1. Write the discriminant of the quadratic equation $(x + 5)^2 = 2 (5x - 3)$.
2. Find after how many places of decimal the decimal form of the number $272^3 \cdot 5^4 \cdot 3^2$2723·54·32will terminate.

OR

Express 429 as a product of its prime factors.

3. Find the sum of first 10 multiples of 6.
4. Find the value(s) of x, if the distance between the points A(0, 0) and B(x, – 4) is 5 units.
5. Two concentric circles of radii a and b (a > b) are given. Find the length of the chord of the larger circle which touches the smaller circle.
6. In Figure 1, PS = 3 cm, QS = 4 cm, $\angle PRQ=\theta, \angle PSQ=90^\circ$∠PRQ=θ,∠PSQ=90∘, PQ ⊥⊥ RQ and RQ = 9 cm. Evaluate tanθθ.

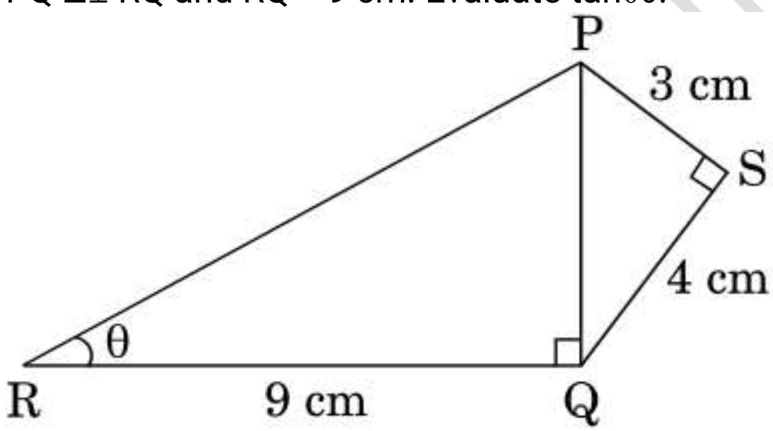


Figure 1

OR

If tan$\alpha=512$α=512, find the value of sec αα.

SECTION - B

7. Points A(3, 1), B(5, 1), C(a, b) and D(4, 3) are vertices of a parallelogram ABCD. Find the values of a and b.

OR

Points P and Q trisect the line segment joining the points A(– 2, 0) and B(0, 8) such that P is near to A. Find the coordinates of points P and Q.

8. Solve the following pair of linear equations :
$3x - 5y = 4$
$2y + 7 = 9x$
9. If HCF of 65 and 117 is expressible in the form 65n – 117, then find the value of n.

OR

On a morning walk, three persons step out together and their steps measure 30 cm, 36 cm and 40 cm respectively. What is the minimum distance each should walk so that each can cover the same distance in complete steps?

10. A die is thrown once. Find the probability of getting (i) a composite number, (ii) a prime number.
11. Using completing the square method, show that the equation $x^2 - 8x + 18 = 0$ has no solution.
12. Cards numbered 7 to 40 were put in a box. Poonam selects a card at random. What is the probability that Poonam selects a card which is a multiple of 7?

SECTION - C

13. The perpendicular from A on side BC of a △△ABC meets BC at D such that DB = 3CD. Prove that $2AB^2 = 2AC^2 + BC^2$.

OR

AD and PM are medians of triangles ABC and PQR respectively where $\Delta ABC \sim \Delta PQR$ΔABC~ΔPQR. Prove that ABPQ=ADPMABPQ=ADPM.

14. $p(x) = x^5 - 4x^3 + x^2 + 3x + 1$, $g(x) = x^3 - 3x + 1$
Check whether g(x) is a factor of p(x) by dividing polynomial p(x) by polynomial g(x), where $p(x) = x^5 - 4x^3 + x^2 + 3x + 1$, $g(x) = x^3 - 3x + 1$
15. Find the area of the triangle formed by joining the mid-points of the sides of the triangle ABC, whose vertices are A(0, – 1), B(2, 1) and C(0, 3).

16. Draw the graph of the equations x − y + 1 = 0 and 3x + 2y − 12 = 0. Using this graph, find the values of x and y which satisfy both the equations.

17. Prove that $3-\sqrt{3}$ is an irrational number.

OR

Find the largest number which on dividing 1251, 9377 and 15628 leaves remainders 1, 2 and 3 respectively.

18. A, B and C are interior angles of a triangle ABC. Show that

i. $\sin\left(\frac{B+C}{2}\right)=\cos\frac{A}{2}$

ii. If $\angle A=90^\circ$, then find the value of $\tan\left(\frac{B+C}{2}\right)$.

OR

If tan (A + B) = 1 and tan (A − B) = $\frac{1}{\sqrt{3}}$, 0 < A + B < 90°, A > B, then find the values of A and B.

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

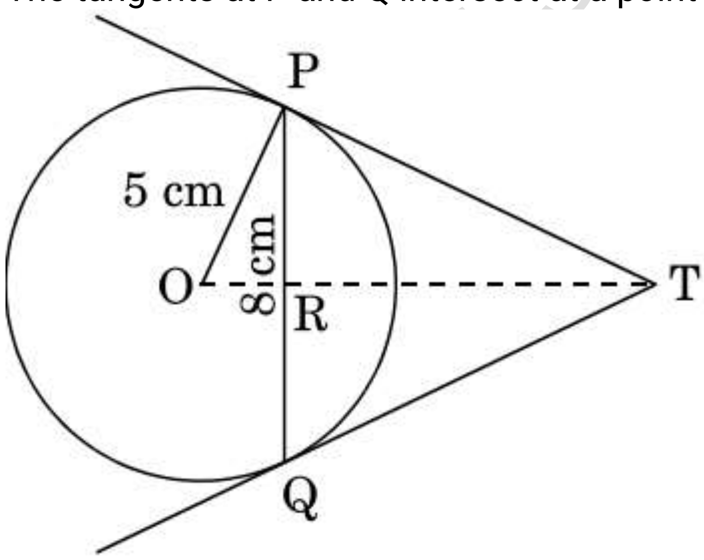


Figure 2

OR

Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

20. Water in a canal, 6 m wide and 1·5 m deep, is flowing with a speed of 10 km/h. How much area will it irrigate in 30 minutes if 8 cm of standing water is needed?

21. A class teacher has the following absentee record of 40 students of a class for the whole term. Find the mean number of days a student was absent

Number of Days	0 - 6	6 - 12	12 - 18	18 - 24	24 - 30	30 - 36	36 - 42
Number of students	10	11	7	4	4	3	1

22. A car has two wipers which do not overlap. Each wiper has a blade of length 21 cm sweeping through an angle 120°. Find the total area cleaned at each sweep of the blades.(Take π=227π=227)

SECTION - D

23. A pole has to be erected at a point on the boundary of a circular park of diameter 13 m in such a way that the difference of its distances from two diametrically opposite fixed gates A and B on the boundary is 7 m. Is it possible to do so? If yes, at what distances from the two gates should the pole be erected?

24. If m times the mth term of an Arithmetic Progression is equal to n times its nth term and m ≠≠ n, show that the (m + n)th term of the A.P. is zero.

OR

The sum of the first three numbers in an Arithmetic Progression is 18. If the product of the first and the third term is 5 times the common difference, find the three numbers.

25. Construct a triangle ABC with side BC = 6 cm, AB = 5 cm and ∠∠ABC = 60°. Then construct another triangle whose sides are 3434 of the corresponding sides of the triangle ABC.

26. In Figure 3, a decorative block is shown which is made of two solids, a cube and a hemisphere. The base of the block is a cube with edge 6 cm and the hemisphere fixed on the top has a diameter of 4·2

cm. Find

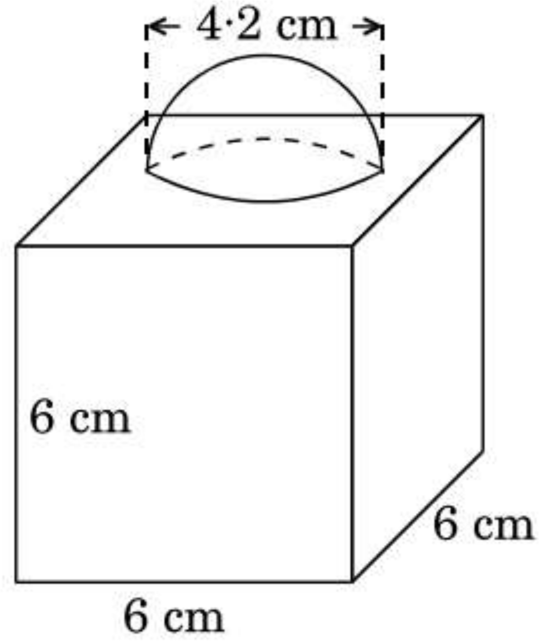


Figure 3

a. the total surface area of the block.
b. the volume of the block formed. (Take $\pi=227\pi=227$)

27. 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 circular ends are 20 cm and 12 cm respectively. Find the height of the bucket and the area of metal sheet used in making the bucket.If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio.

OR

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

28. If 1 + $\sin 2\theta=3\sin\theta\cos\theta \sin 2\theta=3\sin\theta\cos\theta$, then prove that $\tan\theta=1$ or $\tan\theta=12\tan\theta=1$ or $\tan\theta=12$.

29. Change the following distribution to a 'more than type' distribution. Hence draw the 'more than type' ogive for this distribution.

Class Interval	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90
Frequency	10	8	12	24	6	25	15

30. The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° than when it was 60°. Find the height of the tower.(Given 3–√3=1.732)

CBSE Question Paper 2019 (Set-3)
Class 10 Mathematics

Answers

1. (x + 5)2 = 2(5x − 3) ⇒⇒ x^2 + 31 = 10
   D = −124
2. 27 2 3·5 4·3 2=32 3·5 4 2723·54·32=323·54
   It will terminate after 4 decimal places

OR

429 = 3 ×× 11 ×× 13

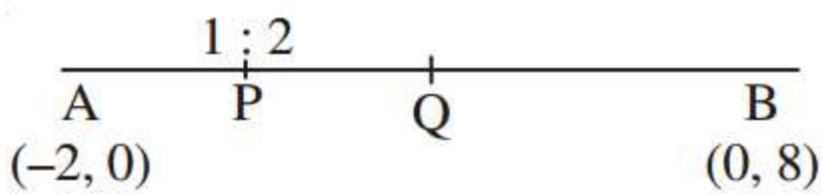
3. S_{10} = 102[2×6+9×6]102[2×6+9×6]= 330
4. AB = 5
   ⇒(x−0)2+(−4−0)2−−−−−−−−−−−−−−−−√=5⇒(x−0)2+(−4−0)2=5
   x^2 + 16 = 25
   x = ±3
5. Length of chord = 2a2−b2−−−−−−√a2−b2
6. PQ = 5 cmtanθ=PQPR=59tanθ=PQPR=59

OR

secα=1+tan2α−−−−−−−−−√secα=1+tan2α
=1+25144−−−−−−√=1312=1+25144=1312

7. Diagonals of parallelogram bisect each other
   ∴(3+a2,1+b2)=(5+42,1+32)∴(3+a2,1+b2)=(5+42,1+32)
   3 + a = 9, 1 + b = 4
   So a = 6, b = 3

OR



∴∴P divides AB in the ratio 1 : 2

Coordinates of P are (0−43,8+02)=(−43,83)(0−43,8+02)=(−43,83)

Q divides AB in the ratio 2 : 1

∴∴ Coordinates of Q are (0−23,16+03)=(−23,163)(0−23,16+03)=(−23,163)

8. 3x − 5y = 4 ...(1)
   9x − 2y = 7
   9x − 15y = 12
   9x − 2y = 7
   − + −

   $-13y = 5 \Rightarrow y = -5/13$

   From (1), x =913913, Solution is (913,−513)(913,−513)

9. HCF (65, 117) = 13
   13 = 65n − 117
   Solving, we get, n = 2

OR

Required minimum distance = LCM (30, 36, 40)

$= 2^3$ ×× 3^2 ×× 5

= 360 cm

30 = 2 ×× 3 ×× 5

36 = 2^2 ×× 32

40 = 2^3 ×× 5

10. Composite numbers on a die are 4 and 6
    ∴∴ P (composite number) = 26 or 1326 or 13
    Prime numbers are 2, 3 and 5
    ∴∴ P(prime number) =36 or 1236 or 12

11. $x^2 - 8x + 18 = 0$
    $x^2 - 8x + 16 + 2 = 0$
    $(x - 4)^2 = -2$

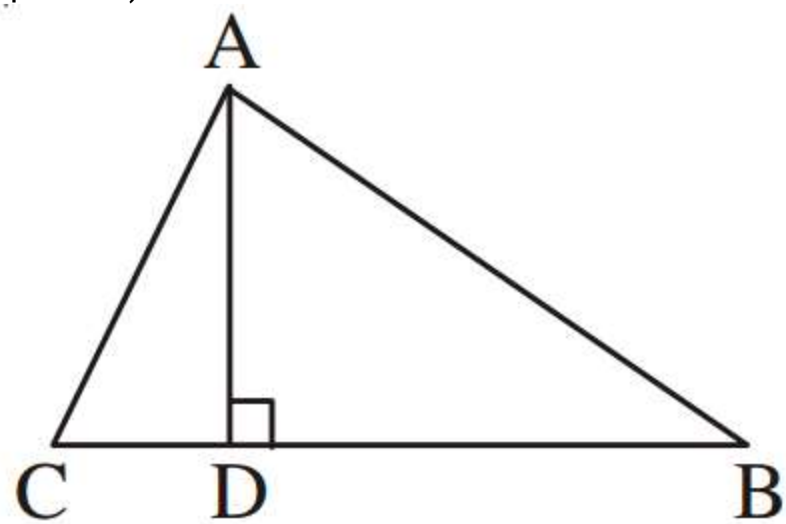
Square of a number can't be negative

∴∴ The equation has no solution.

12. Total number of possible outcomes = 34

Favourable number of outcomes is (7, 14, 21, 28 and 35) = 5

P(multiple of 7) = 534534



13.

$AB^2 = AD^2 + BD^2$

$AC^2 = AD^2 + CD^2$

$AB^2 - AC^2 = BD^2 - CD^2$

$= (3CD)^2 - CD^2$

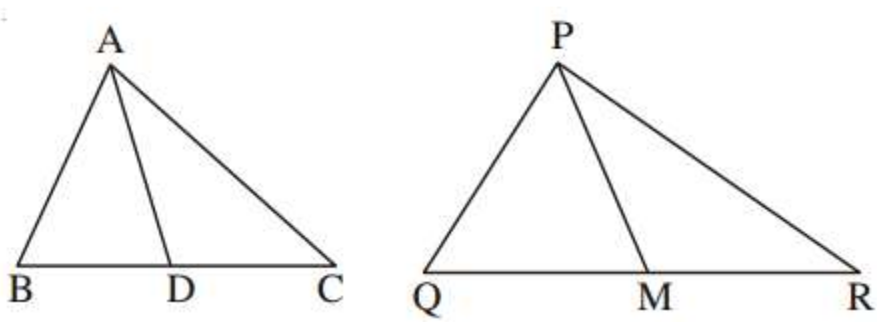
$= 8\ CD^2$

=8×(14BC)2=8×(14BC)2

⇒⇒$2AB^2 - 2AC^2 = BC^2$

or $2AB^2 = 2AC^2 + BC^2$

OR



△ABC∼ΔPQR△ABC∼ΔPQR

∴ABPQ=BCQR=ACPR∴ABPQ=BCQR=ACPR

ABPQ=2BD2QM or BDQMABPQ=2BD2QM or BDQM

Also, ∠B=∠Q∠B=∠Q

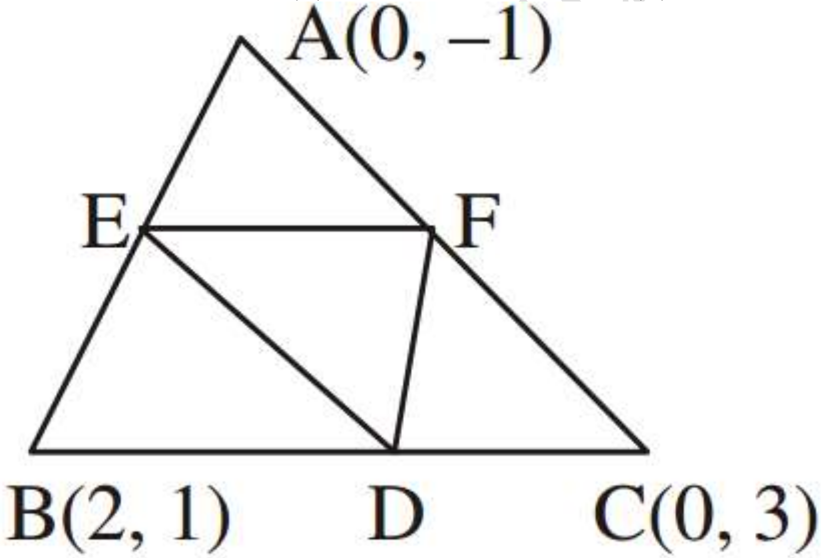
$\therefore \Delta ABD \sim \Delta PQM$∴ΔABD~ΔPQM

So, $\frac{AB}{PQ} = \frac{AD}{PM}$ABPQ=ADPM

14.

$$
\begin{array}{l}
x^3 - 3x + 1 \overline{\big)\, x^5 - 4x^3 + x^2 + 3x + 1 \,\big(}\, x^2 - 1 \\
\qquad\qquad\quad x^5 - 3x^3 + x^2 \\
\qquad\qquad\quad - \quad\; + \qquad - \\
\hline
\qquad\qquad\qquad -x^3 + 3x + 1 \\
\qquad\qquad\qquad -x^3 + 3x - 1 \\
\qquad\qquad\qquad + \quad\; - \quad\; + \\
\hline
\qquad\qquad\qquad\qquad\quad 2
\end{array}
$$

Since remainder ≠ 0 ∴∴ g(x) is not a factor of p(x)



15.

Coordinates of mid points are

D(1, 2)

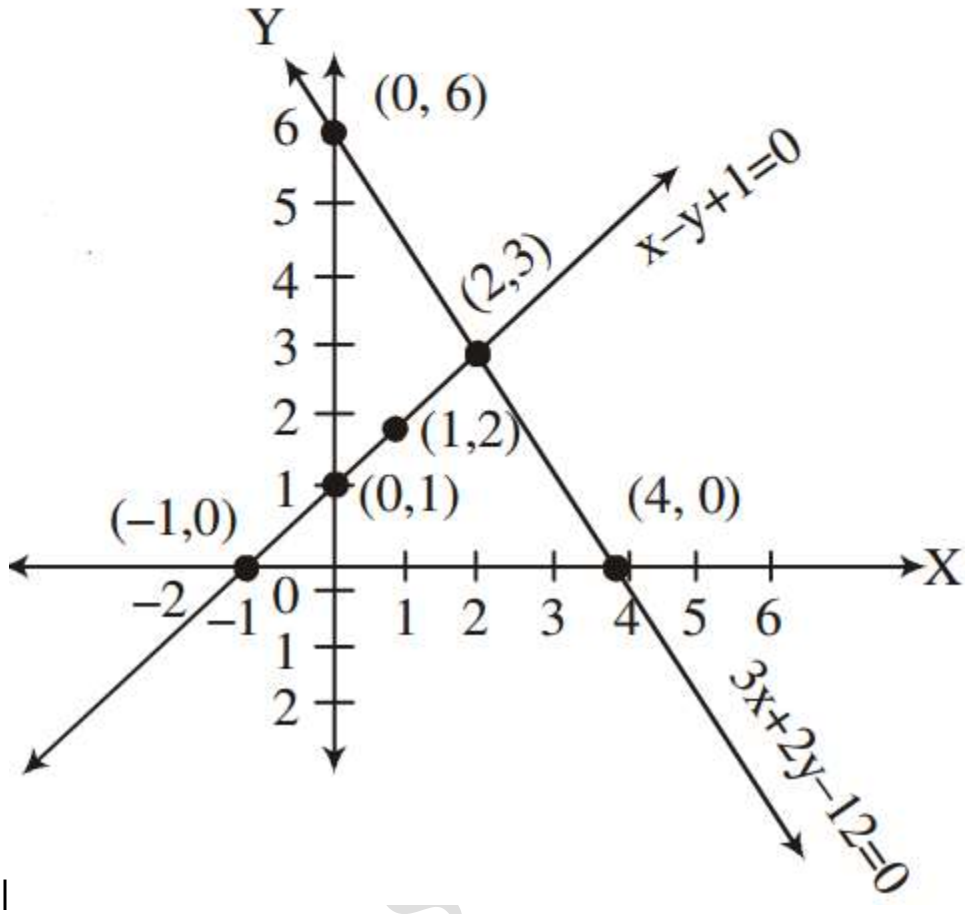
E (1, 0)

F(0 ,1)

Area of triangle DEF = $\frac{1}{2}$12[1(0 - 1) + (1 - 2) + 0]

= $\frac{1}{2}$12(-2) = 1 sq. unit

16.



I

Solution is

x = 2, y = 3

17. Let us assume that 3–√3 be a rational number

3–√=pq3=pq where p and q are co-primes and q ≠ 0

⇒⇒ $p^2 = 3q^2$ ...(1)

∴∴ 3 divides p^2

i.e., 3 divides p also ...(2)

Let p = 3m, for some integer m 1

From (1), $9m^2 = 3q^2$

⇒⇒ $q^2 = 3m^2$

∴∴ 3 divides q^2 i.e., 3 divides q also ...(3)

From (2) and (3), we get that 3 divides p and q both which is a contradiction to the fact that p and q are co-primes.

Hence our assumption is wrong.

∴3–√∴3 is irrational.

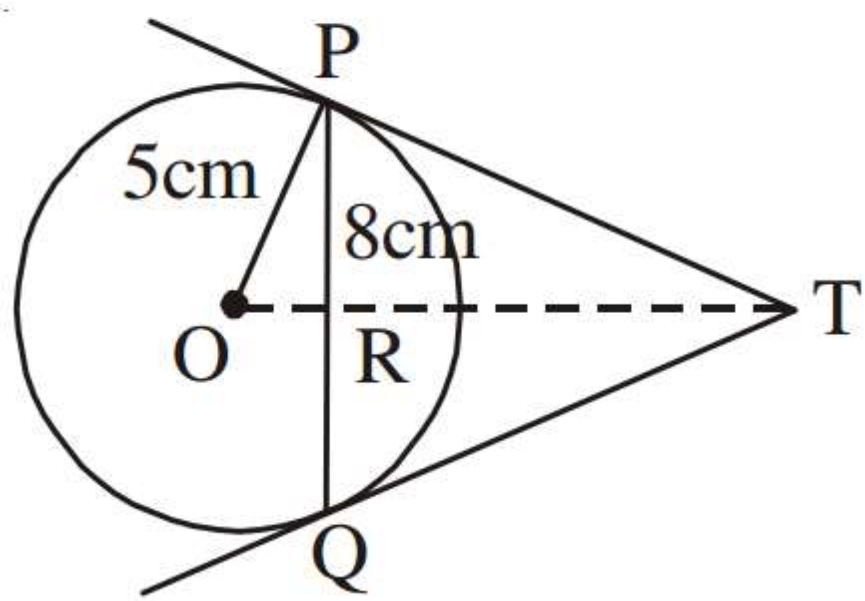
OR

$1251 - 1 = 1250,\ 9377 - 2 = 9375,\ 15628 - 3 = 15625$
Required largest number = HCF (1250, 9375, 15625)
$1250 = 2 \times 5^4$
$9375 = 3 \times 5^4$
$6250 = 2 \times 5^5$
$\therefore$ HCF (1250, 9375, 15625) $= 5^4 = 625$

18. A, B, C are interior angles of $\triangle ABC$
$\therefore A + B + C = 180^\circ$
i. $\sin\left(\frac{B+C}{2}\right) = \sin\left(\frac{180^\circ - A}{2}\right)$
$= \sin\left(90^\circ - \frac{A}{2}\right)$
$= \cos\frac{A}{2}$
ii. $\tan\left(\frac{B+C}{2}\right) = \tan\left(\frac{90^\circ}{2}\right)\quad (\because \angle A = 90^\circ)$
= tan 45° 1
= 1

OR

$\tan(A + B) = 1 \therefore A + B = 45^\circ$
$\tan(A - B) = \frac{1}{\sqrt{3}} \therefore A - B = 30^\circ$
Solving, we get $\angle A = 37\frac{1}{2}^\circ$ or 37.5°
$\angle B = 7\frac{1}{2}^\circ$ or 7.5°



19.
Let TR be x cm and TP be y cm
OT is perpendicular bisector of PQ

So PR = 4 cm

In $\triangle\triangle OPR$, $OP^2 = PR^2 + OR^2$

$\therefore\therefore$ OR = 3 cm

In $\triangle\triangle PRT$, $y^2 = x^2 + 4^2$ ...(1)

In $\triangle\triangle OPT$, $(x + 3)^2 = 5^2 + y^2$

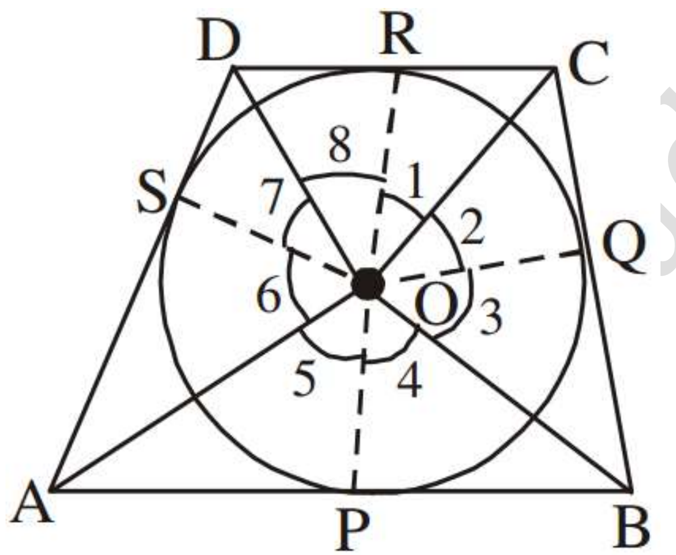
$\therefore\therefore$ $(x + 3)^2 = 5^2 + x^2 + 16$ [using (1)]

Solving, we get $x=\frac{16}{3}cm$

From (1), $y^2 = \frac{256}{9}+16=\frac{400}{9}$

So, y = $\frac{20}{3}cm$

OR



$\Delta ROC\cong\Delta QOC$

$\therefore\angle 1=\angle 2$

Similarly, $\angle 4=\angle 3$

$\angle 5=\angle 6$

$\angle 8=\angle 7$

$\angle ROQ+\angle QOP+\angle POS+\angle SOR=360^\circ$

$\therefore 2\angle 1+2\angle 4+2\angle 5+2\angle 8=360^\circ$

$\Rightarrow\angle 1+\angle 4+\angle 5+\angle 8=180^\circ$

So, $\angle DOC+\angle AOB=180^\circ$

and $\angle AOD+\angle BOC=180^\circ$

20. Volume of water flowing through canal in 30 minutes

= $5000\times 6\times 1.5$ = 45000 m^3

Area = 45000÷8100 45000÷8100

= 562500 m^2

21.

Number of Days	Number of students(f_i)	x_i	$f_i x_i$
0 - 6	10	3	30
6 - 12	11	9	99
12 - 18	7	15	105
18 - 24	4	21	84
24 - 30	4	27	108
30 - 36	3	33	99
36 - 42	1	39	39
Total	40		564

22. $\overline{x}$=ΣfixiΣfi=56440 x¯=ΣfixiΣfi=56440

= 14.1

Total area cleaned = 2 ×× Area of sect

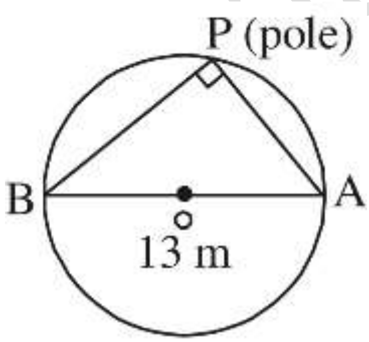
OR

=2×πr2θ260∘=2×πr2θ260∘

=2×227×21×21×120∘360∘=2×227×21×21×120∘360∘

= 924 cm^2

23.



PB −PA = 7 m

Let AP be x m ∴∴ PB = (x + 7) m

∴∴AB^2 = PB^2 + AB^2

∴∴ 13^2 = $(x + 7)^2$ + x^2

x^2+ 7x −60 = 0

= (x + 12) (x − 5) = 0

∴∴ x = 5, −12 Rejected
∴∴ Situation is possible
∴∴ Distance of pole from gate A = 5 m
and distance of pole from gate B = 12 m.

24. $ma_m = na_n$
⇒⇒ ma + m(m − 1)d = na + n(n − 1)d
⇒⇒ $(m - n)a + (m^2 - m - n^2 + n)d = 0$
(m − n)a + [(m − n) (m + n) − (m − n)d] = 0
Dividing by (m − n)
So, a + (m + n − 1)d = 0
or $a_{m+n} = 0$

OR

Let first three terms be a − d, a and a + d
a − d + a + a + d = 18
So a = 6
(a − d) (a + d) = 5d
⇒⇒ $6^2 - d^2 = 5d$
or $d^2 + 5d - 36 = 0$
(d + 9)(d − 4) = 0
so d = −9 or 4 1
For d = −9 three numbers are 15, 6 and −3
For d = 4 three numbers are 2, 6 and 10

25. Correct construction of △△ABC (2 marks)
Correct construction of triangle similar to △△ABC (2 marks)

26.

a. Total surface area of block
= TSA of cube + CSA of hemisphere − Base area of hemisphere 1
= $6a^2$ + 2πr2−πr22πr2−πr2
= $6a^2$ + πr2πr2
=(6×62+227×2.1×2.1)cm2=(6×62+227×2.1×2.1)cm2
= (216 + 13.86) cm^2
= 229.86 cm^2

b. Volume of block

=63+23×227×(2.1)3=63+23×227×(2.1)3

= (216 + 19.40) cm^3

= 235.40 cm^3

OR

Volume of frustum = 12308.8 cm^3

∴13πh(r21+r22+r1r2)=12308.8∴13πh(r12+r22+r1r2)=12308.8

⇒13×3.14×h(202+122+20×12)⇒13×3.14×h(202+122+20×12)= 12308.8

h=12308.8×3784×3.14h=12308.8×3784×3.14

h = 15 cm

l=152+(20−12)2−−−−−−−−−−−−−−√=17cml=152+(20−12)2=17cm

Area of metal sheet used = πl(r1+r2)+πr22πl(r1+r2)+πr22

=3.14[17×32+122]=3.14[17×32+122]

= 3.14 ×× 688 cm^2

= 2160.32 cm^2

27.Correct figure, given, to prove and construction (12×12×4 = 2 marks)
Correct proof. (2 marks)

OR

Correct figure, given, to prove and construction (12×12×4 = 2 marks)
Correct proof. (2 marks)

28.1+sin2θ=3sinθcosθ1+sin2θ=3sinθcosθ

Dividing by cos2θcos2θ

sec2θ+tan2θ=3tanθsec2θ+tan2θ=3tanθ

⇒1+tan2θ+tan2θ=3tanθ⇒1+tan2θ+tan2θ=3tanθ

⇒2tan2θ−3tanθ+1=0⇒2tan2θ−3tanθ+1=0

(tanθ−1)(2tanθ−1)=0(tanθ−1)(2tanθ−1)=0

So, tanθ=1 or 12

29.

Class Interval	Cumulative Frequency
More than or equal to 20	100
More than or equal to 30	90
More than or equal to 40	82
More than or equal to 50	70
More than or equal to 60	46
More than or equal to 70	40
More than or equal to 80	15

Plot of points (20, 100), (30, 90), (40, 82), (50, 70), (60, 46), (70, 40) and (80, 15)

Join the points to get a curve

30.

Let AB = h be the height of tower

In $\Delta ABC, \frac{h}{x} = \tan 60^\circ$

$h = x\sqrt{3}$

In $\triangle ABD, \frac{h}{x+40} = \tan 30^\circ$

$\Rightarrow \frac{h}{\sqrt{3}} = x + 40$

3x + x = 40

∴ x = 20

So, height of tower = $h = 20\sqrt{3}$ m

$= 20 \times 1.732$ m

= 34.64 m