1. Find the coordinates of a point A, where AB is diameter of a circle whose centre is (2, -3) and B is the point (1,4).
2. For what values of k, the roots of the equation $x^2 + 4x + k=0$ are real?

OR

Find the value of k for which the roots of the equation $3x^2 - 10x + k = 0$ are reciprocal of each other.

3. Find A if tan 2A = cot (A -24°)

OR

Find the value of $(\sin^2 33° + \sin^2 57°)$

4. How many two digits numbers are divisible by 3?
5. In Fig. 1, DE || BC, AD = 1 cm and BD = 2 cm. What is the ratio of the ar(△△ ABC) to the ar(△△ADE)?

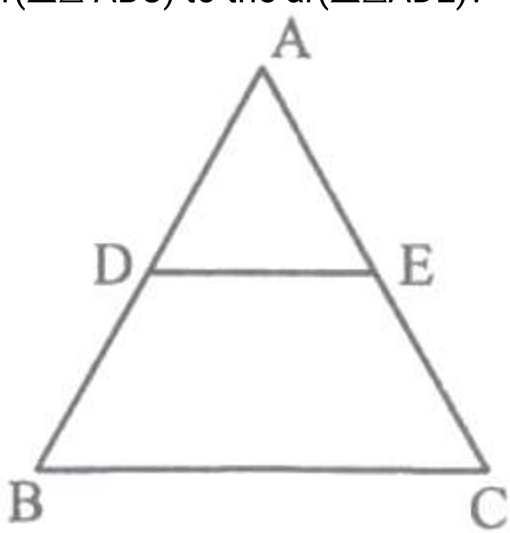


Fig. 1

6. Find a rational number between $2-\sqrt{2}$ and $3-\sqrt{3}$.

SECTION - B

7. Find the HCF of 1260 and 7344 using Euclid's algorithm.

OR

Show that every positive odd integer is of the form (4q+1) or (4q+3), where q is some integer.

8. Which term of the AP 3, 15, 27, 39, ... will be 120 more than its 21st term?

OR

If S_n, the sum of first n terms of an AP is given by $S_n = 3n^2 - 4n$, find the nth term.

9. Find the ratio in which the segment joining the points (1, -3) and (4, 5) is divided by x-axis? Also find the coordinates of this point on x-axis.
10. A game consists of tossing a coin 3 times and noting the outcome each time. If getting the same result in all the tosses is a success, find the probability of losing the game.
11. A die is thrown once. Find the probability of getting a number which (i) is a prime number (ii) lies between 2 and 6.
12. Find c if the system of equations cx+ 3y +(3 - c) = 0; 12x + cy - c = 0 has infinitely many solutions?

SECTION - C

13. Prove that $2-\sqrt{2}$ is an irrational number.
14. Find the value of k such that the polynomial $x^2 -(k + 6)x + 2(2k - 1)$ has sum of its zeros equal to half of their product.
15. A father's age is three times the sum of the ages of his two children. After 5 years his age will be two times the sum of their ages. Find the present age of the father.

OR

A fraction becomes 1313 when 2 is subtracted from the numerator and it becomes 1212when 1 is subtracted from the denominator. Find the fraction.

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

OR

The line segment joining the points A(2, 1) and B(5, -8) is trisected at the points P and Q such that P is nearer to A. If P also lies on the line given by 2x - y + k = 0, find the value of k.

17. Prove that $(\sin\theta+\mathrm{cosec}\,\theta)^2+(\cos\theta+\sec\theta)^2=7+\tan^2\theta+\cot^2\theta$ (sinθ+cosecθ)2+(cosθ+secθ)2=7+tan2θ+cot2θ

OR

Prove that (1 + cotA - cosec A) (1 + tan A + sec A) = 2

18. In Fig. 2, PQ is a chord of length 8 cm of a circle of radius 5 cm and centre O. The tangents at P and Q intersect at point T. Find the length of TP.

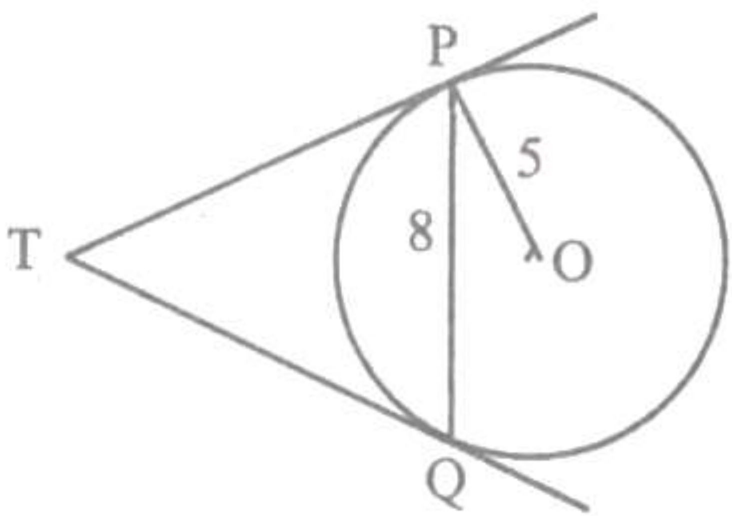


Fig. 2

19. In Fig. 3, $\angle\angle ACB = 90^\circ$ and $CD \perp\perp AB$, prove that $CD^2 = BD \times\times AD$.

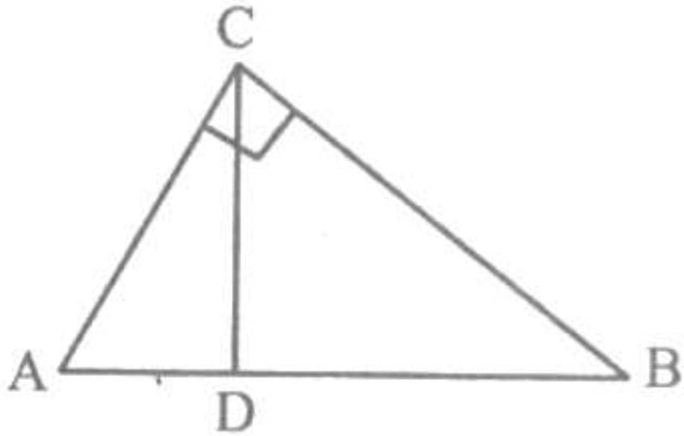


Fig. 3

OR

If P and Q are the points on side CA and CB respectively of A ABC, right angled at C, prove that $(AQ^2 + BP^2) = (AB^2 + PQ^2)$.

20. Find the area of the shaded region in Fig. 4, if ABCD is a rectangle with sides 8 cm and 6 cm and O is the centre of circle. (Take $\pi\pi = 3.14$)

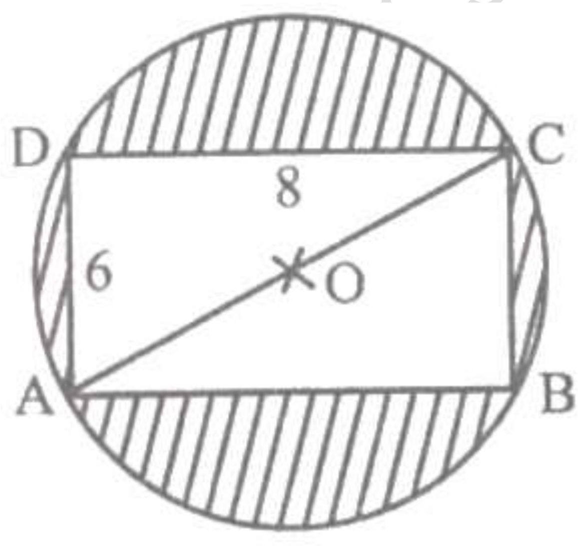


Fig. 4

21. Water in a canal, 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/hour. How much area will it irrigate in 30 minutes; if 8 cm standing water is needed?

22. Find the mode of the following frequency distribution.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	8	10	10	16	12	6	7

SECTION - D

23. Two water taps together can fill a tank in 178178 hours. The tap with longer diameter takes 2 hours less than the tap with smaller one to fill the tank separately. Find the time in which each tap can fill the tank separately. Or A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours, it can go 40 km upstream and 55 km downstream. Determine the speed of the stream and that of the boat in still water.

24. If the sum of first four terms of an AP is 40 and that of first 14 terms is 280. Find the sum of its first n terms.

25. Prove that sinA−cosA+1sinA+cosA−1=1secA−tanAsinA−cosA+1sinA+cosA−1=1secA−tanA.

26. A man in a boat rowing away from a light house 100 m high takes 2 minutes to change the angle of elevation of the top of the light house from 60° to 30°. Find the speed of the boat in metres per minute. [Use 3–√3 = 1.732]

OR

Two poles of equal heights are standing opposite each other on either side of the road, which is 80 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles and the distances of the point from the poles.

27. Construct a △△ABC in which CA = 6 cm, AB = 5 cm and ∠∠BAC = 45°. Then construct a triangle whose sides are of the corresponding sides of △△ABC.

28. A bucket open at the top is in the form of a frustum of a cone with a capacity of 12308.8 cm^3. The radii of the top and bottom of circular ends of the bucket are 20 cm and 12 cm respectively. Find the height of the bucket and also the area of the metal sheet used in making it.

29. Prove that in a right angle triangle, the square of the hypotenuse is equal the sum of squares of other two sides.

30. If the median of the following frequency distribution is 32.5. Find the values of f_1 and f_2.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
Frequency	f_1	5	9	12	f_2	3	2	40

31. **OR**

32. The marks obtained by 100 students of a class in an examination are given below.

Marks	**No. of Students**
0-5	2
5-10	5
10-15	6
15-20	8
20-25	10
25-30	25
30-35	20
35-40	18
40-45	4
45-50	2

33. Draw 'a less than' type cumulative frequency curves(ogive). Hence, find median.

CBSE Question Paper 2019 (Set-1)
Class 10 Mathematics

Answers

1. Let the point A be (x, y)
∴1+x1+x=2∴1+x1+x=2 and 4+ya=−34+ya=−3
⇒⇒ x = 3 and y = -10
∴∴ Point A is (3, -10)

2. Since roots of the equation $x^2 + 4x + k = 0$ are real
   $\Rightarrow 16-4k \geq 0 \Rightarrow 16-4k \geq 0 \Rightarrow k \leq 4 \Rightarrow k \leq 4$

OR

   Roots of the equation $3x^2 - 10x + k = 0$ are reciprocal of each other
   ⇒⇒Product of the roots = 1
   $\Rightarrow \frac{k}{3}=1 \Rightarrow k=3 \Rightarrow \frac{k}{3}=1 \Rightarrow k=3$

3. tan 2A = cot (90° – 2A)
   ∴∴ 90° - 2A = A – 24°
   ⇒⇒ A = 38°

OR

   sin 33° = cos 57°
   ∴∴ $\sin^2 33° + \sin^2 57° = \cos^2 57° + \sin^2 57° = 1$

4. Numbers are 12, 15, 18, ..., 99
   ∴∴ 99 = 12 + (n – 1) ×× 3
   ⇒⇒ n = 30
5. AB = 1 + 2 = 3 cm
   $\triangle ABC \sim \triangle ADE \triangle ABC \sim \triangle ADE$
   $\therefore \frac{ar(ABC)}{ar(ADE)} = \frac{AB^2}{AD^2} = \frac{9}{1} \therefore \frac{ar(ABC)}{ar(ADE)} = \frac{AB2}{AD2} = \frac{9}{1}$
   $\therefore ar(\Delta ABC):ar(\Delta ADE)=9:1 \therefore ar(\Delta ABC):ar(\Delta ADE)=9:1$
6. Any one rational number between $2-\sqrt{2}$(1.41 approx) and $3-\sqrt{3}$(1.73 approx.)
   e.g., 1.5, 1.6, 1.63, etc.
7. Using Euclid's Algorithm
   7344 = 1260 ×× 5 + 1044
   1260 = 1044×× 1 + 216
   1044 = 216×× 4 + 180
   216 = 180×× 1 + 36
   180 = 36×× 5 + 0
   HCF of 1260 and 7244 is 36.

OR

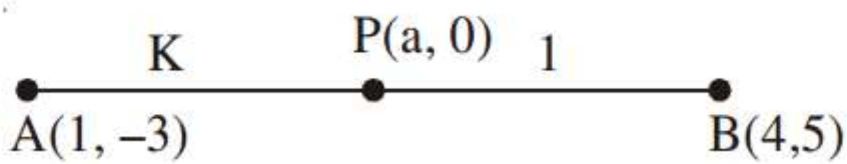
   Using Euclid'sAlgorithm
   a = 4q + r, 0 ≤≤ r < 4

⇒⇒ a = 4q, a = 4q + 1, a = 4q + 2 and a = 4q + 3. 1
Now a = 4q and a = 4q + 2 are even numbers.
Therefore when a is odd, it is of the form
a = 4q + 1 or a = 4q + 3 for some integer q.

8. $a_n = a_{21} + 120$
= (3 + 20 ×× 12) + 120
= 363
∴∴ 363 = 3 + (n − 1) ×× 12
⇒⇒ n = 31
or 31st term is 120 more than a_{21}.

OR

$a_1 = S_1 = 3 - 4 = 1$
$a_2 = S_2 - S_1 = [3(2)^2 - 4(2)] -(-1) = 5$
∴∴ $d = a_2 - a_1 = 6$
Hence, a_n = -1+ (n - 1)×× 6 = 6n - 7



9. Let the required point be (a, 0) and required ratio AP : PB = k : 1
∴a=4k+1k+1∴a=4k+1k+1
0=5k−3k+10=5k−3k+1
⇒k=35⇒k=35 or required ratio is 3 : 5.
Point P is (178,0)(178,0)

10. Total number of outcomes = 8
Favourable number of outcomes (HHH, TTT) = 2
Prob. (getting success) =28 or 1428 or 14
∴∴ Prob. (losing the game) = 1−14=341−14=34

11. Total number of outcomes = 6.
i. Prob. (getting a prime number (2, 3, 5)) = 36 or 1236 or 12
ii. Prob. (getting a number between 2 and 6 (3, 4, 5)) =36 or 1236 or 12

12. System of equations has infinitely many solutions
∴c12=3c=3−c−c∴c12=3c=3−c−c
⇒c2=36⇒⇒c2=36⇒c = 6 or c = -6......(i)
Also, -3c = 3c - c^2 ⇒⇒c = 6 or c = 0......(ii)

From equations (i) and (ii),
c = 6

13. Let us assume 2–√2 be a rational number and its simplest form be abab, a and b are coprime positive integers and b ≠≠ 0.

So, 2–√=ab2=ab

⇒⇒ $a^2 = 2b^2$

Thus, a^2 is a multiple of 2

⇒⇒ a is a multiple of 2

Let a = 2m for some integer m

∴∴ $b^2 = 2m^2$

Thus, b^2 is a mulitple of 2

⇒⇒ b is a multiple of 2

Hence 2 is a common factor of a and b.

This contradicts the fact that a and b are coprimes

Hence 2–√2 is an irrational number.

14. Sum of zeroes = k + 6

Product of zeroes = 2(2k – 1)

Hence, k + 6 = 12×2(2k−1)12×2(2k-1)

⇒⇒ k = 7

15. Let sum of the ages of two children be x yrs and father's age be y yrs.

∴∴ y = 3x ...(1)

and y + 5 = 2(x + 10) ...(2)

Solving equations (1) and (2)

x = 15

and y = 45

Father's present age is 45 years.

OR

Let the fraction be xyxy

∴x−2y=13∴x−2y=13.....(i)

and xy−1=12xy−1=12.........(ii)

Solving (i) and (ii) to get x = 7, y = 15

∴∴ Required fraction if 715715

16. Let the required point on y-axis be (0, b)

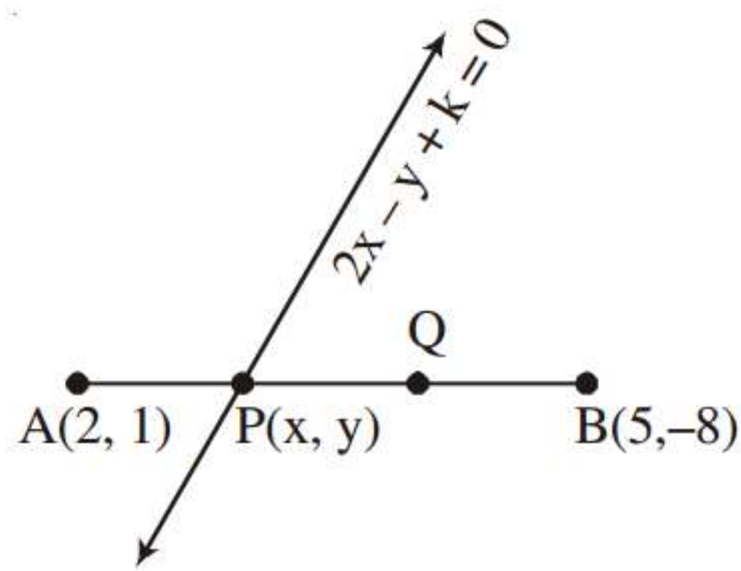
∴∴ $(5 – 0)^2 + (–2 – b)^2 = (–3 – 0)^2 + (2 – b)^2$

⇒⇒ $29 + 4b + b^2 = 13 + b^2 – 4b$

$\Rightarrow b = -2$

$\therefore$ Required point is (0, −2)

OR



AP : PB = 1 : 2

$x = \frac{4+5}{3} = 3$ and $y = \frac{2-8}{3} = -2$

Thus point P is (3, −2).

Point (3, −2) lies on 2x − y + k = 0

$\Rightarrow 6 + 2 + k = 0$

$\Rightarrow k = -8$.

17. LHS

$= \sin^2\theta + \operatorname{cosec}^2\theta + 2\sin\theta\operatorname{cosec}\theta + \cos^2\theta + \sec^2\theta + 2\cos\theta\sec\theta$

$= (\sin^2\theta + \cos^2\theta) + \operatorname{cosec}^2\theta + \sec^2\theta + \frac{2\sin\theta}{\sin\theta} + \frac{2\cos\theta}{\cos\theta}$

$= 1 + 1 + \cot^2\theta + 1 + \tan^2\theta + 2 + 2$

$= 7 + \cot^2\theta + \tan^2\theta =$ RHS

OR

LHS

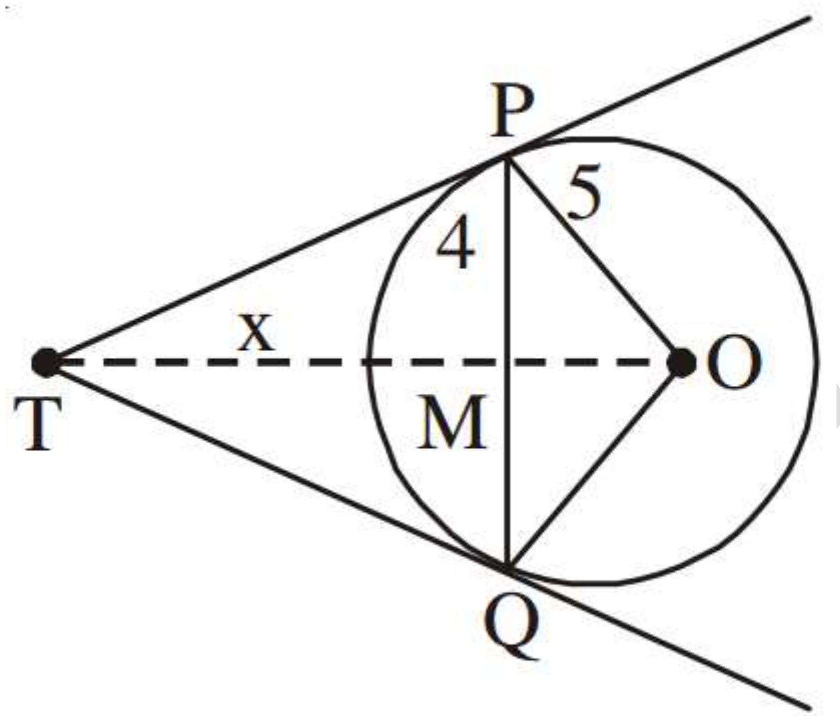
$= \left(1 + \frac{1}{\tan A} - \operatorname{cosec} A\right)(1 + \tan A + \sec A)$

$= \frac{1}{\tan A}(\tan A + 1 - \sec A)(1 + \tan A + \sec A)$

$= \frac{1}{\tan A}[(1 + \tan A)^2 - \sec^2 A)]$

$= \frac{1}{\tan A}[1 + \tan^2 A + 2\tan A - 1 - \tan^2 A]$
$= 2 = RHS$

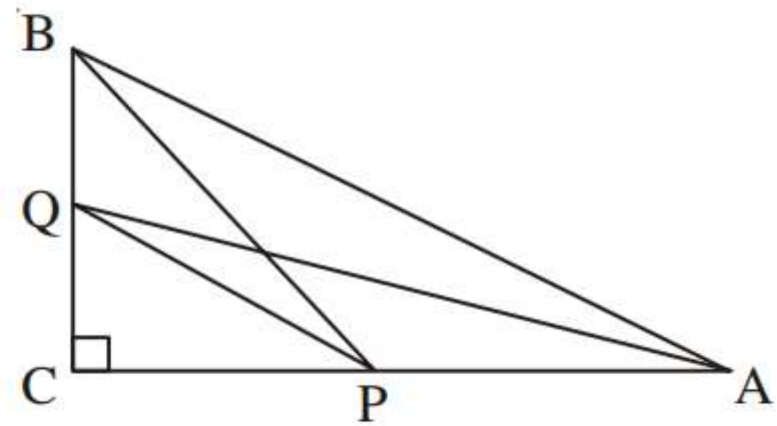
18.



Join OT and OQ.
TP = TQ
∴ TM ⊥ PQ and bisects PQ
Hence PM = 4 cm
Therefore $OM = \sqrt{25-16} = \sqrt{9} = 3$ cm
Let TM = x
From △PMT, $PT^2 = x^2 + 16$
From △POT, $PT^2 = (x + 3)^2 - 25$
Hence $x^2 + 16 = x^2 + 9 + 6x - 25$
$\Rightarrow 6x = 32 \Rightarrow x = \frac{16}{3}$
Hence, $PT^2 = \frac{256}{9} + 16 = \frac{400}{9}$
$\therefore PT = \frac{20}{3}$ cm

19. $\triangle ACB \sim \triangle ADC$ (AA similarity)
$\Rightarrow \frac{AC}{BC} = \frac{AD}{CD}$......(i)
Also $\Delta ACB \sim \Delta CDB$ (AA similarity)
$\Rightarrow \frac{AC}{BC} = \frac{CD}{BD}$.......(ii)
Using equations (i) and (ii),
$\frac{AD}{CD} = \frac{CD}{BD} \Rightarrow CD^2 = AD \times BD$

OR



Correct Figure

$AQ^2 = CQ^2 + AC^2$

$BP^2 = CP^2 + BC^2$

∴∴ $AQ^2 + BP^2 = (CQ^2 + CP^2) + (AC^2 + BC^2)$

$= PQ^2 + AB^2$.

20. AC = 64+36−−−−−−√=10cm64+36=10cm

∴∴Radius of the circle (r) = 5 cm. 1

Area of shaded region = Area of circle – Ar(ABCD)

= 3.14 ×× 25 – 6 ×× 8 1

= 78.5 – 48

= 30.5 cm^2

21. Length of canal covered in 30 min = 5000 m.

∴ Volume of water flown in 30 min = 6 ×× 1.5 ×× 5000 m^3

If 8 cm standing water is needed, then

area irrigated = 6×1.5×5000.086×1.5×5000.08= 562500 m^2

22. Modal Class is 30 - 40

∴ Mode =l+(f1−f02f1−f0−f2)×h∴ Mode =l+(f1−f02f1−f0−f2)×h

=30+(16−1032−10−12)×10=30+(16−1032−10−12)×10

= 36

23. Let the smaller tap fills the tank in x hrs

∴∴ the larger tap fills the tank in (x – 2) hrs.

Time taken by both the taps together = 158158 hrs

Therefore 1x+1x−2=8151x+1x−2=815

⇒⇒$4x^2$ – 23x + 15 = 0

⇒⇒ (4x – 3) (x – 5) = 0

x≠34∴x=5x≠34∴x=5

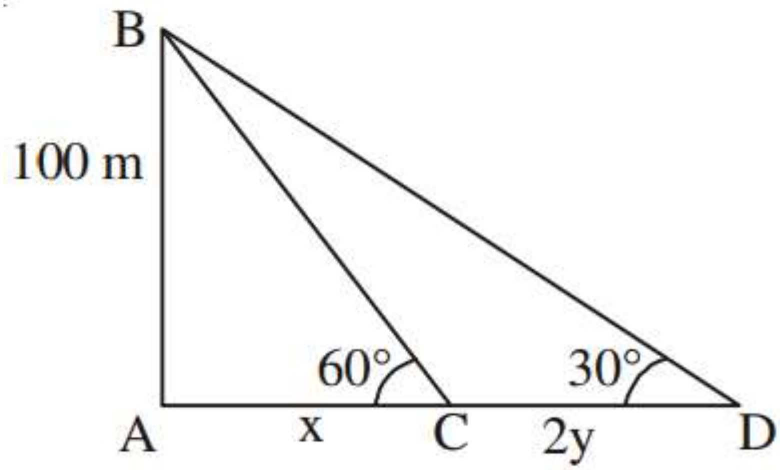
Smaller and larger taps can fill the tank seperately in 5 hrs and 3 hrs resp.

OR

Let the speed of the boat in still water be x km/hr and speed of the stream be y km/hr.
Given, 30x−y+44x+y=1030x−y+44x+y=10......(i)
and 40x−y+55x+y=1340x−y+55x+y=13........(ii)
Solving (i) and (ii) to get
x + y = 11.....(iii)
and x − y = 5.....(iv)
Solving (iii) and (iv) to get x = 8, y = 3.
Speed of boat = 8 km/hr & speed of stream = 3 km/hr.

24. $S_4 = 40 \Rightarrow\Rightarrow 2(2a + 3d) = 40 \Rightarrow\Rightarrow 2a + 3d = 20$
$S_{14} = 280 \Rightarrow\Rightarrow 7(2a + 13d) = 280 \Rightarrow\Rightarrow 2a + 13d = 40$
Solving to get d = 2
and a = 7
∴Sn=n2[14+(n−1)×2]∴Sn=n2[14+(n−1)×2]
= $n(n + 6)$ or $(n^2 + 6n)$

25. LHS = sinA−cosA+1sinA+cosA−1sinA−cosA+1sinA+cosA−1
Dividing num. & deno. by cos A
=tanA−1+secAtanA+1−secA=tanA−1+secAtanA+1−secA
=tanA−1+secA(tanA−secA)+(sec2A−tan2A)=tanA−1+secA(tanA−secA)+(sec2A−tan2A)
=tanA−1+secA(tanA−secA)(1−secA−tanA)=tanA−1+secA(tanA−secA)(1−secA−tanA)
=−1tanA−secA=1secA−tanA=−1tanA−secA=1secA−tanA= RHS



26.

Let the speed of the boat be y m/min

∴ CD = 2y

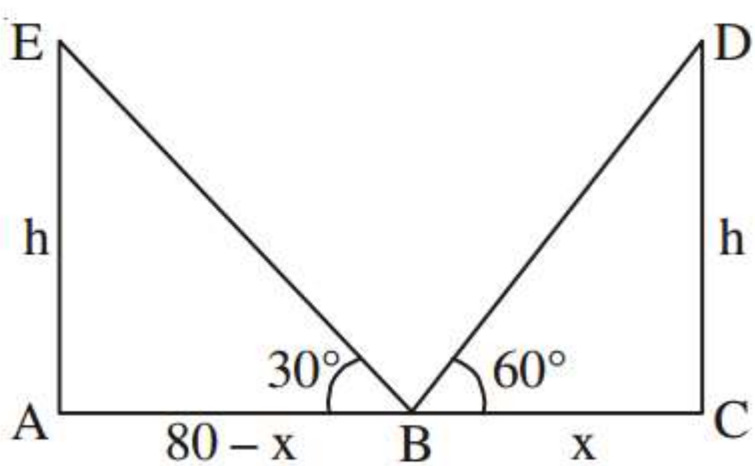
$\tan 60^\circ = \sqrt{3} = \frac{100}{x} \Rightarrow x = \frac{100}{\sqrt{3}}$

$\tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{100}{x+2y} \Rightarrow x+2y = 100\sqrt{3}$

$\therefore y = \frac{100\sqrt{3}}{3} = 57.73$

or speed of boat = 57.73 m/min

OR



Let BC = x so AB = 80 − x

where AC is the road

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

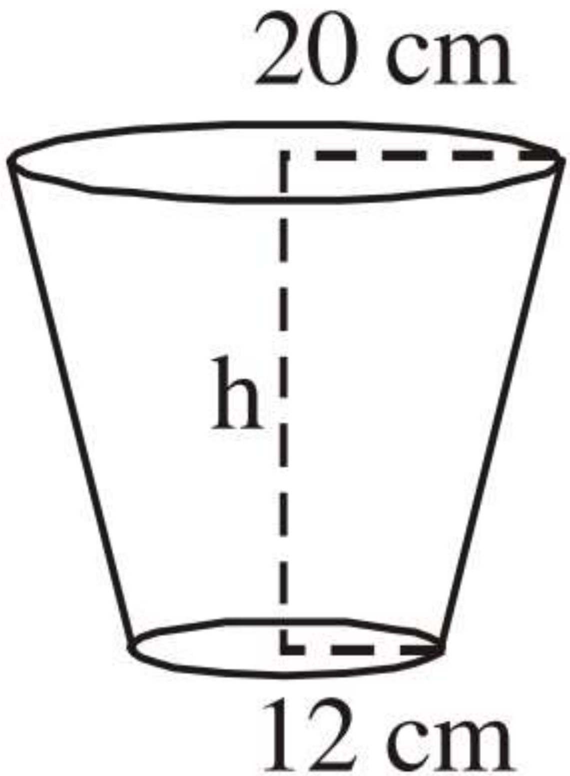
and tan 30° = $\frac{1}{\sqrt{3}} = \frac{h}{80-x} \Rightarrow h\sqrt{3} = 80 - x$

Solving equation to get

x = 20, h = $20\sqrt{3}$

∴ AB = 60 m, BC = 20 m and h = $20\sqrt{3}$ m

27. Correct construction of triangle ABC. 2 marks
Correct construction of triangle similar to triangle ABC. 2 marks



28.
Volume of the bucket = 12308.8 cm^3
Let r_1 = 20 cm, r_2 = 12 cm
$\therefore V = \frac{\pi h}{3}(r_1^2 + r_2^2 + r_1 r_2)$
$\therefore 12308.8 = \frac{3.14 \times h}{3}(400 + 144 + 240)$
$\Rightarrow h = \frac{12308.8 \times 3}{3.14 \times 784} = 15 cm$
Now $l^2 = h^2 + (r_1 - r_2)^2$ = 225 + 64 = 289
$\Rightarrow l$ = 17 cm.
Surface area of metal sheet used = $\pi r_2^2 + \pi l(r_1 + r_2)$
= 3.14 (144 + 17 × 32)
= 2160.32 cm^2.

29. Correct given, to prove, figure and
construction $\frac{1}{2} \times 4 = 2$ marks
Correct proof. 2 marks

30.

Class	Frequency	Cumulative Frequency
0 -10	f_1	f_1
10 - 20	5	$5 + f_1$
20 - 30	9	$14 + f_1$

Class	Frequency	Cumulative Frequency
30 - 40	12	$26 + f_1$
40 - 50	f_2	$26 + f_1 + f_2$
50 - 60	3	$29 + f_1 + f_2$
60 - 70	2	$31 + f_1 + f_2$
	40	

31. Median = 32.5 ⇒⇒ median class is 30-40.

Now 32.5 = 30+1012(20−14−f1)30+1012(20−14−f1)

⇒f1=3⇒f1=3

Also, $31 + f_1 + f_2 = 40$

⇒f2=6⇒f2=6

32. **OR**

33. Less than type distribution is as follows

Marks	Number of students
Less than 5	2
Less than 10	7
Less than 15	13
Less than 20	21
Less than 25	31
Less than 30	56
Less than 35	76
Less than 40	94
Less than 45	98
Less than 50	100

34. Plotting of points (5, 2), (10, 7) (15, 13), (20, 21), (25, 31), (30, 56), (35, 76), (40, 94), (45, 98), (50, 100) 1 1 2

Joining to get the curve 1212 marks

Getting median from graph (approx. 29) 1212 marks