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Super Refresher

Mathematics

10

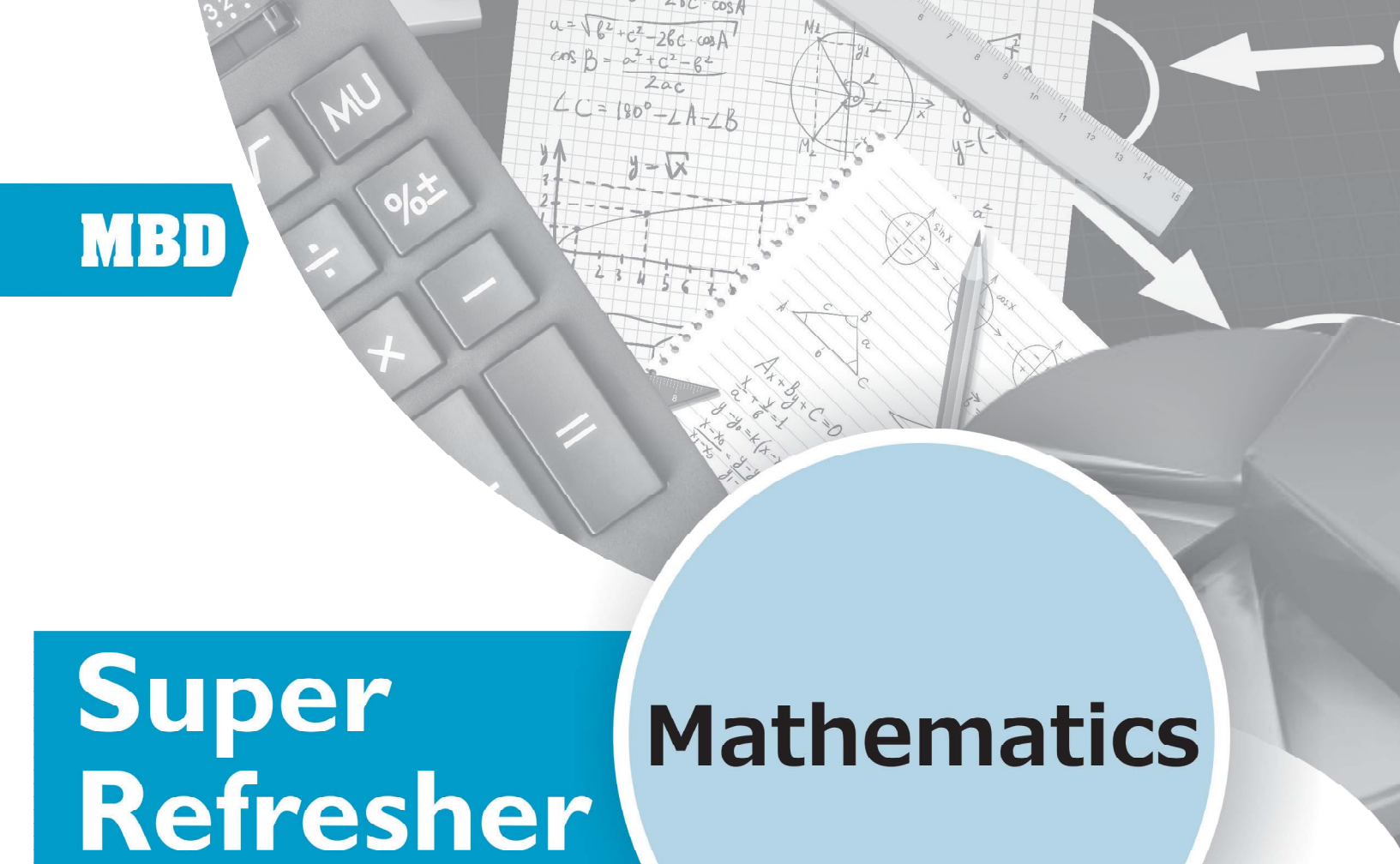
TERM-II

- **NCERT** Textbook Exercises and Exemplar Problems with solutions
- **Comprehensive explanation of each** chapter
- **Large pool of Objective, Short and Long answer type questions**

Highlights important information and questions for last minute revision

Includes **HOTS** and **Value Based** questions

Based on the latest syllabus and textbook issued by CBSE/NCERT



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Super Refresher Mathematics

10

TERM-II

By

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Shilpi Ahuja

Edited by:
H. K. Thakur
Vinay Sharma, Vipul Jain

Based on the latest syllabus and textbook issued by **CBSE/NCERT**

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We are committed to serve students with best of our knowledge and resources. We have taken utmost care and attention while editing and printing this book but we would beg to state that Authors and Publishers should not be held responsible for unintentional mistakes that might have crept in. However, errors brought to our notice, shall be gratefully acknowledged and attended to.

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SYLLABUS

MATHEMATICS (CLASS–X)

Second Term	Marks: 90
UNITS	MARKS
II. ALGEBRA (Contd.)	23
III. GEOMETRY (Contd.)	17
IV. TRIGONOMETRY (Contd.)	08
V. PROBABILITY	08
VI. COORDINATE GEOMETRY	11
VII. MENSURATION	23
TOTAL	90

UNIT II : ALGEBRA (Contd.)

3. QUADRATIC EQUATIONS (15) Periods

Standard form of a quadratic equation $ax^2 + bx + c = 0$, $(a \neq 0)$. Solutions of the quadratic equations (only real roots) by factorization, by completing the square and by using quadratic formula. Relationship between discriminant and nature of roots.

Situational problems based on quadratic equations related to day to day activities to be incorporated.

4. ARITHMETIC PROGRESSIONS (8) Periods

Motivation for studying Arithmetic Progression Derivation of the n^{th} term and sum of first n terms of A.P. and their application in solving daily life problems.

UNIT III : GEOMETRY (Contd.)

2. CIRCLES (8) Periods

Tangents to a circle at a point.

1. (Prove) The tangent at any point of a circle is perpendicular to the radius through the point of contact.
2. (Prove) The lengths of tangents drawn from an external point to circle are equal.

3. CONSTRUCTIONS (8) Periods

1. Division of a line segment in a given ratio (internally).
2. Tangent to a circle from a point outside it.
3. Construction of a triangle similar to a given triangle.

UNIT IV : TRIGONOMETRY (Contd.)

3. HEIGHTS AND DISTANCES (8) Periods

Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation/ depression should be only 30°, 45°, 60°.

UNIT V : STATISTICS AND PROBABILITY

2. PROBABILITY (10) Periods

Classical definition of probability. Simple problems on single events (not using set notation).

UNIT VI : COORDINATE GEOMETRY

1. LINES (In two-dimensions) (14) Periods

Review: Concepts of coordinate geometry, graphs of linear equations. Distance between two points. Section formula (internal division). Area of a triangle.

UNIT VII : MENSURATION

1. AREAS RELATED TO CIRCLES (12) Periods

Motivate the area of a circle; area of sectors and segments of a circle. Problems based on areas and perimeter/circumference of the above said plane figures. (In calculating area of segment of a circle, problems should be restricted to central angle of 60°, 90° and 120° only. Plane figures involving triangles, simple quadrilaterals and circle should be taken.)

2. SURFACE AREAS AND VOLUMES (12) Periods

(i) Problems on finding surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones. Frustum of a cone.

(ii) Problems involving converting one type of metallic solid into another and other mixed problems. (Problems with combination of not more than two different solids be taken.)

QUESTIONS PAPER DESIGNS
CLASS-X

MATHEMATICS (CODE NO. 041) **Time-3 Hours** **Marks-90**

S. No.	Typology of Questions	Very Short Answer (VSA) (1 Mark)	Short Answer-I (SA) (2 Marks)	Short Answer-II (SA) (3 Marks)	Long Answer (LA) (4 Marks)	Total Marks	% Weightage
1	**Remembering-(Knowledge based** Simple recall questions, to know specific facts, terms, concepts, principles, or theories; Identify, define, or recite, information)	1	2	2	3	23	26%
2	**Understanding-(Comprehension**–to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, or interpret information)	2	1	1	4	23	26%
3	**Application** (Use abstract information in concrete situation, to apply knowledge to new situations; Use given content to interpret a situation, provide an example, or solve a problem)	1	2	3	2	22	24%
4	**High Order Thinking Skills (Analysis & Synthesis**–Classify, compare, contrast, or differentiate between different pieces of information; Organize and/or integrate unique pieces of information from a variety of sources)	–	1	4	–	14	16%
5	**Creating, Evaluation and Multi-Disciplinary**–(Generating new ideas, product or ways of viewing things Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	–	–	–	2*	8	8%
	Total	4 × 1 = 4	6 × 2 = 12	10 × 3 = 30	11 × 4 = 44	90	100%

*One of the LA (4 marks) will to assess the values inherent in the texts.

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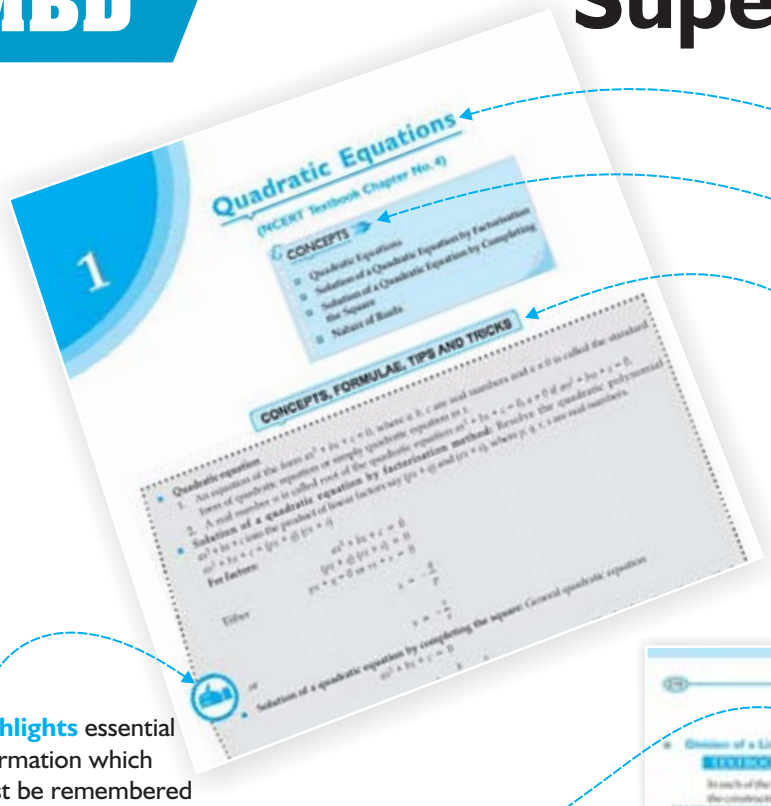
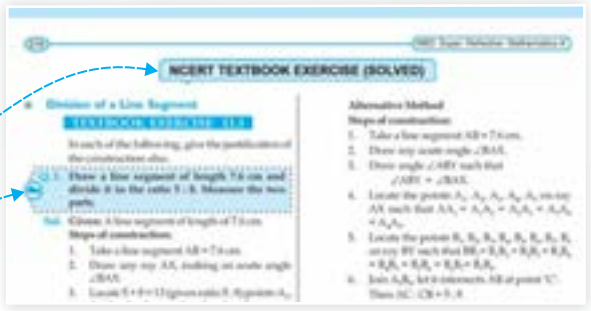


All chapters as per **NCERT** Syllabus and Textbook

Every chapter divided into **Sub-topics**

Concepts, Formulae, Tips and Tricks provides a comprehensive summary of the concept

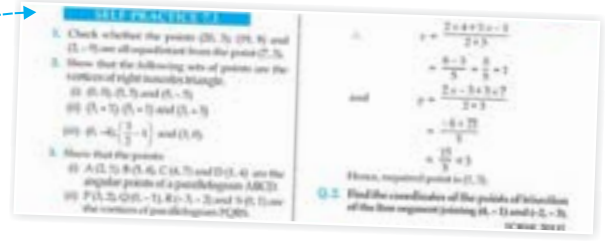
Highlights essential information which must be remembered

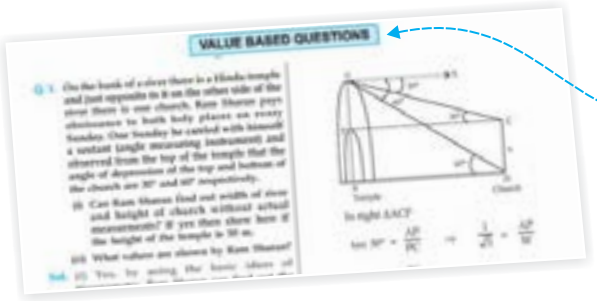


NCERT **Textbook Exercises** with detailed solution

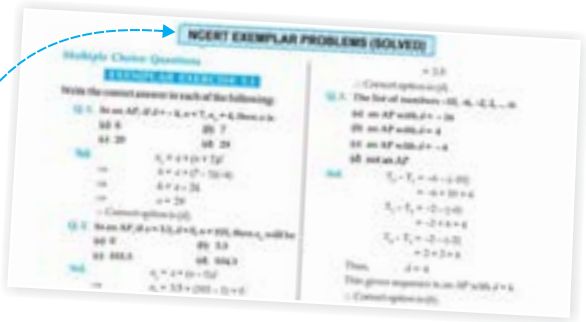
Important Questions from examination point of view to ensure passing marks

Self Practice questions for consolidation of each concept



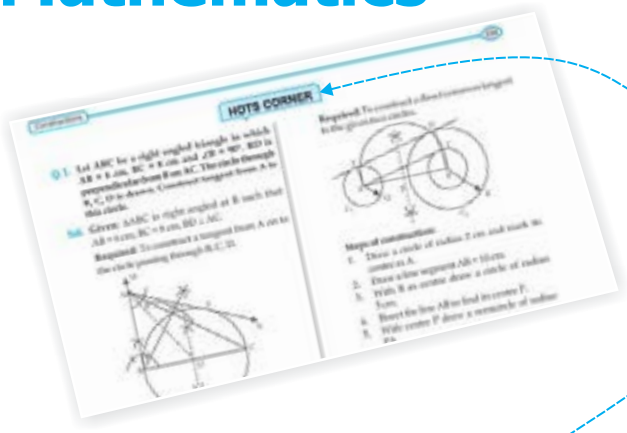


Value Based Questions to apply mathematical concepts to real life situations with stress on social values

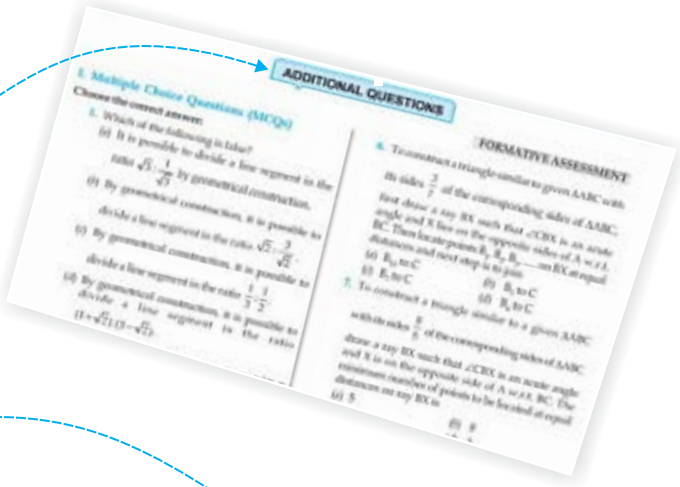


NCERT Exemplar Problems with complete solution to supplement the entire NCERT support material

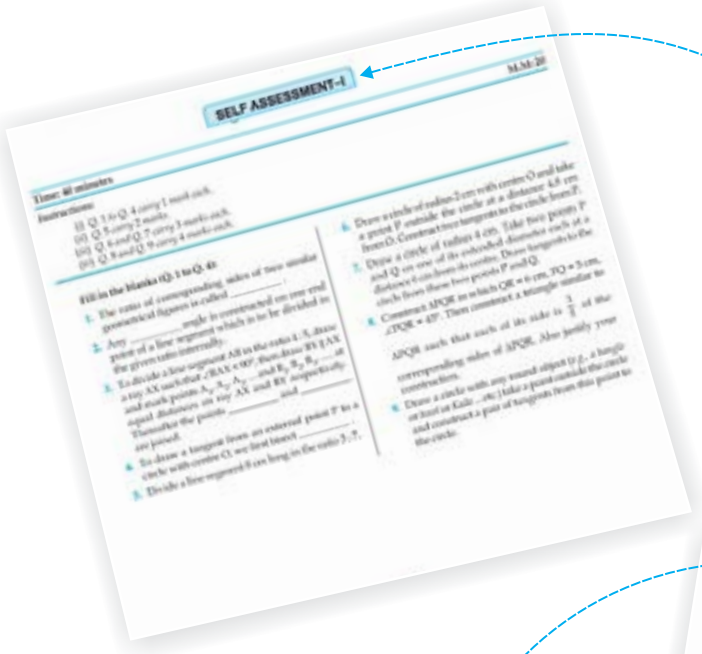
Mathematics



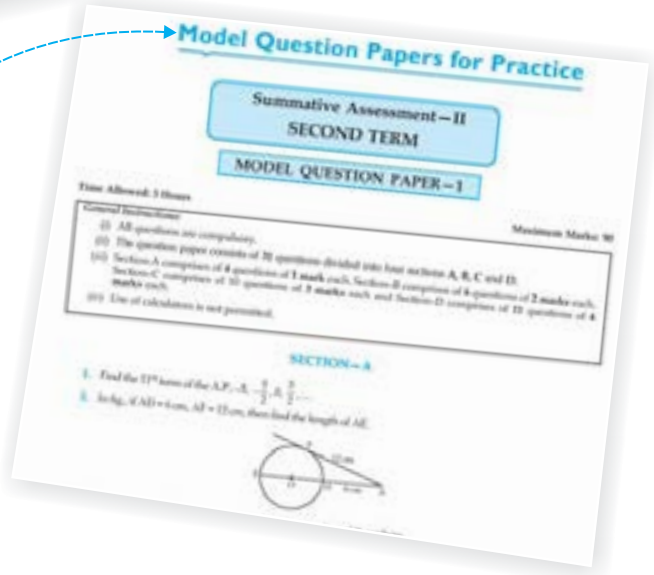
HOTS (Higher Order Thinking Skills)
Questions with answers



Additional Questions with answers at the end of each chapter



Self Assessment with answers at the end of each chapter



3 **Model Question Papers** of 90 marks each

CONTENTS

1 Quadratic Equations

(NCERT Textbook Chapter No. 4)

CONCEPTS

- Quadratic Equations
- Solution of a Quadratic Equation by Factorisation
- Solution of a Quadratic Equation by Completing the Square
- Nature of Roots

CONCEPTS, FORMULAE, TIPS AND TRICKS

- **Quadratic equation**
  1. An equation of the form $ax^2 + bx + c = 0$, where a, b, c are real numbers and $a \neq 0$ is called the standard form of quadratic equation or simply quadratic equation in x.
  2. A real number α is called root of the quadratic equation $ax^2 + bx + c = 0$; $a \neq 0$ if $a\alpha^2 + b\alpha + c = 0$.
- **Solution of a quadratic equation by factorisation method:** Resolve the quadratic polynomial $ax^2 + bx + c$ into the product of linear factors say $(px + q)$ and $(rx + s)$, where p, q, r, s are real numbers.
  $ax^2 + bx + c = (px + q)(rx + s)$
  For factors:

$$ax^2 + bx + c = 0$$
$$(px + q)(rx + s) = 0$$

Either $px + q = 0$ or $rx + s = 0$

$$x = -\frac{q}{p}$$

or

$$x = -\frac{s}{r}$$

- **Solution of a quadratic equation by completing the square:** General quadratic equation

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

$$x^2 + \frac{b}{a}x + \frac{c}{a} = 0 \qquad \text{[Dividing throughout by } a\text{]}$$

$$\Rightarrow \quad x^2 + \frac{b}{a}x = -\frac{c}{a} \qquad \text{[Transposing constant term to RHS]}$$

$$\Rightarrow \quad x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = \left(\frac{b}{2a}\right)^2 - \frac{c}{a} \qquad \left[\text{Adding } \left(\frac{\text{Coeff. of } x}{2}\right)^2 = \left(\frac{b}{2a}\right)^2 \text{ on both sides}\right]$$

$$\Rightarrow \quad \left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$$

$$\Rightarrow \quad \left(x + \frac{b}{2a}\right) = \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

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

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

This is called **quadratic formula**.

Thus, quadratic equation $ax^2 + bx + c = 0$ has two roots α and β given by

$$\alpha = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \text{ and } \beta = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

- **Discriminant:** For the equation $ax^2 + bx + c = 0$, the expression $D = b^2 - 4ac$ is called the discriminant.
- **Nature of roots:** The two roots α and β of a equation $ax^2 + bx + c = 0$ $(a \neq 0)$ are given by

$$\alpha = \frac{-b + \sqrt{D}}{2a}$$

and

$$\beta = \frac{-b - \sqrt{D}}{2a}$$

where $D = b^2 - 4ac$ is called discriminant.

The nature of roots of the quadratic equation depend upon the value of discriminant D.

Following table helps to remember:

Value of D	Nature of roots	Value of roots
$D > 0$	Real and unequal	$\frac{-b \pm \sqrt{D}}{2a}$
$D = 0$	Real and equal	Each root $= \frac{-b}{2a}$
$D < 0$	Non-real roots or Imaginary roots	Non-real

- **Forming a quadratic equation when its roots α and β are given.**

(*i*) The sum of two roots α and β of a quadratic equation $ax^2 + bx + c = 0$ $(a \neq 0)$ is given by

$$\alpha + \beta = -\frac{b}{a}$$

(*ii*) The product of two roots α and β of a quadratic equation is given by

$$\alpha \,.\, \beta = \frac{c}{a}$$

On dividing the equation $ax^2 + bx + c = 0$ $(a \neq 0)$ by a, we get:

$$x^2 - \left(\frac{-b}{a}\right)x + \frac{c}{a} = 0$$

Thus, the required equation is $x^2 - (\text{Sum of roots})x + (\text{Product of roots}) = 0$

NCERT TEXTBOOK EXERCISE (SOLVED)

Quadratic Equations

TEXTBOOK EXERCISE 4.1

Q. 1. Check whether the following are quadratic equations:

(*i*) $(x + 1)^2 = 2(x - 3)$

(*ii*) $x^2 - 2x = (-2)(3 - x)$

(*iii*) $(x - 2)(x + 1) = (x - 1)(x + 3)$

(*iv*) $(x - 3)(2x + 1) = x(x + 5)$

(*v*) $(2x - 1)(x - 3) = (x + 5)(x - 1)$

(*vi*) $x^2 + 3x + 1 = (x - 2)^2$

(*vii*) $(x + 2)^3 = 2x(x^2 - 1)$

(*viii*) $x^3 - 4x^2 - x + 1 = (x - 2)^3$

Sol. (*i*) Given,

$$(x + 1)^2 = 2(x - 3)$$

or $x^2 + 1 + 2x = 2x - 6$

or $x^2 + 1 + 2x - 2x + 6 = 0$

or $x^2 + 7 = 0$

or $x^2 + 0x + 7 = 0$

Which is in the form of $ax^2 + bx + c = 0$; $a \neq 0$.

$\therefore$ It is a quadratic equation.

(*ii*) Given,

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

or $x^2 - 2x = -6 + 2x$

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

or $x^2 - 4x + 6 = 0$

Which is in the form of $ax^2 + bx + c = 0$; $a \neq 0$.

$\therefore$ It is a quadratic equation.

(*iii*) Given,

$$(x - 2)(x + 1) = (x - 1)(x + 3)$$

or $x^2 + x - 2x - 2 = x^2 + 3x - x - 3$

or $x^2 - x - 2 = x^2 + 2x - 3$

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

or $-3x + 1 = 0$

Which has no term of x^2.

So, it is not a quadratic equation.

(*iv*) Given,

$$(x - 3)(2x + 1) = x(x + 5)$$

or $2x^2 + x - 6x - 3 = x^2 + 5x$

or $2x^2 - 5x - 3 - x^2 - 5x = 0$

or $x^2 - 10x - 3 = 0$

Which is in the form of $ax^2 + bx + c = 0$; $a \neq 0$.

$\therefore$ It is a quadratic equation.

(*v*) Given,

$$(2x - 1)(x - 3) = (x + 5)(x - 1)$$

or $2x^2 - 6x - x + 3 = x^2 - x + 5x - 5$

or $2x^2 - 7x + 3 = x^2 + 4x - 5$

or $2x^2 - 7x + 3 - x^2 - 4x + 5 = 0$

or $x^2 - 11x + 8 = 0$

Which is in the form of $ax^2 + bx + c = 0$; $a \neq 0$.

$\therefore$ It is a quadratic equation.

(*vi*) Given,

$$x^2 + 3x + 1 = (x - 2)^2$$

or $x^2 + 3x + 1 = x^2 + 4 - 4x$

or $x^2 + 3x + 1 - x^2 - 4 + 4x = 0$

or $7x - 3 = 0$

Which has no term of x^2.

So, it is not a quadratic equation.

(*vii*) Given,

$$(x + 2)^3 = 2x(x^2 - 1)$$

or $x^3 + (2)^3 + 3(x)^2 2 + 3(x)(2)^2 = 2x^3 - 2x$

or $x^3 + 8 + 6x^2 + 12x = 2x^3 - 2x$

or $x^3 + 8 + 6x^2 + 12x - 2x^3 + 2x = 0$

or $-x^3 + 6x^2 + 14x + 8 = 0$

Here, the highest degree of x is 3.

Which is a cubic equation.

$\therefore$ It is not a quadratic equation.

(*viii*) Given,

$$x^3 - 4x^2 - x + 1 = (x - 2)^3$$

or $x^3 - 4x^2 - x + 1 = x^3 - (2)^3 + 3(x)^2(-2) + 3(x)(-2)^2$

or $x^3 - 4x^2 - x + 1 = x^3 - 8 - 6x^2 + 12x$

or $x^3 - 4x^2 - x + 1 - x^3 + 8 + 6x^2 - 12x = 0$

or $2x^2 - 13x + 9 = 0$

Which is in the form of $ax^2 + bx + c = 0$; $a \neq 0$.

$\therefore$ It is a quadratic equation.

Q. 2. Represent the following situations in the form of quadratic equations:

(*i*) The area of a rectangular plot is 528 m^2. The length of the plot (in metres) is one more than twice its breadth. We need to find the length and breadth of the plot.

(*ii*) The product of two consecutive positive integers is 306. We need to find the integers.

(*iii*) Rohan's mother is 26 years older than him. The product of their ages (in years) 3 years from now will be 360. We would like to find Rohan's present age.

(*iv*) A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then it would have taken 3 hours more to cover the same distance. We need to find the speed of the train.

Sol. (*i*) Let breadth of rectangular plot = x m

Length of rectangular plot = $(2x + 1)$ m

$\therefore$ Area of rectangular plot = $[x\,(2x + 1)]$ m^2

$= (2x^2 + x)$ m^2

According to question,

$$2x^2 + x = 528$$

or $2x^2 + x - 528 = 0$ | S = 1, P = $-528 \times 2 = -1056$

or $2x^2 - 32x + 33x - 528 = 0$

or $2x\,(x - 16) + 33\,(x - 16) = 0$

or $(x - 16)\,(2x + 33) = 0$

Either $x - 16 = 0$

or $2x + 33 = 0$

$x = 16$

or $x = \dfrac{-33}{2}$

$\because$ Breadth of any rectangle cannot be negative,

so, we reject $x = \dfrac{-33}{2}$

$\therefore$ $x = 16$

Hence, breadth of rectangular plot = 16 m

Length of rectangular plot

$= (2 \times 16 + 1)$ m $= 33$ m

and given problem in the form of quadratic equation is $2x^2 + x - 528 = 0$.

(*ii*) Let two consecutive positive integers are x and $x + 1$.

Product of integers = $x(x + 1) = x^2 + x$

According to question,

$$x^2 + x = 306$$

or $x^2 + x - 306 = 0$ [S = 1, P = –306]

or $x^2 + 18x - 17x - 306 = 0$

or $x\,(x + 18) - 17\,(x + 18) = 0$

or $(x + 18)\,(x - 17) = 0$

Either $x + 18 = 0$, $x = -18$ | or $x - 17 = 0$, $x = 17$

$\because$ We are to study about the positive integers,

so, we reject $x = -18$

$\therefore$ $x = 17$

Hence, two consecutive positive integers are

$17,\ 17 + 1 = 18$

and given problem in the form of quadratic equation is $x^2 + x - 306 = 0$.

(*iii*) Let present age of Rohan = x years

Rohan's mother's age = $(x + 26)$ years

After 3 years, Rohan's age = $(x + 3)$ years

Rohan's mother's age = $(x + 26 + 3)$ years

$= (x + 29)$ years

$\therefore$ Their product = $(x + 3)\,(x + 29)$

$= x^2 + 29x + 3x + 87$

$= x^2 + 32x + 87$

According to question,

$$x^2 + 32x + 87 = 360$$

or $x^2 + 32x + 87 - 360 = 0$

or $x^2 + 32x - 273 = 0$

or $x^2 + 39x - 7x - 273 = 0$ | S = 32, P = – 273

or $x\,(x + 39) - 7\,(x + 39) = 0$

or $(x + 39)\,(x - 7) = 0$

Either $x + 39 = 0$, $x = -39$ | or $x - 7 = 0$, or $x = 7$

$\because$ Age of any person cannot be negative.

so, we reject $x = -39$

$\therefore$ $x = 7$

Hence, Rohan's present age = 7 years

and given problem in the form of quadratic equation is $x^2 + 32x - 273 = 0$.

(*iv*) Let u km/hour be the speed of train.

Distance covered by train = 480 km

Time taken by train = $\dfrac{480}{u}$ hour

$\left[\text{Using, Speed} = \dfrac{\text{Distance}}{\text{Time}} \text{ or Time} = \dfrac{\text{Distance}}{\text{Speed}}\right]$

If speed of train be decreased by 8 km/h.

$\therefore$ New speed of train = $u - 8$

and time taken by train = $\dfrac{480}{u - 8}$ hours

According to question,

$$\frac{480}{u - 8} - \frac{480}{u} = 3$$

or $$\frac{480\,u - 480\,(u - 8)}{u\,(u - 8)} = 3$$

or $$\frac{480\,u - 480\,u + 3840}{u^2 - 8u} = 3$$

or $3840 = 3\,(u^2 - 8u)$

or $u^2 - 8u = 1280$

or $u^2 - 8u - 1280 = 0$

or $u^2 - 40u + 32u - 1280 = 0$ | S = – 8, P = – 1280

or $u\,(u - 40) + 32\,(u - 40) = 0$

or $(u - 40)\,(u + 32) = 0$

Either $u - 40 = 0$

or $u + 32 = 0$

$u = 40$

or $u = -32$

But, speed cannot be negative so, we reject

$u = -32$

$\therefore$ $u = 40$

Hence, speed of train is 40 km/h.

The given problem in the form of quadratic equation is

$$u^2 - 8u - 1280 = 0$$

SELF PRACTICE 4.1

1. Check whether the following are quadratic equations:

(*i*) $x = \frac{17}{4} - \frac{1}{x}$

(*ii*) $\frac{1}{15-x} = \frac{3}{10} - \frac{1}{x}$

(*iii*) $x^2 + (x+1)^2 = 2702 - (x+2)^2$

(*iv*) $x^3 - 2060 = (20 - x)^3$

(*v*) $(30 - 2x)(20 - 2x) = 375$

(*vi*) $x(x+1) + 8 = (x+2)(x-2)$

(*vii*) $(x^2 - 4x + 9)^2 = 8(x^2 - 4x + 9) + 15$

(*viii*) $x(x^2 - 6) = 2(4x + 6)$

(*ix*) $x(x+6) = x(4x - 5x^2) + 14$

(*x*) $\frac{360}{(x+4)} = \frac{360}{x} - 3$

2. Represent the following problems/situations in the form of quadratic equations:

(*i*) The product of two consecutive multiples of five is 300. We need to find the integers.

(*ii*) If I had walked 1 km/hour faster, I would have taken 10 minutes less to walk 2 km. We need to find the rate of my walking.

(*iii*) The sides (in cm) of a right triangle containing the right angle are $5x$ and $(3x - 1)$. If the area of the triangle is 60 cm^2, find the sides of the triangle.

(*iv*) The two numbers whose sum is 20 and the sum of whose cubes is 2060. We need to find the two numbers.

(*v*) There are three consecutive integers such that the squares of the first increased by the product of the other two gives 154. We need to find the two integers.

(*vi*) Divide 12 into two parts such that the sum of their squares is 74. We need to find the two numbers.

(*vii*) Two consecutive natural numbers whose product is 20. We want to find the two consecutive natural numbers.

Solution of a Quadratic Equation by Factorisation

TEXTBOOK EXERCISE 4.2

Q. 1. Find the roots of the following quadratic equations by factorisation:

(*i*) $x^2 - 3x - 10 = 0$

(*ii*) $2x^2 + x - 6 = 0$

(*iii*) $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$

(*iv*) $2x^2 - x + \frac{1}{8} = 0$

(*v*) $100x^2 - 20x + 1 = 0$

Sol. (*i*) Given quadratic equation

$x^2 - 3x - 10 = 0$ | S = – 3, P = – 10

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

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

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

Either $x - 5 = 0$ or $x + 2 = 0$

$x = 5$ or $x = -2$

Hence, 5 and – 2 are roots of given quadratic equation.

(*ii*) Given quadratic equation,

$2x^2 + x - 6 = 0$ | S = 1, P = –6 × 2 = –12

or $2x^2 + 4x - 3x - 6 = 0$

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

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

Either $x + 2 = 0$ or $2x - 3 = 0$

$x = -2$ or $x = \frac{3}{2}$

Hence, – 2 and $\frac{3}{2}$ are roots of given quadratic equation.

(*iii*) Given quadratic equation,

$\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$

or $\sqrt{2}x^2 + 2x + 5x + 5\sqrt{2} = 0$

S = 7, P = $\sqrt{2} \times 5\sqrt{2} = 10$

or $\sqrt{2}x(x + \sqrt{2}) + 5(x + \sqrt{2}) = 0$

or $(x + \sqrt{2})(\sqrt{2}x + 5) = 0$

Either $x+\sqrt{2}=0$ or $\sqrt{2}x+5=0$

$x=-\sqrt{2}$ or $x=\frac{-5}{\sqrt{2}}$

Hence, $-\sqrt{2}$ and $\frac{-5}{\sqrt{2}}$ are roots of given quadratic equation.

(*iv*) Given quadratic equation

$$2x^2-x+\frac{1}{8}=0$$

or $\frac{16x^2-8x+1}{8}=0$ | S = – 8

or $16x^2-8x+1=0$, | P = 16 × 1 = 16

or $16x^2-4x-4x+1=0$

or $4x(4x-1)-1(4x-1)=0$

or $(4x-1)(4x-1)=0$

Either $4x-1=0$ or $4x-1=0$

$x=\frac{1}{4}$ or $x=\frac{1}{4}$

Hence, $\frac{1}{4}$ and $\frac{1}{4}$ are roots of given quadratic equation.

(*v*) Given quadratic equation

$100x^2-20x+1=0$ | S = – 20

or $100x^2-10x-10x+1=0$ | P = 100 × 1 = 100

or $10x(10x-1)-1(10x-1)=0$

or $(10x-1)(10x-1)=0$

Either $10x-1=0$ or $10x-1=0$

$x=\frac{1}{10}$ or $x=\frac{1}{10}$

Hence, $\frac{1}{10}$ and $\frac{1}{10}$ are roots of given quadratic equation.

Q. 2. Solve the problems given in Example 1. Statements of these problems are given below:

(*i*) John and Jivanti together have 45 marbles. Both of them lost 5 marbles each, and the product of the number of marbles they now have is 124. We would like to find out how many marbles they had to start with.

(*ii*) A cottage industry produces a certain number of toys in a day. The cost of production of each toy (in rupees) was found to be 55 minus the number of toys produced in a day. On a particular day, the total cost of production was ₹750. We would like to find out the number of toys produced on that day.

Sol. (*i*) Let the number of marbles John had be x.

Then the number of marbles Jivanti had $= 45 - x$

The number of marbles left with John, when he lost 5 marbles $= x - 5$

The number of marbles left with Jivanti, when she lost 5 marbles $= 45 - x - 5 = 40 - x$

Therefore, their product $= (x-5)(40-x)$

$= 40x - x^2 - 200 + 5x$

$= -x^2 + 45x - 200$

According to question,

$-x^2+45x-200=124$

or $-x^2+45x-324=0$

or $x^2-45x+324=0$ | S = – 45, P = 324

or $x^2-36x-9x+324=0$

or $x(x-36)-9(x-36)=0$

or $(x-36)(x-9)=0$

Either $x-36=0$ or $x-9=0$

$x=36$ or $x=9$

$\therefore$ $x=36, 9$

Hence, number of marbles they had to start with were 36 and 9.

(*ii*) Let the number of toys produced on that day be x.

Therefore, the cost of production (in rupees) of each toy that day $= 55 - x$

So, the total cost of production (in rupees) that day $= x(55-x)$

According to question,

$x(55-x)=750$

or $55x-x^2=750$

or $-x^2+55x-750=0$

or $x^2-55x+750=0$ | S = – 55, P = 750

or $x^2-30x-25x+750=0$

or $x(x-30)-25(x-30)=0$

or $(x-30)(x-25)=0$

Either $x-30=0$ | or $x-25=0$

$x=30$ | or $x=25$

$\therefore$ $x=30, 25$

Hence, number of toys produced on that day were 30 and 25.

Q. 3. Find two numbers whose sum is 27 and product is 182.

Sol. Let the first number be x.

2nd number be $27-x$.

Their product $= x(27-x) = 27x - x^2$

According to question,

$27x - x^2 = 182$

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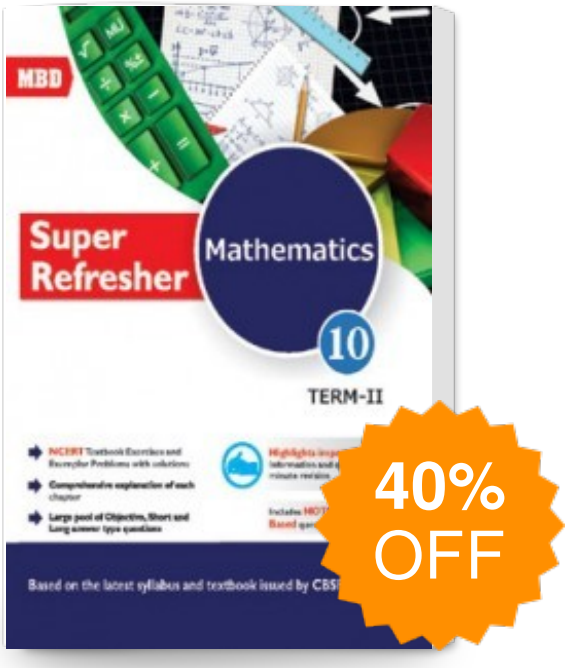

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