# CBSE <br> Pre Board Examination - 2020-21 <br> Mathematics <br> Class - X 

Max. Marks: 80
Time Allowed: 3 hrs

## General Instructions:

1. This question paper contains two parts $\boldsymbol{A}$ and $\boldsymbol{B}$.
2. There are $\mathbf{3 6}$ questions in all printed in $\mathbf{1 0}$ pages.

## Part-A:

1. It consists two Sections I and II.
2. Section I has $\mathbf{1 6}$ questions of $\mathbf{1}$ mark each. Internal choice is provided in $\mathbf{5}$ questions.
3. Section II has $\mathbf{4}$ questions on case study. Each case study has $\mathbf{5}$ sub-questions in it. You should answer any 4 out of 5 sub-questions.

## Part-B:

1. It consists three Sections- III, IV and V.
2. Section III - Very short answer Type. It has $\mathbf{6}$ questions of $\mathbf{2}$ marks each. Internal choice is provided in 2 questions.
3. Section IV - Short Answer Type. It has 7 questions of $\mathbf{3}$ marks each. Internal choice is provided in 2 questions.
4. Section V-Long Answer Type. It has $\mathbf{3}$ questions of $\mathbf{5}$ marks each. Internal choice is provided in 1 question.

## PART A

Section - I

## Section I has 16 questions of $\mathbf{1}$ mark each. Internal choice is provided in $\mathbf{5}$ questions.

1. Find the largest number which divides 70 and 125 , leaving remainders 5 and 8 respectively

## [OR]

If $d=H C F(48,72)$, then find the value of $(d+10)$.
2. If $\frac{1}{2}$ is a root of the equation $x^{2}+k x-\frac{5}{4}=0$, then find the value of ' $k^{\prime}$.
3. What kind of lines will the pair of linear equations $6 x-3 y+10=0$ and $2 x-y+9=0$ will represent graphically?

## [OR]

If the pair of linear equations $3 x+2 k y-2=0$ and $2 x+5 y+1=0$ are parallel, then find the value of ' $k$ '.
4. A shopkeeper gives books on rent for reading. She takes a fixed charge for the first two days, and an additional charge for each day thereafter. Reema paid Rs. 22 for a book kept for six days, while Ruchika paid Rs. 16 for the book kept for four days. Represent the given situation through a pair of linear equation.
5. What kind of decimal expansion will $\frac{987}{10500}$ have?
6. Ram tossed a coin for 560 times in which he got head 230 times. What is the probability of him getting a tail, while tossing the coin?
7. Find the sum of the following A.P: $2,7,12, \ldots \ldots \ldots \ldots \ldots$........ upto 10 terms.

## [OR]

Find the next term of the given series, $\sqrt{2}, \sqrt{8}, \sqrt{18}, \sqrt{32}$, ?
8. Find whether $x=5$, is the root of the equation $x^{2}-13 x+40=0$
9. If $a x^{2}+b x+c=0$, has equal roots, find the value of ' $c$ ' ?
[OR]
What kind of roots does the equation $x^{2}-x+2=0$ have?
10. Find the value of ' $x$ ' from the given figure:

11. Observe the given figure and note that $A C \| D E$ and $D F \| A E$.

Prove that, $\frac{B E}{E C}=\frac{B F}{F E}$.

12. Find the value of $\sin ^{2} 30^{\circ}-\cos ^{2} 30^{\circ}$.
13. If $\sqrt{2} \sin \left(60^{\circ}-\beta\right)=1$, then find the value of $\beta$.
14. If the ratio of circumference to area of a circle is $2: 5$, what is the diameter of the circle?
15. The diameter of a solid metallic sphere is 16 cm . The sphere is melted and recast into 8 equal solid spherical balls. Determine the radius of the spherical balls.
16. What is the probability of getting 53 Mondays in a leap year?

## [OR]

When a die is thrown what is the probability of getting a perfect square number?

## Section-II

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

## 17. Case Study based-1

## Rectangular Plot : Pre-requisite knowledge - Geometry

Ashok wanted to divide his rectangular field to grow flowering plants for his flower business. He wanted to divide the field into four triangular parts as given in the figure below.

In the field $A B C D, E$ and $O$ are the mid points of $A B$ and $B D$ respectively.
Given $A B=400 \mathrm{~m}$ and $A D=480 \mathrm{~m}$.

(a) Find the length of the side $D E$ of $\triangle A D E$.
(i) 520 m
(ii) 670 m
(iii) 650 m
(iv) 580 m
(b) Find the area of the $\triangle A D E$.
(i) 34000 sq.m
(ii) 43000 sq.m
(iii)48000 sq.m
(iv) 36000 sq.m
(c) What is the ratio of the area of $\triangle A D E$ to area of $\triangle B O C$.
(i) 1:4
(ii) $1: 1$
(iii)4: 1
(iv) 2:1
(d) Check whether $\triangle B A D \sim \triangle B C D$ and $\triangle B A D \cong \triangle B C D$.
(i) Not similar
(ii) Congruent
(iii)Similar
(iv) Similar and congruent
(e) What is the ratio of the length of $O C$ to the length of $B D$.
(i) 1:1
(ii) $1: 3$
(iii)3: 1
(iv) $1: 2$
18. Case Study based-2

Card Game: Pre-requisite knowledge - Probability


Anu, Aditya, Rina and Rohan are siblings in a family. They wanted to play a game using playing cards on a holiday. They kept a well shuffled pack of cards facing down on the table.

Each one decided to pick a card in turns from the pack which is kept facing down and the rules of the game is as follows:
(i) Anu will win the game if they get a red King or a Jack
(ii) Aditya will win the game if they gets a non-ace card
(iii) Rina will win the game if they gets neither a king nor a queen
(iv) Rohan will win the game if he gets a face card.
(a) Find the probability of Anu winning?
(i) $\frac{21}{52}$
(ii) $\frac{3}{26}$
(iii) $\frac{21}{26}$
(iv) $\frac{15}{52}$
(b) What is the probability of Rina winning?
(i) $\frac{11}{13}$
(ii) $\frac{9}{13}$
(iii) $\frac{1}{26}$
(iv) $\frac{15}{26}$
(c) If the card picked is a face card who will win?
(i) Anu
(ii) Rina
(iii)Rohan
(iv) Aditya
(d) When Aditya picked a card, if he gets a diamond 10 , who will win the game?
(i) Rohan
(ii) Aditya
(iii)Anu
(iv) No one
(e) What is the probability of Aditya winning?
(i) $\frac{10}{33}$
(ii) $\frac{12}{13}$
(iii) $\frac{1}{52}$
(iv) $\frac{5}{13}$
19. Case Study based-3

## Production of Cars : Pre-requisite knowledge - Arithmetic Progression



A car company produced 1100 cars in the $3^{r d}$ year of introducing their new model and 2700 cars in the $11^{\text {th }}$ year. Assuming that the production increases by a fixed number every year, answer the following questions?
(a) Find the increase in the production every year?
(i) 350
(ii) 200
(iii)250
(iv) 175
(b) Find the number of cars produced in the very first year when the model was introduced.
(i) 700
(ii) 600
(iii)750
(iv) 650
(c) How many cars are produced in the $20^{\text {th }}$ year?
(i) 6700
(ii) 4000
(iii)6750
(iv) 4500
(i) 6700
(ii) 4000
(iii)6750
(d) If $10 \%$ of the production of the $10^{\text {th }}$ year was sold in a Car Mela as a year-end offer, find the number of cars sold in the Mela.
(i) 6700
(ii) 4000
(iii)6750
(iv) 4500
(e) Despite of increasing sales and huge profit, there is a great dissatisfaction among the workers. If you are a part of the management, what will you do to satisfy the workers and to take best out of them?
(i) Stop production
(ii) Reduce work
(iii) Increase the perks
(iv) Change the workers

## 20. Case Study based-4

## Swimming Pool: Pre-requisite knowledge - Co-ordinate Geometry

A Village Panchayat School wanted to encourage their students to take part in the inter-school swimming competitions. In order to bring their idea into action they wanted to construct four identical circular swimming pools to cater training for different age groups at the same time.

A fencing was planned in the shape of quadrilateral $A B C D$ to circumscribe the circular pools for safety concerns. Finally, they came out with their plan on a graph sheet as given in the figure below.

Observe their plan and answer the following questions. Scale in the graph was taken as $1 \mathrm{~cm}=10 \mathrm{~m}$ for both $x$-axis and $y$-axis.

(a) Considering the circular pools are identical, find out what kind of quadrilateral is formed by the fencing $A B C D$ ?
(i) Square
(ii) Rhombus
(iii)Parallelogram
(iv) Rectangle
(b) Find the co-ordinates of the point ' $B$ '?
(i) $[-1,-1]$
(ii) $[1,0]$
(iii) $[0,-4]$
(iv) $[3,3]$
(c)

What is the diameter of each swimming pool?
(i) 3.5 m
(ii) $4 m$
(iii) $\sqrt{7} m$
(iv) $\sqrt{2} m$
(d) If there is a plan to keep a flag post at the point of intersection of $A C$ and $B D$, find the co-ordinates of the position for the flag post in the plan.
(i) $[1,-5]$
(ii) $[0,0]$
(iii) $[3,-2]$
(iv) $[-1,0]$
(e) What values does the village Panchayat depict through this action?
(i) To earn money
(ii) Caring towards students
(iii) To win election
(iv) Help poor people

## Part -B

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

## Section-III

Section III has $\mathbf{6}$ questions of $\mathbf{2}$ marks each. Internal choice is provided in $\mathbf{2}$ questions.
21. Check whether $12^{n}$ can end with digit zero for any positive integer ' $n$ '.
22. Find the ratio in which $y$-axis divides the line segment joining the points $A(5,-6)$ and $B(-1,-4)$. Also find the coordinates of the point of division.
23. $\triangle A B C$ is a right triangle with angle C as $90^{\circ}$. If $D$ is the mid-point of $B C$ prove that, $A B^{2}=4 A D^{2}-3 A C^{2}$
24. If $\alpha$ and $\beta$ are the zeroes of the polynomial $P(x)=2 x^{2}+3 x+1$, then form the quadratic polynomial whose zeroes are $(\alpha+1)$ and $(\beta+1)$.
[OR]

Find the middle term of the A.P. $213,205,197, \ldots \ldots, 37$
25. Prove that, $\frac{\sin ^{3} \theta+\cos ^{3} \theta}{\sin \theta+\cos \theta}=1-\sin \theta \cdot \cos \theta$
[OR]

If $x=p \sec \theta+q \tan \theta$ and $y=p \tan \theta+q \sec \theta$, then prove that $x^{2}-y^{2}=p^{2}-q^{2}$.
26. From an external point P , tangents PA and PB are drawn to a circle with centre O . If $\angle P A B=50^{\circ}$, then find $\angle A O B$.


## Section-IV

## Section IV has $\mathbf{7}$ questions of $\mathbf{3}$ marks each. Internal choice is provided in $\mathbf{2}$ questions.

27. Prove that $3+2 \sqrt{3}$ is an irrational number.
28. Solve the given system of linear equations by elimination method:

$$
\begin{equation*}
3 x=y+5 \text { and } 5 x-y=11 \tag{3}
\end{equation*}
$$

29. Prove that: $(\sec A-\cos A) \cdot(\cot A+\tan A)=\tan A \cdot \sec A$
30. Monthly pocket money of students of a class is given in the following frequency distribution:

| Pocket Money <br> [in QAR] | $100-125$ | $125-150$ | $150-175$ | $175-200$ | $200-225$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Frequency | 14 | 8 | 12 | 5 | 11 |

Find the mean pocket money of the students in the class.
31. Draw a line segment AB of length 7 cm . Taking A as centre, draw a circle of radius 3 cm and taking B as centre, draw another circle of radius 2 cm . Construct tangents to each circle from the centre of the other circle.
[OR]
Draw a circle of radius 5 cm . Construct a pair of tangents to the given circle such that the tangents are inclined at $60^{\circ}$.
32. Find the area of the given shaded region. [Use $\pi=3.14$ ]


In the given figure, $A P B$ and $A Q O$ are semicircles and $O A=O B$. If the perimeter of the figure is 40 cm , find the area of the shaded region. [Use $\left.\pi=\frac{22}{7}\right]$

33. The mode of the following data is 67 . Find the missing frequency ' $p$ '.

| Class Interval | $40-50$ | $50-60$ | $60-70$ | $70-80$ | $80-90$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Frequency | 5 | $p$ | 15 | 12 | 7 |

## Section-V

Section $V$ has $\mathbf{3}$ questions of $\mathbf{5}$ marks each. Internal choice is provided in $\mathbf{1}$ question.
34. Solve the given quadratic equation and find its roots.

$$
\frac{1}{2 x-3}+\frac{1}{x-5}=1, x \neq \frac{3}{2}, 5
$$

35. 

Due to sudden floods, some welfare associations jointly requested the government to get 100 tents fixed immediately and offered to contribute $50 \%$ of the cost. If the lower part of each tent is of the form of a cylinder of diameter 4.2 m and height 4 m with the conical upper part of same diameter but of height 2.8 m and the canvas to be used costs ` 100 per sq. m. Find amount the associations will have to pay.
36. The angle of elevation of an aeroplane from point A on the ground is $60^{\circ}$. After flight of 15 seconds, the angle of elevation change to $30^{\circ}$. If the aeroplane is flying at a constant height of 1500 3 m , find the speed of the plane in $\mathrm{km} / \mathrm{hr}$.

## [OR]

A man standing on the deck of a ship, which is 10 m above water level. He observes the angle of elevation of the top of a hill as $60^{\circ}$ and the angle of depression of the base of the hill as $30^{\circ}$. Calculate the distance of the hill from the ship and the height of the hill.

