








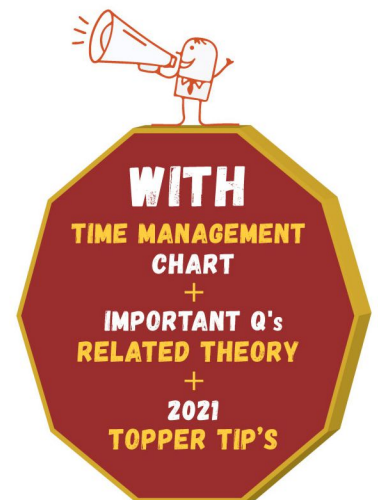
# SAMPLE QUESTION PAPERS MATHEMATICS STANDARD

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

Code  
**SP211**

Price  
**₹ 299**

Pages  
**232**



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**QUESTION PAPERS**  
**MATHEMATICS**  
**STANDARD**

**CBSE CLASS 10**

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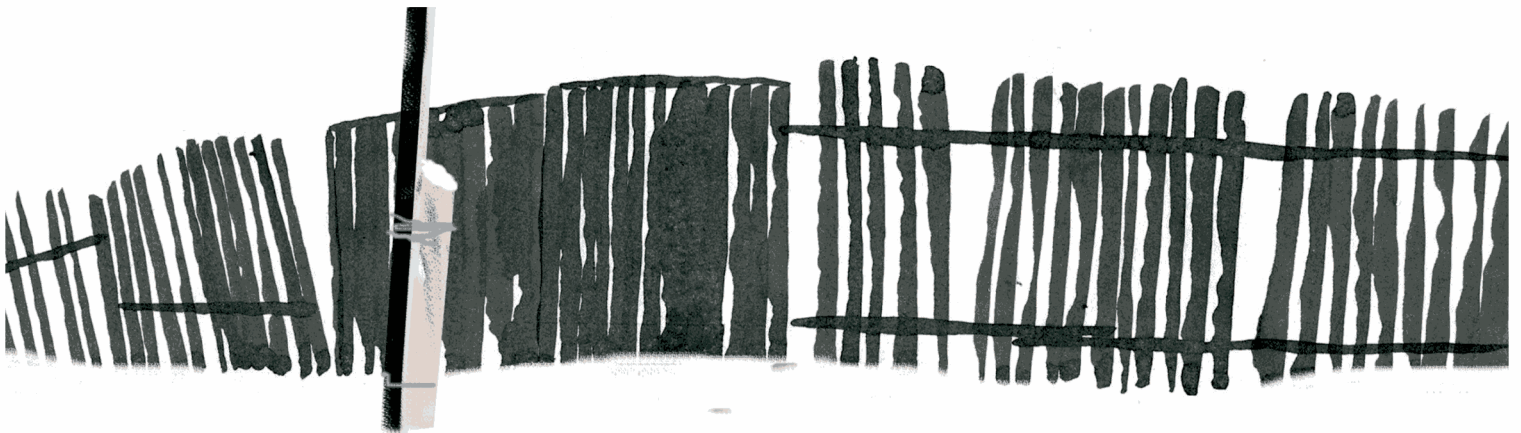
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AGP contributes Rupee One on every book purchased by you to the **Friends of Tribals Society** Organization for better education of tribal children.





# 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** ✓

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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



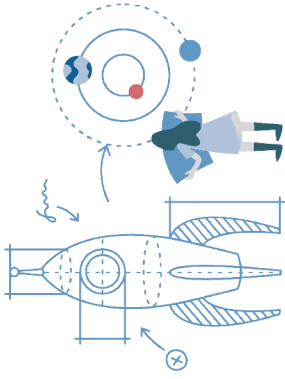
We have reviewed countless Xth Class Maths books but Educart's Sample papers is our top recommendation. Educart has done their homework well on how CBSE students nowadays want to learn solving of maths standard questions.



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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 (Long Answer LA)
<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 (STANDARD)</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)  $\frac{1}{40}$

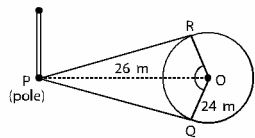
Ans. (d)  $\frac{1}{40}$

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

∴ Required Probability:

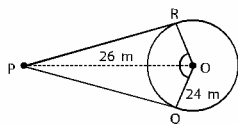
$$\begin{aligned}
 &= \frac{1}{20} \times \frac{5}{20} + \frac{5}{20} \times \frac{1}{20} \\
 &= \frac{1}{80} + \frac{1}{80} \\
 &= \frac{2}{80} \\
 &= \frac{1}{40}
 \end{aligned}$$

- 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

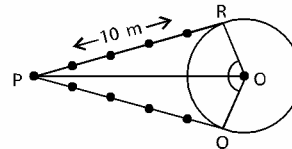


We have:

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

⇒ PR = PQ = 10m

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

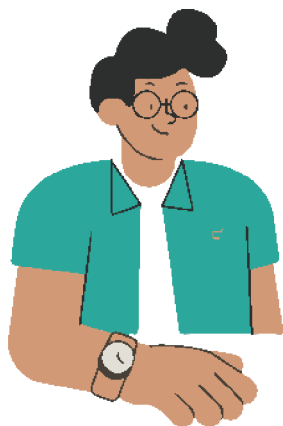


Let's assume the distance between consecutive trees is x.

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 9<sup>th</sup> 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
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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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1. Real Numbers	1
2. Polynomials	2-3
3. Pair of Linear Equations in Two Variables	4-5
4. Quadratic Equations	6
5. Arithmetic Progressions	7
6. Triangles	8-9
7. Coordinate Geometry	10-11
8. Introduction to Trigonometry and Its Applications	12-13
9. Circles	14-15
10. Constructions	16-17
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# CBSE

## SAMPLE PAPER

9<sup>th</sup> October 2020

# MATHAMATICS

## (STANDARD)

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 of 1 mark each. Internal choice is provided in 5 questions.
3. Section II has 4 questions on case study. 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

16 marks

1. If  $xy = 180$  and  $\text{HCF}(x, y) = 3$ , then find the  $\text{LCM}(x, y)$ .

OR

The decimal representation of  $\frac{14587}{2^1 \times 5^4}$  will terminate after how many decimal places? 1

2. If the sum of the zeroes of the quadratic polynomial  $3x^2 - kx + 6$  is 3, then find the value of  $k$ . 1



3. For what value of  $k$ , the pair of linear equations  $3x + y = 3$  and  $6x + ky = 8$  does not have a solution. 1

4. If 3 chairs and 1 table costs ₹ 1500 and 6 chairs and 1 table costs ₹ 2400. Form linear equations to represent this situation. 1

5. Which term of the A.P. 27, 24, 21,.....is zero?

**OR**

In an Arithmetic Progression, if  $d = -4$ ,  $n = 7$ ,  $an = 4$ , then find  $a$ . 1

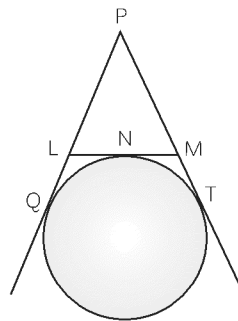
6. For what values of  $k$ , the equation  $9x^2 + 6kx + 4 = 0$  has equal roots? 1

7. Find the roots of the equation  $x^2 + 7x + 10 = 0$

**OR**

For what value(s) of ' $a$ ' quadratic equation  $30ax^2 - 6x + 1 = 0$  has no real roots? 1

8. If  $PQ = 28\text{cm}$ , then find the perimeter of  $\triangle PLM$  1



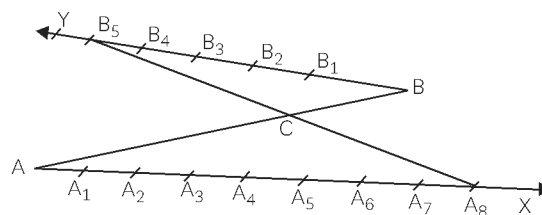
9. If two tangents are inclined at  $60^\circ$  are drawn to a circle of radius 3 cm then find length of each tangent.

**OR**

PQ is a tangent to a circle with centre O at point P. If  $\triangle OPQ$  is an isosceles triangle, then find  $\angle OQP$ . 1

10. In the  $\triangle ABC$ , D and E are points on side AB and AC respectively such that  $DE \parallel BC$ . If  $AE = 2\text{ cm}$ ,  $AD = 3\text{cm}$  and  $BD = 4.5\text{ cm}$ , then find CE. 1

11. In the figure, if  $B_1, B_2, B_3, \dots$  and  $A_1, A_2, A_3, \dots$  have been marked at equal distances. In what ratio C divides AB? 1



12.  $\sin A + \cos B = 1$ ,  $A = 30^\circ$  and B is an acute angle, then find the value of B. 1

13. If  $x = 2\sin^2\theta$  and  $y = 2\cos^2\theta + 1$ , then find  $x + y$ . 1

14. In a circle of diameter 42 cm, if an arc subtends an angle of  $60^\circ$  at the centre where  $\pi = \frac{22}{7}$ , then what will be the length of arc? 1

**15.** 12 solid spheres of the same radii are made by melting a solid metallic cylinder of base diameter 2 cm and height 16 cm. Find the diameter of the each sphere. 1

**16.** Find the probability of getting a doublet in a throw of a pair of dice.

**OR**

Find the probability of getting a black queen when a card is drawn at random from a well-shuffled pack of 52 cards. 1

## SECTION - II

**16 marks**

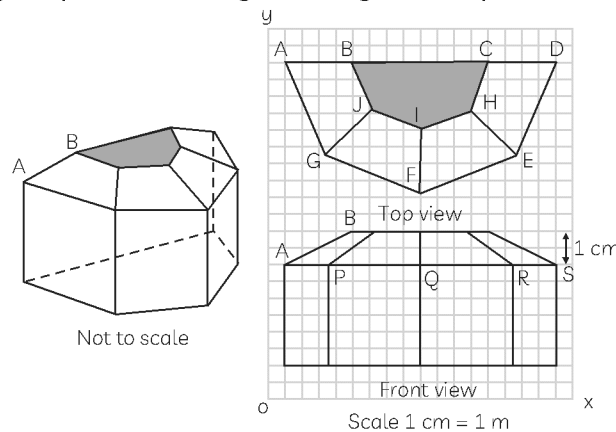
Case study based questions are compulsory. Attempt any four sub-parts of each question. Each sub-part carries 1 mark.

**17.** Case Study based-1

### SUN ROOM

The diagrams show the plans for a sun room. It will be built onto the wall of a house. The four walls of the sunroom are square clear glass panels. The roof is made using

- Four clear glass panels, trapezium in shape, all the same size
- One tinted glass panel, half a regular octagon in shape



(a) Refer to Top View

Find the mid-point of the segment joining the points J (6, 17) and I (9, 16).

(i)  $\left(\frac{33}{2}, \frac{15}{2}\right)$  (ii)  $\left(\frac{3}{2}, \frac{1}{2}\right)$

(iii)  $\left(\frac{15}{2}, \frac{33}{2}\right)$  (iv)  $\left(\frac{1}{2}, \frac{3}{2}\right)$

1

(b) Refer to Top View

The distance of the point P from the  $y$ -axis is

- (i) 4 (ii) 15  
 (iii) 19 (iv) 25

1

(c) Refer to Front View

The distance between the points A and S is

- (i) 4 (ii) 8  
 (iii) 16 (iv) 20

1

(d) Refer to Front View

Find the co-ordinates of the point which divides the line segment joining the points A and B in the ratio 1:3 internally.

(i) (8.5, 2.0)

(ii) (2.0, 9.5)

(iii) (3.0, 7.5)

(iv) (2.0, 8.5)

1

(e) Refer to Front View

If a point  $(x, y)$  is equidistant from the  $Q(9, 8)$  and  $S(17, 8)$ , then

(i)  $x + y = 13$

(ii)  $x - 13 = 0$

(iii)  $y - 13 = 0$

(iv)  $x - y = 13$

1

### 18. Case Study Based- 2

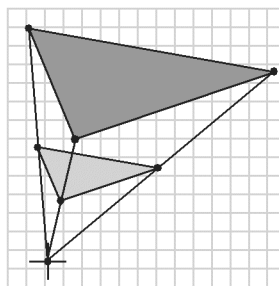
#### SCALE FACTOR AND SIMILARITY

##### SCALE FACTOR

A scale drawing of an object is the same shape as the object but a different size.

The scale of a drawing is a comparison of the length used on a drawing to the length it represents. The scale is written as a ratio.

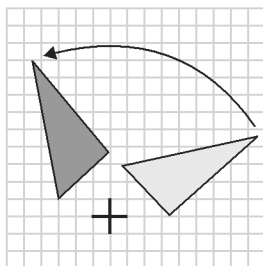
##### SIMILAR FIGURES



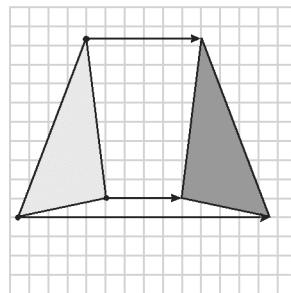
The ratio of two corresponding sides in similar figures is called the scale factor.

$$\text{Scale factor} = \frac{\text{Length in image}}{\text{corresponding length in object}}$$

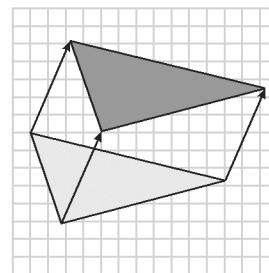
If one shape can become another using Resizing then the shapes are Similar.



Rotation or Turn



Reflection or Flip



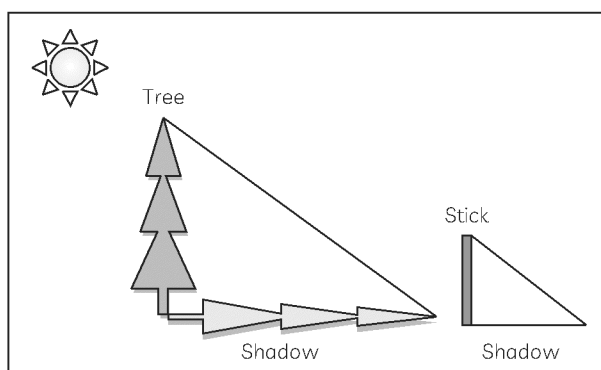
Translation or Slide

Hence, two shapes are Similar when one can become the other after a resize, flip, slide or turn.

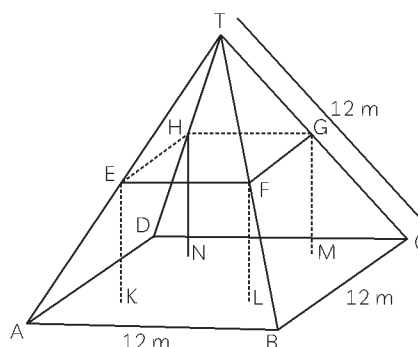
(a) A model of a boat is made on the scale of 1 : 4. The model is 120 cm long. The full size of the boat has a width of 60 cm. What is the width of the scale model?



- (i) 20 cm (ii) 25 cm  
 (iii) 15 cm (iv) 240 cm 1
- (b) What will effect the similarity of any two polygons?  
 (i) They are flipped horizontally  
 (ii) They are dilated by a scale factor  
 (iii) They are translated down  
 (iv) They are not the mirror image of one another 1
- (c) If two similar triangles have a scale factor of  $a : b$ . Which statement regarding the two triangles is true?  
 (i) The ratio of their perimeters is  $3a : b$   
 (ii) Their altitudes have a ratio  $a : b$   
 (iii) Their medians have a ratio  $\frac{a}{2} : b$   
 (iv) Their angle bisectors have a ratio  $a^2 : b^2$  1
- (d) The shadow of a stick 5 m long is 2 m. At the same time the shadow of a tree 12.5 m high is



- (i) 3 m (ii) 3.5 m  
 (iii) 4.5 m (iv) 5 m 1
- (e) Below you see a student's mathematical model of a farmhouse roof with measurements. The attic floor, ABCD in the model, is a square. The beams that support the roof are the edges of a rectangular prism, EFGHLMN. E is the middle of AT, F is the middle of BT, G is the middle of CT, and H is the middle of DT. All the edges of the pyramid in the model have length of 12 m.



What is the length of EF, where EF is one of the horizontal edges of the block?

- (i) 24 m (ii) 3 m  
 (iii) 6 m (iv) 10 m 1



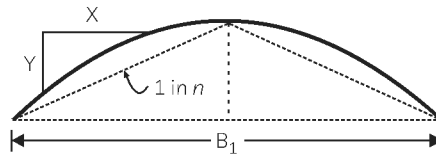
**19. Case Study Based- 3**

Applications of Parabolas-Highway Overpasses/Underpasses A highway underpass is parabolic in shape.



**Parabola**

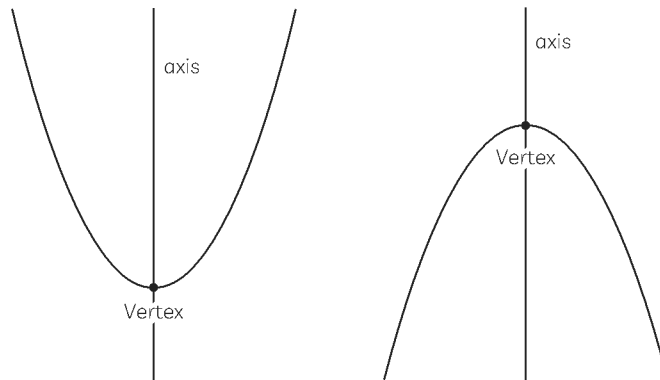
A parabola is the graph that results from  $p(x) = ax^2 + bx + c$



a. Parabolic Camber  $y = 2x^2/nw$

Parabolas are symmetric about a vertical line known as the Axis of Symmetry.

The Axis of Symmetry runs through the maximum or minimum point of the parabola which is called the Vertex.



- (a) If the highway overpass is represented by  $x^2 - 2x - 8$ . Then its zeroes are
- |                  |                 |   |
|------------------|-----------------|---|
| (i) $(2, -4)$    | (ii) $(4, -2)$  |   |
| (iii) $(-2, -2)$ | (iv) $(-4, -4)$ | 1 |
- (b) The highway overpass is represented graphically. Zeroes of a polynomial can be expressed graphically. Number of zeroes of polynomial is equal to number of points where the graph of polynomial
- |   |                           |   |
|---|---------------------------|---|
| (i) Intersects $x$ -axis                | (ii) Intersects $y$ -axis |   |
| (iii) Intersects $y$ -axis or $x$ -axis | (iv) None of these        | 1 |
- (c) Graph of a quadratic polynomial is a
- |                   |              |   |
|-------------------|--------------|---|
| (i) straight line | (ii) circle  |   |
| (iii) parabola    | (iv) ellipse | 1 |

(d) The representation of Highway Underpass whose one zero is 6 and sum of the zeroes is 0, is

(i)  $x^2 - 6x + 2$

(ii)  $x^2 - 36$

(iii)  $x^2 - 6$

(iv)  $x^2 - 3$

1

(e) The number of zeroes that polynomial  $f(x) = (x - 2)^2 + 4$  can have is:

(i) 1

(ii) 2

(iii) 0

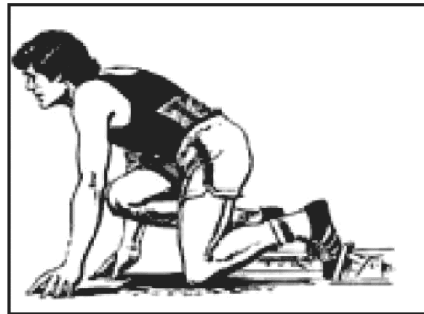
(iv) 3

1

**20. Case Study Based- 4**

100m RACE

A stopwatch was used to find the time that it took a group of students to run 100 m.



Time (in sec)	0-20	20-40	40-60	60-80	80-100
No. of students	8	10	13	6	3

(a) Estimate the mean time taken by a student to finish the race.

(i) 54

(ii) 63

(iii) 43

(iv) 50

1

(b) What will be the upper limit of the modal class ?

(i) 20

(ii) 40

(iii) 60

(iv) 80

1

(c) The construction of cumulative frequency table is useful in determining the

(i) Mean

(ii) Median

(iii) Mode

(iv) All of these

1

(d) The sum of lower limits of median class and modal class is

(i) 60

(ii) 100

(iii) 80

(iv) 140

1

(e) How many students finished the race within 1 minute?

(i) 18

(ii) 37

(iii) 31

(iv) 8

1

**PART - B**

**SECTION - III**

**12 marks**

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

**21.** 3 bells ring at an interval of 4, 7 and 14 minutes. All three bells rang at 6 am, when the three bells will ring together next?

2



22. Find the point on x-axis which is equidistant from the points (2, - 2) and (- 4, 2).

OR

P(- 2, 5) and Q(3, 2) are two points. Find the co-ordinates of the point R on PQ such that  $PR = 2QR$ .

23. Find a quadratic polynomial whose zeroes are  $5 - 3\sqrt{2}$  and  $5 + 3\sqrt{2}$ .

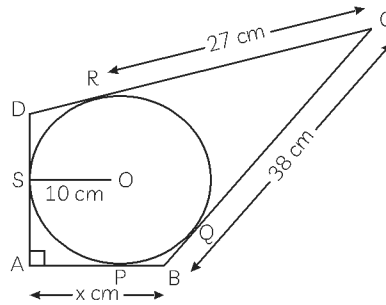
24. Draw a line segment AB of length 9 cm. With A and B as centres, draw circles of radius 5 cm and 3 cm respectively. Construct tangents to each circle from the centre of the other circle.

25. If  $\tan A = \frac{3}{4}$ , find the value of  $\frac{1}{\sin A} + \frac{1}{\cos A}$

OR

If  $\sqrt{3} \sin\theta - \cos\theta = 0$  and  $0^\circ < \theta < 90^\circ$ , find the value of  $\theta$ .

26. In the figure, quadrilateral ABCD is circumscribing a circle with centre O and  $AD \perp AB$ . If radius of incircle is 10 cm, then find the value of x.



### SECTION - IV

21 marks

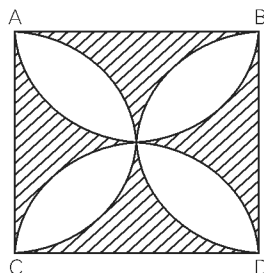
27. Prove that  $2 - \sqrt{3}$  is irrational, given that  $\sqrt{3}$  is irrational.

28. If one root of the quadratic equation  $3x^2 + px + 4 = 0$  is  $\frac{2}{3}$ , then find the value of p and the other root of the equation.

OR

The roots  $\alpha$  and  $\beta$  of the quadratic equation  $x^2 - 5x + 3(k - 1) = 0$  are such that  $\alpha - \beta = 1$ . Find the value k.

29. In the figure, ABCD is a square of side 14 cm. Semi-circles are drawn with each side of square as diameter. Find the area of the shaded region.



- 30.** The perimeters of two similar triangles are 25 cm and 15 cm respectively. If one side of the first triangle is 9 cm, find the length of the corresponding side of the second triangle.

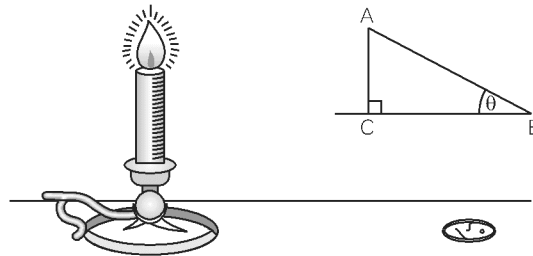
OR

In an equilateral triangle ABC, D is a point on side BC such that  $BD = \frac{1}{3} BC$ . Prove that  $9AD^2 = 7AB^2$ . 3

- 31.** The median of the following data is 16. Find the missing frequencies  $a$  and  $b$ , if the total of the frequencies is 70. 3

Class	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	12	$a$	12	15	$b$	6	6	4

- 32.** If the angles of elevation of the top of the candle from two coins distant ' $a$ ' cm and ' $b$ ' cm ( $a > b$ ) from its base and in the same straight line from it are  $30^\circ$  and  $60^\circ$ , then find the height of the candle. 3



- 33.** The mode of the following data is 67. Find the missing frequency  $x$ . 3

Class	40-50	50-60	60-70	70-80	80-90
Frequency	5	$x$	15	12	7

## SECTION - V

**15 marks**

- 34.** The two palm trees are of equal heights and are standing opposite each other on either side of the river, which is 80 m wide. From a point O between them on the river the angles of elevation of the top of the trees are  $60^\circ$  and  $30^\circ$ , respectively. Find the height of the trees and the distances of the point O from the trees.

OR

The angles of depression of the top and bottom of a building 50 meters high as observed from the top of a tower are  $30^\circ$  and  $60^\circ$  respectively. Find the height of the tower, and also the horizontal distance between the building and the tower. 5

- 35.** Water is flowing through a cylindrical pipe of internal diameter 2 cm, into a cylindrical tank of base radius 40 cm at the rate of 0.7 m/sec. By how much will the water rise in the tank in half an hour? 5

- 36.** A motorboat covers a distance of 16 km upstream and 24 km downstream in 6 hours. In the same time, it covers a distance of 12 km upstream and 36 km downstream. Find the speed of the boat in still water and that of the stream. 5

