SET – 4

MODEL PAPER – 1
S.S.C. PUBLIC EXAMINATIONS – 2021
MATHEMATICS
(English Medium)

Class : X **(Max. Marks : 100)** **Time : 2hr. 45 min.**

Instructions to students :

1. **There are four sections and 33 questions in this paper.**
2. **Answers should be written in a given answer sheets.**
3. **There is an internal choice in Section – IV**
4. **Write all the questions visible and legibly.**
5. **15 Minutes are given for reading the question paper and 2hr 30 min given for writing answers.**

Section – I

Note : 1. Answer all the Questions.

2. Each Question carries 1 mark **12 x 1 = 12 M**

1. Value of k if the distance between (2,k), (4,3) is 8 …… ( )

A) $3\pm2\sqrt{15}$ B) $5+2\sqrt{15}$ C) $4+2\sqrt{15}$ D) $2+\sqrt{15}$

2. The zero values of $p(x)=x^2+x(\alpha+\beta)+\alpha\beta$ are .... ( )

A) $-\alpha,-\beta$ B) $\alpha,-\beta$ C) α,β D) $-\alpha,\beta$

3. If $x-2$ is a factor of $p(x)=x^2+kx-12$ then k = ... ( )

A) -4 B) 4 C) 3 D) 2

4. $\sin 0^0$ = ( )

A) 0 B) 1 C) -1 D) None

5. If $\sum n=55$ then n = ……. ( )

A) 5 B) 7 C) 9 D) 10

6. If $\tan\theta=\cot\theta$ then θ = ... ( )

A) 30^0 B) 0^0 C) 45^0 D) 90^0

7. If the sum of the zeroes of $p(x)=ax^2=bx+c$ is '0' then ..... ( )

A) b=0 B) b=a C) $b=-a$ D) a=0

8. Choose the correct answer and give justification for each.

The angle between a tangent to a circle and the radius drawn at the point of contact is ( )

a) 60^0 b) 30^0 c) 45^0 d) 90^0

9. The arithmetic mean of the cubes of first four natural numbers is .. ( )

A) 25 B) 35 C) 45 D) 65

10. $\{x : x \text{ is an integer and } x+1=1\} = ...$ ( )

A) $\{1\}$ B) $\{0\}$ C) $\{\ \}$ D) $\{0,1\}$

11. Which of the following point lies on the X – axis ? ( )

A) (x,y) B) (x,x) C) (y,0) D) (0,x)

12. The distance between the points $(x_1,0)$ and $(x_2,0)$ is …. ( )

A) $x_1 - x_2$ B) $x_2 - x_1$ C) $|x_1 - x_2|$ D) All of them

Section – II

Note : 1. Answer all the Questions.

2. Each Question carries 2 Marks. **8 x 2 = 16 M**

13. A= $\{0,2,4\}$, *find* $A \cap \phi$ *and* $A \cap A$. Comment.

14. Find the value of 'k' for which the pair of equations $2x - ky + 3 = 0,\ 4x + 6y - 5 = 0$ represent parallel lines.

15. State which of the following statements are true and which are false ? Give reasons for your choice.

16. Writ the G.P. if the first term a =3, and the common ratio r =2.

17. 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 (i) red ? (ii) not red ?

18. Find the mode of the 20, 3, 7, 13, 3, 4, 6, 7, 19, 15, 7, 18, 3.

19. Find the slope of $\overline{AB}$ with the points lying on A(3,2), B(-8,2).

20. A statue stands on the top of a 2m tall pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60^0 and from the same point, the angle of elevation of the top of the pedestal is 45^0. Find the height of the statue.

Section – III

Note : 1. Answer all the Questions.

2. Each Question carries 4 Marks **8 x 4 = 32 M**

21. If $2^{x+1} = 3^{1-x}$ then find the value of x.

22. Solve each pair of equations by using the substitution method.

$2x + 3y = 9 \quad 3x = 4y = 5$

23. State whether each of the following statement is true or false. Justify you answers.

24. Check whether the following are quadratic equations :

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

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

25. Find the point n the X-axis which is equidistant from (2,-5) and (-2,9).

26. Consider the following distribution of daily wages of 50 workers of a factory.

Daily wages in Rupees	200-250	250-300	300-350	350-400	400-450
Number of workers	12	14	8	6	10

Find the mean daily wages of the workers of the factory by using an appropriate method.

27. If tan A = cot B where A and B are acute angles, prove that A + B = 90^0.

28. Five cards – the ten, jack, queen, king and ace of diamonds, are well – shuffled with their face downwards. One card is then picked up at random.

(i) What is the probability that the card is the queen ?

(ii) If the queen is drawn and put aside, what is the probability that the second card picked up is (a) an ace ? (b) a queen ?

Section – IV

Note : 1. Answer all the Questions.

2. Each Question carries 8 marks

3. There is an internal choice for each question **5 x 8 = 40 M**

29. If A= $\{x : x \text{ is a natural number}\}$, $B = \{x : x \text{ is an even natural number}\}$

C= $\{x : x \text{ is an odd natural number}\}$ and $D = \{x; x \text{ is a prime number}\}$

Find $A \cap B, A \cap C, A \cap D, B \cap D,$

(or)

Explain why 7 x 11 x 13 + 13 and 7 x 6 x 5 x 4 x 3 x 2 x 1 + 5 are composite numbers.

30. Show that $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$

(or)

Simplify $(1-\cos\theta)(1+\cos\theta)(1+\cot^2\theta)$

31. To find out the concentration of SO_2 in the air (in parts per million, i.e., ppm), the data was collected for 30 localities in a certain city and is presented below:

Concentration of SO_2 in ppm	0.00-0.04	0.04-0.08	0.08-0.12	0.12-0.16	0.16-0.20	0.20-0.24
Frequency	4	9	9	2	4	2

Find the mean concentration of SO_2 in the air.

(or)

Prove that the points (-7, -3), (5,10) (15,8) and (3,-5) taken in order are the corners of a parallelogram.

32. CD and GH are respectively the bisectors of $\angle ACB$ and $\angle EGF$ such that D and H lie on sides AB and FE of ΔABC and ΔFEG, respectively. If $\Delta ABC \sim \Delta FEG$ then show that

i) $\frac{CD}{GH} = \frac{AC}{FG}$ ii) $\Delta DCB \sim \Delta HGE$ iii) $\Delta DCA \sim \Delta HGF$

(or)

The sum of the reciprocals of Rehman's ages, (in years) 3 years ago and 5 years from now is $\frac{1}{3}$. Find his present age.

33. Divide $3x^2 - x^3 - 3x + 5$ by $x - 1 - x^2$, and verify the division algorithm.

(or)

Find the area of the shaded region in figure, where ABCD is a square of side 10 cm. and semicircles are drawn with each side of the square as diameter (use $\pi = 3.14$)

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Section – I

Note : 1. Answer all the Questions.

2. Each Question carries 1 mark **12 x 1 = 12 M**

1. If (1,2) (-3,4) and (7,-k) are collinear, k = ? ( )

   A) -1 B) 1 C) 2 D) 0

2. The zero values of $p(x) = x^2 - x(\alpha + \beta) + \alpha\beta$ are ..... ( )

   A) $-\alpha, -\beta$ B) $\alpha, -\beta$ C) α, β D) $-\alpha, \beta$

3. If $p(x)$ is divided exactly by $x + a$ then the remainder is ..... ( )

   A) a B) $-a$ C) p(a) D) $p(-a)$

4. $\sin^2\theta + \cos^2\theta =$ ..... ( )

   A) 0 B) 90^0 C) 1 D) -1

5. The sum of first 10 terms of the A.P., 2, 7, 12, ……. ( )

   A) 250 B) 245 C) 240 D) 235

6. How many cards are of red colour present in a deck of playing cards ?

   A) 52 B) 39 C) 13 D) 26 ( )

7. $p(x) = x^2 - 3x + 2$ *then* $p(0) =$ ( )

   A) 0 B) 2 C) -3 D) 1

8. From a point Q, the length of the tangent to a circle is 24 cm. and the distance of Q from the centre is 25 cm. the radius of the circle is ( )

   a) 7cm b) 12 cm c) 15 cm d) 24.5 cm.

9. Outer surface area of a spherical shell = ( )

A) $4\pi r^2$ B) $3\pi r^2$ C) $2\pi r^2$ D) $\frac{4}{3}\pi r^3$

10. If n(A)=4 then n (p(A))= ..... ( )

A) 2 B) 4 C) 8 D) 16

11. The slope of X – axis is …. ( )

A) 0 B) 1 C) 1/2 D) not defined

12. The slope of x – axis is ( )

A) 0 B) 1 C) -1 D) Not defined

Section – II

Note : 1. Answer all the Questions.

2. Each Question carries 2 Marks. **8 x 2 = 16 M**

13. If A and B are two sets such that $A \subset B$ then what is $A \cup B$?

14. Solve the following systems of equations :

$2x - y = 4$; $4x - 2y = 6$

15. P(x) = 3x -1, Find P (1), P (-1)

16. Find the common ratio of the GP $25, -5, 1, \frac{-1}{5}$.

17. Find the probability of getting a head when a coin is tossed once. Also find the probability of getting a tail.

18. Find the mean of 1, 2, 3, 4, 5, 6.

19. Determine x so that 2 is the slope of the line through, P (2,5) and Q (x,3).

20. From the top of a building, the angle of elevation of the top of a cell tower is 60^0 and the angle of depression to its foot is 45^0. If distance of the building from the tower is 7m, then find the height of the tower.

Section – III

Note : 1. Answer all the Questions.

2. Each Question carries 4 Marks **8 x 4 = 32 M**

21. Find the HCF of 90^0 and 270

22. Suppose you have Rs. 12000 to invest. You have to invest some amount at 10% and the rest at 15%. How much should be invested at each rate to yield 12% on the total amount invested ?

23. If $A = \{3,6,9,12,15,18,21\}$; $B = \{4,8,12,16,20\}$

$C = \{2,4,6,8,10,12,14,16\}$; $D = \{5,10,15,20\}$ find

(i) A-B (ii) A-C (iii) A-D (iv) B-A

24. Find two consecutive odd positive integers, sum of whose square is 290.

25. Show that the points A(4,2), B (7,5) and C (9,7) are there points lie on a same line.

26. The table below shows the daily expenditure on food of 25 households in a locality.

Daily expenditure (in Rupees)	100-150	150-200	200-250	250-300	300-350
Number of house holds	4	5	12	2	2

Find the mean daily expenditure on food by a suitable method.

27. Evaluate the $(1+\tan\theta+\sec\theta)(1+\cot\theta-\operatorname{cosec}\theta)$

28. A Kiddy bank contains hundred 50 p coins, fifty Rs. 1 coins, twenty Rs. 2 coins and ten Rs. 5 coins. If it is equally likely that one of the coins will fall out when the bank is turned upside down, what is the probability that the coin (i) will be a 50 p coin ? (ii) will not be a Rs. 5 coin ?

Section – IV

Note : 1. Answer all the Questions.

2. Each Question carries 8 marks

3. There is an internal choice for each question **5 x 8 = 40 M**

29. State the reasons for the following :

(i) $\{1,2,3,.....10\} \neq \{x : x \in N \text{ and } 1 < x < 10\}$

(ii) $\{2,4,6,8,10\} \neq \{x : x = 2n+1 \text{ and } x \in N\}$

(iii) $\{5,15,30,45\} \neq \{x : x \text{ is a multiple of } 15\}$

(iv) $\{2,3,5,7,9\} \neq \{x : x \text{ is a prime number}\}$

(or)

Find the LCM and HCF of 17, 23 and 29 by the prime factorization method.

30. Simplify secA (1-sinA) (secA+ tanA)

(or)

Evaluate the $2\tan^2 45^0 + \cos^2 30^0 - \sin^2 60^0$

31. The following table shows the ages of the patients admitted in a hospital during a year :

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
Number of patients	6	11	21	23	14	5

Find the mode and the mean of the data given above. Compare and interpret the two measures of central tendency.

(or)

Find the values of y for which the distance between the points P(2,-3) and Q(10,y) is 10 units.

32. D,E,F are mid points of sides BC, CA, AB of ΔABC. Find the ratio of areas of $\Delta DEF \text{ and } \Delta ABC$.

(or)

A motor boat whose speed is 18 km/h in still water. It takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.

33. Find all the zeroes of $2x^4 - 3x^3 + 6x - 2$, if you know that two of its zeroes are $\sqrt{2} \text{ and } -\sqrt{2}$.

(or)

A car has two wipers which do not overlap. Each wiper has a blade of length 25 cm. sweeping through an angle of 115^0. Find the total area cleaned at each sweep of the blades. (use $\pi = \frac{22}{7}$)