MATHEMATICS
CLASS – X

Max.Marks:100   **Time: 3 Hrs**

General Instructions:

1. The question paper consists of 25 questions divided into three sections A, B and C.
2. Section A contains 10 questions of 3 marks each. Section B contains 10 questions of 4 marks each.
   Section C contains 5 questions of 6 marks each.
3. There is no overall choice. However, an internal
   Choice is given in some questions.

SECTION A

1. Solve for x, y :
$$(a - b)x + (a + b)y = a^2 - 2ab - b^2$$
$$(a + b)(x + y) = a^2 + b^2$$

2. Find G.C.D and L.C.M of the following polynomials:
$$24(x^3 + 9x^2 + 20x), \ 28(x^4 + x^3 - 12x^2).$$

3. Simplify:
$$\left[\frac{x^2 + y^2}{x^2 - y^2} - \frac{x^2 - y^2}{x^2 + y^2} \right] \div \left[\frac{x + y}{x - y} - \frac{x - y}{x + y} \right]$$

4. Using quadratic formula, solve the following for y:
$$3y^2 + (6 + 4a)y + 8a = 0$$

5. The 8th term of an Arithmetic Progression is 37 and its 12th term is 57. Find the A.P

6. Find the A.P whose10th term is -8 and 20th term is 12.Also find the sum of first 10 terms

OR

7. The 5th term of an A.P is 1 and its 31st term is –77. Which term of the A.P is -17.
   An article is sold for Rs.2000 cash or for Rs.1000 cashdown payment together with Rs.1040 to be paid after 3 months. Find the rate of interest charged under the instalment plan.

8. The cost of a motorcycle is Rs.27000. A customer agrees to make a down payment of Rs.7140, followed by 3 equal annual instalments. If the rate of

interest be 10% per annum, compounded annually, what is the value of each instalment?

9. In the given figure, ABE, ACF are tangents to the circle with centre O. $\angle EBD = 60^0$ and $\angle DCF = 60^0$. Find $\angle BAC$ and $\angle BDC$.
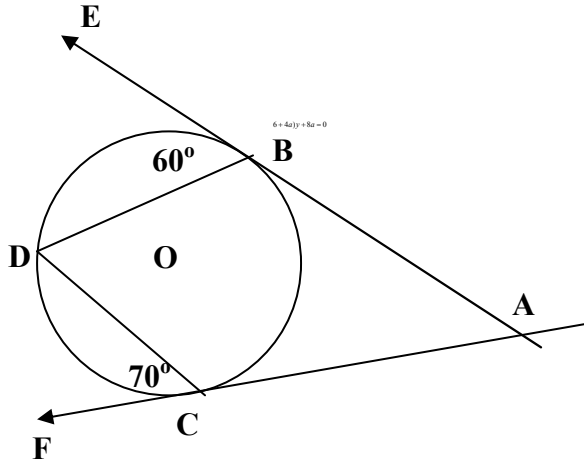
10. The diagonal BD of a parallogram $ABCD$ intersects the line segment AE at the point F, where E is any point on side BC. Prove that $DF \times EF = FB \times FA$

SECTION-B

11. Find graphically the co-ordinates of the triangle formed by the lines
$y = x, y = 2x, x + y = 6$.

12. Find the point on y-axis which is equidistant from (-5,-2) and (3,2).

13. Find the co-ordinates of centroid of a triangle whose vertices are (x_1, y_1), (x_2, y_2), (x_3, y_3).

14. A card is drawn at randomfrom a pack of 52 cards. Find the probability that the card drawn is
(i) a black king
(ii) spade or an ace
(iii) neither a heart nor a king
(iv) a jack,queen or a king.

15. Prove that $\dfrac{\cos A}{1 - \tan A} - \dfrac{\sin^2 A}{\cos A - \sin A} = \sin A + \cos A$

OR

Find the value of:

$$\frac{\tan 20^o}{\cot 70^o} + \frac{\cot 50^o}{\tan 40^o} + \frac{\sin^2 20^o + \sin^2 70^o}{\sin \theta \cos(90^o - \theta) + \cos \theta \sin(90^o - \theta)}$$

16. Find the value of p, if the mean of the following data is 20.

X	15	17	19	$20 + p$	23
F	2	3	4	$5p$	6

17. A well of diameter 3m is dug 14m deep. The earth taken out of it has been spread evenly all around it to a width of 4m to form an embankment. Find the height of the embankment.

18. Solve : $\dfrac{x-1}{x-2} + \dfrac{x-3}{x-4} = \dfrac{10}{3}$, $(x \neq 2,4)$

OR

Two pipes running together can fill a tank in 6 minutes. If one pipe takes 5 minutes more than the other to fill the tank, find the time in which each pipe would fill the tank.

19. Construct $\triangle ABC$ in which $BC = 7cm$, $\angle A = 70^0$ and foot of the perpendicular D on BC from A is $4.5cm$ away from B. How many such triangles are possible?

20. The pie chart alongside shows the monthly expenditure of a family on food,clothing, rent, miscellaneous expences and savings. Read the pie chart carefully and answer the following:
(i) What is the central angle for savings?
(ii) What is the ratio of expenditure on food to that of rent?
(iii) If family spends Rs.825 on clothing, what is the total monthly income?
(iv) What percent of the total income does the family save?
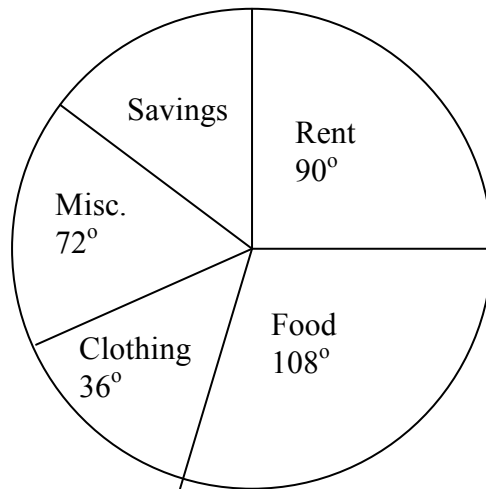
 SECTION-C

21.(i) Prove that the sum of either pair of the opposite angles of a cyclic quadrilateral is 180⁰.

  (ii) *ABCD* is a cyclic trapezium with *AD // BC* . If $\angle B = 70^0$, find the other three angles of the trapezium.

22. Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides.

Using the above result, prove that the area of equilateral triangle described on the side of a square is half the area of the equilateral triangle described on its diagonal.

23 .A pole 5m high is fixed on the top of a tower. The angle of elevation of the top of the pole observed from a point 'A' on the ground is 60⁰ and the angle of depression of the point 'A' from the top of the tower is 45⁰. Find the height of the tower.

24. A hollow cone is cut by a plane parallel to the base and the upper portion is removed. If the curved surface area of the remaining portion is 8/9 of the curved surface of the whole cone, find the ratio of the line-segments into which the cone's altitude is divided by the plane.

                    OR

The interior of a building is in the form of a cylinder of base radius 12m and height 3.5m, surmounted by a cone of equal base and slant height 12.5m. Find the internal curved surface area and the capacity of the building.

25. Shahid income is Rs.60, 000 (excluding   HRA). He pays a premium of Rs.30, 000 annually towards L.I.C, and contributes Rs.5, 000 per month towards P.F. He purchases NSC for Rs.20, 000 and contributes Rs.10, 000 towards P.M.s National Relief fund. He also donates Rs.8, 000 to a school where he studied, earning deduction 100% relief and 50% of the amount donated respectively. Find the total income tax to be paid by him for that year. If Rs.8000 is deducted from his salary every month towards income tax, find the tax to be paid by him in the last month of the year.

For calculation purpose use the following instructions:

Deduction u/s.80c: An individual is allowed a deduction up to Rs.1, 00,000 from gross salary on account of savings for contributions in PF, PPF, LIC, NSC, Infrastructure bonds etc.

Income tax rates for individuals:

Taxable income up to 1,00,000 -	Nil
1,00,000 to 1,50,000 -	10% of the amount exceeding 1,00,000
1,50,001 to 2,50,000 -	Rs.5,000 + 20% of the amount exceeding 1,50,000
2,50,001 & above -	Rs.25,000 + 30% of the amount exceeding 2,50,000
Education Cess:	2% of the total tax payable.