CLASS : 10th (Secondary) **1953/1903**

Series : Sec-M/2017 ***SET : A, B, C & D***

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MARKING INSTRUCTIONS AND MODEL ANSWERS

MATHEMATICS

(Academic/Open)

(Only for Fresh Candidates)

उप-परीक्षक मूल्यांकन निर्देशों का ध्यानपूर्वक अवलोकन करके उत्तर-पुस्तिकाओं का मूल्यांकन करें। यदि परीक्षार्थी ने प्रश्न पूर्ण व सही हल किया है तो उसके पूर्ण अंक दें।

General Instructions :

(i) *Examiners are advised to go through the general as well as specific instructions before taking up evaluation of the answer-books.*

(ii) *Instructions given in the marking scheme are to be followed strictly so that there may be uniformity in evaluation.*

(iii) *Mistakes in the answers are to be underlined or encircled.*

(iv) *Examiners need not hesitate in awarding full marks to the examinee if the answer/s is/are absolutely correct.*

(v) *Examiners are requested to ensure that every answer is seriously and honestly gone through before it is awarded mark/s. It will ensure the authenticity as their evaluation and enhance the reputation of the Institution.*

(vi) A question having parts is to be evaluated and awarded partwise.

(vii) If an examinee writes an acceptable answer which is not given in the marking scheme, he or she may be awarded marks only after consultation with the head-examiner.

(viii) If an examinee attempts an extra question, that answer deserving higher award should be retained and the other scored out.

(ix) Word limit wherever prescribed, if violated upto 10%. On both sides, may be ignored. If the violation exceeds 10%, 1 mark may be deducted.

(x) Head-examiners will approve the standard of marking of the examiners under them only after ensuring the non-violation of the instructions given in the marking scheme.

(xi) Head-examiners and examiners are once again requested and advised to ensure the authenticity of their evaluation by going through the answers seriously, sincerely and honestly. The advice, if not headed to, will bring a bad name to them and the Institution.

महत्त्वपूर्ण निर्देश :

(i) अंक योजना का उद्देश्य मूल्यांकन को अधिकाधिक वस्तुनिष्ठ बनाना है। अंक-योजना में दिए गए उत्तर-बिन्दु अंतिम नहीं हैं। ये सुझावात्मक एवं सांकेतिक हैं। यदि परीक्षार्थी ने इनसे भिन्न, किन्तु उपयुक्त उत्तर दिए हैं, तो उसे उपयुक्त अंक दिए जाएँ।

(ii) शुद्ध, सार्थक एवं सटीक उत्तरों को यथायोग्य अधिमान दिए जाएँ।

(iii) परीक्षार्थी द्वारा अपेक्षा के अनुरूप सही उत्तर लिखने पर उसे पूर्ण अंक दिए जाएँ।

(iv) वर्तनीगत अशुद्धियों एवं विषयांतर की स्थिति में अधिक अंक देकर प्रोत्साहित न करें।

(v) भाषा-क्षमता एवं अभिव्यक्ति-कौशल पर ध्यान दिया जाए।

(vi) मुख्य-परीक्षकों/उप-परीक्षकों को उत्तर-पुस्तिकाओं का मूल्यांकन करने के लिए केवल Marking Instructions/guide lines दी जा रही है, यदि मूल्यांकन निर्देश में किसी प्रकार की त्रुटि हो, प्रश्न का उत्तर स्पष्ट न हो, मूल्यांकन निर्देश में दिए गए उत्तर से अलग कोई और भी उत्तर सही हो तो परीक्षक, मुख्य-परीक्षक से विचार-विमर्श करके उस प्रश्न का मूल्यांकन अपने विवेक अनुसार करें।

SET – A

SECTION – A

1. $\text{LCM} = \dfrac{a \times b}{\text{HCF}} = \dfrac{306 \times \overset{73}{\cancel{657}}}{\cancel{9}} = 22338$

Ans. (B) 1

2. $6x^2 - 7x - 3 = (3x + 1)(2x - 3) = 0$

$\Rightarrow x = -\dfrac{1}{3}, \dfrac{3}{2}$ **Ans. (A)** 1

3. $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} = \dfrac{c_1}{c_2} \Rightarrow$ Infinite solutions

Ans. (C) 1

4. $\frac{1}{3}, \frac{5}{3}, \frac{9}{3}, \frac{13}{3}, ...$

$a = \frac{1}{3}, d = \frac{4}{3} \quad a_{15} = a + 14d$

$= \frac{1}{3} + 14 \times \frac{4}{3} = 19$

Ans. (D) 1

5. $a_3 = 5 \qquad a + 2d = 5$

$a_7 = 13 \quad a + 6d = 13$

$\Rightarrow d = 2, \ a = 1$ **Ans. (B)** 1

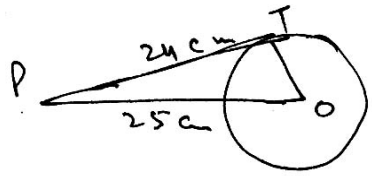
6. $\angle OCD = 40^\circ \Rightarrow \angle OAB = 40^\circ$

Ans. (D) 1

7. Ratio of sides 2 : 3

$\therefore$ Ratio of areas 4 : 9 **Ans. (C)** 1

8. $PT^2 + OT^2 = OP^2$



$\therefore OT^2 = OP^2 - PT^2$

$= 625 - 576$

OT = 7 cm

Ans. (D) 1

9. Maximum parallel tangents = 2

Ans. (B) 1

10. Distance of point $(5, -7)$ from $(0, 0)$ is

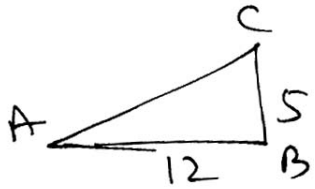
$\sqrt{25+49} = \sqrt{74}$

Ans. (A) 1

11. Area of $\Delta = \frac{1}{2}[1(6+5) - 4(-5+1) - 3(-1-6)]$

$= 24$ **Ans. (C)** 1

12. $\tan = \frac{5}{12}$



$AC = \sqrt{25+144} = 13$

$\cos A = \frac{12}{13}$ **Ans. (D)** 1

13. $\frac{1-\tan^2 30}{1+\tan^2 30} = \frac{1-\frac{1}{3}}{1+\frac{1}{3}} = \frac{1}{2} = \cos 60^\circ$

Ans. (A) 1

14. Ratio of circumference : Diameter

$2\pi r : 2r = \pi : 1$ **Ans. (B)** 1

15. r = 7, h = 6

$$v = \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 6$$

$= 308 \text{ cm}^3$ **Ans. (B)** 1

16. P(E) = 0.05

P(not E) = 1–.05 = .95

Ans. (C) 1

SECTION – B

17. Let $6 + \sqrt{2}$ is a rational number

$6 + \sqrt{2} = \frac{p}{q}$ p and q are integers 1

$\Rightarrow \sqrt{2} = \frac{p}{q} - 6$

$\therefore \frac{p - 6q}{q} = \sqrt{2}$ 1

Left hand side is rational

Right hand side is irrational

Which is not true

$\therefore$ Supposition is wrong

$\therefore$ 6 + $\sqrt{2}$ is irrational 1

18. Zeros are –4, 2

Sum of zeros = – 4 + 2 = –2 1

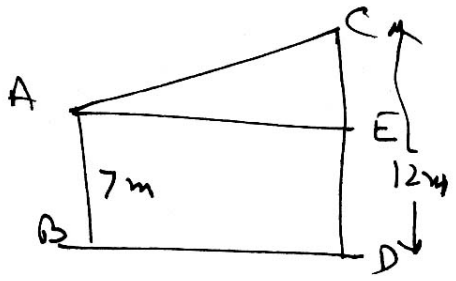
Product of zeros = – 4 × 2 = –8 1

∴ Polynomial is $x^2 - (-2)x + (-8)$

= $x^2 + 2x - 8$ 1

19. Let height of poles AB and CD be 7m and 12 m

1 mark for figure



AE = 12 m, CE = 12 – 7 = 5

∴ $AC^2 = AE^2 + CE^2$ 1

= 144 + 25

∴ AC = 13 m 1

20. $\tan(A+B) = \sqrt{3} \Rightarrow A+B = 60^\circ$ 1

$\tan(A-B) = \frac{1}{\sqrt{3}} \Rightarrow A-B = 30^\circ$ 1

Solving $A = 45°$, $B = 15°$

21. Area of sector $= \frac{\pi r^2 \theta}{360^\circ}$ 1

$= \frac{\pi \times 4 \times 4 \times 45^\circ}{360^\circ}$ 1

$= \frac{22}{7} \times 2$

$= \frac{44}{2}$ sq. units or 6.28 sq. units 1

SECTION – C

22. $\frac{3x}{2} - \frac{5y}{3} = -2$

$\frac{x}{3} + \frac{y}{2} = \frac{13}{6}$

$\Rightarrow 9x - 10y = -12$

$2x + 3y = 13$ 1

$\Rightarrow 27x - 30y = -36$

$20x + 30y = 130$ 1

$47\ x = \quad 94 \quad \Rightarrow x = 2$ 1

Putting $x = 2 \Rightarrow y = 3$ 1

23. Let one side be x and the other be $x - 17$

$x^2 + (x-17)^2 = 25^2$ 1

$2x^2 - 34x + 289 = 625$

$2x^2 - 34x - 336 = 0$

$x^2 - 17x - 168 = 0$ 1

$(x-24)(x+7) = 0 \Rightarrow x = 24$

$x \neq -7$

$\therefore$ Sides are 7, 24 2

24. $S_7 = 49 \quad S_{17} = 289$

$\frac{7}{2}[2a + 6d] = 49$

$\frac{17}{2}[2a + 16d] = 289$ 1

$\Rightarrow a + 3d = 7$ 1

$a + 8d = 17$

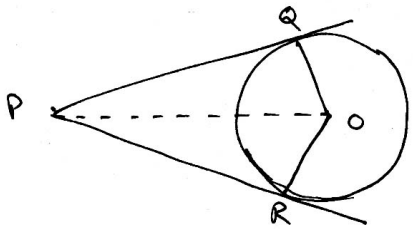
$\Rightarrow$ a = 1, d = 2

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

$= \frac{n}{2}[2 + (x-1)\,2]$

$= n^2$ 1

25.



1

Let *PQ* and *PR*

be tangents from *P* to the circle with centre *O*

To prove *PQ* = *PR*

Construction Join *OP* 1

Prof. In ΔOPQ & *OPR*

OQ = *OR* (Radii of same circle)

OP = *OP*

$\angle$OQP = $\angle$ORP =90°

$\therefore \Delta\, OPQ \cong \Delta\, OPR$

$\therefore$ *PQ* = *PR* 2

26. Total no. of balls = 5 Red + 8 White + 4 Green

$= 17$ 1

No. of red balls = 5

$\therefore$ P(Red ball) = $\frac{5}{17}$ 1

P (Green ball) = $\frac{4}{17}$ 1

P (not green) = $1 - \frac{4}{17} = \frac{13}{17}$ 1

27. Let the ratio be $k : 1$

(5, –6) and (–1, –4)

The coordinates of dividing point is :

$$\left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} \right)$$ 1

$$\Rightarrow \left(\frac{-k+5}{k+1}, \frac{-4k-6}{k+1} \right)$$ 1

$\therefore$ Point on y-axis is (0, y)

$\therefore \frac{-k+5}{k+1} = 0 \Rightarrow k = 5$ 1

$\therefore$ Ratio is 5 : 1

$\therefore$ Coordinate of point of intersecting is

$\left(0, \frac{-20-6}{4+1}\right) = \left(0, -\frac{26}{5}\right)$ 1

SECTION – D

28. Let the speed of the train be x km/hour

Time taken $= \frac{360}{x}$ hours 1

If speed is 5 km/hour is more it is $(x + 5)$ km/hour

Time taken = $\frac{360}{x+5}$ hours 1

According to question $\frac{360}{x} - \frac{360}{x+5} = 1$ 1

$\Rightarrow \frac{360\,(x+5) - 360\,x}{x\,(x+5)} = 1$

$\Rightarrow x^2 + 5x = 1800$

$$x^2 + 5x - 1800 = 0$$

$$(x + 45)(x - 40) = 0$$

$\Rightarrow x = 40\,\text{km/hour}$ 2

$\therefore$ Average speed of train is 40 km/hour.

29. $\dfrac{1+\sec A}{\sec A} = \dfrac{\sin^2 A}{1-\cos A}$

L. H. S. $\dfrac{1+\dfrac{1}{\cos A}}{\dfrac{1}{\cos A}}$

$= \dfrac{1+\cos A}{\cos A} \times \dfrac{\cos A}{1} = \dfrac{1+\cos A}{1}$ $2\frac{1}{2}$

R. H. S.

$\dfrac{\sin^2 A}{1-\cos A} = \dfrac{1-\cos^2 A}{1-\cos A}$

$= \dfrac{(1-\cos A)(1+\cos A)}{1-\cos A}$

$= 1 + \cos A$

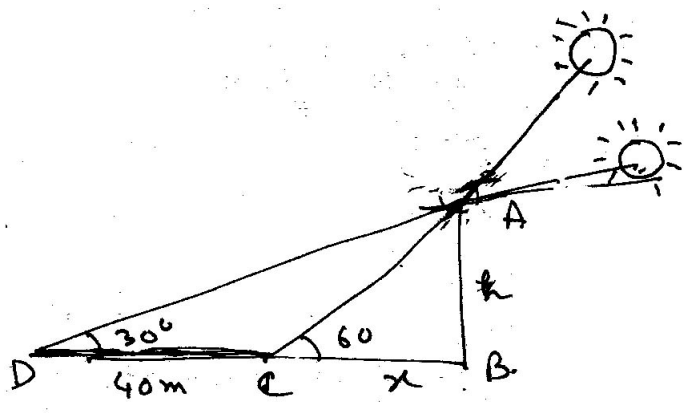
$\therefore$ LHS = RHS $2\frac{1}{2}$

OR

Let AB be the height of tower = h

BC = x

1 mark for figure



From Δ ABC =

$$\tan 60^\circ = \frac{h}{x} \quad \ldots\ldots\ldots\ldots\ldots \text{(i)}$$ 1

From Δ ABD

$$\tan 30 = \frac{h}{x+40} \quad \ldots\ldots\ldots\ldots\ldots \text{(ii)}$$ 1

Dividing (i) by (ii)

$$\frac{\tan 60}{\tan 30} = \frac{x+40}{x}$$

$$\frac{\sqrt{3}\times\sqrt{3}}{1}=\frac{x+40}{x}$$

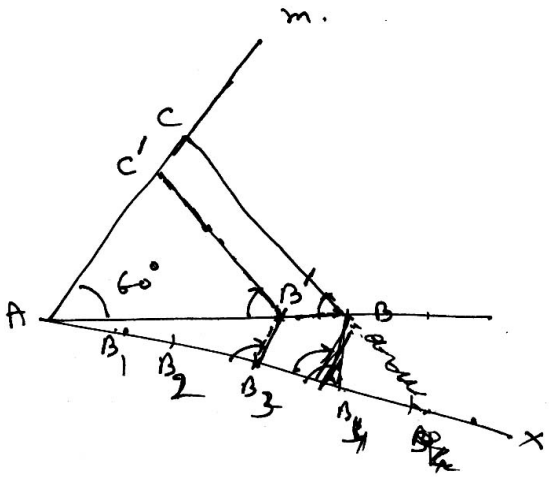
$3x = x + 40 \Rightarrow x = 20$

$h = x \tan 60 = 20\sqrt{3}$ m 2

30. Draw AB = 6 cm

Draw angle of 60° on AB

Cut AC = 5 cm



2 marks for constructing Δ ABC

Joint BC

Draw any ray AX

Cut equal parts

$AB_1 = B_1B_2 = B_2B_3 = B_3B_4$

Draw $B_3B' \parallel BB_4$

Draw $B'C' \parallel BC$

$\Delta\ AB'C'$ is required triangle 3

31. Radius of sphere = 4.2 cm

Volume of sphere = $\frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi (4.2)^3$ $1\frac{1}{2}$

Radius of cone 6 cm

Let height = h cm

Volume of cone = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi\ 6\times 6\times h$ $1\frac{1}{2}$

$\therefore\ \frac{4}{3}\pi (4.2)^3 = \frac{1}{3}\pi\times 6\times 6\times h$

$$\frac{4\times4.2\times4.2\times4.2}{36\times6}=h$$

$\therefore\ h = 8.232$ cm 2

32.

x	f	c	
Weight	No. of Students		
40-45	2	2	
45-50	3	5	C
50-55	8	13	
L → 55-60	f→ 6	19	→ Median Class
60-65	6	25	$\frac{N}{2}=\frac{30}{2}=15$
65-70	3	28	
70-75	2	30	
	N = 30		

$$Md = \text{L} + \frac{\left(\frac{N}{2}-C\right)}{f}\times h$$ 1

$L = 55\ \ f = 6\ \ \ c = 13\ \ \ h = 5$

$$Md = 55 + \frac{(15-13)}{6} \times 5$$

$$= 55 + 1.67 = 56.67$$ 2

OR

Expenditure *C. I.*	Freq.	x	$d = \frac{x-225}{50}$	fd
100-150	4	125	–2	–8
150-200	5	175	–1	–5
200-250	12	225	0	0
250-300	2	275	1	2
300-350	2	325	2	4
	25			Mfd = – 7

2

Mean $\bar{x} = A + \frac{\Sigma fd}{\Sigma f} \times h$ 1

$$\bar{x} = 225 + \frac{-7}{25} \times 50$$

$$= 225 - 14$$

$$= 211$$ 2

SET – B

SECTION – A

1. LCM = $= \frac{96 \times 404}{4} = 9696$ **Ans. (B)** 1

2. $4x^2 + 1 - 4x = (2x - 1)^2$

$\therefore$ Zero are $\frac{1}{2}, \frac{1}{2}$ **Ans. (A)** 1

3. $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $\therefore$ Unique solution **Ans. (C)** 1

4. $a = 0.6, \; d = 1.7 - .6 - 1.1$

$a_{14} = a + 13d$

$= .6 + 13 \times 1.1 = 14.9$ **Ans. (A)** 1

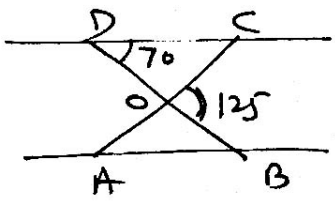
5. $a_3 = 4 \quad a_9 = -8$

$a + 2d = 4$

$a + 8d = -8$

$\therefore$ d = –2 **Ans. (A)** 1

6.



$\angle OCD = 55^\circ$

$\therefore\ \angle OAB = 55^\circ$

Ans. (D) 1

7. Ratio of sides 3 : 5

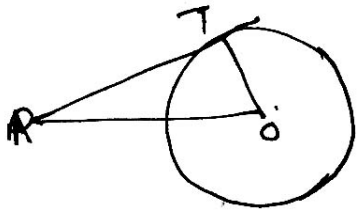
$\therefore$ Ratio of areas 9 : 25 **Ans. (B)** 1

8. OP = 13 cm

OT = 5 cm

$\therefore PT = \sqrt{OP^2 - OT^2}$

$= \sqrt{169 - 25} = 12$ cm



Ans. (D) 1

9. No. of tangents of a point on the circle = 1

Ans. (A) 1

10. Distance of (–4, 5) from origin

$= \sqrt{16 + 25} = \sqrt{41}$

Ans. (C) 1

11. Area of $\Delta = \frac{1}{2}[-5(-2-4)+6(4-3)-3(3+2)]$

$= \frac{1}{2}[30+6-15] = 10.5$

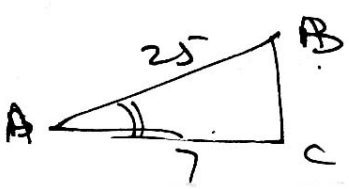
Ans. (C) 1

12. $\cos A = \frac{7}{25}$

$BC = \sqrt{25^2 - 7^2}$

$= 24$

$\therefore \tan A = \frac{24}{7}$



Ans. (B) 1

13. $\frac{2\tan 30}{1+\tan^2 30} = \frac{2\times\frac{1}{\sqrt{3}}}{1+\frac{1}{3}} = \frac{2}{\sqrt{3}}\times\frac{3}{4}$

$= \frac{\sqrt{3}}{2} = \sin 60^\circ$

Ans. (A) 1

14. Ratio of circumference : radius

$2\pi r : r$

$= 2\pi : 1$

Ans. (A) 1

15. $r = 14,\ h = 6$

$v = \pi r^2 h = \pi\times 14\times 14\times 6$

$= 1176\ \pi$

Ans. (C) 1

16. P(A) = 0.07

P(not A) = 1–.07 = 0.93

Ans. (B) 1

SECTION – B

17. $3-2\sqrt{5}$ is irrational

Let $3-2\sqrt{5}$ be a rational number

$3-2\sqrt{5}=\frac{p}{q}$ P & q integer q $\neq$ o 1

$\sqrt{5}=\frac{3q-p}{2}$ 1

RHS is rational and LHS is rational which is not true.

$\therefore$ Our assumption is wrong

$\therefore$ $3-2\sqrt{5}$ is irrational 1

18. Zeros are –3, 5 Zeros

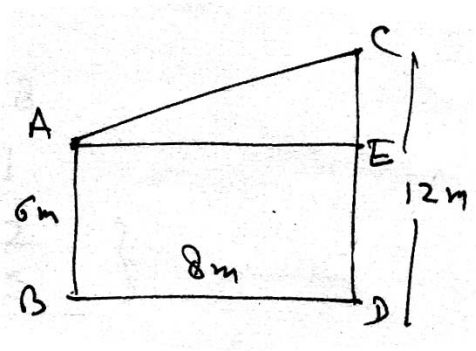
$\therefore$ Sum of zeros = –3 + 5 = 2 1

Product of zeros = –15 1

$\therefore$ Polynomial is $x^2-2x-15$ 1

19. Let AB & CD be poles of height 6m & 12m

BD = 8m



1

CE = 12 - 6 = 6

$\therefore\ AC^2 = AE^2 + CE^2$ 1

$AC^2 = 8^2 + 6^2$

$\therefore\ AC$ = 10 m 1

20. $\sin(A+B) = \frac{\sqrt{3}}{2}$

$\sin(A-B) = \frac{1}{2}$

$\therefore\ A + B = 60^\circ$ 1

$A - B = 30^\circ$ 1

Solving A = 45°, B =15° 1

21. $r = 7, \theta = 30°$

Area of sector $= \dfrac{\pi r^2 \theta}{360^\circ}$ 1

$= \dfrac{\pi \times 7 \times 7 \times 30}{360^\circ}$ 1

$= \dfrac{22}{7} \times \dfrac{7 \times 7}{12} = \dfrac{77}{6}$ sq. units 1

SECTION – C

22. $\dfrac{2x}{3} + \dfrac{y}{2} = 3$

$\dfrac{x}{2} - \dfrac{2y}{3} = \dfrac{1}{6}$

$\Rightarrow 4x + 3y = 18$ 1

$3x - 4y = 1$ 1

$16x + 12y = 72$
$9x - 12y = 3$ 1
$25x \quad = 75 \quad \Rightarrow x = 3$

Putting $x = 3 \Rightarrow y = 2$ 1

23. Let the smaller side of rectangle be x

$\therefore$ Diagonal = $x + 60$ 1

Longer side = $x + 30$

$(x+60)^2 = (x+30)^2 + x^2$ 1

solving $x^2 + 120x + 3600 = x^2 + 60x + 900 + x^2$

$x^2 - 60x - 2700 = 0$ 1

Solving $(x+30)(x-90) = 0$

$\Rightarrow x = 90, x \neq -30$ 1

$\therefore$ Sides are 90 m & 120 m 1

24. $S_6 = 12$

$S_{10} = 60$

$\frac{6}{2}[2a + 5d] = 12$

$\frac{10}{2}[2a + 9d] = 60$ 1

$2a + 5d = 4$

$2a + 9d = 12$ 1

Solving d = 2, a = – 3 1

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

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

$S_n = \frac{n}{2}(2n - 8)$

$= n^2 - 4n$ 1

25. Same as in **Set A**. 4

26. Total no. of cards = 52

Number of spade cards = 13 1

P(spade) = $\frac{13}{52} = \frac{1}{4}$ 1

P(king) = $\frac{4}{52} = \frac{1}{13}$ 1

P(not king) = $1 - \frac{1}{13} = \frac{12}{13}$ 1

27. Let (5, –6) and (–1, –4) is divided by x-axis in k :1

The coordinates of dividing point is :

$\left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right)$ 1

$\Rightarrow \left(\frac{-k+5}{k+1}, \frac{-4k-6}{k+1}\right)$ 1

$\therefore$ Point on x-axis is $(x, 0)$

$\therefore \frac{-4k-6}{k+1} = 0 \Rightarrow k = \frac{-3}{2}$

$\therefore$ Ratio is 3 : 2 externally 1

$\therefore$ Coordinates of point of intersection is

$\left(\frac{\frac{3}{2}+5}{-\frac{3}{2}+1}, 0 \right) = (-13, 0)$ 1

SECTION – D

28. Let speed of the train be x km/hour

Time taken to travel 180 km $= \frac{180}{x}$ hours 1

If the speed be 6 km/hour more

Time taken = $\frac{180}{x+6}$ = hour 1

$\therefore \frac{180}{x} \quad \frac{-180}{x+6} = 1$

Solving :

$\Rightarrow x^2 + 6x = 1080$ 1

$x^2 + 6x - 1080 = 0$

$(x+36)(x-30) = 0$

$\Rightarrow \quad x = 30$ 2

29. $\dfrac{\tan\theta}{1-\cot\theta}+\dfrac{\cot\theta}{1-\tan\theta}$

$\dfrac{\dfrac{\sin\theta}{\cos\theta}}{1-\dfrac{\cos\theta}{\sin\theta}}+\dfrac{\dfrac{\cos\theta}{\sin\theta}}{1-\dfrac{\sin\theta}{\cos\theta}}$ 1

$=\dfrac{\sin^2\theta}{(\sin\theta-\cos\theta)\cos\theta}+\dfrac{\cos^2\theta}{(\cos\theta-\sin\theta)\sin\theta}$ 1

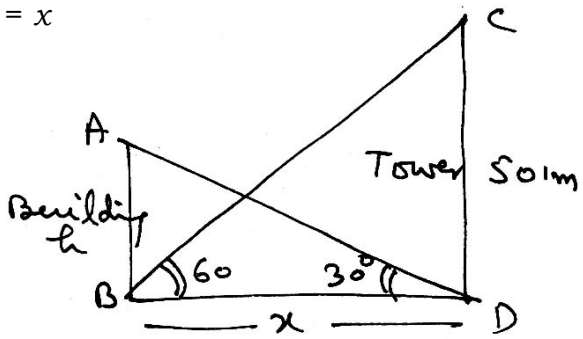
$\dfrac{1}{\sin\theta-\cos\theta}\left(\dfrac{\sin^3\theta-\cos^3\theta}{\sin\theta.\cos\theta}\right)$ 1

$=\dfrac{\sin^2\theta+\cos^2\theta+\sin\theta.\cos\theta}{\sin\theta.\cos\theta}$ 1

$\dfrac{1}{\sin\theta.\cos\theta}+1=1+\sec\theta.\cos ec\,\theta$ 1

OR

Let $AB = h$
$CD = 50$ m
$BD = x$



1 mark for figure

From Δ *ABD*

$\tan 30^\circ = \frac{h}{x}$ ..... (i) 1

From Δ BCD

$\tan 60° = \frac{50}{x}$ ..... (ii) 1

From (ii) no equation $x = \frac{50}{\sqrt{3}}$

Putting in (i) $\frac{1}{\sqrt{3}} = \frac{h}{x}$

$x = h\sqrt{3}$

$\frac{50}{\sqrt{3}} = h\sqrt{3} \Rightarrow h = \frac{50}{3}$

$= 16.67$ m. 2

30. Constructing triangle 2

Constructing similar triangle 3

Same steps as in set I

31. r = 5.6 (sphere)

Volume of sphere = $\frac{4}{3}\pi(5.6)^3$ $1\frac{1}{2}$

Radius of cylinder = 6 cm

$V = \pi r^2 h = \pi \times 6 \times 6 \times h$ $1\frac{1}{2}$

$\frac{4}{3}\pi \times (5.6)^3 = \pi \times 6 \times 6 \times h$

$h = \frac{4}{3} \times \frac{5.6 \times 5.6 \times 5.6}{6 \times 6}$

$\therefore$ h = 6.50 approx 2

32.

% female Teachers	No. of areas	x	$d = \frac{x-50}{10}$	fd
15-25	6	20	–3	–18
25-35	11	30	–2	–22
35-45	7	40	–1	–7
45-55	4	(50)	0	0
55-65	4	60	1	4
65-75	2	70	2	4
75-85	1	80	3	3
	35			– 36

2

Mean $\bar{x} = A + \frac{\sum fd}{\sum f} \times h$ 1

$= 50 - \frac{36}{35} \times 10$

$= 50 - \frac{72}{7}$

$= 50 - 10.28$

$= 39.72\%$ 2

OR

Consumption *C.I.*	Freq.	*C*	
65-85	4	4	
85-105	5	9	← C
105-125	f → 13	22	← L — Median Class
125-145	20	42	$\frac{N}{2} = 30$
145-165	14	56	
165-185	4	60	

2

Md = $L + \frac{\left(\frac{N}{2} - c\right)}{f} \times h$ 1

$= 105 + \frac{(30 - 9) \times 20}{13}$

$= 105 + \frac{21 \times 20}{13}$

= 137.30 Units 2

SET – C

SECTION – A

1. LCM = $= \frac{135 \times 225}{45} = 675$ **Ans. (C)** 1

2. $3x^2 - 4 - x$

$(3x - 4)(x + 1) = 0$

$\Rightarrow x = -1, x = \frac{4}{3}$ **Ans. (B)** 1

3. $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ No solution **Ans. (B)** 1

4. $a = 13,\ d = 2\frac{1}{2}$

$a_{11} = a + 10d = 13 + 25$

$= 38$ **Ans. (A)** 1

5. $a_{11} = 38$

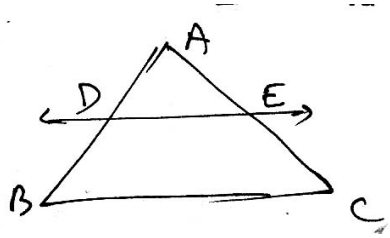
$a + 10d = 38$

$a_{16} = 73$

$a + 15d = 73$

$\therefore$ d = 7, a = – 32 **Ans. (C)** 1

6. $\frac{AD}{DB} = \frac{AE}{EC}$

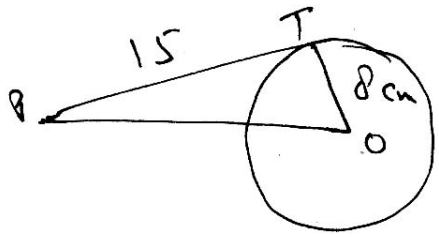


$\frac{1.2}{DB} = \frac{1.8}{5.4} \Rightarrow DB = 3.6$ **Ans. (D)** 1

7. Ratio of areas 4 : 5

$\therefore$ Ratio of sides $\sqrt{4} : \sqrt{5} = 2 : \sqrt{5}$ **Ans. (C)** 1

8.



$\therefore$ OP = $\sqrt{PT^2 + OT^2}$

$= \sqrt{225 + 64} = 17$ cm.

Ans. (C) 1

9. Number of tangents from an external points to the circle = 2

Ans. (C) 1

10. Distance of $(-5, 12)$ from origin

$= \sqrt{25+144} = 13$

Ans. (A) 1

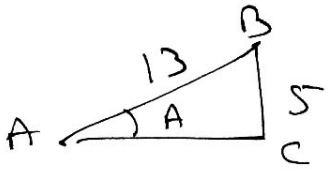
11. Area of $\Delta = \frac{1}{2}[5\,(7+4) + 4\,(-4-2) + 7\,(2-7)]$

$= \frac{1}{2}\,(55 - 24 - 35)$

2 sq. units

Ans. (B) 1

12. $\sin A = \frac{5}{13}$



$\therefore AC = \sqrt{169 - 25}$

$= 12$

$\therefore$ Sec $A = \frac{13}{12}$ **Ans. (B)** 1

13. $\frac{2\tan 30°}{1+\tan^2 30°} = \frac{\frac{2}{\sqrt{3}}}{1-\frac{1}{3}} = \sqrt{3}$

$= \tan 60^\circ$

Ans. (A) 1

14. Ratio of radius : Circumference $r : 2\pi r = 1 : 2\pi$

Ans. (C) 1

15. $r = 3.5,\ h = 9$

Volume of cone

$\frac{1}{3}\pi \times 3.5 \times 3.5 \times 9 = 36.75\pi$ **Ans. (A)** 1

16. P(E) = 0.03

P(not E) = 0.97 **Ans. (A)** 1

SECTION – B

17. Let $2\sqrt{3}$ be a rational

$\therefore 2\sqrt{3} = \frac{p}{q}, q \neq o,$ p, q are integers 1

$\sqrt{3} = \frac{p}{2q}$ 1

LHS is irrational

RHS is rational

$\therefore$ Our assumption is wrong

$\therefore$ $2\sqrt{3}$ is irrational 1

18. Zeros are 4 and –1

$\therefore$ Sum of zeros = 4 – 1 = 3 1

Product of zeros = –4 1

$\therefore$ Polynomial is $x^2 - 3x - 4$ 1

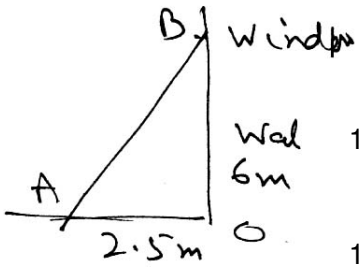
19. OA = 2.5 m

OB = 6 m

$\therefore\ AB^2 = OA^2 + OB^2$ 1

$= (2.5)^2 + 6^2 = 42.25$ 1

$\therefore\ AB$ = 6.5 m 1



20. $\cos 4A = \sin (A - 20°)$ 1

$\sin (90° - 4A) = \sin(A - 20°)$

$90 - 4A = A - 20$ 1

$5A = 110^\circ \Rightarrow A = 22°$ 1

21. $r = 21, \theta = 60°$

Area of sector $= \dfrac{\pi r^2 \theta}{360^\circ}$ 1

$= \dfrac{\pi \times 21 \times 21 \times 60}{360}$ 1

$= \dfrac{22}{7} \times \dfrac{21 \times 21}{6}$

$= 11 \times 21 = 231 \text{ cm}^2$ 1

SECTION – C

22. $\dfrac{x}{2} + \dfrac{2y}{3} = -1$

$\dfrac{x}{3} - \dfrac{y}{2} = \dfrac{13}{6}$

$3x + 4y = -6$ ..... (i)

$2x - 3y = 13$ ..... (ii) 1

equation (i) $\times 3$ & equation (ii) $\times 4$

$9x + 12y = -18$

$8x - 12y = 52$ 1

Adding $17x = 34 \Rightarrow x = 2$ 1

Putting $x = 2$

$6 + 4y = -6 \Rightarrow y = -3$ 1

23. Let the number be x and y

$y^2 - x^2 = 180$ 1

Let $x < y$ $\quad x^2 = 8y$

$y^2 - 8y = 180$ 1

$y^2 - 8y - 180 = 0$

Solving (y – 18) (y+10) = 0

y = 18, x = 12 2

24. $S_6 = 96$

$S_{10} = 240$

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

$\frac{6}{2}[2a + 5d] = 96$

$\frac{10}{2}[2a + 9d] = 240$ 1

$2a + 5d = 32$

$2a + 9d = 48$

d = 4, a = 6 1

$\therefore S_n = \frac{n}{2}[2\times 6 + (n-1)4]$

$2n\,(n+2)$ 1

25. Same as in **Set – A**.

26. 6 Red, 7 White, 5 Black balls Total balls = 18 1

No of white = 7

P (White) = $\frac{7}{18}$ 1

P (Red) = $\frac{6}{18}$ 1

P (not Red) = $1-\frac{1}{3}=\frac{2}{3}$ 1

27. Let the ratio be k : 1

$A\,(1,-5)$, $B\,(-4,\ 5)$

Formula for internal division

$\left(\frac{m_1x_2+m_2x_1}{m_1+m_2}\ ,\ \frac{m_1\ y_2+m_2y_1}{m_1+m_2}\right)$ 1

Coordinate of dividing point is

$\Rightarrow \left(\frac{-4k+1}{k+1}, \frac{5k-5}{k+1}\right)$ 1

$\therefore$ Point on x-axis is (x, 0)

$\therefore \frac{5k-5}{k+1} = 0 \Rightarrow k = 1$ 1

$\therefore$ Ratio is 1 : 1

$\therefore$ Coordinate of point is

$\left(\frac{-4+1}{2}, 0\right) = \left(-\frac{3}{2}, 0\right)$ 1

SECTION – D

28. Let the speed of passenger train be x km/hour

Speed of express train = x + 11 km/hour

Time taken by passenger train is $\frac{132}{x}$ hours

Time taken by express = $\frac{132}{x+11}$

$\frac{132}{x} - \frac{132}{x+11} = 1$

$\Rightarrow x^2 + 11x = 132 \times 11$

$x^2 + 11x - 1452 = 0$

$(x + 44)(x - 33) = 0$

$\Rightarrow \; x = 33 \; x \neq -44$

$\therefore$ Speed of passenger train = 33 km/hour

Speed of Express train = 44 km/hour 2

29. $(\sin A + \text{cosec } A)^2 + (\cos A + \sec A)^2$ 1

$= \sin^2 A + \text{cosec}^2 A + 2 \sin A \text{ cosec } A + \cos^2 A$

$+ \sec^2 A + 2 \cos A \,.\, \sec A$

$= (\sin^2 A + \cos^2 A) + \sec^2 A + \text{cosec}^2 A$

$+ 2 \sin A . \frac{1}{\sin A} + 2 \cos A . \frac{1}{\cos A}$ 1

$= 1 + \sec^2 A + \text{cosec}^2 A + 2 + 2$ 1

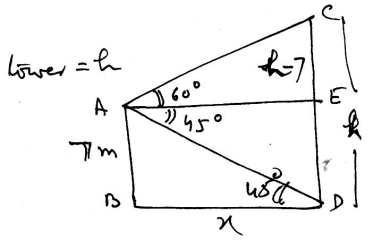
$= 5 + 1 + \tan^2 A + 1 + \cot^2 A$ 1

$= 7 + \tan^2 A + \cot^2 A$ 1

OR

Let height of tower = h

Let BD = x



1 mark for figure

From Δ *ACE*

$$\tan 60^\circ = \frac{h-7}{x} \quad \ldots\ldots\ldots\ldots\ldots \text{(i)}$$ 1

From Δ ABD

$$\tan 45^\circ = \frac{7}{x} \quad \ldots\ldots\ldots\ldots\ldots \text{(ii)}$$ 1

From equation (ii) $1 = \frac{7}{x} \Rightarrow x = 7$

Putting in (i)

$$\sqrt{3} = \frac{h-7}{7}$$

$h - 7 = 7\sqrt{3} \Rightarrow h = 7\left(\sqrt{3}+1\right)$ 2

30. Same as in Set – A.

31. r = 6 cm, h =24 cm.

Volume of cone = $\frac{1}{3}\pi r^2 h$ 1

$= \frac{1}{3}\pi.6\times 6\times 24$

Volume of sphere = $\frac{4}{3}\pi r^3$ 1

$\therefore \frac{4}{3}\pi r^3 = \frac{1}{3}\pi \times 6 \times 6 \times 24$ 1

$r^3 = \frac{6 \times 6 \times 24}{4}$ 1

$r = 6$ cm 1

32.

No. of letters C.I.	Numbers of surnames *(f)*	*c*	
1 – 4	6	6	
4 – 7	30	36 c	
L → 7 – 10	$f \rightarrow 40$	76 ←	Median Class
10 – 13	16	92	$\frac{N}{2} = 50$
13 – 16	4	96	
16 – 19	4	100	

N=100 2

$Md = L + \frac{\left(\frac{N}{2} - c\right)}{f} \times h$ 1

$= 7 + \left(\frac{50-36}{40}\right) \times 3$

$= 7 + 1.05 = 8.05$ 2

OR

Lifetime (Hours)	f	x	$d = \frac{x-50}{20}$	fd
0-20	10	10	–2	–20
20-40	15	30	–1	–15
40-60	12	(50) A	0	0
60-80	21	70	1	21
80-100	8	90	2	16
100-120	9	110	3	27
	75			29

2

$\bar{x} = A + \frac{\sum fd}{\sum f} \times h$ 1

$= 50 + \frac{29}{75} \times 20 = 57.73$ 2

SET – D

SECTION – A

1. LCM = $= \frac{124 \times 148}{4} = 4588$ **Ans. (C)** 1

2. $3x^2 + 4x + 1$

$(3x + 1)(x + 1) = 0$

$\Rightarrow x = -1, -\frac{1}{3}$ **Ans. (D)** 1

3. $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow$ Infinite solutions. **Ans. (B)** 1

4. $a = 5,\ d = 1\frac{1}{2}$

$a_{15} = a + 14d = 5 + 14 \times \frac{3}{2}$

$= 26$ **Ans. (C)** 1

5. $a_3 = 12 \Rightarrow a + 2d = 12$

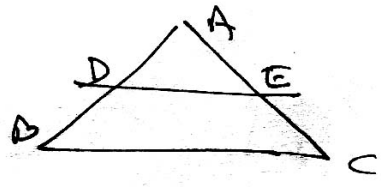
$a_{10} = 26 \Rightarrow a + 9d = 26$

$d = 2, a = 8$

$a_{20} = 8 + 19 \times 2 = 46$

Ans. (A) 1

6. $\frac{AD}{DB} = \frac{AE}{EC}$



$\frac{1.5}{3} = \frac{1.2}{EC}$

$EC = 2.4$ cm

Ans. (C) 1

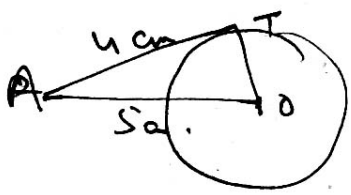
7. Ratio of areas 5 : 3

$\therefore$ Ratio of sides $\sqrt{5} : \sqrt{3}$ **Ans. (C)** 1

8. OT = $\sqrt{DA^2 - AT^2}$

$= \sqrt{25-16} = 3cm.$

$r = 3$ cm



Ans. (A) 1

9. Number of tangents from a point inside the circle = 0

Ans. (D) 1

10. Distance (3, –4) from origin is

$= \sqrt{9+16} = 5$

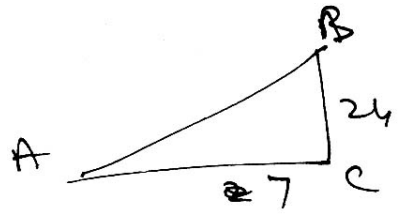
Ans. (C) 1

11. Area of $\Delta = \frac{1}{2}[2(0+4) - 1(-4-3) + 2(3-0)]$

$= \frac{1}{2}[8+7+6] = 10.5$

Ans. (B) 1

12. $\cot A = \frac{7}{24}$



$AB = \sqrt{7^2 + 24^2}$

$= 25$

$\therefore$ Sec $A = \frac{24}{25}$ **Ans. (B)** 1

13. $3\sin 30^\circ - 4\sin^3 30^\circ$

$3 \times \frac{1}{2} - 4 \times \frac{1}{8}$

$\frac{3}{2} - \frac{1}{2} = 1 = \sin 90^\circ$

Ans. (B) 1

14. Ratio of diameter : Circumference $2r : 2\pi r$

$= 1 : \pi$ **Ans. (C)** 1

15. $V = \pi r^2 h, r = 2.1, h = 5$

$V = \pi(2.1)^2 \times 5 = 22.05\pi$ **Ans. (A)** 1

16. P(not A) = 0.04

P(A) = $1 - .06 = 0.96$ **Ans. (C)** 1

SECTION – B

17. Similar as 17 in Set – B. 3

18. Zeros are 3 and –2

Sum of zeros = $3 + -1 = 1$ 1

Product of zeros = $3 \times -1 = -6$ 1

$\therefore$ Polynomial $x^2 - x - 6$ 1

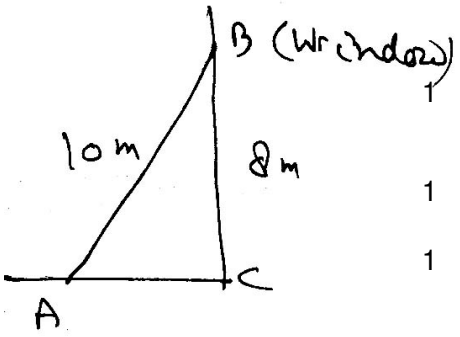
19. Ladder = 10 m = AB

BC = 8 m

$\therefore\ AB^2 = AC^2 + BC^2$ 1

$100 = AC^2 + 64$ 1

AC = 6 m 1



20. $\tan 2A = \cot(A - 18°)$ 1

$\cot(90° - 2A) = \cot(A - 18)$

$90 - 2A = A - 18$ 1

$3A = 108 \Rightarrow A = 36°$ 1

21. $r = 6$ cm, $\theta = 60°$

Area of sector $= \frac{\pi r^2 \theta}{360^\circ}$ 1

$= \frac{\pi \times 6 \times 6 \times 60}{360^\circ}$ 1

$= 6 \times \frac{22}{7} = \frac{132}{7}$ cm^2 1

SECTION – C

22. $\frac{2x}{3} - \frac{3y}{2} = -2$

$\frac{x}{2} + \frac{4}{3}y = \frac{25}{3}$

Simplifying

$4x - 9y = -12$ ..... (i)

$3x + 8y = 50$ ..... (ii) 1

Multiplying equation (i) by 8 and

equation (ii) by 9

$32x - 72y = -96$

$27x + 72y = 450$ 1

Adding $59x = 354 \Rightarrow x = 6$ 1

Putting x in (ii)

$y = 4$ 1

23. Let the breadth of field = x m 1

Length = $2x + 1$

Area of rectangle = $x(2x + 1)$ 1

$x(2x + 1) = 528$

$2x^2 + x - 528 = 0$

$$x = \frac{-1 \pm \sqrt{1 + 4 \times 2 \times 528}}{4}$$

$$= \frac{-1 \pm \sqrt{4225}}{4} = \frac{-1 \pm 65}{4}$$

x = 16 m

width = 16 m, length = 33 m 2

24. $S_{10} = -60$

$S_{15} = -165$

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

$\frac{10}{2}[2a + 9d] = -60$

$\frac{15}{2}[2a + 14d] = -165$ 1

$2a + 9d = -12$

$2a + 14d = -22$

d = –2, a = 3 1

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

$= 4n - n^2$ 1

25. Same as in Set – A.

26. Total number of cards = 52

Number of heart cards = 13 1

Number of aces = 4

P (Heart) = $\frac{13}{52} = \frac{1}{4}$ 1

P (Ace) = $\frac{4}{52} = \frac{1}{13}$ 1

P (not an ace) = $1 - \frac{1}{13} = \frac{12}{13}$ 1

27. Let the ratio k : 1

(3, 4) (-4, 7)

Coordinate of point of division is

$$\left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1\ y_2 + m_2y_1}{m_1 + m_2}\right)$$ 1

$\therefore$ Point of division :

$$\Rightarrow \left(\frac{-4k+3}{k+1}, \frac{7k+4}{k+1}\right)$$ 1

$\therefore$ Point on y-axis = (0, y)

$$\therefore \frac{-4k+3}{k+1} = 0 \Rightarrow k = \frac{3}{4}$$

$\therefore$ Ratio is 3 : 4 1

$\therefore$ Point of intersection

$$\left(0, \frac{7\times\frac{3}{4}+4}{\frac{3}{4}+1}\right)$$

$$\left(0, \frac{37}{7}\right)$$ 1

SECTION – D

28. Let the speed of passenger = x km/hour

Speed of express = (x + 14) km/hour 1

Distance between stations = 168 km.

Time taken by passenger = $\frac{168}{x}$ 1

Time taken by express = $\frac{168}{x+4}$ 1

$\frac{168}{x} - \frac{168}{x+14} = 1$

Simplifying

$\Rightarrow x^2 + 14x = 14 \times 168$

$x^2 + 14x - 14 \times 168 = 0$

$(x + 56)(x - 42) = 0$

$\Rightarrow \ x = 42$ km/hour

$\therefore$ Speed of passenger train = 42 km/hour

Speed of Express train = 56 km/hour 2

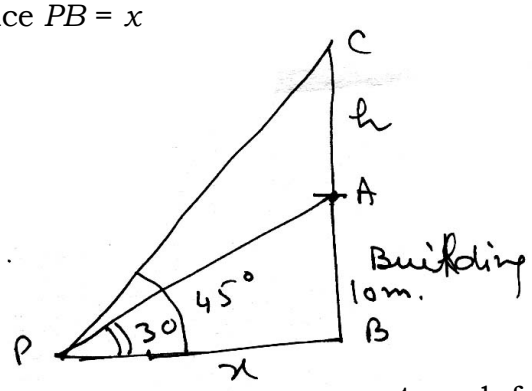
29. Same as in Set – B Question No. 29. 5

OR

Height of Building = 10 m

Let height of flagstaff = h

Distance $PB = x$



1 mark for figure

From Δ *ABP*

$\tan 30^\circ = \frac{10}{x}$ ..... (i) 1

From Δ *BCB*

$\tan 45° = \frac{h+10}{x}$ ..... (ii) 1

Solving $\frac{\tan 30^\circ}{\tan 45^\circ} = \frac{10}{h+10}$

$h+10 = 10\sqrt{3} \Rightarrow h = 10\left(\sqrt{3}-1\right)$ m.

$x = h+10 = 10\left(\sqrt{3}-1\right)+10$

$x = 10\sqrt{3}$ m 2

30. Similar as in Set – A, B, & C. 5

31. Radius of sphere 6 cm.

Volume of sphere $\frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi \times 6 \times 6 \times 6$ 1

Height of cone = 24 cm

Volume of cone = $\frac{1}{3}\pi r^2 h$ 1

$= \frac{1}{3}\pi \times r^2 \times 24$ 1

$\therefore \frac{1}{3}\pi r^2 24 = \frac{4}{3}\pi 6 \times 6 \times 6$ 1

$24r^2 = 24 \times 6 \times 6$

$r^2 = 36 \Rightarrow r = 6\,\text{cm}$ 1

32.

Pocket money	Number of student	x	$d = \frac{x-18}{2}$	fd
11-13	7	12	–3	–21
13-15	6	14	–2	–12
15-17	9	16	–1	–9
17-19	13	(18)	0	0
19-21	20	20	1	20
21-23	5	22	2	10
23-25	4	24	3	12
	64			0

2

$\bar{x} = A + \frac{\sum fd}{\sum f} \times h$ 1

$\bar{x} = 18 + \frac{0}{64} \times 2 = 18$ 2

OR

Length (mm	No. of leaves	C
18-27	3	3
27-36	5	8
36-45	10	18
45-54	f → 13	31
54-63	5	36
63-72	4	40

C

Median Class

L

$\frac{N}{2} = \frac{40}{2} = 20$

2

$$Md = L + \frac{\left(\frac{N}{2} - c\right)}{f} \times h$$ 1

$$Md = 45 + \frac{(20-18)}{13} \times 9$$

$$= 45 + \frac{18}{13}$$

$$= 45 + 1.4 = 46.4$$ 2