



CONCEPTUAL
— S H E E T S —

Class 10 Maths

Score Booster Workbook

Chapter-wise Formulas, Concepts,
Solved Examples & Practice Questions



All 14
Chapters
Covered



Printable
PDF



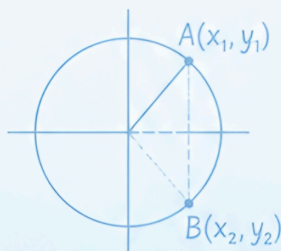
Step-by-Step
Solved
Examples



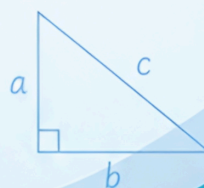
Practice
Questions



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



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



Learn Concepts. Practice Smart. Score Better.

How to Use This Workbook

CONCEPTUAL SHEETS | Class 10 Maths Score Booster Workbook



This workbook is designed to help you revise formulas, understand concepts, and practise important question types chapter-wise. Follow this simple method to get the best results from your workbook.

1



Step 1: Start with the Formula & Concept Sheet

Begin every chapter by revising the important formulas and key concepts. This builds the foundation before solving questions.

2



Step 2: Understand the Question Type

Read the Concept + Formula Used section carefully so you know what the question is asking and which method is needed.

3



Step 3: Study the Solved Example

Follow the solved example step by step and understand how the method is applied correctly.

4



Step 4: Solve the Practice Questions

Now try the same-type practice questions on your own. Work neatly and apply the same method.

5



Step 5: Check and Improve

Review your mistakes, identify weak areas, and revise the concept again wherever needed.

6



Step 6: Track Your Progress

Use the revision checklist, formula tracker, practice tracker, and mistake tracker to stay organised and improve regularly.



Best Study Method

- ✓ Complete one chapter at a time
- ✓ Revise first, then practise
- ✓ Repeat weak question types
- ✓ Use the trackers for regular revision



Quick Tip

Consistency matters more than speed. Practise a little every day, revise formulas regularly, and focus on understanding the method before solving quickly.

Workbook Features

CONCEPTUAL SHEETS | Class 10 Maths Score Booster Workbook



This workbook is designed to make Class 10 Maths revision simple, structured, and practice-focused. Each chapter helps students move from formulas and concepts to solved examples and self-practice in a clear step-by-step format.

1



Chapter-wise Formula & Concept Sheets

Every chapter begins with important formulas and key concepts for quick revision before practice.

2



Type-wise Practice Pages

Each page focuses on one question type, making learning simple, organised, and easy to follow.

3



Concept + Formula Used

Students first understand the concept and formula needed before solving the question.

4



Solved Examples

Clear step-by-step examples show the correct method and build problem-solving confidence.

5



Try These Yourself

Same-type practice questions help students apply the method independently.

6



Final Answer Focus

Solutions are presented clearly so students learn how to write final answers properly.

7



Revision & Progress Trackers

Includes revision checklist, formula tracker, practice tracker, and mistake tracker for better self-monitoring.

8



Printable, Student-Friendly PDF

Large readable text, clean layout, and structured design make the workbook easy to use digitally or in print.



Why This Workbook Works



Revise smarter



Understand concepts clearly



Practise with confidence



Track your improvement



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CONCEPTUAL SHEETS | Class 10 Maths Score Booster Workbook



A chapter-wise roadmap of the workbook for quick navigation and revision.

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Tip: Use this page to track which chapter you want to revise next.



Study Method & Progress Tracker

CONCEPTUAL SHEETS | Class 10 Maths Score Booster Workbook



Use this page to follow a smart study routine and track your chapter progress in an organised way.

Best Study Method

1



Start with the
Formula & Concept
Sheet

2



Read the
Concept +
Formula Used

3



Study the
Solved Example
Carefully

4



Try the Practice
Questions on
Your Own

5



Mark Mistakes
and Revise
Weak Areas

6



Update Your
Progress Tracker
Regularly



Smart Study Tip

Complete one chapter properly before moving to the next. First revise formulas, then study the example, and finally practise the questions yourself.

Chapter Progress Tracker

		Formula	Practice	Revision			Formula	Practice	Revision
1	Real Numbers	☐	☐	☐	8	Introduction to Trigonometry	☐	☐	☐
2	Polynomials	☐	☐	☐	9	Some Applications of Trigonometry	☐	☐	☐
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5	Arithmetic Progressions	☐	☐	☐	12	Surface Areas and Volumes	☐	☐	☐
6	Triangles	☐	☐	☐	13	Statistics	☐	☐	☐
7	Coordinate Geometry	☐	☐	☐	14	Probability	☐	☐	☐



In this chapter you will learn:

Euclid's Division Lemma, HCF using Euclid's Algorithm, Fundamental Theorem of Arithmetic, prime factorization, HCF–LCM relation, rational and irrational numbers, terminating decimal expansion, and powers ending with 0.



IMPORTANT FORMULAS

- | | | |
|---|---------------------------------------|--|
| 1 | Euclid's Division Lemma: | $a = bq + r$, where $0 \leq r < b$ |
| 2 | Division Rule: | Dividend = Divisor $\times$ Quotient + Remainder |
| 3 | Prime Factor Form: | $n = p_1^a \times p_2^b \times p_3^c \times \dots$ |
| 4 | HCF–LCM Relation: | $\text{HCF}(a, b) \times \text{LCM}(a, b) = a \times b$ |
| 5 | Rational Number Form: | p/q , where $q \neq 0$ |
| 6 | Terminating Decimal Condition: | in lowest form, denominator = $2^n \times 5^m$ |
| 7 | Ending with 0 Rule: | a number ending with 0 must have $10 = 2 \times 5$ as a factor |

Key Concepts

KEY CONCEPTS

- Real numbers** include rational and irrational numbers.
- Rational numbers** can be written as p/q , where $q \neq 0$.
- Irrational numbers** cannot be written as p/q ; their decimals are non-terminating and non-recurring. Examples: $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, π .
- Euclid's Division Algorithm** is used to find HCF. Divide until the remainder becomes 0; the last divisor is the HCF.
- Fundamental Theorem of Arithmetic:** every composite number has a unique prime factorization, except for the order of factors.
- HCF and LCM connection:** $\text{HCF} \times \text{LCM} = \text{product of the two numbers}$.
- Decimal expansion check:** first write the rational number in lowest form. If the denominator has only 2 and/or 5 as prime factors, the decimal expansion is terminating.
- Power check:** $6^n = 2^n \times 3^n$, so it has no factor 5. Therefore, 6^n cannot end with 0.



Quick Tip

First identify the question type: HCF, prime factorization, decimal expansion, or powers ending with 0. Then apply the correct rule.

Finding HCF Using Euclid's Division Algorithm

Concept + Formula Used

Concept

Euclid's Division Algorithm is used to find the HCF (Highest Common Factor) of two positive integers.

In this method:

- First, divide the larger number by the smaller number
- Then divide the previous divisor by the previous remainder
- Continue this process until the remainder becomes 0

The last divisor is the HCF.

Formula Used

$$a = bq + r, \text{ where } 0 \leq r < b$$

Where:

a = dividend

b = divisor

q = quotient

r = remainder



Key Rule: When the remainder becomes 0, the divisor in that step is the HCF.

Solved Example

Example: Find the HCF of 135 and 225 using Euclid's Division Algorithm.

Detailed Solution

We have to find the HCF of 135 and 225.

Since 225 is greater than 135, we first divide 225 by 135.

So, take: $a = 225$, $b = 135$

Step 1: Divide 225 by 135

Using the formula $a = bq + r$, we get:

$$225 = 135 \times 1 + 90$$

Here, Dividend = 225, Divisor = 135, Quotient = 1, Remainder = 90.

Since the remainder is 90, not 0, we continue.

New pair: 135 and 90

Step 2: Divide 135 by 90

$$135 = 90 \times 1 + 45$$

Here, Dividend = 135, Divisor = 90, Quotient = 1, Remainder = 45.

Since the remainder is 45, not 0, we continue again.

New pair: 90 and 45

Step 3: Divide 90 by 45

$$90 = 45 \times 2 + 0$$

Here, Dividend = 90, Divisor = 45, Quotient = 2, Remainder = 0.

Now the remainder has become 0, so we stop the process.

Final Answer

When the remainder becomes 0, the divisor in that step is the HCF.

In the last step: $90 = 45 \times 2 + 0$

So, the divisor is 45.

Therefore, HCF of 135 and 225 = 45

Try These Yourself

Solve the following questions using Euclid's Division Algorithm.

- 1 Find the HCF of 96 and 144 using Euclid's Division Algorithm.
- 2 Find the HCF of 196 and 382 using Euclid's Division Algorithm.
- 3 Find the HCF of 255 and 867 using Euclid's Division Algorithm.
- 4 Find the HCF of 4052 and 12576 using Euclid's Division Algorithm.
- 5 Find the HCF of 155 and 1385 using Euclid's Division Algorithm.

Proving Irrationality of $\sqrt{p}$

Concept + Formula Used

Concept

To prove that a number like $\sqrt{2}$, $\sqrt{3}$, or $\sqrt{5}$ is irrational, we use the method of contradiction.

- First, assume that the given number is rational.
- Write it in the form $\frac{p}{q}$, where p and q are co-prime.
- Square both sides.
- Show that both p and q have a common factor.
- This contradicts the condition that p and q are co-prime.

So, the original assumption is wrong, and the given number is irrational.

Formula Used

A rational number can be written as:

$$\frac{p}{q}, \text{ where } q \neq 0$$

and p and q have no common factor other than 1.

Important rule:

If p^2 is divisible by a prime number, then p is also divisible by that prime number.



Key Rule:

To prove $\sqrt{n}$ is irrational, assume $\sqrt{n} = \frac{p}{q}$ where p and q are co-prime. Then prove that both p and q become divisible by the same prime number. This contradiction proves that $\sqrt{n}$ is irrational.

Solved Example

Example: Prove that $\sqrt{2}$ is irrational.

Detailed Solution

1 Step 1: Assume the opposite

Assume that $\sqrt{2}$ is rational.

So, it can be written as $\sqrt{2} = \frac{p}{q}$,

where p and q are co-prime integers and $q \neq 0$.

2 Step 2: Square both sides

$$(\sqrt{2})^2 = \left(\frac{p}{q}\right)^2$$

$$2 = \frac{p^2}{q^2}$$

$$p^2 = 2q^2$$

This means p^2 is divisible by 2. Therefore, p is also divisible by 2.

So, let $p = 2k$, where k is an integer.

3 Step 3: Substitute $p = 2k$

$$p^2 = 2q^2$$

$$(2k)^2 = 2q^2$$

$$4k^2 = 2q^2$$

$$q^2 = 2k^2$$

This means q^2 is divisible by 2. Therefore, q is also divisible by 2.

4 Step 4: Find the contradiction

We have proved that p is divisible by 2 and q is divisible by 2. So, both p and q have 2 as a common factor. But this is not possible because we assumed that p and q are co-prime. Therefore, our assumption that $\sqrt{2}$ is rational is wrong.



Final Answer: Hence, $\sqrt{2}$ is irrational.

Try These Yourself

Prove that each of the following numbers is irrational.

- 1 Prove that $\sqrt{3}$ is irrational.
- 2 Prove that $\sqrt{5}$ is irrational.
- 3 Prove that $\sqrt{7}$ is irrational.
- 4 Prove that $\sqrt{11}$ is irrational.
- 5 Prove that $\sqrt{13}$ is irrational.

Finding Zeroes of a Quadratic Polynomial by Factorization

Concept + Formula Used

Concept

A zero of a polynomial is the value of x for which the polynomial becomes 0.

For a quadratic polynomial, we may get two zeroes.

To find the zeroes by factorization:

- Put the polynomial equal to 0
- Factorize the quadratic polynomial
- Put each factor equal to 0
- Solve each equation to get the zeroes

Formula Used

For a quadratic polynomial:

$$p(x) = ax^2 + bx + c, \text{ where } a \neq 0$$

To find zeroes:

$$p(x) = 0$$

If:

$$p(x) = (x - \alpha)(x - \beta)$$

then the zeroes are:

$$x = \alpha \text{ and } x = \beta$$



Key Rule

If a product of two factors is 0, then at least one factor must be 0.

So, if: $(x - \alpha)(x - \beta) = 0$

then: $x - \alpha = 0$ or $x - \beta = 0$

Therefore: $x = \alpha$ or $x = \beta$

Solved Example

Example: Find the zeroes of the quadratic polynomial:

$$p(x) = x^2 - 5x + 6$$

Detailed Solution

1 Step 1:
Put $p(x) = 0$

To find the zeroes, put the polynomial equal to 0.

$$x^2 - 5x + 6 = 0$$

2 Step 2:
Split the middle term

We need two numbers whose:

Product = 6

Sum = -5

The required numbers are:

-2 and -3

because:

$$(-2) \times (-3) = 6$$

$$(-2) + (-3) = -5$$

Now split the middle term:

$$x^2 - 2x - 3x + 6 = 0$$

3 Step 3:
Factorize by grouping

Group the terms:

$$x(x - 2) - 3(x - 2) = 0$$

Now take the common

factor:

$$(x - 2)(x - 3) = 0$$

4 Step 4:
Put each factor equal to 0

Now use the zero product rule.

$$x - 2 = 0$$

$$\text{So, } x = 2$$

$$x - 3 = 0$$

$$\text{So, } x = 3$$

5 Step 5:
Verify the zeroes

For $x = 2$:

$$p(2) = 2^2 - 5(2) + 6$$

$$p(2) = 4 - 10 + 6$$

$$p(2) = 0$$

For $x = 3$:

$$p(3) = 3^2 - 5(3) + 6$$

$$p(3) = 9 - 15 + 6$$

$$p(3) = 0$$



Final Answer

Zeroes of $p(x) = x^2 - 5x + 6$ are 2 and 3.

Try These Yourself

Find the zeroes of each quadratic polynomial by factorization.

1 Find the zeroes of $p(x) = x^2 - 7x + 12$.

2 Find the zeroes of $p(x) = x^2 + 5x + 6$.

3 Find the zeroes of $p(x) = x^2 - 9x + 20$.

4 Find the zeroes of $p(x) = x^2 + 2x - 15$.

5 Find the zeroes of $p(x) = 2x^2 - 7x + 3$.

Finding Number of Zeroes from Graph

Concept + Formula Used

Concept

The zeroes of a polynomial are the values of x for which the value of the polynomial becomes 0.

On a graph, the value of the polynomial is 0 at the points where the graph meets the x -axis.

So, the number of zeroes of a polynomial is equal to the number of points where its graph cuts or touches the x -axis.

Formula Used

Number of zeroes = Number of points where the graph meets the x -axis

- 0 points $\rightarrow$ number of zeroes = 0
- 1 point $\rightarrow$ number of zeroes = 1
- 2 points $\rightarrow$ number of zeroes = 2
- 3 points $\rightarrow$ number of zeroes = 3



Key Rule

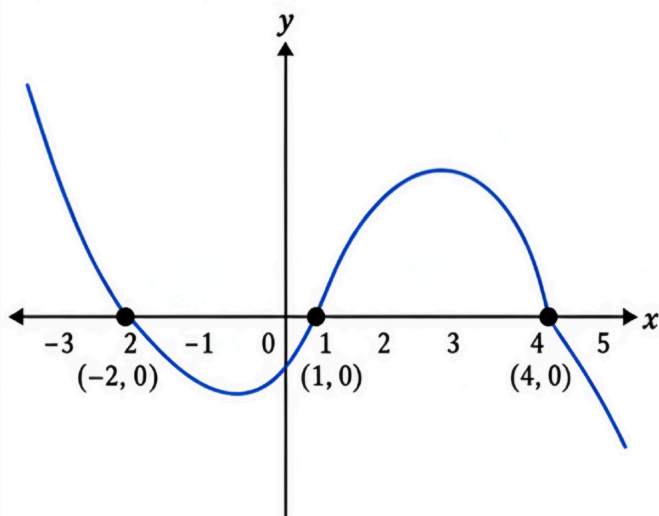
Step 1: Look at the x -axis

Step 2: Count how many times the graph cuts or touches the x -axis

Step 3: That count is the number of zeroes

Solved Example

Example: Observe the graph of polynomial $p(x)$. The graph meets the x -axis at the following points: $(-2, 0)$, $(1, 0)$, and $(4, 0)$. Find: (i) the zeroes of the polynomial (ii) the number of zeroes



1 Identify the x -axis points

The graph meets the x -axis at $(-2, 0)$, $(1, 0)$, and $(4, 0)$. These are the points where $p(x) = 0$.

2 Write the x -coordinates

The x -coordinates are -2 , 1 , and 4 .
So, the zeroes of the polynomial are -2 , 1 , and 4 .

3 Count the zeroes

The graph meets the x -axis at 3 different points.
Therefore, number of zeroes = 3.

4 Write the conclusion

Since the graph cuts or touches the x -axis at 3 points, the polynomial has 3 zeroes.



Final Answer: Zeroes of the polynomial are -2 , 1 , and 4 . Number of zeroes = 3

Try These Yourself

Observe each graph description and find the number of zeroes.

- 1 The graph of a polynomial cuts the x -axis at one point only. Find the number of zeroes.
- 2 The graph of a polynomial cuts the x -axis at two points: $(-3, 0)$ and $(2, 0)$. Write the zeroes and number of zeroes.
- 3 The graph of a polynomial does not meet the x -axis at any point. Find the number of zeroes.
- 4 The graph of a polynomial touches the x -axis at $(5, 0)$. Write the zero and number of zeroes.
- 5 The graph of a polynomial cuts the x -axis at $(-4, 0)$, $(0, 0)$, and $(3, 0)$. Write the zeroes and number of zeroes.



In this chapter you will learn:

standard form of quadratic equations, roots of quadratic equations, solving by factorization, completing the square method, quadratic formula, discriminant, nature of roots, word problems, and equations reducible to quadratic form.



IMPORTANT FORMULAS

- 1 Standard Form of Quadratic Equation**
 A quadratic equation in variable x is written as:

$$ax^2 + bx + c = 0$$
 where a, b, c are real numbers and $a \neq 0$
- 2 Root of a Quadratic Equation**
 A number α is called a root of the quadratic equation $ax^2 + bx + c = 0$ if:

$$a\alpha^2 + b\alpha + c = 0$$
 This means the value of the equation becomes 0 when $x = \alpha$.
- 3 Factorization Method**
 If $ax^2 + bx + c = 0$ can be factorized as:

$$(px + q)(rx + s) = 0$$
 then $px + q = 0$ or $rx + s = 0$
 The values of x obtained are the roots.
- 4 Splitting the Middle Term**
 For $ax^2 + bx + c = 0$, find two numbers whose:
 - Product = $a \times c$
 - Sum = b
 Then split the middle term and factorize.
- 5 Completing the Square Idea**
 To complete the square for an expression like $x^2 + 2kx$, add and subtract k^2 .

$$x^2 + 2kx + k^2 = (x + k)^2$$
- 6 Quadratic Formula**
 For $ax^2 + bx + c = 0$, the roots are:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
 where $a \neq 0$
- 7 Discriminant**
 The discriminant of a quadratic equation is:

$$D = b^2 - 4ac$$
 It helps us decide the nature of roots.
- 8 Nature of Roots**
 For $D = b^2 - 4ac$
 - If $D > 0$, roots are real and distinct
 - If $D = 0$, roots are real and equal
 - If $D < 0$, roots are not real
- 9 Sum and Product of Roots**
 If roots are α and β for $ax^2 + bx + c = 0$, then:

$$\alpha + \beta = -\frac{b}{a} \quad \alpha\beta = \frac{c}{a}$$
- 10 Equations Reducible to Quadratic Form**
 Some equations are not quadratic at first, but become quadratic after simplification or substitution.

Example: $x + \frac{1}{x} = k$

 Multiply by x to convert into quadratic form.

Key Concepts

- 1 Quadratic Equation**
 An equation of degree 2 is called a quadratic equation.
 Example: $2x^2 - 5x + 3 = 0$
- 2 Why $a \neq 0$**
 In $ax^2 + bx + c = 0$, if $a = 0$, the equation becomes linear, not quadratic. So, for a quadratic equation: a must not be 0
- 3 Root or Solution**
 A root of a quadratic equation is a value of x that satisfies the equation. If putting $x = \alpha$ makes the equation equal to 0, then α is a root.
- 4 Number of Roots**
 A quadratic equation can have at most two roots. The roots may be: two distinct real roots, two equal real roots, or no real roots.
- 5 Standard Form First**
 Before solving, always bring the equation into standard form: $ax^2 + bx + c = 0$
 Then identify a, b, c .
- 6 Factorization Method**
 This method is useful when the quadratic equation can be factorized easily. After factorization, apply the rule: If product of two factors is 0, at least one factor is 0.
- 7 Completing the Square Method**
 In this method, we convert the quadratic expression into a perfect square form. This method helps students understand how the quadratic formula is formed.
- 8 Quadratic Formula Method**
 The quadratic formula can be used for any quadratic equation. It is especially useful when factorization is difficult.
- 9 Discriminant**
 The discriminant tells us the nature of roots without solving the full equation. It is one of the most important formulas in this chapter.
- 10 Equal Roots Condition**
 If a quadratic equation has equal roots, then $D = 0$. This condition is used to find unknown values like k .
- 11 Word Problems**
 In word problems: choose the variable, form the quadratic equation, solve it, reject any value that does not fit the question, and write the final answer in statement form.
- 12 Reducible Quadratic Equations**
 Some equations become quadratic after simplification. Always simplify carefully and then solve using factorization or formula.



Quick Tip

In this chapter, first write the equation in standard form: $ax^2 + bx + c = 0$. Then decide whether to use: factorization, completing the square, quadratic formula, discriminant, or word-problem formation. Choosing the correct method first makes quadratic equations much easier.

Mixed Revision Practice

Concept + Formula Used

Concept

This page is for final revision of Chapter 4: Quadratic Equations.

In mixed revision questions, students must first identify the question type and then choose the correct method.

Before solving, check whether the question is based on:

- identifying quadratic equations
- checking whether a value is a root
- forming quadratic equations
- solving by simple factorization
- splitting the middle term
- reducing to standard form
- completing the square
- quadratic formula
- discriminant and nature of roots
- word problems
- equations reducible to quadratic form

Formula Used

1. Standard Form

$$ax^2 + bx + c = 0, \text{ where } a \neq 0$$

2. Quadratic Formula

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

3. Discriminant

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

$D > 0 \rightarrow$ roots are real and distinct

$D = 0 \rightarrow$ roots are real and equal

$D < 0 \rightarrow$ roots are not real

4. Zero Product Rule

$$\text{If } A \times B = 0, \text{ then } A = 0 \text{ or } B = 0$$

5. Completing Square Rule

$$x^2 + 2kx + k^2 = (x + k)^2$$



Key Rule

First identify the question type.

Then choose the correct method:

Factorization, splitting the middle term, completing the square, quadratic formula, discriminant, word-problem formation, or reducing to quadratic form.

Do not start solving directly.

Read the question carefully and select the method first.

Solved Example

Example: Solve the quadratic equation by factorization and also find the nature of its roots:

$$x^2 - 7x + 10 = 0$$

Detailed Solution

1 Step 1: Compare with standard form

Standard form:

$$ax^2 + bx + c = 0$$

Compare:

$$x^2 - 7x + 10 = 0$$

So,

$$a = 1, b = -7, c = 10$$

2 Step 2: Split the middle term

Need two numbers whose:

$$\text{Product} = a \times c = 1 \times 10 = 10$$

$$\text{Sum} = b = -7$$

Required numbers:

$$-5 \text{ and } -2$$

3 Step 3: Factorize

$$x^2 - 5x - 2x + 10 = 0$$

$$x(x - 5) - 2(x - 5) = 0$$

$$(x - 5)(x - 2) = 0$$

4 Step 4: Find roots and nature

Roots:

$$x - 5 = 0 \text{ or } x - 2 = 0$$

$$x = 5 \text{ or } x = 2$$

Discriminant:

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

$$D = (-7)^2 - 4(1)(10)$$

$$D = 49 - 40 = 9$$

Since $D > 0$, the equation has two distinct real roots.



Final Answer

Roots: $x = 5, 2$

Nature of roots: Two distinct real roots

Try These Yourself

Solve the following mixed revision questions from Chapter 4.

- 1 Check whether the equation is quadratic. If yes, write it in standard form and identify a , b , c .

$$3x^2 = 5x + 2$$

- 2 Check whether 3 is a root of:

$$x^2 - 6x + 9 = 0$$

- 3 Solve by splitting the middle term:

$$x^2 - 8x + 15 = 0$$

- 4 Find the nature of roots using the discriminant. Do not solve.

$$2x^2 - 4x + 2 = 0$$

- 5 Solve by reducing to quadratic form:

$$x + \frac{6}{x} = 5, \text{ where } x \neq 0$$

Finding Radius or Diameter from Area / Circumference

Concept + Formula Used

Concept

Sometimes the area or circumference of a circle is given, and we have to find the radius or diameter.

In such questions, we use the circle formula in reverse.

If circumference is given, use:

$$C = 2\pi r$$

If area is given, use:

$$A = \pi r^2$$

After finding the radius, diameter can be found by using:

$$d = 2r$$

Formula Used

For a circle:

$$\text{Circumference} = 2\pi r$$

$$\text{So, } r = \frac{\text{Circumference}}{2\pi}$$

$$\text{Area} = \pi r^2$$

$$\text{So, } r^2 = \frac{\text{Area}}{\pi}$$

$$\text{and } r = \sqrt{\frac{\text{Area}}{\pi}}$$

After finding radius:

$$\text{Diameter} = 2r$$

Use $\pi = \frac{22}{7}$ when values are multiples of 7.



Key Rule

To find radius or diameter from area/circumference:

Step 1: Identify whether area or circumference is given.

Step 2: Choose the correct formula.

Step 3: Substitute the given value.

Step 4: Solve carefully to find the radius.

Step 5: If diameter is required, use $d = 2r$.

Solved Example

Example: The circumference of a circle is 44 cm. Find (i) the radius (ii) the diameter (iii) the area of the circle. Take $\pi = \frac{22}{7}$.

1 Step 1: Write the formula

$$\text{Circumference} = 44 \text{ cm}$$

$$\text{Use: } C = 2\pi r$$

$$\text{So, } 44 = 2 \times \frac{22}{7} \times r$$

2 Step 2: Find the radius

$$44 = \frac{44}{7} \times r$$

$$r = \frac{44 \times 7}{44}$$

$$r = 7 \text{ cm}$$

3 Step 3: Find the diameter

$$d = 2r$$

$$= 2 \times 7$$

$$= 14 \text{ cm}$$

4 Step 4: Find the area

$$A = \pi r^2$$

$$= \frac{22}{7} \times 7 \times 7$$

$$= 154 \text{ cm}^2$$



Final Answer

$$\text{Radius} = 7 \text{ cm}$$

$$\text{Diameter} = 14 \text{ cm}$$

$$\text{Area} = 154 \text{ cm}^2$$

Try These Yourself

Find the required radius, diameter or area.

1. The circumference of a circle is 88 cm. Find its radius and diameter.

2. The circumference of a circle is 132 cm. Find its radius and area.

3. The area of a circle is 154 cm^2 . Find its radius and diameter.

4. The area of a circle is 616 cm^2 . Find its radius and circumference.

5. The circumference of a circle is 66 cm. Find its radius, diameter, and area.

Mixed Revision Practice

Concept + Formula Used

Concept

This page is for final revision of Chapter 11: Areas Related to Circles.

In mixed revision questions, first identify which formula is required.

Questions may involve:

- circumference of a circle
- area of a circle
- radius or diameter from circumference or area
- arc length of a sector
- area of a sector
- area of a segment
- shaded region
- area between concentric circles
- circle-based word problems

First understand the figure or situation, then choose the correct formula.

Formula Used

Circle Formulas:

$$\text{Circumference} = 2\pi r$$

$$\text{Area of circle} = \pi r^2$$

$$\text{Diameter} = 2r$$

Sector Formulas:

$$\text{Arc length} = \frac{\theta}{360} \times 2\pi r$$

$$\text{Area of sector} = \frac{\theta}{360} \times \pi r^2$$

$$\text{Perimeter of sector} = 2r + \text{arc length}$$

Semicircle / Quadrant:

$$\text{Area of semicircle} = \frac{1}{2} \times \pi r^2$$

$$\text{Area of quadrant} = \frac{1}{4} \times \pi r^2$$

Segment / Shaded Region:

$$\begin{aligned} \text{Area of segment} &= \\ \text{Area of sector} &- \text{Area of triangle} \end{aligned}$$

$$\begin{aligned} \text{Area of shaded region} &= \\ \text{Area of bigger figure} &- \text{Area of} \\ \text{smaller figure} & \end{aligned}$$

Ring Formula:

$$\text{Area of ring} = \pi (R^2 - r^2)$$

$$\text{Use } \pi = \frac{22}{7} \text{ when radius is a multiple of 7.}$$



Key Rule

Step 1: Read the question carefully.

Step 2: Identify what is required.

Step 3: Write the correct formula.

Step 4: Substitute the values carefully.

Step 5: Simplify and write the final answer with correct units.

Solved Example

Example: A circle has radius 14 cm. A sector of this circle has central angle 90° . Find (i) circumference of the circle, (ii) area of the circle, (iii) arc length of the sector, and (iv) area of the sector. Take $\pi = \frac{22}{7}$.

Detailed Solution

1 Step 1: Write the given values

$$r = 14 \text{ cm}, \theta = 90^\circ$$

$$\text{We use } \pi = \frac{22}{7}.$$

2 Step 2: Find circumference

$$\text{Circumference} = 2\pi r$$

$$\begin{aligned} &= 2 \times \frac{22}{7} \times 14 \\ &= 88 \text{ cm} \end{aligned}$$

3 Step 3: Find area of circle

$$\text{Area} = \pi r^2$$

$$\begin{aligned} &= \frac{22}{7} \times 14 \times 14 \\ &= 616 \text{ cm}^2 \end{aligned}$$

4 Step 4: Find sector measures

$$\begin{aligned} \text{Arc length} &= \frac{90}{360} \times 2\pi r \\ &= \frac{1}{4} \times 88 = 22 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{Area of sector} &= \frac{90}{360} \times \pi r^2 \\ &= \frac{1}{4} \times 616 \\ &= 154 \text{ cm}^2 \end{aligned}$$



Final Answer

$$\begin{aligned} \text{Circumference} &= 88 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{Area of circle} &= 616 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Arc length} &= 22 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{Area of sector} &= 154 \text{ cm}^2 \end{aligned}$$

Try These Yourself

- Find the circumference and area of a circle with radius 7 cm.
- Find the arc length and area of a sector with radius 21 cm and central angle 60° .
- The circumference of a circle is 88 cm. Find its radius and area.
- A circle is inscribed in a square of side 28 cm. Find the area outside the circle but inside the square.
- Two concentric circles have radii 21 cm and 14 cm. Find the area between the two circles.



In this chapter you will learn:

grouped data, class intervals, class marks, mean by direct, assumed mean and step-deviation methods, median, mode, cumulative frequency, and ogives.

IMPORTANT FORMULAS

1	Class Mark	$x_i = \frac{\text{Lower Limit} + \text{Upper Limit}}{2}$
2	Mean by Direct Method	$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$
3	Mean by Assumed Mean Method	$\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i} \quad \text{where } d_i = x_i - a$
4	Mean by Step-Deviation Method	$\bar{x} = a + \left[\frac{\sum f_i u_i}{\sum f_i} \right] \times h \quad \text{where } u_i = \frac{x_i - a}{h}$
5	Median of Grouped Data	$\text{Median} = l + \left[\frac{N/2 - cf}{f} \right] \times h$
6	Mode of Grouped Data	$\text{Mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right] \times h$
7	Total Frequency	$N = \sum f_i$

Key Concepts

KEY CONCEPTS

- | | |
|--|---|
| <ol style="list-style-type: none"> 1 Grouped Data: Data arranged in class intervals with corresponding frequencies. 2 Class Interval: A range such as 10–20, 20–30, 30–40. 3 Frequency: The number of observations in a class interval. 4 Class Mark: The midpoint of a class interval. 5 Mean: The average value of grouped data. | <ol style="list-style-type: none"> 6 Median: The middle value of the distribution. First find $N/2$, then identify the median class. 7 Median Class: The class whose cumulative frequency first becomes greater than or equal to $N/2$. 8 Mode: The value that occurs most frequently. 9 Modal Class: The class interval having the highest frequency. 10 Cumulative Frequency and Ogive: Running total of frequencies used to find median and draw less than / more than ogives. |
|--|---|



Quick Tip

Before using any formula, first find the class mark, total frequency N , and identify whether the question asks for mean, median, or mode.

Drawing More Than Ogive

Concept + Formula Used

Concept

A **more than ogive** is a graph of the more than cumulative frequency.

In this graph:

- the lower class limits are taken on the x -axis
- the more than cumulative frequencies are taken on the y -axis
- the points are plotted and joined by a smooth decreasing curve

A **more than ogive** is useful for:

- representing cumulative frequency graphically
- finding the median graphically when used with less than ogive
- comparing grouped data visually

Formula Used

More Than Cumulative Frequency

More Than C.F. = Total Frequency – Previous Frequencies

Plotting Points

(Lower Class Limit, More Than C.F.)

For a neat curve, we may also end with:

(Upper Limit of Last Class, 0)



Key Rule

For drawing a more than ogive:

- Prepare the more than cumulative frequency table
- Take lower class limits on the x -axis
- Take more than cumulative frequencies on the y -axis
- Plot the points
- Join the points with a smooth decreasing curve

Remember:

More Than Ogive always falls from left to right

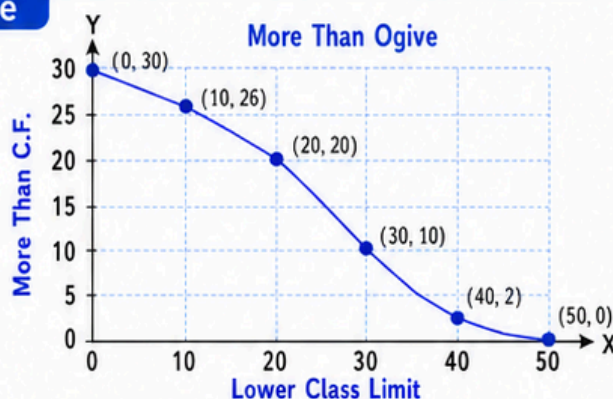
Solved Example

Draw the more than ogive for the following grouped data.

Class Interval	Frequency (f_i)
0–10	4
10–20	6
20–30	10
30–40	8
40–50	2

$$N = 4 + 6 + 10 + 8 + 2 = 30$$

Class Interval	f_i	More Than C.F.
0–10	4	30
10–20	6	26
20–30	10	20
30–40	8	10
40–50	2	2



1 Write More Than Values

More than 0 = 30
More than 10 = 26
More than 20 = 20
More than 30 = 10
More than 40 = 2

2 Write Plotting Points

Use (Lower Class Limit, More Than C.F.)
Points:
(0, 30), (10, 26), (20, 20), (30, 10), (40, 2)
Also take (50, 0) to end the curve neatly.

3 Draw the Axes

On x -axis mark lower class limits:
0, 10, 20, 30, 40, 50
On y -axis mark cumulative frequencies:
0, 5, 10, 15, 20, 25, 30

4 Plot and Join

Plot:
(0, 30), (10, 26), (20, 20), (30, 10), (40, 2), (50, 0)
Join the points with a smooth decreasing curve.
This curve is the more than ogive.



Final Answer

More Than Ogive is drawn using lower class limits and more than C.F.

Plotting points: (0,30), (10,26), (20,20), (30,10), (40,2), (50,0)

Draw the more than ogive for each grouped data set.

1

Class Interval	0–10	10–20	20–30	30–40	40–50
f_i	5	7	9	6	3

2

Class Interval	10–20	20–30	30–40	40–50	50–60
f_i	4	8	12	10	6

3

Class Interval	20–30	30–40	40–50	50–60	60–70
f_i	6	9	15	8	2

4

Class Interval	50–60	60–70	70–80	80–90	90–100
f_i	3	7	14	11	5

5

Class Interval	100–120	120–140	140–160	160–180	180–200
f_i	4	6	13	9	8

Drawing Less Than Ogive

Concept + Formula Used

Concept

A less than ogive is a graph of the less than cumulative frequency.

In this graph:

- the upper class limits are taken on the x -axis
- the less than cumulative frequencies are taken on the y -axis
- the points are plotted and joined by a smooth increasing curve

A less than ogive is useful for:

- representing cumulative frequency graphically
- finding the median graphically
- comparing grouped data visually

Formula Used

Less Than Cumulative Frequency

Less Than C.F. = Previous C.F. + Current Frequency

Plotting Points

(Upper Class Limit, Less Than C.F.)

For a neat curve, we may also start with:

(Lower Limit of First Class, 0)



Key Rule

For drawing a less than ogive:

- Prepare the less than cumulative frequency table
- Take upper class limits on the x -axis
- Take less than cumulative frequencies on the y -axis
- Plot the points
- Join the points with a smooth increasing curve

Remember:

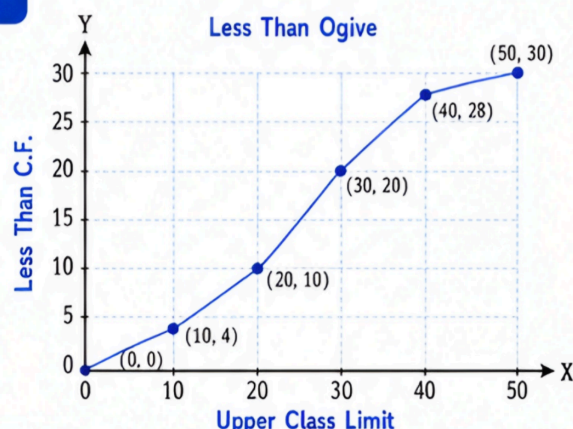
Less Than Ogive always rises from left to right

Solved Example

Draw the less than ogive for the following grouped data.

Class Interval	Frequency (f_i)
0–10	4
10–20	6
20–30	10
30–40	8
40–50	2

Class Interval	f_i	Less Than C.F.
0–10	4	4
10–20	6	10
20–30	10	20
30–40	8	28
40–50	2	30



1 Write Less Than Values

Less than 10 = 4
Less than 20 = 10
Less than 30 = 20
Less than 40 = 28
Less than 50 = 30

2 Write Plotting Points

Use (Upper Class Limit, Less Than C.F.)
Points:
(10, 4), (20, 10), (30, 20), (40, 28), (50, 30)
Also take (0, 0) to start the curve neatly.

3 Draw the Axes

On x -axis mark upper class limits:
0, 10, 20, 30, 40, 50
On y -axis mark cumulative frequencies:
0, 5, 10, 15, 20, 25, 30

4 Plot and Join

Plot:
(0, 0), (10, 4), (20, 10), (30, 20), (40, 28), (50, 30)
Join the points with a smooth increasing curve.
This curve is the less than ogive.



Final Answer

Less Than Ogive is drawn using upper class limits and less than C.F.
Plotting points: (0,0), (10,4), (20,10), (30,20), (40,28), (50,30)

Try These Yourself

Draw the less than ogive for each grouped data set.

1

Class Interval	0–10	10–20	20–30	30–40	40–50
f_i	5	7	9	6	3

2

Class Interval	10–20	20–30	30–40	40–50	50–60
f_i	4	8	12	10	6

3

Class Interval	20–30	30–40	40–50	50–60	60–70
f_i	6	9	15	8	2

4

Class Interval	50–60	60–70	70–80	80–90	90–100
f_i	3	7	14	11	5

5

Class Interval	100–120	120–140	140–160	160–180	180–200
f_i	4	6	13	9	8



Final Revision Checklist

Class 10 Maths Score Booster Workbook

Use this checklist to track your final chapter-wise revision before exams.

Chapter	Formula Revised	Solved Examples Reviewed	Practice Questions Done	Need More Revision
1 Real Numbers	☐	☐	☐	☐
2 Polynomials	☐	☐	☐	☐
3 Pair of Linear Equations in Two Variables	☐	☐	☐	☐
4 Quadratic Equations	☐	☐	☐	☐
5 Arithmetic Progressions	☐	☐	☐	☐
6 Triangles	☐	☐	☐	☐
7 Coordinate Geometry	☐	☐	☐	☐
8 Introduction to Trigonometry	☐	☐	☐	☐
9 Some Applications of Trigonometry	☐	☐	☐	☐
10 Circles	☐	☐	☐	☐
11 Areas Related to Circles	☐	☐	☐	☐
12 Surface Areas and Volumes	☐	☐	☐	☐
13 Statistics	☐	☐	☐	☐
14 Probability	☐	☐	☐	☐



Revision Tip

Tick each box only after revising formulas, understanding solved examples, and completing practice honestly.



Student Notes





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- ✓ Revises formulas quickly
- ✓ Builds concept clarity
- ✓ Teaches correct method step by step
- ✓ Improves confidence with practice
- ✓ Useful for school exams and board revision



3. COVERS ALL 14 CHAPTERS

- | | |
|---|-------------------------------------|
| 1 Real Numbers | 8 Introduction to Trigonometry |
| 2 Polynomials | 9 Some Applications of Trigonometry |
| 3 Pair of Linear Equations in Two Variables | 10 Circles |
| 4 Quadratic Equations | 11 Areas Related to Circles |
| 5 Arithmetic Progressions | 12 Surface Areas and Volumes |
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