

CLASS X (2020-21)
MATHEMATICS BASIC(241)
SAMPLE PAPER-5

Time : 3 Hours

Maximum Marks : 80

General Instructions :

1. This question paper contains two parts A and B.
2. Both Part A and Part B have internal choices.

Part–A :

1. It consists of two sections- I and II.
2. Section I has 16 questions. Internal choice is provided in 5 questions.
3. Section II has four case study-based questions. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part–B :

1. Question no. 21 to 26 are very short answer type questions of 2 mark each.
 2. Question no. 27 to 33 are short answer type questions of 3 marks each.
 3. Question no. 34 to 36 are long answer type questions of 5 marks each.
 4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.
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PART - A

SECTION - I

Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.

- Q1. HCF of two numbers is 27 and their LCM is 162. If one of the numbers is 54, then what is the other number ?

OR

Find HCF of 144 and 198.

- Q2. If one zero of the polynomial $(3x^2 + 8x + k)$ is the reciprocal of the other, then what is the value of k ?

OR

What is the value of x , for which the polynomials $x^2 - 1$ and $x^2 - 2x + 1$ vanish simultaneously?

- Q3. If $am = bl$, then find whether the pair of linear equations $ax + by = c$ and $lx + my = n$ has no solution, unique solution or infinitely many solutions.
- Q4. Find the nature of roots of the quadratic equation $x^2 + x - 5 = 0$.
- Q5. What is the distance of the point $P(-3, -4)$ from the x -axis?
- Q6. If $\sin A = \frac{1}{2}$, then what is the value of $\cot A$?
- Q7. If the angle of depression of an object from a 75 m high tower is 30° , then what is the distance of the object from the tower?

- Q8. From an external point Q , the length of tangent to a circle is 12 cm and the distance of Q from the centre of circle is 13 cm. What is the radius of circle?

OR

QP is a tangent to a circle with centre O at a point P on the circle. If $\triangle OPQ$ is isosceles, then find $\angle OQR$?

- Q9. The ratio of the sides of the triangle to be constructed with the corresponding sides of the given triangle is known as _____
- Q10. The radii of two circles are 19 cm and 9 cm respectively. Find the radius of a circle of a circle which has circumference equal to sum of their circumferences.

OR

The minute hand of a clock is 12 cm long. Find the area of the face of the clock described by the minute hand in 35 minutes.

- Q11. If the radius of the sphere is increased by 100%, then how much volume of the corresponding sphere is increased ?
- Q12. From a solid circular cylinder with height 10 cm and radius of the base 6 cm, a right circular cone of the same height and same base is removed, then find the volume of remaining solid?
- Q13. Observations of some data are $\frac{x}{5}$, x , $\frac{x}{3}$, $\frac{2x}{3}$, $\frac{x}{4}$, $\frac{2x}{5}$ and $\frac{3x}{4}$ where $x > 0$. If the median of the data is 4, then what is the value of x ?

- Q14. Consider the following frequency distribution

Class	0-5	6-11	12-17	18-23	24-29
Frequency	13	10	15	8	11

What is the upper limit of the median class ?

- Q15. In the following distribution what is the frequency of the class 30-40?

Marks obtained	Number of students
More than or equal to 0	63
More than or equal to 10	58
More than or equal to 20	55
More than or equal to 30	51
More than or equal to 40	48
More than or equal to 50	42

- Q16. A card drawn at random from a well shuffled deck of 52 playing cards. What is the probability of getting a black king?

OR

A die is thrown once. What is the probability of getting a number less than 3?

SECTION II

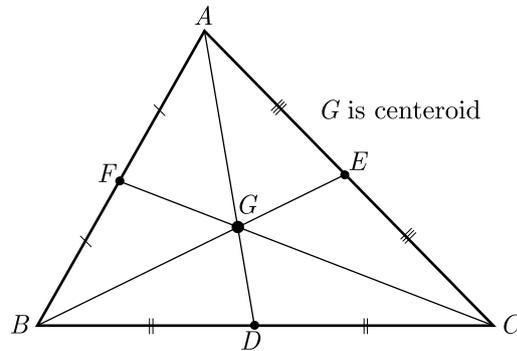
Case study-based questions are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark.

- Q17. A road roller (sometimes called a roller-compactor, or just roller) is a compactor-type engineering vehicle used to compact soil, gravel, concrete, or asphalt in the construction of roads and foundations. Similar rollers are used also at landfills or in agriculture. Road rollers are frequently referred to as steamrollers, regardless of their method of propulsion.



RCB Machine Pvt Ltd started making road roller 10 year ago. Company increased its production uniformly by fixed number every year. The company produces 800 roller in the 6th year and 1130 roller in the 9th year.

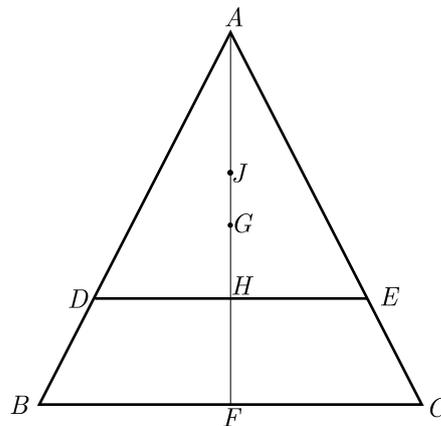
- (i) What was the company's production in first year ?
(a) 150 (b) 200
(c) 250 (d) 290
- (ii) What was the company's production in the 8th year ?
(a) 760 (b) 820
(c) 880 (d) 1020
- (iii) What was the company's total production of the first 6 years?
(a) 3150 (b) 1775
(c) 2250 (d) 1725
- (iv) What was the increase in the company's production every year ?
(a) 160 (b) 130
(c) 90 (d) 110
- (v) In which year the company's production was 1350 rollers ?
(a) 5th (b) 6th
(c) 11th (d) 9th
- Q18. The centroid is the centre point of the object. It is also defined as the point of intersection of all the three medians. The median is a line that joins the midpoint of a side and the opposite vertex of the triangle. The centroid of the triangle separates the median in the ratio of 2 : 1. It can be found by taking the average of x- coordinate points and y-coordinate points of all the vertices of the triangle. See the figure given below



Here D, E and F are mid points of sides BC, AC and AB in same order. G is centroid, the centroid divides the median in the ratio $2 : 1$ with the larger part towards the vertex. Thus $AG : GD = 2 : 1$

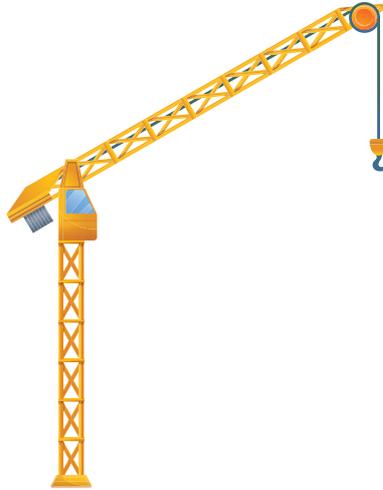
On the basis of above information read the question below.

If G is Centroid of $\triangle ABC$ with height h and J is centroid of $\triangle ADE$. Line DE parallel to BC , cuts the $\triangle ABC$ at a height $\frac{h}{4}$ from BC . $HF = \frac{h}{4}$.

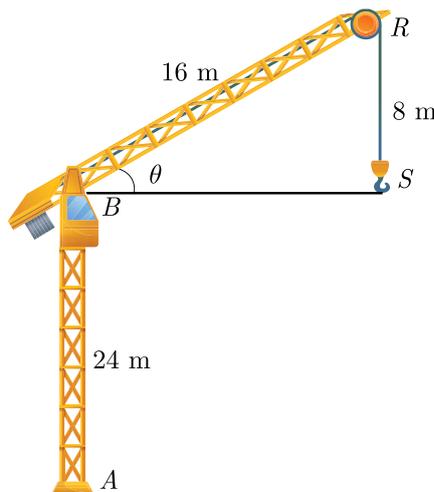


- (i) What is the length of AH ?
 - (a) $\frac{h}{2}$
 - (b) $\frac{2h}{3}$
 - (c) $\frac{3h}{4}$
 - (d) $\frac{h}{4}$
- (ii) What is the distance of point A from point G ?
 - (a) $\frac{2AF}{3}$
 - (b) $\frac{3AF}{2}$
 - (c) $\frac{AF}{3}$
 - (d) $\frac{AF}{2}$
- (iii) What is the distance of point A from point J ?
 - (a) $\frac{2AG}{3}$
 - (b) $\frac{3AG}{4}$
 - (c) $\frac{AG}{3}$
 - (d) $\frac{AG}{2}$
- (iv) What is the distance GJ ?
 - (a) $\frac{AG}{3}$
 - (b) $\frac{AG}{4}$
 - (c) $\frac{2AG}{3}$
 - (d) $\frac{AG}{2}$
- (v) Which of the following concept has been used in solving problem ?
 - (a) SSS Similarity
 - (b) Basic Proportionality theorem
 - (c) Pythagoras theorem
 - (d) None of the above

Q19. Tower cranes are a common fixture at any major construction site. They're pretty hard to miss -- they often rise hundreds of feet into the air, and can reach out just as far. The construction crew uses the tower crane to lift steel, concrete, large tools like acetylene torches and generators, and a wide variety of other building materials.



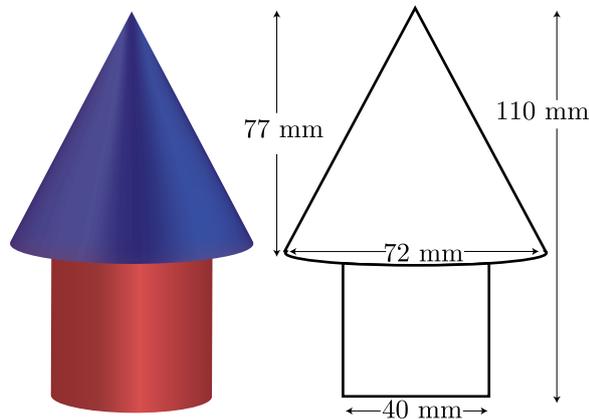
A crane stands on a level ground. It is represented by a tower AB , of height 24 m and a jib BR . The jib is of length 16 m and can rotate in a vertical plane about B . A vertical cable, RS , carries a load S . The diagram shows current position of the jib, cable and load.



- (i) What is the distance BS ?
 - (a) $8\sqrt{3}$ m
 - (b) $4\sqrt{3}$ m
 - (c) $4\sqrt{2}$ m
 - (d) $8\sqrt{2}$ m
- (ii) What is the angle that the jib, BR , makes with the horizontal ?
 - (a) 45°
 - (b) 30°
 - (c) 60°
 - (d) 75°
- (iii) What is the measure of the angle BRS ?
 - (a) 60°
 - (b) 75°
 - (c) 30°
 - (d) 45°
- (iv) Now the jib BR , has been rotated and the length RS is increased. The load is now on the ground at a point 8 m from A . What is the angle through which the jib has been rotated ?
 - (a) 15°
 - (b) 25°
 - (c) 30°
 - (d) 45°

- (v) What is the length by which RS has been increased?
 (a) $8\sqrt{3}$ m (b) $8(\sqrt{3} + 1)$ m
 (c) $8(\sqrt{2} + 1)$ m (d) $8(\sqrt{3} + 2)$ m

Q20. In a toys manufacturing company, wooden parts are assembled and painted to prepare a toy. For the wood processing activity center, the wood is taken out of storage to be sawed, after which it undergoes rough polishing, then is cut, drilled and has holes punched in it. It is then fine polished using sandpaper. For the retail packaging and delivery activity center, the polished wood sub-parts are assembled together, then decorated using paint.



One specific toy is in the shape of a cone mounted on a cylinder. The total height of the toy is 110 mm and the height of its conical part is 77 mm. The diameters of the base of the conical part is 72 mm and that of the cylindrical part is 40 mm.

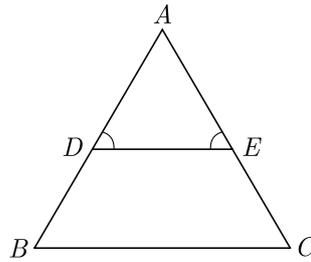
- (i) If its cylindrical part is to be painted red, the surface area need to be painted is
 (a) 2320π mm² (b) 1120π mm²
 (c) 1320π mm² (d) 1720π mm²
- (ii) If its conical part is to be painted blue, the surface area need to be painted is
 (a) 4328π mm² (b) 1124π mm²
 (c) 3956π mm² (d) 3528π mm²
- (iii) How much of the wood have been used in making the toy ?
 (a) 56824π mm³ (b) 46464π mm³
 (c) 84424π mm³ (d) 64684π mm³
- (iv) If the cost of painting the toy is 2 paise for 8π mm², then what is the cost of painting of a box of 100 toys?
 (a) 1598 Rs (b) 2558 Rs
 (c) 1419 Rs (d) 1894 Rs
- (v) If the toy manufacturer company charge 3 paise for 32π mm³ of wood, what is the price of a box of 100 toys?
 (a) 4356 Rs (b) 4698 Rs
 (c) 4178 Rs (d) 4898 Rs

PART - B

All questions are compulsory. In case of internal choices, attempt anyone.

Q21. For what values of k , the roots of the equation $x^2 + 4x + k = 0$ are real?

Q22. In Figure $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$, prove that $\triangle BAC$ is an isosceles triangle.



Q23. Prove that $1 + \frac{\cot^2 \alpha}{1 + \operatorname{cosec} \alpha} = \operatorname{cosec} \alpha$

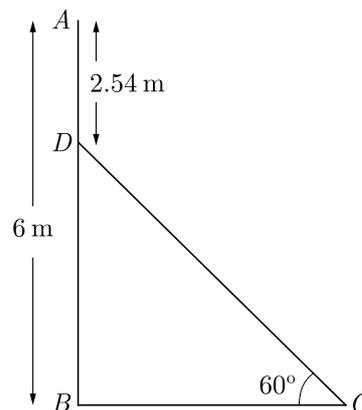
OR

Prove that : $\frac{\sin A - 2\sin^3 A}{2\cos^3 A - \cos A} = \tan A$.

Q24. An observer, 1.7 m tall, is $20\sqrt{3}$ m away from a tower. The angle of elevation from the eye of observer to the top of tower is 30° . Find the height of tower.

OR

In the given figure, AB is a 6 m high pole and DC is a ladder inclined at an angle of 60° to the horizontal and reaches up to point D of pole. If $AD = 2.54$ m, find the length of ladder. (use $\sqrt{3} = 1.73$)



Q25. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball at random from the bag is three times that of a red ball, find the number of blue balls in the bag.

Q26. Two different coins are tossed simultaneously, What is the probability of getting at least one head?

Q27. Find a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $f(x) = ax^2 + bx + c$, $a \neq 0$, $c \neq 0$.

Q28. Solve for x : $\frac{2x}{x-3} + \frac{1}{2x+3} + \frac{3x+9}{(x-3)(2x+3)} = 0, x \neq 3, -\frac{3}{2}$

OR

Solve for x : $\frac{1}{x} + \frac{2}{2x-3} = \frac{1}{x-2}, x \neq 0, \frac{2}{3}, 2$.

Q29. Find the ratio in which $P(4, m)$ divides the segment joining the points $A(2, 3)$ and $B(6, -3)$. Hence find m .

OR

If the point $C(-1, 2)$ divides internally the line segment joining $A(2, 5)$ and $B(x, y)$ in the ratio $3 : 4$ find the coordinates of B .

- Q30. Draw a line segment of length 7 cm. Find a point P on it which divides it in the ratio $3 : 5$.
- Q31. The angle of elevation of the top of a building from the foot of a tower is 30° and the angle of elevation of the top of a tower from the foot of the building is 60° . If the tower is 50 m high, then find the height of the building.
- Q32. A road which is 7 m wide surrounds a circular park whose circumference is 88 m. Find the area of the road.
- Q33. A group of students conducted a survey of their locality to collect the data regarding number of plants and recorded it in the following table :

Number of plants	0-3	3-6	6-9	9-12	12-15
Number of houses	2	4	5	1	2

Find the mode for the above data.

- Q34. State Fundamental theorem of Arithmetic. Find LCM of numbers 2520 and 10530 by prime factorization by 3.

OR

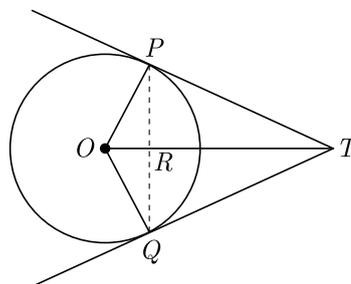
Every composite number can be expressed as the product powers of primes and this factorization is unique.

- Q35. Draw the graphs of the pair of linear equations : $x + 2y = 5$ and $2x - 3y = -4$
Also find the points where the lines meet the x -axis.

OR

Solve graphically the pair of linear equations : $3x - 4y + 3 = 0$ and $3x + 4y - 21 = 0$
Find the co-ordinates of the vertices of the triangular region formed by these lines and x -axis.
Also, calculate the area of this triangle.

- Q36. In figure PQ is a chord of length 8 cm of a circle of radius 5 cm. The tangents drawn at P and Q intersect at T . Find the length of TP .



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