Formulas of mth102

Inverse of matrix

$$A^{-1} = \frac{adj(A)}{\det(A)}$$

Arithmetic Sequence

$$a_n = a_{n-1} + d$$
$$a_n = a_1 + (n-1)d$$

Arithmetic Series

$$S_n = \frac{n}{2}(a_1 + a_n)$$
$$S_n = \frac{n}{2}(a_1 + a_1 + (n-1)d)$$
$$S_n = \frac{n}{2}(2a_1 + (n-1)d)$$

Geometric Sequence

$$a_n = a_1 r^{n-1}$$

Geometric Series

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

$|r| < 1$ Then $|r^n| = 0$ So

$$S_\infty = \frac{a_1}{1-r}$$

Permutation

$${}^nP_r = \frac{n!}{(n-r)!}$$

Combinations

$${}^nC_r = \frac{n!}{r!(n-r)!}$$

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Binomial Theorem

$$(x+y)^n = {}^nC_0x^n + {}^nC_1x^{n-1}y + {}^nC_2x^{n-2}y^2 + {}^nC_3x^{n-3}y^3 + \ldots\ldots + {}^nC_ny^n = \sum_{k=0}^{n} {}^nC_kx^{n-k}y^k$$

After of Mid term

Distance

$$AB = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$$

Mid-point

$$M = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

Gradient or Slope

$$m = \frac{y_2-y_1}{x_2-x_1}$$

Point-slope form

$$y - y_1 = m(x - x_1)$$

Slope-intercept form

$$y = mx + c$$

For

$$ax + by = c$$

$$Slope = m = -\frac{a}{b}$$

Equation of Circle

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When center is zero

$x^2 + y^2 = r^2$

$Center\ of\ Circle = (h,k)$

$Radius = r$

$(x-h)^2 + (y-k)^2 = r^2$

$x^2 + y^2 + 2gx + 2fy + c = 0$

$Center\ of\ Circle = (-g,-f)$

$Radius = r = \sqrt{g^2 + f^2 - c}$

Trigonometry

$$\text{Sin}\,\theta = \frac{Opposite(a)}{hypotenuse(c)}$$

$$\text{Cos}\,\theta = \frac{adjacent(b)}{hypotenuse(c)}$$

$$T\,\text{an}\,\theta = \frac{Opposite(a)}{adjacent(b)}$$

Cosθ

$\text{Cos}\,0 = 1$

$\text{Cos}\,90 = 0$

$\text{Cos}\,180 = -1$

$\text{Cos}\,270 = 0$

$\text{Cos}\,360 = \text{Cos}\,0$

Sinθ

$\text{Sin}\,0 = 0$

$\text{Sin}\,90 = 1$

$\text{Sin}\,180 = 0$

$\text{Sin}\,270 = -1$

Tanθ

$\text{Tan}\,0 = 0$

$\text{Tan}\,90 = \infty$

Function	Periodic properties	Odd/Even properties	Translation properties

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Cosine	$\text{Cos}(\theta \pm 360) = \text{Cos}\,\theta$	$\text{Cos}(-\theta) = \text{Cos}\,\theta$	$\text{Cos}(180-\theta) = -\text{Cos}\,\theta$ $\text{Cos}(\theta-180) = -\text{Cos}\,\theta$
Sine	$\text{Sin}(\theta \pm 360) = \text{Sin}\,\theta$	$\text{Sin}(-\theta) = -\text{Sin}\,\theta$	$\text{Sin}(180-\theta) = \text{Sin}\,\theta$ $\text{Sin}(\theta-180) = -\text{Sin}\,\theta$
Tangent	$\text{Tan}(\theta \pm 180) = \text{Tan}\,\theta$	$\text{Tan}(-\theta) = -\text{Tan}\,\theta$	$\text{Tan}(180-\theta) = -\text{Tan}\,\theta$

Function	**Domain**	**Range**
y=Sinx	$-\infty < x < +\infty$	$-1 \le y \le 1$
y=Cosx	$-\infty < x < +\infty$	$-1 \le y \le 1$
y=Tanx	$-\infty < x < +\infty$, $x \ne \frac{(2n+1)\pi}{2}, n \in Z$	$-\infty < y < +\infty$
y=Sin^{-1}θ	$-1 \le y \le 1$	$-\infty < x < +\infty$
y=Cos^{-1}θ	$-1 \le y \le 1$	$-\infty < x < +\infty$
y=Tan^{-1}θ	$-\infty < x < +\infty$	$-\infty < x < +\infty$, $x \ne \frac{(2n+1)\pi}{2}, n \in Z$

θ Degrees	θ Radians	**Sinθ**	**Cosθ**	**Tanθ**
30	$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
45	$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$	$\frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$	1
60	$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90	$\frac{\pi}{2}$	1	0	∞

Reciprocal Identities

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$$\csc\theta = \frac{1}{\sin\theta}$$

$$\sec\theta = \frac{1}{\cos\theta}$$

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

Quotient Identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

Periodic properties

$$\sin(\theta + 2\pi) = \sin\theta \qquad \csc(\theta + 2\pi) = \csc\theta$$

$$\cos(\theta + 2\pi) = \cos\theta \qquad \sec(\theta + 2\pi) = \sec\theta$$

$$\tan(\theta + \pi) = \tan\theta \qquad \cot(\theta + \pi) = \cot\theta$$

Even-Odd Properties

$$\sin(-\theta) = -\sin\theta \qquad \csc(-\theta) = -\csc\theta$$

$$\cos(-\theta) = \cos\theta \qquad \sec(-\theta) = \sec\theta$$

$$\tan(-\theta) = -\tan\theta \qquad \cot(-\theta) = -\cot\theta$$

Pythagorean Identities

$$\sin^2\theta + \cos^2\theta = 1$$

$$\tan^2\theta + 1 = \sec^2\theta$$

$$1 + \cot^2\theta = \csc^2\theta$$

Sum and Difference Formulas:

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

Double Angle Formulas

$$\cos(\alpha+\alpha)=\cos 2\alpha=\cos\alpha\cos\alpha-\sin\alpha\sin\alpha=\cos^2\alpha-\sin^2\alpha$$
$$\sin(\alpha+\alpha)=\sin 2\alpha=\sin\alpha\cos\alpha+\cos\alpha\sin\alpha=2\cos\alpha\sin\alpha$$
$$\tan(\alpha+\alpha)=\frac{\tan\alpha+\tan\alpha}{1-\tan\alpha\tan\alpha}=\frac{2\tan\alpha}{1-\tan^2\alpha}$$

Frequency Density

$$Frequency\ density=\frac{frequency}{Class\ width}$$

Arithmetic Mean:

For UN Grouped data

$$\bar{x}=\frac{x_1+x_2+x_3+.....+x_n}{n} \qquad OR$$

$$\bar{x}=\frac{\sum_{i=1}^{n}x_i}{n}$$

For Grouped data

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$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$

Geometric mean:

For UN Grouped data

$$GM = \sqrt[n]{a_1 a_2 a_3 ..... a_n} \qquad OR$$

$$GM = \left(a_1 a_2 a_3 ..... a_n\right)^{\frac{1}{n}}$$

$$GM = \left(\prod_{i=1}^{n} a_i\right)^{\frac{1}{n}}$$

$$GM = anti\log\left[\frac{1}{n}\sum_{i=1}^{n}\log\left(x_i\right)\right]$$

For Grouped data

$$GM = \left[x_1^{f_1} x_2^{f_2} x_3^{f_3} ..... x_n^{f_n}\right]^{\frac{1}{n}} \qquad OR$$

$$GM = \left[\prod_{i=1}^{n} x_i^{f_i}\right]^{\frac{1}{N}} \qquad where\ N = \sum_{i=1}^{n} f_i$$

$$GM = anti\log\left[\frac{1}{n}\sum_{i=1}^{n} f_i \log\left(x_i\right)\right]$$

Weighted mean

$$\bar{x} = \frac{w_1 x_1 + w_2 x_2 + w_3 x_3 + ... + w_n x_n}{w_1 + w_2 + w_3 + ... + w_n}$$

Harmonic mean

For UN Grouped data

$$H = \frac{n}{\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} + ... + \frac{1}{x_n}} = \frac{n}{\sum_{i=1}^{n} \frac{1}{x_i}}$$

For Grouped Data

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$$H = \frac{n}{\sum_{i=1}^{n} \frac{f_i}{x_i}}$$

Sifting Property of arithmetic mean

$y_i = x_i + a$ *where a is fix number*

$$\bar{x} = \frac{\sum y_i}{n} + a$$

$$\bar{x} = \frac{\sum (y_i - a)}{n} + a$$

Median

For UN Grouped data

If "n" is odd

$$M_e = X_{\frac{1}{2}(n+1)}$$

If "n" is even

$$M_e = \frac{1}{2}\left(X_{\frac{1}{2}} + X_{\frac{1}{2}+1} \right)$$

For Grouped data

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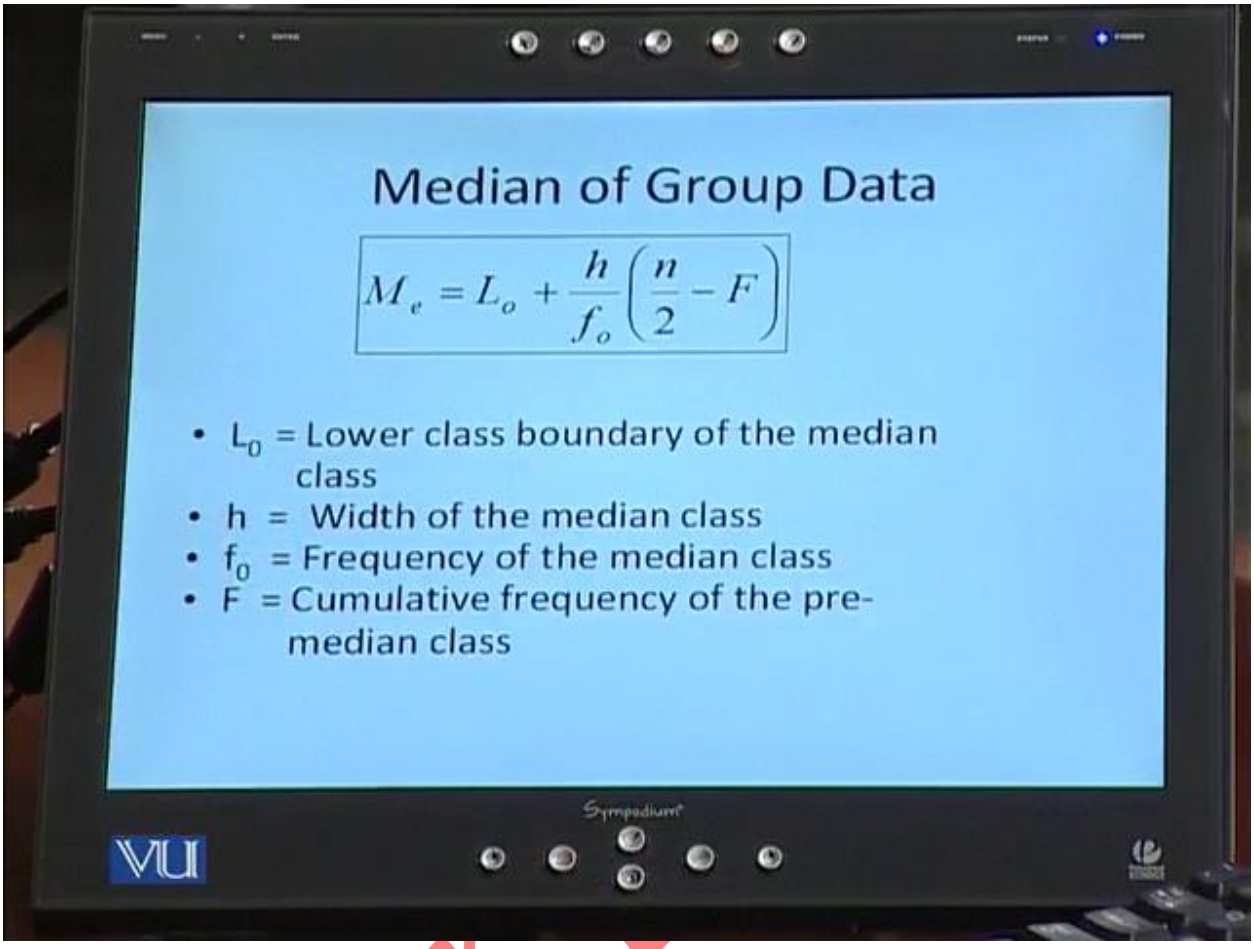

Range

$$Range = l\arg est\ value - smallest\ value$$

Percentile

$$L_y = (n+1)\left(\frac{y}{100}\right)$$

Inter-quartile range

$$IQR = Q_3 - Q_1$$

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