

Class 10 Science & Maths Formula Booklet

Formulas with key concepts for CBSE Boards | by Anish Kumar Sir

Maths: Polynomials & Quadratics

TOPIC	FORMULA	CONCEPT
Zeroes of quadratic	$\alpha + \beta = -b/a, \alpha\beta = c/a$	Roots can be read from coefficients without solving.
Zeroes of cubic	$\alpha + \beta + \gamma = -b/a, \alpha\beta + \beta\gamma + \gamma\alpha = c/a, \alpha\beta\gamma = -d/a$	Same idea extended to $ax^3 + bx^2 + cx + d$.
Quadratic formula	$x = [-b \pm \sqrt{(b^2 - 4ac)}] / 2a$	Works for every quadratic, even when factorising fails.
Discriminant	$D = b^2 - 4ac$	$D > 0$: two distinct real roots; $D = 0$: equal roots; $D < 0$: no real roots.
Pair of linear equations	$a_1/a_2 \neq b_1/b_2$ unique; $a_1/a_2 = b_1/b_2 \neq c_1/c_2$ none; all equal infinite	Ratios tell you if lines intersect, are parallel, or coincide.

Maths: Arithmetic Progression

TOPIC	FORMULA	CONCEPT
nth term	$a_n = a + (n - 1)d$	Each term adds the common difference d once more.
Sum of n terms	$S_n = (n/2)[2a + (n - 1)d] = (n/2)(a + l)$	Average of first and last term $\times$ number of terms.
nth term from sum	$a_n = S_n - S_{n-1}$	Useful when only the sum formula is given.
Three terms in AP	$a - d, a, a + d$	Choosing terms symmetrically makes d cancel when added.

Maths: Coordinate Geometry

TOPIC	FORMULA	CONCEPT
Distance formula	$\sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$	Pythagoras theorem on the coordinate grid.
Section formula	$((mx_2 + nx_1)/(m + n), (my_2 + ny_1)/(m + n))$	Point dividing a segment internally in ratio $m:n$.
Mid-point	$((x_1 + x_2)/2, (y_1 + y_2)/2)$	Special case $m = n = 1$.
Area of triangle	$\frac{1}{2} x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) $	Area = 0 means the three points are collinear.

Maths: Trigonometry

TOPIC	FORMULA	CONCEPT
Ratios	$\sin\theta = P/H, \cos\theta = B/H, \tan\theta = P/B$	Defined in a right triangle relative to angle θ .
Identities	$\sin^2\theta + \cos^2\theta = 1; 1 + \tan^2\theta = \sec^2\theta; 1 + \cot^2\theta = \operatorname{cosec}^2\theta$	All three come from Pythagoras theorem.
Complementary angles	$\sin(90^\circ - \theta) = \cos\theta, \tan(90^\circ - \theta) = \cot\theta$	Co-ratios swap when angle is replaced by its complement.

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Standard values	$\sin 30^\circ = \frac{1}{2}$, $\sin 45^\circ = \frac{1}{\sqrt{2}}$, $\sin 60^\circ = \frac{\sqrt{3}}{2}$, $\tan 45^\circ = 1$	cos values are the sin values in reverse order.
Heights & distances	$\tan \theta = \text{height} / \text{horizontal distance}$	Angle of elevation equals angle of depression (alternate angles).

Maths: Mensuration & Statistics

TOPIC	FORMULA	CONCEPT
Circle	Arc = $(\theta/360) \cdot 2\pi r$, sector = $(\theta/360) \cdot \pi r^2$	A sector is a fraction $\theta/360$ of the full circle.
Cylinder	CSA $2\pi rh$, TSA $2\pi r(r + h)$, V $\pi r^2 h$	Volume = base area $\times$ height.
Cone	$l = \sqrt{r^2 + h^2}$, CSA πrl , V $\frac{1}{3}\pi r^2 h$	A cone holds one-third of the matching cylinder.
Sphere / hemisphere	S $4\pi r^2$, V $\frac{4}{3}\pi r^3$; hemisphere TSA $3\pi r^2$, V $\frac{2}{3}\pi r^3$	Hemisphere TSA includes the flat circular face.
Mean (assumed mean)	$\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$	Shifting the origin reduces calculation.
Median (grouped)	$l + \frac{[(n/2 - cf)/f] \times h}{1}$	Locate median class where cumulative frequency crosses $n/2$.
Mode (grouped)	$l + \frac{[(f_1 - f_0)/(2f_1 - f_0 - f_2)] \times h}{1}$	Empirical: 3 Median = Mode + 2 Mean.
Probability	$P(E) = \text{favourable} / \text{total}$; $P(E) + P(\text{not } E) = 1$	$0 \leq P(E) \leq 1$ always.

Science: Light

TOPIC	FORMULA	CONCEPT
Mirror formula	$1/v + 1/u = 1/f$, $f = R/2$	Use sign convention: distances against incident light are negative.
Mirror magnification	$m = h'/h = -v/u$	m negative: real & inverted; m positive: virtual & erect.
Lens formula	$1/v - 1/u = 1/f$	Note the minus sign, unlike the mirror formula.
Lens magnification	$m = h'/h = v/u$	Convex lens forms real images beyond F, virtual inside F.
Power of lens	$P = 1/f$ (f in metres), unit dioptre (D)	Convex +P, concave -P; $P_{\text{total}} = P_1 + P_2$.
Refractive index	$n = c/v = \sin i / \sin r$	Light bends towards the normal entering a denser medium.
Eye defects	Myopia: concave lens; Hypermetropia: convex lens	Near point of a normal eye ≈ 25 cm, far point at infinity.

Science: Electricity

TOPIC	FORMULA	CONCEPT
Current	$I = Q/t$	1 ampere = 1 coulomb per second.

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Ohm's law	$V = IR$	Holds when temperature stays constant.
Resistance	$R = \rho L/A$	Longer wire: more R; thicker wire: less R.
Series	$R_s = R_1 + R_2 + \dots$	Same current through each resistor.
Parallel	$1/R_p = 1/R_1 + 1/R_2 + \dots$	Same voltage across each; R_p is less than the smallest R.
Power	$P = VI = I^2R = V^2/R$	Household appliances are connected in parallel.
Joule heating	$H = I^2Rt$	Basis of heaters, fuses and bulbs.
Energy unit	$1 \text{ kWh} = 3.6 \times 10^6 \text{ J}$	Electricity bills count units in kWh.

Science: Magnetism & Chemistry

TOPIC	FORMULA	CONCEPT
Right-hand thumb rule	Thumb = current, curled fingers = field	Field lines around a straight wire are concentric circles.
Fleming's left-hand rule	Force $\perp$ field $\perp$ current	Principle of the electric motor.
Electromagnetic induction	Changing magnetic flux induces current	Principle of the generator (Fleming's right-hand rule).
pH	$\text{pH} = -\log[\text{H}^+]$; pH < 7 acidic, 7 neutral, > 7 basic	Each pH unit is a tenfold change in H^+ concentration.
Balancing equations	Atoms of each element equal on both sides	Follows the law of conservation of mass.

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