## HSE FIRST YEAR TOOL KIT IN MATHEMATICS (SCIENCE) 2015

- *Anoop Kumar M K*

# If a set has n elements, total number of subsets of A is $2^n$.

# $(AUB)' = A'\cap B'$ and $(A\cap B)' = A'U\ B'$

# $n(AUB) = n(A) + n(B) - n(A\cap B)$

# If n(A)= x and n(B)= y then (i) Number of relations from A to B is $2^{xy}$

(ii) Number of functions from A to B is $y^x$.

# The domain of the function $\sqrt{a^2 - x^2}$ is [-a,a] and range is [0,a].

# $\pi$ rad = $180^0$

# If in a circle of radius r , an arc of length l subtends an angle of θ radians at the centre then $l = r\theta$

# Any trigonometric function of $(n.90^o \pm \theta)$ is numerically equal to

(i) The same function of θ if n is an even integer
(ii) The corresponding co-function of θ if n is an odd integer.
(iii) The sign depends on the quadrant in which $(n.90^o \pm \theta)$ lies.

# Product Formula $\sin\alpha \pm \sin\beta = 2\sin\frac{1}{2}(\alpha \pm \beta)\cos\frac{1}{2}(\alpha \mp \beta)$

$$\cos\alpha + \cos\beta = 2\cos\frac{1}{2}(\alpha + \beta)\cos\frac{1}{2}(\alpha - \beta)$$

# Maximum value of a sin θ + b cos θ is $\mathbf{\sqrt{a^2 + b^2}}$

# In any ΔABC $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

# If $i = \sqrt{-1}$ then $i^{4m} = 1$ , $i^{4m+1} = i$ , $i^{4m+2} = -1$ and $i^{4m+3} = -i$
# The conjugate of a+ ib is a – i b.

# The polar form of the complex number z= a+ i b is r(cos θ + i sin θ )

# $n! = n(n-1)(n-2)(n-3) \ldots 3.2.1$

# If $nC_p = nC_q$ then either p = q or p + q = n.

# $nC_r + nC_{r-1} = {}^{n+1}C_r$

# If n distinct points are given on the circumference of a circle then

Number of straight lines = $nC_2$ and Number of triangles = $nC_3$

# Given n points p of which are collinear then,

(a) No. of straight lines = $nC_2 - pC_2 + 1$
(b) No. of triangles = $nC_3 - pC_3$

# Number of diagonals of an n-sided polygon = $nC_2 - n$

# In the expansion of $(a+b)^n$ general term is given by $t_{r+1} = nC_r\, a^{n-r}\, b^r$ .

# $(1+x)^n = 1 + nC_1 x + nC_2 x^2 + .... + x^n$ .

# If the $n^{th}$ term of an A P is $p + nq$ then common difference is q.

# If a,b,c are in A.P then $2b = a+c$
# If a,b,c are in G.P then $b = \sqrt{ac}$

# In an AP if the $m^{th}$ term is n and $n^{th}$ term is m then $d = -1$
First term is $m+n-1$ , $p^{th}$ term is $m+n-p$ and $m+n$ $^{th}$ term is Zero.
# Distance formula $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
# Two lines are parallel if $m_1 = m_2$
Two lines are perpendicular if $m_1 m_2 = -1$

# If $p \to q$ is a statement then Converse is $q \to p$
Inverse is $\sim p \to \sim q$
Contrapositive is $\sim q \to \sim p$

# Coefficient of variation CV = $\frac{S.D}{mean} \times 100$

# $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$

# $\lim_{\theta \to 0} \frac{\sin \theta}{\theta} = 1$
# If y = sin x then $\frac{dy}{dx} = \cos x$
# If y = cos x then $\frac{dy}{dx} = -\sin x$

# for any two events A and B
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$.
# If A and B are mutually exclusive $P(A \cup B) = P(A) + P(B)$.