FORMULA SHEET – SAT

1) $x^m . x^n = x^{m+n}$

2) $\frac{x^m}{x^n} = x^{m-n}$

3) $(xy)^m = x^m y^n$

4) $\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$

5) $\left(\frac{x}{y}\right)^{-m} = \left(\frac{y}{x}\right)^m$

6) $x^0 = 1$

1) $Simple\ Interest = PTR$

, where $P = Principal, T = Time\ (years), R = Rate\ (Decimals)$

2) $Amount\ (with\ SI) = P + PTR$

3) $Amount\ (with\ CI) = P\left(1 + \frac{r}{n}\right)^{nt}$, $n = compounding$

4) $CI = Amount - P = P\left(1 + \frac{r}{n}\right)^{nt} - P$

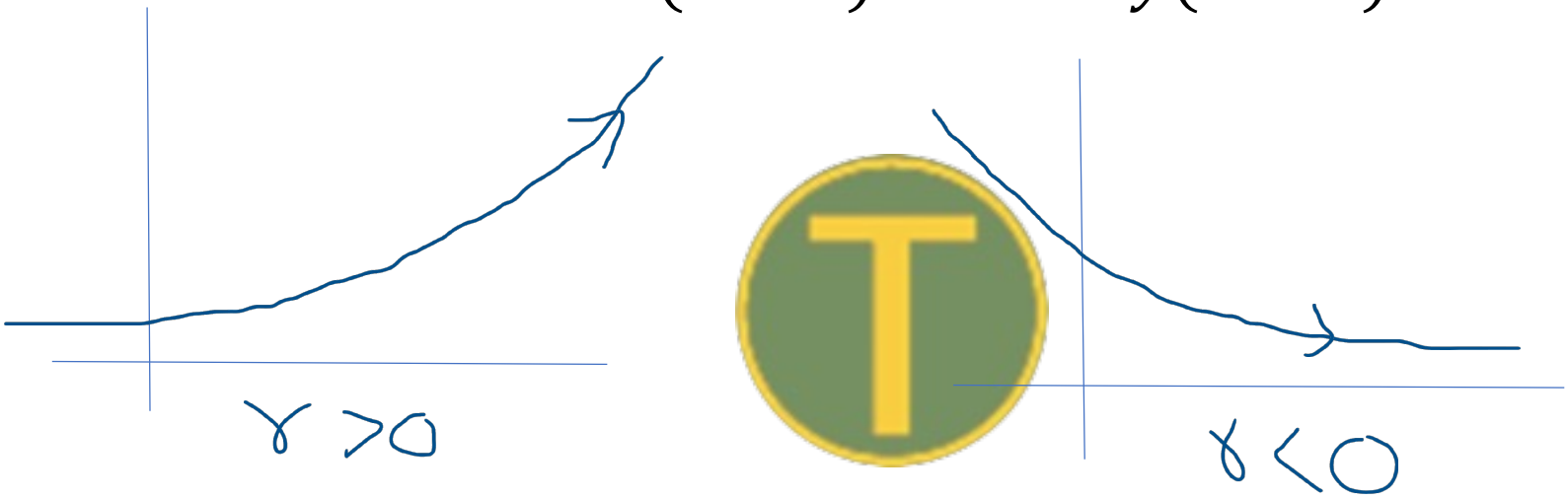
5) $\%\ Change = \frac{New - Old}{Old} \times 100\%$

$$= \frac{Final - Initial}{Initial} \times 100\%$$

1) $y = a(1 + r)^t$ *is an exponential curve*

$a = Initial\ Value$

$r = Growth(r > 0)\ or\ Decay(r < 0)\ Factor$



2) $If\ \frac{a}{b} = \frac{3}{4}\ (example) \Rightarrow a = 3k\ \&\ b = 4k$

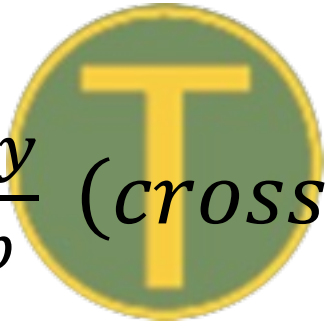
3) $If\ 'a'\ increases\ by\ 20\% \Rightarrow a_{new} = 1.2a$

4) $If\ 'a'\ decreases\ by\ 20\% \Rightarrow a_{new} = 0.8a$

1) $If\ x^2 = 4 \Rightarrow x = \pm 2$

2) $If\ y^3 = 8 \Rightarrow y = 2\ (No\ \pm)$

3) $If\ \frac{x}{a} = \frac{y}{b} \Rightarrow x = \frac{ay}{b}$ $(cross\ multiply\ to\ find\ x)$



4) $If - x < 1 \Rightarrow x > -1$

$(Inequality\ sign\ flips\ when\ you\ multiplied\ with\ a\ negative\ number)$

1) $*$ *For a system of linear equations*:

$$a_1x + b_1y = c_1$$

$$\& \; a_2x + b_2y = c_2$$

a) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow$ *one solution (intersecting lines)*

b) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow$

Infinite solutions (Coincident lines)

c) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow$ *No solution (Parallel line*

**** Most Important***

1) $Equation\ of\ a\ straight\ line\ in$

a) $Slope - intercept\ form$: $y = mx + b$

b) $Point - slope\ form$: $y - y_1 = m(x - x_1)$

c) $Two\ point\ form$: $y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$

2) $Slope = \frac{y_2 - y_1}{x_2 - x_1}$

1) $For\ ax^2 + bx + c = 0$

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

2) $D = b^2 - 4ac$

9) $If\ D > 0\ ; Parabola\ intersects\ x - axis$

$If\ D = 0\ ; Parabola\ touches\ x - axis$

$If\ D < 0\ ; Parabola\ neither\ intersects\ nor\ touches\ x - axis$

$$\begin{cases} D > 0\ ; 2\ distinct\ values \\ D = 0\ ; 1\ (Repeated\ solution) \\ D < 0\ ; No\ (real) solutions \end{cases}$$

3) $y = a(x - x_1)(x - x_2)$

$(Factored\ form\ of\ quadratic\ equation)$

4) $y = a(x - h)^2 + k \Rightarrow vertex/Perfect\ Sq.form$

5) $Coordinate\ of\ vertex\ are\ (h, k)$

6) $If\ roots\ are\ x_1 and\ x_2 \quad ; \quad h = \frac{x_1 + x_2}{2}$

7) $h = \frac{-b}{2a} \quad ; \quad k = \frac{4ac - b^2}{4a}$

8) $If\ a > 0 \quad ; \quad Parabola\ opens\ up \Rightarrow Vertex\ is\ Minima$

$If\ a < 0\ ;\ Parabola\ \ opens\ down\ \Rightarrow Vertex\ is\ Maxima$

10) $ax^2 + bx + c = 0\ ; p\ and\ q\ are\ roots\ \Rightarrow p + q = -\frac{b}{a}\ ;\ pq = \frac{c}{a}$

11) $Roots, solution, zeroes,\ x-\ intercepts\ are\ one\ and\ the\ same$

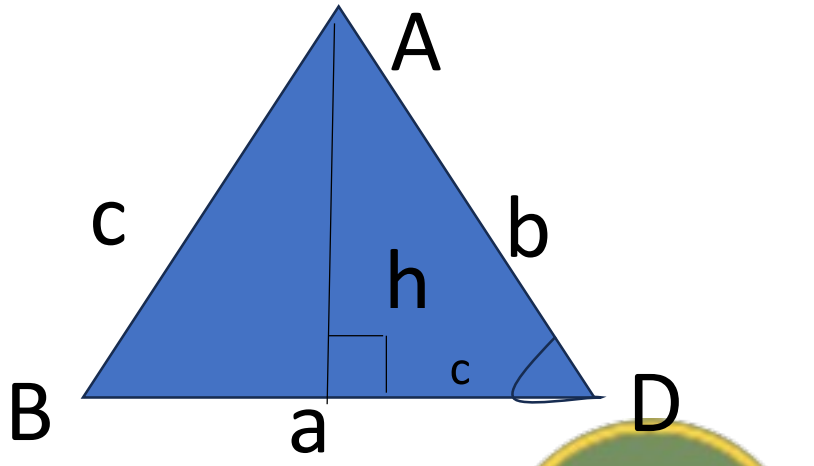
Division Theorem

$$D = dq + r$$

$$Or \quad \frac{D}{d} = q + \frac{r}{d}$$

Remainder Theorem : $If\ x - a$ $divides\ f(x), then\ f(a)\ is\ the\ remainder$

Note : $If\ f(a) = 0\ \Rightarrow x - a\ is\ its\ factor$

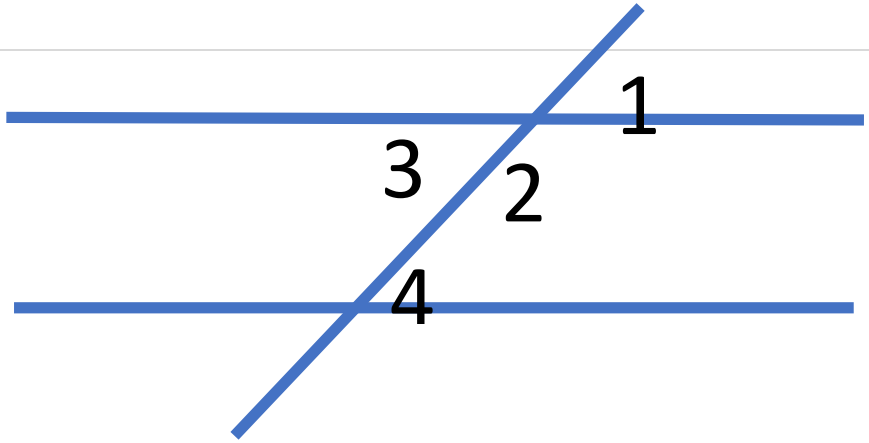


(a) $\angle A + \angle B + \angle C = 180°$

(b) $\angle D = \angle A + \angle B$ $(Exterior\ angle\ property)$

(c) $Area = \frac{1}{2} . a . h$

(d) $a + b > c$; $b + c > a$; $c + a > b$



a) $\angle 1 = \angle 4$ $(corresponding\ angles)$

b) $\angle 1 = \angle 3$ $(Vertically\ opposite\ angle)$

c) $\angle 3 = \angle 4$ $(Alternate\ angle)$

d) $\angle 1 + \angle 2 = 180°$ $(Angle\ in\ a\ straight\ line)$

e) $\angle 2 + \angle 4 = 180°$

$(Interior\ angles\ on\ the\ same\ side)$

1) $Regular\ polygon \Rightarrow Equal\ sides\ and\ angles$

2) $Sum\ of interior\ angles\ of\ any\ 'n'sided\ polygon = 180°(n-2)$

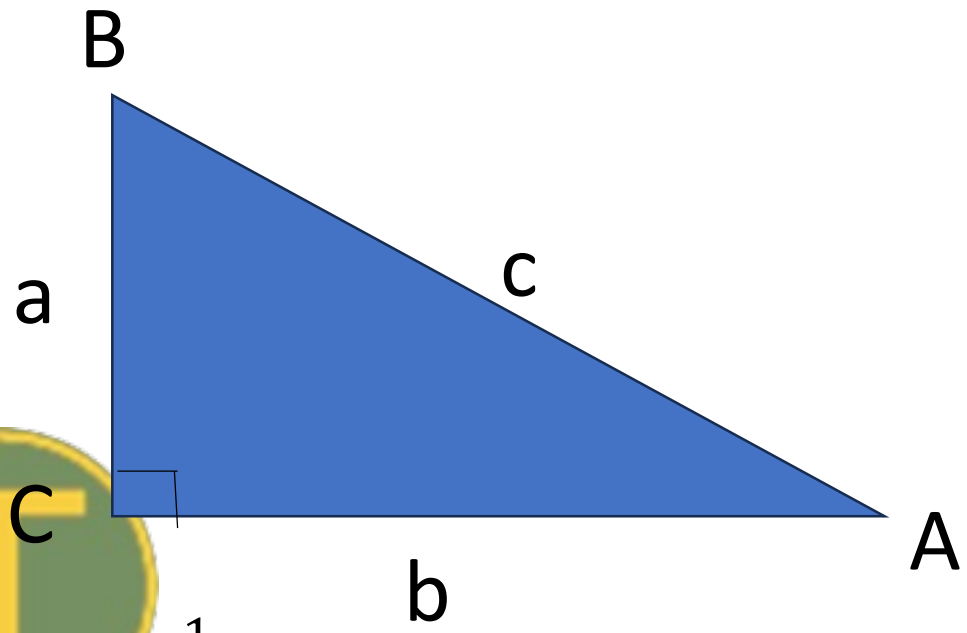
3) $Each\ interior\ angle\ of\ a\ Regular\ Polygon = \frac{180(n-2)}{n}$

4) $Sum\ of\ exterior\ angles\ of\ any\ polygon = 360°$

5) $Each\ exterior\ angle\ of\ a\ regular\ polygon = \frac{360°}{n}$

6) $Isoscales\ triangle: Any\ two\ sides\ of\ a\ triangle\ are\ equal$

7) $Equilateral\ triangle: All\ sides\ are\ equal,\ sides\ opposite\ to\ equal\ side\ are\ equal\ side\ and\ vice\ versa$



a) $a^2 + b^2 = c^2$

b) $\sin A = \frac{a}{c} = \frac{Opposite}{Hypotenuse}$

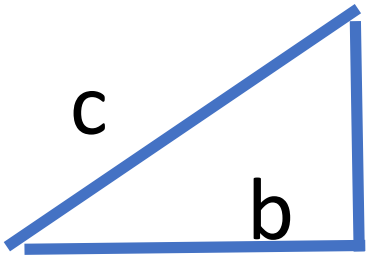
c) $\cos A = \frac{b}{c} = \frac{adjacent}{Hypotenuse}$

d) $\tan A = \frac{a}{b} = \frac{Opposite}{adjacent}$

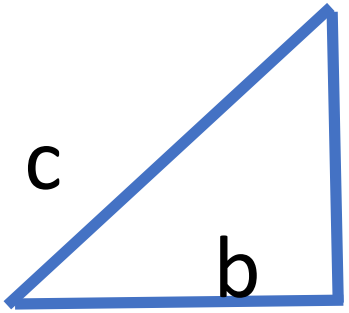
e) $\sin 0 = 0$; $\sin 30° = \frac{1}{2}$; $\sin 45° = \frac{1}{\sqrt{2}}$; $\sin 60° = \frac{\sqrt{3}}{2}$; $\sin 90° = 1$

f) $\cos 0 = 1$; $\cos 30° = \frac{\sqrt{3}}{2}$; $\cos 45° = \frac{1}{\sqrt{2}}$; $\cos 60° = \frac{1}{2}$; $\cos 90° = 0$

Special triangles:



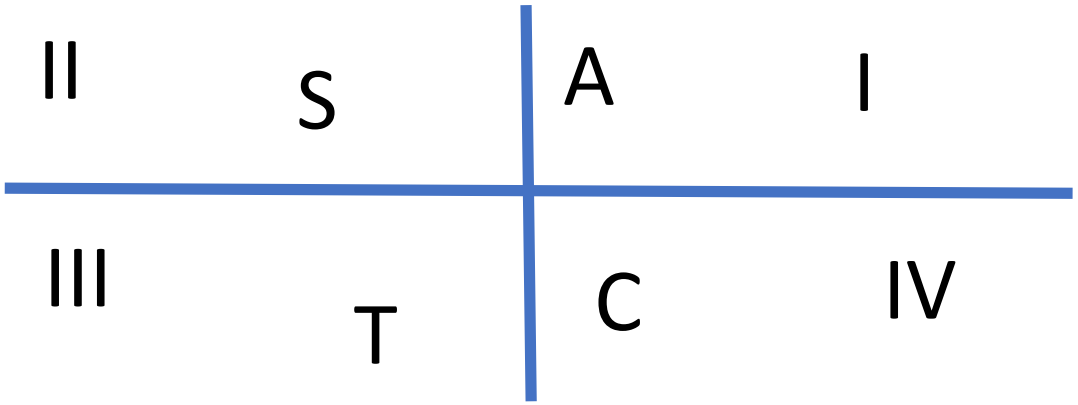
$$a:b:c = 1:\sqrt{3}:2$$



$$a:b:c = 1:1:\sqrt{2}$$

1) $\sin(90^\circ - x) = \cos x$
2) $\cos(90^\circ - x) = \sin x$

3) *Sign of Trigonometric functions*



All Students Take Calculus

1) $1^\circ = 1.\frac{\pi}{180^\circ}\ radians$

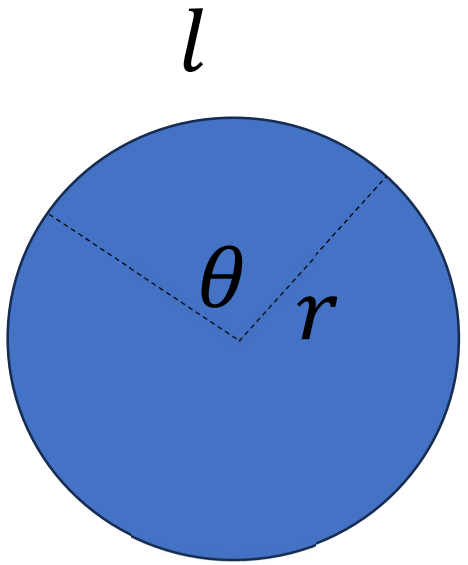
2) $1\ radian = \frac{180^\circ}{\pi}\ degrees$

3) a) $\theta\ (radians) = \frac{l}{r}$

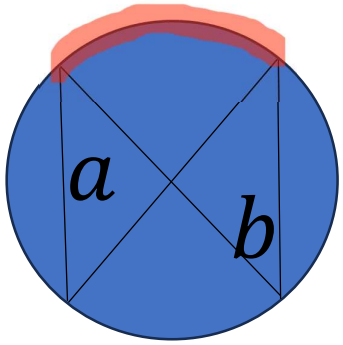
b) $Area\ of\ Sector = \frac{r^2\theta}{2}$

c) $Area\ of\ circle = \pi r^2$

d) $Circumference = 2\pi r$

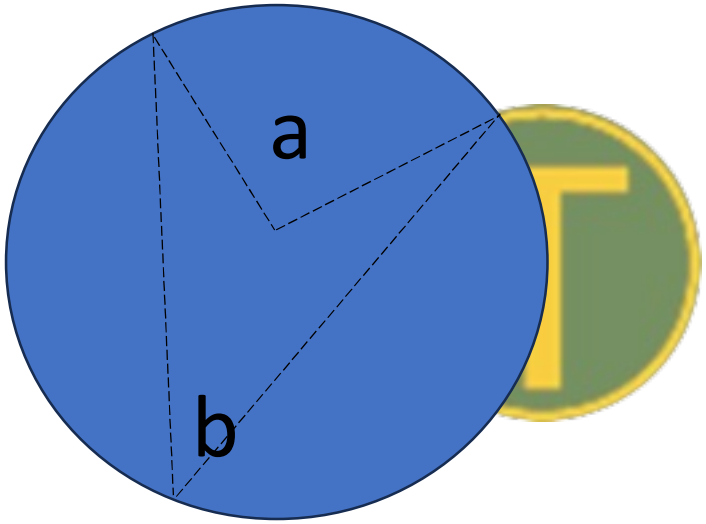


4) *Same arc subtends equal angle at any point on circle*



$\angle a = \angle b$

5) *Angle subtended by an arc at centre is twice the angle subtended by same arc at any other point on circle*



$$a = 2b$$

6) $Angle\ in\ a\ semi - circle = 90^{\circ}$
7) $Line\ joining\ center\ and\ the\ point\ of\ contact\ of\ tangent = 90^{\circ}$
8) $(x-h)^2 + (y-k)^2 = r^2;\ (h,k)\ is\ the\ center\ ;\ r\ \ is\ the\ radius$

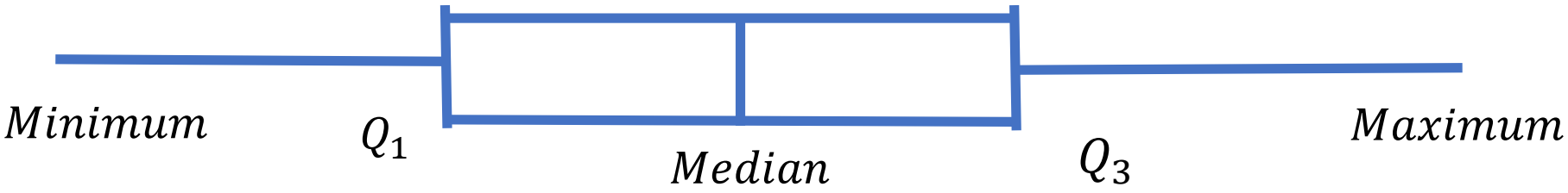
1) $Probability = \frac{Fav.\ Outcomes}{Total\ Outcomes}$
2) $Mean = \frac{Sum\ of\ \#}{No.\ of\ \#}$
3) $Median : Arrange\ in\ increasing\ order$

$$if\ n\ is\ even\ ;\ \ Median = \frac{\frac{n}{2}th + \left(\frac{n}{2}+1\right)^{th}}{2}$$

$$if\ n\ is\ odd\ ;\ \ Median = \left(\frac{n+1}{2}\right)^{th}\ term$$

4) $Mode : No.\ appearing\ most\ no.\ of\ times$
5) $Standard\ deviation : Measure\ of\ the\ spread$

Box Plot



6) $Range = Maximum - Minimum$

1) $Similarity\ Cases\ (\sim)$

a) SSS

b) SAS

c) AA

2) $Congruency\ Cases\ (\cong)$

a) SSS

b) SAS

c) ASA

d) AAS

e) RHS

Shape	***CSA/LSA***	***TSA***	***Volume***
Cube	$4a^2$	$6a^2$	a^3
Cuboid	$2(l+w)h$	$2(lw+wh+hl)$	lwh
Cylinder	$2\pi rh$	$2\pi rh+2\pi r^2$	$\pi r^2 h$
Cone (Rt.)	πrl	$\pi rl+\pi r^2$	$\frac{1}{3}\pi r^2 h$
Sphere	NA	$4\pi r^2$	$\frac{4}{3}\pi r^3$
Hemisphere	$2\pi r^2$	$3\pi r^2$	$\frac{2}{3}\pi r^3$
Prism	–	–	$B.h$ $(B: Base\ area)$
Pyramid	–	–	$\frac{1}{3}B.h$
Equilateral triangle	NA	$\frac{\sqrt{3}}{4}a^2$	NA
Trapezoid	NA	$\frac{1}{2}(a+b)h$	NA

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