1. If HCF (336, 54) = 6, find LCM (336, 54).
2. Find the nature of roots of the quadratic equation $2x^2 - 4x + 3 = 0$.
3. Find the common difference of the Arithmetic Progression (A.P.) 1a,3−a3a,3−2a3a,...(a≠0)1a,3−a3a,3−2a3a,...(a≠0)
4. Evaluate : $\sin^2 60° + 2 \tan 45° - \cos^2 30°$

OR

If sin A =3434, calculate sec A.

5. Write the coordinates of a point P on x-axis which is equidistant from the points A(− 2, 0) and B(6, 0).
6. In Figure 1, ABC is an isosceles triangle right angled at C with AC = 4 cm. Find the length of AB.

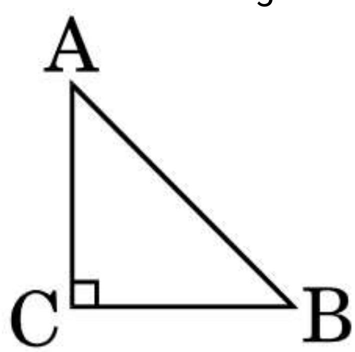


Figure 1

OR

In Figure 2, DE||BC. Find the length of side AD, given that AE = 1·8 cm, BD = 7·2 cm and CE = 5·4 cm.

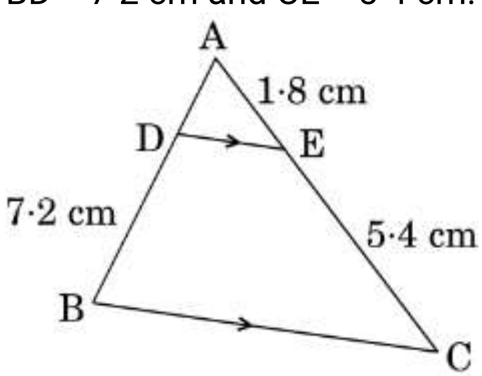


Figure 2

SECTION - B

7. Write the smallest number which is divisible by both 306 and 657.
8. Find a relation between x and y if the points A(x, y), B(– 4, 6) and C(– 2, 3) are collinear.

OR

Find the area of a triangle whose vertices are given as (1, – 1) (– 4, 6) and (– 3, – 5).

9. The probability of selecting a blue marble at random from a jar that contains only blue, black and green marbles is 1515. The probability of selecting a black marble at random from the same jar is 1414. If the jar contains 11 green marbles, find the total number of marbles in the jar.
10. Find the value(s) of k so that the pair of equations x + 2y = 5 and 3x + ky + 15 = 0 has a unique solution.
11. The larger of two supplementary angles exceeds the smaller by 18°. Find the angles.

OR

Sumit is 3 times as old as his son. Five years later, he shall be two and a half times as old as his son. How old is Sumit at present?

12. Find the mode of the following frequency distribution :

Class Interval	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55
Frequency	25	34	50	42	38	14

SECTION - C

13. Prove that 2 + 53–√3 is an irrational number, given that 3–√3 is an irrational number.

OR

Using Euclid’s Algorithm, find the HCF of 2048 and 960.

14. Two right triangles ABC and DBC are drawn on the same hypotenuse BC and on the same side of BC. If AC and BD intersect at P, prove that AP ×× PC = BP ×× DP.

OR

Diagonals of a trapezium PQRS intersect each other at the point O, PQ || RS and PQ = 3RS. Find the ratio of the areas of triangles POQ and ROS.

15. In Figure 3, PQ and RS are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting PQ at A and RS at B. Prove that ∠∠AOB = 90°.

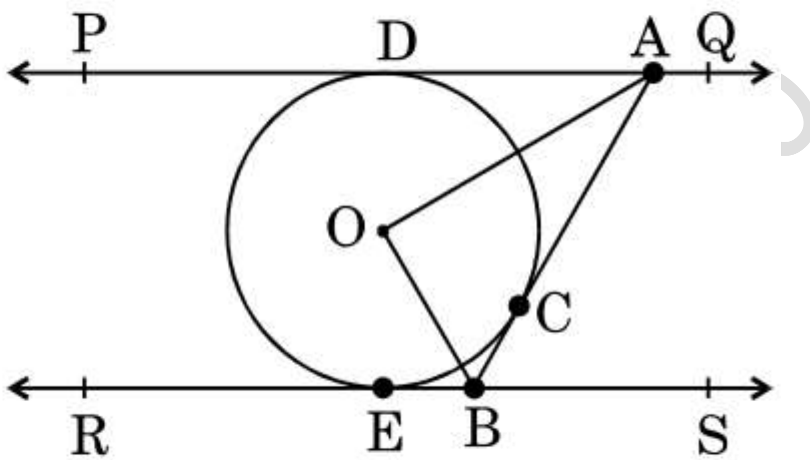


Figure 3

16. Find the ratio in which the line x – 3y = 0 divides the line segment joining the points (– 2, – 5) and (6, 3). Find the coordinates of the point of intersection.

17. Evaluate:

$\left(\frac{3\sin 43^\circ}{\cos 47^\circ}\right)^2 - \frac{\cos 37^\circ \operatorname{cosec} 53^\circ}{\tan 5^\circ \tan 25^\circ \tan 45^\circ \tan 65^\circ \tan 85^\circ}$ (3sin43°cos47°)2−cos37°cosec53°tan5°tan25°tan45°tan65°tan85°

18. In Figure 4, a square OABC is inscribed in a quadrant OPBQ. If OA = 15 cm, find the area of the shaded region. (Use ππ = 3·14)

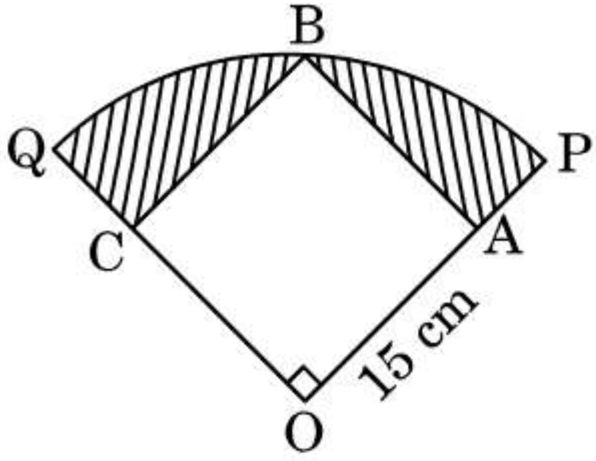


Figure 4

OR

In Figure 5, ABCD is a square with side 2 2 cm and inscribed in a circle. Find the area of the shaded region. (Use ππ=3.14)

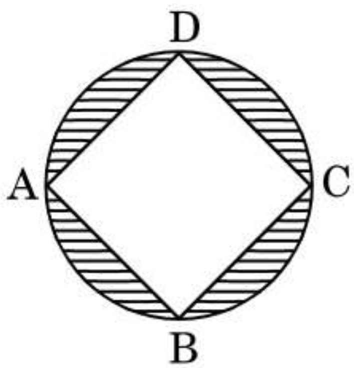


Figure 5

19. A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 20 cm and the diameter of the cylinder is 7 cm. Find the total volume of the solid. (Use π=227π=227)

20. The marks obtained by 100 students in an examination are given below :

Marks	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65
Number of Students	14	16	28	23	18	8	3

21. Find the mean marks of the students.

22. For what value of k, is the polynomial $f(x) = 3x^4 - 9x^3 + x^2 + 15x + k$ completely divisible by $3x^2 - 5$?

OR

Find the zeroes of the quadratic polynomial $7y^2$ −113y−23113y−23 and verify the relationship between the zeroes and the coefficients.

23. Write all the values of p for which the quadratic equation $x^2 + px + 16 = 0$ has equal roots. Find the roots of the equation so obtained.

SECTION - D

23. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

24. Amit, standing on a horizontal plane, finds a bird flying at a distance of 200 m from him at an elevation of 30°. Deepak standing on the roof of a 50 m high building, finds the angle of elevation of the same bird to be 45°. Amit and Deepak are on opposite sides of the bird. Find the distance of the bird from Deepak.

25. A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm, which is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pole, given that 1 cm^3 of iron has approximately 8 gm mass. (Use ππ = 3·14)

26. Construct an equilateral △△ABC with each side 5 cm. Then construct another triangle whose sides are 2323 times the corresponding sides of △△ABC.

OR

Draw two concentric circles of radii 2 cm and 5 cm. Take a point P on the outer circle and construct a pair of tangents PA and PB to the smaller circle. Measure PA.

27. Change the following data into 'less than type' distribution and draw its ogive :

Class Interval:	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Frequency	7	5	8	10	6	6	8

28. Prove that: $\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}=1+\sec\theta\,\mathrm{cosec}\,\theta$

OR

Prove that: $\frac{\sin\theta}{\cot\theta+\mathrm{cosec}\,\theta}=2+\frac{\sin\theta}{\cot\theta-\mathrm{cosec}\,\theta}$

29. Which term of the Arithmetic Progression –7, –12, –17, –22, ... will be –82 ? Is –100 any term of the A.P.? Give reason for your answer.

OR

How many terms of the Arithmetic Progression 45, 39, 33, ... must be taken so that their sum is 180 ? Explain the double answer.

30. In a class test, the sum of Arun’s marks in Hindi and English is 30. Had he got 2 marks more in Hindi and 3 marks less in English, the product of the marks would have been 210. Find his marks in the two subjects.

CBSE Question Paper 2019 (Set-2)
Class 10 Mathematics

Answers

1. LCM (336, 54) = $\frac{336\times 54}{6}$
   = 336 × 9 = 3024
2. $\frac{3-a}{3a}-\frac{1}{a}=\frac{3-a-3}{3a}=-\frac{1}{3}$
3. $2x^2 - 4x + 3 = 0 \Rightarrow D = 16 - 24 = -8$
   Therefore, Equation has NO real roots
4. $\sin^2 60° + 2\tan 45° - \cos^2 30°$
   $=\left(\frac{\sqrt{3}}{2}\right)^2+2(1)-\left(\frac{\sqrt{3}}{2}\right)^2$ [For any two correct values]
   = 2

OR

sin A = 34⇒cosA=1−916−−−−−√=7√434⇒cos⁡A=1−916=74
secA=47√sec⁡A=47

5. Point on x-axis is (2, 0)
6. ΔABC : Isosceles Δ⇒ΔABC : Isosceles Δ⇒AB = BC = 4 cm
   AB = 42+42−−−−−−√=42–√cm42+42=42cm

OR

ADBD=AECE⇒AD7.2=1.85.4ADBD=AECE⇒AD7.2=1.85.4
∴AD=7.2×1.85.4=2.4cm∴AD=7.2×1.85.4=2.4cm

7. Smallest number divisible by 306 and 657 = LCM (306, 657)
   LCM (306, 657) = 22338
8. A, B, C are collinear ⇒⇒ ar. (△△ABC) = 0
   ∴12∴12[x(6 – 3) – 4(3 – y) – 2(y – 6)] = 0
   ⇒⇒ 3x + 2y = 0

OR

Area of triangle = 1212[1(6 5) – 4(–5 1) – 3(–1 – 6)]
= 1212[11 + 16 + 21] = 482482= 24 sq. units

9. P(blue marble) = 1515
   P(black marble) = 1414
   Let total number of marbles be x
   then 1120×x=11⇒x=201120×x=11⇒x=20
10. For unique solution 13≠2k13≠2k
   ⇒k≠6⇒k≠6
11. Let larger angle be x°
   ∴∴ Smaller angle = 180° – x°
   ∴∴(x) – (180 – x) = 18
   2x = 180 + 18 = 198 ⇒⇒ x = 99
   ∴∴The two angles are 99°, 81°

OR

Let Son's present age be x years
Then Sumit's present age = 3x years.
∴∴ 5 Years later, we have, 3x + 5 =5252(x + 5)

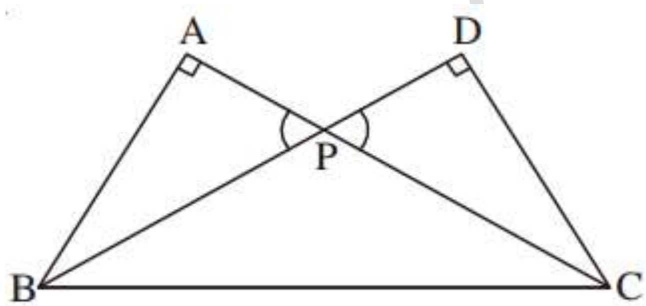
6x + 10 = 5x + 25 ⇒⇒ x = 15
∴∴ Sumit's present age = 45 years

12. Maximum frequency = 50, class (modal) = 35 – 40.
Mode = L+(f1−f02f1−f0−f2)×hL+(f1−f02f1−f0−f2)×h
=35+50−34100−34−42×5=35+50−34100−34−42×5
=35+1624×5=38.33=35+1624×5=38.33

13. Let 2 + 53–√3 = a, where 'a' is a rational number
then, 3–√=a−253=a−25
which is a contradiction as LHS is irrational and RHS is rational
∴2+53–√∴2+53 cannot be rational
Hence, 2+53–√2+53 is irrational.

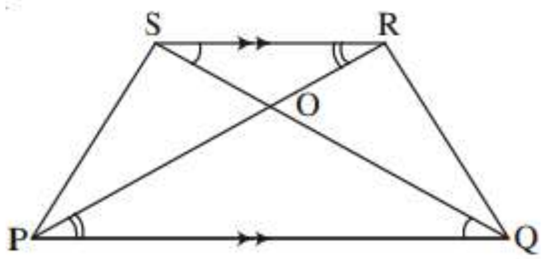
OR

2048 = 960 ×× 2 + 128
960 = 128 ×× 7 + 64 2
128 = 64 ×× 2 + 0
∴∴ HCF (2048, 960) = 64

14.


△APB∼ΔDPC△APB∼ΔDPC[AA similarity]
APDP=BPPCAPDP=BPPC⇒AP×PC=BP×DP⇒AP×PC=BP×DP

OR



In ΔPOQ and ΔROS

$\angle P=\angle R$[Alternate angles]

$\angle Q=\angle S$[Alternate angles]

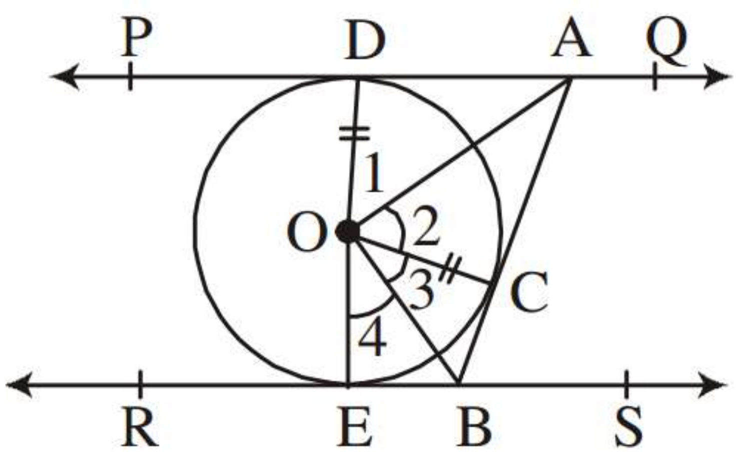
$\therefore \Delta POQ \sim \Delta ROS$[AA similarity]

$\therefore \frac{ar(\Delta POQ)}{ar(\Delta ROS)}=\left(\frac{PQ}{RS}\right)^2$

$=\left(\frac{3}{1}\right)^2=\frac{9}{1}$

$\therefore ar(\Delta POQ):ar(\Delta ROS)=9:1$

15.



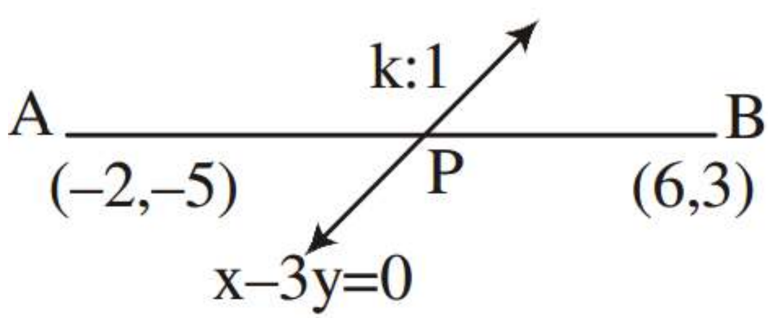
$\Delta AOD \cong AOC$[SAS]

$\Rightarrow \angle 1=\angle 2$

Similarly, $\angle 4=\angle 3$

$\Rightarrow \angle 1+\angle 4=\angle 2+\angle 3=\frac{1}{2}(180^\circ)$

$\Rightarrow \angle 2+\angle 3=90^\circ$ or $\angle AOB=90^\circ$



16.

Let the line x – 3y = 0 intersect the segment joining A(−2, −5) and B(6, 3) in the ratio k : 1

∴∴ Coordinates of P are (6k−2k+1,3k−5k+1)(6k−2k+1,3k−5k+1)

P lies on x - 3y =

0⇒6k−2k+1=3(3k−5k+1)⇒k=133⇒6k−2k+1=3(3k−5k+1)⇒k=133

∴∴Ratio is 13 : 3

⇒⇒ Coordinates of P are (92,32)(92,32)

17. (3sin43∘cos47∘)2−cos37∘cosec53∘tan5∘tan25∘tan45∘tan65∘tan85∘(3sin43∘cos47∘)2−cos37∘cosec53∘tan5∘tan25∘tan45∘tan65∘tan85∘

=(3sin43∘cos(90∘−43∘))2−cos37∘⋅cosec(90∘−37∘)tan5∘tan25∘(1)tan(90∘−25∘)tan(90∘−5∘)=(3sin43∘cos(90∘−43∘))2−cos37∘⋅cosec(90∘−37∘)tan5∘tan25∘(1)tan(90∘−25∘)tan(90∘−5∘)

=(3sin43∘sin43∘)2−cos37∘⋅sec37∘tan5∘⋅tan25∘(1)cot25∘cot5∘=(3sin43∘sin43∘)2−cos37∘⋅sec37∘tan5∘⋅tan25∘(1)cot25∘cot5∘

=9−11=8=9−11=8

18. Radius of quadrant = OB =152+152−−−−−−−−−√=152–√cm=152+152=152cm

Shaded area = Area of quadrant – Area of square

=14(3.14)[(152–√)2−(15)2]=14(3.14)[(152)2−(15)2]

= $(15)^2$ (1.57 – 1) = 128.25 cm^2

OR

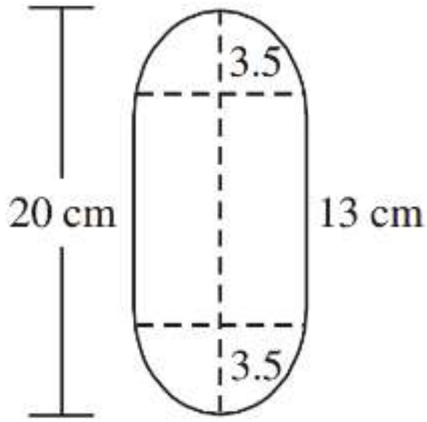
BD = (22–√)2+(22–√)2−−−−−−−−−−−−−−√=16−−√=4cm(22)2+(22)2=16=4cm

∴∴Radius of circle = 2 cm

∴∴Shaded area = Area of circle - Area of square

=3.14×22−(22–√)2=3.14×22−(22)2

= 12.56 - 8 = 4.56 cm^2



19.

Height of cylinder = 20 − 7 = 13 cm

Total Volume = π(72)2·13+43π(72)3cm3π(72)2·13+43π(72)3cm3

=227×494(13+43·72)cm3=227×494(13+43·72)cm3

=77×536=680.17cm3=77×536=680.17cm3

20.

x_i	f_i	u_i	f_iu_i
32.5	14	-3	-42
37.5	16	-2	-32
42.5	28	-1	-28
47.5	23	0	0
52.5	18	1	18
57.5	8	2	16
62.5	3	3	9
	ΣΣf_i = 110		ΣΣf_iu_i = -59

21. Mean = 47.5−59×5110=47.5−2.68=44.847.5−59×5110=47.5−2.68=44.8

$3x^2 - 5 \overline{)\, 3x^4 - 9x^3 + x^2 + 15x + k\,} (x^2 - 3x + 2$

$3x^4 \quad - 5x^2$

$- \quad +$

$-9x^3 + 6x^2 + 15x + k$

$-9x^3 \quad + 15x$

$+ \quad -$

$6x^2 + k$

$6x^2 - 10$

$- \quad +$

$k + 10$

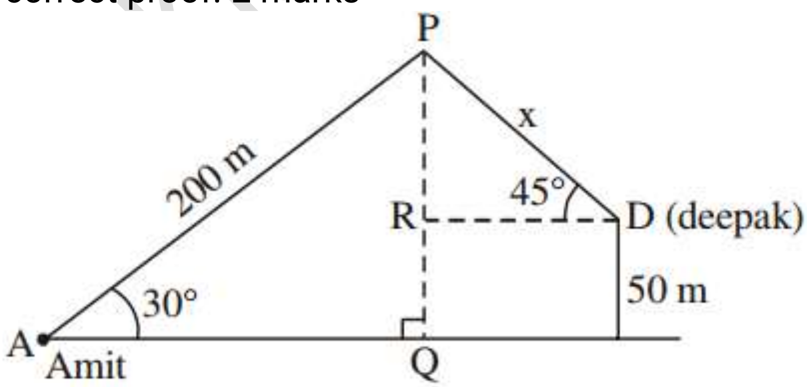
22. ∴k+10=0⇒k=−10∴k+10=0⇒k=-10

OR

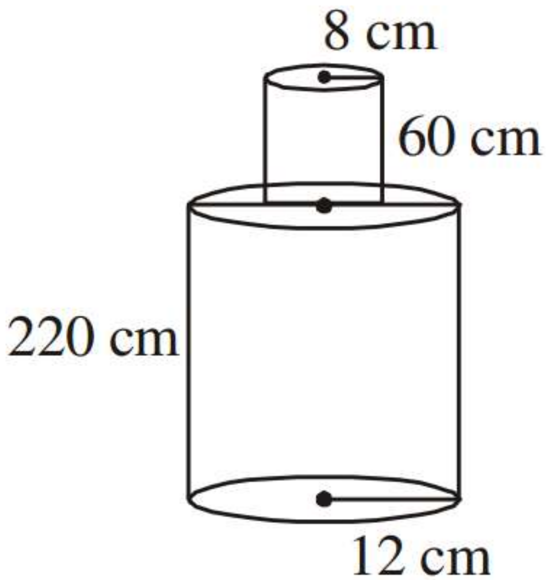
p(y) = $7y^2$ −113y−23=13(21y2−11y−2)−113y−23=13(21y2−11y−2)
=13=13[(7y + 1)(3y − 2)]
∴∴ Zeroes are 23,−1723,−17
Sum of Zeroes = 23−17=112123−17=1121
−ba=1121∴−ba=1121∴ sum of zeroes =−ba=−ba
Product of Zeroes = (23)(−17)=−221(23)(−17)=−221
ca=−23(17)=−221ca=−23(17)=−221
∴∴ Product =ca=ca

23. x^2 + px + 16 = 0 have equal roots if D = p^2 − 4(16)(1) = 0
p^2 = 64 ⇒⇒ p = ±8 1
∴∴ x2 ± 8x + 16 = 0 ⇒⇒ (x ± 4)2 = 0
x ± 4 = 0
∴∴ Roots are x = −4 and x = 4

24. For correct, given, to prove, construction and
figure 12×4=212×4=2 marks
For correct proof. 2 marks



25.
In △△APQ,
PQAP=sin30∘=12PQAP=sin30∘=12
PQ = (200)(12)=100m(200)(12)=100m
PR = 100 - 50 = 50 m
In ΔPRD,PRPD=sin45∘=12√ΔPRD,PRPD=sin45∘=12
PD = (PR)(2–√)=502–√m(2)=502m



26.

Total volume = $3.14(12)^2(220) + 3.14(8)^2(60)$ cm^3

= 99475.2 + 12057.6 = 111532.8 cm^3

Mass = $\frac{111532.8 \times 8}{1000}$ kg

= 892.262 kg

27. Constructing an equilateral triangle of side 5 cm (1 marks)

Constructing another similar triangle with scale factor $\frac{2}{3}$ (3 marks)

OR

Constructing two concentric circle of radii 2 cm and 5 cm (1 marks)

Drawing two tangents PA and PB (2 marks)

PA = 4.5 cm (approx) (1 marks)

28.

Class Interval	c.f.
Less than 40	7
Less than 50	12
Less than 60	20
Less than 70	30
Less than 80	36
Less than 90	42
Less than 100	50

29. Plotting of points (40, 7), (50, 12), (60, 20), (70, 30), (80, 36), (90, 42) and (100, 50)

Joining the points to get the curve

30. LHS

$= \frac{\tan\theta}{1-\frac{1}{\tan\theta}} + \frac{\frac{1}{\tan\theta}}{1-\tan\theta} = \frac{\tan^2\theta}{\tan\theta-1} - \frac{1}{\tan\theta(\tan\theta-1)}$

$= \frac{\tan^3\theta-1}{\tan\theta(\tan\theta-1)} = \frac{(\tan\theta-1)(\tan^2\theta+\tan\theta+1)}{\tan\theta(\tan\theta-1)}$

$= \tan\theta+1+\cot\theta = 1+\frac{\sin\theta}{\cos\theta}+\frac{\cos\theta}{\sin\theta} = 1+\frac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta}$

$= 1+\frac{1}{\sin\theta\cos\theta} = 1+\operatorname{cosec}\theta\sec\theta$ = RHS

OR

$\frac{\sin\theta}{\operatorname{cosec}\theta+\cot\theta} - \frac{\sin\theta}{\cot\theta-\operatorname{cosec}\theta}$

$= \frac{\sin\theta}{\operatorname{cosec}\theta+\cot\theta} + \frac{\sin\theta}{\operatorname{cosec}\theta-\cot\theta}$

$= \frac{\sin\theta[\operatorname{cosec}\theta-\cot\theta+\operatorname{cosec}\theta+\cot\theta]}{\operatorname{cosec}^2\theta-\cot^2\theta}$

$= \frac{\sin\theta(2\operatorname{cosec}\theta)}{1} = 2 + \frac{\sin\theta}{\cot\theta-\operatorname{cosec}\theta}$

31. Let $-82 = a_n$ ∴ $-82 = -7 + (n-1)(-5)$

⇒ $15 = n - 1$ or $n = 16$

Again $-100 = a_m = -7 + (m-1)(-5)$ 1

⇒ $(m-1)(-5) = -93$

$m-1 = \frac{93}{5}$ or $m = \frac{93}{5}+1 \notin N$

∴ -100 is not a term of the A.P.

OR

$S_n = 180 = \frac{n}{2}\cdot[90+(n-1)(-6)]$

$360 = 90n - 6n^2 + 6n$ ⇒ $6n^2 - 96n + 360 = 0$ 1

⇒ $6[(n-6)(n-10)] = 0$ ⇒ $n = 6, n = 10$ 1

Sum of $a_7, a_8, a_9, a_{10} = 0$ ∴ $n = 6$ or $n = 10$

32. Let marks in Hindi be x

Then marks in Eng = $30 - x$

∴ $(x+2)(30-x-3) = 210$

⇒ $x^2 - 25x + 156 = 0$ or $(x-13)(x-12) = 0$

⇒ $x = 13$ or $x = 12$

∴ $30 - 13 = 17$ or $30 - 12 = 18$

∴ Marks in Hindi & English are (13, 17) or (12, 18)