MOCK EXAMINATION: 2022
MATHEMATICS

Time: $2\frac{1}{2}$ Hrs.

Class: X

Full Marks: 80

Answers to this paper must be written on the single line paper.
You will not be allowed to write during the first 15 minutes.
The time at the head of this paper is the time allowed for writing the answers.

Attempt all questions from ***Section A*** *and* ***any four*** *questions from* ***Section B.***
All working, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answer.
Omission of essential working will result in loss of marks.
The intended marks for questions or parts of questions are given in brackets [].

SECTION – A (40 Marks)

(Attempt **all** questions)

Question 1: [15]

Choose the correct answer to the question from the given options:

i) In a showroom, a discount of 30% is offered on an article marked at Rs. 12,000. The rate of GST is 18% then the CGST to be paid is:
(a) Rs.1, 512,
(b) Rs. 1,080
(c) Rs. 756
(d) Rs. 2,160

ii) If $x \in R$: the solution set of $6 \leq -3(2x-4) < 12$ is:
(a) $\{x: x \in R,\ 0 < x \leq 1;$
(b) $\{x: x \in R, 0 \leq x < 1;$
(c) $\{0, 1\}$
(d) none of these.

iii) The roots of the equation $x^2 - 3x - 10 = 0$ are:
(a) $2, -5$ (b) $-2, 5$ (c) $2, 5$ (d) $-2, -5.$

iv) If on dividing $2x^3 + 6x^2 - (2k-7)x + 5$ by $(x+3)$, the remainder is $(k-1)$ then the value of k is:
(a) 2 (b) -2 (c) -3 (d) 3.

v) If $A = \begin{bmatrix} 2 & a \\ -3 & 5 \end{bmatrix}$, $B = \begin{bmatrix} -2 & 3 \\ 7 & b \end{bmatrix}$, $C = \begin{bmatrix} c & -9 \\ -1 & -11 \end{bmatrix}$ and 5A+2B = C. then the value of a is:
(a) 3, (b) -9 (c) -3, (d) $-15.$

vi) If $A = \begin{bmatrix} 2 & a \\ -3 & 5 \end{bmatrix}$, $B = \begin{bmatrix} -2 & 3 \\ 7 & b \end{bmatrix}$, $C = \begin{bmatrix} c & -9 \\ -1 & -11 \end{bmatrix}$ and 5A+2B = C. then the value of c is:

(a) 6, (b) 2 (c) -2, (d) -6.

vii) The 12th term of the A.P. 5, 12, 19, 26…….. is:

a) 87, b) 82, (c) 89 (d) 75.

viii) If the nth term of an A.P. is (2n+1) , then the sum of its first n term is :

a) $n(n+1)$ (b) $n(n+2)$ (c) $n(n-2)$ (d) $n(n-1)$.

ix) The reflection of the point p(1,-2) is the line y =2 is:

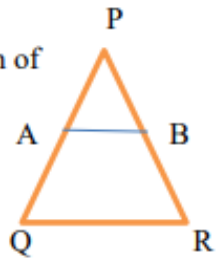
(a) $(-1,2)$ (b) $(1,2)$ (c) $(1,4)$ (d) $(1,6)$.

x) If P(9a-2, 3) divides the line segment joining A (3a+1 , -3) and B(8a,5) in the ratio 3:1 then the value of a is:

(a) 2, (b) -3, (c) 1 (d) -1.

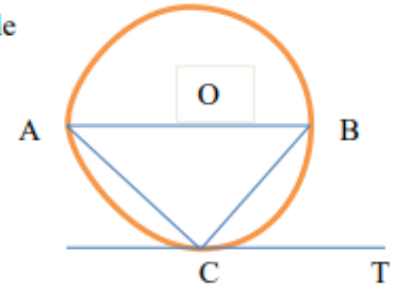
xi) In ΔPQR AB‖ QR and PA =$2\sqrt{2}$ cm, AQ =$3\sqrt{2}$ cm, PR = 10 cm. then the length of PB =

(a) $4\sqrt{2}$. cm (b) 4cm. (c) 6cm. (d) $6\sqrt{2}$ cm.



xii) In the figure, CT is the tangent to the circle at, C and AB is a diameter of the circle'

If $\angle BCT = 40°$, then $\angle ABC$ is:



(a) 40° (b) 80°, (c) 90°, (d) 50°.

xiii) If the circumference of the circular top of a hemispherical bowl is 132cm, then the depth of the bowl is :

(a) 22cm, (b)12cm, (c) 21cm, (d) 14cm.

xiv)The mode of the following data is: 2,3,2,4,3,5,6,7,3,5,8,6,7.

(a) 2 (b) 3 (c) 5 (d) 7.

xv) The probability of selecting a prime number randomly from the numbers, 1, 2, 3, 4,…….28, 29,30, is:

(a) $\frac{1}{3}$ (b) $\frac{11}{30}$ (c) $\frac{3}{10}$ (d) $\frac{2}{5}$.

Question 2 [4 + 4 + 4]

(a) David opened a recurring deposit account in a bank and deposited Rs.300 per month for two years. If he received Rs.7725 at the time of maturity, find the rate of interest per annum.

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

(c) Given a line segment AB joining the points A$(-4,6)$ and B $(8,-3)$.

i) Find the equation of the straight line AB.

ii) The ratio in which AB is divided by the y axis,

iii) The length of AB.

Question 3 [4+4+5]

(a) Prove the following identities:

$$\frac{\cot B - \tan A}{\cot A - \tan B} = \tan A \cot B.$$

(b) A cylindrical can whose base is horizontal and radius 3.5cm contains sufficient water so that when a sphere is placed in the can, the water just covers the sphere. Given that the sphere just fits into the can.

Calculate:

i) The total area of the can in contact with water when the sphere is in it, and

ii) The depth of water in the can before the sphere was put into the can. (Take π to be $\frac{22}{7}$ and give your answers as proper fractions).

(c) Use graph paper for this question. Take 1cm = 1 unit on both x and y axes.

i) plot the following points on your graph sheets: A (-4,0), B (-3,2), C (0,4), D (4,1) and E (7,3).

ii) Reflect the points B, C, D and E on the x axes and name them B', C', D' and E' respectively.

iii) join the points A, B, C, D, E, E', D', C', B' and A in order.

iv) Name the closed figure formed.

SECTION - B (40 Marks)

(Attempt any **four** questions from this Section)

Question 4 [3+3+4]

(a) Mrs. Jain went for lunch with her friends at a restaurant which offers her a 20% discount. The cost of the food that they order is Rs. 6480. Given that there is a service charge of 5% and GST is at 18%, Calculate:

(i) The amount of service charge she has to pay.

(ii) The amount of the bill.

(b) Find the solution set of the inequation $|2x - 3| \leq 8, x \in R$ and represent the solution on the number line.

(c) The sum of the first n terms of an A.P. is $5n - n^2$. Find:

(i) First term of the A.P.

(ii) The sum of first three terms

(iii) The second term

(iv) The A.P.

Question 5 [3+3+4]

(a) Find the number which when added to each of the numbers 15, 17, 34 and 38, makes them in proportion.

(b) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 4 \\ 3 & 2 \end{bmatrix}$ Find $A^2 - 2AB + B^2$

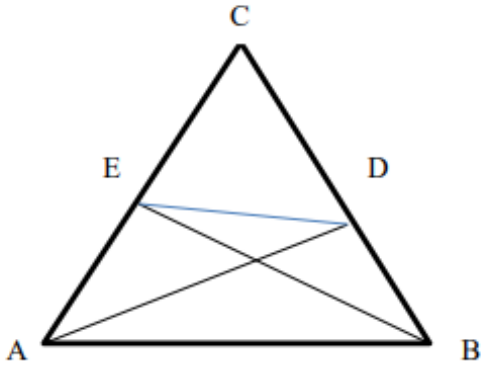
(c) In the figure segment AD and BE are perpendiculars to the side BC and AC respectively. Show that:

(i) $\Delta ADC \sim \Delta BEC$

(ii) $CA \times CE = CB \times CD$

(iii) $\Delta ABC \sim \Delta DEC$

(iv) $CD \times AB = CA \times DE$



Question 6 [3+3+4]

(a) The equation of a line is $4x - 3y + 12 = 0$. Find:

(i) The slope of the line

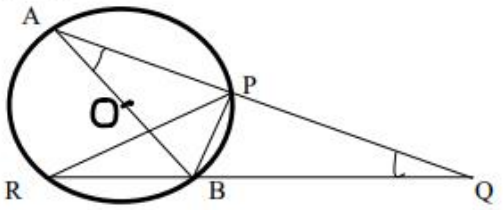
(ii) The equation of a line perpendicular to the given line passing through the intersection of the lines $x - y + 2 = 0$ and $3x + y - 10 = 0$.

(b) From the figure find:

(i) $\angle PRB$

(ii) $\angle PBR$

(iii) $\angle BPR$, when AB is the diameter.
and, $\angle BAQ = 35°, \angle BQA = 25°$



(c) In a school the weekly pocket money of 60 students is as follows:

Weekly pocket Money (in Rs)	50-60	60-70	70-80	80-90	90-100	100-110
Number of students	2	8	16	18	20	6

Draw a histogram and find the mode, using the histogram.

Question 7 [3+3+4]

(a) Solve the following quadratic equation and give the answer correct to two significant figures:
$4x^2 - 7x + 2 = 0$

(b) Find the mean of the following frequency distribution:

Class intervals	84-90	90-96	96-102	102-108	108-114	114-120
Frequency	8	12	15	20	10	5

(c) The angle of elevation of the top of a hill from the foot of a tower is 60° and the angle of depression from the top of the tower to the foot of the hill is 30°. If the tower is 60m height, find the height of the hill.

Question 8 [4+6]

(a) If $(x-2)$ is a factor of $2x^3 - x^2 - Px - 2$
   (i) Find the value of P
   (ii) With the value of P, factorise the above expression completely.

(b) Use graph paper for this question. The marks obtained by 120 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	5	9	16	22	26	18	11	6	4	3

Draw the Ogive and hence, estimate:

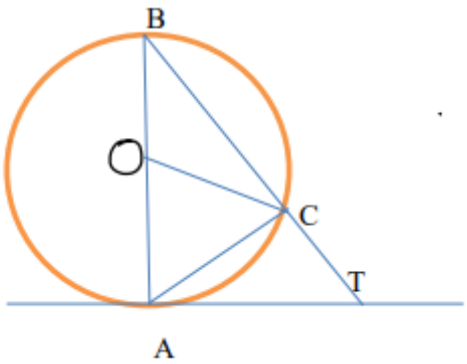
i) The median marks
ii) The number of students who did not pass the test if the pass percentage was 50 and
iii) The upper quartile marks.

Question 9 [3+3+4]

a) Prove the following identities $\frac{1+\cos A}{1-\cos A} = \frac{tan^2 A}{(\sec A - 1)^2}$.

b) Cards marked with number, 5,6, 7…….27,28,29, are well shuffled and a card is drawn at random. What is the probability that the number on the card is (i) a prime number, (ii) divisible by 3? (iii) a number divisible by 4 or 5.

c) In the given figure, AB is the diameter of the circle, with centre O, and AT is the tangent, calculate the value of (i) $\angle ATC$ (ii) $\angle CAT$ $(iii)\angle ACT$. when $\angle AOC = 64°$.



Question 10 [3+3+4]

(a) A hollow metal sphere of internal and external radii 2cm and 4cm respectively is melted and recast into the shape of solid cone of base radius 4cm. Find the height and slant height of the cone.

(b) Draw a line AB =5cm, mark a point C on AB such that AC =3cm. Using ruler and compass only, construct:

i) A circle of radius 2.5cm, passing through A and C.

ii) Two tangents to the circle from the external point B. Measure and record the length of the tangents.

(d) Prove that if the roots of the quadratic equation

$(c^2 - ab)x^2 - 2(a^2 - bc)x + (b^2 - ac) = 0$ are equal then

$a = 0 \text{ or } a^3 + b^3 + c^3 - 3abc = 0.$

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