CLASS : 10th (Secondary) **4253/4203**

Series : Sec-M/2019 ***SET : A, B, C & D***

Total No. of Printed Pages : **64**

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. $0.375 = \frac{375}{1000} = \frac{3 \times 5^3}{2^3 \times 5^3} = \frac{3}{8}$ 1

2. Polynomial = $x^2 + 7x + 10$

Sum of zeroes = $\frac{-7}{1} = -7$ 1

3. $x + y = 14$ ..... (i)

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

Adding (i) and (ii), we get

$2x = 18 \Rightarrow x = 9$,

from (i), y = 5

Ans. (B) 1

4. $a = 10,\ d = -3$

$T_{30} = 10 + (30 - 1)(-3)$

$= 10 - 87 = -77$

Ans. (C) 1

5. $d = 1 - 3 = -1 - 1 = -3 + 1 = -2$

$\therefore$ d = –2 1

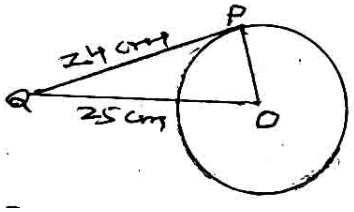
6. Similar. 1

7. $\frac{\text{Area of Ist } \Delta}{\text{Area of 2nd } \Delta} = \frac{(side\ of\ Ist\ \Delta)^2}{(side\ of\ 2nd\ \Delta)^2}$ 1

$$= \frac{(4)^2}{(9)^2} = \frac{16}{81}$$ **Ans. (A)** 1

8. In ΔDPQ,

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



$\Rightarrow OP^2 = (25)^2 - (24)^2 = 49$

$\therefore OP = 7\ cm$ **Ans. (D)** 1

9. A tangent to a circle intersects it in ***one*** point. 1

10. Let A(2, 3) and B(4, 1)

$\therefore$ AB = $\sqrt{(4-2)^2 + (1-3)^2}$

$= \sqrt{4+4} = 2\sqrt{2}$ 1

11. Mid point $\equiv \left(\frac{7-3}{2}, \frac{6-4}{2}\right)$

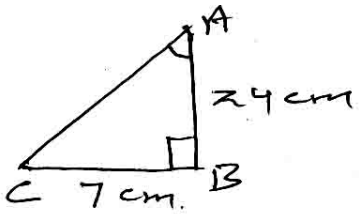
$\equiv (2,\ 1)$ 1

12. $\dfrac{\sin 18^\circ}{\cos 72^\circ} = \dfrac{\sin (90^\circ - 72^\circ)}{\cos 72^\circ}$

$= \dfrac{\cos 72^\circ}{\cos 72^\circ} = 1$ 1

13. In ΔABC,

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



$= (24)^2 + (7)^2$

$= 576 + 49 = 625$

$\therefore AC = 25$ cm

$\therefore \sin A = \dfrac{BC}{AC} = \dfrac{7}{25}$

Ans. (A) 1

14. Area fo sector = $\dfrac{\theta}{360^\circ} \times \pi r^2$

$= \frac{60}{360} \times 3.14 \times 6 \times 6$

$= 3.14 \times 6 = 18.84 \text{ cm}^2$ 1

15. Volume of cuboid = $l \times b \times h$

$= 12 \times 10 \times 8$

$= 960 \text{ m}^3$ **Ans. (B)** 1

16. $S = \{(1, 1), (1, 2), \ldots . (1,6), \ldots . , (6, 6)\}$

$A = \{(2, 6), (3, 5) , (4, 4), (5, 3), (6, 2)\}$

$\therefore P(A) = \frac{5}{36}$ 1

SECTION – B

17. Suppose, if possible $\sqrt{2}$ is rational.

$\therefore \sqrt{2} = \frac{p}{q}$, where p and q are co-prime.

Squaring, $2 = \frac{p^2}{q^2}$

$\Rightarrow p^2 = 2q^2$ ..... (i)

$\therefore$ 2 is a factor of p^2

$\Rightarrow$ 2 divides p^2

$\therefore$ 2 divides p ($\because$ p is prime) 1

$\Rightarrow p = 2m$

from (i), $4m^2 = 2q^2$

$\Rightarrow q^2 = 2m^2$

$\therefore$ 2 divides q^2

$\Rightarrow$ 2 divides q also 1

Thus 2 is a common factor of p and q, but p and q are co-prime.

$\therefore$ our supposition is wrong.

Hence $\sqrt{2}$ is an irrational. 1

18.

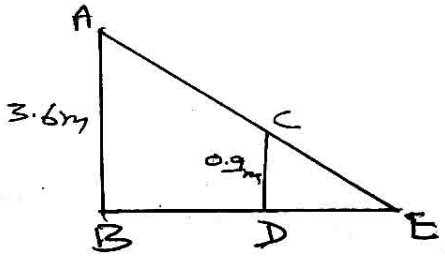
$$
\begin{array}{r}
x - 3 \\
x^2 - 2 \overline{)\, x^3 - 3x^2 + 5x - 3} \\
x^3 - 2x \\
\hline
- 3x^2 + 7x - 3 \\
\mp 3x^2 \quad \pm 6 \\
\hline
7x - 9
\end{array}
$$

1

Quotient $= x - 3$ 1

Remainder = 7x –9 1

19. Let DE = x metres



$BD = 1.2 \times 4 = 4.8\text{m}$

Δ ABE and Δ CDE are similar

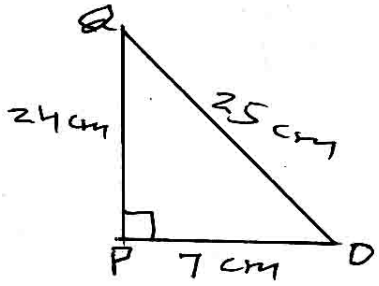
$\therefore \dfrac{BE}{DE} = \dfrac{AB}{CD}$ 1

$\Rightarrow \dfrac{4.8 + x}{x} = \dfrac{3.6}{0.9}$ 1

$\Rightarrow 4.8 + x = 4x \Rightarrow 3x = 4.8$

$\Rightarrow x = 1.6$ m 1

20. $OQ - PQ = 1$ cm



In $\Delta\ OPQ$,

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

$\Rightarrow (1 + PQ^2) = OP^2 + PQ^2$

$\Rightarrow 1 + PQ^2 + 2PQ = OP^2 + PQ^2$

$\Rightarrow 1 + 2PQ = 49$

$\Rightarrow PQ = 24$ cm $\frac{1}{2}$

$\therefore\ OQ = 1 + PQ = 1 + 24 = 25$ cm $\frac{1}{2}$

$\sin\ Q = \frac{7}{25}$ 1

$\cos\ Q = \frac{24}{25}$ 1

21. $\pi r^2 = 6.16$

$\Rightarrow r^2 = \frac{6.16}{\pi} = \frac{6.16}{22} \times 7$ 1

$= \frac{616}{100} \times \frac{7}{22} = \frac{28 \times 7}{100}$

$\Rightarrow r^2 = \frac{196}{100}$

$\therefore r = \sqrt{\frac{196}{100}} = \frac{14}{10} = 1.4$ cm 1

$\therefore$ Circumference = $2\pi r$

$$= 2 \times \frac{22}{7} \times 1.4 = 8.8 \text{ cm} \qquad 1$$

SECTION – C

22. Let $\frac{1}{x} = u$ and $\frac{1}{y} = v$

$\therefore 2u + 3v = 13$ ..... (i) 1

$5u - 4v = -2$ ..... (ii) 1

from (i) and (ii), we get

$u = 2, v = 3$ 1

$\therefore x = \frac{1}{2}, y = \frac{1}{3}$ 1

23. $5x^2 - 6x - 2 = 0$ ..... (i)

Dividing by 5, we get

$$x^2 - \frac{6}{5}x - \frac{2}{5} = 0$$

$$\Rightarrow x^2 - 2 \times x \times \frac{3}{5} = \frac{2}{5} \qquad 1$$

$$\Rightarrow x^2 - 2 \times x \times \frac{3}{5} + \left(\frac{3}{5}\right)^2 = \frac{2}{5} + \left(\frac{3}{5}\right)^2 \qquad 1$$

$$\Rightarrow \left(x - \frac{3}{5}\right)^2 = \frac{19}{25} \qquad 1$$

$\Rightarrow x - \frac{3}{5} = \pm\frac{\sqrt{19}}{5}$

$\therefore\ x = \frac{3+\sqrt{19}}{5}, \frac{3-\sqrt{19}}{5}$ 1

24. First 40 positive integers divisible by 6 are

6, 12, 18, 24, ... , 240 A. P. 1

a = 6, d = 6, n = 40 1

$\therefore\ S_{40} = \frac{40}{2}[2\times 6 + (40-1)\times 6]$ 1

$= 20[12 + 234]$

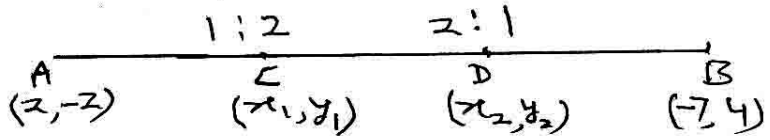
$= 20 \times 246$

$= 4920$ 1

25. Steps of construction. 2

Construction of figure. 2

26.



$x_1 = \frac{1\times(-7)+2\times 2}{1+2} = \frac{-7+4}{3} = -1$

$$y_1 = \frac{1\times 4 + 2\times(-2)}{1+2} = \frac{4-4}{3} = 0$$

$\therefore C \equiv (-1, 0)$ 2

$$x_2 = \frac{2\times(-7) + 1\times 2}{2+1} = \frac{-14+2}{3} = -4$$

$$y_2 = \frac{2\times 4 + 1\times(-2)}{2+1} = \frac{8-2}{3} = 2$$

$\therefore D \equiv (-4,\ 2)$ 2

27. (i) Required Probability = $\frac{4}{52}$

$= \frac{1}{13}$ 2

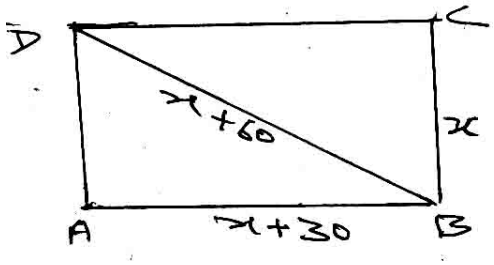
(ii) Required probability = $1 - \frac{1}{13}$

$= \frac{12}{13}$ 2

SECTION – D

28. Let shorter side = x

According to question :



$BD = x + 60$ metre and $AB = x + 30$ metre

In Rt. angle triangle,

$BD^2 = AB^2 + AD^2$ 1

$\Rightarrow (x + 60)^2 = (x + 30)^2 + x^2$

$\Rightarrow x^2 + 3600 + 120x = x^2 + 900 + 60x + x^2$

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

$\Rightarrow (x - 90)(x + 30) = 0$

$\therefore x = 90, x = -30$ (not possible) 1

$\therefore$ shorter side = 90 metre. 1

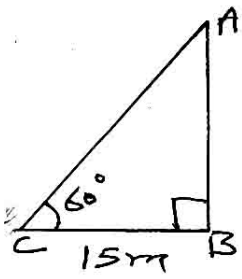
Longer side = 90 + 30 = 120 metre 1

29. Steps of construction. 2

Construction of figure. 3

30. Let BC = 15 m

$\angle ACB = 60^\circ$



1

In ΔACB,

$\tan 60^\circ = \frac{AB}{BC}$ 1

$\Rightarrow \sqrt{3} = \frac{AB}{15}$ 1

$\therefore AB = 15\sqrt{3}$ m 1

Hence height of the tower $= 15\sqrt{3}$ m 1

OR

L. H. S. = $(\text{cosec}\ \theta - \cot\theta)^2$

$= \left(\frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta}\right)^2$ 1

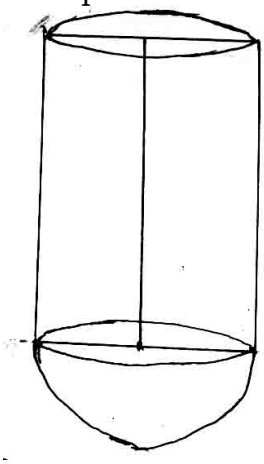
$= \left(\frac{1-\cos\theta}{\sin\theta}\right)^2$ 1

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

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

$= \frac{1-\cos\theta}{1+\cos\theta}$ = R.H.S. 1

31. Diametre of hemisphere = 14cm



1

$\therefore$ radius of hemisphere = 7cm

Total height of vessel = 13 cm

$\therefore$ height of cylinder = 13 – 7

= 6 cm 1

Surface area of vessel

$= 2\pi rh + 2\pi r^2$ 1

$= 2\pi r\,(h + r)$

$= 2 \times \frac{22}{7} \times 7\,(6 + 7)$ 1

$= 44 \times 13 = 572 \text{ cm}^2$ 1

32.

Class-Interval	**Frequency f**	**x**	**d = x – A**	**u = $\frac{x - A}{20}$**	**f. u.**
100-120	12	110	–40	–2	–24
120-140	14	130	–20	–1	–14
140-160	8	150 = A	0	0	0
160-180	6	170	20	1	6
180-200	10	190	40	2	20
Total	50				–12

3

Mean $= A + \frac{\Sigma f.u}{\Sigma f} \times h$ 1

$$= 150 + \frac{-12}{50} \times 20$$

$$= 150 - \frac{24}{5} = 150 - 4.8 = 145.2 .$$ 1

Note : May be solved by another method.

OR

Class-Interval	**Frequency**	**Cumulative Frequency**
0-100	2	2
100-200	5	7
200-300	x	$7+ x$
300-400	12	$19 + x$
400-500	17	$36 + x$
500-600	20	$56 + x$
600-700	y	$56 + x + y$
700-800	9	$65 + x + y$
800-900	7	$72 + x + y$
900-1000	4	$76 + x + y$

2

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

$$525 = 500 + \frac{50 - 36 - x}{20} \times 100$$ 1

$$525 - 500 = 5(14 - x)$$

$25 = 70 - 5x$

$5x = 45 \Rightarrow x = 9$ 1

$76 + x + y = 100$

$\Rightarrow 76 + 9 + y = 100 \Rightarrow y = 15$ 1

SET – B

SECTION – A

1. $0.104 = \frac{104}{1000} = \frac{13 \times 2^3}{125 \times 2^3} = \frac{13}{125}$ 1

2. Polynomial = $x^2 + 7x + 10$

Product of zeroes = $\frac{10}{1} = 10$ 1

3. $x - y = 3$ ..... (i)

$2x + 3y = 36$ ..... (ii)

eq. (i) Multiply by 3, we get

$3x - 3y = 9$ ..... (iii)

adding (ii) and (iii)

$5x = 45 \Rightarrow x = 9$

from (i), y = 6

Ans. (B) 1

4. $a = -3, \ d = -\frac{1}{2} + 3 = \frac{5}{2}$

$T_{11} = -3 + (11-1) \times \frac{5}{2}$

$= -3 + 25 = 22$

Ans. (C) 1

5. $d = -1 + 5 = 3 + 1 = 7 - 3 = 4$

$\therefore$ Common difference = 4 1

6. All squares are Similar. 1

7. $\frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta DEF} = \frac{(BC)^2}{(EF)^2}$

$\Rightarrow \frac{64}{121} = \left(\frac{BC}{15.4}\right)^2$

$\Rightarrow \frac{8}{11} = \frac{BC}{15.4} \Rightarrow BC = \frac{8 \times 15.4}{11}$

$\therefore BC = 11.2$ cm

$\therefore$ **Ans. (A)** 1

8. $\angle PTQ = 180^\circ - 110^\circ = 70^\circ$

Ans. (C) 1

9. A line intersecting a circle in two points is called a secant. 1

10. Let A $\equiv$ (–5, 7), B $\equiv$ (–1, 3)

$\therefore$ AB = $\sqrt{(-1+5)^2 + (3-7)^2}$

$= \sqrt{16+16} = 4\sqrt{2}$ 1

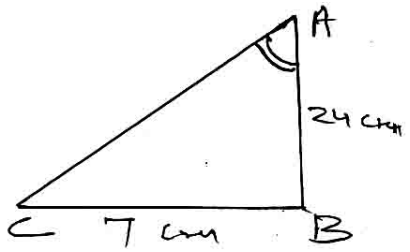
11. Mid point $= \left(\frac{3+5}{2}, \frac{4+2}{2}\right)$

$= (4,\ 3)$ 1

12. $\frac{\tan 26^\circ}{\cot 64^\circ} = \frac{\tan (90^\circ - 26^\circ)}{\cot 64^\circ}$

$= \frac{\cot 64^\circ}{\cot 64^\circ} = 1$ 1

13. In $\Delta\ ABC$



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

$= (24)^2 + (7)^2$

$= 576 + 49 = 625$

$\therefore AC = 25$ cm

$\therefore \cos A = \frac{AB}{AC} = \frac{24}{25}$

Ans. (B) 1

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

$= \frac{30}{360} \times 3.14 \times 4 \times 4$

$= 4.19 \text{ cm}^2$ (appro,) 1

15. Volume of cuboid = $l \times b \times h$

$= 10 \times 8 \times 6 \text{ m}^3$

$= 480 \text{ m}^3$ **Ans. (B)** 1

16. $S = \{(1, 1), (1, 2), \ldots, (1, 6), \ldots, (6, 6)\}$

$A = \{\}$

$\therefore P(A) = \frac{0}{36} = 0$ 1

SECTION – B

17. Suppose, if possible $\sqrt{3}$ is rational.

$\therefore \sqrt{3} = \frac{p}{q}$, where p and q are co-prime.

Squaring, we get

$$3 = \frac{p^2}{q^2}$$

$\Rightarrow p^2 = 3q^2$ ..... (i)

$\therefore$ 3 is a factor of p^2

$\Rightarrow$ 3 divides p^2

$\therefore$ 3 divides p ($\because$ p is prime) 1

$\Rightarrow p = 3m$

Now from (i),

$9m^2 = 3q^2$

$\Rightarrow q^2 = 3m^2$

$\therefore$ 3 divides $q^3 \Rightarrow$ 3 also divides q. 1

Thus 3 is a common factor of p and q but p and q are co-prime.

$\therefore$ our supposition is wrong.

Hence $\sqrt{3}$ is an irrational. 1

18.

$$x^2 - x + 1 \overline{)\, x^4 - 3x^2 + 4x + 5} \quad (x^2 + x - 3)$$

$$x^4 - x^3 \pm x^2$$

$$- \quad +$$

$$x^3 - 4x^2 + 4x + 5$$

$$x^3 - x^2 + x$$

$$- \quad + \quad -$$

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

$$-3x^2 + 3x - 3$$

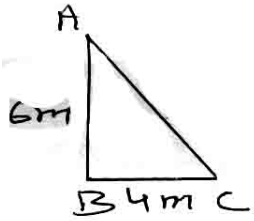
$$+ \quad - \quad +$$

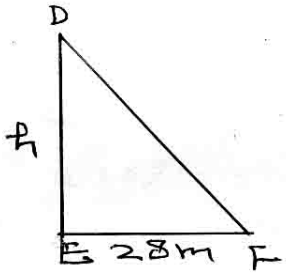
$$8$$ 1

Quotient $= x^2 + x - 3$ 1

Remainder = 8 1

19.





1

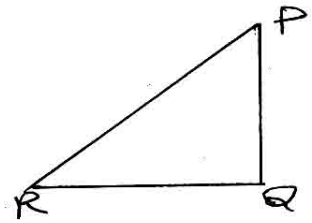
In similar ΔABC and ΔDEF

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

$\Rightarrow \frac{6}{4} = \frac{h}{28}$

$\therefore h = \frac{6 \times 28}{4} = 42$ m 1

20. PQ = 5 cm



$PR + QR = 25$ cm

In ΔPQR,

$PR^2 = QR^2 + PQ^2$

$(25 - QR)^2 = QR^2 + PQ^2$ 1

$625 + QR^2 - 50QR = OR^2 + 25$

$\Rightarrow 600 = 50QR$

$\Rightarrow QR = 12$ cm 1

$\therefore PR = 13$ cm

$\sin P = \frac{QR}{PR} = \frac{12}{13}$ 1

21. $2\pi r = 4 \times 11$

$$r = \frac{4 \times 11}{2 \times 22} \times 7 = 7\text{cm}$$ 1

$\therefore$ Area of circle $= \pi r^2$

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

$= 154 \text{ cm}^2$ 2

SECTION – C

22. Let $\frac{1}{x} = u$, $\frac{1}{y} = v$

$\frac{u}{2} + \frac{v}{3} = 2 \Rightarrow 3u + 2v = 12$ ..... (i) 1

$\frac{u}{3} + \frac{v}{2} = \frac{13}{6} \Rightarrow 2u + 3v = 13$ ..... (ii) 1

from (i) and (ii), we get

$u = 2, v = 3$ 1

$\therefore x = \frac{1}{2}, y = \frac{1}{3}$ 1

23. $4x^2 + 3x + 5 = 0$

dividing by 4, we get

$\Rightarrow x^2 + \frac{3}{4}x + \frac{5}{4} = 0$ 1

$\Rightarrow x^2 + 2 \times x \times \frac{3}{8} = -\frac{5}{4}$ 1

$\Rightarrow x^2 + 2 \times x \times \frac{3}{8} + \frac{9}{64} = \frac{9}{64} - \frac{5}{4}$

$\Rightarrow \left(x + \frac{3}{5}\right)^2 = -\frac{71}{64} < 0$ 1

$\left(x + \frac{3}{8}\right)^2$ can not be neigative

$\therefore$ equation has no real roots. 1

24. 8, 16, 24, 32, ... to 15 terms 1

a = 8, d = 8, n = 15 1

$S_{15} = \frac{15}{2}[2 \times 8 + (15-1)\,8\,]$ 1

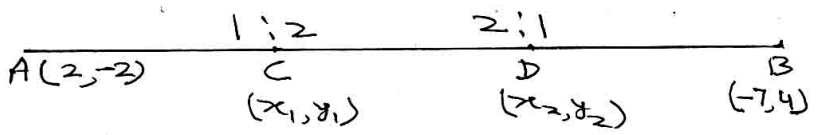
$= \frac{15}{2}[16 + 112]$

$= \frac{15}{2} \times 128 = 960$ 1

25. Steps of construction. 2

Construction of figure. 2

26.



$$x_1 = \frac{1\times(-7)+2\times 2}{1+2} = \frac{-7+4}{3} = -1$$

$$y_1 = \frac{1\times 4+2\times(-2)}{1+2} = \frac{4-4}{3} = 0$$

$\therefore C \equiv (-1, 0)$ 2

$$x_2 = \frac{2\times(-7)+1\times 2}{2+1} = \frac{-14+2}{3} = -4$$

$$y_2 = \frac{2\times 4+1\times(-2)}{2+1} = \frac{8-2}{3} = 2$$

$\therefore D \equiv (-4,\ 2)$ 2

27. 3 blue, 2 white, 4 red marbles 1

(i) $P(W) = \frac{2}{3+2+4} = \frac{2}{9}$ 1

(ii) $P(B) = \dfrac{3}{3+2+4} = \dfrac{3}{9} = \dfrac{1}{3}$ 1

(iii) $P(R) = \dfrac{4}{3+2+4} = \dfrac{4}{9}$ 1

SECTION – D

28. Let large number = x

and smaller number = y

$x^2 - y^2 = 180$ ..... (i) 1

$y^2 = 8x$ ..... (ii) 1

From (i) and (ii), we get

$x^2 - 8x = 180$ 1

$\Rightarrow x^2 - 8x - 180 = 0$

$\Rightarrow (x-18)(x+10) = 0$

$\Rightarrow x = 18$ or $x = -10$ 1

Where $x = 18$

$y^2 = 8 \times 18 = 16 \times 9$

$\Rightarrow y = 4 \times 3 = 12$

at $x = -10$, $y^2 = -80$ (Not possible)

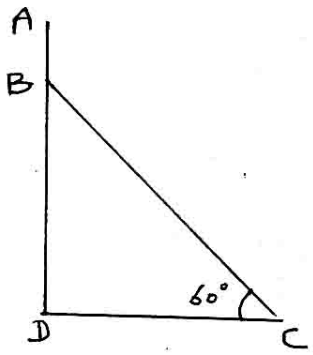
$\therefore x = 18$ and $y = 12$ 1

29. Steps of construction. 2

Construction of figure. 3

30. AD = 5 m

AB = 1.3 m



1

$\therefore$ BD = 5 – 1.3 = 3.7 m

In ΔBDC

$\frac{BD}{BC} = \sin 60^\circ$ 1

$BC = \dfrac{BD}{\sin 60^\circ}$ 1

$= \dfrac{3.7 \times 2}{\sqrt{3}}$ 1

$= \dfrac{7.4}{1.73} = \dfrac{740}{173} = 4.28$ m (approx.) 1

OR

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

$= \dfrac{\cos^2 A + (1 + \sin A)^2}{\cos A\,(1 + \sin A)}$ 1

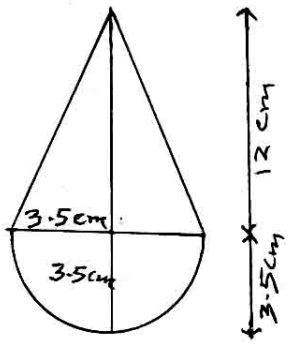
$= \dfrac{\cos^2 A + 1 + \sin^2 A + 2 \sin A}{\cos A\,(1 + \sin A)}$ 1

$= \dfrac{2 + 2 \sin A}{\cos A(1 + \sin A)}$ 1

$= \dfrac{2(1 + \sin A)}{\cos A(1 + \sin A)}$ 1

$= \dfrac{2}{\cos A} = 2 \sec A =$ R. H. S. 1

31. Base radius = 3.5cm



1

Height of cone = 15.5 – 3.5 = 12 cm

$l^2 = r^2 + h^2$

$= (3.5)^2 + (12)^2$

$= 12.25 + 144 = 156.25$

$\therefore l = \sqrt{156.25} = 12.5$ cm 1

Surface area of cone = πrl

$= \frac{22}{7} \times 3.5 \times 12.5$

$= 22 \times 0.5 \times 12.5$

$= 137.5$ cm^2 1

Surface area of hemisphere = $2\pi r^2$

$$= 2 \times \frac{22}{7} \times 3.5 \times 3.5$$

$$= 22 \times 3.5 = 77 \text{cm}^2 \quad 1$$

Total surface area = $137.5 + 77 = 214.5 \text{ cm}^2$ 1

32.

Class-Interval	**Frequency f**	**x**	**d = x – A**	**u = $\frac{x - A}{3}$**	**f. u.**
65-68	2	66.5	–9	–3	–6
68-71	4	69.5	–6	–2	–8
71-74	3	72.5	–3	–1	–3
74-77	8	75.5 = A	0	0	0
77-80	7	78.5	3	1	7
80-83	4	81.5	6	2	8
83-86	2	84.5	9	3	6
Total	30				4

3

$$\text{Mean} = A + \frac{\Sigma f.u.}{\Sigma f} \times h \quad 1$$

$$= 75.5 + \frac{4}{30} \times 3$$

$$= 75.5 + .4 = 75.9. \quad 1$$

Note : May be solved by another method.

OR

Class-Interval	Frequency	Cumulative Frequency
65-85	4	4
85-105	5	9
105-125	13	22
125-145	20	42
145-165	14	56
165-185	8	64
185-205	4	68

2

$$\text{Median} = l + \frac{\left(\frac{N}{2} - c.f.\right)}{f} \times h, \quad 1$$

$$= 125 + \frac{34 - 22}{20} \times 20 \quad 1$$

$$= 125 + 12 = 137 \quad 1$$

SET – C

SECTION – A

1. $0.15 = \frac{15}{100} = \frac{3 \times 5}{20 \times 5} = \frac{3}{20}$ 1

2. Polynomial = $x^2 - 2x - 8$

Sum of zeroes = $+\frac{2}{1} = 2$ 1

3. $\frac{3}{9} = \frac{-1}{-3} = \frac{1}{3}$

$\therefore$ Equations has infinite number of solutions.

Ans. (C) 1

4. $a = 2,\ d = 5$

$T_{10} = 2 + (10 - 1)\ .5$

$= 2 + 45 = 47$

Ans. (C) 1

5. $d = \frac{5}{3} - \frac{1}{3} = \frac{9}{3} - \frac{5}{3} = \frac{13}{3} - \frac{9}{3} = \frac{4}{3}$

$\therefore$ d $= \frac{4}{3}$ 1

6. All equilateral triangles are similar. 1

7. $\frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta DEF} = \frac{(BC)^2}{(EF)^2}$

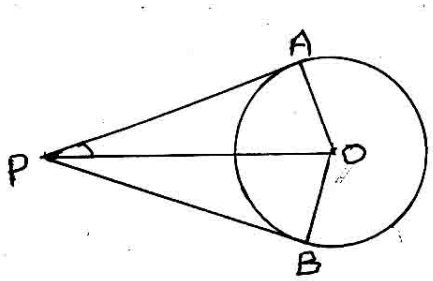
$$\Rightarrow \frac{16}{25} = \left(\frac{2.3}{EF}\right)^2$$

$$\Rightarrow \frac{4}{5} = \frac{2.3}{EF}$$

$$\Rightarrow \ EF = \frac{2.3 \times 5}{4} = \frac{11.5}{4}$$

$= 2.875$ cm **Ans. (A)** 1

8. In $\angle APB = 80^\circ$



$$\therefore \angle PDA = 90^\circ - \frac{1}{2} \angle APB$$

$= 90^\circ - 40^\circ$

$= 50^\circ$

Ans. (B) 1

9. A circle can have two parallel tangents at the most. 1

10. Let $A \equiv (4, 7), B \equiv (10, -1)$

$\therefore$ AB $= \sqrt{(10-4)^2 + -1-7)^2}$

$= \sqrt{36+64} = \sqrt{100} = 10$ 1

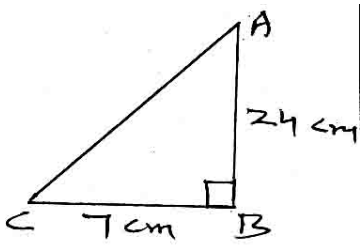
11. Mid point $= \left(\frac{4+2}{2}, \frac{7+3}{2}\right)$

$= (3,\ 5)$ 1

12. $\cos 48^\circ - \sin 42^\circ = \cos (90^\circ - 42^\circ) - \sin 42^\circ$

$= \sin 42^\circ - \sin 42^2 = 0$ 1

13. In ΔABC



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

$= (24)^2 + (7)^2$

$= 576 + 49 = 625$

$\therefore AC = 25$ cm

$\therefore \sin C = \frac{AB}{AC} = \frac{24}{25}$

Ans. (A) 1

14. Length of arc = $\frac{\theta}{360^\circ} \times 2\pi r$

$= \frac{60}{360} \times 2 \times \frac{22}{7} \times 21$

$= 22$ cm 1

15. Volume of cuboid = $l \times b \times h$

$= 10 \times 8 \times 5$ m^3

$= 400$ m^3 **Ans. (A)** 1

16. $S = \{(1, 1), (1, 2), (1, 3), \ldots\ldots, (1, 6), \ldots\ldots\ldots, (6, 6)\}$

$A = \{(1, 1), (1, 2), (1, 3), \ldots\ldots, (1, 6)\ldots., (6. 6)\} = S$

Required probability = $\frac{36}{36} = 1$ 1

SECTION – B

17. Suppose, if possible $\sqrt{5}$ is rational.

$\therefore \sqrt{5} = \frac{p}{q}$, where p and q are co-prime.

Squaring, we get

$5 = \frac{p^2}{q^2}$

$\Rightarrow p^2 = 5q^2$ ..... (i)

$\therefore$ 5 is a factor of p^2

$\Rightarrow$ 5 divides p^2

$\Rightarrow$ 5 divides p ($\because$ p is prime) 1

$\Rightarrow p = 5m$

Now, form (i),

$25m^2 = 5q^2$

$\Rightarrow q^2 = 5m^2$

$\therefore$ 5 divides $q^2 \Rightarrow 5$ also divides q 1

Thus 5 is a common factor of p and q.

But p and q are Co-prime.

$\therefore$ our supposition is wrong.

Hence $\sqrt{5}$ is an irrational. 1

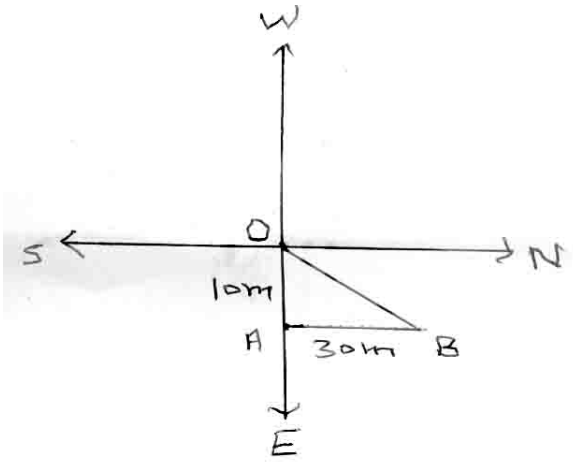
18.

$$
\begin{array}{r}
x^2+2 \\
x^2-2\overline{)x^4-5x+6} \\
x^4-2x^2 \\
\hline
2x^2-5x+6 \\
2x^2-4 \\
\hline
-5x+10
\end{array}
$$

Quotient $= x^2 + 2$ 1

Remainder = –5x + 10 1

19. Let OA = 10 m



2

AB = 30 m

In Δ OAB,

$OB^2 = OA^2 + AB^2$

$\Rightarrow OB^2 = 10^2 + 30^2$

$= 100 + 900$

$= 1000$

$\therefore OB = \sqrt{1000} = 10\sqrt{10}$ m 1

20. $\sin(A-B)=\frac{1}{2}\Rightarrow A-B=30^\circ$ ..... (i) 1

$\cos(A+B)=\frac{1}{2}\Rightarrow A+B=60^\circ$ ..... (ii) 1

from (i) and (ii), we get

$A=45^\circ,\ B=15^\circ$ 1

21. Perimeter of semi-circular piece

$=\pi r+2r$ 1

$\therefore 72=(\pi+2)\,r$

$\Rightarrow 72=\left(\frac{22}{2}+2\right)r\Rightarrow r=14$ cm 1

Area of semi-ciruclar piece = $\frac{1}{2}\pi r^2$

Area $=\frac{1}{2}\times\frac{22}{7}\times14\times14$

$=308\ \text{cm}^2$ 1

SECTION – C

22. Let $\frac{1}{x}=$ u and $\frac{1}{y}=v$, we get

$\frac{1}{2}u-v=-1\ \Rightarrow\ u-2v=-2$ ..... (i) 1

$u + \frac{1}{2}v = 8 \Rightarrow 2u + v = 16$ ..... (ii) 1

from (i) and (ii), we get

$u = 6, v = 4$ 1

$\therefore x = \frac{1}{6}, y = \frac{1}{4}$ 1

23. $2x^2 - 7x + 3 = 0$

dividing by 2, we get

$x^2 - \frac{7}{2}x + \frac{3}{2} = 0$

$\Rightarrow x^2 - \frac{7}{2}x = -\frac{3}{2}$

$\Rightarrow x^2 - 2 \times x \times \frac{7}{4} + \frac{49}{16} = \frac{49}{16} - \frac{3}{2}$ 1

$\Rightarrow \left(x - \frac{7}{4}\right)^2 = \frac{25}{16}$ 1

$\Rightarrow x - \frac{7}{4} = \pm\frac{5}{4}$ 1

$\Rightarrow x = \frac{7}{4} \pm \frac{5}{4}$

$\therefore x = 3, \frac{1}{2}$ 1

24. 1, 3, 5, 7, ... , 49 A. P.

a = 1, d = 2. $T_n = 49$ 1

$T_n = a + (n-1)\,d$

$\Rightarrow$ 49 = 1 + (n – 1) . 2 1

$\Rightarrow$ 48 = 2x –2

$\Rightarrow x = 25$ 1

$S_{25} = \frac{25}{2}[2 \times 1 + (25-1) . 2\ ]$ 1

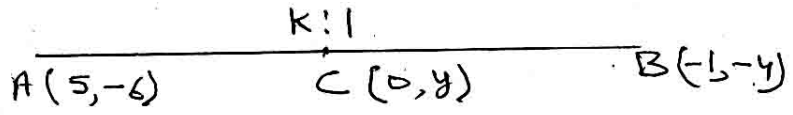
$= \frac{25}{2}[2 + 48]$

$= 25 \times 25 = 625$ 1

25. Steps of construction. 2

Construction of figure. 2

26.



Let Point C intersect line AB in the Ratio K : 1 and at Y – axis

$\therefore$ at y-axis, $x = 0$ 1

$$\therefore 0 = \frac{k(-1) + 1 \times 5}{k + 1}$$

$\Rightarrow k = 5$ 1

Now $y = \frac{k(-4) + 1 \times (-6)}{k + 1} = \frac{-20 - 6}{6} = \frac{-26}{6}$

Ratio $k : 1 \equiv 5 : 1 \ = -\frac{13}{3}$ 1

and point $C\,(0, y) \equiv \left(0, -\frac{13}{3}\right)$. 1

27. $S = \{1, 2, 3, 4, 5, 6\}$ 1

(i) $A = \{2, 3, 5\}$

$P(A) = \frac{3}{6} = \frac{1}{2}$ 1

(ii) B = {3, 4, 5}

$P(B)\,\frac{3}{6} = \frac{1}{2}$ 1

(iii) $C = \{1, 3, 5\}$

$$P(C) = \frac{3}{6} = \frac{1}{2}$$ 1

SECTION – D

28. Distance covered by train = 360 km

Let uniform speed= u *km/h* 1

$\therefore$ Time covered by train $= \frac{360}{u} h$ 1

According to question,

$$\frac{360}{u+5} = \frac{360}{u} - 1$$ 1

$\Rightarrow u^2 + 5u - 1800 = 0$

$\Rightarrow (u - 40)(u + 45) = 0$ 1

$\therefore u = 40$ or $u = -45$

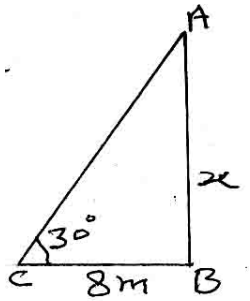
$\Rightarrow$ u = 40 km/h 1

($\because$ u = –45 not possible)

29. Steps of construction. 2

Construction of figure. 3

30. Let height of tree = h metre and tree broken above the height = x metre



$AB + AC = h$

$AB = x$

$\therefore AC = h - x$ 1

In ΔABC, $\frac{x}{8} = \tan 30^\circ$ 1

$\Rightarrow \frac{x}{8} = \frac{1}{\sqrt{3}}$

$\Rightarrow x = \frac{8}{\sqrt{3}} m$ 1

and $\frac{AC}{8} = \sec 30^\circ$

$\therefore$ AC = $8 \times \frac{2}{\sqrt{3}}$ 1

$\Rightarrow h - x = \frac{16}{\sqrt{3}}$

$\Rightarrow h = \frac{16}{\sqrt{3}} + x = \frac{16}{\sqrt{3}} + \frac{8}{\sqrt{3}} = \frac{24}{\sqrt{3}} = 8\sqrt{3}$ m 1

OR

L. H. S. $= \frac{\cot A - \cos A}{\cot A + \cos A}$

$= \frac{\frac{\cos A}{\sin A} - \cos A}{\frac{\cos A}{\sin A} + \cos A}$ 1

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

$= \frac{\frac{1}{\sin A} - 1}{\frac{1}{\sin A} + 1}$ 1

$= \frac{\text{cosec } A - 1}{\text{cosec } A + 1}$ = R. H. S. 2

31. Side of a cube = 7 cm

$\therefore$ Diameter of a hermisphere = 7cm

and radius of hemisphere = $\frac{7}{2}$ = 3.5 cm 1

Surface area of cube $= 6l^2$

$= 6 \times 7 \times 7 = 294 \text{ cm}^2$ 1

Surface area of hemisphere $= 2\pi r^2$

$= 2 \times \frac{22}{7} \times 3.5 \times 3.5 = 74.93 \text{ cm}^2$ 1

Surface area of base of hemisphere $= \pi r^2$

$= \frac{22}{7} \times 3.5 \times 3.5 = 38.5 \text{ cm}^2$ 1

Required area of solid $= 6l^2 + 2\pi r^2 - \pi r^2$

$= 6l^2 + \pi r^2$

$= 6 \times 7 \times 7 + \frac{22}{7} \times 3.5 \times 3.5$

$= 294 + 38.5$

$= 332.5 \text{ cm}^2$ 1

32.

Class-Interval	**Frequency f**	**x**	**d = x – A**	**u = $\frac{x - A}{3}$**	**f. u.**
50-52	15	51	–6	–2	–30
53-55	110	54	–3	–1	–110
56-58	135	57 = A	0	0	0
59-61	115	60	3	1	115
62-64	25	63	6	2	50
Total	400				25

3

$$\text{Mean} = A + \frac{\Sigma f.u}{\Sigma f} \times h$$ 1

$$= 57 + \frac{25}{400} \times 3$$

$$= 57 + 0.19 = 57.19\,.$$ 1

Note : May be solved by another method.

OR

Class-Interval	**Frequency**	**Cumulative Frequency**
0-10	5	5
10-20	x	$5 + x$
20-30	20	$25 + x$
30-40	15	$40 + x$
40-50	y	$40 + x + y$
50–60	5	$45 + x + y$
Total	60	

2

$\text{Median} = 28.5\,,$

$x + y + 45 = 60 \Rightarrow x + y = 15$ ..... (i) 1

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

$$28.5 = 20 + \frac{30 - (5 + x)}{20} \times 10$$

$8.5 = \frac{25 - x}{2}$ 1

$25 - x = 17$

$x = 8$

$x + y = 15 \Rightarrow y = 7$ 1

SET – D

SECTION – A

1. $15.75 = \frac{1575}{100} = \frac{5^2 \times 63}{5^2 \times 4} = \frac{63}{4}$ 1

2. Polynomial = $x^2 - 2x - 8$

Product of zeroes = $\frac{-8}{1} = -8$ 1

3. $2x - y = 3$ ..... (i)

$4x + y = 3$ ..... (ii)

from (i) and (ii), we get

$6x = 6$ adding

$\Rightarrow x = 1$

from (i), we get $y = -1$

Ans. (A) 1

4. $a = -0.1,\ d = -0.1$

$T_{10} = -0.1 + (10 - 1) \cdot (-0.1)$

$= -0.1 - 0.9 = -1.0$

Ans. (C) 1

5. $d = 1.7 - 0.6 = 2.8 - 1.7 = 3.9 - 2.8 = 1.1$

$\therefore$ d = 1.1 1

6. Two polygons of same number of sides are similar, if their corresponding angles are equal. 1

7. $\frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta DEF} = \frac{(AC)^2}{(DF)^2}$

$= \frac{(19)^2}{(8)^2} = \frac{361}{64}$ **Ans. (B)** 1

8. $\angle QOR = 180° - 46° = 134°$

Ans. (D) 1

9. The common point of a tangent to a circle and the circle is called point of contact. 1

10. Let A $\equiv$ (–1, –4) and B $\equiv$ (3, 5)

$\therefore$ AB = $\sqrt{(3+1)^2 + (5+4)^2}$

$= \sqrt{16+81} = \sqrt{97}$ 1

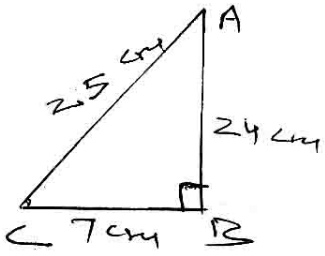
11. Mid point $= \left(\frac{3+7}{2}, \frac{-4+10}{2}\right)$

$= (5, 3)$ 1

12. $\text{cosec } 31^\circ - \sec 59^\circ = \text{cosec } (90^\circ - 59^\circ) - \sec 59^\circ$

$= \sec 59^\circ - \sec 59^\circ = 0$ 1

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



$= (24)^2 + (7)^2$

$= 576 + 49 = 625$

$\therefore AC = 25$

$\therefore \cos C = \frac{BC}{AC} = \frac{7}{25}$

Ans. (A) 1

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

$= \frac{60}{360} \times \frac{22}{7} \times 21 \times 21$

$= 231 \text{ cm}^2$ 1

15. Valume of cuboid = $l \times b \times h$

$= 13 \times 10 \times 8 \text{ m}^3$

$= 1040 \text{ m}^3$ **Ans. (A)** 1

16. $S = \{(1, 1), (1, 2), (1, 3), \ldots, (1, 6), \ldots\ldots, (6, 6)\}$

$A = \{(4, 6), (5, 5), (6, 4)\}$

$\therefore P(A) = \frac{3}{36} = \frac{1}{12}$ 1

SECTION – B

17. Suppose, if possible $3\sqrt{2}$ is rational.

$\therefore 3\sqrt{2} = \frac{p}{q}$, where p and q are co-prime integers. 1

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

3, p and q are integers,

$\therefore \frac{p}{3q}$ is rational

but it is contradiction ($\because \sqrt{2}$ is irrational)

$\therefore$ our supposition is wrong

Hence $3\sqrt{2}$ is an irrational 1

18.

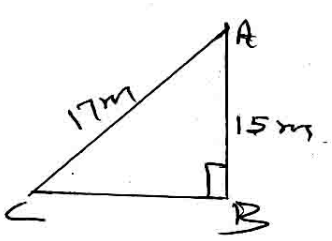
$$
\begin{array}{r}
3x - 5 \\
x^2 + 2x + 1 \overline{)\,3x^3 + x^2 + 2x + 5} \\
3x^3 + 6x^2 + 3x \\
- \quad - \quad - \\
\hline
-5x^2 - x + 5 \\
-5x^2 - 10x - 5 \\
+ \quad + \quad + \\
\hline
9x + 10
\end{array}
$$

1

Quotient $= 3x - 5$ 1

Remainder $= 9x + 10$ 1

19. Ladder = AC = 17m



height of window = AB = 15m

In $\Delta\, ABC$

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

$(17)^2 = (15)^2 + BC^2$ 1

$\Rightarrow\ BC^2 = 289 - 225 = 64$ 1

$\therefore\ BC = 8m$

Distance of the foot of ladder from the building

= 8m 1

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

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

from (i) and (ii), we get

$A = 45^\circ$ and $B = 15^\circ$ 1

21. Circumference = diameter + 33.6

$2\pi r = 2r + 33.6$ 1

$\Rightarrow 2 \times \frac{22}{7} r - 2r = 33.6$

$\Rightarrow 44r - 14r = 235.2$

$\Rightarrow 30r = 235.2$

$\therefore$ r = 7.84 cm 1

Hence area of circle $= \pi r^2$

$= \frac{22}{7} \times 7.84 \times 7.84$

$= 193.18 \text{ cm}^2$ 1

SECTION – C

22. Let $\frac{1}{x} = u$, $\frac{1}{y} = v$

$\therefore 5u - 4v = -2$ ..... (i) 1

$2u + 3v = 13$ ..... (ii) 1

from (i) and (ii), we get

$u = 2, v = 3$ 1

$\therefore x = \frac{1}{2}, y = \frac{1}{3}$ 1

23. $2x^2 + x - 4 = 0$

dividing by 2, we get

$x^2 + \frac{1}{2}x - 2 = 0$

$\Rightarrow x^2 + 2 \times x \times \frac{1}{4} = 2$ 1

$\Rightarrow x^2 + 2 \times x \times \frac{1}{4} + \frac{1}{16} = \frac{1}{16} \times 2$ 1

$\Rightarrow \left(x + \frac{1}{4}\right)^2 = \frac{33}{16}$ 1

$\Rightarrow x + \frac{1}{4} = \pm \frac{\sqrt{33}}{4}$

$\therefore\ x = -\frac{1}{4} \pm \frac{\sqrt{33}}{4} = \frac{-1 \pm \sqrt{33}}{4}$ 1

24. 1 + 2 +3 + 4 + ... + 1000 A. P. 1

a = 1, d = 2–1 = 1, x = 1000 1

$S_{100} = \frac{1000}{2}[2 \times 1 + (1000 - 1) \times 1]$ 1

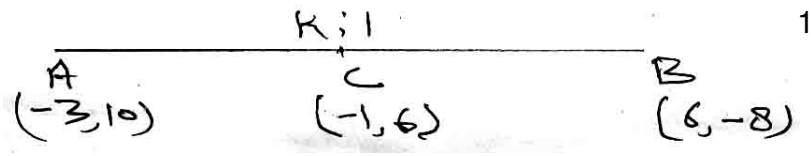
$= 500\,[2 + 999]$

$= 500 \times 1001 = 500500$ 1

25. Steps of construction. 2

Construction of figure. 2

26.



1

Let Ratio is k : 1

$$-1 = \frac{6k-3}{k+1} \Rightarrow -k-1 = 6k-3$$ 1

$$\Rightarrow 7k = 2$$

$$\Rightarrow k = \frac{2}{7}$$ 1

$\therefore$ Ratio is 2 : 7 1

27. (i) Probability (king of Red Colour) = $\frac{2}{52}$

$$= \frac{1}{26}$$ 2

(ii) Probability (a face card) $= \frac{12}{52} = \frac{3}{13}$ 2

SECTION – D

28. Let x, $x + 2$ be two +ve odd integers

According to question :

$x^2 + (x+2)^2 = 290$ 1

$\Rightarrow 2x^2 + 4x - 286 = 0$

$\Rightarrow x^2 + 2x - 143 = 0$ 1

$\therefore x = \dfrac{-2 \pm \sqrt{4 + 4 \times 1 \times 143}}{2}$ 1

$= \dfrac{-2 \pm \sqrt{4 + 572}}{2} = \dfrac{-2 \pm \sqrt{576}}{2}$ 1

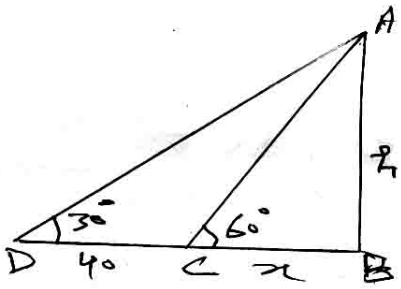
$= \dfrac{-2 \pm 24}{2} = -1 \pm 12$

$\therefore x = 11$ or $x = -13$ 1

29. Steps of construction. 2

Construction of figure. 3

30. Let $BC = h$ meter height of tower



1

and $BC = x$ metre

$CD = 40$ m

$\therefore BD = (40 + x)\ m$

In ΔABC,

$$\tan 60^\circ = \frac{h}{x}$$

$$\Rightarrow h = x\sqrt{3} \quad \ldots\ldots\ldots\ldots \text{(i)}$$ 1

In ΔABD

$$\tan 30^\circ = \frac{h}{40 + x}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{40 + x} \quad \ldots\ldots\ldots\ldots \text{(ii)}$$ 1

from (i) and (ii), we get

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

$\Rightarrow 3x = 40 + x \Rightarrow x = 20\ m$ 1

Now from (i), we get

h = $20\sqrt{3}$ m

$\therefore$ height of tower = $20\sqrt{3}\ m$ 1

OR

L. H. S. = $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1}$,

dividing numerator and denominator by cos θ

$\therefore$ L. H. S. = $\frac{\tan\theta - 1 + \sec\theta}{\tan\theta + 1 - \sec\theta}$ 1

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

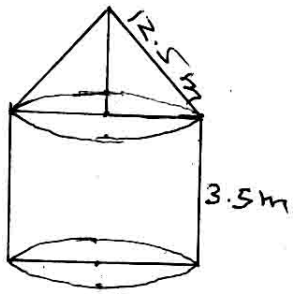
$= \frac{(\tan^2\theta - \sec^2\theta) - (\tan\theta - \sec\theta)}{(\tan\theta - \sec\theta + 1)(\tan\theta - \sec\theta)}$ 1

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

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

$= \frac{1}{\sec\theta - \tan\theta}$ = R. H. S. 1

31. Base radius of cylinder = 12m



Height of cylinder = 3.5 m

Volume of cylinder = $\pi r^2 h$

$= \frac{22}{7} \times 12 \times 12 \times 3.5$

$= 1584 \text{ m}^3$

In a cone, $l^2 = r^2 + h^2$ 1

$\Rightarrow h^2 = l^2 - r^2$

$= (12.5)^2 - (12)^2$

$= 156.25 - 144 = 12.25$ 1

$\therefore h = \sqrt{12.25} = 3.5m$

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

$= \frac{1}{3} \times \frac{22}{7} \times 12 \times 12 \times 3.5 = 528 \text{m}^3$ 1

$\therefore$ Total capacity of building = Volume of cylinder

+ Volume of cone 1

$= 1584 + 528 = 211\,2\ m^3$ 1

32.

Class-Interval	**Frequency f**	**x**	**d = x – A**	**u = $\frac{x - A}{50}$**	**f. u.**
100-150	4	125	–100	–2	–8
150-200	5	175	–50	–1	–5
200-250	12	225 = A	0	0	0
250-300	2	275	50	1	2
300-350	2	325	100	2	4
Total	25				–7

3

Mean $= A + \frac{\Sigma f.u.}{\Sigma f} \times h$ 1

$= 225 - \frac{7}{25} \times 50 = 225 - 14 = 211$ 1

Note : May be solved by another method.

OR

Class-Interval	Frequency	Cumulative Frequency
40-45	2	2
45-50	3	5
50-55	8	13
55-60	6	19
60-65	6	25
65-70	3	28
70-75	2	30
Total	30	

3

$$\text{Median} = l + \frac{\frac{N}{2} - C}{f} \times h, \quad 1$$

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

$$= 55 + \frac{1}{3} \times 5$$

$$= 55 + 1.7 = 56.7 \text{ (Approx.)} \quad 1$$