Time : 3 hrs.   *F. M. : 80*

Name & Roll No : _____

Class & Section : _____

Please do not write anything else on the question paper.
This question paper contains 8 Pages.

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 type questions of 2 marks each.

4. Section C has 6 Short Answer type questions of 3 marks each.

5. Section D has 4 Long Answer type questions of 5 marks each.

6. Section E has 3 Case Based questions of 4 marks each with sub parts.   26

Section - A

(Each question carries 1 mark)

1. If the zeroes of the quadratic polynomial $x^2 + px + q$ are double in value to the zeroes of $2x^2 - 5x - 3$, then the values of p and q are

    a) $p = 5, q = 6$ b) $p = -5, q = -6$

    c) $p = -5, q = 6$ d) $p = 5, q = -6$

2. The value of a for which the system of linear equations $2x + 3y = 7$ and $(a - 1)x + (a + 1)y = 3a + 1$ represent parallel lines is

    a) 14   b) 7

    c) 6   d) 5

3. The common difference of an AP, the sum of whose n terms is S_n is,

    a) $S_n - 2S_{n-1} + S_{n-2}$ b) $S_n - 2S_{n-1} - S_{n-2}$

    c) $S_n - S_{n-2}$ d) $S_n - S_{n-1}$

(1)   (Turn Over)

4. Given that $\sin\alpha = \dfrac{\sqrt{3}}{2}$ and $\tan\beta = \dfrac{1}{\sqrt{3}}$, then the value of $\cos(\alpha - \beta)$, where $0 \le \alpha, \beta \le \dfrac{\pi}{2}$ is

   a) $\dfrac{\sqrt{3}}{2}$ b) $\dfrac{1}{2}$ c) 0 d) $\dfrac{1}{\sqrt{2}}$

5. The coordinates of the vertex A of a rectangle ABCD whose three vertices are given B(0, −4), C(0, 0) and D (3, 0) are

   a) (−4, −3)   b) (−3, −4)   c) (3, −4)   d) (−4, 3)

6. The mean and median of the data a, b, c are 50 and 35 respectively, where a<b<c. If c − a = ? then b − a is

   a) 8   b) 7   c) 3   d) 5

7. The distribution below gives the marks obtained by 80 students on a test.
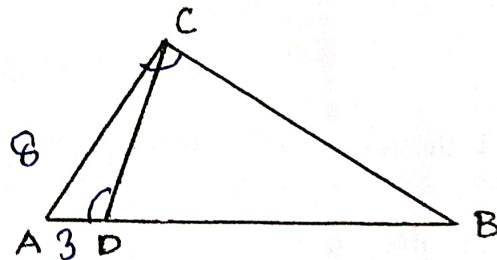
Marks	less than 10	less than 20	less than 30	less than 40	less than 50	less than 60
No. of students	3	12	27	57	75	80

   The modal class of this distribution is

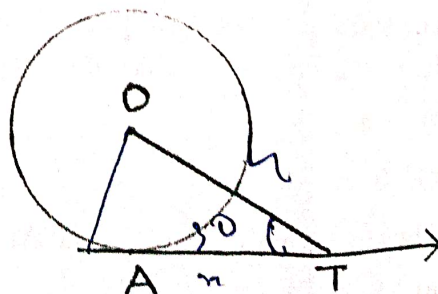   a) 10-20   b) 20-30   c) 30-40   d) 50-60

8. In the given figure, $\angle ACB = \angle CDA$, AC = 8cm, AD = 3 cm then BD is equal to

   a) $\dfrac{22}{3}$ cm   b) $\dfrac{26}{3}$ cm

   c) $\dfrac{55}{3}$ cm   d) $\dfrac{64}{3}$ cm

9. In the given figure, AT is a tangent to the circle with centre O such that OT = 4 cm $\angle OTA = 30°$, then the length of AT is

   a) 4 cm   b) 2 cm

   c) $2\sqrt{3}$ cm   d) $4\sqrt{3}$ cm

10. The least positive value of k, for which the quadratic equation $2x^2 + kx - 4 = 0$ has rational roots is

   a) $2\sqrt{2}$ b) 2   c) $-2\sqrt{2}$ d) $\sqrt{2}$
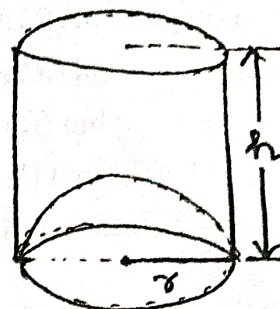
(2)

1. A number consists of two digits. The sum of the digits is 12 and the unit's digit when divided by the ten's digit gives the result as 3. The number is

a) 63   b) 68   c) 93   d) 39

2. The capacity of the cylindrical vessel with the hemispherical bottom portion raised upwards is

a) $\dfrac{\pi}{3}(3h - 2r).r^2$ b) $\dfrac{\pi}{3}(3h + 2r).r^2$

c) $\dfrac{\pi}{2}(2h - 3r).r^2$ d) $\dfrac{\pi}{2}(2h + 3r).r^2$

3. If $\tan^2\theta + \cot^2\theta = 2$, θ is an acute angle, then $\tan^3\theta + \cot^3\theta$ is

a) 1   b) 2   c) 3   d) 0

4. The perimeter of a triangle with vertices (0, 4), (0, 0) and (3, 0) is

a) $7 + \sqrt{5}$ b) 5   c) 10   d) 12

5. A solid is hemispherical at the bottom and conical above it. If the surface area of the two parts are equal, then the ratio of its radius and height of conical part is

a) $1 : \sqrt{2}$ b) $\sqrt{2} : 1$ c) $1 : \sqrt{3}$ d) $\sqrt{3} : 1$

6. If a number x is chosen from the numbers 1, 2, 3 and a number y is selected from the numbers 1, 4, 9 then P(xy<9) is

a) $\dfrac{7}{9}$ b) $\dfrac{5}{9}$ c) $\dfrac{2}{3}$ d) $\dfrac{1}{9}$

7. In the given figure, if PQR is the tangent to a circle at Q whose centre is O, AB is a chord parallel to PR and $\angle BQR = 70°$, then $\angle AQB$ is equal to
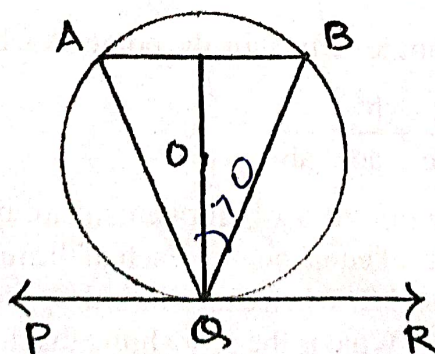
a) 20°   b) 40°   c) 35°   d) 45°

8. If $\alpha = $ ABCDEFGH.....Z. A letter is selected at random from the letters in odd positions. The probability that it is a vowel is

a) $\dfrac{5}{13}$ b) $\dfrac{6}{13}$ c) $\dfrac{5}{26}$ d) $\dfrac{6}{26}$

ASSERTION - REASON BASED QUESTIONS

Question numbers 19 and 20 are Assertion and Reason based questions carrying 1 mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the codes (a), (b), (c) and (d) as given below.

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. (A) : Given that HCF (306, 657) = 9, LCM (306, 657) is 22338

    (R) : If a and b are two positive integers and HCF (a, b) = q, then LCM (a, b) = $\dfrac{a+b}{q}$

20. (A) : If the length of the minute hand of a clock is 7 cm, then the area swept by it in 5 minutes is $\dfrac{77}{6}$ cm².

    (R) : The length of an arc of a sector with angle θ and radius r is given by $l = \dfrac{\theta}{360} \times 2\Pi r$

SECTION - B

(Each question carries 2 marks)

21. If $\sin\theta + \cos\theta = \sqrt{3}$, then prove that $\tan\theta + \cot\theta = 1$

22. P is the LCM of 2, 4, 6, 8, 10 ; Q is the LCM of 1, 3, 5, 7, 9 and L is the LCM of P & Q. Evaluate L – 21 P.

OR

Dhudnath has two vessels containing 720 ml and 405 ml of milk respectively. Milk from these containers is poured into glasses of equal capacity to their brim. Find the minimum number of glasses that can be filled.

23. If the centroid of the triangle formed by the points P(a, b), Q(b, c) and R(c,a) is at the origin then find the value of $\dfrac{a^2}{bc} + \dfrac{b^2}{ac} + \dfrac{c^2}{ab}$

24. In the given figure, the top view of an open square box is shown that is divided into compartments with walls of equal height. Each of the rectangle D, E, F has twice the area each of the square A, B and C. When a marble is dropped into the box at random, it falls in one of the compartments. What is the probability that it will fall into compartment F?

A	D
B	E
C	F

25.

26.

27.

28.

29. If

30. On gro pe
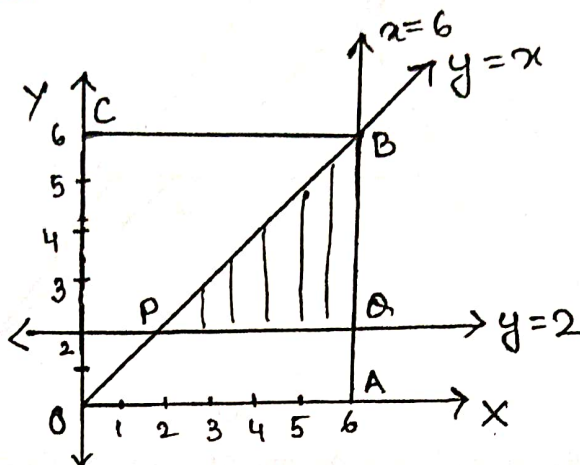
X-Math

Con
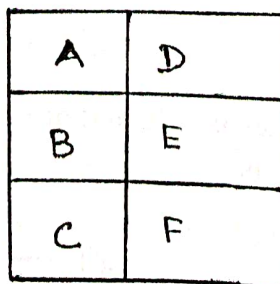
OR

A square dart board is placed in the first quadrant from x = 0 to x = 6 and y = 0 to y = 6. A triangular region on the dart board is enclosed by the lines y = 2, x = 6 and y = x. Find the probability that a dart that randomly hits the dart board will land in the triangular region formed by the three lines.

25. P(−1, −3), Q(2, −3) and R(a,b) are the vertices of a right-angled triangle with PR as the hypotenuse. Find the values of a & b.

SECTION - C

(Each question carries 3 marks)

26. Prove that $\sqrt{5}$ is an irrational number. Hence, show that $2 + \sqrt{5}$ is irrational.

27. Solve by using quadratic formula $9x^2 - 9(a + b)x + (2a^2 + 5ab + 2b^2) = 0$

28. Find the areas of two segments of a circle formed by a chord of length 5cm subtending an angle of 90° at the centre.

OR

Find the area of segment as shown in the figure if the radius of the circle is 21 cm and $\angle AOB = 120° \left(\pi = \dfrac{22}{7} \right)$ (0 is the centre of circle)
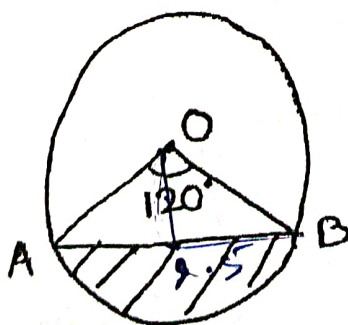

29. If $1 + \sin^2 \theta = 3 \sin \theta \cos \theta$, prove that $\tan \theta = 1$ or $\dfrac{1}{2}$

30. One fourth of a group of people claim that they are creative, twice the square root of the group claims to be caring and the remaining 15 claims that they are optimistic. How many persons in the group are creative?

X-Math. (5) (Turn Over)

31. In the given figure $\angle BED = \angle BDE$ and E divides BC in the ratio 2:1. Prove th
    AF × BE = 2AD × CF
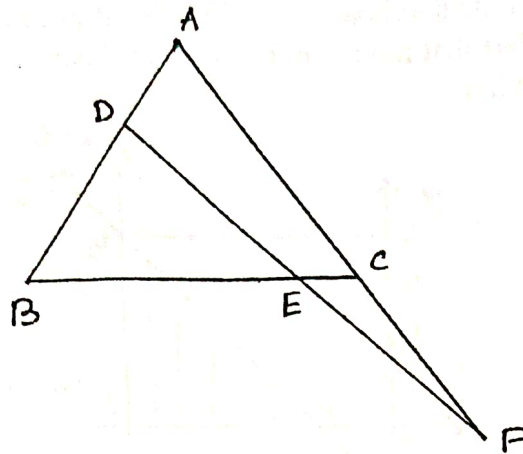
OR

In $\triangle ABC$, P and Q are points on AB and AC respectively such that PQ ||BC. Prove that th
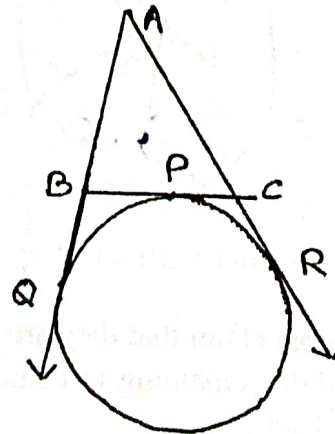median AD, drawn from A to BC, bisects PQ.
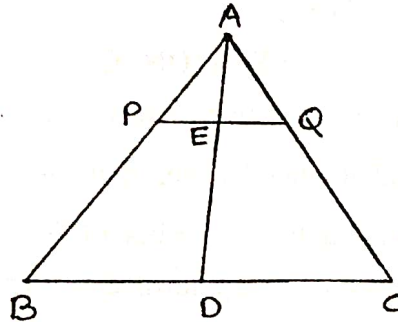
SECTION - D

(Each question carries 5 marks)

32. Show that the length of two tangents drawn from a same external point to a circle are equal in leng

If a circle touches the side BC of a triangle ABC at P and the extended sides AB and AC a
and R respectively. Prove that

$$AQ = \frac{1}{2} \text{ perimeter of } \triangle ABC$$ [3

Co

33. The angle of elevation of a cliff from a fixed point is θ. After going up a distance of k metres towards the top of the cliff at an angle ϕ, it is found that the angle of elevation is α. Show that the height of the cliff is

$$\frac{k(\cos\phi - \sin\phi\cot\alpha)}{\cot\theta - \cot\alpha} \text{ metres}$$

34. Draw the graphs of the equation $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Determine the coordinates of the vertices of the triangle formed by these lines and the X-axis. Also find the area of the triangle.

OR

Two vessels A and B contain mixtures of Boric acid and water. A mixture of 3 parts from A and 2 parts from B is found to contain 29% of boric acid and a mixture of 1 part from A and 9 parts from B is found to contain 34% of boric acid. Find the percentage of boric acid in A and B.

35. The median of the following data is 50. Find the values of p and q if the sum of all frequencies is 90. Also find the mode.

Marks obtained	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Number of students	p	15	25	20	q	8	10

OR

Determine the mean of the following (by using step-deviation method)

Marks	Above 0	Above 10	Above 20	Above 30	Above 40	Above 50	Above 60	Above 70	Above 80	Above 90	Above 100
No. of students	80	77	72	65	55	43	23	16	10	8	0

SECTION - E

(Each question carries 4 marks)

36. The students of a school decided to beautify the school on the annual day by fixing colourful flags on the straight passage of the school. They have 27 flags to be fixed at intervals of every 2m. The flags are stored at the position of the middle most flag. Ruchi was given the responsibility of placing the flags. Ruchi kept books where the flags were stored.

i)   What is the distance travelled to fix the first flag?   [1]

ii) What is the maximum distance travelled carrying a flag?   [1]

iii) How much distance did she cover in completing this job and returning back to collect her books?   [2]

OR

iii) If the time taken to fix the 13th flag is 8 secs, find the speed of Ruchi.

37. A golf ball is spherical with about 300-500 dimples that help increase its velocity while in play. Golf balls are tradionally white but available in colours also. In the given figure, a golf ball has diameter 4.2 cm and surface has 315 dimples (hemispherical) of radius 2 mm.
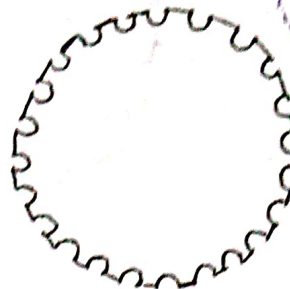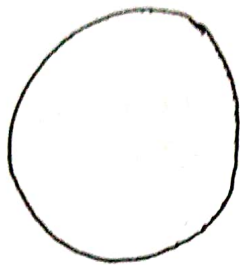
Based on the above, answer the following questions.

i) Find the surface area of one such dimple. [1]

ii) Find the volume of the material dug out to make one dimple. [1]

iii) Find the total surface area exposed to the surroundings. [2]

<div align="center">OR</div>

Find the volume of the golf ball.

38. Digvijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles. The height of Digvijay's house is 20 m when Digvijay's house casts a shadow 10 m long on the ground. At the same time, the tower casts a shadow 10 m long on the ground and the house of Anshul casts 20 m long shadow on the ground.

Digvijay's House   Tower   Anshul's House
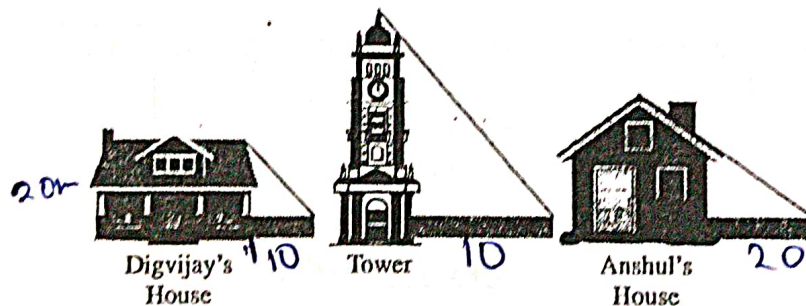
Based on the above information, solve the following questions :

i) What is the height of the tower? [1]

ii) What will be the length of the shadow of the tower when Digvijay's house cast a shadow of 18 m? [1]

iii) What is the height of Anshul's house? [2]

<div align="center">OR</div>

When the tower casts a shadow of 40 m, at same time what will be the length of the shadow of Anshul's house.

<div align="center">———— XXXX ————</div>