COMMON PRE-BOARD EXAMINATION 2022-23

Subject: MATHEMATICS (241)

Date:

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 18 MCQ's and 02 Assertion-Reason based questions 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 sub parts.

	SECTION A (Multiple Choice Questions) Each question carries 1 mark	
1.	If the distance between the points (4,p) and (1,0) is 5, then value of p is (a) 4 only (b) ±4 (c) -4 only (d) 0	1
2.	If p and q are positive integers such that $p = a^3 b^2$ and $q = a^2 b$, where 'a' and 'b' are prime numbers, then the LCM (p, q) is ….. (a) ab (b) $a^2 b^2$ (c) $a^3 b^2$ (d) $a^3 b^3$	1
3.	108 can be expressed as a product of its primes as …………….. (a) $2^3 \times 3^2$ (b) $2^3 \times 3^3$ (c) $2^2 \times 3^2$ (d) $2^2 \times 3^3$	1
4.	Two dice are thrown at the same time and the product of numbers appearing on them is noted. The probability that the product is a prime number is (a) 1/3 (b) 1/6 (c) 1/5 (d) 5/6	1
5.	The pair of equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ have (a) a unique solution (b) exactly two solutions (c) Infinitely many solutions (d) no solution	1
6.	If p and q are the zeroes of the quadratic polynomial $f(x) = 2x^2 - 7x + 3$, find the value of $p + q - pq$ is (a) 1 (b) 2 (c) 3 (d) None of these	1
7.	If $\sin 2A = 1/2 \tan^2 45°$ where A is an acute angle, then the value of A is (a) 60° (b) 45° (c) 30° (d) 15^0	1
8.	In ΔABC right angled at B, if $\cot C = \sqrt{3}$, then then cosAsinC + sinAcosC = (a) –1 (b) 0 (c) 1 (d) $\sqrt{3} / 2$	1
9.	If is an acute angle and $\tan\theta + \cot\theta = 2$, then the value of $\sin^3\theta + \cos^3\theta$ is (a) 1 (b) 1 /2 (c) $\sqrt{2}/2$ (d) $\sqrt{2}$	1
10.	A girl walks 200m towards East and then 150m towards North. The distance of the girl from the starting point is (a) 350m (b) 250m (c) 300 m (d) 325 m.	1
11.	In ABC, DE || AB, If CD = 3 cm, EC = 4 cm, BE = 6 cm, then DA is equal to (a) 7.5 cm (b) 3 cm (c) 4.5 cm (d) 6 cm	1

12. If angle between two radii of a circle is 130º, the angle between the tangents at the ends of the radii is : (a) 90º (b) 50º (c) 70º (d) 40º — 1

13. The relationship between mean, median and mode for a moderately skewed distribution is — 1
(a) mode = median – 2 (b) mode = 3 median – 2 mean
(c) mode = 2 median – 3 mean (d) mode = median – mean

14. For the following distribution: — 1

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60
No. of Students	3	12	27	57	75	80

the modal class is (a) 10 – 20 (b) 20 – 30 (c) 30 – 40 (d) 50 – 60

15. The area of a quadrant of a circle, whose circumference is 22 cm, is — 1
(a) 11/ 8 cm^2 (b) 77/ 8 cm^2 (c) 77/ 2 cm^2 (d) 77/ 4 cm^2

16. If the quadratic equation $x^2 + 4x + k = 0$ has real and equal roots, then — 1
(a) $k < 4$ (b) $k > 4$ (c) $k = 4$ (d) $k \geq 4$.

17. Volumes of two spheres are in the ratio 64 : 27. The ratio of their surface areas is — 1
(a) 3 : 4 (b) 4 : 3 (c) 9 : 16 (d) 16 : 9

18. The area of the square that can be inscribed in a circle of radius 8 cm is — 1
(a) 256 cm^2 (b) 128 cm^2 (c) $64\sqrt{2}$ cm^2 (d) 64 cm^2

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

19. Assertion (A): If HCF (90, 144) = 18, then LCM (90, 144) = 720 — 1
Reason (R): HCF (a, b) x LCM (a, b) = a x b
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

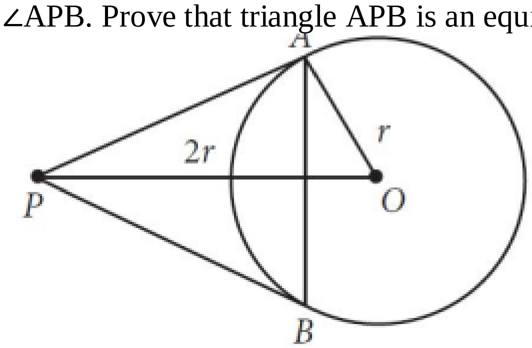
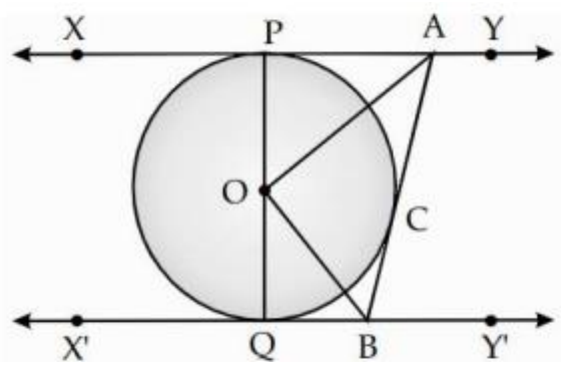
20. Assertion (A): The point (0, 4) lies on y -axis. — 1
Reason (R): The x co-ordinate on the point on y -axis is zero.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A
(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of Assertion (A)
(c) Assertion (A) is true but reason(R) is false.
(d) Assertion (A) is false but reason(R) is true.

SECTION B

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

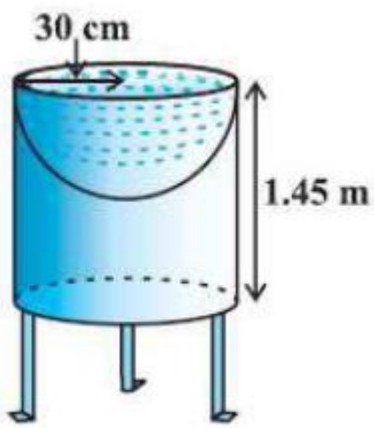
21. If $\tan (A + B) = \sqrt{3}$ and $\tan (A – B) = 1/\sqrt{3}$; $0° < A+B \leq 90°$; $A > B$, find A and B. — 2
OR
If $x\sin^3 \theta + y\cos^3 \theta = \sin\theta \cos\theta$ and $x\sin\theta = y\sin\theta$ then find $x^2 + y^2$.

22. ABCD is a trapezium in which AB || CD and its diagonals intersect each other at the point O. Using a similarity criterion of two triangles, show that OA /OB = OC/ OD — 2

23.	The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes. OR In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find (i) the length of the arc (ii) area of the sector formed by the arc	2
24.	From a point P, two tangents PA and PB are drawn to a circle C(0, r). If OP = 2r, then find ∠APB. Prove that triangle APB is an equilateral triangle.  	2
25.	For what value of k will the following system of linear equations have no solution? $3x + y = 1$; $(2k - 1)x + (k - 1)y = 2k + 1$	2
	SECTION C (This section comprises of short answer type questions (SA) of 3 marks each)	
26.	Prove that $\sqrt{5}$ is an irrational number.	3
27.	Find the zeroes of the quadratic polynomial $x^2 - 2x - 8$ and verify the relationship between the zeroes and the coefficients of the polynomial.	3
28.	The sum of the digits of a two-digit number is 9. Also 9 times this number is twice the number obtained by reversing the order of the digits. Find the number. OR Yash scored 40 marks in a test, getting 3 marks for each right answer and losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks been deducted for each incorrect answer, then Yash would have scored 50 marks. How many questions were there in the test	3
29.	. Prove that $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$	3
30.	Prove that the lengths of the tangents drawn from an external point to a circle are equal. OR In the figure XY and X'Y' are two parallel tangents to a circle with centre O and another tangent AB with point of contact C interesting XY at A and X'Y' at B, what is the measure of ∠AOB  	3
31.	. Two dice are thrown at the same time. What is the probability that the sum of the two numbers appearing on the top of the dice is (i) 8? (ii) 7? (iii) less than or equal to 12?	3

SECTION D

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

32.	A person on tour has Rs.360 for his expenses. If he extends his tour for 4 days, he has to cut down his daily expenses by Rs.3. Find the original duration of the tour. OR Rs.6500 were divided equally among a certain number of persons. Had there been 15 more persons, each would have got Rs.30 less. Find the original number of persons	5
33.	State and Prove Basic Proportionality Theorem.	5
34.	Ramesh made a bird-bath for his garden in the shape of a cylinder with a hemispherical depression at one end. The height of the cylinder is 1.45 m and its radius is 30 cm. Find the total surface area of the bird-bath.  OR A tent is in shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1m and 4m respectively and the slant height of the top is 2.8m. Find the area of canvas used for making the tent. Also find the cost of canvas of the tent at the rate of 500 per m2	5
35.	The following frequency distribution gives the monthly consumption of 68 consumers of a locality. Find median, mean and mode of the data and compare them.	5

Monthly consumption of electricity (in units)	Number of consumers
65-85	4
85-105	5
105-125	13
125-145	20
145-165	14
165-185	8
185-205	4

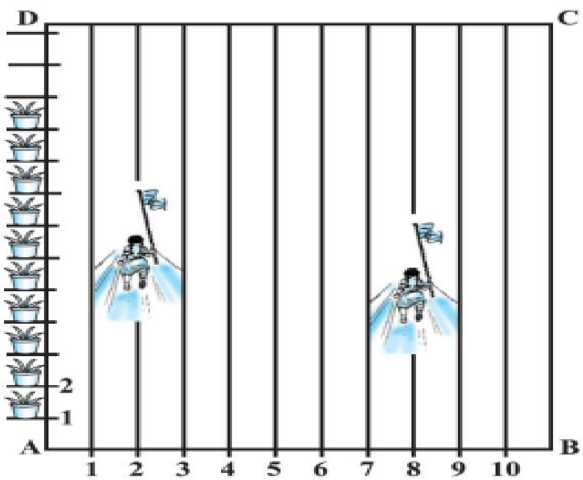
SECTION E

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

36.	Mohan takes a loan from a bank for his car. Mohan repays his total loan of Rs.118000 by paying every month starting with the first instalment of Rs.1000. If he increases the instalment by Rs.100 every month.	

(i) What is the first term and common difference of given question (1)
(ii) The amount paid by him in 30th instalment. (1)
(iii) The amount paid by him in the 30 instalments is (2)
(OR)
(iii) What amount does he still have to pay after 30th instalment? (2)

37. In order to conduct sports day activities in your school, lines have been drawn with chalk powder at a distance of 1 m each in a rectangular shaped ground ABCD. 100 flower pots have been placed at the distance of 1 m from each other along AD, as shown in the following figure.



Niharika runs (1 /4)th distance AD on the 2nd line and posts a green Flag. Preet runs (1 /5) th distance AD on the eighth line and posts are red flags. Taking A as the origin AB along x-axis and AD along y-axis, answer the following questions:
(i) Find the coordinates of the green flag. (1)
(ii) Find the distance between the two flags. (1)
(iii) If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, where should she post her flag? (2)
OR
(iii) If Joy has to post a flag at one fourth distance from the green flag, in the line segment joining the green and red flags, then where should he post his flag? (2)

38. Case-Study 3: Read the following passage and answer the questions given below.

Lakshaman Jhula is located 5 kilometers north-east of the city of Rishikesh in the Indian state of Uttarakhand. The bridge connects the villages of Tapovan to Jonk. Tapovan is in Tehri Garhwal district, on the west bank of the river, while Jonk is in Pauri Garhwal district, on the east bank. Lakshman Jhula is a pedestrian bridge also used by motorbikes. It is a landmark of Rishikesh. A group of Class X students visited Rishikesh in Uttarakhand on a trip. They observed from a point (P) on a river bridge that the angles of depression of opposite banks of the river are 60° and 30° respectively. The height of the bridge is about 18 meters from the river.

Based on the above information answer the following questions.

(i) Find the distance PA. (1)

(ii) Find the distance PB (1)

(iii) Find the width AB of the river. (2)

OR

(iii) Find the height BQ if the angle of the elevation from P to Q be 30°. (2)