

## **Secondary School Term II Compartment Examination, 2022**

### **Marking Scheme — Mathematics 30/B/6 Subject Code – 041**

#### ***General Instructions:***

1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
2. “Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. Its’ leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc may invite action under IPC.”
3. 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. However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and marks be awarded to them. In class-X, while evaluating two competency based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, marks should be awarded.
4. The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
5. Evaluators will mark (✓) wherever answer is correct. For wrong answer ‘X’ be marked. Evaluators will not put right kind of mark while evaluating which gives an impression that answer is correct and no marks are awarded. This is most common mistake which evaluators are committing.
6. If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.
7. If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.

8. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.
9. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
10. A full scale of marks \_\_\_\_\_ (example 0-40 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
11. Every examiner has to necessarily do evaluation work for full working hours i.e. 8 hours every day and evaluate 30 answer books per day in main subjects and 35 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the reduced syllabus and number of questions in question paper.
12. Ensure that you do not make the following common types of errors committed by the Examiner in the past:-
  - Leaving answer or part thereof unassessed in an answer book.
  - Giving more marks for an answer than assigned to it.
  - Wrong totaling of marks awarded on a reply.
  - Wrong transfer of marks from the inside pages of the answer book to the title page.
  - Wrong question wise totaling on the title page.
  - Wrong totaling of marks of the two columns on the title page.
  - Wrong grand total.
  - Marks in words and figures not tallying.
  - Wrong transfer of marks from the answer book to online award list.
  - Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)
  - Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
13. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.
14. Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
15. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.
16. Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.\
17. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

QUESTION PAPER CODE 30/B/6  
**EXPECTED ANSWER/VALUE POINTS**

**SECTION A**

*Question numbers 1 to 6 carry 2 marks each.*

1. If 4 is a root of the equation  $x^2 + kx + 8 = 0$  then find the other root. Also find the value of k.

**Ans.**  $(4)^2 + 4k + 8 = 0$

$$\Rightarrow k = -6$$

$$\therefore x^2 - 6x + 8 = 0$$

$$(x - 4)(x - 2) = 0$$

$$x = 4, 2$$

So, other root is 2.

2. (a) Find the sum of the first 10 multiples of 5, using an A.P.

OR

- (b) Find the 10<sup>th</sup> term of the A.P. :  $\sqrt{3}, \sqrt{12}, \sqrt{27}, \dots$

**Ans.** (a) A.P. is 5, 10, 15, ..... , 10 terms

Here  $a = 5$  and  $d = 10 - 5 = 5$

$$S_{10} = \frac{10}{2} [2 \times 5 + 9 \times 5]$$

$$= 275$$

OR

(b) A.P. is  $\sqrt{3}, 2\sqrt{3}, 3\sqrt{3}, \dots$

Here  $a = \sqrt{3}$  and  $d = 2\sqrt{3} - \sqrt{3} = \sqrt{3}$

$$a_{10} = \sqrt{3} + 9 \times (\sqrt{3})$$

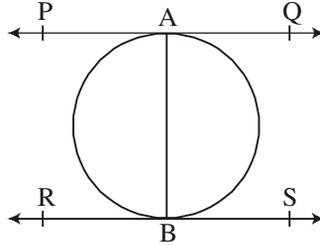
$$= 10\sqrt{3} \text{ or } \sqrt{300}$$

3. Prove that the tangents drawn at the ends of a diameter of a circle are parallel.

**Ans.** Let PQ and RS be tangents at the ends A and B respectively of diameter AB.

$$\angle PAB = 90^\circ \text{ and } \angle ABS = 90^\circ$$

1



$$\therefore \angle PAB = \angle ABS$$

 $\frac{1}{2}$ 

$$\therefore PQ \parallel RS \text{ [As Alternate interior angles are equal]}$$

 $\frac{1}{2}$ 

4. (a) A cone of height 20 cm and base radius 5 cm is made of clay. A child reshapes it in the form of a sphere. Find the diameter of the sphere.

OR

- (b) Three cubes each of volume  $64 \text{ cm}^3$  are joined end to end to form a cuboid. Find the surface area of the resulting cuboid.

**Ans.** (a) Volume of cone =  $\frac{1}{3} \times \pi \times 5 \times 5 \times 20$

 $\frac{1}{2}$ 

A.T.Q.

Volume of sphere = Volume of cone

$$\Rightarrow \frac{4}{3} \pi r^3 = \frac{1}{3} \times \pi \times 5 \times 20$$

 $\frac{1}{2}$ 

$$\Rightarrow r = 5 \text{ cm}$$

 $\frac{1}{2}$ 

$$\therefore \text{Diameter of the sphere} = 2 \times 5 = 10 \text{ cm}$$

 $\frac{1}{2}$ 

OR

(b) Edge of cube = 4 cm

 $\frac{1}{2}$

∴ Dimensions of cuboid are 12 cm, 4 cm, 4 cm

Surface Area of resulting cuboid =  $2 \times [12 \times 4 + 4 \times 4 + 4 \times 12]$

$$= 224 \text{ cm}^2$$

5. The following table shows the ages of students appearing for an entrance test:

Age (in years)	Number of Students
16 – 18	50
18 – 20	78
20 – 22	46
22 – 24	28
24 – 26	23

Find the modal age of the students.

**Ans.** Modal class  $\rightarrow$  18 – 20

$$\text{Mode} = 18 + \left[ \frac{78 - 50}{2 \times 78 - 50 - 46} \right] \times 2$$

$$= 18.93$$

Modal age = 18.93 years

6. If the sum of the first n terms of an A.P. is given by  $S_n = 2n^2 + n$ , then determine its 10th term.

**Ans.**  $a_1 = S_1 = 2(1)^2 + 1 = 3$

$$a_2 = S_2 - S_1 = [2(2)^2 + 2] - [2(1)^2 + 1] = 7$$

$$d = 7 - 3 = 4$$

$$a_{10} = 3 + 9 \times 4 = 39$$

## SECTION B

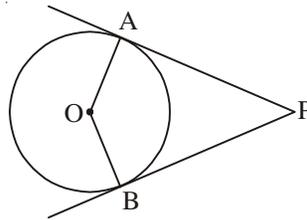
Question numbers 7 to 10 carry 3 marks each.

7. (a) Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact, at the centre.

OR

- (b) Write the steps of construction for dividing a line segment of length 7 cm, in the ratio 3 : 5.

Ans. (a)



$$\angle OAP = \angle OBP = 90^\circ \quad 1$$

In Quad, OAPB,

$$\angle OAP + \angle APB + \angle OBP + \angle AOB = 360^\circ \quad 1$$

$$90^\circ + \angle APB + 90^\circ + \angle AOB = 360^\circ$$

$$\angle APB + \angle AOB = 180^\circ \quad 1$$

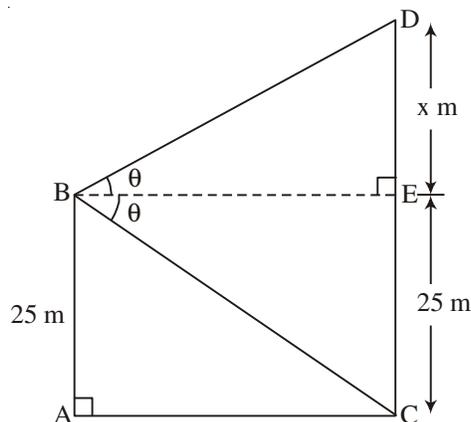
$\therefore \angle APB$  and  $\angle AOB$  are supplementary

OR

- (b) Correct steps of construction 3

8. From the top of a cliff 25 m high, the angle of elevation of the top of a tower is found to be equal to the angle of depression of the foot of the tower. Find the height of the tower.

Ans. Let  $\angle DBE = \angle CBE = \theta$  and  $DE = xm$   $\frac{1}{2}$



$$\text{In } \triangle BED, \tan \theta = \frac{x}{BE} \dots(1)$$

 $\frac{1}{2}$ 

$$\text{In } \triangle BEC, \tan \theta = \frac{25}{BE} \dots(2)$$

 $\frac{1}{2}$ 

From (i) and (ii) we have

$$x = 25 \text{ m}$$

 $\frac{1}{2}$ 

$$\therefore CD = 25 + 25 = 50 \text{ m}$$

1

9. The following table shows the daily income of 50 workers in a factory:

Daily Income (in ₹)	Number of Workers
500 – 520	12
520 – 540	8
540 – 560	14
560 – 580	4
580 – 600	12

Find the median daily income of the workers.

Ans.

Daily Income (in ₹)	Number of Workers (fi)	Cf
500 – 520	12	12
520 – 540	8	20
540 – 560	14	34
560 – 580	4	38
580 – 600	12	50

Correct table

1

Median class  $\rightarrow$  540 – 560

 $\frac{1}{2}$ 

$$\therefore \text{Median} = 540 + \left( \frac{25 - 20}{14} \right) \times 20$$

1

$$= ₹ 547.14$$

 $\frac{1}{2}$ 

Median daily income of the worker = ₹ 547.14

10. The mean of the following distribution is 50. Find the missing frequency  $x$ .

Class	Frequency
0 – 20	17
20 – 40	28
40 – 60	12
60 – 80	$x$
80 – 100	19

Ans.

Class	Frequency ( $f_i$ )	$x_i$	$f_i x_i$
0 – 20	17	10	170
20 – 40	28	30	840
40 – 60	12	50	600
60 – 80	$x$	70	$70x$
80 – 100	19	90	1710
Total	$76 + x$		$3320 + 70x$

Correct table

$$50 = \frac{3320 + 70x}{76 + x}$$

$$\Rightarrow x = 24$$

$1\frac{1}{2}$

1

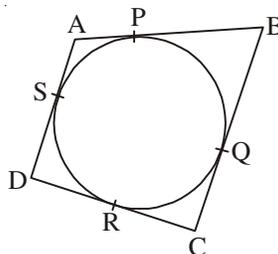
$\frac{1}{2}$

### SECTION C

Question numbers 11 to 14 carry 4 marks each.

11. A quadrilateral ABCD is drawn to circumscribe a circle. Prove that  $AB + CD = AD + BC$ .

Ans.



$$AP = AS \quad \dots(1)$$

$$BP = BQ \quad \dots(2)$$

$$DR = DS \quad \dots(3)$$

$$RC = CQ \quad \dots(4)$$

$$4 \times \frac{1}{2}$$

Adding (1), (2), (3) and (4) we have

$$(AP + BP) + (DR + RC) = (AS + DS) + (BQ + CQ) \quad 1$$

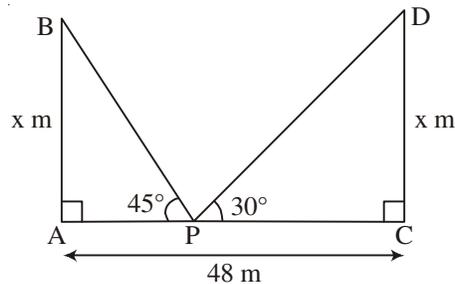
$$\therefore AB + CD = AD + BC \quad 1$$

12. (a) Two poles of equal height are standing opposite each other on either side of the road which is 48 m wide. From a point between them on the road, the angles of elevation of the top of the poles are  $45^\circ$  and  $30^\circ$ , respectively. Find the height of the poles and the distances of the point from the poles.

OR

- (b) From the top of a 9 m high building, the angle of elevation of the top of a cable tower is  $60^\circ$  and the angle of depression of its foot is  $45^\circ$ . Determine the height of the cable tower.

Ans. (a)



$$\text{In } \triangle BAP, \frac{x}{AP} = \tan 45^\circ$$

$$\Rightarrow AP = x \quad \dots(1) \quad \frac{1}{2}$$

$$\text{In } \triangle DCP, \frac{x}{PC} = \tan 30^\circ$$

$$\Rightarrow PC = \sqrt{3}x \quad \dots(2) \quad \frac{1}{2}$$

Given,  $AC = 48$  m

$$x + \sqrt{3}x = 48$$

 $\frac{1}{2}$ 

$$\Rightarrow x = \frac{48}{\sqrt{3}+1} = \frac{48(\sqrt{3}-1)}{2} = 24(\sqrt{3}-1)\text{m}$$

1

$$\therefore \text{height of pole} = 24(\sqrt{3}-1)\text{m}$$

$$AP = 24(\sqrt{3}-1)\text{m}$$

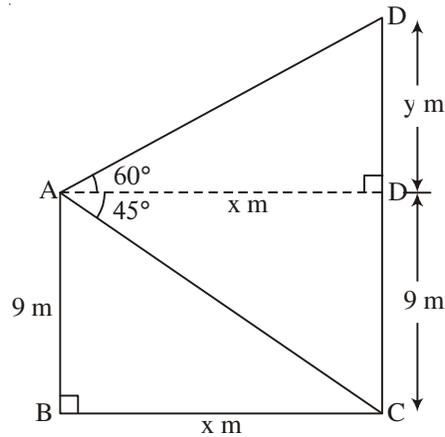
 $\frac{1}{2}$ 

$$PC = 48 - [24(\sqrt{3}-1)] = 24[(3-\sqrt{3})]\text{m}$$

1

OR

(b)



$$\text{In } \triangle ADE, \frac{y}{x} = \tan 60^\circ$$

$$y = \tan 60^\circ$$

$$y = \sqrt{3}x \quad \dots(1)$$

1

$$\text{In } \triangle ABC, \frac{9}{x} = \tan 45^\circ$$

$$x = 9 \quad \dots(2)$$

1

$$\text{from (1) and (2), we have } y = 9\sqrt{3}\text{m}$$

1

$$\therefore \text{Height of tower} = 9 + y$$

$$= 9 + 9\sqrt{3}$$

$$= 9(\sqrt{3}+1)\text{m}$$

1

(8)

## Case Study – 1

13. In an auditorium, the sloping floor allows the seats to be arranged to give a clear view of the stage. The seats are arranged in such a way that the number of rows are equal to the number of seats in each row. When the number of rows are doubled and the number of seats in each row is reduced by 16, then the total number of seats increases by 320.

Based on the above, answer the following questions:

- (a) If  $x$  is taken as the number of rows in the original arrangement, describe the above situation by a quadratic equation.
- (b) Find the number of rows and hence the total number of seats in the original arrangement.

Ans. (a) A.T.Q.

$$(2x)(x - 16) = x^2 + 320 \quad 1$$

$$\Rightarrow x^2 - 32x - 320 = 0 \quad 1$$

$$(b) x^2 - 40x + 8x - 320 = 0$$

$$\Rightarrow (x - 40)(x + 8) = 0 \quad 1$$

$$\Rightarrow x = 40 \text{ or } -8$$

Number of rows is always positive

$$\therefore x = 40 \quad \frac{1}{2}$$

$$\text{Total no. of seats} = (40)^2 = 1600 \quad \frac{1}{2}$$

## Case Study – 2

14. Underground water tanks are constructed in buildings for the storage of large amounts of water. This also saves space. Water in these tanks remains cool in both winter and summer. Electric pump are used to move water from underground tank to overhead tank.

Following are the dimensions of tanks in a recently constructed house:

Underground tank: Base 1.5 m  $\times$  1.5 m and height 1 m

Overhead cylindrical tank: Radius 50 cm and height 1.4 m

Based on the above, answer the following questions:

- (a) Find the capacity of the underground tank in litres.
- (b) If water is filled in th overhead tank at the rate of 11 litres per minute, find the time in which the tank will be filled completely.

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**Ans.** (a) Capacity of the Underground tank =  $1.5 \times 1.5 \times 1\text{m}^3$  1

$$= 2.25 \times 1000$$

$$= 2250 \text{ litres} \quad 1$$

(b) Capacity of overhead tank =  $\frac{22}{7} \times 50 \times 50 \times 140 \text{ cm}^3$   $\frac{1}{2}$

$$= \frac{22}{7} \times \frac{50 \times 50 \times 140}{1000} \text{ litres} \quad \frac{1}{2}$$

$$= 1100 \text{ litres} \quad \frac{1}{2}$$

$$\text{Time} = \frac{1100}{11} = 100 \text{ minutes or 1 hour 40 minutes} \quad \frac{1}{2}$$