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Secondary School Examination

March -2015

Marking Scheme--- Mathematics (30/B)

General Instructions

1. The Marking Scheme provides general guidelines to reduce subjectivity and maintain uniformity among large number of examiners involved in the marking. The answers given in the marking scheme are the best suggested answers.
2. Marking is to be done as per the 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. The Head-Examiners have to go through the first five answer-scripts evaluated by each evaluator to ensure that the evaluation has been done as per instructions given in the marking scheme. The remaining answer scripts meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
5. If a question is attempted twice and the candidate has not crossed any answer, only first attempt is to be evaluated. Write 'EXTRA' with second attempt.
6. 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.
7. Separate Marking Scheme for all the three sets has been given.
8. The Examiners should acquaint themselves with the guidelines given in the Guidelines for Spot Evaluation before starting the actual evaluation.
9. Every Examiner should stay upto sufficiently reasonable time normally 5-6 hours every day and evaluate 20-25 answer books and should devote minimum 15-20 minutes to evaluate each answer book.
10. Every Examiner should acquaint himself/herself with the marking schemes of all the sets.

QUESTION PAPER CODE 30(B)

EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Q.No. Marks

1. 1 2. 10 cm. 3. 27 4. 12 4 x 1 = 4 m

SECTION - B

5. Given equation can be written as $x^2 - 3\sqrt{5}x + 10 = 0$ ½ m

$\Rightarrow x^2 - 2\sqrt{5}x - \sqrt{5}\,x + 10 = 0$

$\Rightarrow \left(x - \sqrt{5}\right)\left(x - 2\sqrt{5}\right) = 0$ 1 m

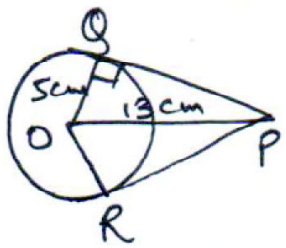
$\Rightarrow x = \sqrt{5},\ 2\sqrt{5}$ ½ m

6. $s_n = 4n^2 + n \Rightarrow s_1 = 5 = a_1$ ½ m

$s_2 = a_1 + a_2 = 18 \Rightarrow a_2 = 13$ ½ m

$\therefore\ a = 5,\ d = 8$ ½ m

$a_{10} = 5 + 9 \times 8 = 77$ ½ m

7. 

In ΔOQP, $OP = 13\text{cm}$, $OQ = 5\text{cm}$

$\Rightarrow PQ = 12\text{cm}$ 1 m

$\text{ar}\left(\Delta OQP\right) = \frac{1}{2} \times 12 \times 5\ \text{cm}^2 = 30\ \text{cm}^2$ ½ m

$\text{ar}\left(PQOR\right) = 2 \times 30\ \text{cm}^2 = 60\text{cm}^2$ ½ m

8. Let the radins of required circle be R

$\pi R^2 = \pi \times 15^2 + \pi\ x\ 8^2$ 1 m

$\Rightarrow R^2 = 289 \therefore R = 17\text{cm}$ ½ m

$\therefore$ Diameter of circle = 34cm ½ m

9. Total number of cards = 52 – 4 – 12 = 36 ½ m

Number of red face cards = 3 ½ m

P(red face card) = $\frac{3}{36}$ or $\frac{1}{12}$ 1 m

10. Total possible outcomes = 15

Prime numbers are 2, 3, 5, 7, 11, 13 ie, 6 1 m

P (prime number) = $\frac{6}{15}$ or $\frac{2}{5}$ 1 m

SECTION - C

11. $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$

$\Rightarrow 30\left[x-7-x-4\right] = 11\left[x^2-3x-28\right]$ 1 m

$\Rightarrow x^2 - 3x + 2 = 0$

$\Rightarrow (x-2)(x-1) = 0$ 1 m

$\Rightarrow x = 2, 1$ 1 m

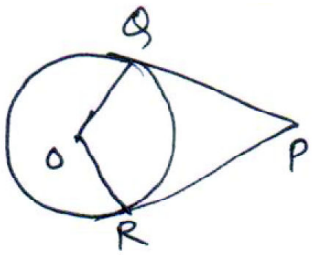
12. $s_7 = 112 \Rightarrow \frac{7}{2}(2a+6d) = 112 \Rightarrow a+3d = 16$ .....(i) 1 m

$s_{17} = 697 \Rightarrow \frac{17}{2}(2a+16d) = 697 \Rightarrow a+8d = 41$ .....(ii) ½ m

Solving (i) and (ii) we get a = 1, d = 5 ½ m

$s_n = \frac{n}{2}\left[2+5n-5\right]$

$= \frac{n(5n-3)}{2}$ or $\frac{5n^2-3n}{2}$ 1 m

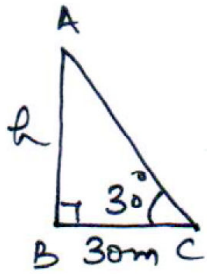
13. 

$\angle OQP = \angle ORP = 90^o$ 1 m

In quad. ORPQ,

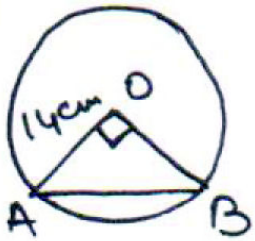
$\angle ORP + \angle OQP + \angle RPQ + \angle ROQ = 360^o$ 1 m

$\Rightarrow \quad \angle RPQ + \angle ROQ = 180^o$ 1 m

14. 

In ΔABC, $\frac{h}{30} = \tan 30^o$ 1½ m

$\Rightarrow h = \frac{30}{\sqrt{3}}$ or $10\sqrt{3} = 17.3\,m$ 1 + ½ m

15. 

(i) Length of arc $= \frac{2\pi r\theta}{360^o}$

$= 2 \times \frac{22}{7} \times 14 \times \frac{90^o}{360^o} = 22\,cm$ 1 m

(ii) Area of minor segment

$= \frac{\pi r^2\theta}{360^o} - \frac{1}{2} \times b \times h$

$= \left(\frac{22}{7} \times 14 \times 14 \times \frac{90^o}{360^o} - \frac{1}{2} \times 14 \times 14\right) cm^2$ 1 m

$= (154 - 98)\,cm^2 = 56\,cm^2$ 1 m

16. Circum ference of circular field $= \frac{3960}{18} = 220$ m — 1 m

$\Rightarrow 2\pi r = 220$ m — ½ m

$\Rightarrow r = 35$ m

Area of field $= \frac{22}{7} \times 35 \times 35 \times m^2$

$= 3850\ m^2$ — 1 m

Cost $= ₹\ 3850 \times \frac{70}{100} = ₹\ 2695$ — ½ m

17. Surface area of remaining solid — 1 m

= TSA of cube + CSA of hemisphere – Base area of hemisphere — 1 m

$= 6a^2 + 2\pi r^2 - \pi r^2 = 6a^2 + \pi r^2$

$= \left(6 \times 28 \times 28 + \frac{22}{7} \times 14 \times 14\right) cm^2$ — 1 m

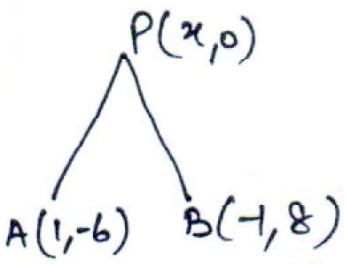
$= 28\ (168 + 22)\ cm^2 = 5320\ cm^2$ — 1 m

18. Volume of earth dug out from well = Volume of earth in platform — 1 m

$\Rightarrow \frac{22}{7} \times 4 \times 4 \times 14 = 11 \times 8 \times H$ — 1 m

$\Rightarrow H = 8$ m

$\therefore$ height of platform = 8 m — 1 m

19. 

Let the required point be P(x, o) — ½ m

PA = PB $\Rightarrow$ $PA^2 = PB^2$ — ½ m

$\Rightarrow (x-1)^2 + 6^2 = (x+1)^2 + (-8)^2$ — 1 m

Solving, we get $x = 7$ — ½ m

$\therefore$ Required point is $(-7, 0)$ — ½ m

20. Let P devide AB in the ratio k : 1 ½ m

$$\therefore \frac{4k-5}{k+1} = -3 \Rightarrow 4k-5 = -3k-3$$

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

$\therefore$ P divides AB in the ratio 2 : 7 ½ m

$$\text{Also } \frac{-10k+8}{k+1} = y \Rightarrow \frac{10\times\frac{2}{7}+8}{\frac{2}{7}+1} = y \Rightarrow y = 4$$ 1 m

SECTION - D

21. $\frac{x+3}{x-2} - \frac{1-x}{x} = \frac{17}{4}$

$\Rightarrow 4\left(x^2+3x-3x+x^2+2\right) = 17\left(x^2-2x\right)$ 1 m

$\Rightarrow 9x^2-34x-8=0$ 1 m

$\Rightarrow 9x^2-36x+2x-8 = 0$ 1 m

$\Rightarrow (x-4)(9x+2) = 0$ 1 m

$\Rightarrow x = 4, -\frac{2}{9}$ 1 m

22. Let the smaller pipe fills the tank in x hours

$\Rightarrow$ larger pipe fills the tank in $(x-10)$ hours ½ m

$\therefore \frac{1}{x} + \frac{1}{x-10} = \frac{8}{75}$ 1 m

$\Rightarrow 75\left(x-10+x\right) = 18\left(x^2-10x\right)$ ½ m

$\Rightarrow$ $4x^2 - 115x + 375 = 0$

$\Rightarrow$ $(x - 25)\ (4x - 15) = 0$

$\Rightarrow$ $x = 25, + \frac{15}{4}$ (neglected) 1½ m

$\therefore$ The pipe with smaller diameter fills the tank in 25 hours

and pipe with larger diameter fills the tank in 15 hours ½ m

23. A . P formed is 3, 6, 9, ..., 30 2 m

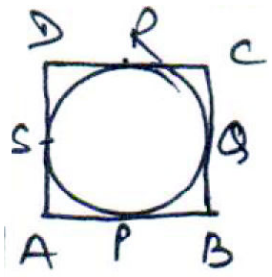
$s_{10} = \frac{10}{2}\ (3 + 30) = 165$

$\therefore$ Total number of trees planted = 165 } 1 m

Any suitable value 1 m

24. Figure, Given, To prove, construction 2 m

Correct proof 2 m

25. 

AP = AS , BP = BQ, CR = CQ, DR = DS 2 m

Adding, we get AB + CD = AD + CB 1 m

$\Rightarrow$ 2 AB = 2 AD

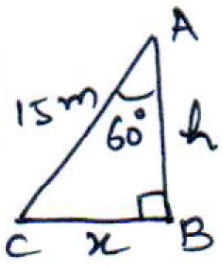
$\Rightarrow$ AB = AD 1 m

$\therefore$ ABCD is a rhombus.

26. Writing the correct steps of construction of Δ ABC 1½ m

Writing the correct steps of construction of similar triangle 2½ m

27.



$$\frac{AB}{AC} = \cos 60^\circ \Rightarrow \frac{h}{15} = \frac{1}{2} \Rightarrow h = \frac{15}{2}$$

$\therefore$ height of wall $= \frac{15}{2}$ m or 7.5 cm — 2 m

$$\frac{BC}{AC} = \sin 60^\circ \Rightarrow \frac{x}{15} = \frac{\sqrt{3}}{2} \Rightarrow x = \frac{15\sqrt{3}}{2}$$

$\therefore$ Distance of foot of ladder from wall $= \frac{15\sqrt{3}}{2}$ m — 2 m

28. Area of wheel $= 1.54\ m^2$

$\Rightarrow \pi r^2 = 1.54$

$\Rightarrow r^2 = \frac{49}{100} \Rightarrow r = \frac{7}{10}$ m — 1½ m

Circumference of wheel $= 2 \times \frac{22}{7} \times \frac{7}{10}$ m — 1½ m

$= 4.4$ m

Number of revolutions $= \frac{176}{4.4} = 40$ revolutions — 1 m

29. Volume of water flowing in 1 hr.

$= 20 \times 1000 \times \frac{300}{100} \times \frac{120}{100}$ — 2 m

$= 72{,}000\ m^3$

$\Rightarrow$ Volume of water flowing in 20 minutes $= 24000\ m^3$ — 1 m

$\therefore$ Area irrigated in 20 min $= \frac{24000}{8} \times 100$

$= 300000\ m^2$ — 1 m

30. (i) (1, 1) (1,2) (1, 3) (1, 4) (1, 5) (1, 6)

(2, 1) (2,2) (2, 3) (2, 4) (2, 5) (2, 6)

(3, 1) (3,2) (3, 3) (3, 4) (3, 5) (3, 6)

(4, 1) (4,2) (4, 3) (4, 4) (4, 5) (4, 6)

(5, 1) (5,2) (5, 3) (5, 4) (5, 5) (5, 6) 2 m

(6, 1) (6,2) (6, 3) (6, 4) (6, 5) (6, 6)

(ii) Favourable outcomes are

(2, 6) (6,2) (3, 5) (5, 3) (4, 4) i.e, 5 1 m

$\therefore$ P (Sum 8) $= \frac{5}{36}$ 1 m

31. or $(\Delta ABC) = \frac{1}{2}\left[-3(-3+4)-2(-4-9)+1(9+3)\right]$

$= \frac{35}{2}$ sq. units } 1½ m

or $(\Delta ACD) = \frac{1}{2}\left[-3(-4-7)+1(7-9)+6(9+4)\right]$

$= \frac{109}{2}$ sq. units } 1½ m

$\therefore$ Area of quad. ABCD $= \frac{35}{2} + \frac{109}{2} = 72$ sq. units 1 m