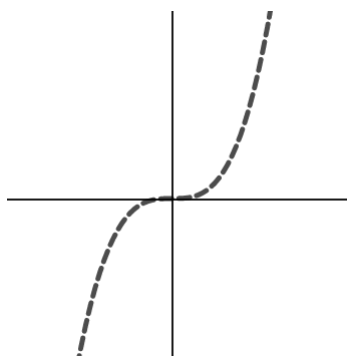
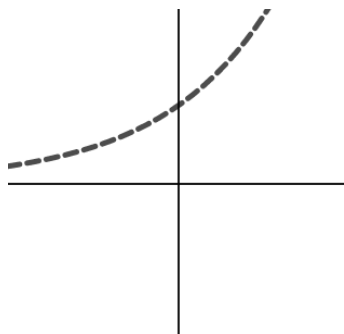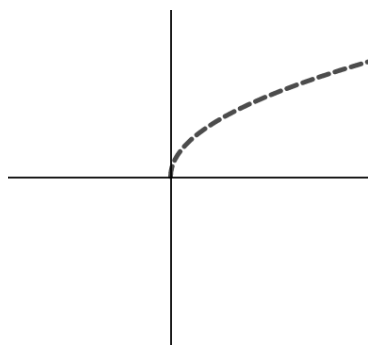# Parent Graphs & Transformations

Y=x

$Y = |x|$

$Y = x^2$

$Y = x^3$

Y =a^x

Y = $\sqrt{x}$

Transformations	Visual effect
f(x)+k	Shift up by k units
f(x)-k	Shift down by k units
f(x+h)	Shift left by h units
f(x-h)	Shift right by h units
-f(x)	Reflect over the x axis (flip upside down)
cf(x)	Stretch vertically by a factor of c (becomes skinnier)
$\frac{1}{c}$f (x)	Shrink vertically by a factor of c (becomes fatter)

Rates,Ratio & Proportions

General form of a conversion factor: $\left(\dfrac{ending\_units}{starting\_units} \right)$

Concentration A x Volume of A + Concentration B x Volume of B

= Final Concentration (Vol. of A + Vol. of B)

Distance = Rate * Time