Topper's* Answers

C.B.S.E.
2020
Class-X
Delhi / Outside Delhi Sets

Mathematics Standard

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

Maximum Time: 3 hour **MM: 80**

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.

Question numbers 1 to 10 are multiple choice questions.

Choose the correct option.

Sol.

1. The value(s) of k for which the quadratic equation $2x^2 + kx + 2 = 0$ has equal roots, is

(A) 4

(B) ± 4

(C) – 4

(D) 0

$2x^2 + kx + 2 = 0$

For Equal roots;

$b^2 - 4ac = 0$

$k^2 - 16 = 0$

$k = \pm 4$

Ans (B) ± 4

2. Which of the following is **not** an A.P. ?

(A) – 1.2, 0.8, 2.8, ...

(B) $3, 3+\sqrt{2}, 3+2\sqrt{2}, 3+3\sqrt{2}, \ldots$

(C) $\frac{4}{3}, \frac{7}{3}, \frac{9}{3}, \frac{12}{3}, \ldots$

(D) $\frac{-1}{5}, \frac{-2}{5}, \frac{-3}{5}, \ldots$

Sol. (c) $\frac{4}{3}, \frac{7}{3}, \frac{9}{3}, \frac{12}{3}$

3. In Figure-1, from an external point *P*, two tangents *PQ* and *PR* are drawn to a circle of radius 4 cm with centre *O*. If $\angle QPR = 90°$, then length of *PQ* is

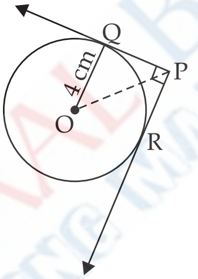


Figure-1

(A) 3 cm

(B) 4 cm

(C) 2 cm

(D) $2\sqrt{2}$ cm

Sol. (B) 4cm

4. The distance between the points (m, – n) and (– m, n) is

(A) $\sqrt{m^2+n^2}$

(B) $m + n$

(C) $2\sqrt{m^2+n^2}$

(D) $\sqrt{2m^2+2n^2}$

Sol. A (m, −n)

B (−m, n)

$AB = \sqrt{(m+m)^2 + (-n-n)^2}$

$AB = \sqrt{4m^2 + 4n^2}$

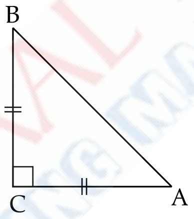
$AB = 2\sqrt{m^2 + n^2}$

Ans- (c) $2\sqrt{m^2+n^2}$

5. The degree of polynomial having zeroes – 3 and 4 only is
   - **(A)** 2
   - **(B)** 1
   - **(C)** more than 3
   - **(D)** 3

Sol. (A) 2

6. In Figure-2, *ABC* is an isosceless triangle, right-angled at C. Therefore



   - **(A)** $AB^2 = 2AC^2$
   - **(B)** $BC^2 = 2AB^2$
   - **(C)** $AC^2 = 2AB^2$
   - **(D)** $AB^2 = 3AC^2$

Sol. $AB^2 = AC^2 + BC^2$

$AB^2 = 2AC^2$

Ans- (A) $AB^2 = 2AC^2$

7. The point on the x-axis which is equidistant from (– 4, 0) and (10, 0) is
   - **(A)** (7, 0)
   - **(B)** (5, 0)
   - **(C)** (0, 0)
   - **(D)** (3, 0)

OR

The centre of a cirele whose end points of a diameter are (– 6, 3) and (6, 4) is

(A) (8, –1)

(B) (4, 7)

(C) $\left(0, \frac{7}{2}\right)$

(D) $\left(4, \frac{7}{2}\right)$

Sol. $A(-6, 3)$

$B(6, 4)$

$O = \left(\frac{-6+6}{2}, \frac{3+4}{2}\right)$

$O = \left(0, \frac{7}{2}\right)$

Ans - (c) $\left[0, \frac{7}{2}\right])$

8. The pair of linear equations $\frac{3x}{2} + \frac{5y}{3} = 7$ and $9x + 10y = 14$ is

(A) consistent

(B) inconsistent

(C) consistent with one solution

(D) consistent with many solutions

Sol. $\frac{3}{2}x + \frac{5}{3}y = 7$

$9x + 10y = 14$

$\frac{a_1}{a_2} = \frac{\cancel{3}}{2} \times \frac{1}{\cancel{9}3} = \frac{1}{6}$

$\frac{b_1}{b_2} = \frac{\cancel{5}}{3} \times \frac{1}{\cancel{10}2} = \frac{1}{6}$

$\frac{c_1}{c_2} = \frac{+7}{+14} = \frac{1}{2}$

$\frac{a1}{a2} - \frac{b1}{b2} \neq \frac{c1}{c2}$

Ans (B) Inconsistent

9. In figure-3, *PQ* is tangent to the circle with centre at *O*, at the point B. If ∠*AOB* = 100°, then ∠*ABP* is equal to

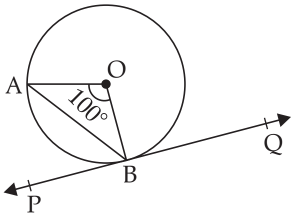


Figure-3

(A) 50°
(B) 40°
(C) 60°
(D) 80°

Sol. (A) 50°

10. The radius of a sphere (in cm) whose volume is 12π cm^3, is
(A) 3
(B) $3\sqrt{3}$
(C) $3^{2/3}$
(D) $3^{1/3}$

Sol. Volume = 12π

$\frac{4}{3}\cancel{\pi}r^3 = \overset{3}{\cancel{12}}\cancel{\pi}$

$r^3 = 9$

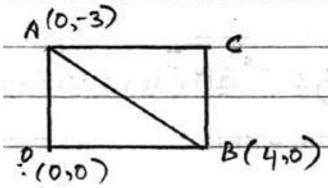
$r = 3^{\frac{2}{3}}$ cm.

Ans: (C) $3^{\frac{2}{3}}$ cm

Fill in the blanks in question numbers 11 to 15.

11. *AOBC* is a rectangle whose three vertices are *A*(0, – 3), O (0, 0) and *B*(4, 0). The length of its diagonal is ....

Sol.



Length of diagonal AB = $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{(0-4)^2+(-3-0)^2} = \sqrt{16+9} = 5$ units

12. In the formula $\bar{x} = a + \left(\frac{\Sigma f_i u_i}{\Sigma f_i}\right) \times h,\ u_i =$ ....

Sol. $u_i = \frac{x_i - a}{h}$

13. All concentric circles are .... to each other.

Sol. Similar

14. The probability of an event that is sure to happen, is ....

Sol. $P(\text{Sure event}) = 1$

15. Simplest form of $(1 - \cos^2 A)(1 + \cot^2 A)$ is ....

Sol. $(1 - \cos^2 A)(1 + \cot^2 A)$

$(1 - \cos^2 A)\left(1 + \frac{\cos^2 A}{\sin^2 A}\right)$

$(1 - \cos^2 A)\frac{(\sin^2 A + \cos^2 A)}{\sin^2 A}$

$\frac{(1 - \cos^2 A)}{\sin^2 A} \Rightarrow \frac{\cancel{\sin^2 A}}{\cancel{\sin^2 A}} =$

Answer the following questions numbers 16 to 20.

16. The *LCM* of two numbers is 182 and their *HCF* is 13. If one of the numbers is 26, find the other.

Sol. Product of 2 nos. = LCM × HCF

Let other number be x

$x \times \overset{2}{\cancel{26}} = \overset{91}{\cancel{182}} \times \cancel{13}$

$x = 91$

Ans: other number is 91

17. From a quadratic polynomial, the sum and product of whose zeroes are (– 3) and 2 respectively.

OR

Can $(x^2 - 1)$ be a remainder while dividing $x^4 - 3x^2 + 5x - 9$ by $(x^2 + 3)$? Justify your answer with reasons.

Sol. Sum of Zeroes = −3

Product of Zeroes = 2.

The required Polynomial:

$P(x) = k(x^2 + 3x + 2)$

18. Find the sum of the first 100 natural numbers.

Sol. $n = 100$

Sum of first 100 natural numbers $= \frac{n(n+1)}{2}$

Ans: Sum of 1st 100 natural nos. $\Rightarrow \frac{\overset{50}{\cancel{100}} \times 101}{\cancel{2}} = 5050$

19. Evaluate : 2 sec 30° × tan 60°

Sol. $2\sec 30° \times \tan 60°$

$2 \times \frac{2}{\cancel{\sqrt{3}}} \times \cancel{\sqrt{3}} = \boxed{4}$

20. In figure-4, the angle of elevation of the top of a tower from a point C on the ground. which is 30 m away from the foot of the tower, is 30°. Find the height of the tower.

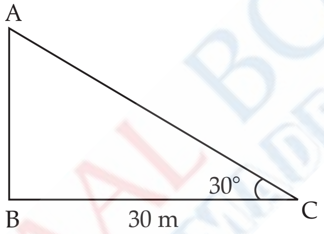
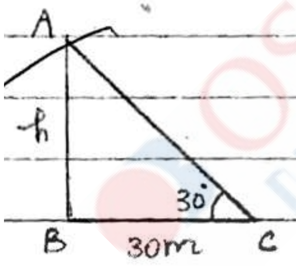


Figure-4

Sol.



Let ht of tower = AB = h m

In right Δ ABC,

$\tan 30° = \frac{h}{30}$

$\frac{1}{\sqrt{3}} = \frac{h}{30} \Rightarrow h = \frac{\overset{10}{\cancel{30}}\sqrt{3}}{\cancel{3}}$

$h = 10\sqrt{3} \Rightarrow 17.32$ m.

Ans- Height of tower = 17.32m (approx).

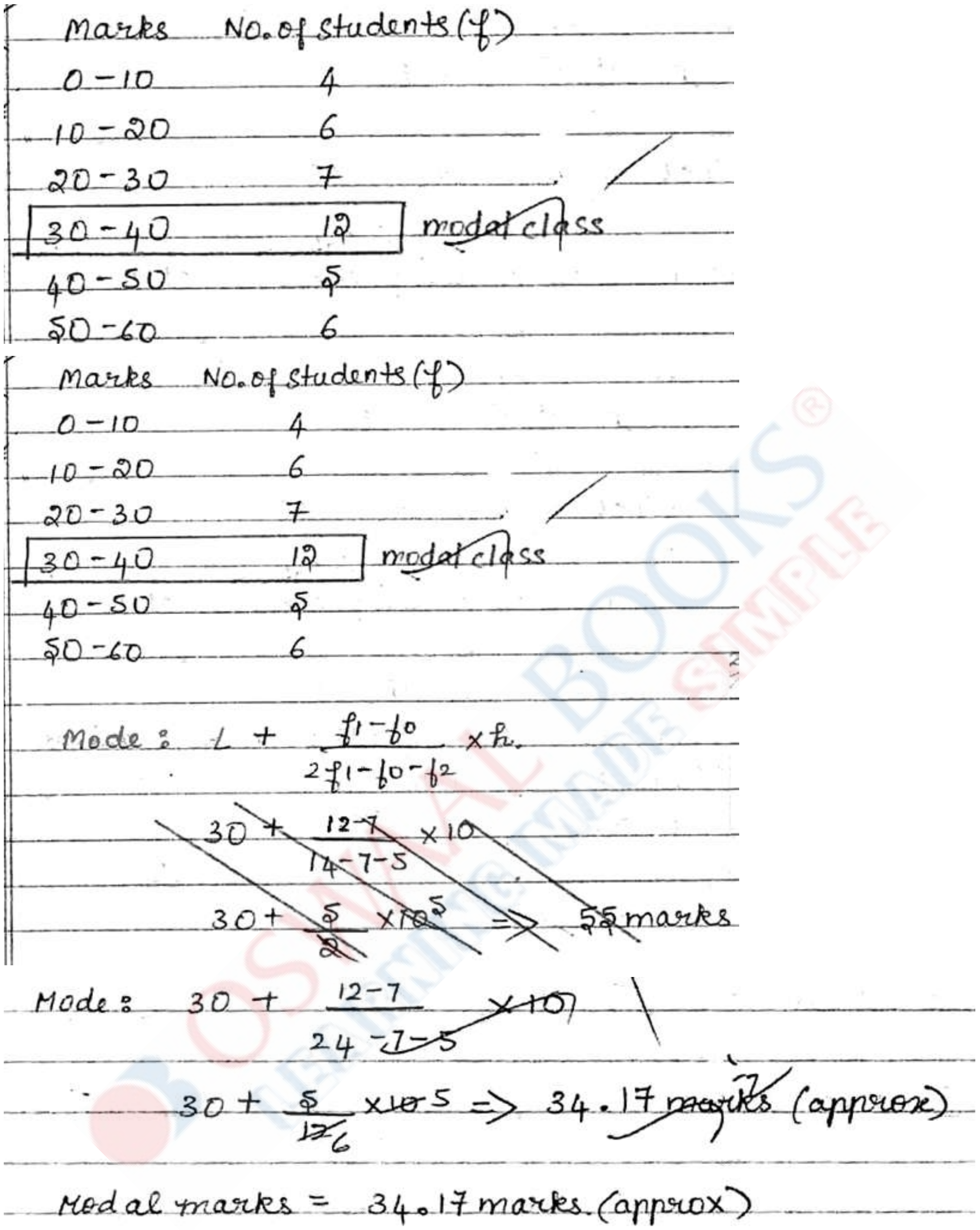
SECTION - B

Question number 21 to 26 carry 2 marks each.

21. Find the mode of the following distribution:

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of Students	4	6	7	12	5	6

Sol.



Marks	No. of students (f)
0 – 10	4
10 – 20	6
20 – 30	7
30 – 40	12
40 – 50	5
50 – 60	6

modal class

Marks	No. of students (f)
0 – 10	4
10 – 20	6
20 – 30	7
30 – 40	12
40 – 50	5
50 – 60	6

modal class

Mode : $l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$

~~$30 + \frac{12-7}{14-7-5} \times 10$~~

~~$30 + \frac{5}{2} \times \cancel{10}^{5} \Rightarrow 55$ marks~~

Mode : $30 + \frac{12-7}{24-7-5} \times 10$

$30 + \frac{5}{\cancel{12}6} \times \cancel{10}5 \Rightarrow 34.17$ ~~marks~~ (approx)

Modal marks = 34.17 marks (approx)

22. In Figure-5, a quadrilateral *ABCD* is drawn to circumscribe a circle. Prove that

$$AB + CD = BC + AD.$$

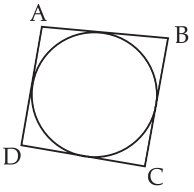


Figure-5

In Figure-6, find the perimeter of ΔABC, if AP = 12 cm.

$$AB + CD = BC + AD.$$

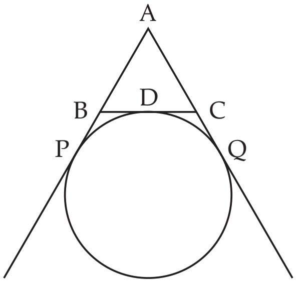
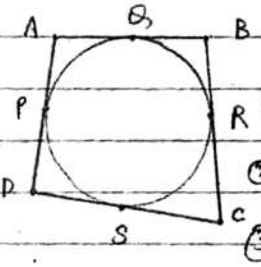


Figure-6

Sol. choice-① Let the circle and quadrilateral ~~square~~ meet at P, Q, R, S.



① ← AP = AQ
② ← DP = DS
③ ← BR = BQ
④ ← CR = CS

} lengths of Tangents from external points A, B, C, D to the circle are equal

Adding ①, ②, ③, ④,

AP + DP + BR + CR = AQ + BQ + DS + CS

AD + BC = AB + DC //

Proved.

23. How many cubes of side 2 cm can be made from a solid cube of side 10 cm ?

Sol. For Small cube : a = 2cm

large cube : A = 10cm

Let number of cubes = n.

125 × 2 × 2 × 2 =

$\frac{\overset{5}{\cancel{10}} \times \overset{5}{\cancel{10}} \times \overset{5}{\cancel{10}}}{\cancel{2} \times \cancel{2} \times \cancel{2}}$

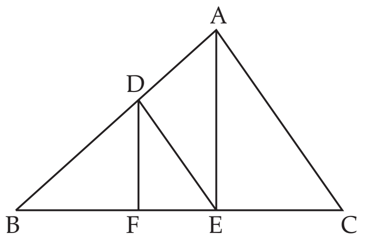
$A^3 = n \times a^3$

$n = \frac{A^3}{a^3}$

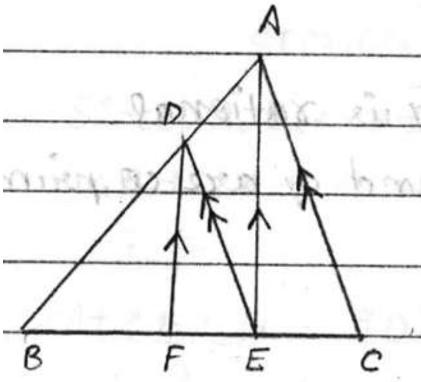
~~$n = \frac{\overset{40}{1000}}{8}$~~ $= \quad n = \frac{\overset{250}{\cancel{1000}}}{\cancel{8}_{2}} = 125$

Number of cubes that can be made = 125 cubes

24. In the given Figure-7, *DE*||AC and *DF* || *AF*. Prove that $\frac{\text{BF}}{\text{FE}} = \frac{\text{BE}}{\text{EC}}$.



Sol.



Given: ΔBAC

DE || AC

DF || AE

To Prove: $\frac{BF}{FE} = \frac{BE}{EC}$

Proof: In Δ ABE, DF || AE

by BPT, $\frac{BF}{FE} = \frac{BD}{DA} \rightarrow ①$

In Δ ABC, DE || AC

by BPT, $\frac{BE}{EC} = \frac{BD}{DA} \rightarrow ②$

From ① and ②,

$\frac{BF}{FE} = \frac{BE}{EC}$ // Proved

25. Show that $5+2\sqrt{7}$ is an irrational number, where $\sqrt{7}$ is given to be an irrational number.

OR

Check whether 12^n can end with the digit 0 for any natural number *n*.

Sol. Let us assume to the contrary that $5+2\sqrt{7}$ is rational.

Then $5+2\sqrt{7}$ is of the form $\frac{p}{q}$ where p and q are co primes and $q \neq 0$.

$$\frac{p}{q} = 5+2\sqrt{7}$$

$$\frac{p}{q} - 5 = 2\sqrt{7}$$

$$\frac{p-5q}{2q} = \sqrt{7}$$

$\frac{p-5q}{2q}$ is rational as p and q are integers

This contradicts the given fact that $\sqrt{7}$ is irrational.

∴ Our assumption is wrong

$5+2\sqrt{7}$ is irrational //

Proved.

26. If *A*, *B* and *C* are interior angles of a ΔABC, then show that $\cot\left(\frac{B+C}{2}\right) = \tan\left(\frac{A}{2}\right)$.

Sol.

Since A, B, C are interior angles of ΔABC,

$\angle A + \angle B + \angle C = 180^\circ$ (ASP).

$$\frac{\angle A+\angle B+\angle C}{2} = 90^\circ$$

$$\frac{\angle B+\angle C}{2} = 90^\circ - \frac{A}{2} \rightarrow ①$$

$\cot\left(\frac{B+C}{2}\right) = \tan\left(\frac{A}{2}\right)$ → To Prove:

LHS:

$\cot\left(\frac{B+C}{2}\right)$

Sub ①,

$\cot\left(90^\circ - \frac{\angle A}{2}\right)$ $\left\{\because \cot(90^\circ-\theta) = \tan\theta\right\}$

$\text{ctan}\left(\frac{\angle A}{2}\right) = \text{RHS}$

// Proved.

SECTION - C

Question number 27 to 34 carry 3 marks each.

27. In figure-8, a square *OPQR* is inscribed in a quadrant *OAQB* of a circle. If the radius of circle is $6\sqrt{2}$ cm, find the area of the shaded region.

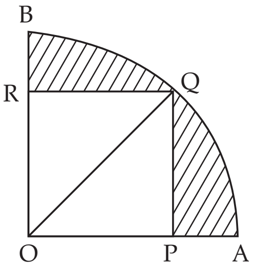
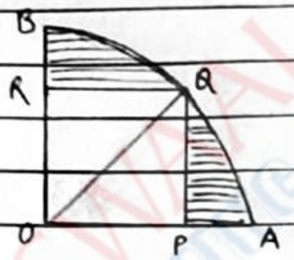


Figure-8

Sol.

Given, radius of circle $(r) = 6\sqrt{2}$ cm

Here, $OA = OB = OQ = 6\sqrt{2}$ cm



In ΔOPQ,

$$(OP)^2 + (PQ)^2 - (OQ)^2$$

$$(OP)^2 + (OP)^2 = (OQ)^2$$

$$2(OP)^2 = (OQ)^2$$

$$2(OP)^2 = (6\sqrt{2})^2$$

$$OP = 6 \text{ cm}$$

Now, area of shaded region =

area (quadrant with radius $= 6\sqrt{2}$ cm)

− area (square with side, $OP = 6$ cm)

$$= \frac{1}{4}\pi r^2 - (OP)^2$$

$$= \frac{1}{4} \times \frac{22}{7} \times (6\sqrt{2})^2 - (6)^2$$

$$= \frac{11 \times 36}{7} - 36$$

$$= 36 \times \frac{4}{7}$$

$$= 20.57 \text{ cm}^2$$

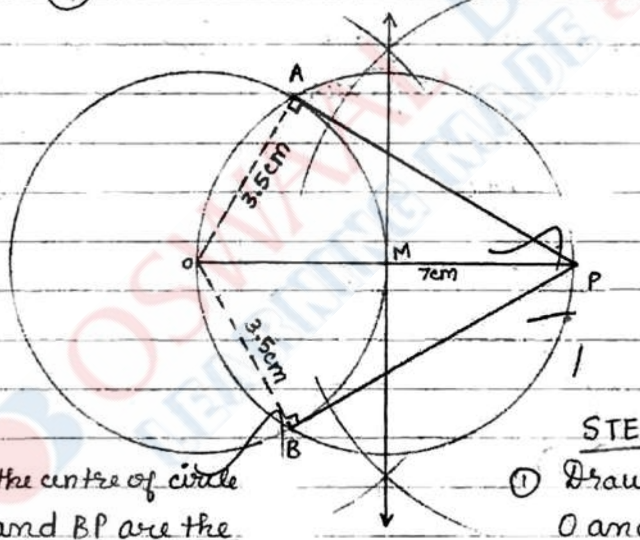
Thus, area of shaded region is 20.57 cm².

28. Construct a ΔABC with sides $BC = 6$ cm, $AB = 5$ cm and $\angle ABC = 60°$. Then construct a triangle whose sides are $\frac{3}{4}$ of the corresponding sides of ΔABC.

OR

Draw a circle of radius 3.5 cm. Take a point P outside the circle at a distance of 7 cm from the centre of the circle and construct a pair of tangents to the circle from that point.

Sol. Choice - ②



STEPS OF CONSTRUCTION:

① Draw a circle with centre O and radius 3.5 cm

② Take a point P outside the circle so that OP = 7cm.

③ Join OP.

④ construct perpendicular bisector for OP and let it meet OP at M,

⑤ with M as centre and r = OM draw a circle, passing through O and P to meet the previous circle at A and B.

⑥ Join AP, BP. AP and BP are the required tangents.

- O is the centre of circle
- AP and BP are the required Tangents from P.
- OA = OB = radius = 3.5cm
- OP = 7cm.

29. Prove that : $\dfrac{2\cos^3\theta - \cos\theta}{\sin\theta - 2\sin^3\theta} = \cot\theta$

Sol.

$$\frac{2\cos^3\theta - \cos\theta}{\sin\theta - 2\sin^3\theta} = \cot\theta$$

LHS:

$$\frac{\cos\theta\,(2\cos^2\theta - 1)}{\sin\theta\,(1 - 2\sin^2\theta)}$$

$$\frac{\cos\theta.\,[2(1-\sin^2\theta) - 1]}{\sin\theta\,(1 - 2\sin^2\theta)}$$

$$\frac{\cos\theta\,[2 - 2\sin^2\theta - 1]}{\sin\theta\,(1 - 2\sin^2\theta)} \Rightarrow \frac{\cos\theta}{\sin\theta} \times \frac{\cancel{(1-2\sin^2\theta)}}{\cancel{(1-2\sin^2\theta)}} \Rightarrow \cot\theta$$

LHS = RHS = $\cot\theta$ //

Proved.

30. A fraction becomes $\frac{1}{3}$ when 1 is subtracted from the numerator and it becomes $\frac{1}{4}$ when 8 is added to its denominator. Find the fraction.

OR

The present age of a father is three years more than three times the age of his son. Three years hence the father's age will be 10 years more than twice the age of the son. Determine their present ages.

Sol. Choice - ②

Let the Present age of
Father = x years
Son = y years

$x = 3y + 3$
~~$x/$~~ $x - 3y - 3 = 0 \rightarrow$ ①

~~$x+3 = 2y+10$~~

$x + 3 = 2(y+3) + 10$
$x + 3 = 2y + 6 + 10$

$x - 2y = 16 - 3$

$x - 2y - 13 = 0 \rightarrow ②$

Solving ① and ②,

$$\begin{aligned} \cancel{x} - 3y - 3 &= 0 \\ -\cancel{x} + 2y + 13 &= 0 \\ \hline -y + 10 &= 0 \\ y &= 10 \\ x &= 33 \end{aligned}$$

Ans: Present age of father = 33 years

son = 10 years

31. Using Euclid's Algorithm, find the largest number which divides 870 and 258 leaving remainder 3 in each case.

Sol. $870 - 3 = 867$

$258 - 3 = 255$

HCF(867, 255) by Euclid's Division Algorithm:

$867 = 255 \times 3 + 102$

$255 = 102 \times 2 + 51$

$102 = ⑤① \times 2 + 0$

HCF(867, 255) = 51

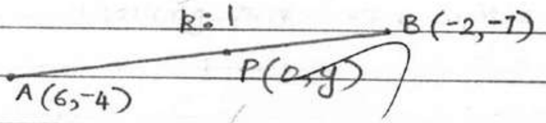
Ans: The largest number which divides 870 and 258 leaving remainder 3 in each case is 51.

32. Find the ratio in which the y-axis divides the line segment joining the points (6, – 4) and (– 2, – 7). Also find the point of intersection.

OR

Show that the points (7, 10), (–2, 5) and (3, – 4) are vertices of an isosceles right triangle.

Sol. choice - ①



let the y axis meet the line segment joining points A(6, -4) and B(-2, -7) be P(0, y).

let P divide AB in the ratio k:1

coordinates of P: $P\left(\frac{-2k+6}{k+1}, \frac{-7k-4}{k+1}\right)$

$\frac{-2k+6}{k+1} = 0$

$-2k+6=0$

$2k=6$

$k=3$

Ratio in which y axis divides AB = 3:1

$y = \frac{-7(3)-4}{(3)+1}$

$y = \frac{-21-4}{4}$

$y = \frac{-25}{4}$

∴ Point of intersection of y axis and line segment = $P\left(0, \frac{-25}{4}\right)$.

33. In an *A.P.* given that the first term (*a*) = 54, the common difference (*d*) = – 3 and the n^{th} term (a_n) = 0, find *n* and the sum of first *n* terms (S_n) of the *A.P.*

Sol. $a = 54$

$d = -3$

$a_n = 0$

$a_n = 0$

$a + (n-1)d = 0$

$54 - 3(n-1) = 0$

$\cancel{-}\cancel{3}(n-1) = \cancel{-}\overset{18}{\cancel{54}}$

$n = 19$

Ans: $n = 19$

$\cancel{S_n}$ $a_{19} = 0$

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

$S_n = \frac{n}{2}[108 - 3(n-1)]$

$S_n = \frac{n}{2}[108 - 3n + 3] \Rightarrow \frac{n}{2}(111 - 3n)$

Here, n = 19

$S_{19} = \frac{19}{2}[111 - 57]$

$S_{19} = \frac{19}{\cancel{2}} \times \overset{27}{\cancel{54}}$

$S_{19} = 513$

Ans: n = 19

$S_n = S_{19} = 513.$

34. Read the following passage and answer the questions given at the end :

Diwali Fair

A game in a booth at a Diwali Fair involves using a spinner first. Then, if the spinner stops on an even number, the player is allowed to pick a marble from a bag. The spinner and the marbles in the bag are represented in Figure-9.

Prizes are given, when a black marble is picked. Shweta plays the game once.

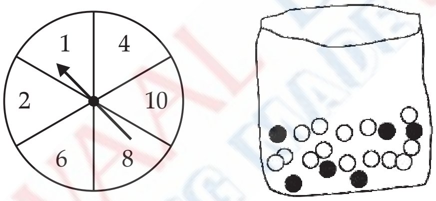


Figure-9

(i) What is the probability that she will be allowed to pick a marble from the bag ?

(ii) Suppose she is allowed to pick a marble from the bag, what is the probability of getting a prize, when it is given that the bag contains 20 balls out of which 6 are black ?

Sol. (i) Total number of 'Numbers' on spinner = 6

'Even numbers' = 5

P(Shweta being allowed to pick a marble) = $\frac{\text{No. of favourable outcomes}}{\text{Total number of outcomes}}$

Probability of being allowed to pick a marble $\Rightarrow \frac{5}{6}$

(ii) Total number of marbles = 20

black marbles = 6.

P(Shweta winning a prize) = $\frac{6}{20} \Rightarrow \frac{3}{10} \Rightarrow 0.3$ $\left\{\frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}\right\}$

Ans: Probability of getting a prize = $\frac{3}{10}$

SECTION - D

Question number 35 to 40 carry 4 marks each.

35. Sum of the areas of two squares is 544 m^2. If the difference of their perimeters is 32 m, find the sides of the two squares.

OR

A motorboat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.

Sol. For motorboat:

Speed in still water = 18 km/hr

let speed of stream = x km/hr

upstream speed = $18-x$ km/hr

downstream speed = $18+x$ km/hr.

$$t = \frac{d}{s}$$

$$\frac{24}{18-x} - \frac{24}{18+x} = 1$$

$$24\left(\frac{1}{18-x} - \frac{1}{18+x}\right) = 1$$

$$\frac{\cancel{18}+x-\cancel{18}+x}{(18-x)(18+x)} = \frac{1}{24}$$

$$\frac{2x}{324-x^2} = \frac{1}{24}$$

$$48x = 324 - x^2$$

$$x^2 + 48x - 324 = 0.$$

$$(x+54)(x-6) = 0.$$

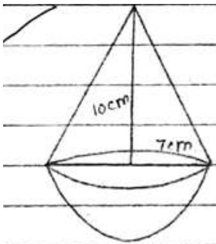
$x = -54$ (invalid - speed cannot be negative)

$x = 6$

Speed of the stream = 6 km/hr.

36. A solid toy is the form of a hemisphere surmounted by a right circular cone of same radius. The height of the cone is 10 cm and the radius of the base is 7 cm. Determine the volume of the toy. Also find the area of the coloured sheet required to cover the toy $\left(\text{Use } \pi = \frac{22}{7} \text{ and } \sqrt{149} = 12.2\right)$.

Sol.



For Hemisphere :

$r = 7cm.$

For cone :

$h = 10cm$

$r = 7cm.$

$l = \sqrt{100+49} = 12.2\ cm$

volume of the toy : Volume of cone + Volume of hemisphere

$\frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$

$\frac{1}{3}\pi r^2 (h + 2r)$

$\frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \, (10 + 14)$

$\frac{1}{\cancel{3}} \times \frac{22}{\cancel{7}} \times \cancel{7} \times 7 \times \cancel{24}^{8}$

$\Rightarrow 1232\ cm^3$

Area of coloured sheet required : CSA of cone + CSA of hemisphere

$\Rightarrow \pi r l + 2\pi r^2$

$\Rightarrow \pi r (l + 2r)$

$\Rightarrow \frac{22}{7} \times 7 \, (12.2 + 14)$

$\Rightarrow \frac{22}{\cancel{7}} \times \cancel{7} \times 26.2$

$\Rightarrow 576.4\ cm^2$

Volume of the toy $= 1232\ cm^3$

Area of coloured sheet required $= 576.4\ cm^2.$

37. For the following data, draw a 'less than' ogive and hence find the median of the distribution.

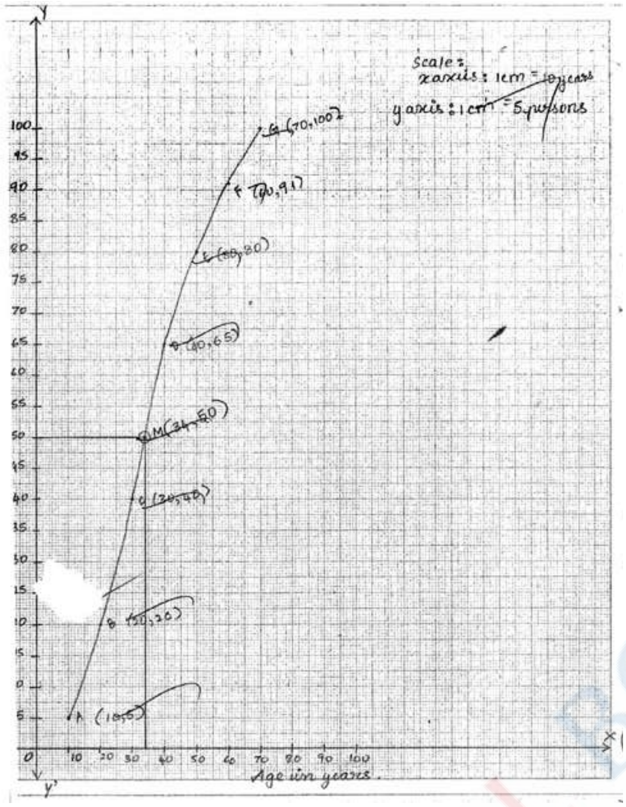
Age (in years)	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Number of Persons	5	15	20	25	15	11	9

OR

The distribution given below shows the number of wickets taken by bowlers in one-day cricket matches. Find the mean and the median of the number of wickets taken.

Number of wickets	20 – 60	60 – 100	100 – 140	140 – 180	180 – 220	220 – 260
Number of bowlers	7	5	16	12	2	3

Sol.



Age (in yrs) (C.I)	No. of persons (f)	less than	cf
0 – 10	5	< 10	5
10 – 20	15	< 20	20
20 – 30	20	< 30	40
30 – 40	25	< 40	65
40 – 50	15	< 50	80
50 – 60	11	< 60	91
60 – 70	9	< 70	100
	100		

Median Age :

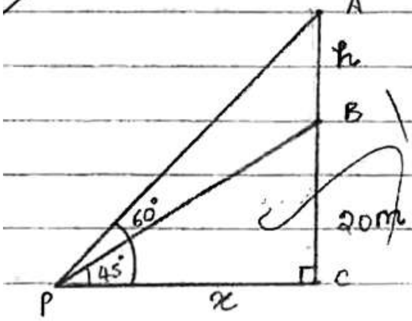
$$L + \left(\frac{\frac{n}{2} - cf_0}{f}\right) \times h \Rightarrow 30 + \frac{50-40}{25} \times 10$$

$$\Rightarrow 30 + \frac{\cancel{100}^{4}}{\cancel{25}} \Rightarrow 34 \text{ years}$$

Median of the distribution : 34 years (by graph and calculation)

38. 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. $\left(\text{Use } \sqrt{3} = 1.73\right)$

Sol.



Let AB → Transmission tower

BC → Building - 20m

P → Point on the ground.

In $\triangle PBC$, $\angle C = 90°$

$\tan 45° = \frac{20}{x} \Rightarrow 1 = \frac{20}{x}$

$x = 20m$

In $\triangle PAC$, $\angle C = 90°$

$\tan 60° = \frac{h+20}{x}$

$\frac{20+h}{20} = \sqrt{3}$

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

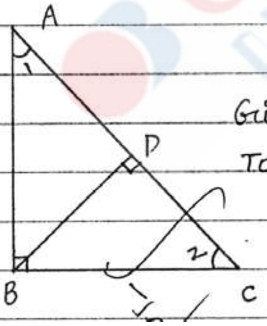
$h = 20(\sqrt{3}-1)$

$h = 14.6m$.

Ans :- Height of transmission tower = 14.6m

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

Sol.



Given: Right $\triangle ABC$, $\angle B = 90°$

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

Construction:

Draw $BD \perp AC$.

Proof:

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

$\angle ABC = \angle ADB = 90°$

$\angle 1 = \angle 1$ (common)

$\therefore \triangle ABC \sim \triangle ADB$ (AA) by CPST, $\frac{AB}{AD} = \frac{BC}{DB} = \frac{AC}{AB}$

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

$AB^2 = AC.AD \rightarrow$ ①

In Δ ABc and Δ BDc

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

$\angle 2 = \angle 2$ (common)

$\therefore \Delta ABC \sim \Delta BDC$ (AA)

by CPST, $\frac{AB}{BD} = \frac{BC}{DC} = \frac{AC}{BC}$

$\frac{BC}{DC} = \frac{AC}{BC} \Rightarrow BC^2 = AC.DC \rightarrow$ ②

Adding ① and ②,

$AB^2 + BC^2 = AC.AD + AC.DC$

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

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

Hence Proved.

40. Obtain other zeroes of the polynomial $p(x) = 2x^4 - x^3 - 11x^2 + 5x + 5$ if two of its zeroes are $\sqrt{5}$ and $-\sqrt{5}$.

OR

What minimum must be added to $2x^3 - 3x^2 + 6x + 7$ so that the resulting polynomial will be divisible by $x^2 - 4x + 8$?

Sol. choice - ①

$P(x) = 2x^4 - x^3 - 11x^2 + 5x + 5.$

Given zeroes: $\sqrt{5}, -\sqrt{5}.$

Sum of zeroes $= \sqrt{5} - \sqrt{5} = 0$

Product of zeroes $= \sqrt{5} \times -\sqrt{5} = -5.$

$f(x) = x^2 + 0x - 5$

$$
\begin{array}{r|l}
 & 2x^2 - 1x - 1 \\
\hline
x^2+0x-5 & 2x^4 - x^3 - 11x^2 + 5x + 5 \\
 & -2x^4 + 0x^3 + 10x^2 \\
\hline
 & 0 \quad -x^3 - 1x^2 + 5x + 5 \\
 & \quad + x^3 + 0x^2 \overset{(-)}{+} 5x \\
\hline
 & \quad 0 \quad -1x^2 \pm 0x + 5 \\
 & \quad\quad +1x^2 + 0x \overset{(-)}{+} 5 \\
\hline
 & \quad\quad 0 \quad 0 \quad 0
\end{array}
$$

$g(x) = 2x^2 - 1x - 1$

$g(x) = 0$

$2x^2 - 1x - 1 = 0$

$2x^2 - 2x + 1x - 1 = 0$

$2x(x-1) + 1(x-1) = 0$

$x = 1$

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

Ans: The other Zeroes of $P(x)$ are : $1, \frac{-1}{2}$

Zeroes of $P(x)$: $\sqrt{5}, -\sqrt{5}, 1, \frac{-1}{2}$