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Secondary School Certificate Examination

July 2017

Marking Scheme — Mathematics 30/1, 30/2, 30/3 [Outside Delhi]

General Instructions:

1. The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the Marking Scheme are suggested answers. The content is thus indicative. If a student has given any other answer which is different from the one given in the Marking Scheme, but conveys the meaning, such answers should be given full weightage

2. Evaluation is to be done as per instructions provided in the marking scheme. It should not be done according to one's own interpretation or any other consideration — Marking Scheme should be strictly adhered to and religiously followed.

3. Alternative methods are accepted. Proportional marks are to be awarded.

4. If a candidate has attempted an extra question, marks obtained in the question attempted first should be retained and the other answer should be scored out.

5. A full scale of marks - 0 to 90 has to be used. Please do not hesitate to award full marks if the answer deserves it.

6. Separate Marking Scheme for all the three sets has been given.

7. As per orders of the Hon'ble Supreme Court. The candidates would now be permitted to obtain photocopy of the Answer book on request on payment of the prescribed fee. All examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

QUESTION PAPER CODE 30/1

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. $\tan\theta = \frac{30}{10\sqrt{3}} = \sqrt{3}$, $\therefore\ \theta = 60°$ — $\frac{1}{2}+\frac{1}{2}$

2. $-1 + (n-1)5 = 129$, $\therefore\ n = 27$ — $\frac{1}{2}+\frac{1}{2}$

3. $\angle OPQ = \angle OQP = 55°$ $\therefore\ \angle TPQ = 35°$ — $\frac{1}{2}+\frac{1}{2}$

4. Total number of outcomes = 8, P(2 heads) = $\frac{3}{8}$ — $\frac{1}{2}+\frac{1}{2}$

SECTION B

5. For equal roots, $k^2 - 4(2)(8) = 0$ — 1

$k^2 = 64 \Rightarrow k = \pm 8$ — 1

6. $a + 2d = 5$ and $a + 6d = 9$ — 1

Solving to get $a = 3, d = 1$ $\therefore$ AP is 3, 4, 5, 6,... — 1

7. $OK = OL \Rightarrow \angle OKL = \angle OLK = 30°$ — 1

$\angle OKP = 90°$ $\therefore\ \angle PKL = 90° - 30° = 60°$ — 1

8. Let P(x, y), A(a + b, b – a) and B(a – b, a + b) be the given points

$PA^2 = PB^2 \Rightarrow [x-(a+b)]^2 + [y-(b-a)]^2 = [x-(a-b)]^2 + [y-(a+b)]^2$ — 1

Solving to get $bx = ay$ — 1

9. Here, BP = BQ = 8 cm, AP = AR = 6 cm, Let CQ = CR = x cm.

Perimeter of $\Delta ABC = (28 + 2x)$ cm — $\frac{1}{2}$

$\therefore$ area $\Delta ABC = \frac{1}{2}(28+2x)(4) = 84\ cm^2$

$\Rightarrow \quad x = 7$ 1

$\therefore \quad AC = 6 + 7 = 13$ cm and $BC = 8 + 7 = 15$ cm $\frac{1}{2}$

10.

P(x, y) divides AB in the ratio 1 : 2 1

$\therefore \quad x = \frac{1(5)+2(2)}{1+2} = 3,\ y = \frac{1(-8)+2(1)}{1+2} = -2$ 1

$\therefore$ Coordinates of P are (3, –2)

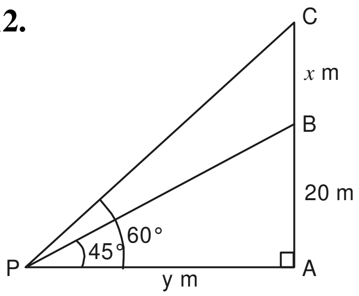
SECTION C

11. 63, 65, 67, ... $\Rightarrow a_n = 63 + (n-1)2$ 1

3, 10, 17, ... $\Rightarrow a_n = 3 + (n-1)7$ $\frac{1}{2}$

$63 + (n-1)2 = 3 + (n-1)7 \Rightarrow n = 13.$ $\frac{1}{2}+1$

12.



For Correct figure: $\frac{1}{2}$

Let AP = ym and BC = xm

$\therefore \quad \frac{20}{y} = \tan 45° = 1 \Rightarrow y = 20$ m. $\frac{1}{2}+\frac{1}{2}$

$\frac{x+20}{y} = \tan 60°$ $\frac{1}{2}$

$\frac{x+20}{20} = \sqrt{3} \quad \Rightarrow \quad x = 20(\sqrt{3}-1)$ m $\frac{1}{2}+\frac{1}{2}$

or 14.64 m

13. Surface area of remaining solid

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

$= \pi[2 \times 6 \times 8 + (6)^2 + 6 \times \sqrt{6^2 + 8^2}\,]\,\text{cm}^2$ 1

$= 3.14\ [96 + 36 + 60]\ \text{cm}^2$

$= 3.14 \times 192 = 602.88\ \text{cm}^2$ 1

14. Let a be the side of triangle, then $\frac{\sqrt{3}a^2}{4} = 121\sqrt{3} \Rightarrow a = 22\ \text{cm}$ $\frac{1}{2}$

$\therefore$ Length of wire = 66 cm. $\frac{1}{2}$

$\Rightarrow 2 \times \frac{22}{7} \times r = 66 \Rightarrow r = \frac{21}{2}\ \text{cm}$ 1

$\therefore$ Area of enclosed circle = $\frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} = 346.5\ \text{cm}^2$ 1

15. Let the vertices of given triangle be A(0, –1), B(2, 1) and C(0, 3)

Coordinates of mid-points are P(1, 0), Q(1, 2) and R(0, 1) $1\frac{1}{2}$

$\therefore$ area $\Delta PQR = \frac{1}{2}[1(2-1) + 1(1-0) + 0(0-2)] = 1\ \text{sq. units}.$ $1\frac{1}{2}$

16. Total number of pens = 144, Number of defective pens = 20

(i) P(customer will buy) = P(Pen is good) = $\frac{124}{144}$ or $\frac{31}{36}$ $1\frac{1}{2}$

(ii) P(customer will not buy) = $\frac{20}{144}$ or $\frac{5}{36}$ $1\frac{1}{2}$

17. Speed = 10 km/h $\therefore$ length in 30 minutes = 5000 m. $\frac{1}{2}$

$\therefore$ Volume of water in 30 minutes = $6 \times 1.5 \times 5000\ \text{m}^3$. 1

Area, that will be irrigated = $\frac{6 \times 1.5 \times 5000}{.08}\ \text{m}^2$ 1

$= 562500\ \text{m}^2$ $\frac{1}{2}$

18. Given AB = BC = 7 cm, DE = 4 cm, BF = 3.5 cm

Area of trapezium ABCD = $\frac{1}{2}[7+11]\times 3.5 = 31.5\text{ cm}^2$ 1

Area of the sector BGEC = $\frac{22}{7}\times 7\times 7\times\frac{30}{360}=\frac{77}{6}=12.83\text{ cm}^2$ 1

∴ Area of shaded region = 31.50 – 12.83 = 18.67 cm^2 1

19. $\sqrt{2}x^2+7x+5\sqrt{2} = 0 \Rightarrow \sqrt{2}x^2+2x+5x+5\sqrt{2} = 0$ 1

$\sqrt{2}x\,(x+\sqrt{2})+5(x+\sqrt{2}) = 0 \Rightarrow (\sqrt{2}\,x+5)(x+\sqrt{2}) = 0$ 1

$\Rightarrow$ $x = -\sqrt{2},\ = \frac{-5}{\sqrt{2}}$ or $\frac{-5\sqrt{2}}{2}$ 1

20. Here r = 7m, h = 24m ∴ l = $\sqrt{7^2+24^2} = 25$ m $\frac{1}{2}$

Canvas required for 10 tents = $10\times\frac{22}{7}\times 7\times 25 = 5500\text{ m}^2$ $1\frac{1}{2}$

cost of cloth = $\frac{5500}{2}\times 40 =$ ₹110000 1

∴ Rampal helped the centre by ₹ 110000

SECTION D

21. Given equation can be written as $\frac{3x-5}{x^2-3x+2} = \frac{6}{x}$ $1\frac{1}{2}$

$\Rightarrow$ $6x^2 - 18x + 12 = 3x^2 - 5x$ or $3x^2 - 13x + 12 = 0$ 1

$\Rightarrow$ $(x-3)(3x-4) = 0$ 1

∴ $x = 3,\ x = \frac{4}{3}$ $\frac{1}{2}$

22. Let B takes x days to finish the work, then A takes (x – 5) days to finish $\frac{1}{2}$

∴ $\frac{1}{x}+\frac{1}{x-5} = \frac{1}{6}$ $1\frac{1}{2}$

$\Rightarrow \quad 6(2x - 5) = x^2 - 5x$ or $x^2 - 17x + 30 = 0$ $\frac{1}{2}$

$\Rightarrow \quad (x - 15)(x - 2) = 0 \therefore x = 15$ or $x = 2$. 1

$x \neq 2$ as $x > 5 \therefore x = 15$

So, B can finish the work in 15 days. $\frac{1}{2}$

23. $a_n = 3 + 2n \Rightarrow a = 5, d = a_2 - a = 7 - 5 = 2$. 1+1

$S_{24} = \frac{24}{2}[10 + 23 \times 2]$ 1

$= 12 \times 56 = 672$ 1

24. For correct given, To prove, Construction and figure $4 \times \frac{1}{2} = 2$

Correct proof 2

25. Constructing ΔABC $1\frac{1}{2}$

Constructing a triangle similar to ΔABC $2\frac{1}{2}$

26. ΔTPQ is isosecles and TO is angle bisector of $\angle PTQ$

$\therefore \quad OT \perp PQ$, so OT bisects PQ, $\therefore PR = RQ = 4$ cm $\frac{1}{2}$

Also, $OR = \sqrt{OP^2 - PR^2} = \sqrt{5^2 - 4^2} = 3$ cm $\frac{1}{2}$

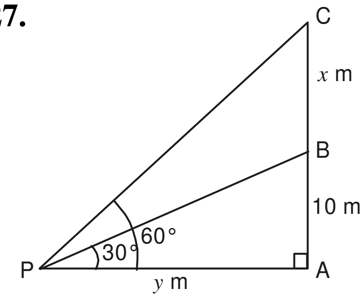
Let $TP = x$ and $TR = y$, then $x^2 = y^2 + 16$ ...(i) 1

Alsoin ΔOPT, $x^2 + (5)^2 = (y + 3)^2$ ...(ii) 1

Solving (i) and (ii) to get $y = \frac{16}{3}$ and $x = \frac{20}{3}$ 1

$\therefore \quad TP = \frac{20}{3}$ cm

27. Correct Figure 1



In ΔABP, $\frac{10}{y} = \tan 30° = \frac{1}{\sqrt{3}}$

$\Rightarrow$ $y = 10\sqrt{3}$ m 1

In ΔACP, $\frac{x+10}{10\sqrt{3}} = \tan 60° = \sqrt{3}$ 1

$\Rightarrow$ $x + 10 = 30$ m $\Rightarrow x = 20$ m

Height above the ground = 20 + 10 = 30 m. 1

28. Number of cards removed = 8

Number of remaining cards = 52 – 8 = 44 1

P(black queen) = 0 $\frac{1}{2}$

P(a red card) = $\frac{22}{44} = \frac{1}{2}$ $\frac{1}{2}$

P(a jack of black colour) = $\frac{2}{44}$ or $\frac{1}{22}$ 1

P(a face card) = $\frac{6}{44}$ or $\frac{3}{22}$ 1

29. $PA^2 = PB^2 \Rightarrow (x-3)^2 + (5-4)^2 = (x-5)^2 + (5+2)^2$ 1

Solving to get $x = 16$. 1

$\therefore$ Area ΔPAB = $\frac{1}{2}[16(4+2) + 3(-2-5) + 5(5-4)]$ 1

$= \frac{1}{2}[96 - 21 + 5] = 40$ sq.units 1

30. Volume of cylinder = $\pi \cdot (6)^2 \cdot (15)$ cm^3. 1

Volume of one conical toy = $\frac{1}{3}\pi(3)^2 \cdot 9$ cm^3 1

Let n. be the number of toys formed

$\Rightarrow \; n \cdot \frac{1}{3}\pi \cdot (3)^2 \cdot 9 \; = \pi(6)^2(15)$ 1

$\Rightarrow \quad n = 20.$ 1

31. $h = 42$ cm, $r_1 = 30$ cm, $r_2 = 10$ cm.

$\therefore \quad$ Capacity of bucket $= \frac{1}{3} \times \frac{22}{7} \times 42 \times [900 + 100 + 300]\ \text{cm}^3$ $1\frac{1}{2}$

$= 57200\ \text{cm}^3 = 57.2$ litres $\frac{1}{2}$

Selling price $= 57.5 \times 40 =$ ₹ 2288 1

Any relevant value 1

30/2

SECTION A

1. Total number of outcomes = 8, P(2 heads) = $\frac{3}{8}$ $\frac{1}{2}+\frac{1}{2}$

2. $-1 + (n-1)5 = 129, \quad \therefore n = 27$ $\frac{1}{2}+\frac{1}{2}$

3. $\tan\theta = \frac{30}{10\sqrt{3}} = \sqrt{3}, \quad \therefore \theta = 60°$ $\frac{1}{2}+\frac{1}{2}$

4. $\angle OPQ = \angle OQP = 55° \quad \therefore \angle TPQ = 35°$ $\frac{1}{2}+\frac{1}{2}$

SECTION B

5. $OK = OL \Rightarrow \angle OKL = \angle OLK = 30°$ 1

$\angle OKP = 90° \therefore \angle PKL = 90° - 30° = 60°$ 1

6. Let P(x, y), A(a + b, b – a) and B(a – b, a + b) be the given points

$PA^2 = PB^2 \Rightarrow [x-(a+b)]^2 + [y-(b-a)]^2 = [x-(a-b)]^2 + [y-(a+b)]^2$ 1

Solving to get bx = ay 1

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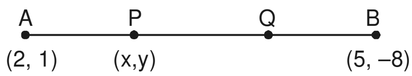

P(x, y) divides AB in the ratio 1 : 2 1

$\therefore \quad x = \frac{1(5)+2(2)}{1+2} = 3, \; y = \frac{1(-8)+2(1)}{1+2} = -2$ 1

$\therefore$ Coordinates of P are (3, –2)

8. Here, BP = BQ = 8 cm, AP = AR = 6 cm, Let CQ = CR = x cm.

Perimeter of $\Delta ABC = (28 + 2x)$ cm $\frac{1}{2}$

$\therefore \quad \text{area } \Delta ABC = \frac{1}{2}(28+2x)(4) = 84 \text{ cm}^2$

$\Rightarrow \quad x = 7$ 1

$\therefore$ AC = 6 + 7 = 13 cm and BC = 8 + 7 = 15 cm $\frac{1}{2}$

9. For equal roots, $k^2 - 4(2)(8) = 0$ 1

$k^2 = 64 \Rightarrow k = \pm 8$ 1

10. a + 4d = 26, a + 9d = 51 1

Solving to get a = 6, d = 5 $\therefore$ AP is 6, 11, 16, ... 1

SECTION C

11. Speed = 10 km/h $\therefore$ length in 30 minutes = 5000 m. $\frac{1}{2}$

$\therefore$ Volume of water in 30 minutes = $6 \times 1.5 \times 5000\ m^3$. 1

Area, that will be irrigated = $\frac{6 \times 1.5 \times 5000}{.08}\ m^2$ 1

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15. Surface area of remaining solid

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

$= \pi[2 \times 6 \times 8 + (6)^2 + 6 \times \sqrt{6^2 + 8^2}\,]\ \text{cm}^2$ 1

$= 3.14\ [96 + 36 + 60]\ \text{cm}^2$

$= 3.14 \times 192 = 602.88\ \text{cm}^2$ 1

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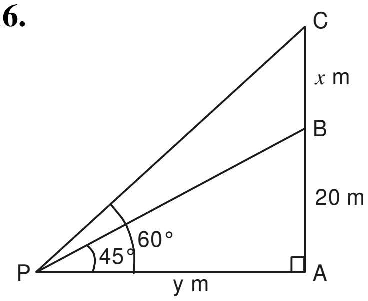


For Correct figure: $\frac{1}{2}$

Let AP = ym and BC = xm

$\therefore \quad \dfrac{20}{y} = \tan 45° = 1 \Rightarrow y = 20$ m. $\frac{1}{2}+\frac{1}{2}$

$\dfrac{x+20}{y} = \tan 60°$ $\frac{1}{2}$

$\dfrac{x+20}{20} = \sqrt{3} \quad \Rightarrow \quad x = 20(\sqrt{3} - 1)$ m $\frac{1}{2}+\frac{1}{2}$

or 14.64 m

17. Let a be the side of triangle, then $\dfrac{\sqrt{3}a^2}{4} = 121\sqrt{3} \quad \Rightarrow \quad a = 22$ cm $\frac{1}{2}$

$\therefore$ Length of wire = 66 cm. $\frac{1}{2}$

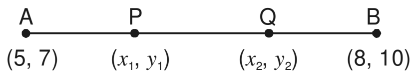
$\Rightarrow \quad 2 \times \dfrac{22}{7} \times r = 66 \quad \Rightarrow \quad r = \dfrac{21}{2}$ cm 1

$\therefore$ Area of enclosed circle $= \dfrac{22}{7} \times \dfrac{21}{2} \times \dfrac{21}{2} = 346.5\ \text{cm}^2$ 1

18. The number divisible by 9 are 306, 315, 324, ..., 693 1

$\therefore \quad 693 = 306 + (n - 1)9$ $1\frac{1}{2}$

$\Rightarrow \quad n = 44$ $\frac{1}{2}$

19. 

Let $P(x_1, y_1)$ and $Q(x_2, y_2)$ trisect $\overline{AB}$

$\therefore$ P divides AB in the ratio 1 : 2 1

$\therefore \quad x_1 = \frac{1(8) + 2(5)}{3} = 6; \; y_1 = \frac{1(10) + 2(7)}{3} = 8 \;\; \therefore P(6, 8)$ 1

Q is mid-point of PB $\Rightarrow x_2 = \frac{6+8}{2} = 7; \; y_2 = \frac{8+10}{2} = 9 \;\; \therefore Q(7, 9)$ 1

20. $2x^2 + \sqrt{3}x - 3 = 0 \Rightarrow 2x^2 + 2\sqrt{3}x - \sqrt{3}x - 3 = 0$ 1

$2x(x + \sqrt{3}) - \sqrt{3}(x + \sqrt{3}) = 0$

$(2x - \sqrt{3})(x + \sqrt{3}) = 0$ 1

$\Rightarrow \quad x = \frac{\sqrt{3}}{2}, \; x = -\sqrt{3}$ 1

SECTION D

21. Volume of cylinder $= \pi \cdot (6)^2 \cdot (15)$ cm^3. 1

Volume of one conical toy $= \frac{1}{3}\pi(3)^2 \cdot 9$ cm^3 1

Let n. be the number of toys formed

$\Rightarrow n \cdot \frac{1}{3}\pi \cdot (3)^2 \cdot 9 = \pi(6)^2(15)$ 1

$\Rightarrow \quad n = 20.$ 1

22. h = 42 cm, r_1 = 30 cm, r_2 = 10 cm.

$\therefore$ Capacity of bucket $= \frac{1}{3} \times \frac{22}{7} \times 42 \times [900 + 100 + 300]\ cm^3$ $1\frac{1}{2}$

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Selling price = 57.5 × 40 = ₹ 2288 1

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23. Given equation can be written as $\frac{3x-5}{x^2-3x+2} = \frac{6}{x}$ $1\frac{1}{2}$

$\Rightarrow$ $6x^2 - 18x + 12 = 3x^2 - 5x$ or $3x^2 - 13x + 12 = 0$ 1

$\Rightarrow$ $(x-3)(3x-4) = 0$ 1

$\therefore$ $x = 3,\ x = \frac{4}{3}$ $\frac{1}{2}$

24. ΔTPQ is isosecles and TO is angle bisector of ∠PTQ

$\therefore$ OT ⊥ PQ, so OT bisects PQ, ∴ PR = RQ = 4 cm $\frac{1}{2}$

Also, OR $= \sqrt{OP^2 - PR^2} = \sqrt{5^2 - 4^2} = 3$ cm $\frac{1}{2}$

Let TP = x and TR = y, then $x^2 = y^2 + 16$ ...(i) 1

Alsoin ΔOPT, $x^2 + (5)^2 = (y + 3)^2$ ...(ii) 1

Solving (i) and (ii) to get $y = \frac{16}{3}$ and $x = \frac{20}{3}$ 1

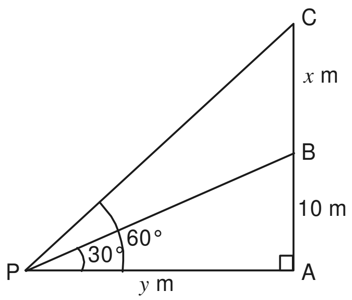
$\therefore$ TP $= \frac{20}{3}$ cm

25. $a_n = 3 + 2n \Rightarrow a = 5,\ d = a_2 - a = 7 - 5 = 2.$ 1+1

$S_{24} = \frac{24}{2}[10 + 23 \times 2]$ 1

$= 12 \times 56 = 672$ 1

26.



Correct Figure 1

In ΔABP, $\frac{10}{y} = \tan 30° = \frac{1}{\sqrt{3}}$

$\Rightarrow$ $y = 10\sqrt{3}$ m 1

In ΔACP, $\frac{x+10}{10\sqrt{3}} = \tan 60° = \sqrt{3}$ 1

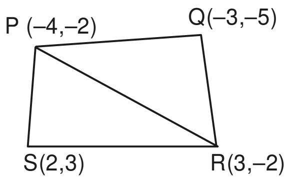
$\Rightarrow$ $x + 10 = 30$ m $\Rightarrow x = 20$ m

Height above the ground = 20 + 10 = 30 m. 1

27. For correct given, To prove, Construction and figure $4\times\frac{1}{2}=2$

Correct proof 2

28.



Area $\Delta PQR = \frac{1}{2}[-4(-3) - 3(0) + 3(3)] = \frac{21}{2}$ sq.units $1\frac{1}{2}$

Area $\Delta PRS = \frac{1}{2}[-4(-5) + 3(5) + 2(0)] = \frac{35}{2}$ sq.units $1\frac{1}{2}$

$\therefore$ area PQRS $= \frac{21}{2} + \frac{35}{2} = 28$ sq.units 1

29. Total number of possible outcomes = 36 $\frac{1}{2}$

Favourable outcomes are:

{(1, 1), (1, 4), (2, 2), (3, 3), (4, 1), (4, 4), (5, 5), (6, 6)} $1\frac{1}{2}$

$\therefore$ Number of favourable outcomes = 8 1

Required probability $= \frac{8}{36} = \frac{2}{9}$ 1

30. Let her marks in English be x

then, Marks in Mathematics = 30 – x $\frac{1}{2}$

$\therefore$ $(x - 3)(30 - x + 2) = 210$ 1

$\Rightarrow$ $x^2 - 35x + 306 = 0$ $\frac{1}{2}$

$(x - 18)(x - 17) = 0 \Rightarrow x = 17, 18$ 1

$\therefore$ If marks in English = 17, then marks in Maths = 13 $\frac{1}{2}$

If marks in English = 18, then marks in Maths = 12 $\frac{1}{2}$

31. Constructing ΔABC (correctly) $1\frac{1}{2}$

Correct construction of triangle similar to ABC $2\frac{1}{2}$

30/3

SECTION A

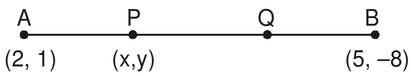
1. $\angle OPQ = \angle OQP = 55°$ $\therefore$ $\angle TPQ = 35°$ $\frac{1}{2}+\frac{1}{2}$

2. Total number of outcomes = 8, P(2 heads) = $\frac{3}{8}$ $\frac{1}{2}+\frac{1}{2}$

3. $\tan\theta = \frac{30}{10\sqrt{3}} = \sqrt{3}$, $\therefore$ $\theta = 60°$ $\frac{1}{2}+\frac{1}{2}$

4. $-1 + (n-1)5 = 129$, $\therefore$ $n = 27$ $\frac{1}{2}+\frac{1}{2}$

SECTION B

5. 

P(x, y) divides AB in the ratio 1 : 2 1

$\therefore$ $x = \frac{1(5)+2(2)}{1+2} = 3,\ y = \frac{1(-8)+2(1)}{1+2} = -2$ 1

$\therefore$ Coordinates of P are (3, –2)

6. Let P(x, y), A(a + b, b – a) and B(a – b, a + b) be the given points

$PA^2 = PB^2 \Rightarrow [x-(a+b)]^2 + [y-(b-a)]^2 = [x-(a-b)]^2 + [y-(a+b)]^2$ 1

Solving to get bx = ay 1

7. For equal roots, $k^2 - 4(2)(8) = 0$ 1

$k^2 = 64 \Rightarrow k = \pm 8$ 1

8. Here, BP = BQ = 8 cm, AP = AR = 6 cm, Let CQ = CR = x cm.

Perimeter of $\Delta ABC = (28 + 2x)$ cm $\frac{1}{2}$

$\therefore$ area $\Delta ABC = \frac{1}{2}(28+2x)(4) = 84\ cm^2$

$\Rightarrow \quad x = 7$ 1

$\therefore \quad AC = 6 + 7 = 13$ cm and $BC = 8 + 7 = 15$ cm $\frac{1}{2}$

9. $OK = OL \Rightarrow \angle OKL = \angle OLK = 30°$ 1

$\angle OKP = 90° \therefore \angle PKL = 90° - 30° = 60°$ 1

10. $S_n = \frac{n}{2}\left[2(-6) + (n-1)\frac{1}{2}\right] = 0$ 1

$\Rightarrow \quad n = 25$ 1

SECTION C

11. Let a be the side of triangle, then $\frac{\sqrt{3}a^2}{4} = 121\sqrt{3} \quad \Rightarrow \quad a = 22$ cm $\frac{1}{2}$

$\therefore$ Length of wire = 66 cm. $\frac{1}{2}$

$\Rightarrow \quad 2 \times \frac{22}{7} \times r = 66 \quad \Rightarrow \quad r = \frac{21}{2}$ cm 1

$\therefore$ Area of enclosed circle $= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} = 346.5\ cm^2$ 1

12. Let the vertices of given triangle be A(0, –1), B(2, 1) and C(0, 3)

Coordinates of mid-points are P(1, 0), Q(1, 2) and R(0, 1) $1\frac{1}{2}$

$\therefore$ area $\Delta PQR = \frac{1}{2}[1(2-1) + 1(1-0) + 0(0-2)] = 1$ sq. units. $1\frac{1}{2}$

13. Speed = 10 km/h $\therefore$ length in 30 minutes = 5000 m. $\frac{1}{2}$

$\therefore$ Volume of water in 30 minutes $= 6 \times 1.5 \times 5000\ m^3$. 1

Area, that will be irrigated $= \frac{6 \times 1.5 \times 5000}{.08}\ m^2$ 1

$= 562500\ m^2$ $\frac{1}{2}$

14. Surface area of remaining solid

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

$= \pi[2 \times 6 \times 8 + (6)^2 + 6 \times \sqrt{6^2 + 8^2}]\,cm^2$ 1

$= 3.14\,[96 + 36 + 60]\,cm^2$

$= 3.14 \times 192 = 602.88\,cm^2$ 1

15. Here r = 7m, h = 24m $\therefore$ $l = \sqrt{7^2 + 24^2} = 25$ m $\frac{1}{2}$

Canvas required for 10 tents = $10 \times \frac{22}{7} \times 7 \times 25 = 5500\,m^2$ $1\frac{1}{2}$

cost of cloth = $\frac{5500}{2} \times 40 =$ ₹ 110000 1

$\therefore$ Rampal helped the centre by ₹ 110000

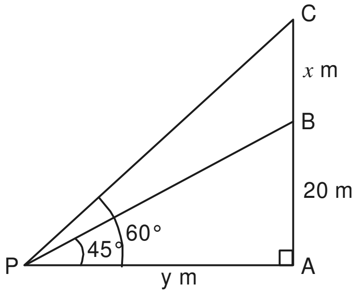
16. Given AB = BC = 7 cm, DE = 4 cm, BF = 3.5 cm

Area of trapezium ABCD = $\frac{1}{2}[7 + 11] \times 3.5 = 31.5\,cm^2$ 1

Area of the sector BGEC = $\frac{22}{7} \times 7 \times 7 \times \frac{30}{360} = \frac{77}{6} = 12.83\,cm^2$ 1

$\therefore$ Area of shaded region = 31.50 – 12.83 = 18.67 cm^2 1

17.



For Correct figure: $\frac{1}{2}$

Let AP = ym and BC = xm

$\therefore$ $\frac{20}{y} = \tan 45° = 1 \Rightarrow y = 20$ m. $\frac{1}{2} + \frac{1}{2}$

$\frac{x + 20}{y} = \tan 60°$ $\frac{1}{2}$

$\frac{x + 20}{20} = \sqrt{3} \Rightarrow x = 20(\sqrt{3} - 1)$ m $\frac{1}{2} + \frac{1}{2}$

or 14.64 m

18. -3 is a root of $2x^2 + px - 15 = 0 \Rightarrow 2(9) - 3p - 15 = 0$ 1

$\Rightarrow$ $p = 1$ $\frac{1}{2}$

$x^2 - 4px + k = 0$ has equal roots $\Rightarrow 16 - 4k = 0$ 1

$\Rightarrow$ $k = 4$ $\frac{1}{2}$

19. $a = 10, S_{14} = 1050 \Rightarrow 7[20 + 13d] = 1050$ 1

$\Rightarrow$ $d = 10$ 1

$a_{20} = 10 + 19(10) = 200$ 1

20. Number of all 2-digit number are 90 1

$\{10, 11, 12, ..., 99\}$

Multiple of 7 are $\{7, 14, 21, ..., 98\}$ i.e. 14 1

$\therefore$ Required probability $= \frac{14}{90}$ or $\frac{7}{45}$ 1

SECTION D

21. For correct given, To prove, Construction and figure $4\times\frac{1}{2}=2$

Correct proof 2

22. Volume of cylinder $= \pi\cdot(6)^2\cdot(15)$ cm^3. 1

Volume of one conical toy $= \frac{1}{3}\pi(3)^2 \cdot 9$ cm^3 1

Let n. be the number of toys formed

$\Rightarrow n\cdot\frac{1}{3}\pi\cdot(3)^2\cdot 9 = \pi(6)^2(15)$ 1

$\Rightarrow$ $n = 20.$ 1

23. h = 42 cm, r_1 = 30 cm, r_2 = 10 cm.

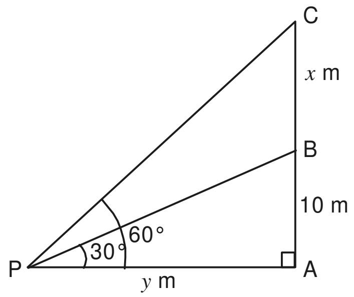
$\therefore$ Capacity of bucket $= \frac{1}{3} \times \frac{22}{7} \times 42 \times [900 + 100 + 300]\ \text{cm}^3$ $1\frac{1}{2}$

$= 57200\ \text{cm}^3 = 57.2$ litres $\frac{1}{2}$

Selling price = 57.5 × 40 = ₹ 2288 1

Any relevant value 1

24.



Correct Figure 1

In ΔABP, $\frac{10}{y} = \tan 30° = \frac{1}{\sqrt{3}}$

$\Rightarrow$ $y = 10\sqrt{3}$ m 1

In ΔACP, $\frac{x+10}{10\sqrt{3}} = \tan 60° = \sqrt{3}$ 1

$\Rightarrow$ $x + 10 = 30$ m $\Rightarrow x = 20$ m

Height above the ground = 20 + 10 = 30 m. 1

25. ΔTPQ is isosecles and TO is angle bisector of $\angle$PTQ

$\therefore$ OT $\perp$ PQ, so OT bisects PQ, $\therefore$ PR = RQ = 4 cm $\frac{1}{2}$

Also, OR $= \sqrt{OP^2 - PR^2} = \sqrt{5^2 - 4^2} = 3$ cm $\frac{1}{2}$

Let TP = x and TR = y, then $x^2 = y^2 + 16$ ...(i) 1

Alsoin ΔOPT, $x^2 + (5)^2 = (y + 3)^2$ ...(ii) 1

Solving (i) and (ii) to get $y = \frac{16}{3}$ and $x = \frac{20}{3}$ 1

$\therefore$ TP $= \frac{20}{3}$ cm

26. Given equation can be written as $\frac{3x-5}{x^2-3x+2} = \frac{6}{x}$ $1\frac{1}{2}$

$\Rightarrow$ $6x^2 - 18x + 12 = 3x^2 - 5x$ or $3x^2 - 13x + 12 = 0$ 1

$\Rightarrow$ $(x-3)(3x-4) = 0$ 1

$\therefore$ $x = 3, x = \frac{4}{3}$ $\frac{1}{2}$

27. $a_n = 3 + 2n \Rightarrow a = 5, d = a_2 - a = 7 - 5 = 2.$ 1+1

$S_{24} = \frac{24}{2}[10 + 23 \times 2]$ 1

$= 12 \times 56 = 672$ 1

28. Total number of shirts = 125

No. of shirts with no defect = 110

No. of shirts with minor defect = 12

No. of shirts with major defects = 3.

P(Ram Lal will buy the shirt) = $\frac{110}{125}$ or $\frac{22}{25}$ 2

P(Naveen will buy the shirt) = $\frac{122}{125}$ 2

29. Constructing ΔABC (correctly) $1\frac{1}{2}$

Constructing a triangle similar to ΔABC $2\frac{1}{2}$

30. Let one tap takes x minutes to fill the cistern

$\therefore$ Other tap can fill the cistern in $(x + 1)$ minutes $\frac{1}{2}$

$\Rightarrow$ $\frac{1}{x} + \frac{1}{x+1} = \frac{11}{30}$ $1\frac{1}{2}$

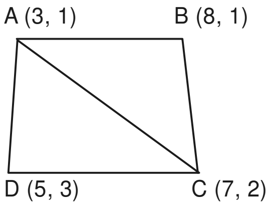
$\Rightarrow \quad 11x^2 - 49x - 30 = 0$

or $\quad (11x + 6)(x - 5) = 0 \Rightarrow x = 5$ $\quad 1\frac{1}{2}$

$\therefore$ One tap can fill thecistern in 5 minutes

While, the other takes 6 minutes. $\quad \frac{1}{2}$

31.



Area $\Delta ABC = \frac{1}{2}[3(-1) + 8(1) + 7(0)] = \frac{5}{2}$ sq.units $\quad 1\frac{1}{2}$

Area $\Delta ACD = \frac{1}{2}[3(-1) + 7(2) + 5(-1)] = 3$ sq.units $\quad 1\frac{1}{2}$

$\therefore$ Area ABCD $= \frac{5}{2} + 3 = \frac{11}{2}$ sq.units $\quad 1$