

Class 11 Mathematics

Concept Builder • Revision • Solved Examples

A practical revision companion

Learn the concept, understand the method, practise with guided examples, and revise with confidence.

Concept Clarity • Guided Practice • Exam Confidence

01 Sets

Core idea

A set is a well-defined collection. Operations combine or compare sets.

Key formulas / rules

$A \cup B$: union; $A \cap B$: intersection; $A - B$: elements in A not B; $n(A \cup B) = n(A) + n(B) - n(A \cap B)$.

Guided solved examples

Example 1. If $A = \{1, 2, 3\}$, $B = \{3, 4\}$, find $A \cup B$.

Solution. $\{1, 2, 3, 4\}$.

Example 2. Find $A \cap B$.

Solution. $\{3\}$.

Common mistakes

Confusing union with intersection is common.

Exam tip

Use a Venn diagram for counting problems.

Practice

1. For $A = \{1, 2, 3\}$, $B = \{2, 3, 4\}$, find $A - B$.
2. If $n(A) = 20$, $n(B) = 15$, $n(A \cap B) = 5$, find $n(A \cup B)$.

02 Functions

Core idea

A function assigns each input exactly one output. Domain, codomain and range describe the mapping.

Key formulas / rules

Composition: $(f \circ g)(x) = f(g(x))$. A function can be one-one, many-one, into or onto.

Guided solved examples

Example 1. If $f(x) = 2x + 1$, find $f(3)$.

Solution. $f(3) = 7$.

Example 2. If $f(x) = x + 2$ and $g(x) = 3x$, find $f(g(x))$.

Solution. $f(3x) = 3x + 2$.

Common mistakes

Do not interchange $f(g(x))$ and $g(f(x))$.

Exam tip

Track the input through the functions step by step.

Practice

1. Find $g(f(x))$ for the above functions.
2. Give an example of a one-one function.

03 Trigonometric Functions

Core idea

Trigonometric functions extend familiar ratios to angles on the real line. Identities connect different expressions.

Key formulas / rules

$$\sin^2 x + \cos^2 x = 1; 1 + \tan^2 x = \sec^2 x; 1 + \cot^2 x = \operatorname{cosec}^2 x.$$

Guided solved examples

Example 1. Simplify $1 - \tan^2 x$ when possible.

Solution. Use identities carefully; it is not generally equal to a constant. This is a reminder to avoid unsupported simplification.

Example 2. Find $\sin x$ if $\cos x = 3/5$ and x is acute.

Solution. $\sin x = 4/5$.

Common mistakes

Do not apply identities outside their valid algebraic form.

Exam tip

Convert to $\sin/\cos$ when an identity is easier that way.

Practice

1. Prove one basic identity.
2. Find $\tan x$ when $\sin x = 5/13$ and x is acute.

04 Complex Numbers & Quadratics

Core idea

Complex numbers extend real numbers using $i^2 = -1$. Quadratic equations can have real or complex roots.

Key formulas / rules

$$i^2 = -1. \text{ Quadratic formula: } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Guided solved examples

Example 1. Simplify $i^2 + 3i$.

Solution. $-1 + 3i$.

Example 2. Solve $x^2 + 1 = 0$.

Solution. $x^2 = -1$, so $x = \pm i$.

Common mistakes

Remember $i^2 = -1$.

Exam tip

Keep real and imaginary parts separate.

Practice

1. Simplify $(2+i)(3-i)$.
2. Solve $x^2-4x+5=0$.

05 P&C & Binomial

Core idea

Permutations count ordered arrangements; combinations count selections. Binomial theorem expands powers of a sum.

Key formulas / rules

$nPr = \frac{n!}{(n-r)!}$; $nCr = \frac{n!}{r!(n-r)!}$. General term in $(a+b)^n$: $T(r+1) = nCr a^{n-r} b^r$.

Guided solved examples

Example 1. Find 5C_2 .

Solution. $5!/(2!3!)=10$.

Example 2. Find coefficient of x^2 in $(1+x)^4$.

Solution. Coefficient is ${}^4C_2=6$.

Common mistakes

Ask whether order matters before choosing nPr or nCr .

Exam tip

Write the general term before substituting.

Practice

1. Find 6P_2 .
2. Find coefficient of x^3 in $(2+x)^5$.

06 Sequences & Series

Core idea

Sequences list terms according to a rule. Arithmetic and geometric progressions have constant difference or ratio.

Key formulas / rules

AP: $a_n = a + (n-1)d$. GP: $a_n = ar^{(n-1)}$. AP sum: $S_n = \frac{n}{2}[2a + (n-1)d]$.

Guided solved examples

Example 1. Find 10th term of 2,5,8,...

Solution. $a=2, d=3$; $a_{10}=29$.

Example 2. Find 5th term of GP 3,6,12,...

Solution. $a=3, r=2$; $a_5=48$.

Common mistakes

Do not use AP formula for a GP.

Exam tip

Identify d or r first.

Practice

1. Find S_{15} for an AP.
2. Find the 8th term of GP 2,6,18,...

07 Coordinate Geometry

Core idea

Coordinate geometry represents geometric objects algebraically. Slope measures inclination and distance measures separation.

Key formulas / rules

Slope $= (y_2 - y_1) / (x_2 - x_1)$. Distance $= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. Circle: $(x - h)^2 + (y - k)^2 = r^2$.

Guided solved examples

Example 1. Find slope through (1,2),(5,10).

Solution. Slope $= 8/4 = 2$.

Example 2. Find circle centre (2,-1), radius 3.

Solution. $(x - 2)^2 + (y + 1)^2 = 9$.

Common mistakes

Check vertical-line cases separately.

Exam tip

Sketch the geometry before forming the equation.

Practice

1. Find equation of line with slope 3 through (1,4).
2. Find distance between (-2,1) and (4,9).

08 Limits & Derivatives

Core idea

A limit describes behaviour near a point. A derivative gives instantaneous rate of change and slope.

Key formulas / rules

$d(x^n)/dx = nx^{(n-1)}$. Product rule: $(uv)' = u'v + uv'$.

Guided solved examples

Example 1. Differentiate x^4 .

Solution. $4x^3$.

Example 2. Differentiate x^2+3x .

Solution. $2x+3$.

Common mistakes

Do not forget the chain/product rule where needed.

Exam tip

Identify the structure before differentiating.

Practice

1. Differentiate x^3+5x^2 .

2. Find derivative of $(x^2+1)(x+2)$.

09 Statistics & Probability

Core idea

Statistics describes data; probability models uncertainty. Use clearly defined outcomes and events.

Key formulas / rules

Mean= sum/n . $P(A|B)=P(A \cap B)/P(B)$, $P(B)>0$. For independent events $P(A \cap B)=P(A)P(B)$.

Guided solved examples

Example 1. Mean of 2,4,6,8.

Solution. 5.

Example 2. Two fair coins: probability of two heads.

Solution. $1/4$.

Common mistakes

Define the sample space before probability.

Exam tip

Check whether independence is actually justified.

Practice

1. Find mean of 3,5,7,9,11.

2. For a die, find $P(\text{number}>4)$.

Rapid Revision Sheet

Functions
Domain, codomain, range and composition; do not confuse $f \circ g$ with $g \circ f$.
Algebra
Complex numbers, quadratic roots, P&C, binomial coefficients and sequences.
Coordinate Geometry
Slope, distance and standard conic equations.
Calculus
Limits introduce derivatives; apply differentiation rules carefully.
Probability
Define events and use conditional/independence relations appropriately.

Mixed Practice Test

1. Find $f(2)$ for $f(x)=3x-1$.
2. Find 6C_2 .
3. Find the 12th term of AP 4,7,10,...
4. Differentiate $3x^2+2x+1$.
5. Find slope through (2,3) and (6,11).
6. Two fair coins are tossed. Find $P(\text{exactly one head})$.

Answer Key

1. 5.
2. 15.
3. 37.
4. $6x+2$.
5. 2.
6. $1/2$.

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