

ARMY PUBLIC SCHOOL SHILLONG
ANNUAL EXAMINATION (2022-23)
SUBJECT: MATHEMATICS (CODE 041)
CLASS XI

Time Allowed: 3 hours

Maximum marks: 80

GENERAL INSTRUCTIONS:

1. This question paper contains- five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
 2. Section A has 20 MCQ's of 1 mark each.
 3. Section B has 5 Very Short Answer (VSA) type questions of 2 marks each.
 4. Section C has 6 Short Answer (SA) type questions of 3 marks each.
 5. Section D has 4 Long Answer (LA) type questions of 5 marks each.
 6. Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with subparts.
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SECTION A
(Multiple Choice Question)
Each question carries 1 mark

1. If $n(A) = 3, n(B) = 2$, then number of non-empty relations from set A to set B are 1
a) 8 b) 4 c) 64 d) 63
2. If $(2x, y - x) = (y + 3, 0)$ then value of y is 1
a) -3 b) 3 c) x d) -x
3. The value of $\sin \frac{7\pi}{12} \cos \frac{\pi}{4} - \cos \frac{7\pi}{12} \sin \frac{\pi}{4}$ is 1
a) $\frac{1}{2}$ b) $\frac{\sqrt{3}}{2}$ c) $\frac{1}{\sqrt{2}}$ d) 1
4. The value of $\sin \frac{31\pi}{3}$ is 1
a) $\frac{1}{2}$ b) $\frac{\sqrt{3}}{2}$ c) $\frac{1}{\sqrt{2}}$ d) 1
5. $5 < 6, 9 < 10$ are examples of 1
a) Inequalities
b) Numerical inequalities
c) Literal inequalities
d) None of the above
6. If $-3x + 17 < -13$, then 1
a) $x \in (10, \infty)$ b) $x \in [10, \infty)$ c) $x \in (-\infty, 10)$ d) $x \in [-10, 10)$
7. Total number of words formed by 2 vowels and 3 consonants taken from 4 vowels and 5 consonants is equal to 1
a) 60 b) 120 c) 7200 d) 720

8. Find r if ${}^{15}C_{3r} = {}^{15}C_{r+3}$ 1
 a) 6 b) 5 c) 4 d) 3
9. The 10th term in the expansion of $(2x^2 - \frac{1}{x})^{12}$ is 1
 a) $-1760x^{-3}$ b) $1760x^3$ c) $-1760x^3$ d) $1760x^{-3}$
10. Number of terms in the expansion of $(3x + y)^8 - (3x - y)^8$ are 1
 a) 4 b) 5 c) 6 d) 9
11. A line passes through (x_1, y_1) and (h, k) . If the slope of the line is 'm' then 1
 $k - y_1 =$
 a) m b) $m(h - x_1)$ c) $-m$ d) $(h - x_1)$
12. The equation of straight line passing through the point $(-1, 2)$ and making an 1
 angle of 135° with the x axis is
 a) $x - y = 1$
 b) $y + x = -1$
 c) $x + y = 1$
 d) $-x - y = 0$
13. The centre and radius of the circle $2x^2 + 2y^2 = 25$ is 1
 a) $(2, 2); 25$ b) $(0, 0); 5$ c) $(0, 0); \sqrt{2}$ d) $(0, 0); \frac{5}{\sqrt{2}}$
14. The distance between the foci for the ellipse $x^2 + 4y^2 = 1$ is 1
 a) $\sqrt{3}$ b) $\frac{\sqrt{3}}{2}$ c) $\frac{1}{2}$ d) 1
15. What will be the coordinate of the point on x axis which is equidistant from 1
 the points P $(2, 2, 2)$ and Q $(5, 5, 4)$?
 a) $(-9, 0, 0)$ b) $(9, 0, 0)$ c) $(7, 0, 0)$ d) $(-7, 0, 0)$
16. The plane determined by the y-axis and the z-axis taken together is 1
 a) XY-plane b) YZ-plane c) XZ- plane d) XYZ-plane
17. $\lim_{x \rightarrow \frac{1}{2}} \frac{4x^2 - 1}{2x - 1}$ is equal to 1
 a) $\frac{1}{2}$ b) $-\frac{1}{2}$ c) 2 d) -2
18. If $y = \sqrt{x} + \frac{1}{\sqrt{x}}$ then $\frac{dy}{dx}$ at $x = 1$ is 1
 a) 1 b) $\frac{1}{2}$ c) $\frac{1}{\sqrt{2}}$ d) 0
19. A die is thrown once, events A, B and C are given by 1
 A; getting a number ≤ 3
 B: getting a number 3
 C: getting a number > 4
 The events are
 a) mutually exclusive

- b) exhaustive
- c) not exhaustive
- d) mutually exclusive and exhaustive

20. When a pair of dice is rolled, what is the probability of getting the sum of the numbers divisible by 5? 1
- a) $\frac{1}{6}$ b) $\frac{3}{10}$ c) $\frac{7}{36}$ d) $\frac{1}{18}$

SECTION B

(This section comprises of very short answer type questions (VSA) of 2 marks each)

21. Draw the graph of the function $f: R \rightarrow R$ defined by $f(x) = x^3, -3 \leq x \leq 3$ 2
22. In a circle of diameter 40cm, the length of the chord is 20cm. Find the length of the minor arc of the chord. 2
23. How many different numbers of 6-digit (without repetition of digit) can be formed from the digits 3,1,7,0,9,5? 2

OR

Find the number of arrangements of the letters of the word INDEPENDENCE.

24. Find the equation of an ellipse whose vertices are $(0, \pm 6)$ and eccentricity is $\frac{1}{3}$ 2
25. Find the equation of a line passing through the points $(0,3)$ and $(-1, -4)$. 2

SECTION C

(This section comprises of short answer type questions (SA) of 3 marks each)

26. Prove that $\frac{\sin 3x + \sin 5x + \sin 7x + \sin 9x}{\cos 3x + \cos 5x + \cos 7x + \cos 9x} = \tan 6x$ 3

27. Find the middle terms in the expansion of $(3x - \frac{x^3}{6})^7$ 3

OR

Find the term independent of x in the expansion of $(x^2 + \frac{1}{x})^9$.

28. Find the ratio in which the line segment, joining the points P $(2,3,4)$ and Q $(-3,5, -4)$ is divided by the YZ-plane. Also, find the point of intersection. 3

29. Evaluate $\lim_{x \rightarrow 0} \frac{(1 - \cos 4x)}{(1 - \cos 5x)}$ 3

OR

Evaluate $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\cos x}{(\frac{\pi}{2} - x)}$

30. A cricket team of 11 players is to be selected from 16 players including 5 bowlers and 2 wicketkeepers. In how many ways can a team be selected so as to consist of exactly 3 bowlers and 1 wicketkeeper? 3

31. Solve the following inequation and represent the solution set on the number line: 3

$$\frac{1}{4}\left(\frac{2}{3}x + 1\right) \geq \frac{1}{3}(x - 2), x \in R$$

SECTION D

(This section comprises of long answer type questions (LA) of 5 marks each)

32. Using the first principle of differentiation, find the derivative of $\tan x$ w.r.t x 5
 OR

Differentiate $\frac{(\sin x + \cos x)}{(\sin x - \cos x)}$ w. r. t x .

33. Solve graphically the following system of inequations: 5
 $x + 2y \leq 20, 3x + y \leq 15, x \geq 0, y \geq 0$

34. Find the lengths of the transverse and conjugate axis; coordinates of the vertices and the foci; the eccentricity and length of the latus rectum of the hyperbola $\frac{x^2}{36} - \frac{y^2}{4} = 1$. 5

OR

Find the equation of the line so that the line segment intercepted between the axes is divided by the point P (-5,4) in the ratio 1: 2.

35. If the coefficients of $(r - 1)th, rth$ and $(r + 1)th$ terms in the expansion of $(x + 1)^n$ are in the ratio 1:3:5, find n and r. 5

SECTION E

(This section comprises of 3 case-study/passage-based questions of 4 marks each with two sub-parts. First two case study questions have three sub-parts (i), (ii), (iii) of marks 1,1,2 respectively. The third case study question has two sub-parts of 2 marks each)

36. Four friends are sitting together in a line and they are clicking snaps. Frequently they are changing their positions, suddenly one of them asked are all these snaps same, they started thinking and answered NO. One of the friends asked 1
- a) what do we call these assignments? 1
- b) In how many ways, can the letters of the word PERMUTATIONS be arranged, if the 2
- i) word starts with P and ends with S? 1
- ii) vowels are all together? 2

37. In today's world, children want to know how one concept can be related to the other or in other words how we can integrate different fields of knowledge. When we talk about relations, we took for similarities and how one concept can be represented in different forms. In mathematical terms that becomes a part of relations and functions, with a change in one, the other gets affected. Let $f = \{(1,1), (2,3), (0, -1), (-1, -3)\}$ be a function in the set of integers defined by $f(x) = ax + b$

With respect to above, answer the following questions

- a) find the value of a. 1

b) find the value of b

1

c) what is the value of x for which $f(x)=0$?

2

38.



Four friends Sheetal, Seema, Shalini and Preeti tossed three coins and reports their result as following A, B, C and D respectively.

Sheetal (A) = got exactly two head

Seema (B) = got at least two head

Shalini (C) = got at most two head

Preeti (D) = got exactly three head

Based on the given information, answer the following questions.

a) Find events which are mutually exclusive not exhaustive.

2

b) Find events which are mutually exclusive as well as exhaustive.

2