

M.P. Birla Foundation Higher Secondary School

Selection Examination 2020-21

Class X

Full marks:- 80

Mathematics

Time:- $2\frac{1}{2}$ hrs

Section A (4 X 10= 40)

(All Questions in this section are compulsory)

1.

- a) Solve the given inequation and graph the solution on the number line:

$$2y - 3 < y + 1 \leq 4y + 7; y \in R$$

- b) Solve the quadratic equation and give the answer correct to two decimal places.

$$3x^2 - x - 7 = 0$$

- c) Shahrugh opened a Recurring Deposit account in a bank and deposited Rs 800 per month for $1\frac{1}{2}$ yrs. If he received Rs 15084 at the time of maturity, find the rate of interest per annum.

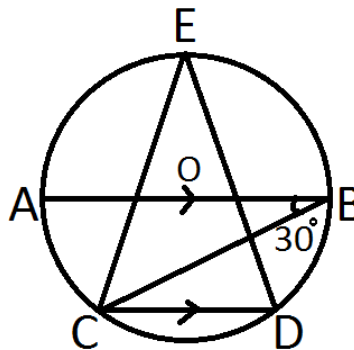
[3+3+4]

2.

- a) Prove the identity:

$$\frac{\cos A}{1 - \tan A} + \frac{\sin A}{1 - \cot A} = \sin A + \cos A$$

- b) In the given figure, O is the centre of the circle. Chord CD is parallel to the diameter AB. If $\angle ABC = 25^\circ$, Calculate $\angle CED$.



- c) Draw a histogram and estimate the mode for the following frequency distribution.

Classes	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	2	8	10	5	4	3

[3+3+4]

3.

- a) The sum of three numbers in A.P is 12 and the sum of their cubes is 216. Find the numbers.
- b) If $\begin{bmatrix} 1 & 2 \\ 3 & 3 \end{bmatrix} \begin{bmatrix} x & 0 \\ 0 & y \end{bmatrix} = \begin{bmatrix} x & 0 \\ 9 & 0 \end{bmatrix}$ find the value of x and y.
- c) Show that (x-3) is a factor of $x^3 - 7x^2 + 15x - 9$. Hence factorise $x^3 - 7x^2 + 15x - 9$.
[3+3+4]

4.

- a) If x, y, z are in continued proportion, prove that :

$$\frac{(x+y)^2}{(y+z)^2} = \frac{x}{z}$$

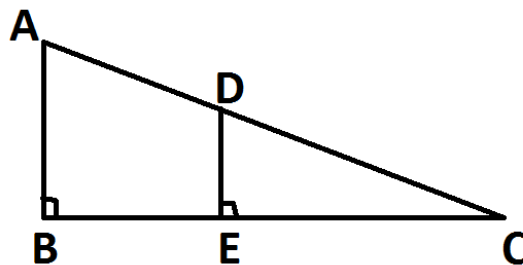
- b) If A= (-4, 3) and B= (8, -6)
- Find the length of AB.
 - In what ratio is the line segment joining AB, divided by the x-axis?
- c) A conical tent is 10cm high and the radius of its base is 24cm. Find:-
- Slant height of the tent.
 - Cost of canvas required to make the tent, if the cost of 1m² canvas is Rs 70.
- [3+3+4]

Section B (4 X 10= 40)

(Answer any four questions in this section)

5.

- a) Find the values of k for which the following quadratic equation has equal roots.
 $x^2 - 2kx + 7k - 12 = 0$
- b) A box contains 7 blue, 8 white and 5 black marbles. If a marble is drawn at random from the box, what is the probability that it will be:
- Black?
 - Blue or black?
 - Not black?
- c) In the given figure, AB and DE are perpendiculars to BC.
- If AB=6cm, DE= 4cm, and AC= 15cm, Calculate CD.
 - Find the ratio of the area of $\triangle ABC$: area of $\triangle DEC$.



[3+3+4]

6.

- a) A dealer buys an article at a discount 30% from the wholesaler, the market price being Rs 6000. The dealer sells it to the consumer at a discount of 10% on the marked price. If the Sales are intra-state and the rate of GST is 5%, find:
- The amount paid by the consumer for the article.
 - The tax (under GST) paid by the dealer to the state government.
 - The amount of tax (under GST) received by the central Government.
- b) Use graph paper for this question.
- Plot the points A (6, 4) and B (0, 4).
 - Reflect A and B in the origin to get images A' and B'. Write the co-ordinates of A' and B'.
 - State the geometrical names for the figure ABA'B'.
 - Find its perimeter. [5+5]

7.

- a) A vertical pole and a vertical tower are on the same level ground. From the top of the pole, the angle of elevation of the top of the tower is 60° and the angle of depression of the foot of the tower is 30° . Find the height of the tower if the height of the pole is 20m.
- b) The marks obtained by 100 students in a mathematics test are given below:-

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of Students	3	7	12	17	23	14	9	6	5	4

Draw ogive from it determine:-

- Median
- Lower quartile
- Number of students who obtained more than 85% marks in the test. [4+6]

8.

- a) When $0^\circ < \theta < 90^\circ$, solve: $2\cos^2\theta + \sin\theta - 2 = 0$
- b) The volume of a cone is the same as that of the cylinder whose height is 9cm and diameter is 40 cm. Find the radius of the base of the cone if its height is 108cm.
- c) Calculate the mean of the following distribution:-

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	8	5	12	35	24	16

[3+3+4]

9.

- a) In $\triangle ABC$, A(3,5), B(7,8) and C(1,-10). Find the equation of the median through A.
- b) If the sum of the first 7 terms of an A.P is 49 and that of first 17 terms is 289, find the sum of first n terms.

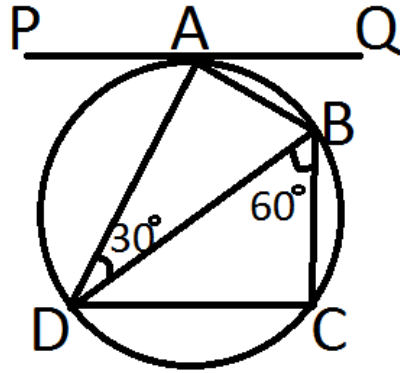
c) If $x = \frac{\sqrt{a+1} + \sqrt{a-1}}{\sqrt{a+1} - \sqrt{a-1}}$, using properties of proportion, show that $x^2 - 2ax + 1 = 0$.

[3+3+4]

10.

- a) In the given figure, PQ is a tangent to the circle at A, DB is a diameter, $\angle ADB = 30^\circ$ and $\angle CBD = 60^\circ$, calculate:-

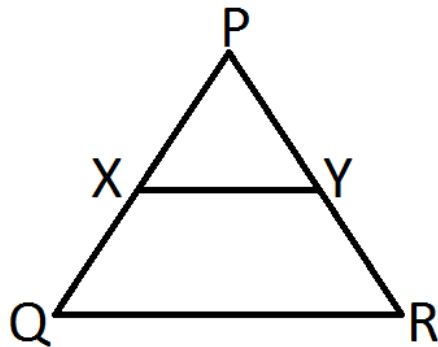
- i) $\angle QAB$
- ii) $\angle PAD$
- iii) $\angle CDB$



- b) What number must be subtracted from $2x^2 - 5x$ so that the resulting polynomial leaves the remainder 2 when divided by $(2x+1)$?
- c) A car covers a distance of 400km at a certain speed. Had the speed been 12km/hr more, the time taken for the journey would have been 1 hour 40 minutes less, find the original speed of the car. [3+3+4]

11.

- a) In the given figure, $XY \parallel QR$. If $\frac{PQ}{XQ} = \frac{7}{3}$ and $PR = 6.3\text{cm}$ find YR .



- b) If $(3x+1) : (5x+3)$ is the triplicate ratio of 3:4, find the value of x .
- c) If $A = \begin{bmatrix} 1 & 3 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 1 \\ -3 & 2 \end{bmatrix}$ and $A^2 - 5B^2 = 5C$, find the matrix C where C is a 2×2 matrix. [3+3+4]