







# SAMPLE QUESTION PAPERS MATHEMATICS BASIC

CBSE CLASS 10

ALL PAPERS STRICTLY ON REDUCED SYLLABUS AND  
AS PER LATEST CBSE SAMPLE PAPER PROVIDED ON 9<sup>th</sup> OCT 2020

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**WITH**  
TIME MANAGEMENT  
CHART  
+  
IMPORTANT Q's  
RELATED THEORY  
+  
2021  
TOPPER TIP'S

**Fact:** Last year 40% of CBSE Board Paper came from Educart Sample Papers Book.

Code  
SP214

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₹ 299

Pages  
224



आत्म-निर्भर भारत COMPLETE SELF-PREP BOOK

**SAMPLE**  
**QUESTION PAPERS**  
**MATHEMATICS**  
**BASIC**

**CBSE CLASS 10**

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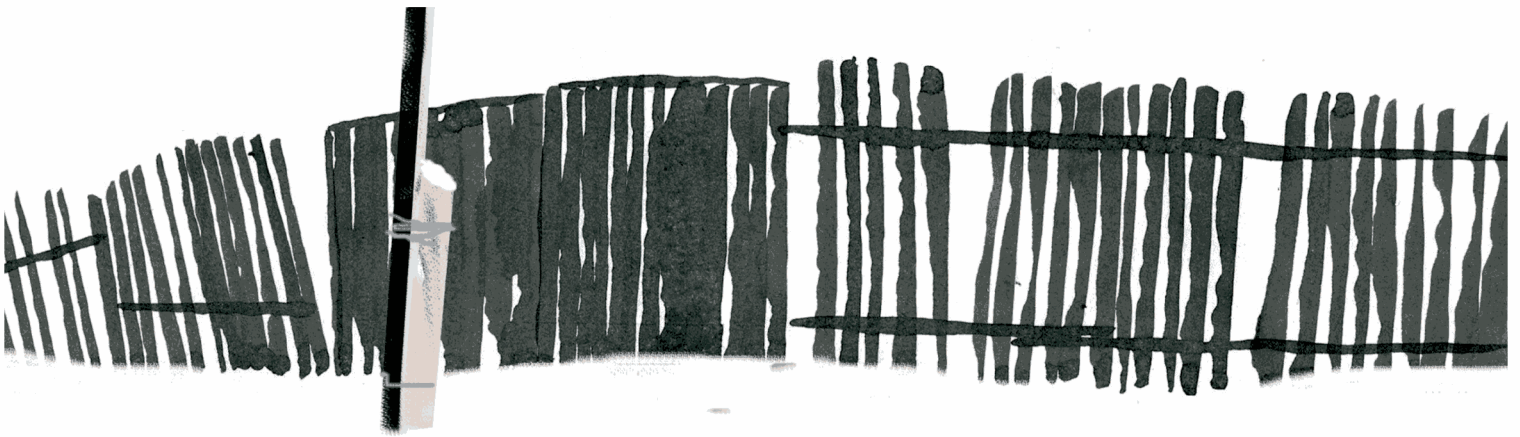
**Edition:** Latest

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AGP contributes Rupee One on every book purchased by you to the **Friends of Tribals Society** Organization for better education of tribal children.





# Hello!

Friends, this year is all about keeping caution, strengthening determination and smart learning. CBSE has made sweeping changes in the paper pattern of all the subjects and we at Educart have adhered 100% to those changes.

After the record breaking sales and acceptance of our sample papers last year pan-india, we have come back with some critical new value additions. This is our special self-prep version for 2021 with solutions of the latest CBSE Sample Question Paper for 2021 Board Exams and the new objective section included.

EduCart has also roped in CBSE expert Mathematics veterans and most experienced teachers, to analyse the new pattern and best prepare a fine X<sup>th</sup> Class Mathematics Sample Papers Book for 2021.

**Go break a leg!**



# Reviews



★★★★★ **Read carefully what I am writing**

By Sathya Raji on 2 October, 2020



Guys, this is a very emotional review who has gone through a lot. I lost confidence because of the lack of interest in studies. Dad said focus only on studies but I only like TikTok and PUBG. Now both got banned and I had no other option but to study effectively as mid-terms were near. Now 4 months has passed and I had no preparation of boards at all. So I decided to change things and bought EDUCART.

Their maps (mind maps rather) for the first time in life helped me understand that what all comes in the chapters & what's important in those chapters. I was actually being able to study. I mean how can someone put so much effort in writing the book. So that definately helped me figure some topics well. Today, I finished 2 chapters of chemistry from Educart book and managed to make my father proud.



★★★★★ **Worth for** 💰

By Malika on 3 September, 2020



It's a very good book for the candidates appearing in 2021.... very nice explanation and also very nice editing 👍👍 Go for itt!!!!!!



5★ **Great product**

Student



I recommend this book..... magnificent book for revision...so many good questions are there... My God! the mind maps are super cool... A must buy book ...for class 10 students...just a little mistakes are there but it doesn't matter as those are check points of your learning Mustbuy 👍👍👍👍👍



★★★★★ **Wonderful book** 😊

By S S on 10 September, 2020



Every paper has CBSE questions written in neat way with explanations and related theory. My father purchased this book for me as i m weak in science but i am so happy with it that im posting the review myself to thank educart personally. Edcart, please continue to make such books, in this covid time, this book is what we needed really!



**Dear Sir** ✓

6.77M Subscribers



India ki pehli atma-nirbhar self prep book that really no publisher can match with. Educart question bank is a must buy for all students!



**T S Sudhir**

(Author of Saina Nehwal's Biography | Journalist | Educator)

To: quickreply@agpgroup.in



Educart Exemplar is my suggested book for this year and I rarely recommend books. This one I have thoroughly read and liked for my students.



**RC Chauhan**

HOD of Mathematics - DPS

To: quickreply@agpgroup.in



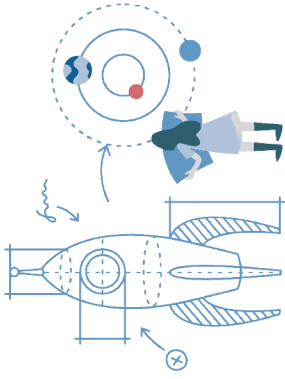
We have reviewed countless Xth Class Maths books but Educart's Sample papers is our top recommendation. Educart has done their homework well on how CBSE students nowadays want to learn solving of maths standard questions.



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\* Self-assessment papers' solution are available on our website ([www.educart.net](http://www.educart.net)).



# Question Paper Design

Section / Part	PART A			PART B		
	Objective type (VSA) 1m each	Objective type (Case-based) 4m (1m per MCQ)	Subjective type (Short Answer SA-1) 2m each	Subjective type (Short Answer SA-2) 3m each	Subjective type (Long Answer LA)	Subjective type
<b>Section I</b> 16m (5 choice)	16Q	-	-	-	-	-
<b>Section II</b> 16m (5 choice)	-	4Q	-	-	-	-
<b>Section III</b> 12m (2 choice)	-	-	6Q	-	-	-
<b>Section IV</b> 21m (2 choice)	-	-	-	7Q	-	-
<b>Section V</b> 15m (1 choice)	-	-	-	-	-	3Q
<b>Total Marks</b>	<b>16m</b>	<b>16m</b>	<b>12m</b>	<b>21m</b>	<b>15m</b>	<b>15m</b>

(5)

**Note:** This blueprint is prepared for simplicity purpose, based on the CBSE Sample Paper provided on 9<sup>th</sup> October 2020.



# Time Management

Divide the 3 hours such that you mentally allocate a particular time to each Section beforehand and can revise all the answers. So you can finish the paper within a manageable time limit. With input from the experts in this field, we have collated a fair breakdown of time that should be spent on each section for 2021 board exam:

<b>MATHEMATICS (BASIC)</b>				
<b>Part</b>	<b>Questions Type</b>	<b>Questions</b>	<b>Time To Be Spent (Per Question)</b>	<b>Total Time</b>
A	VSA (Section-I)	16Q (1m each)	2 min per question	$16 \times 2 = \mathbf{32 \text{ min}}$
	CBQ (Section-II)	4CBQ (4m each)	11 min per CBQ	$4 \times 11 = \mathbf{44 \text{ min}}$
B	SA-1 (Section-III)	6Q (2m each)	3 min per question	$6 \times 3 = \mathbf{18 \text{ min}}$
	SA-2 (Section-IV)	7Q (3m each)	5 min per question	$7 \times 5 = \mathbf{35 \text{ min}}$
	LA (Section-V)	3Q (5m each)	10 min per question	$3 \times 10 = \mathbf{30 \text{ min}}$
				Total Time: <b>2 hours 40 min</b>
				Revision Time: <b>20 min</b>





# Complete Self-prep

We have solved every single question from MCQ to Short Answer in great detail for students to know what is the best (and in some cases even quickest) way of solving any question.

- 19.\* First person chooses a word at random from the whole sentence. Another person chooses a word at random from the whole

sentence. What is the probability that one person chooses a 2-letter word and the other chooses a 6-letter word?

The number of letters in each word is counted and the table below shows the frequency distribution:

Number of letters	2	3	4	5	6	7
Frequency	1	4	5	3	5	2

- (a)  $\frac{1}{20}$                       (b)  $\frac{1}{80}$   
 (c)  $\frac{1}{2}$                         (d)  $\frac{1}{40}$

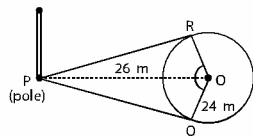
Ans. (d)  $\frac{1}{40}$

If first person chooses a 2-letter word, then second person chooses a 6-letter word or vice versa.

∴ Required Probability:

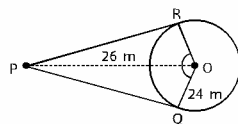
$$\begin{aligned}
 &= \frac{1}{20} \times \frac{5}{20} + \frac{5}{20} \times \frac{1}{20} \\
 &= \frac{1}{80} + \frac{1}{80} \\
 &= \frac{2}{80} \\
 &= \frac{1}{40}
 \end{aligned}$$

- 1.\* There is a circular park of radius 24 m and there is a pole at a distance of 26 m from the centre of the park as shown in the figure. It is planned to enclose the park by planting trees along line segments PQ and PR tangential to the park.



- (A) Find the length of PQ and PR;  
 (B) If six trees are to be planted along each tangential line segments at equal distances, find the distance between any two consecutive trees.

Ans. (A) In right triangle PRO

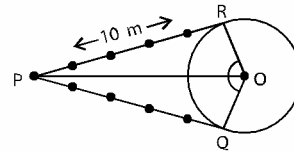


We have:

$$\begin{aligned}
 PR &= \sqrt{PQ^2 - RO^2} \\
 &= \sqrt{26^2 - 24^2} \\
 &= \sqrt{676 - 576} \\
 &= \sqrt{100} \\
 &= 10\text{m}
 \end{aligned}$$

⇒ PR = PQ = 10m

- (B) As six trees are to be planted along PQ and PR each.

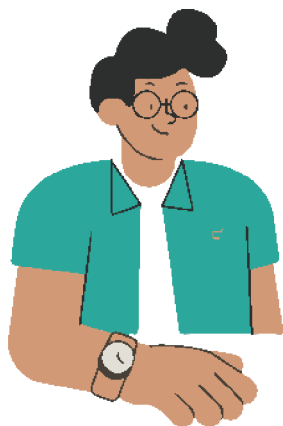


Let's assume the distance between consecutive trees is x.

Total trees are 5 equal distances.

$$\begin{aligned}
 \text{Hence, } 5x &= 10 \\
 x &= 2\text{ m}
 \end{aligned}$$

\* Questions shown along with the solution just for demonstration purpose.



# Topper Tips

## (on cracking new pattern)

Friends, on special request of the Educart team, some important points I've prepared for you to keep in mind whilst attempting the Class 10 Board Exams on the new pattern:

### Cracking Case-based Questions

Here is the trick. You can actually solve the MCQ's of case-based questions straight away without even reading the passage. You may need to search for relevant information (variables, data) within the passage or images but complete understanding of the passage isn't needed. Also, since there is internal choice given, the questions will not be dependent on each other so you can easily solve straight forward MCQ's first and then decide on the remaining.

### 15 Minutes Reading Time Hack

There is 30-50% internal choice this time in almost each section. You get good 15 minutes in the beginning to read the question paper. Use this time to mark the choice questions you are more confident in attempting. Thus, saving critical time while writing the exam.

### Prioritise Your Sections Order

Decide which Section you would want to attempt first and which Section at last. Always attempt the easy questions first. This way your confidence will grow and you will be mentally ready to take on the more challenging questions.

### Units Representation Should Be Correct

The following units should be written correctly always:

**Length** - cm, mm, m, km (not as cms, mms, ms, kms)

**Area** - sq cm, sq m, sq km (not as  $\text{cm}^2$ ,  $\text{mm}^2$ ,  $\text{m}^2$ ,  $\text{km}^2$ )

**Volume** - cu cm, cu m, cu km (not as  $\text{cm}^3$ ,  $\text{mm}^3$ ,  $\text{m}^3$ ,  $\text{km}^3$ , etc)

**Speed and Mass** - km/h, kg, g (not as km/hr, kgs, gs)

### Double-check numerical Values

Very common mistake we make is to not copy the correct values (numbers, equations etc) from the Question itself as we are in a rush. Ensure you read the questions word by word with great care.

### Use Of Graph Paper

Graph paper should be used when necessary. Diagrams should be neatly drawn to score full marks.

### Final Answer Marks

½ to 1 Marks are allocated just for the concluding answer. Ensure to mention the final answer neatly and correctly at the end of the solution. However, remember your working or method/steps contain majority marks.



# Syllabus

## (Reduced)

Units	Unit Name	Marks
I	NUMBER SYSTEMS	06
II	ALGEBRA	20
III	COORDINATE GEOMETRY	06
IV	GEOMETRY	15
V	TRIGONOMETRY	12
VI	MENSURATION	10
VII	STATISTICS & PROBABILITY	11
<b>Total</b>		<b>80</b>
<b>INTERNAL ASSESSMENT</b> (Assessment 10m + Portfolio 5m + Practical 5m)		<b>20</b>

### UNIT I: NUMBER SYSTEMS

#### 1. REAL NUMBERS

1. Euclid's division lemma
2. Fundamental Theorem of Arithmetic - statements after reviewing work done earlier and after illustrating and motivating through examples.
3. Proofs of irrationality of  $\sqrt{2}$ ,  $\sqrt{3}$ ,  $\sqrt{5}$ . Decimal representation of rational numbers in terms of terminating/non-terminating recurring decimals.

### UNIT II: ALGEBRA

#### 1. POLYNOMIALS

1. Zeros of a polynomial.
2. Relationship between zeros and coefficients of quadratic polynomials.
3. Statement and simple problems on division algorithm for polynomials with real coefficients.

#### 2. PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

1. Pair of linear equations in two variables and graphical method of their solution, consistency/inconsistency.
2. Algebraic conditions for number of solutions. Solution of a pair of linear equations in two variables algebraically - by substitution, by elimination. method.
3. Simple situational problems. Simple problems on equations reducible to linear equations.
4. Solution of a pair of linear equations in two variables by cross multiplication method.

*Text in red are topics deleted for 2021 Exam.*

### 3. QUADRATIC EQUATIONS

1. Standard form of a quadratic equation  $ax^2+bx+c=0$ , ( $a \neq 0$ ). Solutions of quadratic equations (only real roots) by factorization, and by using quadratic formula.
2. Relationship between discriminant and nature of roots.
3. Situational problems based on quadratic equations related to day to day activities to be incorporated.

### 4. ARITHMETIC PROGRESSIONS

1. Motivation for studying Arithmetic Progression Derivation of the  $n^{\text{th}}$  term and sum of the first  $n$  terms of A.P
2. Application in solving daily life problems (based on sum to  $n$  term).

## UNIT III: COORDINATE GEOMETRY

### 1. Coordinate Geometry

1. Review: Concepts of coordinate geometry, graphs of linear equations.
2. Distance formula.
3. Section formula (internal division).
4. Area of a triangle.

## UNIT IV: GEOMETRY

### 1. TRIANGLES

Definitions, examples, counter examples of similar triangles.

1. (Prove) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.
2. (Motivate) If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side.
3. (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar.
4. (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.
5. (Motivate) If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.
6. (Motivate) If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other.
7. (Prove) In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.
8. (Prove) The ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides.
9. (Prove) In a triangle, if the square on one side is equal to sum of the squares on the other two sides, the angles opposite to the first side is a right angle.

### 2. CIRCLES

Tangent to a circle at, point of contact

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 a circle are equal.

*Text in red are topics deleted for 2021 Exam.*

### 3. CONSTRUCTIONS

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

## UNIT V: TRIGONOMETRY

### 1. INTRODUCTION TO TRIGONOMETRY AND ITS APPLICATIONS

(Identities, height and distance)

#### Introduction To Trigonometry

1. Trigonometric ratios of an acute angle of a right-angled triangle. Proof of their existence (well defined);
2. Motivate the ratios whichever are defined at  $0^\circ$  and  $90^\circ$ .
3. Values of the trigonometric ratios of  $30^\circ$ ,  $45^\circ$  and  $60^\circ$ . Relationships between the ratios.

#### Trigonometric Identities

1. Proof and applications of the identity  $\sin^2 A + \cos^2 A = 1$ . Only simple identities to be given.
2. Trigonometric ratios of complementary angles.

#### Heights And Distance : Angle of elevation, Angle of Depression.

1. Simple problems on heights and distances.
2. Problems should not involve more than two right triangles. Angles of elevation / depression should be only  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ .

## UNIT VI: MENSURATION

### 1. AREAS RELATED TO CIRCLES

1. Motivate the area of a circle; area of sectors and segments of a circle.
2. 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  $60^\circ$ ,  $90^\circ$  only. Plane figures involving triangles, simple quadrilaterals and circle should be taken.)
3. Problems should be restricted to central angle of  $120^\circ$ .

### 2. SURFACE AREAS AND VOLUMES

1. Surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones.
2. Frustum of a cone.
3. 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).

## UNIT VII: STATISTICS AND PROBABILITY

### 1. STATISTICS AND PROBABILITY

#### Statistics

1. Mean, median and mode of grouped data (bimodal situation to be avoided).
2. Step deviation Method for finding the mean, Cumulative frequency graph.

#### Probability

1. Classical definition of probability. Simple problems on finding the probability of an event.

*Text in red are topics deleted for 2021 Exam.*



# FAQs

## **1. What subjects are mandatory and what happens if I fail in any of the subjects?**

You have to take Mathematics (standard or basic), Social Science, Science and English as mandatory subjects. Hindi (A or B) is mostly taken as the 5<sup>th</sup> subject but is replaced with a regional language subject in certain states. Subject 6<sup>th</sup> can be taken by a student depending on his/her interest. If you fail in any of the above subject(s), you will have to give a compartment exam to pass the class.

## **2. Will the CBSE 2021 paper on reduced syllabus come based on the sample paper CBSE released? Will the difficulty level be the same?**

Yes, it will be exactly as per the paper pattern and type of questions introduced by CBSE in the 9th October 2020 uploaded Sample paper. As far as the difficulty level is concerned, expect an easier paper than the provided sample paper as CBSE will not want to reduce chances of students to pass considering COVID-19 has made things a bit difficult. However, this Educart book is prepared keeping a medium difficulty level to prepare students fully for the upcoming new pattern paper.

## **3. When will CBSE provide datesheet for 2021 boards?**

Exact dates for all subjects' exams is usually provided in the month of December of the ongoing academic session. Last year it came on 16<sup>th</sup> December 2019. Expect the same in the month of December and expect the exams start date to be later than March for the 2020-21 session.

## **4. How shall I prepare when there is not much time left?**

When in shortage of time, less material to study from, is better. This can be done by focusing on only NCERT books (for theory) and our Educart sample papers for practice and nothing else. Educart Sample papers book is 100% designed on the upcoming 2021 paper to help you cover questions on all possible topics with detailed explanations. You can refer to free YouTube videos for learning concepts visually.

## **5. What is the Pass Marks Cut-off and Criteria?**

A candidate has to obtain a grade higher than E (i.e. atleast 33% marks) in all the five subjects of external examination in the main or at the compartmental examinations.

## **6. How do I access latest CBSE circulars and announcements?**

You can always email us on [quickreply@agpgroup.in](mailto:quickreply@agpgroup.in) for any update you want. As far as official source is concerned, refer: [www.cbseacademic.nic.in/circulars.html](http://www.cbseacademic.nic.in/circulars.html).

## **7. What are the provisions for alternate Questions for candidates with Disabilities in the context of Class X examination?**

Alternative type questions are provided in lieu of questions having visual inputs for disabled candidates in the subjects of English Communicative and Social Science. Separate question papers with enlarged font size are provided in the subjects of Mathematics and Science.

## **8. What is the process of applying for a recheck of Marks in a particular subject?**

Any student has the right to do so within a week from date of declaration of CBSE board exam result.

The whole process of verification of marks is done online. Steps to apply for verification/rechecking of the answer sheet, are as follows: Apply for rechecking of marks on the CBSE's website [www.cbse.nic.in](http://www.cbse.nic.in) by filling in your details and paying Rs. 500 per subject online (only). The result of verification of marks will be uploaded on the website automatically.

Overall, the verification will be restricted to checking whether all the answers have been checked, there has been no mistake in totalling of marks for each question and the marks have been transferred correctly on the title page of the answer book. A candidate may also apply for obtaining a copy of the evaluated answer book(s) at a later stage if not satisfied with the evaluation

## **9. What is the best way to practice from this book to score good marks?**

In order to crack the board exam, this book is custom made to start with Topper Tips and time management. This includes an explanation of how to smartly structure your 3 hours during the paper.

Once, you have covered the basics, you can go through the exclusive CBSE last year Topper hand-written solutions and CBSE papers to get a feel of what is normally asked and how to answer them.

Then you start with our most likely 7 solved sample papers, where you time yourself to complete each paper and cross-check your performance with our detailed solutions.

Lastly, the unsolved papers help you self-assess without the temptation of looking at the back and fine-tune your preparation. These are 10 solid papers that if done well will fully prepare you to do well in the 2021 board exam.

## **10. Who should I reach out to for any issue related to examination, re-evaluation of copy or any serious matter?**

Ideally your only point of contact should be your school and they will take action on your behalf by submitting a request to CBSE regional office. However, we have managed to source some useful contacts in CBSE. Please **refer to the next page** for more information.



# IMPORTANT CBSE CONTACTS

Lots of students and parents face the problem of not knowing how best to contact CBSE for matters related to *Examination, admission fees, last-minute change of subject, direct admissions, passing criteria, examination centre related issue, unfair means or even re-evaluation of results* if not satisfactory. This list is not exhaustive.

We have compiled a comprehensive list of contacts of your nearest CBSE Regional Offices for various issues depending on the region you belong to. CBSE prefers any request to be sent to Regional Offices only and that also via the head of your school ideally. It is, therefore, advised to make the request accordingly through a proper channel for prompt and timely action.

Your School Location/Region	CBSE Regional Office (RO) Contact Details
General	Dr. Sanyam Bhardwaj (Controller of Examinations) sanyamb.cbse@nic.in   011-22515828 Dr. Joseph Emmanuel (Director (Academics)) directoracad.cbse.nic.in   011-23212603
Delhi, Foreign Schools	CBSE, PS-1-2, Institutional Area, I.P. Extn, Patparganj, Delhi - 110092 rodelhi.cbse@nic.in   91-11-22239177-80, 22235948, 22235904
Uttar Pradesh, Uttarakhand	CBSE, 35 B, Civil Station, M.G. Marg, Civil Lines, Allahabad - 211001 roallahabad.cbse@nic.in   91-532-2407970-72
Haryana, Chandigarh, Punjab, J&K, Himachal Pradesh	CBSE, Sector- 5, Panchkula, Haryana - 134152 ropanchkula.cbse@nic.in   91-172-2585193/2583547
Tamil Nadu, Kerala, Andhra Pradesh, Karnataka, Maharashtra, Goa, Puducherry, Andaman and Nicobar Islands, Daman and Diu	CBSE, New No-3, Old No. 1630 A, "J" Block, 16th Main Road, Anna Nagar West, Chennai - 600040 rochennai.cbse@nic.in   91-44-26162214, 26162213, 26162264
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West Bengal, Orissa, Chhattisgarh	CBSE, 6 <sup>th</sup> Floor, Alok Bharti Complex, Shaheed Nagar, Bhubaneswar-751007 robhubaneshwa.cbse@nic.in   91-674-2542312



# OBJECTIVE SECTION

# MAPS

(Starting from next page)

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# CBSE

## SAMPLE PAPER

9<sup>th</sup> October 2020

# MATHAMATICS

## (BASIC)

Time Allowed: 3 Hours

Maximum Marks: 80

### General Instructions:

1. This question paper contains two parts A and B.
2. Both Part A and Part B have internal choices.

### Part – A:

1. It consists two sections-I and II.
2. Section I has 16 questions. Internal choice is provided in 5 questions.
3. Section II has four case study-based questions. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

### Part – B:

1. Question No. 21 to 26 are Very short answer Type questions of 2 marks each,
2. Question No. 27 to 33 are Short Answer Type questions of 3 marks each
3. Question No. 34 to 36 are Long Answer Type questions of 5 marks each.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

## PART - A

### SECTION - I

1. Express 156 as the product of primes. 1
  2. Write a quadratic polynomial, sum of whose zeroes is 2 and product is – 8. 1
  3. Given that HCF (96, 404) is 4, find the LCM (96, 404). 1
- OR**
- State the fundamental Theorem of Arithmetic. 1
4. On comparing the ratios of the coefficients, find out whether the pair of equations fequations  $x - 2y = 0$  and  $3x + 4y - 20 = 0$  is consistent or inconsistent. 1

5. If  $a$  and  $b$  are co-prime numbers, then find the HCF ( $a, b$ ). 1

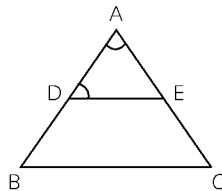
6. Find the area of a sector of a circle with radius 6 cm if angle of the sector is  $60^\circ$ .

$$\left( \text{Take } \pi = \frac{22}{7} \right)$$

OR

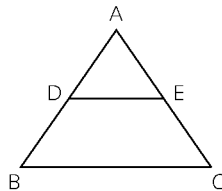
A horse is tied to a pole with 28 m long rope. Find the perimeter of the field where the horse can graze.  $\left( \text{Take } \pi = \frac{22}{7} \right)$  1

7. In the given fig.  $DE \parallel BC$ ,  $\angle ADE = 70^\circ$  and  $\angle BAC = 50^\circ$ , then  $\angle BCA = \dots\dots\dots$



OR

In the given figure,  $AD = 2$  cm,  $BD = 3$  cm,  $AE = 3.5$  cm and  $AC = 7$  cm. Is  $DE$  parallel to  $BC$ ? 1



8. The cost of fencing a circular field at the rate of ₹ 24 per metre is ₹ 5280. Find the radius of the field. 1

9. A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground where it makes an angle  $30^\circ$ . The distance between the foot of the tree to the point where the top touches the ground is 8 m. Find the height of the tree from where it is broken. 1

10. If the perimeter and the area of a circle are numerically equal, then find the radius of the circle. 1

11. Write the empirical relationship among mean, median and mode. 1

12. To divide a line segment  $BC$  internally in the ratio  $3 : 5$ , we draw a ray  $BX$  such that  $\angle CBX$  is an acute angle. What will be the minimum number of points to be located at equal distances, on ray  $BX$ ? 1

13. For what values of  $p$  does the pair of equations  $4x + py + 8 = 0$  and  $2x + 2y + 2 = 0$  has unique solution?

OR

What type of straight lines will be represented by the system of equations  $2x + 3y = 5$  and  $4x + 6y = 7$ ? 1

14. A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is red?

OR

A die is thrown once. What is the probability of getting a prime number? 1

15. A tower stands vertically on the ground. From a point on the ground, which is 15 m away from the foot of the tower, the angle of elevation of the top of the tower is found to be  $60^\circ$ . Find the height of the tower. 1

16. Probability of an event E + Probability of the event  $\bar{E}$  (not E) is, ..... . 1

## SECTION - II

Case study based questions are compulsory. Attempt any four sub-parts of each question. Each sub-part carries 1 mark.

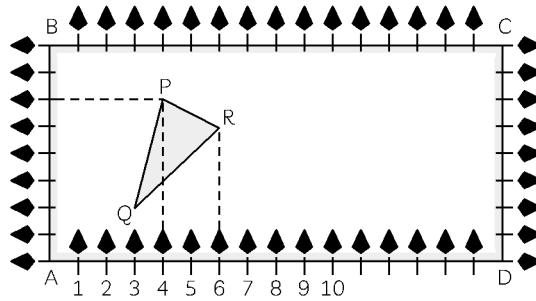
17.



Mathematics teacher of a school took her 10<sup>th</sup> standard students to show Red fort. It was a part of their Educational trip. The teacher had interest in history as well. She narrated the facts of Red fort to students. Then the teacher said in this monument one can find combination of solid figures. There are 2 pillars which are cylindrical in shape. Also 2 domes at the corners which are hemispherical. 7 smaller domes at the centre. Flag hoisting ceremony on Independence Day takes place near these domes.

- (A) How much cloth material will be required to cover 2 big domes each of radius 2.5 metres?  $\left( \text{Take } \pi = \frac{22}{7} \right)$
- |                         |                         |   |
|-------------------------|-------------------------|---|
| (a) $75 \text{ m}^2$    | (b) $78.57 \text{ m}^2$ |   |
| (c) $87.47 \text{ m}^2$ | (d) $25.8 \text{ m}^2$  | 1 |
- (B) Write the formula to find the volume of a cylindrical pillar.
- |                    |               |   |
|--------------------|---------------|---|
| (a) $\pi r^2 h$    | (b) $\pi r l$ |   |
| (c) $\pi r(l + r)$ | (d) $2\pi r$  | 1 |
- (C) Find the lateral surface area of two pillars if height of the pillar is 7m and radius of the base is 1.4 m.
- |                          |                          |   |
|--------------------------|--------------------------|---|
| (a) $112.3 \text{ cm}^2$ | (b) $123.2 \text{ m}^2$  |   |
| (c) $90 \text{ m}^2$     | (d) $345.2 \text{ cm}^2$ | 1 |
- (D) How much is the volume of a hemisphere if the radius of the base is 3.5 m?
- |                        |                         |   |
|------------------------|-------------------------|---|
| (a) $85.9 \text{ m}^3$ | (b) $80 \text{ m}^3$    |   |
| (c) $98 \text{ m}^3$   | (d) $89.83 \text{ m}^3$ | 1 |
- (E) What is the ratio of sum of volumes of two hemispheres of radius 1 cm each to the volume of a sphere of radius 2 cm?
- |           |            |   |
|-----------|------------|---|
| (a) 1 : 1 | (b) 1 : 8  |   |
| (c) 8 : 1 | (d) 1 : 16 | 1 |

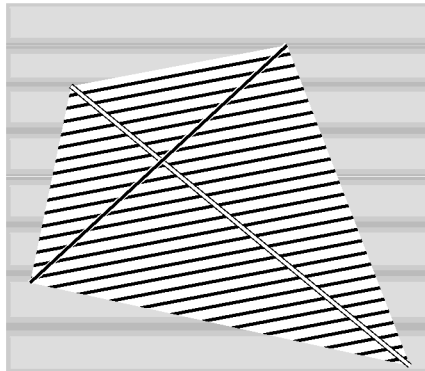
18. Class X students of a secondary school in Krishnagar have been allotted a rectangular plot of a land for gardening activity. Saplings of Gulmohar are planted on the boundary at a distance of 1 m from each other. There is a triangular grassy lawn in the plot as shown in the fig. The students are to sow seeds of flowering plants on the remaining area of the plot.



Considering A as origin, answer question (i) to (v):

- (A) Considering A as the origin, what are the coordinates of A?  
 (a) (0, 1) (b) (1, 0)  
 (c) (0, 0) (d) (-1, -1) 1
- (B) What are the coordinates of P?  
 (a) (4, 6) (b) (6, 4)  
 (c) (4, 5) (d) (5, 4) 1
- (C) What are the coordinates of R?  
 (a) (6, 5) (b) (5, 6)  
 (c) (6, 0) (d) (7, 4) 1
- (D) What are the coordinates of D?  
 (a) (16, 0) (b) (0, 0)  
 (c) (0, 16) (d) (16, 1) 1
- (E) What are the coordinate of P if D is taken as the origin?  
 (a) (12, 2) (b) (-12, 6)  
 (c) (12, 3) (d) (6, 10) 1

19.

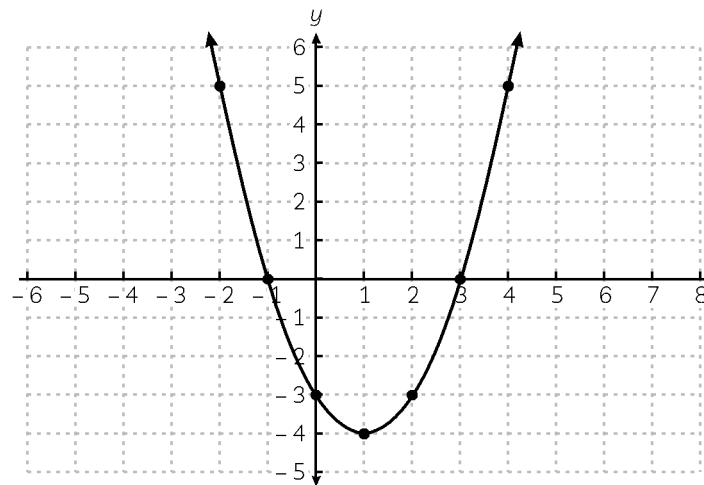


Rahul is studying in X<sup>th</sup> Standard. He is making a kite to fly it on a Sunday. Few questions came to his mind while making the kite. Give answers to his questions by looking at the figure.

- (A) Rahul tied the sticks at what angles to each other?  
 (a) 30° (b) 60°  
 (c) 90° (d) 60° 1
- (B) Which is the correct similarity criteria applicable for smaller triangles at the upper part of this kite?  
 (a) RHS (b) SAS  
 (c) SSA (d) AAS 1

- (C) Sides of two similar triangles are in the ratio 4 : 9. Corresponding medians of these triangles are in the ratio:
- (a) 2 : 3 (b) 4 : 9  
(c) 81 : 16 (d) 16 : 81 1
- (D) In a triangle, if square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle. This theorem is called as:
- (a) Pythagoras theorem (b) Thales theorem  
(c) Converse of Thales theorem (d) Converse of Pythagoras theorem 1
- (E) What is the area of the kite, formed by two perpendicular sticks of length 6 cm and 8 cm?
- (a)  $48 \text{ cm}^2$  (b)  $14 \text{ cm}^2$   
(c)  $24 \text{ cm}^2$  (d)  $96 \text{ cm}^2$  1

**20.** Due to heavy storm an electric wire got bent as shown in the figure. It followed a mathematical shape. Answer the following questions below:



- (A) Name the shape in which the wire is bent.
- (a) Spiral (b) Ellipse  
(c) Linear (d) Parabola 1
- (B) How many zeroes are there for the polynomial (shape of the wire)?
- (a) 2 (b) 3  
(d) 1 (d) 0 1
- (C) The zeroes of the polynomial are:
- (a) -1, 5 (b) -1, 3  
(c) 3, 5 (d) -4, 2 1
- (D) What will be the expression of the polynomial?
- (a)  $x^2 + 2x - 3$  (b)  $x^2 - 2x + 3$   
(c)  $x^2 - 2x - 3$  (d)  $x^2 + 2x + 3$  1
- (E) What is the value of the polynomial if  $x = -1$ ?
- (a) 6 (b) -18  
(c) 18 (d) 0 1

## PART - B

### SECTION - III

All questions are compulsory. In case of internal choices, attempt any one.

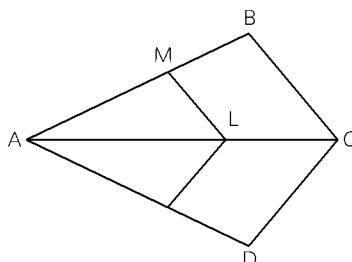
- 21.** Find the coordinates of the point which divides the line segment joining the points (4, -3) and (8, 5) in the ratio 3 : 1 internally.

**OR**

Find a relation between  $x$  and  $y$  such that the point  $(x, y)$  is equidistant from the points (7, 1) and (3, 5).

2

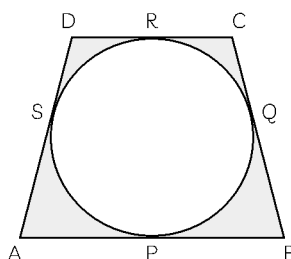
- 22.**



In the fig. if  $LM \parallel CB$  and  $LN \parallel CD$ , prove that  $\frac{AM}{MB} = \frac{AN}{ND}$

2

- 23.** A quadrilateral ABCD is drawn to circumscribe a circle. Prove that  $AB + CD = AD + BC$ .



2

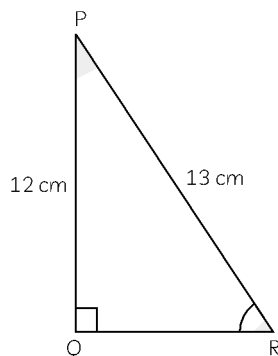
- 24.** Draw a line segment of length 7.8 cm and divide it in the ratio 5 : 8. Measure the two parts.

2

- 25.** Given  $15 \cot A = 8$ , find  $\sin A$  and  $\sec A$ .

**OR**

Find  $\tan P - \cot R$



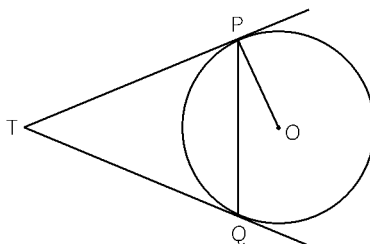
2

- 26.** How many terms of the A.P. : 9, 17, 25, ..... must be taken to give a sum 636?

2

## SECTION - IV

27. Prove that  $\sqrt{3}$  is an irrational number. 3
28. Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that  $\angle PTQ = 2\angle OPQ$ .



29. Meena went to a bank to withdraw ₹ 2,000. She asked the cashier to give her ₹ 50 and ₹ 100 notes only. Meena got 25 notes in all. Find how many notes of ₹ 50 and ₹ 100 she received? 3
30. A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears:  
(A) a two-digit number  
(B) a perfect square number.  
(C) a number divisible by 5.

OR

One card is drawn from a well shuffled deck of 52 cards. Find the probability of getting

- (A) A king of red colour.  
(B) A spade  
(C) The queen of diamonds 3
31. Metallic spheres of radii 6 cm, 8 cm and 10 cm respectively are melted to form a solid sphere. Find the radius of the resulting sphere. 3
32. Prove that  $\frac{\sin A - \cos A + 1}{\sin A + \cos A - 1} = \frac{1}{\sec A - \tan A}$  3
33. A motor boat whose speed in still water is 18 km/h, takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.

OR

Find two consecutive odd positive integers, sum of whose squares is 290. 3

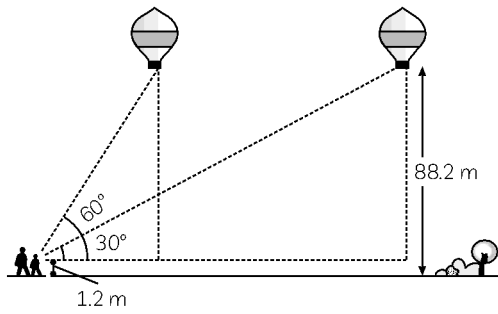
## SECTION - V

34. The angles of depression of the top and bottom of a 8 m tall building from the top of a multi storied building are  $30^\circ$  and  $45^\circ$ , respectively. Find the height of the multi storied building and the distance between the two buildings.

OR

A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is  $60^\circ$ . After sometime, the angle of elevation reduces to  $30^\circ$ . Find the distance travelled by the balloon during the interval.





5

**35.** The  $p^{\text{th}}$ ,  $q^{\text{th}}$  and  $r^{\text{th}}$  terms of an A.P. are  $a$ ,  $b$  and  $c$  respectively.

Show that  $a(q - r) + b(r - p) + c(p - q) = 0$

5

**36.** A survey regarding the heights (in cm) of 51 girls of class X of a school was conducted and the following data was obtained. Find the median height and the mean using the formulae.

Height (in cm)	Number of Girls
Less than 140	4
Less than 145	11
Less than 150	29
Less than 155	40
Less than 160	46
Less than 165	51

5



## SECTION - IV

**27.** Let us suppose that  $\sqrt{3}$  is a rational number.

Then  $\sqrt{3}$  can be written in the form  $\frac{p}{q}$   
where p, q are co-prime i.e., they do not have  
common factor other than 1.

Now,  $\sqrt{3} = \frac{p}{q}$   
 $\Rightarrow 3 = \frac{p^2}{q^2}$  [squaring both sides]

$\Rightarrow p^2 = 3q^2$   
 $\Rightarrow 3$  divides  $p^2$   
 $\Rightarrow 3$  divides  $p$   
 $\Rightarrow 3$  is factor of  $p$ . ... (i)

$\therefore$  Let  $p = 3m$ .  
 $\Rightarrow p^2 = 3q^2$   
 $\Rightarrow (3m)^2 = 3q^2$   
 $\Rightarrow 3m^2 = q^2$   
 $\Rightarrow 3$  divides  $q^2$   
 $\Rightarrow 3$  divides  $q$

It means 3 is a factor of both p and q. But p  
and q cannot have any common factor other  
than 1.

It means our assumption is wrong.  
Hence,  $\sqrt{3}$  is an irrational number.

**28.** Reena's yearly amount (in ₹) of monthly  
salary.

$$48000, 49400, 50800, \dots$$

It is A.P. with  $a = 48000$  and  $d = 1400$ .

Sunita's yearly amount (in ₹) of monthly  
salary.

$$40000, 41800, 43600, \dots$$

It is A.P. with  $a' = 40000$  and  $d' = 1800$ .

(A) So, Reena's 13th year monthly salary

$$\begin{aligned} &= a + 12d \\ &= 48000 + 12 \times 1400 \\ &= ₹ 64800 \end{aligned}$$

Sunita's 13th year monthly salary

$$\begin{aligned} &= a + 12d \\ &= 40000 + 12 \times 1800 \\ &= ₹ 61600 \end{aligned}$$

(B) Reena's total salary of 13 years

$$\begin{aligned} &= \frac{13}{2} [a_1 + a_{13}] \\ &= 78 [48000 + 64800] \\ &= ₹ 8,798,400 \end{aligned}$$

Similarly, Sunita's total salary of 13 years

$$\begin{aligned} &= \frac{13}{2} [40000 + 61600] \times 12 \\ &= ₹ 79,24,800 \end{aligned}$$

(C) Reena will get more than Sunita by  
₹ (8798400 - 7924800) i.e., ₹ 8,73,600.

**29.** The given equation is

$$\begin{aligned} \frac{1}{x+4} - \frac{1}{x-7} &= \frac{11}{30} \\ \Rightarrow \frac{x-7-x-4}{(x+4)(x-7)} &= \frac{11}{30} \\ \Rightarrow \frac{-11}{(x+4)(x-7)} &= \frac{11}{30} \end{aligned}$$

$$\begin{aligned} \Rightarrow (x+4)(x-7) &= -30 \\ \Rightarrow x^2 + 4x - 7x - 28 &= -30 \\ \text{or } x^2 - 3x + 2 &= 0 \\ \text{or } (x-2)(x-1) &= 0 \\ \Rightarrow x-2=0, x-1 &= 0 \\ \Rightarrow x &= 2, 1 \end{aligned}$$

So, the two roots are  $x = 2$  and  $x = 1$ .

**OR**

Let the required fraction be  $\frac{p}{q}$ . Then,

$$\begin{aligned} \frac{p}{q+4} = \frac{1}{2} \text{ and } \frac{p-5}{q} &= \frac{1}{8} \\ \Rightarrow 2p - q - 4 = 0 \text{ and } 8p - q - 40 &= 0 \end{aligned}$$

Subtracting the first equation from the  
second equation, we get

$$\begin{aligned} 6p - 36 &= 0 \\ \Rightarrow p &= 6. \end{aligned}$$

Substituting this value  $p = 6$  in either  
equations, we get

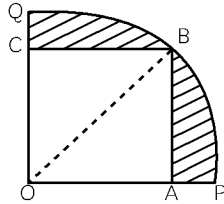
$$q = 8$$

Thus, the required fraction is  $\frac{6}{8}$

30. As,  $OA = 20$  cm

$\therefore$  Diagonal,

$$\begin{aligned} OB &= \sqrt{20^2 + 20^2} \\ &= \sqrt{400 + 400} \\ &= \sqrt{800} \\ &= 20\sqrt{2} \text{ cm} \end{aligned}$$



So, radius of the quadrant

$$= 20\sqrt{2} \text{ cm}$$

Area of the quadrant

$$\begin{aligned} &= \frac{\pi}{4} (20\sqrt{2})^2 \text{ sq cm} \\ &= 200\pi \text{ sq cm} \end{aligned}$$

Area of the square

$$= (20)^2 \text{ sq cm, i.e. } 400 \text{ sq cm}$$

Area of the shaded region

$$\begin{aligned} &= (200\pi - 400) \text{ sq cm} \\ &= (628 - 400) \text{ sq cm} \\ &= 228 \text{ sq cm} \end{aligned}$$

31. (A) Here,

$\angle PRQ = 54^\circ$  (vertically opposite angles)

Now, In  $\Delta PQR$ ,

$$\angle PQR = 180^\circ - (68^\circ + 54^\circ) = 58^\circ$$

$\therefore \Delta PQR \sim \Delta BAR$

$\therefore \angle Q = \angle A$

$$\Rightarrow x = 58^\circ$$

(B) Again,  $\Delta PQR \sim \Delta BAR$ ,

$$\therefore \frac{PQ}{BA} = \frac{QR}{AR}$$

$$\Rightarrow \frac{2y}{y+2} = \frac{y+3}{y}$$

$$\Rightarrow 2y^2 = y^2 + 5y + 6$$

$$\Rightarrow y^2 - 5y - 6 = 0$$

$$\Rightarrow (y-6)(y+1) = 0$$

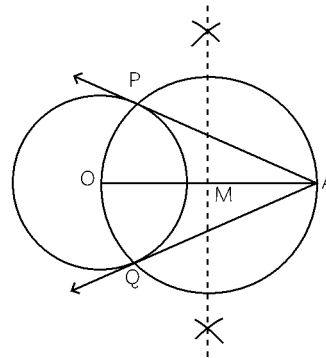
$$\Rightarrow y = 6 \quad (\because y \neq -1)$$

OR

Steps of construction:

- (1) Draw a circle with centre O and radius 3 cm.
- (2) Take a point say A outside the circle such that  $OA = 5$  cm.
- (3) Join OA.
- (4) Draw perpendicular bisector of OA to get its midpoint M.
- (5) Taking m as centre and  $OM = MA$  as radius, draw a circle which intersects the circle of radius 3 cm, at points P and Q.
- (6) Join AP and AQ.

Thus, AP and AQ are the required tangents.

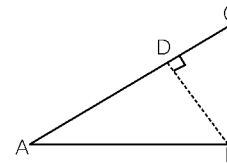


32. **Statement :** In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

**Proof :** Let ABC be a right angled triangle. We need to prove that

$$AC^2 = AB^2 + BC^2$$

Draw  $BD \perp AC$ .



Now, consider  $\Delta$ s ADB and ABC.

Here,  $\angle A = \angle A$  (Common angle)

and  $\angle D = \angle B$  (Each is of  $90^\circ$ )

So, by AA criterion of similarity,

$$\Delta ADB \sim \Delta ABC$$

$$\text{So, } \frac{AD}{AB} = \frac{AB}{AC}$$

$$\text{or } AB^2 = AD \times AC \quad \dots(i)$$

Also,  $\Delta BDC \sim \Delta ABC$ , as

$$\angle C = \angle C \text{ and } \angle D = \angle B$$

So,  $\frac{DC}{BC} = \frac{BC}{AC}$   
 or  $BC^2 = DC \times AC$  ... (ii)

Adding (i) and (ii), we get  
 $AB^2 + BC^2 = AD \times AC + DC \times AC$   
 $= (AD + DC) \times AC$   
 $= AC \times AC$  or  $AC^2$

**33.** The cumulative frequency table for the given data is:

Ranifall (in cm)	Frequency	Cumulative frequency
0-10	22	22
10-20	10	32
20-30	8	40
30-40	15	55
40-50	5	60
50-60	6	66

Here,  $N = 66$

So,  $\frac{N}{2} = 33$

Cumulative frequency just greater than 33 is 40, which belongs to class 20 – 30.

So, the median class is 20 – 30.

For this class,

$l = 20, cf = 32, f = 8, \frac{N}{2} = 33$  and  $h = 10$

So,

$$\begin{aligned} \text{Median} &= l + \frac{\frac{N}{2} - cf}{f} \times h \\ &= 20 + \frac{33 - 32}{8} \times 10 \\ &= 20 + \frac{1}{8} \times 10 \\ &= 21.25 \end{aligned}$$

Thus the median rain fall (in cm) is 21.25

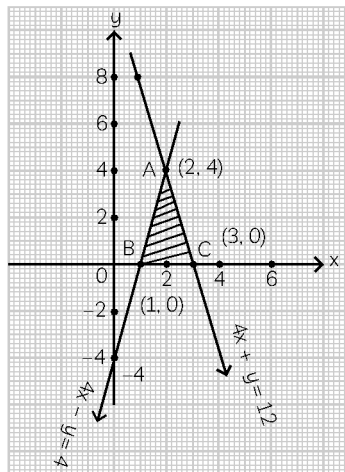
## SECTION - V

**34.** Table of values of  
 $4x - y = 4$

<b>x</b>	1	0	2
<b>y</b>	0	-4	4

Table of values of  
 $4x + y = 12$

<b>x</b>	1	2	3
<b>y</b>	8	4	0



From the graph, we find the vertices A, B, C of  $\Delta ABC$  as  $A(2, 4), B(1, 0), C(3, 0)$ .

Also, triangular region ABC is shaded.

**35. 1<sup>st</sup>-Part:**

We are given a circle with centre O, a point A lying outside the circle and two tangents AX and AY on the circle from the point A.

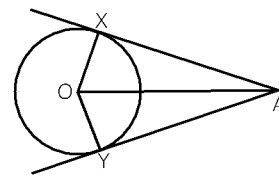
We need to prove that

$$AX = AY$$

Join OX, OY and AO.

We know, tangent is perpendicular to radius, at the point of contact.

$$\angle AXO = \angle AYO = 90^\circ$$



Now, in right triangles AXO and AYO, we have

$$AO = AO \text{ (common)}$$

$$OX = OY \text{ (radii of the same circle)}$$

$$\angle AXO \cong \angle AYO \quad (\text{each } 90^\circ)$$

Therefore, by R.H.S. congruence criterion,

$$\triangle AXO \cong \triangle AYO$$

$$\Rightarrow AX = BY$$

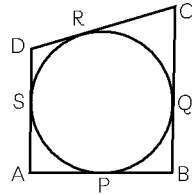
**III<sup>rd</sup>-Part:**

Here, a circle touches all the four sides of quadrilateral ABCD.

From the figure, using the above result, we have,

$$AS = AP, BP = BQ, CQ = CR$$

and  $DS = DR$



$$\begin{aligned} \text{Now, } AB + CD &= (AP + BP) + (CR + DR) \\ &= (AP + DR) + (BP + CR) \\ &= (AS + DS) + (BQ + CQ) \\ &= AD + BC \end{aligned}$$

**36.** 
$$\begin{aligned} \text{L.H.S.} &= \frac{\cot \theta + \operatorname{cosec} \theta - 1}{\cot \theta - \operatorname{cosec} \theta + 1} \\ &= \frac{\cot \theta + \operatorname{cosec} \theta - (\operatorname{cosec}^2 \theta - \cot^2 \theta)}{\cot \theta - \operatorname{cosec} \theta + 1} \\ &= \frac{(\cot \theta + \operatorname{cosec} \theta) - (\operatorname{cosec} \theta - \cot \theta)(\operatorname{cosec} \theta + \cot \theta)}{\cot \theta - \operatorname{cosec} \theta + 1} \\ &= \frac{(\cot \theta + \operatorname{cosec} \theta)(1 - \operatorname{cosec} \theta + \cot \theta)}{\cot \theta - \operatorname{cosec} \theta + 1} \\ &= \cot \theta + \operatorname{cosec} \theta \end{aligned}$$

$$\begin{aligned} &= \frac{\cos \theta}{\sin \theta} + \frac{1}{\sin \theta} \\ &= \frac{\cos \theta + 1}{\sin \theta} \text{ or } \frac{1 + \cos \theta}{\sin \theta} \\ &= \text{R.H.S.} \end{aligned}$$

**OR**

$$\begin{aligned} \text{L.H.S.} &= \frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A} \\ &= \frac{\frac{\sin A}{\cos A}}{1 - \frac{\cos A}{\sin A}} + \frac{\frac{\cos A}{\sin A}}{1 - \frac{\sin A}{\cos A}} \\ &= \frac{\sin A \cdot \frac{\sin A}{\cos A}}{\sin A - \cos A} + \frac{\cos A \cdot \frac{\cos A}{\sin A}}{\cos A - \sin A} \\ &= \frac{\sin^3 A - \cos^3 A}{\sin A \cos A (\sin A - \cos A)} \\ &= \frac{(\sin A - \cos A)(\sin^2 A + \cos^2 A + \sin A \cos A)}{\sin A \cos A (\sin A - \cos A)} \end{aligned}$$

$$\begin{aligned} \therefore a^3 - b^3 &= (a - b)(a^2 - b^2 + ab) \\ &= \frac{1 + \sin A \cos A}{\sin A \cos A} \end{aligned}$$

[ $\because \sin^2 \theta + \cos^2 \theta = 1$ ]

$$\begin{aligned} \text{R.H.S.} &= 1 + \tan A + \cot A = 1 + \frac{\sin A}{\cos A} + \frac{\cos A}{\sin A} \\ &= \frac{\sin A \cos A + \sin^2 A + \cos^2 A}{\sin A + \cos A} \\ &= \frac{\sin A \cos A + 1}{\sin A \cos A} \end{aligned}$$

Thus, L.H.S. = R.H.S.

