## Model examination -April-2020

## X MATHEMATICS

## TIME:3.00 Hrs.

Max Marks:100

## General instructions:

(i) This question paper consists of four sections. Read the note carefully under each section section before answering them.
(ii) The rough work should be shown at the bottom of the pages of the answer book.
(iii) Calculator and other electronic devices are not permitted.

SECTION -A

## Note(i) Answer all the 14 questions.

## $14 \times 1=14$

1. If $\{(7,11),(5, a)\}$ represents a constant function, then the value of ' $a$ ' is
(A) 7
(B) 11 (C) 5
(D) 9
2. If $\mathrm{f} A: \rightarrow \mathrm{B}$ is a bijective function and if $\mathrm{n}(\mathrm{A})=5$, then $\mathrm{n}(\mathrm{B})$ is equal to
(A) 10
(B) 4
(C) 5
(D) 25
3. If the $\mathrm{n}^{\text {th }}$ term of a sequence is $100 \mathrm{n}+10$, then the sequence is
(A) an A.P.
(B) a G.P.
(C) a constant sequence
(D) neither A.P. nor G.P.
4. If $\mathrm{a}, \mathrm{b}, \mathrm{c}, 1, \mathrm{~m} . \mathrm{n}$ are in A.P., then $3 \mathrm{a}+7,3 \mathrm{~b}+7,3 \mathrm{c}+7,31+7,3 \mathrm{~m}+7,3 \mathrm{n}+7$ form
(A) a G.P.
(B) an A.P.
(C) a constant sequence
(D) neither A.P. nor G.P
5. Let $\mathrm{b}=\mathrm{a}+\mathrm{c}$. Then the equation $\mathrm{ax}^{2}+\mathrm{bx}+\mathrm{c}=0$ has equal roots, if
(A) $a=c$
(B) $a=-c$
(C) $\mathrm{a}=2 \mathrm{c}$
(D) $a=-2 c$
6. The system of equations $x-4 y=8,3 x-12 y=24$
(A) has infinitely many solutions
(B) has no solution
(C) has a unique solution
(D) may or may not have a solution
7. If $A$ and $B$ are square matrices such that $A B=I$ and $B A=I$, then $B$ is
(A) Unit matrix
(B) Null matrix
(C) Multiplicative inverse matrix of A
(D) -A
8. If a straight line $\mathrm{y}=2+\mathrm{k}$ passes through the point $(1,2)$, then the value of k is equal to
(A) 0
(B) 4
(C) 5
(D) -3
9. Area of the triangle formed by the points $(0,0),(20)$, and ( 02 ), is
(A) 1 sq. units
(b) 2 sq. units (
(c) 4 sq. units
(d) 8 sq. units
10. The perimeter of two similar triangles DABC and DDEF are 36 cm and 24 cm respectively. If
$\mathrm{DE}=10 \mathrm{~cm}$, then AB is.....
(A) 12 cm
(B) 20 cm
(C) 15 cm
(D) 18 cm
11. AB and CD are two chords of a circle which when produced to meet at a point P such that
12. If the radius of a sphere is half of the radius of another sphere, then their respective volumes are in the ratio .....
(A) $1: 8$
(B) 2: 1
(C) $1: 2$
(D) $8: 1$
13. Variance of first 20 natural numbers is (1) 32.25 (2) 44.25 (3) 33.25 (4) 30
14. The outcome of a random experiment results in either success or failure. If the probability of success is twice the probability of failure, then the probability of success is
(A) $1 / 3$
(B) $2 / 3$
(C) 1
(D) 0

SECTION:B
Note: (i) Answer 10 question
(ii)Answer any 9 questions from the first 14 questions. Question no. 30 is compulsory.
(iii)Each question carries 2 marks
$10 \times 2=20$
16. Let $f$ be a function from $R$ to $R$ defined by $f(x)=3 x-5$. Find the values of $a$ and $b$ given that $(\mathrm{a}, 4)$ and $(1, \mathrm{~b})$ belong to f .
17. If $\mathrm{X}=\{1,2,3,4,5\}, \mathrm{Y}=\{1,3,5,7,9\}$ determine which of the following relations from X to Y are functions? Give reason for your answer. If it is a function, state its type
(i) $\mathrm{R}_{1}=\{(1,3),(2,5),(4,7),(5,9),(3,1)\}$
(ii) $\mathrm{R}_{2}=\{(1,1),(2,1),(3,3),(4,3),(5,5)\}$
18. In the geometric series $2+4+8+$ starting from the first term how many consecutive terms are needed to yield the sum 1022 ?
19. Calculate the standard deviation of the first 13 natural numbers.
20. The ratio of income of two persons is $9: 7$ and the ratio of their expenditure is $4: 3$. If each of them manages to save `Rs. 2000 per month, find their monthly income.
21. using quadratic formula : $3 a^{2} x^{2}-a b x-2 b^{2}=0$
22. One year ago, a man was 8 times as old as his son. Now his age is equal to the square of his son's age. Find their present ages.

$$
\text { If } A=\left(\begin{array}{rrr}
8 & 5 & 2 \\
1 & -3 & 4
\end{array}\right) \text {, then find } A^{T} \text { and }\left(A^{T}\right)^{T}
$$

Solve for $x$ and $y$ if $\binom{x^{2}}{y^{2}}+3\binom{2 x}{-y}=\binom{-9}{4}$.
25. A card is drawn from a deck of 52 cards. Find the probability of getting a King or a Heart or a Red card.
26. If the points $(a, 1),(1,2)$ and $(0, b+1)$ are collinear, then show that $1 / a+1 / b=1$
27. In the figure, $\mathrm{AP}=3 \mathrm{~cm}, \mathrm{AR}=4.5 \mathrm{~cm}, \mathrm{AQ}=6 \mathrm{~cm}, \mathrm{AB}=5 \mathrm{~cm}$, and $\mathrm{AC}=10 \mathrm{~cm}$.
29. A ladder leaning against a vertical wall, makes an angle of $60^{\circ}$ with the ground. The foot of the ladder is 3.5 m away from the wall. Find the length of the ladder
30. (a) Find the equations of the lines, whose sum and product of intercepts are 1 and -6 respectively

## (OR)

(b) The sum of thrice the first number, second number and twice the third number is 5 . If thrice the second number is subtracted from the sum of first number and thrice the third we get 2 . If the third number is subtracted from the sum of twice the first, thrice the second we get 1 . Find the number.

## SECTION C

Note: (i)Answer 9 questions
(ii)Answer any 8 questions from the first 14 questions. Question no. 45 is compulsory.
(iii)Each questions carries 5 marks $\quad 10 \times 5=50$
31. Forensic scientists can determine the height (in cms ) of a person based on the length of their thigh bone. They usually do so using the function $h(b)=2.47 b+54.10$ where $b$ is the length of the thigh bone. (i) Check if the function $h$ is one - one (ii) Also find the height of a person if the length of his thigh bone is 50 cms . (iii) Find the length of the thigh bone if the height of a person is 147.96 cms .

A function $\mathrm{f}:[-5,9,] \rightarrow \mathrm{R}$ is defined as follows:

$$
f(x)=\left\{\begin{array}{llr}
6 x+1 & \text { if } & -5 \leq x<2 \\
5 x^{2}-1 & \text { if } & 2 \leq x<6 \\
3 x-4 & \text { if } & 6 \leq x \leq 9
\end{array}\right.
$$

Find
(i) $f(-3)+f(2)$
(ii) $f(7)-f(1)$
(iii) $2 f(4)+f(8)$
(iv) $\frac{2 f(-2)-f(6)}{f(4)+f(-2)}$
33. The ratio of the sums of first $m$ and first $n$ terms of an arithmetic series $m^{2}: n^{2}$ show that the ratio of the $\mathrm{m}^{\text {th }}$ and $\mathrm{n}^{\text {th }}$ terms is $(2 \mathrm{~m}-1):(2 \mathrm{n}-1)$
34. If $S_{1}, S_{2}$ and $S_{3}$, are the sum of first $n, 2 n$ and $3 n$ terms of a geometric series respectively, then prove that $S_{1}\left(S_{3}-S_{2}\right)=\left(S_{2}-S_{1}\right)^{2}$.
35. $\quad$ Factorize: $4 x^{3}-5 x^{2}+7 x-6$
36. If $m-n x+28 x^{2}+12 x^{3}+9 x^{4}$ is a perfect square, then find the values of $m$ and $n$ If $A=\left(\begin{array}{ll}a & b \\ c & d\end{array}\right)$ and $I_{2}=\left(\begin{array}{ll}1 & 0 \\ 0 & 1\end{array}\right)$, then show that $A^{2}-(a+d) A=(b c-a d) I_{2}$.
37.

40. To prove: Angle Bisector Theorem
41. A vertical tree is broken by the wind. The top of the tree touches the ground and makes an angle $30^{0}$ with it. If the top of the tree touches the ground 30 m away from its foot, then find the The diameter of a road roller of length 120 cm is 84 cm . If it takes 500 complete
42. The diameter of a road roller of length 120 cm is 84 cm . If it takes 500 complete revolutions to level a playground, then find the cost of levelling it at the cost of 75 paise per square metre.
43. A sector containing an angle of $120^{\circ}$ is cut off from a circle of radius 21 cm and folded into a cone. Find the curved surface area of the cone
44. 48 students were asked to write the total number of hours per week they spent on watching television. With this information find the standard deviation of hours spent for watching television

| $x$ | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $f$ | 3 | 6 | 9 | 13 | 8 | 5 | 4 |

45. (a) Find the equations of the straight lines each passing through the point $(6,-2)$ and whose sum of the intercepts is 5 .
(b) A funnel consists of a frustum of a cone attached to a cylindrical portion 12 cm long attached at the bottom. If the total height be 20 cm , diameter of the cylindrical portion be 12 cm and the diameter of the top of the funnel be 24 cm . Find the outer surface area of the funnel.

## SECTION:D

Note; (i) This section contains two questions, each with two alternatives. Answer both the questions choosing either of the alternatives.
(ii)
(iii) Each question carries ten marks.

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2 \times 8=16
$$

46. (a) Draw a circle of diameter 10 cm . From a point $\mathrm{P}, 13 \mathrm{~cm}$ away from its centre, draw the two tangents PA and PB to the circle, and measure their lengths.
(OR)
(b) A boat takes 1.6 hours longer to go 36 kms up a river than down the river. If the speed of the water current is 4 km per hr , what is the speed of the boat in still water?
47. (a) Draw the graph of $y=2 x^{2}$ and hence solve $2 x^{2}+x-6=0$.
(b) In the adjacent figure, ABC is a right angled triangle with right angle at B and points $\mathrm{D} . \mathrm{E}$

trisect $B C$. Prove that $8 A E^{2}=3 A^{2}+5 A D^{2}$
