Topper's* Answers	**C.B.S.E. 2020** **Class–X** **Delhi / Outside Delhi**	**Mathematics (Basic)**

Maximum Time: 3 hours **MM: 80**

**Note : This paper is solely for reference purpose. The pattern of the paper has been changed for the academic year 2022-23.*

General Instructions:

Read the following instructions very carefully and strictly follow them:

*(i) This question paper comprises **four** sections – A, B, C and D. This question paper carries **40** questions. All questions are compulsory.*

*(ii) **Section A:** Question Numbers **1** to **20** comprises of **20** questions of **one** mark each.*

*(iii) **Section B:** Question Numbers **21** to **26** comprises of **6** questions of **two** marks each.*

*(iv) **Section C:** Question Numbers **27** to **34** comprises of **8** questions **three** marks each.*

*(v) **Section D:** Question Numbers **35** to **40** comprises of **6** questions of **four** marks each.*

*(vi) There is no overall choice in the question paper. However, an internal choice has been provided in 2 questions of one mark, 2 questions of two marks, 3 questions of three marks and 3 questions of four marks. You have to attempt **only one of the choices** in such questions.*

(vii) In addition to this, separate instructions are given with each section and question, wherever necessary.

*(viii) Use of calculators is **not** permitted.*

SECTION - A

Question numbers 1 to 20 carry 1 mark each.

Choose the correct option in question numbers 1 to 10.

1. Given that HCF (156, 78), LCM (156, 78) is

(A) 156 **(B)** 78 **(C)** 156×78 **(D)** 156×2

Sol. (A) 156

2. Sides of two similar triangles are in the ratio 4 : 9. Areas of these triangles are in the raio

(A) 4 : 9 **(B)** 2 : 3 **(C)** 81 : 16 **(D)** 16 : 81

Sol. (D) 16 : 81

3. The distance between the points (– 1, – 3) and (5, – 2) is

(A) $\sqrt{61}$ units **(B)** $\sqrt{37}$ units **(C)** 5 units **(D)** $\sqrt{17}$ units

Sol. (B) $\sqrt{37}$ units

4. The discriminant of the quadratic equation $2x^2 - 4x + 3 = 0$ is

(A) – 8 **(B)** 10 **(C)** 8 **(D)** $2\sqrt{2}$

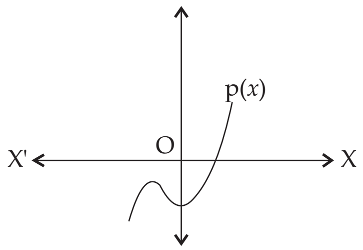
OR

Roots of the quadratic equation $2x^2 - 4x + 3 = 0$ are

(A) real and equal **(B)** real and distinct **(C)** not real **(D)** real

Sol. (choice-I) (A) –8

5. Numbers of zeroes of the polynomial $p(x)$ shown in Figure-1, are



(A) 3 (B) 2 (C) 1 (D) 0

Sol. (C) 1

6. A dice is thrown once. The probability of getting an od number is

(A) 1 (B) $\frac{1}{2}$ (C) $\frac{4}{6}$ (D) $\frac{2}{6}$

Sol. (B) $\frac{1}{2}$

7. The value of k for which the equations $3x - y + 8 = 0$ and $6x + ky = -16$ represent coincident lines, is

(A) $-\frac{1}{2}$ (B) $\frac{1}{2}$ (C) 2 (D) -2

Sol. (D) -2

8. If $\sin A = \cos A$, $0 \le A \le 90°$, then the angle A is equal to

(A) 30° (B) 60° (C) 0° (D) 45°

Sol. (D) 45°

9. The second term from the end of the A.P. 5, 8, 11, ..., 47 is

(A) 50 (B) 45 (C) 44 (D) 41

Sol. (C) 44

10. Total surface area of a solid hemisphere is

(A) $3\pi r^2$ (B) $2\pi r^2$ (C) $4\pi r^2$ (D) $\frac{2}{3}\pi r^2$

Sol. (A) $3\pi r^2$

Fill in the blanks in question numbers 11 to 15.

11. The roots of the equation, $x^2 + bx + c = 0$ are equal if _____.

Sol. D = 0 (discriminant ~~is~~ zero)
or $b^2 - 4ac = 0$ {here a = 1}.
$b^2 = 4c$

12. The mid-point of the line segment joining the points $(-3, -3)$ and $(-3, 3)$ is _____.

Sol. $(-3, 0)$

13. The lengths of the tangents drawn from an external point to a circle are _____.

Sol. equal.

14. For a given distribution with 100 observations, the 'less than' ogive an 'more than' ogive intersect at (58, 50). The median of the distribution is _____.

Sol. 58

15. In the quadratic polynomial $t^2 - 16$, sum of the zeroes is _____.

Sol. $\alpha + \beta = \frac{-b}{a} = \frac{0}{1} = 0$

Answer the following question numbers 16 to 20.

16. Write the 26[th] term of the A.P. 7, 4, 1, – 2, ...

Sol. $a_{26} = ?$ $\quad n = 26,\ a = 7,\ d = a_2 - a_1 = 4 - 7 = -3$

$a_n = a + (n-1)d$

$a_{26} = 7 + (26-1)(-3)$

~~$a_{26} = 7 + \quad a_{26} =$~~

$a_{26} = 7 - 75$

$\boxed{a_{26} = -68}$

17. Find the coordinates of the point on x-axis which divides the line segment joining the points (2, 3) and (5, – 6) in the ratio 1 : 2.

Sol. $m_1 = 1,\ m_2 = 2$

$x_1 = 2,\ x_2 = 5$

$y_1 = 3,\ y_2 = -6$

Let the point be P and its coordinates be (x, y).

$(x, y) = \left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}\right)$

$(x, y) = \left(\frac{1(5) + 2(2)}{1+2}, \frac{1(-6) + 2(3)}{1+2}\right)$

$(x, y) = \left(\frac{5+4}{3}, \frac{-6+6}{3}\right)$

$(x, y) = \left(\frac{9}{3}, \frac{0}{3}\right)$

$\boxed{(x, y) = (3, 0)}$

Since the point is on x-axis, therefore ~~+~~ the point on y-axis will be '0'.

18. If cosec θ = $\frac{5}{4}$, find the vlue of cot θ.

OR

Find the value of sin 42° – cos 48°.

Sol. (Choice-II)

$\sin 42^\circ - \cos 48^\circ$

$= \sin 42^\circ - \sin(90-48)^\circ$ $\{\because \cos\theta = \sin(90-\theta)\}$

$= \sin 42^\circ - \sin 42^\circ$

$= \boxed{0}$

19. The angle of elevation of the top of the tower AB from a point C on the ground, which is 60 m away from the foot of the tower, is 30°, as shown in figure-2. Find the height of the tower.

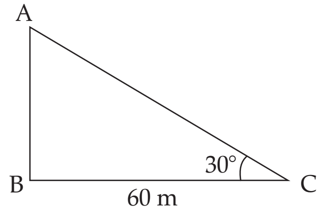
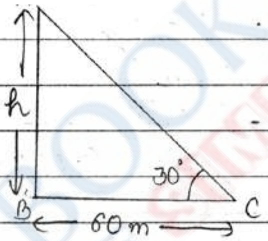


Figure-2

Sol.

Let the height of the tower be h m



In $\triangle ABC$

$\angle ABC = 90^\circ$ (Tower stands vertical on the ground)

$\therefore \tan 30^\circ = \dfrac{AB}{BC}$

$\dfrac{1}{\sqrt{3}} = \dfrac{h}{60}$

$h = \dfrac{60}{\sqrt{3}} \Rightarrow h = \dfrac{20 \times \cancel{3}^{\sqrt{3}}}{\cancel{\sqrt{3}}} \Rightarrow \boxed{h = 20\sqrt{3}\ m}$

20. In Figure-3, find the length of the tangent PQ drawn from the point P to a circle with centre at O, given that OP = 12 cm and OQ = 5 cm.

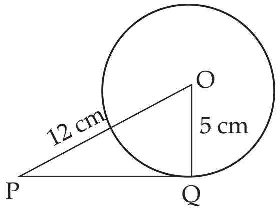


Figure-3

Sol.

In $\triangle OQP$

$\angle OQP = 90^\circ$ (radius is $\perp$ to tangent)

By Pythagoras theorem,

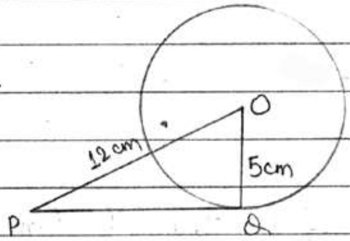
$OP^2 = OQ^2 + PQ^2$

$PQ^2 = OP^2 - OQ^2$

$PQ^2 = (12)^2 - (5)^2$

$PQ = \sqrt{144 - 25}$

$\boxed{PQ = \sqrt{119}\ cm}$



SECTION - B

Question number 21 to 26 carry 2 marks each.

21. A cylindrical bucket, 32 cm high and with radius of base 14 cm, is filled completely with sand. Find the volume of the sand. $\left(\text{Use } \pi = \dfrac{22}{7}\right)$

Sol. Cylinder

$h = 32$ cm $\quad \pi = \dfrac{22}{7}$

$r = 14$ cm

Volume of sand = vol. of cylinder

$= \pi r^2 h$

$= \left(\dfrac{22}{\cancel{7}} \times \cancel{14}^{2} \times 14 \times 32\right)$ cm^3

$\boxed{19712 \text{ cm}^3}$

22. In Figure-4, Δ ABC and Δ XYZ are shown. If AB = 3.8 cm, AC = $3\sqrt{3}$ cm, BC = 6 cm, XY = $6\sqrt{3}$ cm, XZ = 7.6 cm, YZ = 12 cm and ∠A = 65°, ∠B = 70°, then find the value of ∠Y.

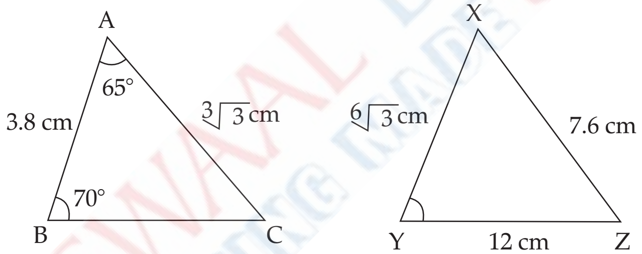


Figure-4

OR

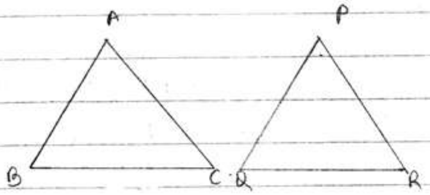
If the areas of two similar triangles are equal, show that they are congruent.

Sol. Ans. 22. (Choice II)

Given

Δ ABC ~ Δ PQR

ar(ABC) = ar(PQR)



To prove: Δ ABC ≅ Δ PQR

Proof:

$\dfrac{ar(ABC)}{ar(PQR)} = 1 \quad \{\because ar(ABC) = ar(PQR)\}$

$\dfrac{ar(ABC)}{ar(PQR)} = \left(\dfrac{AB}{PQ}\right)^2 \quad$ {∵ the ratio of areas of two similar Δs is equal to the square of the ratio of their sides}

$\dfrac{AB}{PQ} = 1^2$

$AB = PQ$ — (1)

Similarly $\dfrac{BC}{QR} = 1^2 \Rightarrow BC = QR$ — (2), $\dfrac{AC}{PR} = 1^2 \Rightarrow AC = PR$ — (3)

from (1.), (2.) and (3.)

$\triangle ABC \cong \triangle PQR$ (SSS congruency)

$\therefore$ Proved

23. If sec 2A = cosec (A – 30°), 0° < 2A < 90°, then find the value of ∠A.

Sol. $\sec 2A = \text{cosec}(A-30^\circ)$

$\Rightarrow \text{cosec}(90^\circ-2A) = \text{cosec}(A-30^\circ)$ $\{\because \sec\theta = \{\text{cosec}(90^\circ-\theta)\}\}$

$\Rightarrow 90^\circ-2A = A-30^\circ$

$\Rightarrow 90^\circ+30^\circ = 3A$

$\Rightarrow 120^\circ = 3A$

$\Rightarrow \cancel{\boxed{A=60^\circ}} \Rightarrow \boxed{A = \left(\frac{120}{3}\right)^\circ = 40^\circ}$

24. Show that every positive even integer is of the form 2q and that every positive odd integer is of the form 2q + 1, where q is some integer.

Sol. Let a be any positive integer. Let it be divided by 2 giving 'q' as quotient, 'r' as remainder.

$a = 2q + r$

According to Euclid's divison algorithm.

$0 \le r < b \Rightarrow 0 \le r < 2$

r can either be 0 or 1

When r = 0

$a = 2q + 0 \Rightarrow a = 2q$ (Here a is even) — (1.)

When r = 1

$a = 2q+1$ (Here a is odd) — (2.)

Thus, from (1.) and (2.) it can be said that every even positive integer is of the form 2q and every positive odd integer is of the form 2q+1.

25. How many two-digit numbers are divisible by 6 ?

OR

In an A.P. it is given that common difference is 5 and sum of its first ten terms is 75. Find the first term of the A.P.

Sol. Ans. 25. (Choice – II)

$d = 5$, $n = 10$, $S_{10} = 75$

$a = ?$

$S_n = \frac{n}{2}[2a + (n-1)d]$

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$d = 5$, $n = 10$, $S_{10} = 75$

$a = ?$

$S_n = \frac{n}{2}[2a + (n-1)d]$

$S_{10} = \frac{10}{2}[2a + (10-1)5]$

$S_{10} = \frac{10}{2}[2a + 45]$

$75 \times 2 = 20a + 450$

$150 - 450 = 20a$

$-300 = 20a$

$a = \frac{-300}{20}$

$\boxed{a = -15}$

26. The following table shows the ages of the patients admitted in a hospital during a year :

Age (in years) :	5 – 15	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65
Number of patients :	60	110	210	230	150	50

Find the mode of the distribution.

Sol.

C.I.	f
5 – 15	60
15 – 25	110
25 – 35	210 — f_0
35 – 45	230 — f_1
45 – 55	150 — f_2
55 – 65	50

$f_1 = 230$, $f_2 = 150$, $f_0 = 210$

$l = 35$, $h = 10$

$\text{Mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$

$= 35 + \left[\frac{230 - 210}{460 - 210 - 150}\right] \times 10$

$= 35 + \left[\frac{\cancel{20}^2}{\cancel{100}} \times 1\cancel{0}\right]$

$= 35 + 2$

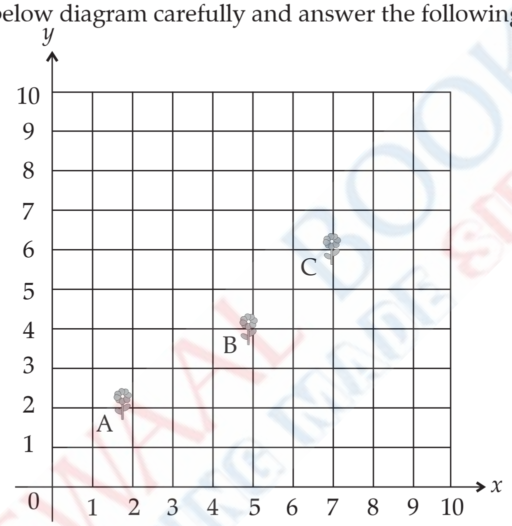
$= \boxed{37}$

SECTION - C

Question number 27 to 34 carry 3 marks each.

27. Seema has a 10 m × 10 m kitchen garden attached to her kitchen. She divides it into a 10 × 10 grid and wants to grow some vegetables and herbs used in the kitchen. She puts some soil and manure in that and sows a green chilly plant at A, a coriander plant at B and a tomato plant at C.

Her friend Kusum visited the garden and praised the plants grown there. She pointed out that they seem to be in a straight line. See the below diagram carefully and answer the following questions :



(i) Write the coordinates of the points A, B and C taking the 10 × 10 grid as coordinate axes.

(ii) By distance formula or some other formula, check whether the points are collinear.

Sol.

(i.) Coordinates of A = (2, 2)

Coordinates of B = (5, 4)

Coordinates of C = (7, 6)

(ii.) If the points are collinear then,

AB + BC = AC

$AB = \sqrt{(5-2)^2 + (4-2)^2} \quad \{\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}\}$

$AB = \sqrt{9 + 4}$

$AB = \sqrt{13}$ unit

$BC = \sqrt{(7-5)^2 + (6-4)^2}$

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$BC = \sqrt{4 + 4}$

$BC = \sqrt{8}$ unit

$AC = \sqrt{(7-2)^2 + (6-2)^2}$

$AC = \sqrt{25 + 16}$

$AC = \sqrt{41}$

$\because \sqrt{13} + \sqrt{8} \neq \sqrt{41}$

$\therefore$ The points are not collinear.

28. In Figure-5, a circle is inscribed in a Δ ABC touching BC, CA and AB at P, Q and R respectively. If AB = 10 cm, AQ = 7 cm, CQ = 5 cm, find the length of BC.

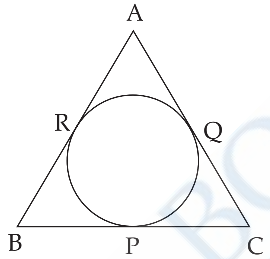

Figure-5

OR

In Figure-6, two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$.

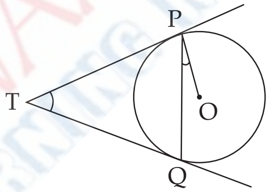

Figure-6

Sol. Ans. 28. (Choice – I)

AB = 10 cm , AQ = 7 cm , CQ = 5 cm

BC = ?

AR = AQ (equal tangents from point A) {tangents from a point outside the circle are equal in length}

AR = 7cm

AB = AR + BR

BR = AB − AR

BR = 10 − 7

BR = 3 cm

BR = BP = 3 cm (equal tangents from B)

1.

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CQ = 5cm = CP {equal tangents from C} — (2)

BC = BP + CP {∵ from (1) & (2)}

BC = 3 + 5

$\boxed{BC = 8cm}$

29. Prove that $\sqrt{2}$ is an irrational number.

Sol. Let us assume that $\sqrt{2}$ is rational

Then, $\frac{a}{b}$ is its simplest where 'a' and 'b' are

co-prime integers, $b \neq 0$

$\sqrt{2} = \frac{a}{b}$

Squaring both the sides we get

$2 = \frac{a^2}{b^2}$

$2b^2 = a^2$ — (1)

Thus, 2 divides a^2 {∵ it divides b^2}

⇒ 2 divides a {∵ 2 is prime & divides a^2} — (2)

Let a = 2c for some integer c

$a^2 = 4c^2$

$2b^2 = 4c^2$ [from (1)]

$b^2 = 2c^2$

Thus, 2 divides b^2 {∵ 2 divides c^2}

⇒ 2 divides b {∵ 2 is prime & divides b^2} — (3)

from (2) and (3) we get 2 as a common factor of a and b

But this contradicts the fact that a and b are co-primes.

This contradiction has arisen due to our wrong assumption

Therefore, $\sqrt{2}$ is irrational number.

30. Prove that :

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

Sol. $(\operatorname{cosec}\theta - \cot\theta)^2 = \frac{1-\cos\theta}{1+\cos\theta}$

From L.H.S.

$(\operatorname{cosec}\theta - \cot\theta)^2$

$= \operatorname{cosec}^2\theta + \cot^2\theta - 2\operatorname{cosec}\theta\cot\theta$ $\{(a-b)^2 = a^2 + b^2 - 2ab\}$

$= \frac{1}{\sin^2\theta} + \frac{\cos^2\theta}{\sin^2\theta} - 2 \times \frac{1}{\sin\theta} \times \frac{\cos\theta}{\sin\theta}$

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

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

$$= \frac{(1-\cos\theta)^2}{1-\cos^2\theta} \quad \left\{ \begin{array}{l} \because a^2+b^2-2ab=(a-b)^2 \\ \because \sin^2\theta + \cos^2\theta = 1 \end{array} \right\}$$

$$= \frac{\cancel{(1-\cos\theta)}(1-\cos\theta)}{\cancel{(1-\cos\theta)}(1+\cos\theta)} \quad \{\because a^2-b^2=(a+b)(a-b)\}$$

$$= \frac{1-\cos\theta}{1+\cos\theta}$$

= R.H.S.

Therefore, Proved.

31. 5 pencils and 7 pens together cost Rs. 250 whereas 7 pencils and 5 pens together cost Rs. 302. Find the cost of one pencil and that of a pen.

OR

Solve the following pair of equations using cross-multiplication method :

$$x - 3y - 7 = 0$$
$$3x - 5y - 15 = 0$$

Sol.

Let the cost of 1 pencil be ₹ x and cost of 1 pen be ₹ y.

Then, ~~as~~ ATQ,

$$5x + 7y = 250 \quad \text{--- (1)}$$

$$7x + 5y = 302 \quad \text{--- (2)}$$

Multiplying (1) by 7 and (2) by 5 and subtracting (1) from (2)

$$35x + 49y = 1750$$
$$35x + 25y = 1510$$
$$\overline{\quad 24y = 240 \quad}$$

$$y = \frac{240}{24}$$

$$y = ₹\ 10$$

Substituting $y=10$ in (1), we get,

$$5x + 7(10) = 250$$
$$5x = 250 - 70$$
$$x = \frac{180}{5}$$
$$x = ₹\ 36$$

Cost of one pencil = ₹ 36

Cost of one pen = ₹ 10

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32. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting

(i) a king of red colour.

(ii) the queen of diamonds.

(iii) an ace.

OR

A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears

(i) a two-digit number.

(ii) a perfect square number.

(iii) a prime number less than 15.

Sol. (Choice-I (i.) Total no. of red king = 2

Total no. of cards = 52

P(getting a king of red colour) = $\dfrac{\text{favourable outcome}}{\text{Total no. of outcomes}}$

$= \dfrac{2}{52}$

$= \dfrac{1}{26}$

(ii.) Diamond suit has 1 queen

P(getting the queen of diamonds) = $\dfrac{1}{52}$

(iii.) There are total 4 ace (one in each suit)

P(getting an ace) = $\dfrac{4}{52} = \dfrac{1}{13}$

33. In Figure-7, ABCD is a square of side 14 cm. From each corner of the square, a quadrant of a circle of radius 3.5 cm is cut and also a circle of radius 4 cm is cut as shown in the figure. Find the area of the remaining (shaded) portion of the square.

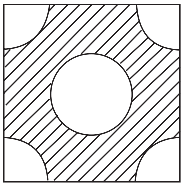


Figure-7

Sol. Area of the square = $(\text{side})^2$

$= (14)^2$

$= 196 \text{ cm}^2$

Area of 4 quadrants $= 4 \times \left[\dfrac{\theta}{360°} \times \pi r^2\right]$

$= 4 \times \left[\dfrac{\cancel{90°}}{\cancel{360°}_4} \times \dfrac{22}{\cancel{7}} \times \overset{0.5}{\cancel{3.5}} \times 3.5\right]$

$= \left(\cancel{4} \times \frac{1}{\cancel{4}} \times 22 \times 0.5 \times 3.5\right)$

$= 38.5 \text{ cm}^2$

Area of circle $= \pi r^2$

$= \cancel{\frac{22}{7} \times 16}\ \frac{22}{7} \times (4)^2$

$= \frac{352}{7} = 50.29 \text{ cm}^2$ (approx.)

Area of shaded region = Area of square − (Area of ~~4~~ quadrants + Area of circle)

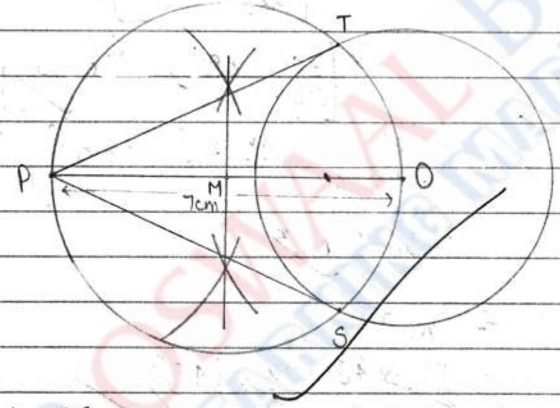
$= 196 - (38.5 + 50.29)$

$= (196 - 88.79)$

$= 107.21 \text{ cm}^2$ (approx)

34. Draw the circle of radius 3 cm. Take a point P outside the circle at a distance of 7 cm from the centre O of the circle and draw two tangents to the circle.

Sol.



PT and PS are the required tangents.

Steps of construction:

1. Draw a circle with radius 3 cm
2. Take a point P outside the circle which is 7 cm away from the centre of the circle.
3. Join OP.
4. Draw the perpendicular bisector of OP which intersects it at M.
5. Taking M as centre and radius equal to PM draw another circle.
6. Mark the points of intersection of bigger circle and smaller circle as T and S
7. Join PT and PS.

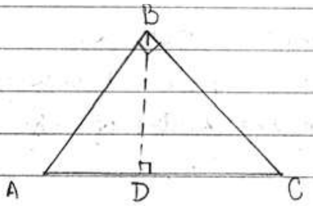
SECTION - D

Question number 35 to 40 carry 4 marks each.

35. In a right-angled triangle, prove that the square of the hypotenuse is equal to the sum of the squares of the remaining two sides.

Sol.

Ans. 35.



ABC is a right - angled $\triangle$

$\angle B = 90^\circ$

AC $\rightarrow$ hypotenuse

To prove : $AC^2 = AB^2 + BC^2$

Const. : Draw $AD \perp$ ~~AD~~ AC

Proof :

In $\triangle ADB$ and $\triangle ABC$

$\angle ADB = \angle ABC = 90^\circ$

$\angle DAB = \angle BAC$ (common)

$\therefore \triangle ADB \sim \triangle ABC$ (AA - similarity criterion),

$\Rightarrow \dfrac{AD}{AB} = \dfrac{AB}{AC}$

$\Rightarrow AB^2 = AD \times AC$ —— (1.)

In $\triangle BDC$ and $\triangle ABC$

$\angle BDC = \angle ABC = 90^\circ$

$\angle BCD = \angle ACB$ (common)

$\therefore \triangle BDC \sim \triangle ABC$ (AA- similarity criterion)

$\Rightarrow \dfrac{\cancel{BD}\ BC}{AC} = \dfrac{DC}{BC}$

$\Rightarrow BC^2 = AC \times DC$ —— (2.)

Adding (1.) & (2.) we get,

$AB^2 + BC^2 = AD \times AC + AC \times DC$

$AB^2 + BC^2 = AC(AD + DC)$

$AB^2 + BC^2 = AC \times AC$

$\boxed{AB^2 + BC^2 = AC^2}$

$\therefore$ Proved

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36. Divide polynomial $-x^3 + 3x^2 - 3x + 5$ by the polynomial $x^2 + x - 1$ and verify the division algorithm.

OR

Find other zeroes of the polynomial
$p(x) = 2x^4 - 3x^3 - 3x^2 + 6x - 2$

if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$

Sol. Ans. 36. (Choice-I)

$$
\begin{array}{r|l}
 & -x + 4 \\
x^2 + x - 1 & -x^3 + 3x^2 - 3x + 5 \\
 & -x^3 - x^2 + x \\
 & + \quad + \quad - \\
\hline
 & 4x^2 - 4x + 5 \\
 & 4x^2 + 4x - 4 \\
 & - \quad - \quad + \\
\hline
 & -8x + 9
\end{array}
$$

Divisor = $x^2 + x - 1$

Dividend = $-x^3 + 3x^2 - 3x + 5$

Remainder = $-8x + 9$

Quotient = $-x + 4$

According to the division algorithm :

Dividend = Divisor × Quotient + Remainder

~~$-x^3 + 3x^2 - 3x + 5 = (-x+4)(-x+4) + (-8x+9)$~~

$$-x^3 + 3x^2 - 3x + 5 = (x^2 + x - 1) \times (-x + 4) + (-8x + 9)$$
$$= -x^3 + 4x^2 - x^2 + 4x + x - 4 - 8x + 9$$
$$= -x^3 + 3x^2 - 3x + 5$$
$$= \text{L.H.S.}$$

∴ Proved.

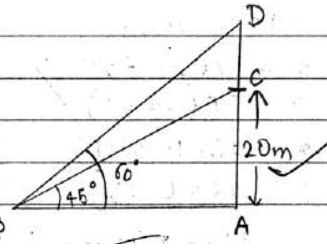
37. From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower, fixed at the top of a 20 m high building, are 45° and 60° respectively. Find the height of the tower. (Use $\sqrt{3} = 1.73$)

Sol. Ans. 37.

AC → height of building = 20m

CD → height of transmission tower

CD = x m.



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AB → distance of the point from the foot of the building = y m

In △ ABC

∠CAB = 90° [building stands vertical on the ground]

$\therefore \tan 45° = \frac{AC}{AB} \Rightarrow 1 = \frac{AC}{y} \Rightarrow y = 20\text{ m}$ —(1)

In △ADB

∠DAB = 90° (building stands vertical on the ground)

$\therefore \tan 60° = \frac{AD}{AB}$

$\Rightarrow \sqrt{3} = \frac{20+x}{y}$

$\Rightarrow \sqrt{3} = \frac{20+x}{20}$ {from (1)}

$20 + x = 20\sqrt{3}$

$x = 20\sqrt{3} - 20$

$x = 20(\sqrt{3}-1)$

$x = 20(1.73-1)$

$x = (20 \times 0.73)$

$x = 14.60$ m (height of tower)

38. A bucket is in the form of a frustum of a cone of height 30 cm with the radii of its lower and upper circular ends as 10 cm and 20 cm respectively. Find the capacity of the bucket. (Use $\pi = 3.14$)

OR

Water in a canal 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/hr. How much area will it irrigate in 30 minutes if 4 cm of standing water is needed ?

Sol. (Choice-I) $h = 30$ cm

$r_1 = 10$ cm

$r_2 = 20$ cm

Capacity = Volume

Volume of frustum of a cone = ~~$\frac{1}{3} \times \pi \times h$~~ (

$= \frac{1}{3}\pi(r_1^2 + r_2^2 + r_1 r_2) \times h$

$= \frac{1}{3} \times 3.14 (10^2 + 20^2 + 200) \times 30$

$= 3.14(100 + 400 + 200) \times 10$

$= 3.14 \times 700 \times 10$

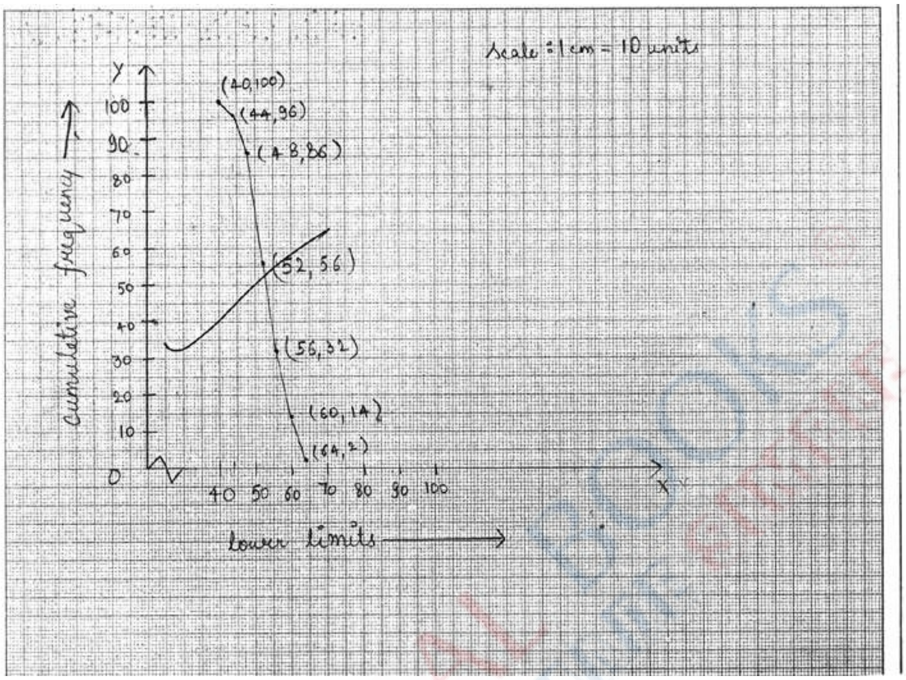
$= 2198 \times 10$

$= 21980 \text{ cm}^3$

39. Draw a 'more than' ogive for the following distribution :

Weight (in kg) :	40 – 44	44 – 48	48 – 52	52 – 56	56 – 60	60 – 64	64 – 68
Number of Students :	4	10	30	24	18	12	2

Sol.



C.I (lower limits)	c.f.
More than 40 (or equal to)	100
More than 44 (or equal to)	(100−4) = 96
More than 48 (or equal to)	96−10 = 86
More than 52 (or equal to)	86−30 = 56
More than 56 (or equal to)	56−24 = 32
More than 60 (or equal to)	32−18 = 14
More than 64 (or equal to)	14−12 = 2

Coordinates → (40, 100)
(44, 96)
(48, 86)
(52, 56)
(56, 32)
(60, 14)
(64, 2)

40. A train travels 360 km at a uniform speed. If the speed had been 5 km/hr more, it would have taken 1 hour less for the same journey. Find the original speed of the train.

OR

Sum of the areas of two squares is 468 m^2. If the difference of their parameters is 24 m, find the sides of the two squares.

Sol. (Choice-II) Ans. 40. Choice (II)

Let the sides of the two squares be x m and y m resp.

ATQ, Perimeter of square = $4 \times$ side

ATQ, $4x - 4y = 24$

$4(x-y) = 24$

$x - y = 6$ — (1)

$x = 6 + y$ — (1.)

Area of square = $(\text{side})^2$

ATQ,

$x^2 + y^2 = 468$

$\cancel{x^2+}\,(6+y)^2 + y^2 = 468$ (from (1.))

$36 + y^2 + 12y + y^2 = 468$

$2y^2 + 12y + 36 - 468 = 0$

$2y^2 + 12y - 432 = 0$

$2(y^2 + 6y - 216) = 0$

$y^2 + 6y - 216 = 0$

$y^2 + 18y - 12y - 216 = 0$

$y(y+18) - 12(y+18) = 0$

$(y+18)(y-12) = 0$

$y = -18$ E

$y = 12$

We consider $y = 12$ m because distance cannot be negative

$x = 12 + 6$

$= 18$ m

Sides of two squares are 18 m and 12 m.

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