

CLASS X (2020-21)
MATHEMATICS BASIC(241)
SAMPLE PAPER-6

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.

PART - A

SECTION - I

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

- Q1. Expressed 225 in prime factorization.

OR

The decimal expansion of $\frac{23}{2^5 \times 3^2}$ will terminate after how many places of decimal?

- Q2. If α and β are zeroes and the quadratic polynomial $f(x) = x^2 - x - 4$, then what is the value of $\frac{1}{\alpha} + \frac{1}{\beta} - \alpha\beta$?

- Q3. If $ad \neq bc$, then find whether the pair of linear equations $ax + by = p$ and $cx + dy = q$ has no solution, unique solution or infinitely many solutions.

- Q4. Find the nature of roots of the quadratic equation $x^2 + 3x + 2\sqrt{2} = 0$.

OR

Find the nature of roots of the quadratic equation $5x^2 - 3x + 1 = 0$.

- Q5. If $A(\frac{m}{3}, 5)$ is the mid-point of the line segment joining the points $Q(-6, 7)$ and $R(-2, 3)$, then what is the value of m ?

OR

The mid-point of the line-segment AB is $P(0, 4)$, if the coordinates of B are $(-2, 3)$ then find the co-ordinates of A .

- Q6. If $\sin \theta = \frac{a}{b}$, then find the value of $\cos \theta$?

- Q7. A tree casts a shadow 15 m long on the level of ground, when the angle of elevation of the sun is 45° . Find the height of a tree.
- Q8. A chord of a circle of radius 10 cm, subtends a right angle at its centre. What is the length of the chord?
- Q9. To divide a line segment AB in the ratio 3 : 4, we draw a ray AX , so that $\angle BAX$ is an acute angle and then mark the points on ray AX at equal distances such that the minimum number of these points is _____
- Q10. The radius of a circle is 17.5 cm. find the area of the sector of the circle enclosed by two radii and an arc 44 cm in length.

OR

Find the area of the sector of a circle of radius 6 cm whose central angle is 30° . (Take $\pi = 3.14$)

- Q11. A sphere is melted and half of the melted liquid is used to form 11 identical cubes, whereas the remaining half is used to form 7 identical smaller spheres. Find the ratio of the side of the cube to the radius of the new small sphere.
- Q12. If two solid hemispheres of same base radius r are joined together along their bases, then find the curved surface area of this new solid.
- Q13. If the mean of the squares of first n natural numbers is 105, then find the first n natural numbers.
- Q14. For the following distribution what is the modal class:

Marks	Number of students
Below 10	3
Below 20	12
Below 30	27
Below 40	57
Below 50	75
Below 60	80

- Q15. Find the class-marks of the classes 10-25 and 35-66.
- Q16. If the probability of winning a game is 0.07, what is the probability of losing it?

OR

A die is thrown once. Find the probability of getting “at most 2.”

SECTION II

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

- Q17. The Prime Minister’s Citizen Assistance and Relief in Emergency Situations Fund was created on 28 March 2020, following the COVID-19 pandemic in India. The fund will be used for combating, and containment and relief efforts against the coronavirus outbreak and similar pandemic like situations in the future.



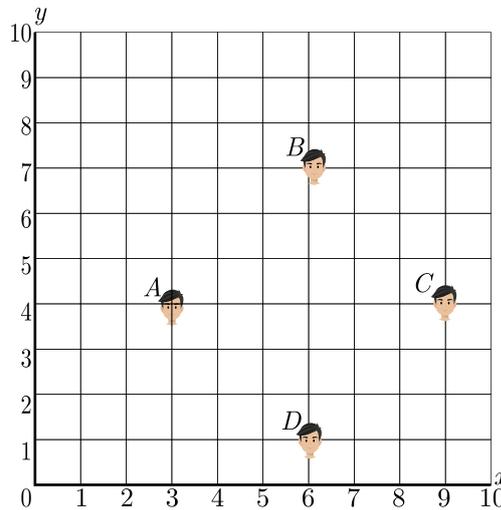
The allotment officer is trying to come up with a method to calculate fair division of funds across various affected families so that the fund amount and amount received per family can be easily adjusted based on daily revised numbers. The total fund allotted for a village is $x^3 + 6x^2 + 20x + 9$. The officer has divided the fund equally among families of the village and each family receives an amount of $x^2 + 2x + 2$. After distribution, some amount is left.

- (i) How many families are there in the village?
- (a) $x + 4$ (b) $x - 3$
 (c) $x - 4$ (d) $x + 3$
- (ii) If an amount of ₹1911 is left after distribution, what is value of x ?
- (a) 190 (b) 290
 (c) 191 (d) 291
- (iii) How much amount does each family receive?
- (a) 24490 (b) 34860
 (c) 22540 (d) 36865
- (iv) What is the amount of fund allocated?
- (a) Rs 72 72 759 (b) Rs 75 72 681
 (c) Rs 69 72 846 (d) Rs 82 74 888
- (v) How many families are there in the village?
- (a) 191 (b) 98
 (c) 187 (d) 195

- Q18. Morning assembly is an integral part of the school's schedule. Almost all the schools conduct morning assemblies which include prayers, information of latest happenings, inspiring thoughts, speech, national anthem, etc. A good school is always particular about their morning assembly schedule. Morning assembly is important for a child's development. It is essential to understand that morning assembly is not just about standing in long queues and singing prayers or national anthem, but it's something beyond just prayers. All the activities carried out in morning assembly by the school staff and students have a great influence in every point of life. The positive effects of attending school assemblies can be felt throughout life.



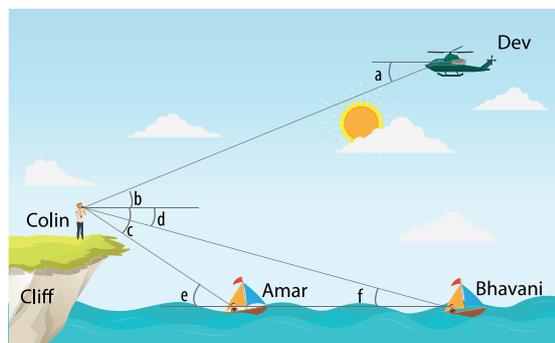
Have you noticed that in school assembly you always stand in row and column and this make a coordinate system. Suppose a school have 100 students and they all assemble in prayer in 10 rows as given below.



Here A, B, C and D are four friend Amar, Bharat, Colin and Draavid.

- (i) What is the distance between A and B ?
 - (a) 8
 - (b) 6
 - (c) $3\sqrt{3}$
 - (d) $2\sqrt{3}$
- (ii) What is the distance between C and D ?
 - (a) 8
 - (b) 6
 - (c) $3\sqrt{3}$
 - (d) $2\sqrt{3}$
- (iii) What is the distance between A and C ?
 - (a) 8
 - (b) 6
 - (c) $3\sqrt{3}$
 - (d) $2\sqrt{3}$
- (iv) What is the distance between D and B ?
 - (a) 8
 - (b) 6
 - (c) $3\sqrt{3}$
 - (d) $2\sqrt{3}$
- (v) These 4 friends seating arrangement make a
 - (a) square
 - (b) rhombus
 - (c) parallelogram
 - (d) rectangle

Q19. Navy officer Mr. Colin is tasked with planning a coup on the enemy at a certain date. Currently he is inspecting the area standing on top of the cliff. Agent Dev is on a chopper in the sky. When Mr. Colin looks down below the cliff towards the sea, he has Bhawani and Amar in boats positioned to get a good vantage point. Bhawani boat is behind the Amar boat.



Following angle have been measured :

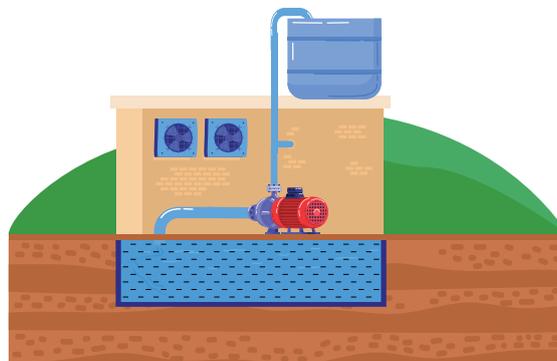
From Colin to Bhawani : 30°

From Dev to Colin : 60°

From Amar to Colin : 60°

- (i) Which of the following is a pair of angle of elevation?
 (a) $(\angle a, \angle e)$ (b) $(\angle b, \angle e)$
 (c) $(\angle c, \angle d)$ (d) $(\angle a, \angle f)$
- (ii) Which of the following is a pair of angle of depression?
 (a) $(\angle a, \angle e)$ (b) $(\angle b, \angle e)$
 (c) $(\angle c, \angle d)$ (d) $(\angle a, \angle f)$
- (iii) If angle of elevation of Amar to Colin is 60° , what is the distance of Amar boat from the base of hill ?
 (a) $\frac{\sqrt{3}h}{2}$ (b) $\frac{h}{\sqrt{3}}$
 (c) $\frac{2h}{\sqrt{3}}$ (d) $\sqrt{3}h$
- (iv) If angle of depression of Colin to Bhawani is 30° , what is the distance of Amar boat from the Bhawani boat?
 (a) $\frac{\sqrt{3}h}{2}$ (b) $\frac{h}{\sqrt{3}}$
 (c) $\frac{2h}{\sqrt{3}}$ (d) $\sqrt{3}h$
- (v) If angle of depression of Dev to Colin is 60° , what is the height of Dev from base of hill ?
 (a) h (b) $2h$
 (c) $3h$ (d) $4h$

Q20. Underground water tank is popular in India. It is usually used for large water tank storage and can be built cheaply using cement-like materials. Underground water tanks are typically chosen by people who want to save space. The water in the underground tank is not affected by extreme weather conditions. The underground tanks maintain cool temperatures in both winter and summer. Electric pump is used to move water from the underground tank to overhead tank.



Ramesh has build recently his house and installed a underground tank and overhead tank. Dimensions of tanks are as follows :

Underground Tank : Base $2\text{ m} \times 2\text{ m}$ and Height 1.1 m .

Overhead tank : Radius 50 cm and Height 175 cm

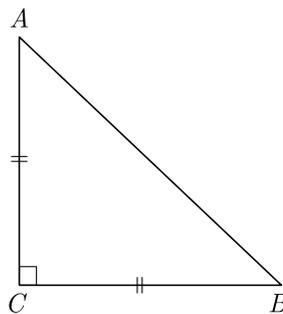
- (i) What is the capacity of the underground tank ?
 (a) 2200 litres (b) 44000 litres
 (c) 4400 litres (d) 22000 litres
- (ii) What is the ratio of the capacity of the underground tank to the capacity of the overhead tank?
 (a) 1.75
 (b) 1.25
 (c) 2.5
 (d) 3.2

- (iii) If curved part of overhead tank need to be painted to save it from corrosion, how much area need to be painted?
 (a) 5.5 m^2 (b) 3.3 m^2
 (c) 2.5 m^2 (d) 4.5 m^2
- (iv) If water is filled in the overhead tank at the rate of 11 litre per minute, the tank will be completely filled in how much time?
 (a) 65 minutes (b) 62.5 minutes
 (c) 130 minutes (d) 125 minutes
- (v) If the amount of water in the underground tank, at an instant, is 2400 litres, then the water level in the underground tank at that instant is
 (a) 60 cm (b) 50 cm
 (c) 70 cm (d) 65 cm

PART - B

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

- Q21. Find the value of k for which the roots of the equations $3x^2 - 10x + k = 0$ are reciprocal of each other.
- Q22. In Figure, ABC is an isosceles triangle right angled at C with $AC = 4 \text{ cm}$, Find the length of AB .



- Q23. Prove that $\sqrt{\frac{1 - \sin \theta}{1 + \sin \theta}} = \sec \theta - \tan \theta$.
- Q24. If the angles of elevation of the top of a tower from two points distant a and b ($a > b$) from its foot and in the same straight line from it are respectively 30° and 60° , then find the height of the tower.
- Q25. If a pair of dice is thrown once, then what is the probability of getting a sum of 8?
- OR**
- A die thrown once. What is the probability of getting an even prime number?
- Q26. A pair of dice is thrown once. What is the probability of getting a doublet?
- OR**
- A die is thrown once. What is the probability of getting a prime number.
- Q27. Verify whether 2, 3 and $\frac{1}{2}$ are the zeroes of the polynomial $p(x) = 2x^3 - 11x^2 + 17x - 6$.
- Q28. Solve the following quadratic equation for x : $x^2 + \left(\frac{a}{a+b} + \frac{a+b}{a}\right)x + 1 = 0$
- Q29. Find the ratio in which the segment joining the points $(1, -3)$ and $(4, 5)$ is divided by x -axis? Also find the coordinates of this point on x -axis.

Q30. Draw a line segment of length 5 cm and divide it in the ratio 3 : 7.

OR

Draw a circle of radius 3.5 cm. From a point P , 6 cm from its centre, draw two tangents to the circle.

Q31. The angles of depression of the top and bottom of a 50 m high building from the top of a tower are 45° and 60° respectively. Find the height of the tower and the horizontal distance between the tower and the building. (Use $\sqrt{3} = 1.73$)

OR

The horizontal distance between two towers is 60 m. The angle of elevation of the top of the taller tower as seen from the top of the shorter one is 30° . If the height of the taller tower is 150 m, then find the height of the shorter tower.

Q32. Three horses are tied each with 7 m long rope at three corners of a triangular field having sides 20 m, 34 m and 42 m. Find the area of the plot which can be grazed by the horses.

Q33. If the median for the following frequency distribution is 28.5, find the value of x and y :

Class	Frequencies
0-10	5
10-20	x
20-30	20
30-40	15
40-50	y
50-60	5
Total	60

Q34. For any positive integer n , prove that $n^3 - n$ is divisible by 6.

Q35. Solve the following pair of linear equations graphically:

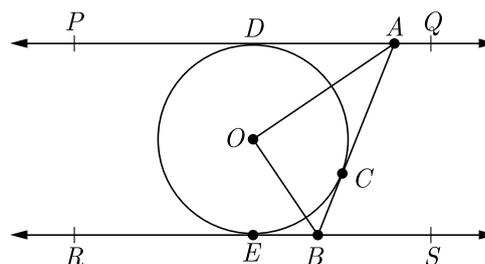
$$2x + 3y = 12 \text{ and } x - y = 1$$

Find the area of the region bounded by the two lines representing the above equations and y -axis.

Q36. From a point T outside a circle of centre O , tangents TP and TQ are drawn to the circle. Prove that OT is the right bisector of line segment PQ .

OR

In Figure, PQ and RS are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting PQ at A and RS at B . Prove that $\angle AOB = 90^\circ$.



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