NATIONAL BOARD OF SCHOOL EDUCATION

Sample Question Paper

Mathematics

Time : 3 Hours **Maximum Marks :** 100

Note : 1. Question Numbers (1–16) are Multiple Choice Questions. Each question carries one mark. For each question, four alternative choices are given, of which only one is correct. You have to select the correct alternative and indicate it in the box provided against each question by writing A, B, C or D as the case may be.

2. Question Numbers (17–26) carry 3 marks each.

3. Question Numbers (27–34) carry 5 marks each.

4. Question Numbers 35 and 36 are of 7 marks each.

5. All Questions are compulsory.

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1. The sum of 2^0, 3^0 and 4^0 is :

(A) 0 (B) 1

(C) 3 (D) 9 ☐

2. In terms of power of prime numbers, 360 can be written as;

(A) $2 \times 3 \times 5$ (B) $2^2 \times 3^2 \times 5$

(C) $8 \times 9 \times 5$ (D) $3^2 \times 2^3 \times 5^1$ ☐

3. The HCF of 12 and 28 is :

(A) 2 (B) 3

(C) 4 (D) 36 ☐

4. The square root of 0.04 is :

(A) 0.002 (B) 0.02

(C) 0.2 (D) 0.16 ☐

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5. A person took a loan of Rs 1500 from his employer for 3 months at 12% per annum simple interest. The amount he has to return is :

(A) Rs 45 (B) Rs 1500

(C) Rs 1545 (D) Rs 1455 ☐

6. At a book stall, a discount of x% was allowed on each book. A book was purchased by a customer for Rs y, its marked price was :

(A) Rs $\frac{100y}{100-x}$ (B) Rs $\frac{100y}{100+x}$

(C) Rs $\frac{100y}{x}$ (D) Rs xy ☐

7. A wholesaler allows a discount of 20% on the list price to a retailer. The retailer sells at 8% discount on the list price. The profit percent of the retailer is :

(A) 20% (B) 15%

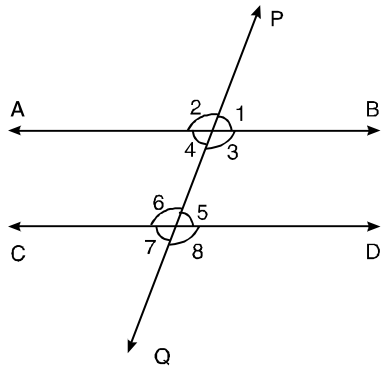
(C) 12% (D) 8% ☐

8. A man purchased a bundle of cloth, with a list price of Rs 20000, and a sales tax of 10% on it. He paid Rs 25000 to the shopkeeper. The money he got back was :

(A) Rs 22000 (B) Rs 15000

(C) Rs 3000 (D) Rs 2000 ☐

9. A transversal PQ intersects two lines AB and CD as shown in the adjacent figure. A pair of alternate angles is :



(A) 1 and 2 (B) 1 and 4

(C) 2 and 3 (D) 4 and 5 ☐

10. In ΔABC, the bisector $\angle A$ is same as the median through A. ΔABC is :

(A) isosceles with AB = BC (B) a right angled triangle

(C) isosceles with AB = AC (D) isosceles with BC = AC ☐

11. The area of a circle is 314 cm^2. If $\pi = 3.14$, then its diameter is :

(A) 100 cm (B) 50 cm

(C) 20 cm (D) 10 cm ☐

12. The total surface area of a closed right circular cylinder of radius 3.5 m and height 7 m is :

(A) 77 m^2 (B) 154 m^2

(C) 231 m^2 (D) 308 m^2 ☐

13. If $\tan\theta = \frac{3}{4}$, then $\sin\theta$ is :

(A) $\frac{4}{5}$ (B) $\frac{3}{5}$

(C) $\frac{4}{3}$ (D) $\frac{5}{4}$ ☐

14. If $\sin\theta + \cos\theta = \sqrt{2}\cos\theta$, the value of $\tan\theta$ is :

(A) $\sqrt{2}$ (B) 1

(C) $\sqrt{2}-1$ (D) $\sqrt{2}+1$ ☐

15. Cumulative frequency of a class in a frequency distribution table is :

(A) total of all frequencies

(B) sum of all frequencies prior to that class

(C) sum of all frequencies upto the class

(D) sum of frequencies after the class ☐

16. The cumulative frequency of the last class of a frequency distribution is equal to :

(A) frequency of last class

(B) frequency of first class

(C) frequency of the class prior to the last class

(D) total of all frequencies

17. Simplify : $\sqrt{\frac{3125}{343}}$

18. Expand : $\left(2x^2 - \frac{1}{x}\right)^2$

19. Factorize : $1 - x^4y^4$

20. Express $-0.\overline{3}$ in the form $-\frac{p}{q}$ where p and q are natural numbers.

21. The sides of a triangle are in the ratio 1 : 1.5 : 2. If the perimeter is 13.5 cm, find the length of each side.

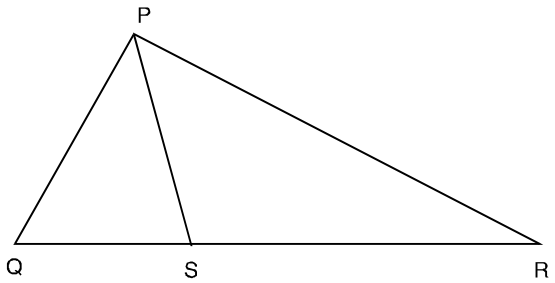
22. The entries in the pass book of a saving bank account holder in a particular year are as below :

Date	Particulars	Amount withdrawn Rs P	Amount Deposited Rs P	Balance Rs P
1.7.2002	B/F	—	—	20,000.00
22.7.2002	By cheque	—	10,000.00	30,000.00
30.7.2002	To cheque	12,000.00	—	18,000.00
20.9.2002	By cheque	—	8,000.00	26,000.00
10.10.2002	By cheque	—	10,000.00	36,000.00
9.11.2002	By cash	—	8,000.00	44,000.00
24.12.2002	To cheque	33,000.00	—	11,000.00

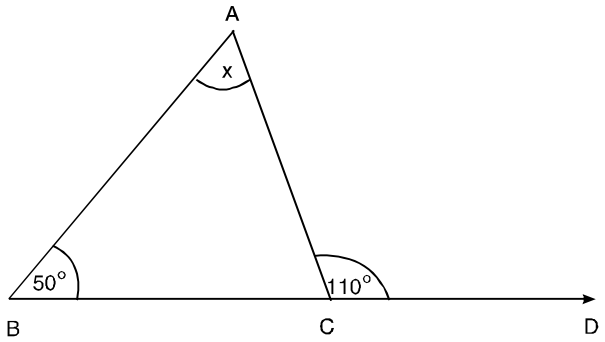
Find the principle on which interest is payable for one month.

23. In the given figure, S is any point on QR. Prove that

PQ + QR + RP > 2PS



24. In the given figure, find the value of x.



25. The volume of a cube is 1728 cubic cm. Find its total surface area.

26. Evaluate : $\frac{\cos^2 32° + \cos^2 58°}{\sin^2 59° + \sin^2 31°}$

27. Find the sum

$$\frac{1}{2} + \frac{1}{6} + \frac{1}{12} + \ldots + \frac{1}{156}$$

28. Prove that : $\frac{1}{1 + x^{b-a} + x^{c-a}} + \frac{1}{1 + x^{a-b} + x^{c-b}} + \frac{1}{1 + x^{b-c} + x^{a-c}} = 1$

29. A salesman sells articles at Rs 5 each. He sells 1600 articles in the first week. In the second week, he sells 15% more than in the first week and in the third week, he sells 10% more than in the second week.

Calculate the amount received by the salesman if he gets 12% of the price of each article on the first 1000 sold and 15% of the price of each article he sells in excess of 1000.

30. Prove that the medians drawn on equal side of an isosceles triangle are equal.

31. Draw a ΔABC in which base BC = 4 cm, $\angle B = 60°$ and $\angle C = 45°$

OR

(For visually impaired learners only)

Write steps of construction of a ΔABC in which base BC = 4 cm, $\angle B = 60°$ and $\angle C = 45°$.

32. A square flower bed is prepared in the centre of a square field, of side 40 m, leaving a gravel path all around the bed. The total cost of laying the flower bed and gravels at the path at the rate of Rs 2.75 and Rs 1.50 per sq. m respectively is Rs 4020. Find the width of the path.

OR

(For visually impaired learners only)

A square flower bed is prepared in the centre of a square field of side 40 m, leaving a path of width 2 m around it. Find the total cost of laying the flower bed and the path at the rate of Rs 2.75 and 1.50 sq. m respectively.

33. Three coins are tossed

(i) Write all possible outcomes

(ii) Find the probability of getting atleast two head.

34. A survey on causes of strikes in factories gave the following results :

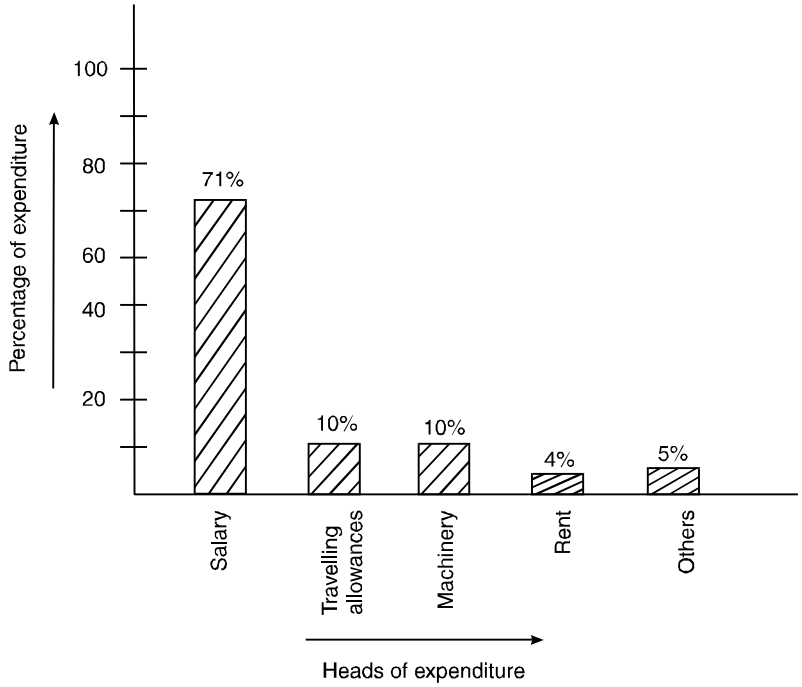
Economic	32%
Political	28%
Rivalry	10%
Accidents	20%

Draw a bar chart to a represent the above data.

OR

(For visually impaired learners only)

The expenditure of a company under different heads are shown by the following bar chart. Read the bar chart and answer the following :



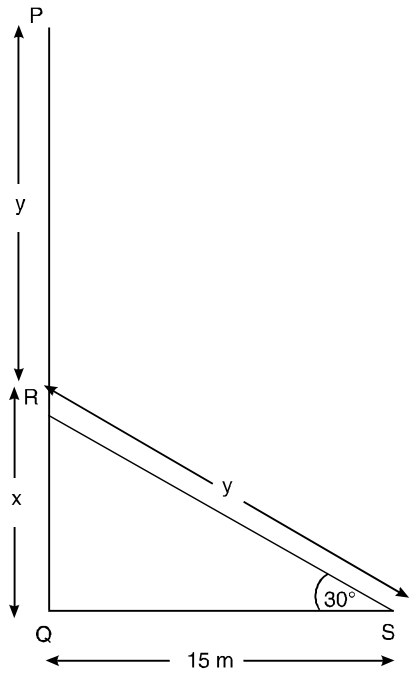
(i) what was the expenditure on travelling allowances given ?

(ii) what was the total expenditure other than salary ?

(iii) what was the minimum expenditure ?

35. Prove that parallelograms on equal (or same) bases and between the same parallels are equal in area.

36. A pole PQ being broken at R by the wind. Its top P strikes the ground at S at an angle of 30° at a distance of 15 m from the foot Q of the pole. Find the original height PQ, of the pole.



Marking Scheme

1. C	**2.** D	**3.** C	**4.** C	
5. C	**6.** A	**7.** B	**8.** C	
9. D	**10.** C	**11.** C	**12.** C	
13. B	**14.** C	**15.** C	**16.** D	$1 \times 16 = 16$

17. $\sqrt{\frac{3125}{243}} = \sqrt{\frac{5\times5\times5\times5\times5}{3\times3\times3\times3\times3}}$ 1

$= \frac{5\times5\sqrt{5}}{3\times3\sqrt{3}}$ 1

$= \frac{25\sqrt{5}}{9\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ $\frac{1}{2}$

$= \frac{25\sqrt{15}}{27}$ $\frac{1}{2}$

18. $\left(2x^2 - \frac{1}{x}\right)^2 = (2x^2)^2 - 2.2x^2.\frac{1}{x} + \left(\frac{1}{x}\right)^2$ 2

$= 4x^4 - 4x + \frac{1}{x^2}$ 1

19. $1 - x^4y^4 = 1 - (x^2y^2)^2$ 1

$= (1 - x^2y^2)\,(1 + x^2y^2)$ 1

$= (1 - xy)\,(1 + xy)\,(1 + x^2y^2)$ 1

20. Let $x = -0.\overline{3}$

$= -0.3333$ ....(i) 1

$\therefore$ $10x = -3.333$ ....(ii) 1

(ii) – (i) gives,

$$9x = -3$$

or $$x = -\frac{1}{3}$$ 1

21. If the perimeter is 4.5 cm, first side = 1 cm

If the perimeter is 13.5 cm, first side = $\frac{1}{4.5} \times 13.5 = 3$ cm 1

Second side = $\frac{1.5}{4.5} \times 13.5 = 4.5$ cm 1

Third side = (13.5 – 7.5) cm = 6 cm 1

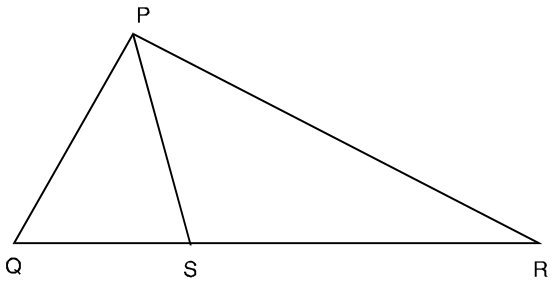
22. Monthwise principal on which interest in payable :

July.	18000
Aug.	18000
Sept.	18000
Oct.	36000
Nov.	44000
Dec.	11000
Total	1,45,000

(1 + 1)

Here, P = Rs 145000 1

23.



PQ + QS > PS ...(i) $\frac{1}{2}$

also PR + SR > PS ...(ii) $\frac{1}{2}$

adding (i) & (ii)

$PQ + QS + PR + SR > 2PS$ 1

or $PQ + QR + RP > 2PS$ 1

24. $110° + \angle ACB = 180°$ $\frac{1}{2}$

or $\angle ACB = 70°$ 1

Also $\angle x + 50° + 70° = 180°$ $\frac{1}{2}$

or $x = 60°$ 1

25. Let the edge of the cube is x cm

$\therefore$ $x^3 = 1728$ 1

or $x^3 = 12 \times 12 \times 12$

or $x = 12$ $\frac{1}{2}$

$\therefore$ edge of the cube is 12 cm

Hence the total surface area = $6 x^2$ $\frac{1}{2}$

$= 6 \times 12 \times 12 \text{ cm}^2$

$= 864 \text{ cm}^2$ 1

26. $\frac{\cos^2 32° + \cos^2 58°}{\sin^2 59° + \sin^2 31°} = \frac{\cos^2 32° + \cos^2 (90° - 32°)}{\sin^2 (90° - 31°) + \sin^2 31°}$ 1

$= \frac{\cos^2 32° + \sin^2 32°}{\cos^2 31° + \sin^2 31°}$ 1

$= \frac{1}{1}$

$= 1$ 1

27. We have to find

$\frac{1}{2} + \frac{1}{6} + \frac{1}{12} + ... + \frac{1}{156}$

$$\frac{1}{2} = 1-\frac{1}{2}$$

$$\frac{1}{6} = \frac{1}{2}-\frac{1}{3}$$

$$\frac{1}{12} = \frac{1}{3}-\frac{1}{4}$$

$$\vdots$$

$$\frac{1}{156} = \frac{1}{12}-\frac{1}{13}$$

3

$$\therefore \frac{1}{2}+\frac{1}{6}+\frac{1}{12}+.....+\frac{1}{156} = \left(1-\frac{1}{2}\right)+\left(\frac{1}{2}-\frac{1}{3}\right)+\left(\frac{1}{3}-\frac{1}{4}\right)+.....+\left(\frac{1}{12}-\frac{1}{13}\right)$$ 1

$$= 1-\frac{1}{13} = \frac{12}{13}$$ 1

28. $$\frac{1}{1+\frac{x^b}{x^a}+\frac{x^c}{x^a}}+\frac{1}{1+\frac{x^a}{x^b}+\frac{x^c}{x^b}}+\frac{1}{1+\frac{x^b}{x^c}+\frac{x^a}{x^c}}$$ 2

$$= \frac{x^a}{x^a+x^b+x^c}+\frac{x^b}{x^a+x^b+x^c}+\frac{x^c}{x^a+x^b+x^c}$$ 1

$$= \frac{x^a+x^b+x^c}{x^a+x^b+x^c}$$ 1

$$= 1$$ 1

29. In the Ist week, the number of articles sold = 1600

In the 2nd week, the number of articles sold = 1600 + 15% of 1600 = 1840 1

In the 3rd week, the number of articles sold = 1840 + 10% of 1840 = 2024 1

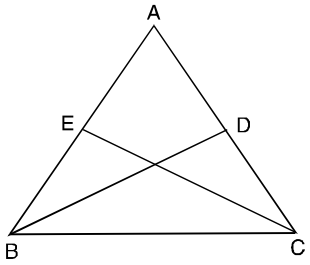
Amount received by the salesman

$$= \text{Rs } \frac{12}{100}(5000)+\frac{15}{100}(4464\times 5)$$ 1 + 1

$$= \text{Rs } 600 + 3348$$

$$= \text{Rs } 3948$$ 1

30. In triangle ABC, AB = AC



$\therefore$ $\angle ABC = \angle ACB$ 1

i.e. $\angle EBC = \angle DCB$

Also $\frac{1}{2}AB = \frac{1}{2}AC$

$BE = CD$ 1

In ΔBCD and ΔBCE

$BC = BC$

$\angle DCB = \angle EBC$ 1

$CD = BE$

$\therefore$ $\Delta BCD \cong \Delta CBE$

$\therefore$ $BD = CE$ 2

31. For correct construction 5

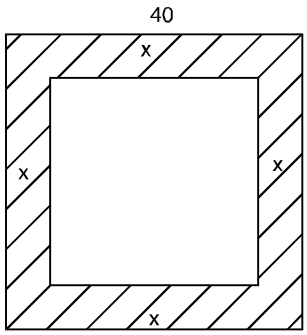
OR

(For visually impaired learners only)

Steps of construction

1. Draw a line segment BC = 4 cm
2. At B, draw $\angle CBX = 60°$
3. At C, draw $\angle BCY = 45°$ intersecting BX at A.
4. Join AB and AC.
5. ABC is the required triangle. 5

32.



Let the width of the path = x m

Area of flower bed = $(40 - 2x)^2$ $\frac{1}{2}$

Area of path $= (160x - 4x^2)$ $\frac{1}{2}$

$\therefore (40 - 2x)^2 \times (2.75) + (160x - 4x^2)(1.50) = 4020$ 1

or $(40 - 2x)^2 \cdot \frac{11}{4} + (160x - 4x^2)\frac{3}{2} = 4020$

or $(20 - x)^2 . 11 + (80x - 2x^2) .3 = 4020$

or $4400 + 11x^2 - 440x + 240x - 6x^2 = 4020$ 2

or $x^2 - 40x + 76 = 0$

or $(x - 38)(x - 2) = 0$

or $x = 2, 38$ $\frac{1}{2}$

Rejecting x = 38, we have x = 2

i.e. the width of the path = 2 m $\frac{1}{2}$

OR

(For visually imapaired learners only)

Area of the square = 1600 sq. m $\frac{1}{2}$

width of the path = 2 m

Area of the flower bed $= 36^2$ sq. m

= 1296 sq. m 1

Area of the path = 1600 – 1296 = 304 sq. m 1

Cost of lying flower bed = Rs 1296 × 2.75

= Rs 3564 1

Cost of lying flower on the path = Rs 304 × 1.50

= Rs 456 1

$\therefore$ Total cost = Rs 4020 $\frac{1}{2}$

33. (i) Possible outcomes are

HHH, HHT, HTH, THH, HTT

THT, TTH, TTT 2

$\therefore$ Total number of possible outcomes = 8 $\frac{1}{2}$

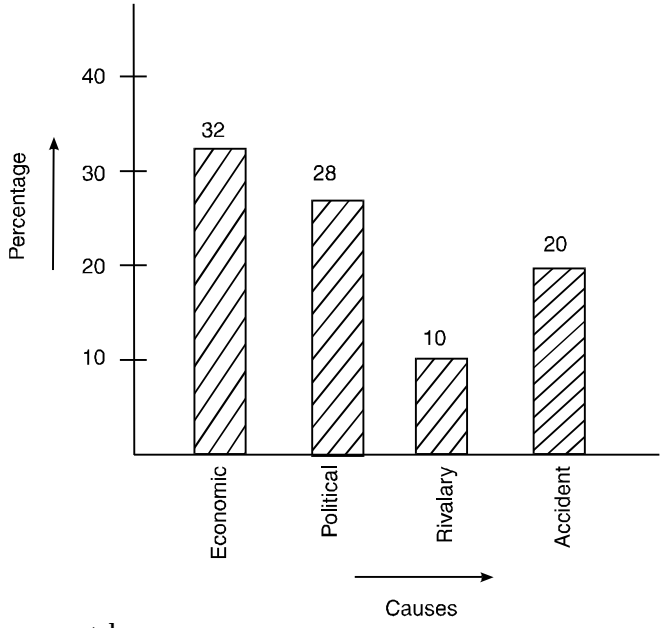
(ii) Favourable outcomes are

HHH, HHT, HTH, THH 1

$\therefore$ Number of favourable outcomes = 4 $\frac{1}{2}$

$\therefore$ Required probability = $\frac{4}{8} = \frac{1}{2}$ 1

34.



1 mark for each correct bar 1 x 4 = 4

For correct axis and making 1

OR

(For visually impaired leaners only)

(i) 10% 1

(ii) (10 + 10 + 4 + 5)% = 29% 3

(iii) 4% 1

35.Given : Parallelograms ABCD and PBCQ stand on the same base BC and between the same parallels BC and AQ. 1

To prove : Area (ABCD) = Area (BCQP) 1

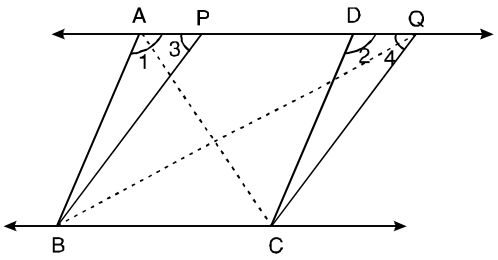
Proof : Consider two triangles ABP and DCQ,

we have AB = DC (Opposite sides of a parallelogram)

$\angle 1 = \angle 2$ (Corresponding Angles)

$\angle 3 = \angle 4$ 2

$\therefore$ $\Delta ABP \cong \Delta DCQ$ AAS



$\therefore$ Area (ΔABP) = Area (ΔDCQ) ...(i)

Now, Area ($||^{gm}$ ABCD) = Area(ΔABP) + Area(trap. BCDP) ...(ii) 1

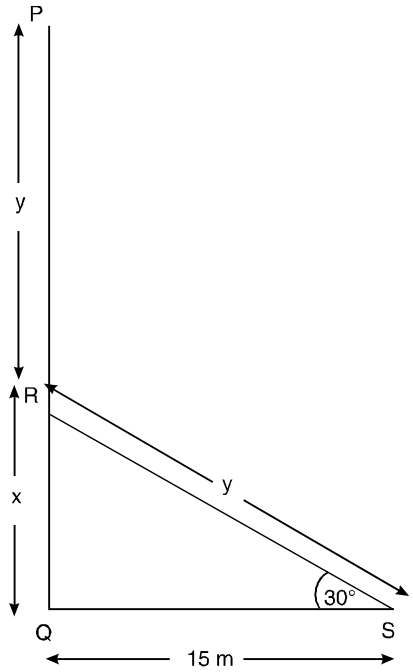
Area ($||^{gm}$ BCQP) = Area (ΔCQD) + Area(trap. BCDP) ...(iii) 1

From (i), (ii) and (iii), we get

Area ($||^{gm}$ ABCD) = Area ($||^{gm}$ BCQP) 1

Note : $||^{gm}$ and trap. stands for parallelogram and trapezium respectively.

36.



Let RP strikes the ground at S

Let QR = x and SR = y

and QS = 15 m (Given) 1

In ΔRQS,

$$\frac{x}{15} = \tan 30° \qquad \frac{1}{2}$$

or $$x = 15 \tan 30° = 5\sqrt{3} \text{ m} \qquad 1$$

Again $$\frac{15}{y} = \cos 30° \qquad 1$$

$$\frac{15}{y} = \frac{\sqrt{3}}{2} \qquad \frac{1}{2}$$

or $$y = 10\sqrt{3} \qquad \frac{1}{2}$$

$\therefore$ $$PQ = QR + RP$$

$$= QR + SR \qquad [Q\ SR = RP]$$

$$= x + y \qquad \frac{1}{2}$$

$$= 15\sqrt{3} \text{ m} \qquad 1$$

$$= 15 \times 1.732 \text{ m}$$

$$= 25.98 \text{ m} \qquad 1$$