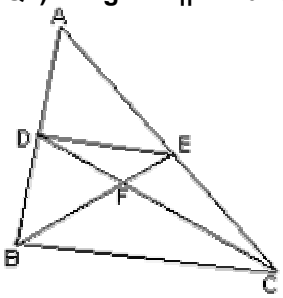
MATHEMATICS
CLASS X

Q1) For what value of k will the following system of linear equations have an infinite number of solutions: 2x + 3y = 2; (k + 2)x + (2k + 1)y = 2(k - 1) ?

Q2) Find whether the number 4, 7, 6 and 10 are in proportional or not. If not what number be added to each number so that they become proportional ?

Q3) Reduce the following relation expression into lowest form:
$(x^4 - 10x^2 + 9)/(x^3 + 4x^2 + 3x)$

Q4) In fig. DE || BC and AD/DB = 4/5, find ar(△DFE)/ar(△CFB) (Marks 2)



Q5) A suit is available for Rs. 1500 cash or for Rs. 500 cash down payment followed by 3 monthly instalments of Rs. 345 each. Find the rate of interest charged under the instalment scheme.

Q6) A loan has to be returned in two equal annual instalments. If the rate of interest is 16% per annum compounded annually and each instalment is of Rs. 1682, find the sum borrowed and the total interest paid.

Q7) If (x — 2) is a factor of $x^2 + ax + b$ and a + b = 1, find the values of a and b.

Q8) Find two consecutive numbers, whose square have sum 85.

Q14) The mean weight of 25 students of a class is 60 kg. If the mean weight of the first 13 students of the class is 57 kg and that of the last 13 students is 63 kg, find the weight of the 13th student.

Q8. Which term of the A.P. 3, 15, 27, 39.... is 132 more than its 54th term ?
OR
Derive the formula for the sum of first n terms of an A.P. whose first term is 'a' and the common difference is 'd'

Q9) A part of monthly hostel charges in a college are fixed and the remaining depends on the number of days one has taken food in the mess. When a student X takes food for 25 days, he has to pay Rs. 1750 as hostel charges where as a student Y, who takes food for 28 days, pays Rs. 1900 as hostel charges. Find the fixed charge and the cost of food per day. (Marks 4)

Q10) Without using trignometric table, show that:
$\tan 7^\circ . \tan 23^\circ . \tan 60^\circ . \tan 67^\circ . \tan 83^\circ = \sqrt{3}$

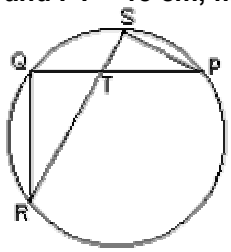
Q11) Construct a triangle ABC in which BC = 13cm, CA = 5cm and AB = 12cm. Draw its incircle and measure its radius.

Q13) The total surface area of a closed right circular cylinder is 6512 cm², and the circumference of its base is 88 cm. Find the volume of the cylinder (Use $\pi = 22/7$)

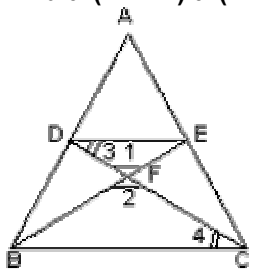
Q14) Prove the identity :

$(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \tan\theta + \sec\theta) = 2.$

Q15) In the given figure chord PQ and RS of a circle intersect at T. If RS = 18 cm, ST = 6 cm and PT = 18 cm, find the length of TQ. (Marks 2)



Q16) In the given figure DE || BC and AD : DB = 5 : 4
Find ar(△DFE)/ar(△CFB). (Marks 2)



Q17) Determine graphically the co-ordinates of the vertices of the triangle, the equation of whose sides are:

$y = x, 3y = x, x + y = 8.$

Q18) Find the value of a and b so that the polynomials p(x) and q(x) have (x + 1)(x - 2) as their HCF.

$p(x) = (x^2 + 3x + 2)(x^2 + x + a)$

$q(x) = (x^2 - 3x + 2)(x^2 - 3x + b)$

Q19) Show that the points (7, 10), (-2, 5) and (3, -4) are the vertices of an isosceles right triangle.

OR

Using distance formula, show that the points (-1, -1), (2, 3) and (8, 11) are collinear.

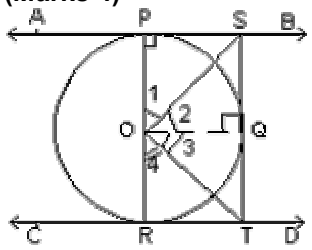
Q20) Find the ratio in which the point (-3, p) divides the line segment joining the points (-5, -4) and (-2, 3). Hence find the value of p.

Q21) Compute the missing frequencies 'f_1' and 'f_2' in the following data if the mean is 166 and the sum of observations is 52.

Classes	140-150	150-160	160-170	170-180	180-190	190-200	
Frequency	5	f_1	20	f_2	6	2	=52

Q22) An unbiased dice is tossed.
i) Write the sample space of the experiment
ii) Find the probability of getting a number greater than 4
iii) Find the probability of getting a prime number.

Q23) In fig. AB and CD are two parallel tangents to a circle with centre O. ST is tangent segment between two parallel tangents touching the circle at Q. Show that $\angle SOT = 90^{\circ}$. (Marks 4)

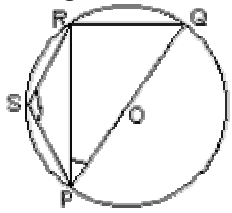


Q24) Construct a quad. ABCD in which AB = 2.5 cm BC = 3.5 cm, AC = 4.2 cm, CD = 3.5 cm and AD = 2.5 cm. Construct another quad. AB'C'D' with diagonal AC' = 6.3 cm such that it is similar to quad ABCD.

Q25) Prove that the angle subtended by an arc of a circle at its center is double the angle subtended by it at any point on the remaining part of the circle.
Using the above result prove that the angle in a major segment is acute.

Q26) 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, prove that the area of an equilateral triangle described on the side of a square is half the area of the equilateral triangle described on its diagonal.

Q 27) Prove that sum of either pair of opposite angles of a cyclic quadrilateral is 180°. Using the above solve the following:



In fig POQ is a diameter and PQRS is a cyclic quadrilateral. If $\angle PSR = 150^{\circ}$, find $\angle RPQ$.

Q28) State and prove Pythagoras Theorem.

Q289 Solve for x : $9^{x+2} - 6 \times 3^{x+1} + 1 = 0$

Q 30) If a radius of the circular and of a conical bucket, which is 45 cm high are 28 cm, 7 cm, find the capacity of the bucket.

Q31) From the top of a tower 60m. high, the angles of depression of the top and bottom of a building whose base is in the same straight line with the base of the tower are observed to be 30° and 60° respectively. Find the height of the building.

OR

An aeroplane flying horizontally at a height of 1.5km above the ground is observed at a certain point on earth to subtend an angle of 60°. After 15 seconds, its angle of elevation at the same point is observed to be 30°. Calculate the speed of the aeroplane in km/h.

Q32) A man on the roof of a home, which is 10 m high, observes the angle of elevation of the top of a building as 42° and angle of depression of the base of the building as 40°. Find the height of the building and its distance from the home.

Q33) A solid toy is in the form of a hemisphere surmounted by a right circular cone. If the height of the cone is 4 cm and diameter of the base is 6 cm calculate:
i) the volume of the toy
ii) surface area of the toy (use π= 3.14)

Q34) A bucket of height 8cm. and made up of copper sheet is in the form of frustrum of a right circular cone with radii of its lower and upper ends as 3 cm and 9 cm respectively.
Calculate :
i) the height of the cone of which the bucket is a part
ii) the volume of water which can be filled in the bucket.
iii) the area of copper sheet required to make the bucket (Leave the answer in terms of π)

Q25. Anil's total annual salary excluding HRA is Rs. 1,96,000. He contributes Rs., 5000 per month in his G.P.F. How much he should invest in N.S.C. to get maximum Rebate? After getting maximum rebate he wants to pay income tax in equal monthly installments. Find the amount which should be deducted per month towards tax from his salary.

Assume the following for calculating income tax :

a) Standard deduction : (i) 40% of the total income subject to a maximum of Rs. 30,000/- in case the total annual income is up to Rs. 100,000.
(ii) Rs. 30,000/- in case the total annual income is from Rs. 100,001 to Rs. 500,000.

b) Rate of income Tax :

Slab Income Tax	
i) Up to Rs. 50,000	**No tax**
ii) From Rs. 50,001 to Rs. 60,000	**10% of the amount exceeding Rs. 50,000**
iii) From Rs. 60,001 to Rs. 1,50,000	**Rs. 1000 + 20% of the amount exceeding Rs. 60,000**
iv) Above Rs. 1,50,000	**Rs. 19,000 + 30% of the amount exceding Rs. 1,50,000**

c) Rebate in income tax:

i) 20% of the amount of saving subject to maximum Rs. 14,000/-, if gross income is upto Rs. 1,50,000

ii) 15% of the amount of saving subject to a maximum of Rs. 10,500/-if gross income is above Rs. 1,50,000 but not exceeding Rs. 500,000