Question Paper 2011 Outside Delhi set 1
CBSE Class 10 Mathematics

Time allowed: 3 hours Maximum marks: 100

General Instructions:

(i) All questions compulsory.

(ii) The question paper consists of 34 questions divided into four sections – A, B, C and D.

(iii) Section A contains 10 questions of 1 mark each, which are multiple choice type questions, Section B contains 8 questions of 2 marks each, Section C contains 10 questions of 3 each and Section D contains 6 questions of 4 marks each.

(iv) There is no overall choice in the paper. However, internal choice is provided in one questions of 2 marks, three questions of 3 marks and two questions of 4 marks.

(v) Use of calculators is not permitted.

Section A

Question number 1 to 10 carry 1 mark each. For each of the question number 1 to 10, four alternative choice have been provided, of which only one is correct. Select the correct choice.

1. The roots of the equation $x^2 - 3x - m(m+3)=0$, where m is a constant, are

(A) m, m + 3

(B) – m, m + 3

(C) m, – (m + 3)

(D) – m, – (m + 3)

Ans. (B) – m, m + 3

2. If the common difference of A.P. is 3, then $a_{20} - a_{15}$ is

(A) 5

(B) 3

(C) 15

(D) 20

Ans. (C) 15

3. In Figure 1, O is the centre of a circle, PQ is a chord and PT is the tangent at P. If $\angle POQ = 70°$, then $\angle$ TPQ is equal to

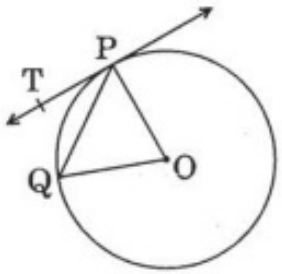


Figure 1

(A) 55°

(B) 70°

(C) 45°

(D) 35°

Ans. (D) 35°

4. In Figure 2, AB and AC are tangents to the circle with centre O such that $\angle BAC = 40°$. Then $\angle$ BOC is equal to

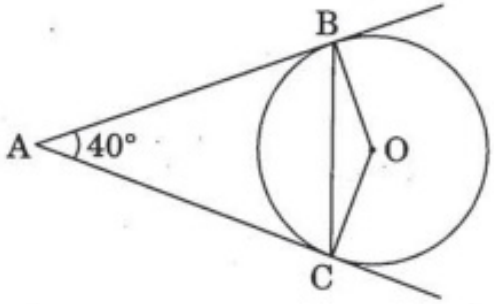


Figure 2

(A) 40°

(B) 50°

(C) 140°

(D) 150°

Ans. (C) 140°

5. The perimeter (in cm) of a square circumscribing a circle of radius a cm, is

(A) 8 a

(B) 4 a

(C) 2 a

(D) 16 a

Ans. (A) 8 a

6. The radius (in cm) of the largest right circular cone that can be cut out from a edge 4.2 cm is

(A) 4.2

(B) 2.1

(C) 8.4

(D) 1.05

Ans. (B) 2.1

7. A tower stands vertically on the ground. From a point on the ground which is 25 m away from the foot of the tower, the angle of elevation of the top of the towers is found to be 45°. Then the height (in meters) of the tower is

(A) $25\sqrt{2}$

(B) $25\sqrt{3}$

(C) 25

(D) 12.5

Ans. (C) 25

8. If $p\left(\frac{a}{2}, 4\right)$ **is the mid-point of the Line segment joining the points A(-6, 5) and B(-2, 3), then the value of a is**

(A) – 8

(B) 3

(C) – 4

(D) 4

Ans. (A) – 8

9. If A and B are the points (-6, 7) and (-1, -5) respectively, then the distance 2AB is equal

to

(A) 13

(B) 26

(C) 169

(D) 238

Ans. (B) 26

10. A card is drawn from a well-shuffled deck of 52 playing cards. The probability that the card will not be in an ace is

(A) $\frac{1}{13}$

(B) $\frac{1}{4}$

(C) $\frac{12}{13}$

(D) $\frac{3}{4}$

Ans. (C) $\frac{12}{13}$

Section B

Question numbers 11 to 18 carry 2 marks each.

11. Find the value of m so that the quadratic equation mx(x – 7) + 49 = 0 has two roots.

Ans. mx (x – 7) + 49 = 0

$mx^2 - 7mx + 49 = 0$

For equal roots $B^2 - 4AC = 0$

$\therefore (-7m)^2 - 4 (m) (49) = 0$

m = 0 and or m = 4

but $m \neq 0$ ∴ m = 4

12. Find how many two-digit number are divisible by 6.

Ans. The number are

12, 18, 24, ---, 96 which is an A.P.

∴ 96 = 12 + (n -1)6

n = 15

13. In figure 3, a circle touches all the four sides of a quadrilateral ABCD whose sides are AB = 6 cm, BC = 9 cm and CD = 8 cm. Find the length of side AD.

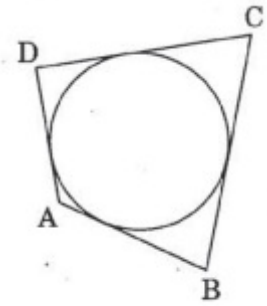


Figure 3

Ans. Let P, Q, R, S be the points of contact

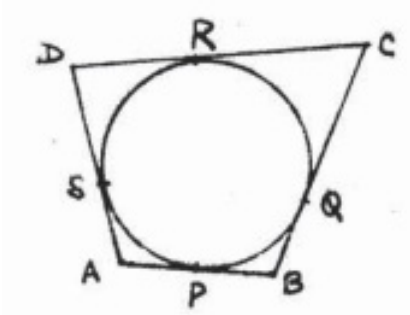
∴ AP = AS

PB = BQ

DR = DS

CR = CQ

∴ (AP + PB) + (DR + CR) = (AS + DS) + (BQ + QC)



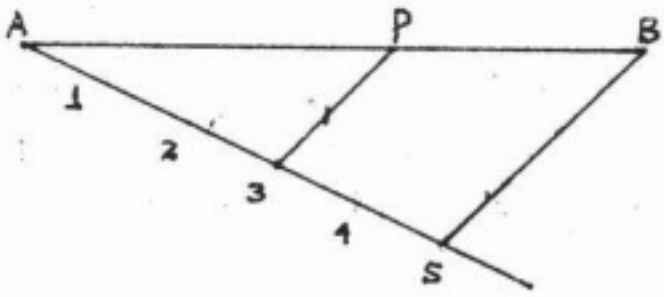
∴ AB + CD = AD + BC

6 + 8 = AD

AD = 5 cm.

14. Draw a line segment AB of length 7 cm. Using ruler and compass, find a point P on AB such that $\frac{AP}{AB}=\frac{3}{5}$.

Ans. For writing (or using) AP : PB = 3:2



For correct construction

15. Find the perimeter of the shaded region in Figure 4, If ABCD is a square of side 14 cm and APB and CPD are semicircles. $\left[\text{Use } \pi=\frac{22}{7}\right]$

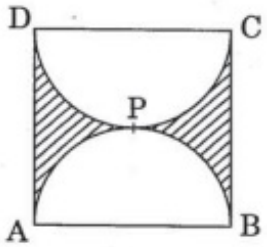


Figure 4

Ans. Required Perimeter = circumference of circle of radius 7cm + length AD and BC.

$$=(2\times\frac{22}{7}\times7+14+14)cm$$

= 44 + 28 = 72 cm.

16. Two cubes each of volume 27 cm^3 are joined end to end to form a solid. Find the surface area of resulting cuboid.

OR

A cone of height 20 cm and radius of base 5 cm is made up of modelling clay. A child reshapes it in the form of a sphere. Find the diameter of the sphere.

Ans. Getting of cube = 3 cm.

Dimensions of the resulting cuboid are 6 cm × 3 cm × 3 cm

∴ Surface area = $2(6\times3 + 3\times3 + 3\times6)$ cm^2

= 90 cm^2

OR

Volume of cone $= \frac{1}{3}\pi(5)^2.20cm^2$

$\therefore \frac{4}{3}\pi r^3 = \frac{1}{3}\pi(5)^2.20cm^2$

∴ Diameter = 10 cm

17. Find the value of y for which the distance between the points A (3, -1) and B(11, y) is 10 units.

Ans. AB $= \sqrt{(11-3)^2+(y+1)^2} = \sqrt{65+y^2+2y}$

$\Rightarrow$ 65 + y^2 + 2y = 100 or y^2 + 2y – 35 = 0

∴ y = -7 or y = 5

18. A ticket is drawn at random from a bag containing ticket of numbered from 1 to 40. Find the probability that the selected ticket has a number which is a multiple of 5.

Ans. Total number of tickets = 40

Number of tickets with number divisible by 5 = 8

∴ Required Probability $= \frac{8}{40}$ or $\frac{1}{5}$

Section C

Question number 19 to 28 carry 3 marks each.

19. Find the roots of the following quadratic equation:

$$x^3 - 3\sqrt{5}x + 10 = 0$$

Ans. $D = (-3\sqrt{5})^2 - 4(1)(10) = 5$

$$\therefore x = \frac{(3\sqrt{5}) \pm \sqrt{5}}{2}$$

$$= 2\sqrt{5},\ \sqrt{5}$$

20. Find an A.P. Whose fourth term is 9 and the sum of its sixth term and thirteenth term is 40.

Ans. a + 3d = 9, a + 5d + a + 12d = 40

Or 2a + 17d = 40

Solving to get a = 3 and d = 2

∴ AP is 3, 5, 7, ...

21. In Figure 5, a triangle PQR is drawn to circumscribe a circle of radius 6 cm such that the segment OT and TR into which QR is divided by the point of contact T, are of length 12 cm and 9 cm respectively. If the area of $\triangle$PQR = 189 cm^2, then find the length of sides PQ and PR.

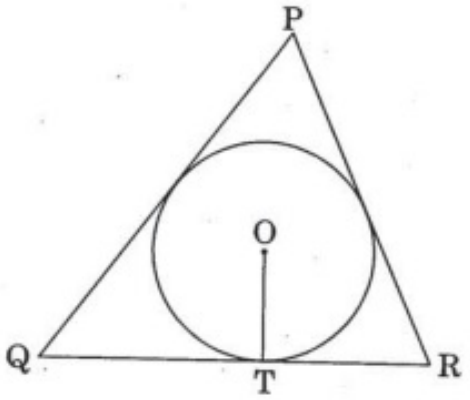
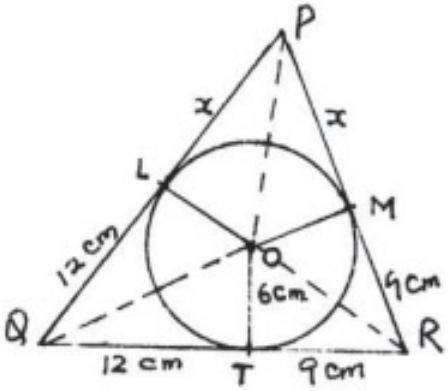


Figure 5

Ans. Let PL = PM = x, also, QL = 12 cm and RM = 9 cm



$$\therefore \Delta PQR = \frac{1}{2}(PQ + QR + PR).OT = 189$$

$$\Rightarrow \frac{1}{2}(2x + 42)6 = 189 \text{ or } 2x + 42 = 63$$

$\Rightarrow$ 2x = 21 or x = 10.5

$\therefore$ PQ = 22.5 cm and PR = 19.5 cm

22. Draw a pair of tangents to a circle of radius 3 cm, which are inclined to each other at an angle of 60°.

OR

Draw a right triangle in which the sides (other than hypotenuse) are of lengths 4 cm and 3 cm. Then construct another triangle. Whose sides are $\frac{3}{5}$ times, the corresponding sides of the given triangle.

Ans.

23. A chord of a circle of radius 14 cm subtends an angle of 120° at the centre. Find the area of the corresponding minor segment of the circle. $\left[\text{Use } \pi=\frac{22}{3} \text{ and } \sqrt{3}=1.73\right]$

Ans. Area of segment $= \pi(14)^2 \times \frac{120}{360} - (14)^2 \times \sin 60° \times \cos 60°$

$$= \frac{22}{7} \times 14 \times 14 \times \frac{1}{3} - (196) \times \frac{\sqrt{3}}{2} \times \frac{1}{2} = \frac{616}{3} - 49(1.73) cm^2$$

= 205.33 – 84.77 = 120.56 cm^2

24. An open metal bucket is in the shape of a frustum of a cone of height 21 cm with radii of the lower and upper ends as 10 cm and 20 cm respectively. Find the cost of milk which can completely fill the bucket at Rs. Per little. $\left[\text{Use } \pi=\frac{22}{3}\right]$

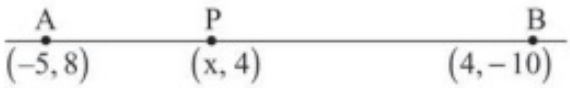
Ans. Volume $= \frac{1}{3} \times \frac{22}{7} \times 21\left[(20)^2 + (10)^2 + 20 \times 10\right] cm^2$

$= 22 \times 700 = 15400 cm^2 = 15.4$ liters

Cost = 15.4 × 30 = Rs. 462

25. Point P (x, 4) lies on the line segment joining the points A (-5, 8) and B (4, -10). Find the ratio in which point p divides the line segment AB. Also find the value of x.

Ans.



Let P divide AB in the ratio K:l

$$\therefore\ x = \frac{4k-5}{k+1},\ 4 = \frac{-10k+8}{k+1}$$

$$\Rightarrow\ 4k+4 = -10k+8 \quad \text{or} \quad 14k = 4 \ \Rightarrow\ k = 2/7 \quad \therefore\ \text{Ratio is } 2:7$$

$$\therefore\ x = \frac{\frac{8}{7}-5}{\frac{2}{7}+1} = -\frac{27}{9} = -3$$

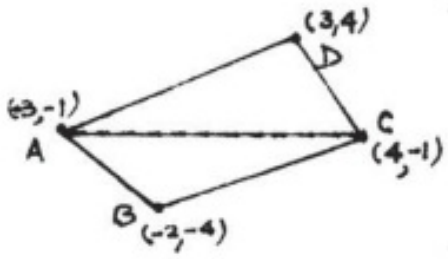
26. Find the area of the quadrilateral ABCD, whose vertices are A(-3, -1), B(-2, -4), C(4, -1) and D (3, 4)

OR

Find the area of the triangle of formed by joining the mid-points of the sides of the triangle whose vertices are A (2, 1), B (4, 3) and C (2, 5).

Ans. Area $\Delta ABC = \frac{1}{2}[-3(-4+1)-2(-1+1)+4(-1+4)]$

$= \frac{1}{2}[9+0+12] = \frac{21}{2} = 10.5$ sq.U.



Area $\therefore ACD = \frac{1}{2}[-3(-1-4)+4(4+1)+3(-1+1)]$

$= \frac{1}{2}[15+20+0] = \frac{35}{2} = 17.5$ sq.U.

OR

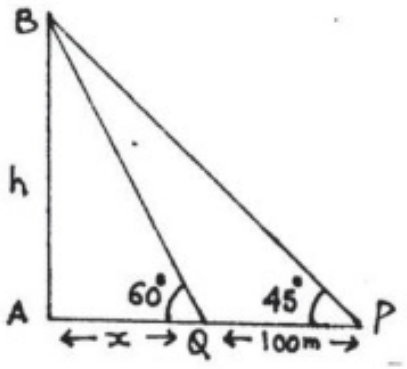
Mid-point are (3, 2), (3, 4) and (2, 3)

Area of $\Delta = \frac{1}{2}[3(4-3)+3(3-2)+2(2-4)]$

$= \frac{1}{2}[3+3-4]$ = 1 sq.U.

27. From the top of a vertical tower, the angle of depression of two cars, in the same straight line with the base of the tower, at an instant are founded to be 45° and 60°. If the cars are 100 m apart of the dice, whose product is 12.

Ans. Let height of tower (AB) be h.m.



$$\therefore \frac{h}{x} = \tan 60^\circ = \sqrt{3} \Rightarrow x = \frac{h}{\sqrt{3}}$$

$$\frac{h}{100+x} = \tan 45^\circ = 1 \Rightarrow 100 + x = h$$

$$\Rightarrow h - \frac{h}{\sqrt{3}} = 100 \Rightarrow h = \frac{100\sqrt{3}}{\sqrt{3}-1} = 50\sqrt{3}(\sqrt{3}+1)$$

28. Two dice are rolled once. Find the probability of getting such number on the two dice, whose product is 12.

OR

A box contains 80 discs which are numbered from 1 to 80. If one disc is drawn at random the box, find the probability that it bears a perfect square number.

Ans. Total number of possible outcomes = 36

No. of pairs whose product is 12

{(2, 6), (6, 2), (3, 4), (4, 3)} = 4

$\therefore$ Required Probability $= \frac{4}{36} = \frac{1}{9}$

OR

Total number of discs = 80

Number of discs with a perfects square = 8

{1, 4, 9, 16, 25, 36, 49, 64}

$\therefore$ Prob $= \frac{8}{80} = \frac{1}{10}$

Section D

Question numbers 29 to 34 carry 4 marks each.

29. prove that the tangent an any point of a circle is perpendicular to the radius through the point of contact.

Ans.

30. The first and the last terms of an A.P. are 8 and 350 respectively. If its common difference is 9, how many terms are there and what is their sum?

OR

How many multiples of 4 lie between 10 and 250? Also find their sum.

Ans. a = 8, a_n = 350 and d = 9

$\therefore$ 350 = 8 + (n-1) 9

n = 39

$$S_{39} = \frac{39}{2}[8 + 350] = 39 \times 179 = 6981$$

OR

Number are 12, 16, 20, ..., 248

$\therefore 248 = 12++(n-1)\,4$

$n = 60$

$S_{60} = 30[12+248] = 30\times 260 = 7800$

31. A train travels 180 km at a uniform speed. If the speed had been 9 km/hour more, it would have taken 1 hour less for the same journey. Find the speed of the train.

OR

Find the roots of the equation $\frac{1}{2x-3}+\frac{1}{x-5}=1, x\neq\frac{3}{2},5.$

Ans. Let speed of train be x km/h

$\Rightarrow \frac{180}{x}-\frac{180}{x+9}=1$

$\Rightarrow x(x+9)=180\times 9$ Or $x^2 + 9x - 1620 = 0$

Solving to get x = - 45, 36

$\therefore$ Speed of train= 36 km/hr.

OR

$\frac{1}{2x-3}+\frac{1}{x-5}=1 \Rightarrow (2x-3)(x-5) = (3x-8)$

$\therefore 2x^2 - 10x - 3x + 15 - 3x + 8$ or $2x^2 - 16x + 23 = 0$

Solving to get $x=\frac{8+3\sqrt{2}}{2}, \frac{8-3\sqrt{2}}{2}$

32. In figure 6, three circle each of radius 3.5 cm are drawn in the such a way that each of the touches the other two. Find the area enclosed. Between these three circle (shaded region). $\left[\text{Use } \pi=\frac{22}{3}\right]$

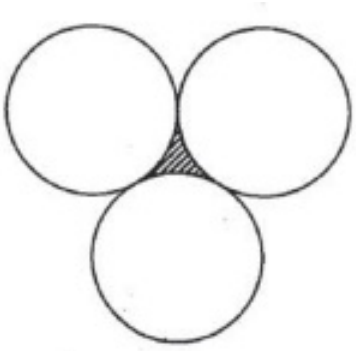
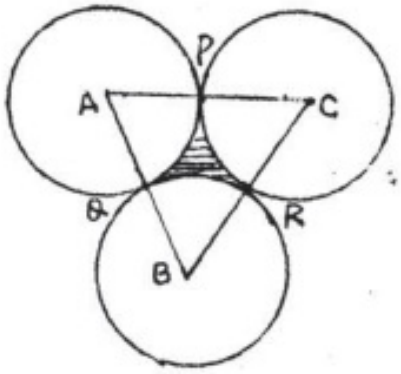


Figure 6

Ans. From figure, AB = BC = AC = 7cm



$\therefore$ Area of $\Delta ABC = \frac{\sqrt{3}(7)^2}{4} = \frac{49(1.73)}{4}$

= 21.19 cm^2

Area of 3 sectors $= 3 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{60}{360} = \frac{77}{4} cm^2$

= 19.25 cm^2

$\therefore$ Area of shaded region = 21.19 – 19.25 = 1.94 cm^2

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

Ans. Volume of pond $= 50 \times 40 \times \frac{21}{100} m^3$

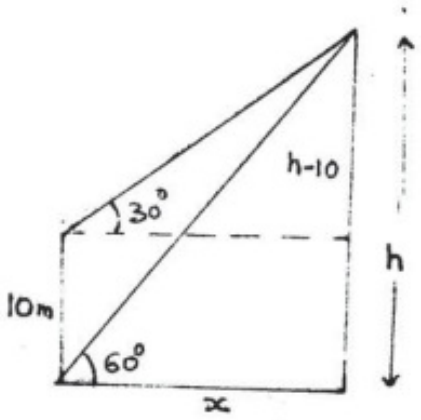
Volume of water through the pipe in 1 hr. $= 15000 \times \frac{22}{7} \times \frac{7}{100} \times \frac{7}{100} m^3$

$\therefore$ Time (in hrs.) $= \frac{50 \times 44 \times 21 \times 7 \times 100 \times 100}{15000 \times 22 \times 100 \times 7 \times 7}$

= 2 hours.

34. The angle of elevation of the top of a vertical tower from a point on the ground is 60°. From another point 10 m vertically above the first, its angle of elevation is 30°. Find the height of the tower.

Ans.



$\frac{h}{x} = \tan 60^\circ = \sqrt{3}$

$\Rightarrow x = \frac{h}{\sqrt{3}}$ ...(1)

$\therefore \quad x = \sqrt{3}(h-10)$ .....(ii)

$\frac{h}{\sqrt{3}} = \sqrt{3}(h-10) \Rightarrow h = 3h - 30$

$2h = 30 \Rightarrow h = 15$ m