DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

24-0010-C TEST BOOKLET

Time Allowed: 3:00 hrs

MAIN PAPER- MATH

Maximum Marks: 300

INSTRUCTIONS TO CANDIDATES

Read the instructions carefully before answering the questions: -

1. This Test Booklet consists of 16 (sixteen) printed pages and has 75 (seventy five) **items (questions).**
2. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
3. **Please note that it is the candidate's responsibility to fill in the Roll Number and other required details carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet and the Separate Answer Booklet. Any omission/discrepancy will render the OMR Answer Sheet and the Separate Answer Booklet liable for rejection.**
4. Do not write anything else on the OMR Answer Sheet except the required information. Before you proceed to mark in the OMR Answer Sheet, please ensure that you have filled in the required particulars as per given instructions.
5. Use **only Black Ball Point Pen** to fill the OMR Answer Sheet.
6. This Test Booklet is divided into 4 (four) parts – **Part – I, Part - II , Part – III** and **Part IV.**
7. All FOUR parts are **Compulsory**.
8. **Part-I consists of Multiple Choice-based Questions.** The answers to these questions have to be marked in the **OMR Answer Sheet** provided to you.
9. **Part - II , Part – III** and **Part IV consist of Conventional Questions.** The answers to these questions have to be written in the **Separate Answer Booklet** provided to you.
10. In Part-I, each item (question) comprises of 04 (four) responses (answers). You are required to select the response which you want to mark on the OMR Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
11. After you have completed filling in all your responses on the OMR Answer Sheet and the Answer Booklet(s) and the examination has concluded, you should hand over to the Invigilator ***only the OMR Answer Sheet and the Answer Booklet(s)***. You are permitted to take the Test Booklet with you.
12. **Penalty for wrong answers in Multiple Choice-based Questions:**

THERE WIL BE **PENALTY** FOR WRONG ANSWERS MARKED BY A CANDIDATE.

(i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third** of the marks assigned to the question will be deducted as penalty.

(ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to the question.

(iii) If a question is left blank. i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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PART – I

MULTIPLE CHOICE BASED QUESTIONS

Instructions for Questions 1 to 50:

- Choose the correct answer for the following questions
- Each question carries 3 marks (50 x 3 = 150 marks)

1. If HCF of the numbers 175 and 315 is of the form 3m – 4, then the value of m is :

   (a) 10
   (b) 11
   (c) 13
   (d) 17

2. The LCM of two numbers is 14 times of their HCF. The sum of LCM and HCF is 600. If one number is 280, then the other number is :

   (a) 90
   (b) 140
   (c) 80
   (d) 70

3. The greatest 4-digit number exactly divisible by 18, 24 and 42 is :

   (a) 9980
   (b) 9576
   (c) 9579
   (d) 9996

4. When 24 is divided by a positive integer n, the remainder in (n – 4). The possible value of n is :

   (a) 11
   (b) 9
   (c) 7
   (d) 5

5. Sum of all factors of the number 56 is :

   (a) 121
   (b) 120
   (c) 119
   (d) 118

6. The largest number which when divides 2053 and 967, leaves the remainder 5 and 7 respectively, is :

(a) 64
(b) 90
(c) 128
(d) 156

7. If n is a natural number, then $6^n - 5^n$ always ends with the digit

(a) 1
(b) 3
(c) 5
(d) 7

8. For any positive integer n, the sum $(-1)^n + (-1)^{n+1} + (-1)^{n+2} + (-1)^{n+3}$ is equal to :

(a) 4
(b) 2
(c) 0
(d) –2

9. If the zeroes of the polynomial $x^2 + px + q$ are double in value to the zeroes of the polynomial $3x^2 - 7x - 1$, then the values of p and q are :

(a) $p = \frac{14}{3}, \quad q = \frac{-4}{3}$

(b) $p = \frac{14}{3}, \quad q = \frac{4}{3}$

(c) $p = \frac{-14}{3}, \quad q = \frac{4}{3}$

(d) $p = \frac{-14}{3}, \quad q = \frac{-4}{3}$

10. If 3 and –5 are the zeroes of the quadratic polynomial $x^2 + (a + 3)x + b$, then the values of a and b are :

(a) $a = 1, b = 15$

(b) $a = 1, b = -5$

(c) $a = -1, b = -15$

(d) $a = -1, b = 5$

11. If 2 is one of the zeroes of the cubic polynomial $x^3 + 7x + 6$, then its other two zeroes are :

(a) 1 and –3
(b) 1 and 3
(c) –1 and 3
(d) –1 and –3

12. If α, β are the zeroes of the quadratic polynomial $2x^2 + 7x + 5$, then $(\alpha - 1)(\beta - 1)$ is equal to :

(a) –1
(b) 0
(c) 2
(d) 7

13. If $\alpha - \beta$, α and $\alpha + \beta$ are the zeroes of the cubic polynomial $x^3 - 12x^2 + 39x + k$, then the value of k is

(a) 28
(b) –28
(c) 100
(d) –100

14. If the zeroes of the polynomial $(a^2 + 6)x^2 + 13x + 5a$ are reciprocal to each other, then the values of a are :

(a) –2, –3
(b) 2, –3
(c) –2, 3
(d) 2, 3

15. If 3 is a common zero to both the polynomials $3x^2 + mx - 6$ and $2x^3 + nx^2 - x - 6$, then $m - 2n$ is equal to :

(a) –3
(b) 3
(c) –9
(d) 9

16. If the zeroes of the polynomial $x^2 - bx + c$ are two consecutive odd integers, then $b^2 - 4c$ is :

(a) 2
(b) 4
(c) – 4
(d) 8

17. If the sum of first n terms of an A.P. is $\frac{1}{2}(3n^2 + 7n)$, then its n^{th} term is :

(a) $3n - 2$
(b) $2n - 3$
(c) $2n + 3$
(d) $3n + 2$

18. The 11^{th} term of an A.P. is three times its 5^{th} term. If its 8^{th} term is -12, then sum of its first 10 terms is :

(a) -140
(b) -112
(c) -70
(d) -56

19. The first and the last term of an A.P. are 8 and 65 respectively. If the sum of all its terms is 730, then the common difference of the A.P. is :

(a) 5
(b) 2
(c) 3
(d) 7

20. The sum of the first an A.P. is $5n - n^2$. The n^{th} term of the A.P. will be :

(a) $2n - 6$
(b) $6 - 2n$
(c) $2n + 6$
(d) $8n - 2$

21. The number of all 3-digit natural numbers that are divisible by 7 are :

(a) 126
(b) 128
(c) 130
(d) 140

22. The sum of three consecutive terms of an A.P. is 12 and the sum of their cubes is 288. The terms are :

(a) $-2, 4, 10$
(b) $-4, 4, 12$
(c) $-3, 4, 11$
(d) $2, 4, 6$

23. The sum of first n, 2n and 3n terms of an A.P. are x, y and z respectively. Which of the following is correct ?

(a) $z = 3(x - y)$
(b) $z = 3(y - x)$
(c) $y = 3x + z$
(d) $y = 3(z - x)$

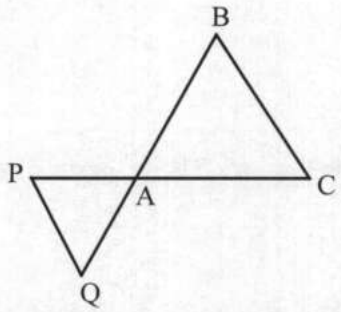
24. The first term and the common difference of an A.P. are 8 and 7 respectively. If the last term of this A.P. is 218, then its middle term is :

(a) 134
(b) 127
(c) 120
(d) 113

25. ABCD is a trapezium in which sides AB and CD are parallel to each other. The diagonals AC and BD intersect each other at the point O. If the sides OA, OB, OC and OD are $2x - 9$, $x - 3$, $x - 4$ and 2 respectively, then x is :

(a) 4
(b) 7
(c) 8
(d) 6

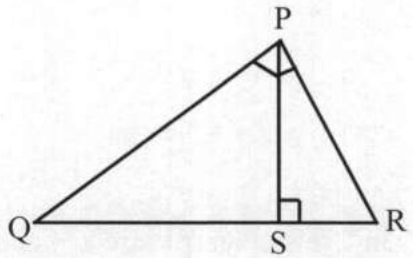
26. Consider the following figure :



In the figure ΔACB and ΔAPQ are similar triangles. If AB = 6.5 cm, BC = 8 cm, AP = 2.8 cm and PQ = 4 cm, then BQ is :

(a) 5.6 cm
(b) 5.75 cm
(c) 9.75 cm
(d) 11.75 cm

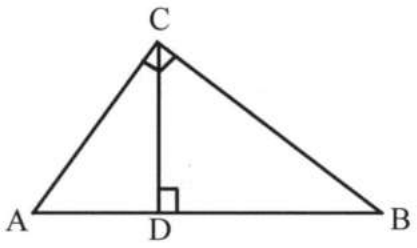
27. Consider the following figure :



If QR = 16 cm, SR = 4 cm and PR = x cm, then the value of x is :

(a) 4 cm
(b) 6 cm
(c) 8 cm
(d) 10 cm

28. Consider the following figure :



If $\angle ACB = 90°$, AD = 4 cm, BD = 9 cm and CD is perpendicular to AB, then the ratio AC : BC is :

(a) 2 : 3
(b) 3 : 2
© 16 : 81
(d) 81 : 16

29. ABCD is a trapezium of which the side CD is parallel to AB and CD = 3 cm. If the diagonal AC of the trapezium divides the other diagonal in the ratio 1 : 3, and if AB > CD, then AB is equal to :

(a) 6 cm
(b) 9 cm
© 12 cm
(d) 15 cm

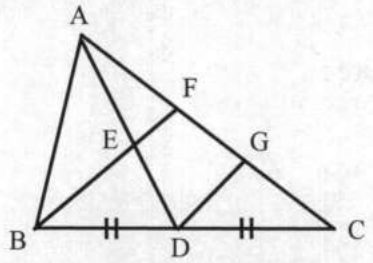
30. PQR and SQR are two right triangles having the common hypotenuse QR. The sides PR and QS intersect each other at the point M such that PM = 3 cm, MR = 6 cm and SM = 4 cm. Length of the side QS is :

(a) 4.5 cm
(b) 7.5 cm
© 8.5 cm
(d) 10.5 cm

31. In the ΔABC, AD is the internal bisector of the $\angle$ BAC. If AB = 10 cm, AC = 14 cm and BC = 6 cm, then BD is equal to :

(a) 2.5 cm
(b) 3 cm
© 3.5 cm
(d) 4 cm

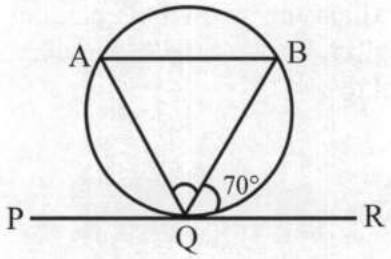
32. Consider the following figure :



AD is the median through A and E is the mid point of AD. DG is parallel to BF. Then AF : AC is :

(a) 2 : 3
(b) 1 : 3
(c) 3 : 2
(d) 3 : 1

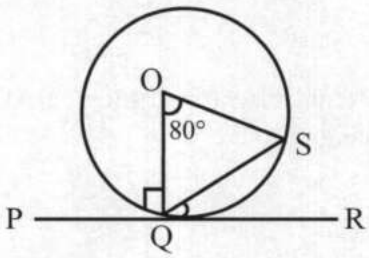
33. In the following figure PQR is the tangent to the circle at the point Q. AB is a chord of the circle which is parallel to the tangent PQR.



If $\angle BQR = 70°$, then $\angle AQB$ is equal to :

(a) 20°
(b) 35°
(c) 40°
(d) 50°

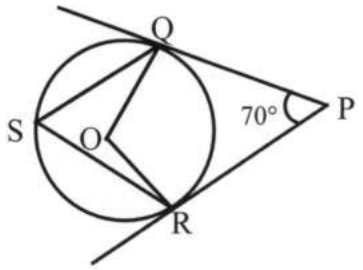
34. Consider the following figure :



PQR is the tangent to the circle whose centre is O and QS is a chord of the circle. If $\angle QOS = 80°$, then $\angle SQR$ is equal to :

(a) 55°
(b) 50°
(c) 45°
(d) 40°

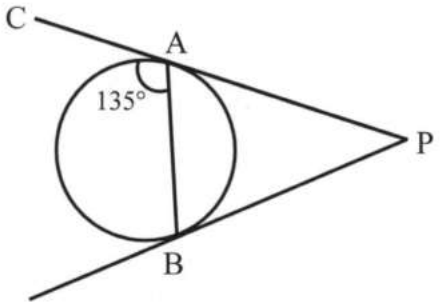
35. Consider the following figure having the circle whose centre is O.



If PQ and PR are the tangents to the circle from the point P and if $\angle$ QPR = 70°, then $\angle$ QSR is equal to :

(a) 110°
(b) 70°
(c) 65°
(d) 55°

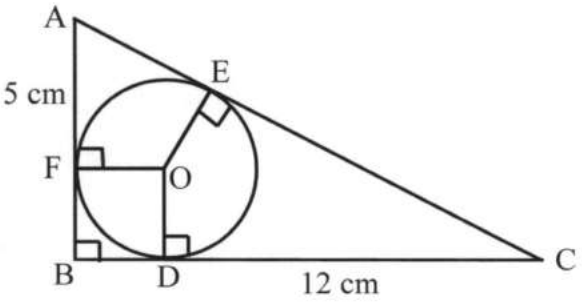
36. Consider the following figure :



If PA and PB are the tangent to the circle from the external point P such that PA = 5 cm and $\angle$BAC = 135°, then the length of the chord AB is :

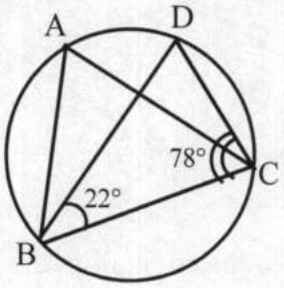
(a) $5\sqrt{2}$ cm
(b) $6\sqrt{2}$ cm
(c) 5.5 cm
(d) 6.5 cm

37. The radius of the circle in the following figure is equal to :



(a) 1 cm
(b) 2 cm
(c) 2.5 cm
(d) 3 cm

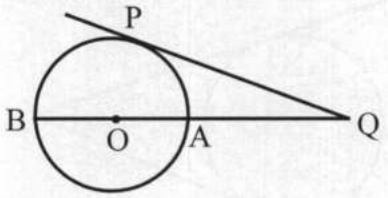
38. Consider the following figure :



If $\angle DBC = 22°$ and $\angle DCB = 78°$, then $\angle BAC$ is

(a) 54°
(b) 66°
(c) 80°
(d) 88°

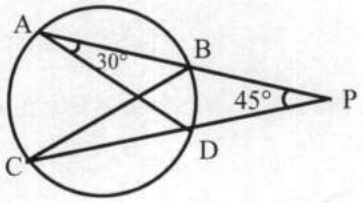
39. In the following figure, O is the centre of the circle, PQ is tangent to the circle at the point P and secant QAB passes through the centre O



If PQ = 5 cm and AQ = 1 cm, then the radius of the circle is :

(a) 6 cm
(b) 8 cm
(c) 10 cm
(d) 12 cm

40. Consider the following figure :



If $\angle PAD = 30°$ and $\angle APC = 45°$, then $\angle PBC$ is equal to :

(a) 105°
(b) 110°
(c) 115°
(d) 135°

41. If the area of a circle is A, its radius is R and circumference is C, then

(a) $2C = RA$
(b) $R^2 = 2AC$
(c) $RC = 2A$
(d) $R^2 = 4AC$

42. The area of the sector of a circle of radius 16 cm whose corresponding arc length is 18.5 cm, will be :

(a) 148 cm^2
(b) 154 cm^2
(c) 168 cm^2
(d) 176 cm^2

43. If the radius of a circle is decreased by 50%, its area will be decreased by :

(a) 25%
(b) 40%
(c) 50%
(d) 75%

44. Two circles touch each other externally. If the sum of their areas is 185 π cm^2 and distance between their centres is 19 cm, then the radius of the larger circle is :

(a) 10 cm
(b) 11 cm
(c) 13 cm
(d) 15 cm

45. The length of the minute hand of a clock is 21 cm. The area swept by the minute hand in 10 minute will be :

(a) 178 cm^2
(b) 211 cm^2
(c) 225 cm^2
(d) 231 cm^2

46. Two sight circular cylinders have equal total surface areas. The radius of each cylinder is equal to the height of the other. The sum of volumes of both cylinders is 250 π cm^3. The sum of their curved surface areas (in cm^2) is :

(a) 80 π
(b) 100 π
(c) 125 π
(d) 216 π

47. If the breadth of a rectangle is increased by 5 cm, its area increases by 25 cm^2. But if its length is increased by 5 cm, then the area increases by 20 cm^2. The area of the rectangle is :

(a) 20 cm^2
(b) 25 cm^2
(c) 30 cm^2
(d) 40 cm^2

48. The ratio of the height of two right circular cones is 5 : 2 and that of their radii is 2 : 5. The ratio of their volumes is :

(a) 1 : 5
(b) 5 : 1
(c) 2 : 5
(d) 5 : 2

49. A right circular cone with base radius of 10 cm is divided into two parts by a plane through the mid point of its axis, parallel to the base. The ratio of the volumes of the larger to smaller part is :

(a) 7 : 1
(b) 7 : 2
(c) 7 : 3
(d) 7: 5

50. A tent is in the form of a cylinder of diameter 8 m and height 2 m surmounted by a cone of equal base and height 3m. The total canvas used for making the tent is equal to :

(a) 24 m^2
(b) 28 m^2
(c) 32 m^2
(d) 36 m^2

PART-II

Instruction for questions 51 to 63 :

- **Answer any 10 (Ten) out of following thirteen questions.**
- **Each question carries 5 marks** **[10 × 5 = 50]**

51. Using Euclid's division algorithm, find whether the numbers 847 and 2160 are co-primes (relatively prime) or not.

52. If the product of two zeroes of the cubic polynomial $f(x) = x^3 - 6x^2 + 11x - 6$ is 2, then find its third zero.

53. If α, β, v are the zeroes of the cubic polynomial $x^3 + px^2 + qx + 2$, such that $\alpha\beta = -1$, then find the value of $2p + q$.

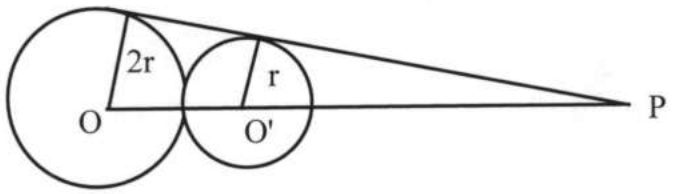
54. Which term of the A.P. 8, 14, 20, 26,... is more than its 41^{st} term ?

55. In an A.P. of 50 terms, the sum of the first 10 terms is 210 and the sum of its last 15 terms is 2565. Find the A.P.

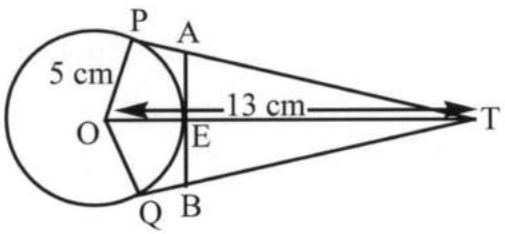
56. A triangle ABC is right angled at B. D is the mid-point of the side BC. Prove that $AC^2 = 4AD^2 - 3AB^2$

57. In a triangle ABC, $AD \perp BC$ and $AD^2 = BD \times DC$. Show that the ΔABC is a right triangle, right angled at the vertex A.

58. Find the length PO in the following figure :

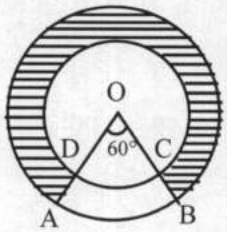


59. In the following figure, O is the centre of the circle of radius 5 cm. TP and TQ are the two tangents on the circle from the external point T. The line OT intersects the circle at the point E and AB is tangent to the circle at the point E. If OT =13 cm, then find the length of AB.



60. AB is an arc of a circle whose centre is the point O and radius 14 cm. If the length of the arc AB is 13.2 cm, find the area of the corresponding sector of the circle.

61. In the following figure, the two concentric circles with centre O have radii 21 cm and 42 cm respectively. If $\angle AOB = 60°$, find the area of the shaded region.



62. A hemispherical bowl of internal radius 9 cm is full of water. This water is to be filled in cylindrical bottles each of diameter 3 cm and height 4 cm. How many bottles will be needed to empty the bowl?

63. The radii of the internal and external surfaces of a hollow spherical shell are 3 cm and 5 cm respectively. If its material were formed in a solid cylinder of height $\frac{32}{3}$ cm, what would be its diameter?

PART-III

Instructions for questions 64 to 71:

- **Answer any 5 (Five) out of the eight questions.**
- **Each question carries 10 marks** **[5×10 = 50]**

64. Show that any positive odd integer can be written in the form $4n + 1$ or $4n + 3$, where n is a positive integer.

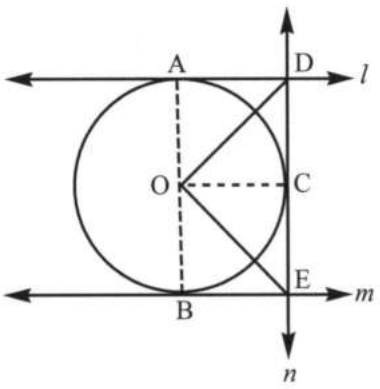
65. Find the condition that the zeroes of the polynomial $f(x) = x^3 - 3px^2 + qx - r$ are in arithmetic progression.

66. If $S_1, S_2, S_3 \ldots S_m$ are the sums of n terms of m A.P's whose first terms are 1, 2, 3,..., m and common differences are 1, 3, 5,...,(2m–1) respectively, then find the sum $S_1 + S_2 + \ldots + S_m$.

67. If the ratio of the sum of first m terms and first n terms of an A.P. is $m^2 : n^2$, then find the ratio of its m^{th} and n^{th} terms.

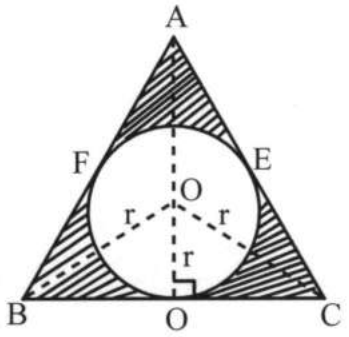
68. ABC is a right triangle, right angled at B. AD and CE are the medians drawn from A and C respectively. If AC = 5 cm and $AD = \frac{3\sqrt{5}}{2}$ cm, then find the length of the median CE.

69. Consider the following figure :



l, *m* and *n* are the tangents to the circle at the points A, B and C respectively whose centre is O. DE is the intercept of the tangent *n* between the tangents *l* and *m* which are parallel to each other. Prove that $\angle DOE = 90°$.

70. In the following figure, a circle with centre O is inscribed in an equilateral triangle ABC of side 12 cm. Find the radius of the in-circle and the area of the shaded region.



71. Water is flowing at the rate of 15 km/hour through a cylindrical pipe of diameter 14 cm into a cuboidal pond which is 50 meter long and 44 meter wide. In what time will the level of water in the pond will rise by 21 cm ?

PART-IV

Instructions for questions 72 to 75.

- **Answer any 2 (Two) out of the four questions.**
- **Each question carries 25 marks** **[2 × 25 = 50]**
-

72.(a) Show that there is no positive integer n for which $\sqrt{n-1}+\sqrt{n+1}$ is a rational number.

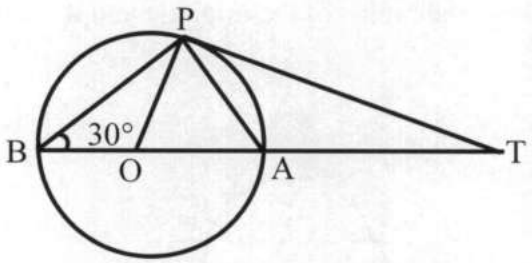
(b) Give that the zeroes of the cubic polynomial $f(x) = x^3 - 6x^2 + 3x + 10$ are of the form a, a + b and a + 2b, for some real numbers a and b. Find the values of a and b and as well as the zeroes of the polynomial.

73.(a) The sum of first p terms of an A.P. is q and the sum of its first q terms is p. Find the sum of first (p + q) terms of this A.P.

(b) If the ratio of the sum of first n terms of two A.P.'s is (7n + 1) : (4n + 27), find the ratio of their m^{th} terms.

74.(a) In an equilateral triangle ABC, D is a point on the side BC such that 4BD = BC. Show that $16\,AD^2 = 13\,BC^2$.

(b) Consider the following figure, in which O is the centre of the circle and TP is the tangent to to the circle from the external point T, T being the point on the diameter BA produced.



If $\angle PBT = 30°$, then find the ratio AB : AT.

75.(a) An 8 meter wide circular track is to be made around a circular park of radius 500 meter at the rate of Rs. 3.00 per m^2. If the total cost is reduced by Rs. 9570, then find the width of the new track.

(b) A cylindrical pipe has inner diameter of 7 cm and the water flows through it at the rate of 192.5 litres per minute. Find the rate of flow in kilometers per hour.

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