MATHEMATICS
CLASS XII

Time allowed: 3 hours   ***Maximum Marks: 100***

General Instructions:
   1. *All questions are compulsory.*
   2. *The question paper consists of 25 questions divided into three sections A, B and C. Section A contains 10 questions of 3 marks each, Section B is of 10 questions of 4 marks each and section C is of 5 questions of 6 marks each.*
   3. *There is no overall choice. However, an internal choice has been provided in two questions of three mark each, two questions of four marks each and two questions of six mark each.*
   4. *In question on construction, the drawing should be neat and exactly as per the given measurements.*
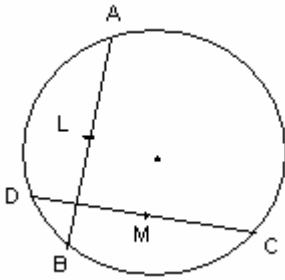   5. *Use of calculators is not permitted.*

SECTION A

Question numbers 1 to 10 carry 3 marks each.

   1. Solve for x and y : $311 x + 125 y = 747$; $125 x + 311 y = 561$

Reduce the following rational expression into its lowest terms : $\left(\dfrac{x^2 - 9}{x^2 + 6x - 27}\right) \times \left(\dfrac{x^2 + 6x + 8}{x^2 + 7x - 36}\right) \div \left(\dfrac{x^2 - 2x - 8}{x^2 + 5x - 36}\right)$

   3. In fig, L and M are the midpoints of equal chords AB and CD of a circle, with centre O. prove that
       (i) $\llcorner OLM = \llcorner OML$
       (ii) $\llcorner ALM = \llcorner CML$

4. A walkman is available for Rs 500 cash or Rs 150 cash down payment followed by 4 monthly instalments of Rs 90 each. Find the rate interest charged under the instalment plan.

   5. A loan has to be returned in three equal annual instalments. If the rate of interest is 10 % p.a compounded annually and each instalment is Rs 1331, Find the sum borrowed and the total interest paid.

   6. If (x – 5) is a factor of $x^2 + cx + d$ and $c + d = 12$, find the values of c and d.

   7. Using sridharacharyas's formula, solve for x: $\dfrac{x-2}{x-3} + \dfrac{x-4}{x-5} = \dfrac{10}{3}$

                                           OR

The sum of the squares of two consecutive odd natural numbers is 34. find the numbers

   8. Which term of the A.P 3 ,6 ,9 , …. is 36 more than its 24th term?

                                           OR

For what value of n , the nth terms of the two A.P 's given below are same:
       (i)   2 , -3 , -8 , ……….   (ii)   -26 , -27 , -28 ,,…..

Find the sum of all natural numbers between 250 and 1000 which are exactly divisible by 9

   10. D is appoint on the side BC of ΔABC such that $\llcorner ADC = \llcorner BAC$, prove that $\dfrac{CA}{CD} = \dfrac{CB}{CA}$

SECTION B

Question numbers 11 to 20 carry 4 marks each.

   11. Solve the following system of linear equations graphically: $2x + 3y = -4$, $5x - y = 7$. Also shade the region between the lines and X – axis.

12. Solve for x :
$$2\left(x^2+\frac{1}{x^2}\right)-9\left(x+\frac{1}{x}\right)+14=0$$

13. Construct a Δ ABC in which AB = 4 cm , BC = 6 cm and AC = 4 cm. Draw its incircle and measure its radius.

14. A right triangle with sides 3 cm and 4 cm is revolved around its hypotenuse. Find the volume of the double cone thus generated.

15. Prove that: $\dfrac{1}{1+\cos(90-\theta)}+\dfrac{1}{1-\cos(90-\theta)}=2\cos ec^2(90-\theta)$

OR

Evaluate: $3\dfrac{\sin 62}{\cos 28}-\dfrac{\sec 42}{\cos ec48}-\tan 20.\tan 40.\tan 45.\tan 50.\tan 70$

13. Show that the points (4 , 4), (-4 , -4) and (-4√3, 4√3) form the vertices of an equilateral triangle.

OR

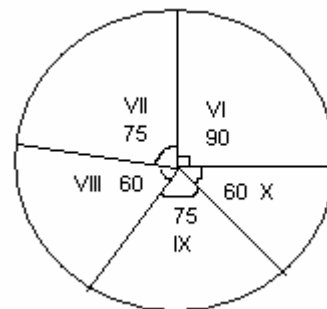Show that the point (1 , 4) , (4 , 4) , (4 , 8) , (1 , 8) are the vertices of a parallelogram

17. In what ratio does the point (3, 12) divide the line segment joining the points (1 , 4) and (4 , 16).

18. Using step deviation method, find the mean of the following data.

Class	350-450	450-550	550-650	650-750	750-850	850-950	Total
Frequency	14	46	58	70	48	14	250

19. A bag contains 100 identical tokens on which numbers 1 to 100 are marked. A token is drawn. What is the probability that the number, which leaves the remainder 3 when divided by 5

20. The pie chart given shows the enrolment of students in different classes of a school. If the total enrolment of all classes is 2400, Answer the following:
   (i) Which class has more enrolment than class IX and by how much?
   (ii) Which pair of classes have equal enrolment? Write their enrolments also.
   (iii) The class X has how many students less than class VI?

SECTION C

Question numbers 21 to 25 carry 6 marks each.

21. Prove that angles in the same segment of a circle are equal .Using the above, find the following:
   In fig, ∟BAC = 60° , ∟CDE = 30° and ∟DBC = 40° . Find ∟DCE
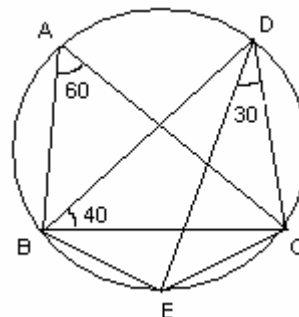
22. In a right triangle, Prove that the square on the hypotenuse is equal to the sum of the squares on the other two sides.

Using the above, do the following:

ABC is a right triangle , right angled at CD $\perp$ AB . If CD = p , AC = b , BC = a and AB = c ,

Show that pc = ab

OR

Prove that the ratio of the areas of similar triangles is equal to the ratio of the squares on their corresponding sides. Using the above, do the following:

The perimeters of two similar triangles ABC and A'B'C' are 60 cm and 36 cm respectively. If A'B' = 9 cm, find AB and the ratio of the areas of two triangles

23. An aeroplane flying horizontally 1 km above the ground, is observed at an angle of 60° from a point on the ground. After 10 seconds of flight, the angle of elevation is observed to be 30°. Find the speed of the aeroplane (in m/second).

24. A cone is divided into two parts by drawing a plane through the mid point of its axis, parallel to the base. Find the ratio of the volumes of two parts into which the plane divides the cone.

OR

A toy is in the form of a cone mounted on a hemisphere of radius 3.5 cm. The total height of the toy is 15.5 cm. Find the total surface area and volume of the toy.

25. Lakshmi's annual income is Rs 3,96,000. She contributes Rs 6,500 per month in her PF and pays quarterly premium of Rs 2,500 for her LIC policy.She contributes RS 10,000 towards Prime minister' relief fund(100 % exemption) and Rs 10,000 to a charitable trust (50% exemption) . If Rs 2,000 is deducted per month from her salary towards income tax, find the income tax to be paid by her in the last month.

Assume the following for calculating income tax:

(a) Standard deduction
  (i) Rs 25,000 if income is upto Rs 3,00,000
  (ii) Rs 20,000 if income is above Rs 3,00,000

(b) Rates of Income Tax

Income slab	Income tax
(i) upto Rs 45,000	no income tax
(ii) From Rs 45,001 to Rs 65,000	5 % of the amount exceeding Rs 45,000
(iii) From Rs 65,001 to Rs 1,75,000	Rs 1,000 + 10 % of the amount exceeding Rs 65,000
(iv) From Rs 1,75,001 onward	Rs 12,000 + 20 % of the amount exceeding Rs 1,75,000

(c) Rebate under section 88
  (i) 20 % of the savings subject to a maximum of Rs 16,000 if the gross income is upto Rs 2,50,000.
  (ii) 15 % of the savings subject to a maximum of Rs 12,000 if the gross income is above Rs 2,50,000 but upto Rs 5,00,000.

      (iii)   If gross total income exceeds Rs. 5,00,000 tax rebate under section 88 is not available.

(d) Educational Cess: 3 % of the net tax payable

(e) A surcharge of 10% will be levied once the taxable income is more than Rs 850,000.

(f) Special Rebate: Additional rebate maximum Rs 8,000 for females and Rs 20000 for senior citizen.