

CLASS X (2020-21)
MATHEMATICS STANDARD (041)
SAMPLE PAPER-03

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. If $\text{HCF}(336, 54) = 6$, find $\text{LCM}(336, 54)$.

OR

Explain why 13233343563715 is a composite number?

- Q2. For which value(s) of p , will the lines represented by the following pair of linear equations be parallel ?

$$3x - y - 5 = 0$$

$$6x - 2y - p = 0$$

- Q3. Find the roots of the quadratic equation $x^2 - 0.04 = 0$

OR

If $\frac{1}{2}$ is a root of the equation $x^2 + kx - \frac{5}{4} = 0$, then what is the value of k ?

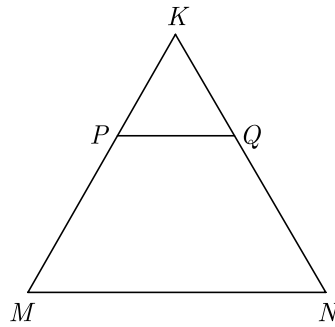
- Q4. Fill the two blanks in the sequence 2, 26, so that the sequence forms an AP.

OR

The sum of first 20 terms of the AP 1, 4, 7, 10 is

- Q5. A ladder 10 m long reaches a window 8 m above the ground. The distance of the foot of the ladder from the base of the wall is m.

Q6. In the figure, PQ is parallel to MN . If $\frac{KP}{PM} = \frac{4}{13}$ and $KN = 20.4$ cm then find KQ .



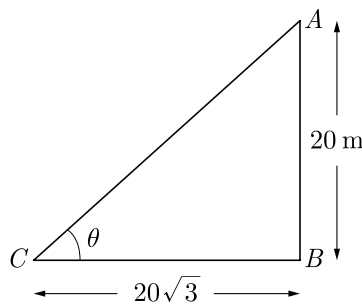
Q7. If $\sin \theta = \frac{5}{13}$, then the value of $\tan \theta$ is

Q8. If $x = 3 \sin \theta + 4 \cos \theta$ and $y = 3 \cos \theta - 4 \sin \theta$ then prove that $x^2 + y^2 = 25$.

Q9. 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.

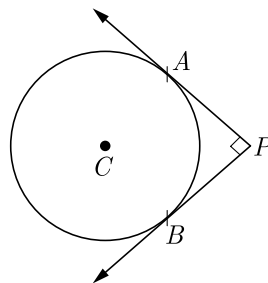
OR

In figure, a tower AB is 20 m high and BC , its shadow on the ground, is $20\sqrt{3}$ m long. find the Sun's altitude.



Q10. Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of larger circle (in cm) which touches the smaller circle.

Q11. In figure, PA and PB are two tangents drawn from an external point P to a circle with centre C and radius 4 cm. If $PA \perp PB$, then find the length of each tangent.



Q12. Find the radius of a circle whose circumference is equal to the sum of the circumference of two circles of diameter 36 cm and 20 cm

OR

Find the diameter of a circle whose area is equal to the sum of areas of two circles of diameter 16 cm and 12 cm.

- Q13. The curved surface area of a cylinder is 264 m^2 and its volume is 924 m^3 . Find the ratio of its height to its diameter.
- Q14. Two cubes each of volume 8 cm^3 are joined end to end, then what is the surface area of resulting cuboid.
- Q15. Find median of the data, using an empirical relation when it is given that Mode = 12.4 and Mean = 10.5.
- Q16. Consider the following frequency distribution of the heights of 60 students of a class

Height (in cm)	150-155	155-160	160-165	165-170	170-175	175-180
Number of students	15	13	10	8	9	5

What is the upper limit of the median class in the given data?

SECTION II

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

- Q17. An barrels manufacturer can produce up to 300 barrels per day. The profit made from the sale of these barrels can be modelled by the function $P(x) = -10x^2 + 3500x - 66000$ where $P(x)$ is the profit in rupees and x is the number of barrels made and sold.



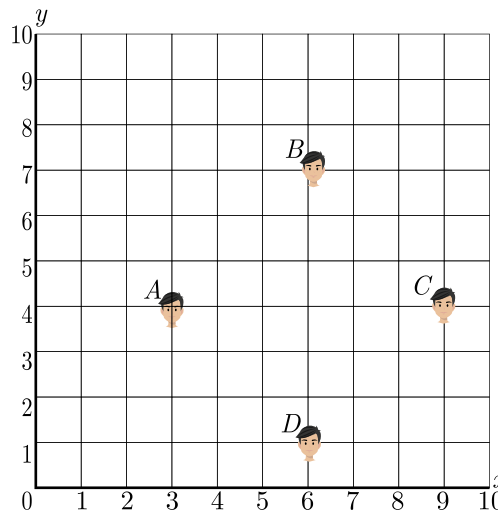
Based on this model answer the following questions:

- (i) When no barrels are produce what is a profit loss?
 (a) Rs 22000 (b) Rs 66000
 (c) Rs 11000 (d) Rs 33000
- (ii) What is the break even point ? (Zero profit point is called break even)
 (a) 10 barrels (b) 30 barrels
 (c) 20 barrels (d) 100 barrels
- (iii) What is the profit/loss if 175 barrels are produced
 (a) Profit 266200 (b) Loss 266200
 (c) Profit 240250 (d) Loss 240250
- (iv) What is the profit/loss if 400 barrels are produced
 (a) Profit Rs 466200 (b) Loss Rs 266000
 (c) Profit Rs 342000 (d) Loss Rs 342000
- (v) What is the maximum profit which can manufacturer earn?
 (a) Rs 240250 (b) Rs 480500
 (c) Rs 680250 (d) Rs 240250

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.

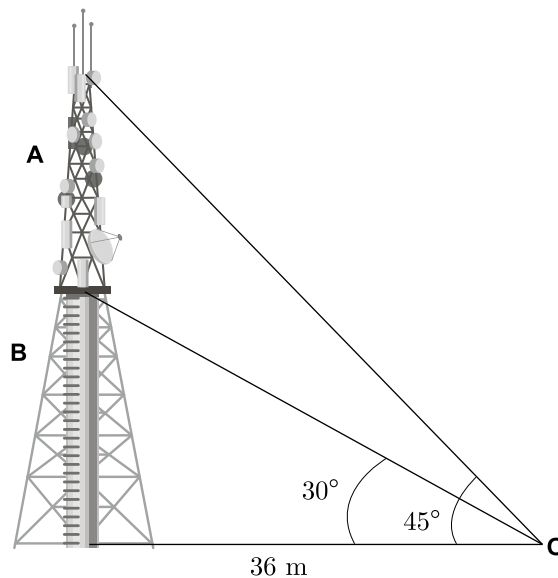


Here A, B, C and D are four friend Amar, Bharat, Colin and Draavid.

- (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

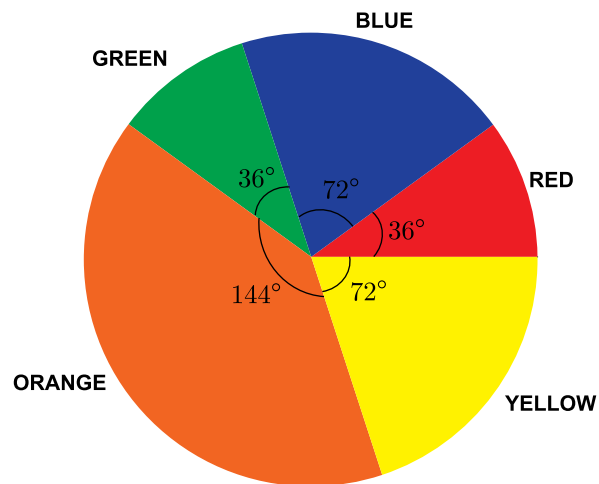
Q19. Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure, including microwave dishes. They are among the tallest human-made structures. There are 2 main types: guyed and self-supporting structures.

On a similar concept, a radio station tower was built in two sections *A* and *B*. Tower is supported by wires from a point *O*. Distance between the base of the tower and point *O* is 36 m. From point *O*, the angle of elevation of the top of section *B* is 30° and the angle of elevation of the top of section *A* is 45° .



- (i) What is the height of the section *B* ?
 - (a) $12\sqrt{3}$ m
 - (b) $12\sqrt{2}$ m
 - (c) $8\sqrt{3}$ m
 - (d) $4\sqrt{2}$ m
- (ii) What is the height of the section *A* ?
 - (a) $12(2 - \sqrt{2})$
 - (b) $24(2 - \sqrt{2})$
 - (c) $12(3 - \sqrt{3})$
 - (d) $24(3 - \sqrt{3})$
- (iii) What is the length of the wire structure from the point *O* to the top of section *A* ?
 - (a) $32\sqrt{2}$ m
 - (b) $24\sqrt{3}$ m
 - (c) $28\sqrt{3}$ m
 - (d) $36\sqrt{2}$ m
- (iv) What is the length of the wire structure from the point *O* to the top of section *B* ?
 - (a) $12\sqrt{3}$ m
 - (b) $24\sqrt{3}$ m
 - (c) $28\sqrt{3}$ m
 - (d) $16\sqrt{3}$ m
- (v) What is the angle of depression from top of tower to point *O* ?
 - (a) 30°
 - (b) 45°
 - (c) 15°
 - (d) 75°

Q20. A survey was taken at a high school, and the results were put in a circle graph. The students were asked to list their favourite colours. The measurement of each central angle is shown. If a person is chosen at random from the school, find the probability of each response.

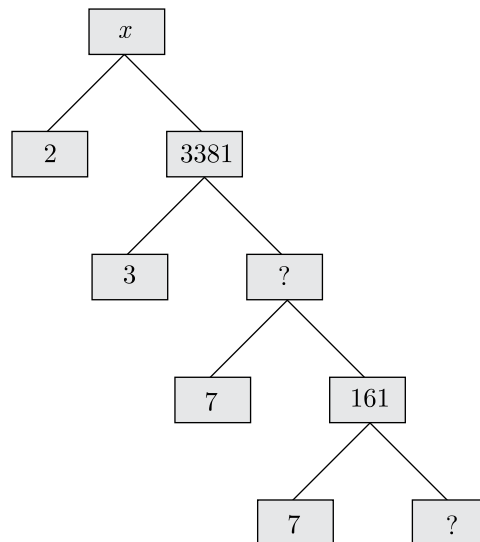


- (i) What is the probability of favourite colour being red ?
 (a) 0.1 (b) 0.2
 (c) 0.3 (d) 0.4
- (ii) What is the probability of favourite colour being blue or green ?
 (a) 0.1 (b) 0.2
 (c) 0.3 (d) 0.4
- (iii) What is the probability of favourite colour not being red or blue?
 (a) 0.35 (b) 0.70
 (c) 0.15 (d) 0.50
- (iv) What is the probability of favourite colour not being orange or green ?
 (a) 0.65 (b) 0.75
 (c) 0.25 (d) 0.50
- (v) What is the probability of favourite colour being red or blue?
 (a) 0.2 (b) 0.3
 (c) 0.1 (d) 0.4

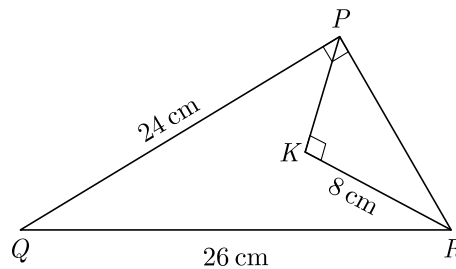
PART - B

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

Q21. Complete the following factor tree and find the composite number x .



Q22. In the given triangle PQR , $\angle QPR = 90^\circ$, $PQ = 24$ cm and $QR = 26$ cm and in $\triangle PKR$, $\angle PKR = 90^\circ$ and $KR = 8$ cm, find PK .



Q23. The points $A(4,7)$, $B(p,3)$ and $C(7,3)$ are the vertices of a right triangle, right-angled at B . Find the value of p .

OR

Show that the points (a, a) , $(-a, -a)$ and $(-\sqrt{3}a, \sqrt{3}a)$ are the vertices of an equilateral triangle.

Q24. Find the value of θ , if, $\frac{\cos\theta}{1 - \sin\theta} + \frac{\cos\theta}{1 + \sin\theta} = 4; \theta \leq 90^\circ$

OR

Prove that : $-1 + \frac{\sin A \sin(90^\circ - A)}{\cot(90^\circ - A)} = -\sin^2 A$

Q25. A cylinder and a cone have base radii 5 cm and 3 cm respectively and their respective heights are 4 cm and 8 cm. Find the ratio of their volumes.

Q26. Find the mode of the following frequency distribution.

Class	0- 10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	8	10	10	16	12	6	7

Q27. Find HCF and LCM of 16 and 36 by prime factorization and check your answer.

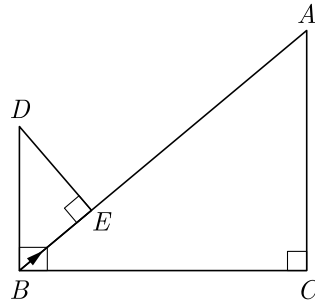
OR

Find the HCF and LCM of 510 and 92 and verify that $\text{HCF} \times \text{LCM} = \text{Product of two given numbers}$.

Q28. In an election contested between A and B , A obtained votes equal to twice the no. of persons on the electoral roll who did not cast their votes and this later number was equal to twice his majority over B . If there were 1,8000 persons on the electoral roll. How many votes for B .

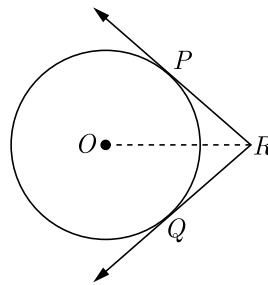
Q29. The 14th term of an AP is twice its 8th term. If the 6th term is -8 , then find the sum of its first 20 terms.

Q30. In the given figure, $DB \perp BC$, $DE \perp AB$ and $AC \perp BC$. Prove that $\frac{BE}{DE} = \frac{AC}{BC}$.



Q31. Prove that : $(\cot \theta - \operatorname{cosec} \theta)^2 = \frac{1 - \cos \theta}{1 + \cos \theta}$

Q32. In figure, two tangents RQ and RP are drawn from an external point R to the circle with centre O . If $\angle PRQ = 120^\circ$, then prove that $OR = PR + RQ$.



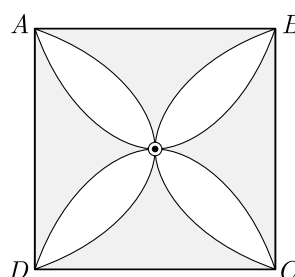
Q33. Draw a circle of radius of 3 cm. Take two points P and Q one of its diameter extended on both sides, each at a distance of 7 cm on opposite sides of its centre. Draw tangents to the circle from these two points.

OR

Draw a circle of radius 4 cm. Draw two tangents to the circle inclined at an angle of 60° to each other.

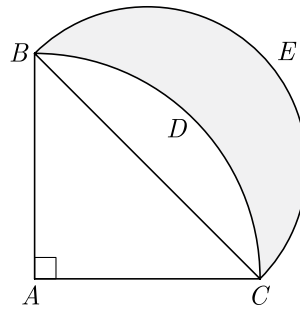
Q34. Write all the values of p for which the quadratic equation $x^2 + px + 16 = 0$ has equal roots. Find the roots of the equation so obtained.

Q35. In fig. $ABCD$ is a square of side 14 cm. Semi-circle are drawn with each side of square as diameter. Find the area of the shaded region. Use $\pi = \frac{22}{7}$.



OR

As $ABDC$ is a quadrant of a circle of radius 28 cm and a semi-circle BEC is drawn with BC as diameter. Find the area of the shaded region. Use $\pi = \frac{22}{7}$.



Q36. Monthly expenditures on milk in 100 families of a housing society are given in the following frequency distribution :

Monthly expenditure (in Rs.)	0- 175	175-350	350-525	525-700	700-875	875-1050	1050-1125
Number of families	10	14	15	21	28	7	5

Find the mode and median for the distribution.

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