CLASS : 10th (Secondary) **3553/3503**

Series : Sec-M/2018 ***SET : A, B, C & D***

Total No. of Printed Pages : **40**

MARKING INSTRUCTIONS AND MODEL ANSWERS

MATHEMATICS

(Academic/Open)

(Only for Fresh/Re-appear 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/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 पूर्णांक 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/ Guidelines 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

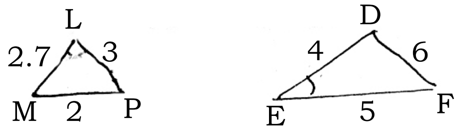
1. LCM = 60, HCF = 4, HCF < LCM **Ans. (B)** 1

2. $x^3 + 1$ **Ans. (D)** 1

3. $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow$ Parallel lines **Ans. (C)** 1

4. –10 , –6, –2, 2 .... **Ans. (C)** 1

5. $-77 = a + (n-1)\,d = 10 + 29 \times (-3)$ **Ans. (C)** 1

6. 

Ans. (C) 1

7. $\sqrt{5} : \sqrt{3}$ **Ans. (D)** 1

8. 2 **Ans. (B)** 1

9. Two 1

10. Fourth **Ans. (D)** 1

11. $\left(\frac{3}{2}, 2\right)$ **Ans. (B)** 1

12. False 1

13. False 1

14. $\frac{\theta}{360} \times \pi R^2$ **Ans. (D)** 1

15. CSA = $\pi rl = \pi r\sqrt{r^2 + h^2} = 20\pi\,\text{cm}^2$ **Ans. (B)** 1

16. 0 **Ans. (B)** 1

SECTION – B

17. Let $\sqrt{5}$ is rational number.

$\therefore\ \sqrt{5} = q / p,\ p, q$ are co-prime integers and $p \neq 0$ 1

Squaring and simplifying, we get

$q^2 = 5\ p^2$ .... (1)

$\Rightarrow$ 5 divides q^2

$\Rightarrow$ 5 divides q So we can write q = 5.k for some interger k 1

putting the value of q in equation (1), we get

$5p^2 = 25\ k^2$ 1

or $p^2 = 5\ k^2$

$\Rightarrow$ 5 divides p^2

$\Rightarrow$ 5 divides p

Hence 5 is common factor of p and q. Contradiction has arisen. Our assumption that $\sqrt{5}$ is rational is wrong. Hence $\sqrt{5}$ is an irrational number.

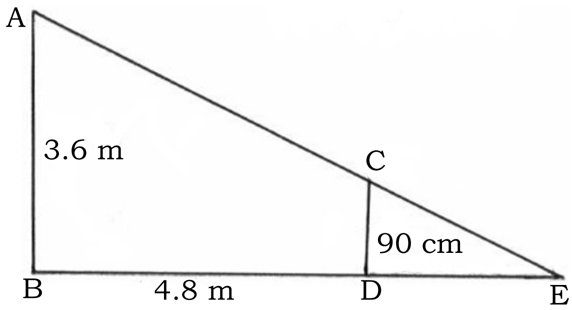
18. Zeroes are $\frac{1}{4}, -1$

Sum of the zeroes = $\frac{1}{4} - 1 = -\frac{3}{4}$ 1

Product of zeroes = $\frac{1}{4} \times -1 = -\frac{1}{4}$ 1

$\therefore$ Polynomial is $x^2 + \frac{3}{4}x - \frac{1}{4}$ 1

19. Let AB denote the lamp-post and CD the girl after walking for 4 seconds away from the lamp-post. Let DE is shadow of the girl. Distance travelled in 4 seconds is $1.2 \times 4 = 4.8$ m = BD



ΔABE and ΔCDE are similair $\left(\angle E = \angle E, \angle B = \angle D\right)$

$\therefore \dfrac{AB}{CD} = \dfrac{BE}{DE}$

or $\dfrac{3.6}{.9} = \dfrac{4.8 + DE}{DE}$ 1

or 4 DE = 4.8 + DE

or 3 DE = 4.8

or DE = 1.6 m 1

20. ABC is a given triangle and A, B, C are its interior angles. We know that in any triangle sum of angle is 180°. 1

$\therefore$ A + B + C = 180

or $\dfrac{B+C}{2} = 90 - A/2$ 1

L.H.S. = sin $\left(\dfrac{B+C}{2}\right) = \sin(90 - A/2) = \cos A/2$

= R.H.S. 1

21. Length of fence = $\frac{5275}{25} = 211\text{m}$ 1

Let d be diameter of the field; then circumference

$\pi d = 211$

$d = \frac{211}{22} \times 7 = \frac{1477}{22} = 67.14$ (app.) m

SECTION – C

22. Given equation are

$.2x + .3y = 1.3$

$.4x + .5y = 2.3$

or $2x + 3y = 13$ ....(1) 1

$4x + 5y = 23$ ....(2)

opreating 2(1) –(2), we get

$y = 3$ ....(3)

putting $y = 3$ in eq. (1) we get 1

$x = 2$

Hence $x = 2$ and $y = 3$ is the solution of given equs. 1

23. Let n, $(n + 1)$ are two positive consecutive numbers (integers) and it is given that 1

$n^2 + (n + 1)^2 = 365$ 1

on simplification we get

or $n^2 + n - 182 = 0$ 1

or $(n + 14)(n - 13) = 0$

$\therefore \quad n = 13, n + 1 = 14$ 1

Hence 13, 14 are two integers whose sum of square is 365.

24. Three digit numbers which are divisible by 7 are 105, 112, 119, ... 994. 1

These numbers are in A.P. suppose 994 is nth term of A.P. 1

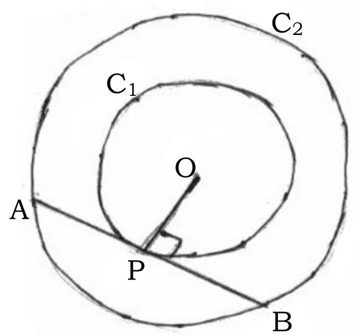
$\therefore$ 994 = 105 + (n – 1) (7) 2

$\Rightarrow \quad n - 1 = 127$

or $\quad n = 128.$

25. Let C_1 and C_2 are two circle having same centre O. 1

Let a chord AB of the larger circle C_2 which touches the smaller circle C_1 at the point P. Join OP, then AB is tangent to C_1 at P and OP is its radius. 2



$\therefore$ OP $\perp$ AB

AB is a chord of the circle C_2 1

and OP $\perp$ AB. Therefore OP is bisector of the chord AB (the perpendicular from centre bisects the chord)

$\therefore$ AP = BP.

26. Well-shuffling ensures equally likely outcomes. 1

There are 2 kings of red colour in a deck. Let E be the event "the card is king of red. colour". 1

$\therefore$ Total favourable cases to E = 2 1

and Total possible outcomes = 52 1

$\therefore P(E) = \frac{2}{52} = \frac{1}{26}$ 1

27. Area of Δ formed by three collinear points is zero. 3

$\therefore \frac{1}{2}\left[2(k+3)+4(-3-3)+6(3-k)\right]=0$

or $2k + 6 - 24 + 18 - 6k = 0$ 1

or $-4k = 0$

or $k = 0$

SECTION – D

28. Suppose the breadth is x *m* and length is $2x$ *m* of a rectangular mango grove. Then area is 1

$x(2x) = 800$ 2

or $x^2 = 400$

or $x = 20$ m 2

$\therefore$ length = 2 × x = 2 × 20 = 40 m and breadth is 20 m.

Yes it is possible having length 40 m and breadth 20 m.

29. Taking L.H.S. $= \dfrac{\sin\theta + \cos\theta - 1}{\sin\theta - \cos\theta + 1}$, dividing N and D by $\cos\theta$, we get 1

$$= \frac{\tan\theta + 1 - \sec\theta}{\tan\theta - 1 + \sec\theta}$$

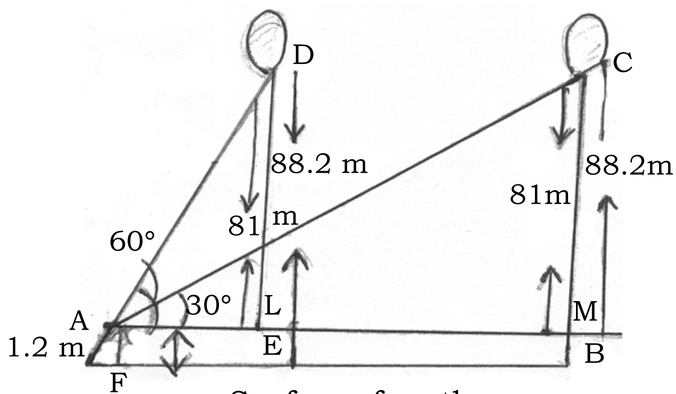
$$= \frac{(\tan\theta - \sec\theta + 1)}{(\tan\theta + \sec\theta) - (\sec^2\theta - \tan^2\theta)} \quad 1$$

$$= \frac{(\tan\theta - \sec\theta + 1)}{(\tan\theta + \sec\theta)\,(1 - \sec\theta + \tan\theta)} \quad 1$$

$$= \frac{1}{\tan\theta + \sec\theta} = \text{R.H.S.} \quad 1$$

OR

Let height of girl is 1.2 m = AF and height of ballon is from earth surface DE = CB = 88.2 2



$\therefore$ Height at the level of girl = 88.2 – 1.2 = 81 m

Then m ΔALM 2

$\tan 60° = \frac{81}{AL}$

$\therefore$ AL = $\frac{81}{\sqrt{3}}$ m = $27\sqrt{3}$ m.

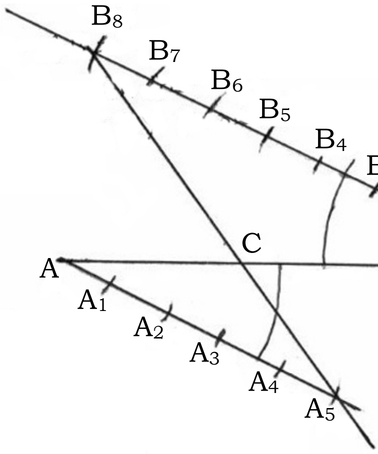
In ΔAMC, $\tan 30° = \frac{81}{AM}$ 1

$\therefore$ AM 81 $\sqrt{3}$ m

Required distance = 81 $\sqrt{3} - 27\sqrt{3}$ = $54\sqrt{3}$ m

30. Draw a line AB = 7.6 cm. Draw any ray AX, making an acute angle with AB.

2 Draw another ray By parallel to AX by making $\angle ABY = \angle BAX$ 1



2 Locate 5 points 2

A_1, A_2, A_3, A_4 and A_5 on AX and 8 points B_1, B_2, B_3, B_u, B_4, B_5, B_6 B_7 and B_8 on BY such that $AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5 = BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5 = B_5B_6 = B_6B_7 = B_7B_8$.

Join A_5B_8 which cut AB line at C.
Then AC : CB = 5 : 8.

Justification Δ's AC A_5 and BC B_8 are similar

$$\frac{AA_5}{BB_8} = \frac{AC}{CB} = \frac{5}{8}$$

31. Volume of the cuboid $\forall = 5.5 \times 10 \times 3.5$ cm^3 2

Volume of the silver one coin = $.2 \times \frac{22}{7} \times (.875)^2$ cm^3 2

Number of silver coin = $\frac{5.5 \times 10 \times 3.5 \times 7}{.2 \times 22 \times .875 \times .875}$ 1

= 400 coins

32.

Class Intervales	**Frequency**	**Cumulative frequency**
Below 140	4	4
140-145	7	11
145-150	18	29
150-155	11	40
155-160	6	46
160-165	5	51

Median class 2½

Now $\frac{n}{2} = \frac{51}{2} = 25.5$, Then 145-150 is a median class. Hence l = 145, $c.f$ = 11, f = 18, h = 5 2½

$$\text{Median} = l + \left(\frac{\frac{n}{2} - c.f.}{f}\right) \times h$$

$$= 145 + \left(\frac{25.5 - 11}{18}\right) \times 5$$

$$= 145 + \frac{72.5}{18}$$

= 149.03 cm

OR

Daily expenditure (in ₹)	**Number of Households f_i**	**Mid value x**	**d_i = x – 225**	**$u_i = \frac{d_i}{50}$**	**$f_i u_i$**
100-150	4	125	–100	–2	–8
150-200	5	175	–50	–1	–5
200-250	12	225	0	0	0
250-300	2	275	50	1	2
300-350	2	325	100	2	4
Σf_i	25				–7 = $\Sigma f_i u_i$

$$\bar{x} = 225 + \frac{(-7)}{25} \times 50 = 211$$

∴ Mean is ₹ 211 2½

SET – B

SECTION – A

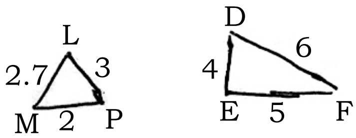
1. LCM > HCF **Ans. (A)** 1

2. $x + \sqrt{2}$ **Ans. (D)** 1

3. Coincident lines **Ans. (B)** 1

4. –10 , –6, –2, 2 ……… **Ans. (C)** 1

5. $a_{20} = -10 + 19 \times 4 = 66$ **Ans. (A)** 1

6. 

Ans. (C) 1

7. 9 : 4 **Ans. (C)** 1

8. 0 **Ans. (C)** 1

9. Infinitely many **Ans. (C)** 1

10. Third **Ans. (B)** 1

11. (0, 0) **Ans. (B)** 1

12. False 1

13. True 1

14. $\frac{\theta}{360} \times 2\pi r$ **Ans. (B)** 1

15. $20\pi \text{ cm}^2$ **Ans. (B)** 1

16. $\frac{1}{6}$ **Ans. (C)** 1

SECTION – B

17. Suppose $\sqrt{7}$ is rational number. 1

$\therefore \sqrt{7} = p/q, p, q$ are co-prime integers and $q \neq 0$ 1

Squaring and simplifying, we get

$p^2 = 7\ q^2$ .... (1)

$\Rightarrow$ 7 divides p^2

$\Rightarrow$ 7 divides p So we can write p = 7.k for some integer k.

putting the value of p in equation (1), we get

$7q^2 = 7^2k^2$ 1

or $q^2 = 7k^2$

$\Rightarrow$ 7 divides p^2

$\Rightarrow$ 7 divides p

Hence 7 is common factor of p and q. Contradiction has arisen. Our assumption that $\sqrt{7}$ is rational is wrong. Hence $\sqrt{7}$ is an irrational number.

18. Sum of the zeroes = $\frac{1}{4}$ 1

Product of the zeroes = 4 1

$\therefore$ Polynomial is $x^2 - \frac{1}{4}x + 4$ 1

19. $\Delta ABC \sim \Delta PQR$

so $\dfrac{AB}{PQ} = \dfrac{BC}{QR} = \dfrac{CA}{RP}$ ....(1)

and $\angle A = \angle P, \angle B = \angle Q$ *and* $\angle C = \angle R$ ....(2) 1

But AB = 2AM and PQ = 2 PN ....(3)

(As CM and RN are medians)

So that from equations (1) and (3), we get

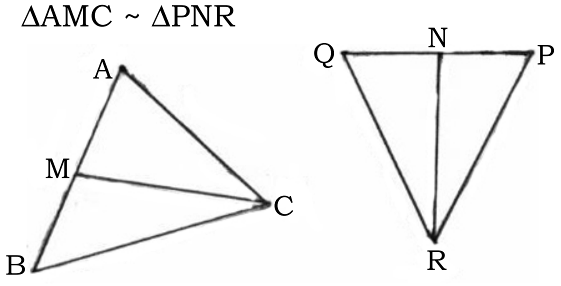
$$\frac{2AM}{2PN} = \frac{CA}{RP}$$ 1

$\Rightarrow$ $\dfrac{AM}{PN} = \dfrac{CA}{RP}$ ....(4)

Also $\angle MAC = \angle NPR$ ....(5)

From (4) and (5), we get

$\Delta AMC \sim \Delta PNR$ 1



20. The value of

$$\frac{\tan 65^\circ}{\cot 25^\circ} = \frac{\tan(90^\circ - 25^\circ)}{\cot 25^\circ} = \frac{\cot 25^\circ}{\cot 25^\circ} = 1$$ 1 + 1 + 1

21. Area of circular field = $\pi r^2 = \frac{22}{7} \times 5 \times 5$ sq. m. 1½

Total cost of ploughing $= \frac{22}{7} \times 25 \times \frac{3}{2} = \frac{825}{7} =$

₹ 117.85 App. 1½

SECTION – C

22. Given equations are $3x - y = 3$ ....(1) 1

$x - y = 4$ ....(2)

Subtracting (2) from (1), we get

$2x = -1$

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

Putting the value of $x = -\frac{1}{2}$ in eq. (1), we get 1

$y = -\frac{9}{2}$

Hence $x = -\frac{1}{2}$ and $y = -\frac{9}{2}$ is the solution of given equations. 1

23. Let x and y are two numbers s.t.

$x + y = 27$ ....(1) 1

$xy = 182$ ....(2)

Putting the value of $x = 27 - y$ from eq. (1) in equation (2), we get

$y(27 - y) = 182$

or $y^2 - 27y + 182 = 0$

$\therefore$ $(y - 14)(y - 13) = 0$ 2

$\therefore$ $y = 14$, and $y = 13$

then $x = 13$ then $x = 14$

Hence two numbers are 13, and 14.

24. Numbers divisible by 4 between 10 and 250 are 12, 16, 20, ………… 248.

Let *n*th is the last term of this A.P. whose first term is 12 and c.d. is 4. 2

a_nth = 248 = 12 + $(n - 1)4$

or $n - 1 = \frac{236}{4}$ or $n = 60$. 2

25. Same in Set A.

26. Let E be the event "The coming card is face card." 1

$\therefore$ Total favourable cases to event E = 12 1

and Total possible outcomes = 52 1

$\therefore$ $P(E) = \frac{12}{52} = \frac{3}{13}$ 1

27. Area of triangle formed by three collinear points is zero. 2½

$\therefore$ $\frac{1}{2}[8(-4+5) + k(-5-1) + 2(.1+4)] = 0$

$\therefore$ $8 - 6k + 10 = 0$ 1½

or $6k = 18$

or $k = 3$

SECTION – D

28. Let the present ages of two friends are x years and y years respectively. Then 1

$x + y = 20$ ....(1)

Four years ago, the ages are

$(x-4)\ (y-4) = 48$ ....(2) 1

Putting $y = 20 - x$ from equation (1) in equation (2) we get

$(x-4)\ (20 - x - 4) = 48$ 2

or $(x-4)\ (x-16) + 48 = 0$

or $x^2 - 20\,x + 112 = 0$ ....(3) 1

on solving equation (3), we get imaginary values of x. This shows that It is not possible.

29. Taking L.H.S. $= \dfrac{\cos A - \sin A - 1}{\cos A + \sin A - 1} = \dfrac{\cot A - 1 + \operatorname{cosec} A}{\cot A + 1 - \operatorname{cosec} A}$

on dividing N & D by sin A

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

1 + 1 + 1 + 2

$$= \frac{(\cot A + \operatorname{cosec} A)(1 - \operatorname{cosec} A + \cot A)}{(1 - \operatorname{cosec} A + \cot A)}$$

$= \cot A + \operatorname{cosec} A = \text{R.H.S.}$

OR

A and B represent points on the bank on opposite sides of the river, so that AB is the width of the river P is a point on the bridge at a height of 3m a.e. $DP = 3$ m we want to determine the width of the river which is equal to the side AB of the ΔAPB. 2½

Now $AB = AD + DB$

In right ΔAPD; $\angle A = 30°$

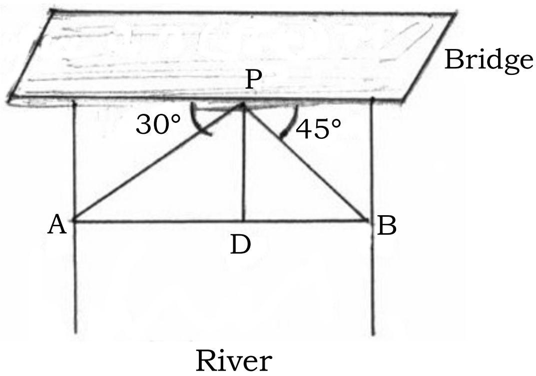
$$\tan 30° = \frac{PD}{AD}$$

or $AD = 3\sqrt{3}$ m

Also in right ΔPBD, $\angle B = 45°$ so $BD = PD = 3$m

$$\therefore AB = BD + AD = 3 + 3\sqrt{3} = 3\,(1 + \sqrt{3})\text{m}.$$

Hence width of the river is $3\,(\sqrt{3} + 1)$m. 2½



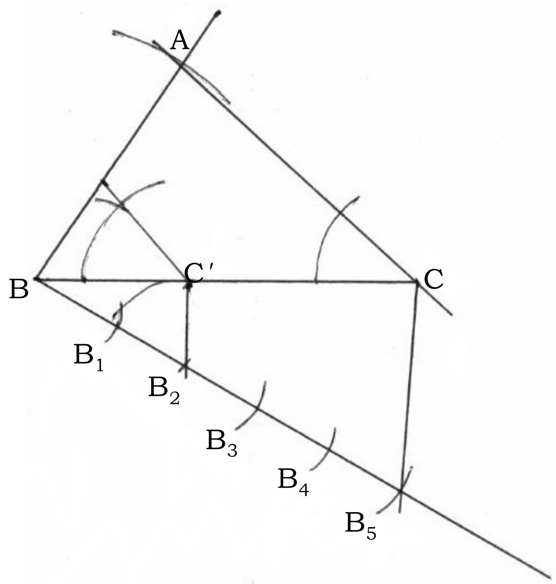
30. 1. Draw given triangle ABC. We want to construct another triangle whose sides are $\frac{2}{3}$ of the corresponding sides of triangle ABC.

2. Draw any ray BX making an acute angle with BC on the side opposite to the vertex A.

3. Locate 3 points B_1, B_2 and B_3 on BX so that $BB_1 = B_1 B_2 = B_2 B_3$.

4. Join B_3C and draw a line through B_2 parallel to B_3C to meet BC at C′.

5. Draw a line through parallel to the line CA to meet BA at A′. Then Δ A′ B′ C′ is the required triangle.



31. Volume of a metallic sphere = $\frac{4}{3}\pi\,(4.2)^3$ cm^3

Volume of cylinder = $\pi\,(6)^2 \times$ h cm^3

where h is height of the cylender.

$\therefore\ \frac{4}{3}\pi \times 4.2 \times 4.2 \times 4.2 = \pi \times 36 \times h$

$\therefore\ h = \frac{4.2 \times 4.2 \times 4.2}{3 \times 3 \times 3} = 2.744\,\text{cm}$

32.

Length in mm ***x***	**Number of Leaves *f***	***c.f***
117.5-126.5	3	3
126.5-135.5	5	8
135.5-144.5	9	17
144.5-153.5	12	29 median class
153.5-162.5	5	34
162.5-171.5	4	38
171.5-180.5	2	$40 = \Sigma f_i = N$

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

$\therefore$ Median $= 144.5 + \left(\frac{20-17}{12}\right) \times 9$

$= 144.5 + \frac{9}{4} = 144.5 + 2.25 = 146.75$ mm

OR

Allowance (in ₹)	Mid value x_i	No. of children f	$u_i = \frac{x_i - 18}{2}$	$u_i f_i$
11-13	12	7	–3	–21
13-15	14	6	–2	–12
15-17	16	9	–1	–9
17-19	18	13	0	0
19-21	20	f	1	f
21-23	22	5	2	10
23-25	24	4	3	12

$N = 44 + f \qquad \Sigma u_i f_i = f - 20$

$$\therefore\ 18 = 18 + \frac{f - 20}{f + 44} \times 2$$

or $\quad f - 20 = 0 \Rightarrow f = 20$

SET – C

SECTION – A

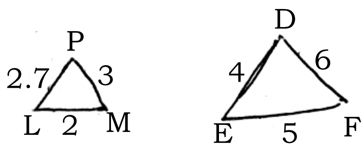
1. LCM > HCF **Ans. (C)** 1

2. $x^3 + 1$ **Ans. (D)** 1

3. Coincident lines **Ans. (A)** 1

4. a, 2a, 3a, 4a, ... **Ans. (C)** 1

5. $a_{10th} = 2 + 9 \times 5 = 47$ **Ans. (B)** 1

6. 

Ans. (D) 1

7. 16 : 81 **Ans. (D)** 1

8. only one **Ans. (A)** 1

9. 90° **Ans. (B)** 1

10. First **Ans. (A)** 1

11. (0, 0) **Ans. (C)** 1

12. False 1

13. False 1

14. $\left(\frac{360-\theta}{360}\right)\pi R^2$ **Ans. (C)** 1

15. CSA of hemisphere = $2\pi r^2 = 32\ \pi\ \text{cm}^2$ **Ans. (A)** 1

16. $\frac{1}{6}$ **Ans. (A)** 1

SECTION – B

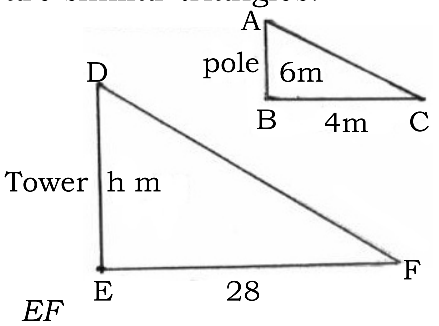
17. Put $\sqrt{3}$ is place of $\sqrt{7}$ in set B and proceeding on same pattern. 3

18. $\therefore$ Sum of zeroes = 3 1

Product of zeroes = 2 1

Hence polynomial becomes = $x^2 - 3x + 2$ 1

19. Both are similar triangles. 1



$\frac{DE}{AB} = \frac{EF}{BC}$ 1

or $\frac{h}{6} = \frac{28}{4}$ 1

or $h = 7 \times 6 = 42$m

where h is the height of the tower.

20. The value of cos 48° – sin 42°

$= \cos(90° - 42°) - \sin 42°$ 2

$= \sin 42° - \sin 42°$

$= 0$ 1

21. Area of the circular field having radius r

$= \pi r^2$ cm^2 1½

Total cost of ploughing at the rate of ₹ 10 per square meter = $\pi r^2 \times 10$ 1½

$\therefore 1540 = \pi r^2 \times 10$

$\therefore r^2 = \frac{154}{22} \times 7 = 7^2$

or $r = 7$m

SECTION – C

22. Given equations are

$1.5x - 5/3y + 2 = 0$

$\frac{1}{3}x + 0.5y - \frac{13}{6} = 0$ 1

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

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

or $9x - 10y = -12$ ....(1) 1

$2x + 3y = 13$ ....(2)

operating 3(1) + 10 (2), we get

$$\begin{array}{r} 27x - 30y = -36 \\ 20x + 30y = 130 \\ \hline 47x = 94 \end{array}$$

$x = 2$

Putting the value of $x = 2$ in equation (1), we get

$18 - 10y = -12$ 1

or $-10y = -30$

or $y = 3$

Hence $x = 2$ and $y = 3$ is the solution of given eq.

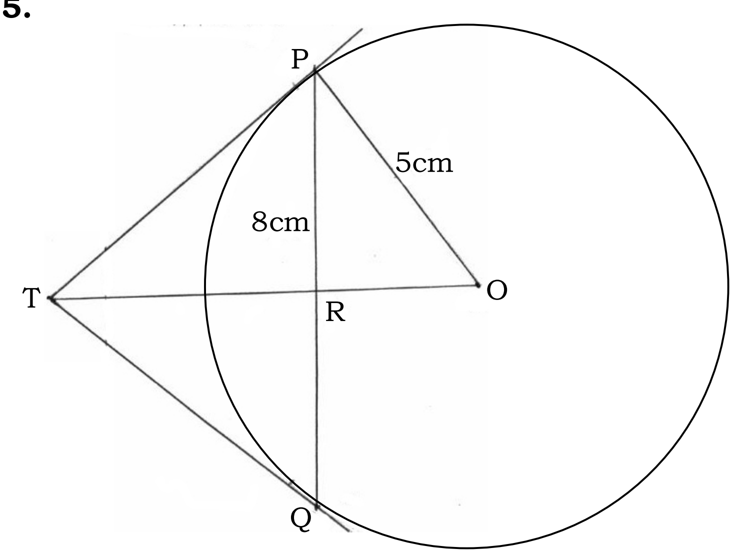
24. Two-digit numbers divisible by 3 are 12, 15, 18, 21, ...99 which is an A. P. whose first term is 12 and common difference is 3. 1½

Let 99 is nth term 1½

$99 = 12 + (n - 1)_3$

$\therefore\ n - 1 = \frac{87}{3} = 29$ or $n = 30$

25.



1

Let O be the centre of circle of radius 5 cm. Join OT which intersect chord PQ at R. Then ΔTPQ is isosceles. ($\therefore$ Then lengths of tangents drawn from an external point to a circle are equal) 1

$\therefore$ To line is the angle bisector of $\angle PTQ$.

So OT $\perp$ PQ, OT bisects PQ at R.

$\therefore$ PR = RQ = 4 cm

In right angled ΔPRQ, OR = $\sqrt{OP^2 - PR^2}$

$$= \sqrt{5^2 - 4^2} = 3\text{ cm}$$ 1

We know that

$$\angle TPR + \angle RPQ = 90° = \angle TPR + \angle PTR$$

$$\Rightarrow \quad \angle RPO = \angle PTR$$

Therefore right triangle TRP ~ right triangle PRO

$$\Rightarrow \frac{TP}{PO} = \frac{RP}{RO} \Rightarrow TP = \frac{20}{3}\text{ cm.}$$

Alter Method

Let $TP = x$ *and* $TR = y$

$x^2 = y^2 + 16$ (Taking right ΔPRT) 1

$x^2 + 5^2 = (y + 3)^2$ (Taking right ΔOPT)

On solving we get the value of $x = \frac{20}{3}$. 1

26. Let E be the event 'card drawn is Jack of hearts' Then number of outcomes favourable to the event E = 1. 1

The number of possible outcomes = 52 1

$\therefore$ P(E) = $\frac{1}{52}$ 1

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

1½

$\frac{1}{2}[11+16+21) = \frac{48}{2} = 24$ sq. unit 1½

SECTION – D

28. Let length and breadth of a park are x cm and y cm.

then $2(x + y) = 80$

$\therefore\ x + y = 40$ ....(1)

and $xy = 400$ ....(2) 2½

Putting the value of $y = 40 - x$ in equation (2) we get

$x(40 - x) = 400$

or $x^2 - 40x + 400 = 0$

$\therefore$ $(x - 20)^2 = 0$ or $x = 20$ cm 2½

then $y = 40 - 20 = 20$ cm

29. L.H.S. $= \dfrac{\cos A + \sin A - 1}{\cos A - \sin A + 1}$

Dividing N & D by sin A, we get

$= \dfrac{\cot A - \text{cosec } A + 1}{\cot A + \text{cosec } A - 1}$ 1½

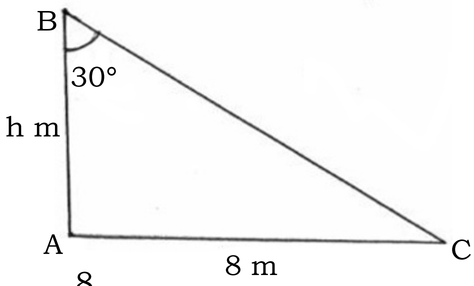
$= \dfrac{\cot A - \text{cosec } A + 1}{(\cot A + \text{cosec } A) - (\text{cosec}^2 A - \cot^2 A)}$ 2½

$= \dfrac{(\cot A - \text{cosec } A + 1)}{(\cot A + \text{cosec } A)(1 - \text{cosec } A + \cot A)}$ 1

$= \dfrac{1}{\cot A + \text{cosec } A} = \text{R.H.S.}$

OR

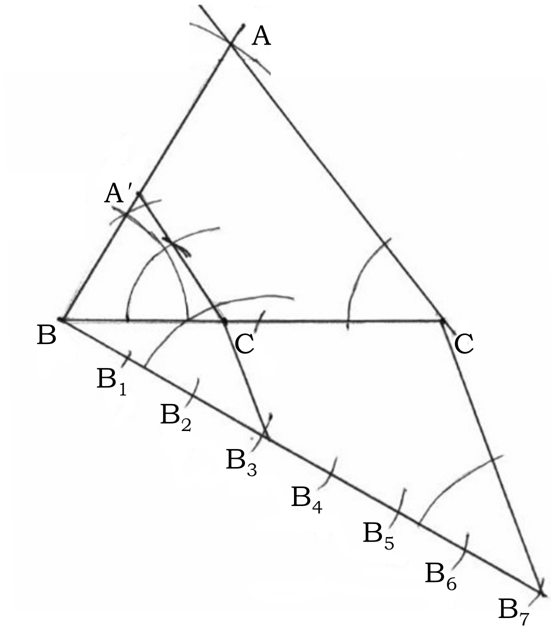
After breaks, and form a triangular form. Let $h = AB$ be the broken part of tree. 2½



$\tan 30° = \dfrac{8}{h}$

$\therefore$ $h = 8\sqrt{3}$ m 2½

30. Same in Set B. $1\frac{1}{2} + 1\frac{1}{2} + 2$



31. The earth taken out from the well of diameter 3 m and 14 m deep.

$\therefore$ Volume of the earth taken out = $\pi\,(1.5)^2 \times 14\ \text{m}^3$ 2

Then the taken out earth has been spread evenly all around the well in the shape of circular ring of width 4m. Let *h* is height of the embankment. Then volume of this space is equal to the volume of the earth taken out from the well.

A.T.Q.

$$\pi\,(1.5)^2 \times 14 = 22 \times 14 \times h$$ 2

$$h = \frac{22}{7} \times \frac{1.5 \times 15 \times 14}{14 \times 22}$$

$$= \frac{1.5 \times 1.5}{7} = \frac{2.25}{7} = 0.32\ \text{m}, \quad = 32\ \text{cm}$$ 1

32.

No. of letters *x*	**No. of surnames *f***	***commulative frequency c.f.***
1-4	6	6
4-7	30	36
7-10	40	76 Median class
10-13	16	92
13-16	4	96
16-19	4	100

2½

$$\therefore \frac{N}{2} = \frac{100}{2} = 50$$

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

$$= 7 + \frac{14 \times 3}{40} = \frac{322}{40} = 8.05$$ 2½

OR

Daily Wages (in ₹)	***No. of workers f***	***Mid value x***	$u = \frac{x-150}{20}$	$u_i f_i$
100-120	12	110	–2	–24
120-140	14	130	–1	–14
140-160	8	150	0	0
160-180	6	170	1	6
180-200	10	190	2	20
	50			

$\Sigma u_i f_i = -12$ 2½

Mean $= 150 + \dfrac{(-12)}{50} \times 20$ 2½

$= 150 - 4.8$

$= ₹\ 145.2$

SET – D

SECTION – A

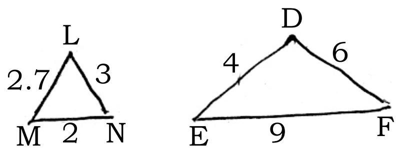
1. $g > l$ **Ans. (A)** 1

2. $x^2 + 1$ **Ans. (B)** 1

3. Intersecting lines **Ans. (B)** 1

4. a, 2a, 3a, 4a, ... **Ans. (D)** 1

5. $a_{20} = 2 + 19 \times 5 = 97$ **Ans. (D)** 1

6. 

Ans. (D) 1

7. 16 : 81 **Ans. (C)** 1

8. one **Ans. (A)** 1

9. Two **Ans. (B)** 1

10. Third **Ans. (C)** 1

11. $(-1,7)\overset{A\qquad 2:3\qquad 13}{\overline{\qquad\qquad C\qquad\qquad}}(4,-3)$

$$\left(\frac{8-3}{5}, \frac{-6+21}{5}\right) = (1, 3)$$ **Ans. (A)** 1

12. True 1

13. False 1

14. $\frac{P}{720}.2\,\pi r^2$ **Ans. (D)** 1

15. πr^2 **Ans. (B)** 1

16. 0 **Ans. (C)** 1

SECTION – B

17. Replace $\sqrt{3}$ by $\sqrt{2}$ in Set C and proceding on same pattern. 3

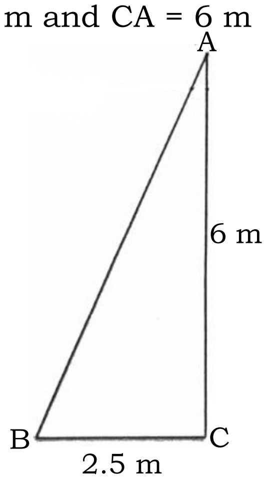
18. $\therefore$ Sum of zeroes = 5 1

Product of zeroes = 3 1

$\therefore$ Polynomial becomes = $x^2 - 5x + 3$ 1

19. Let AB be the ladder and CA be the wall with the window at A. 1

$\therefore$ BC = 2.5 m and CA = 6 m



Then Pythagoras Theorem, we have 1

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

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

$= 42.25$

so AB = 6.5 m

20. cot 85° + cos 75° 2

$= \cot (90° - 5°) + \cos (90° - 75°)$

$= \tan 5° + \sin 15°$ 1

21. Same as in Set C. 3

SECTION – C

22. $\sqrt{2}\ x+\sqrt{3}\ y=0$ ....(1)

$\sqrt{3}\ x-\sqrt{8}\ y=0$ ....(2)

operating $\sqrt{3}\ eq\ (1)-\sqrt{2}\ eq(2),$ we get 2

$7y = 0 \Rightarrow y = 0$

putting $y = 0$ in eq. (1) we get

$x = 0$

$\therefore$ $x = 0,\ y = 0$ are the solution of given equation. 2

24. Given equation is

$$\sqrt{2}x^2+7x+5\sqrt{2}=0$$

Dividing both sides by $\sqrt{2}$, we get 2

$$x^2+\frac{7}{\sqrt{2}}x+5=0$$

or $x^2+\frac{5}{\sqrt{2}}x+\sqrt{2}x+5=0$

or $x(x+\sqrt{2})+\frac{5}{\sqrt{2}}(x+\sqrt{2})=0$ 2

or $(x+\sqrt{2})\left(x+\frac{5}{\sqrt{2}}\right)=0$

Case I

$\therefore$ $x+\sqrt{2}=0 \Rightarrow x=-\sqrt{2}$

Case II

$x + 5/\sqrt{2} = 0$

$\therefore \quad x = -\frac{5}{\sqrt{2}}$

Hence $-\sqrt{2}, -5/\sqrt{2}$ are roots of given eq.

24. 12, 16, 20, ... 96 are two digit numbers 2

Which are divisible by 4. They form an A.P. whose first term is 12 and d = common difference is 4. Suppose 96 is nth term. Then 2

$a_n = 96 = 12 + (n - 1)\ 4$

or $\quad n - 1 = \frac{84}{4} = 21$

or $\quad n = 22$

25. Same as in Set C. 4

26. Let E be the event "card drawn is queen of diamonds'. Then number of out comes favourable to the even E = 1. 1

The nubmer of possible outcomes = 52 1

$\therefore$ P(E) = $\frac{1}{52}$ 1

27. Area of triangle = $\frac{1}{2}[-1.5(-2-4) + 6\ (4-3) - 3\ (3+2)]$ 2

$= \frac{1}{2}[9 + 6 - 15) = 0$

If the area of a triangle is 0 square units, then its vertices will be collinear. 1

SECTION – D

28. Given quadratic equation is

$$2x^2 + kx + 3 = 0$$

If the roots of this equation are equal then discriment should be zero. 2½

$\therefore \quad k^2 - 4.2.3 = 0$

or $\quad k^2 = 24$

or $\quad k = \pm\ 2\sqrt{6}$ 2½

29. Take L.H.S. $= \dfrac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1}$; Dividing N and D by cos θ, we get

$$= \frac{\tan\theta - 1 + \sec\theta}{\tan\theta + 1 - \sec\theta}$$

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

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

= tan θ + sec θ = R.H.S.

OR

AB is the chimney, CD the height of the observer and $\lfloor \underline{ADE} = 45°$ angle of elevation. In triangle ADE right-angled at *E*.

Height of chimney = AB = AE + EB

= AE + DC

= AE + 1.5

($\because$ CD = 1.5 m) 2½

In ΔADE,

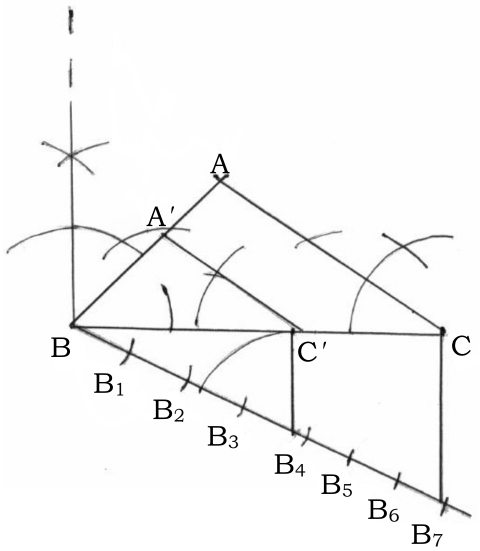
$$\tan\ 45° = \frac{AE}{DE} = \frac{AE}{CB} \Rightarrow AE = CB = 28.5\ \text{m}$$

(Given)

∴ Height of chimney = AB = 28.5 + 1.5 = 30 m

2½

30.



Construction is same as in Set C. 5

31. Volume of three sphere having radii 6 cm, 8 cm and 10 cm is

$$V = \frac{4}{3}\pi(6^3 + 8^3 + 10^3)\ \text{cm}^3$$

$$= \frac{4}{3}\pi(1728)\ \text{cm}^3$$

2½

After melting form a singel sphere whose radius is R cm and volume is V_1.

$$\therefore \quad V_1 = \frac{4}{3}\pi R^3 = V = \frac{4}{3}\pi(1728) \qquad 2\tfrac{1}{2}$$

$$\Rightarrow R^3 = 1728$$

$$\Rightarrow R = 12 \text{ cm}$$

32.

Weight (in kg)	**No. of Students *f***	***c.f.***
40-45	2	2
45-50	3	5
50-55	8	13
55-60	6	19 Median class
60-65	6	25
65-70	3	28
70-75	2	30

2½

$$\therefore \frac{N}{2} = \frac{30}{2} = 15$$

Median $= 55 + \left(\frac{15-13}{6}\right) \times 5$ 2½

$= 55 + 1.666$

$= 56.67$ kg

OR

Literacy rate (in %)	***No. of cities f_i***	***Mid value x_i =***	$u_i = \frac{x_i - 70}{10}$	$u_i f_i$
45-55	3	50	–2	–6
55-65	10	60	–1	–10
65-75	11	70	0	0
75-85	8	80	1	8
85-95	3	90	2	6
	N = 35		$\Sigma u_i = 0$	

$-2 = \Sigma u_i f_i$

$\therefore$ Mean $= 70 + \frac{-2}{35} \times 10$ 2½

$= 70 - .571$

$= 69.429$

$= 69.43\%$