MATHEMATICS
Grade 10

Total Questions: 50   **Time:** 1 hour

### DO NOT OPEN THIS BOOKLET UNTIL INSTRUCTED TO DO SO

➢ All questions are compulsory.

➢ Read the instructions on the **ANSWER SHEET** and fill in your **NAME**, **CLASS** and **OTHER INFORMATION**.

➢ To mark your choice of answer by darkening the circles in the **ANSWER SHEET**, use a **BLUE/BLACK BALL PEN** only.

➢ You **MUST** record your answers on the **ANSWER SHEET** only.

➢ There are **50 MULTIPLE CHOICE QUESTIONS**. Use the information provided to choose the **BEST** possible answer among the four options. On your **ANSWER SHEET** fill in the circle that matches your answer.

➢ $\frac{1}{2}$ **MARK** will be deducted for every **WRONG ANSWER**.

➢ Return the **ANSWER SHEET** to the invigilator at the end of the examination.

➢ You are **NOT** allowed to use a calculator. You may use a ruler and spare paper for rough work.

This question paper contains a total of 50 questions divided into three sections—A, B and C.

Read the instructions carefully before attempting these questions.

Section A (Logical Reasoning)

1. Pointing to a man in the photograph a woman said, "He is the son of the only son of my grandfather." How is the man in the photograph related to that woman?
   - (A) Father
   - (B) Brother
   - (C) Grandfather
   - (D) Insufficient data

2. Swati moves towards South-east a distance of 9 m, then she moves towards West and travels a distance of 18 m. From here, she moves towards North-west a distance of 9 m and finally she moves a distance of 7 m towards East and stood at that point. How far is the starting point from where she stood?
   - (A) 11
   - (B) 9
   - (C) 8
   - (D) 7

3. Fill in the blank for the series: TSR, QPO, NML, ……, HGF.
   - (A) IJK
   - (B) IHG
   - (C) JIH
   - (D) KJI

4. Find out which of the figures (1), (2), (3) and (4) can be formed from the pieces given in figure (X).

   - (A) 1
   - (B) 2
   - (C) 3
   - (D) 4
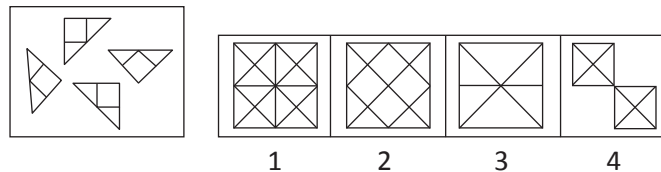
5. If $B^2 + H^2 = 68$, $L^2 + C^2 = 153$, then $T^2 + E^2$ is _____.
   - (A) 525
   - (B) 425
   - (C) 225
   - (D) 212

6. How many triangles are there in the figure below?
   - (A) 5
   - (B) 6
   - (C) 8
   - (D) 10

7. Arrange the following words in a meaningful sequence:
   1. Selection
   2. Probation
   3. Interview
   4. Appointment
   5. Advertisement
   6. Application
   - (A) 2, 6, 3, 1, 5, 4
   - (B) 5, 6, 3, 1, 4, 2
   - (C) 5, 3, 1, 6, 4, 2
   - (D) 1, 6, 3, 5, 4, 2

8. 10 women can complete a work in 7 days and 10 children take 14 days to complete the work. How many days, will 5 women and 10 children take to complete the work?
   - (A) 7 days
   - (B) 5 days
   - (C) 6 days
   - (D) 4 days
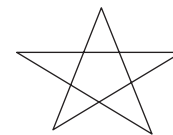
9. In a shop, there were 4 dolls of different heights A, B, C and D. D is neither as tall as A nor as short as C. B is shorter than D but taller than C. If Mini wants to purchase the tallest doll, which one should she purchase?

(A) Only A (B) Only D

(C) Either A or D (D) Either B or D

10. B is twice as old as A but two times younger than F. C is half the age of A but is two times elder than D. Which two persons form the pair of the oldest and youngest?

(A) B and C (B) F and A

(C) F and D (D) B and F

Section B (Subject Specific)

11. For any positive integers a and b, there exist unique integers q and r such that a = 3q + r, where r must satisfy.

(A) $0 \leq r < 3$ (B) $1 < r < 3$

(C) $0 < r < 3$ (D) $0 < r \leq 3$

12. The sum of the digits of a two-digit number is 5. Also, three times the original number is 1 more than the number obtained by reversing the digits. Find the number.

(A) 23 (B) 32

(C) 14 (D) 41

13. If the point (5,0), (0, −2) and (3,6) lie on the graph of a polynomial. Then which of the following is a zero of the polynomial?

(A) −2 (B) 5

(C) 6 (D) Not defined

14. Which term of the AP 21, 18, 15, 12, ... is zero?

(A) 7th term (B) 6th term

(C) 9th term (D) 8th term

15. Five years hence, the age of Neelam will be three times that of her daughter. Five years ago, Neelam's age was seven times that of her daughter. Find their present ages in terms of x and y respectively.

(A) x = 48, y = 12 (B) x = 37, y = 7

(C) x = 43, y = 13 (D) x = 40, y= 10

16. In the given figure, DE || BC, if BD = x − 3, AB = 2x, CE = x − 2 and AC = 2x + 3, then the value of x is _____.

(A) 6 (B) 7

(C) 8 (D) 9

17. If the area of a rectangle is 24 m² and its perimeter is 20 m, the equation to find its length and breadth would be:

(A) $x^2 - 10x - 24 = 0$ (B) $x^2 - 10x + 24 = 0$

(C) $x^2 + 10x + 28 = 0$ (D) $x^2 + 12x + 24 = 0$

18. If (a, b) is the mid-point of the line segment joining the points (10, −6) and (k, 4), and a − 2b = 18, then the value of k is _____.

(A) 11 (B) 22

(C) 33 (D) 44

19. A triangle is formed by the points 0(0, 0), A(5,0) and B(0,5). The number of points having integral coordinates (both x and y) and strictly inside the triangle is _____.
    (A) 6
    (B) 10
    (C) 16
    (D) 17

20. Three sides of a triangle are; a, $\sqrt{3a}$ and $\sqrt{2a}$, then the angle opposite to the largest side is _____.
    (A) 45°
    (B) 30°
    (C) 60°
    (D) 90°

21. If $\cos A + \cos^2 A = 1$, then find the value of $\sin^2 A + \sin^4 A$.
    (A) −1
    (B) 0
    (C) 1
    (D) None of these

22. Tangents PA and PB are drawn to the circle with centre O, if $\angle AOB = 105°$, then $\angle OPA$ is _____.
    (A) 75°
    (B) 105°
    (C) 52.5°
    (D) 37.5°

23. A man is standing on the deck of a ship, which is 8 m above water level. He observes the angle of elevation of the top of a hill as 60° and angle of depression of the base of the hill as 30°. What is the height of the hill?
    (A) 24 m
    (B) 8√3 m
    (C) 24√3 m
    (D) 32 m

24. ABC is a right-angled triangle with AC = 8 cm and AB = 6 cm. A circle is inscribed in a triangle, then diameter of the circle is _____.
    (A) 5 cm
    (B) 2 cm
    (C) 4 cm
    (D) 3 cm

25. An electric pole is tied from the top to a point (some distance away from the base) on the ground using a string. The ratio of the height of pole to the string is √3 : 2, then find the angle of elevation of the top from the point on the ground.
    (A) 30°
    (B) 45°
    (C) 60°
    (D) 90°

26. If (a, b) is the mid-point of the line segment joining the points (10, −6) and (k, 4), and a − 2b = 18, then the value of k is _____.
    (A) 11
    (B) 22
    (C) 33
    (D) 44

27. If 7 times the 7th term of an A.P. is equal to 11 times its 11th term, then what will be the value of the 18th term?
    (A) 0
    (B) 7
    (C) 11
    (D) 18

28. The cards bearing numbers 2, 3, 4, ..., 11 are kept in a bag. A card is drawn at random from the bag, the probability of getting a prime numbered card is _____.
    (A) $\dfrac{1}{2}$
    (B) $\dfrac{2}{5}$
    (C) $\dfrac{3}{10}$
    (D) $\dfrac{5}{9}$

29. The sum of first y terms of an AP is $Ay + By^2$ where A and B are constants. Find the common difference of this AP.
    (A) 2A
    (B) 2B
    (C) A − B
    (D) A + B

30. In the series, 9, 11, 33, 13, 15, 33, 17, ..., Which pair of numbers comes next?
    (A) 91, 33
    (B) 33, 35
    (C) 33, 19
    (D) 19, 21

31. In triangle PQR, length of the side QR is less than twice the length of the side PQ by 2 cm. Length of the side PR exceeds the length of the side PQ by 10 cm. The perimeter is 40 cm. What will be the length of the smallest side of the triangle PQR?
    (A) 7 cm
    (B) 8 cm
    (C) 9 cm
    (D) 10 cm

32. Two students separately add first eighty natural numbers but each of them made a mistake. The first one took 55 in place of 65 and the second one took 65 in place of 55. The difference between the results is _____.
    (A) 5 or –5
    (B) 10 or –10
    (C) 20 or –20
    (D) 30 or – 30

33. A circle is inscribed in a ΔABC having AB = 10cm, BC = 12cm and CA = 8cm and touching these sides at D, E, F respectively. What will be the lengths of AD, BE and CF respectively?
    (A) AD = 3cm, BE = 7cm, CF = 5cm
    (B) AD = 2cm, BE = 6cm, CF = 7cm
    (C) AD = 4cm, BE = 6cm, CF = 8cm
    (D) AD = 5cm, BE = 9cm, CF = 4cm

34. A kite is flying at a height of 30 m from the ground and the angle of elevation formed is 30°. Assuming that there is no slack in the string, the length of the string from the kite to the ground is _____.
    (A) 60 m
    (B) 45 m
    (C) 40 m
    (D) 50 m

35. It is proposed to build a single circular park equal in area to the sum of areas of two circular parks of diameters 16 m and 12 m in a locality. What would be the radius of the new park?
    (A) 10 m
    (B) 12 m
    (C) 18 m
    (D) 21 m

Instruction: Q. 36 to 40 are two-key based questions having four options A, B, C and D out of which TWO are correct.

36. Any positive even integer is of the form _____.
    (A) $4m$
    (B) $4m + 1$
    (C) $4m + 2$
    (D) $4m + 3$

37. Find the surface area as well as the cost of painting a cubical box of side 3m at the rate of ₹2 per square metre.
    (A) 54 m²
    (B) 56 m²
    (C) ₹108
    (D) ₹112

38. Two quadratic polynomials, one of whose zeros is $\sqrt{5}$ and the product of zeros is $-2\sqrt{5}$, are _____ and _____.
    (A) $x^2 + \left(2 - \sqrt{5}\right)x - 2\sqrt{5}$
    (B) $k\left\{x^2 - \left(\sqrt{5} - 2\right)x - 2\sqrt{5}\right\}$
    (C) $x^2 - \left(2 - \sqrt{5}\right)x + 2\sqrt{5}$
    (D) $x^2 - \left(2 - \sqrt{5}\right)x - 2\sqrt{5}$

39. The median of a set of 9 distinct observations is 21. If each of the largest 4 observations of the set is increased by 9, then find the median of the new set. What will be the increase in new mean?
    (A) Median becomes two times of the original number.
    (B) Median remains the same as that of the original set.
   (C) Mean is increased by 4.
    (D) Mean is increased by 9.

40. A canal is 3 m wide and 1.2 m deep. The water in the canal is flowing with a speed of 20,000 m/hr. How much area will it irrigate in half an hour, if 8 cm of standing water is desired?

    (A) 45 hectares   (B) 4.5×105 m^2
    (C) 35 hectares   (D) 3.5×105 m^2

Section C (Competency Enhancement)

Read the following description and observe the factor tree given below, and then answer the questions 41 & 42 accordingly:

A Mathematics Exhibition is being conducted in your school, and one of your friends is making a model of a factor tree. He has some difficulty and asks for your help in completing a quiz for the audience.
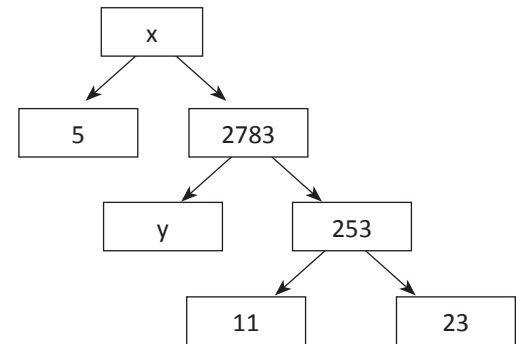
41. What will be the value of x?

    (A) 13915   (B) 15005
    (C) 17429   (D) 56920

42. What will be the value of y?

    (A) 11   (B) 19
    (C) 22   (D) 23

Read the following description and answer the questions 43 to 45:

Rashmi wants to measure the distance of a park during the visit to her village. She marks points A and B on the opposite edges of the park as shown in the figure below. To find the distance between the points, she makes a right-angled triangle using rope connecting B with another point C at a distance of 12m, connecting C to point D at a distance of 40m and the connecting D to the point A which is at a distance of 30m and has the $\angle ADC= 90°$.
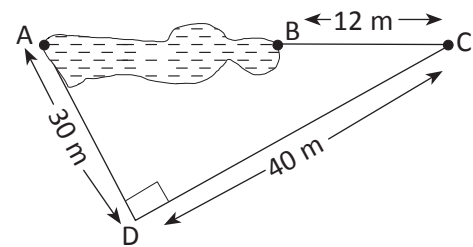
43. Which property of geometry will be used to find the distance AC?

    (A) Pythagoras Theorem   (B) Area of similar triangles
    (C) Thales Theorem   (D) Similarity of triangles

44. What is the distance AB?

    (A) 12m   (B) 38m
    (C) 50m   (D) 100m

45. Find the length of the rope used.

    (A) 22m   (B) 70m
    (C) 82m   (D) 120m

Study the text given below and answer the questions 46 and 47.

Sum to n terms of an AP is given by $S_n = \dfrac{n}{2}\big(2a+(n-1)d\big)$ OR $S_n = \dfrac{n}{2}(a+l)$

When a is the first term, d is the common difference and l is the last term.

46. The value of $\displaystyle\sum_{k=1}^{15}(2k-3)$ is

    (A) 420   (B) 390
    (C) 210   (D) 195

47. If the sums of n, 2n and 3n terms of an AP are S_1, S_2 and S_3 respectively, then $\dfrac{S_3}{S_2 - S_1}$ is
    (A) 3 (B) 2
    (C) 1 (D) 0

    Study the text given below and answer the following question:

    The distance between the points $P(x_1, y_1)$ and $Q(x_2, y_2)$ is

 $PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

    It is called the distance formula.

48. Find the radius of the circle, if the end points of diameter of circle are (2, 4) and (−3, −1).
    (A) $5\sqrt{2}$ (B) $3\sqrt{2}$
    (C) $\pm\dfrac{5\sqrt{2}}{2}$ (D) $\dfrac{5\sqrt{2}}{2}$

Read the given information and answer the following PISA based questions:

49. A water tank has shape and dimensions as shown in the diagram. At the beginning, the tank is empty, then it is filled with water at the rate of one litre per second.

    Which of the following graphs shows how the height of the water surface changes over time?

    (A)

    (B)

    (C)

    (D)
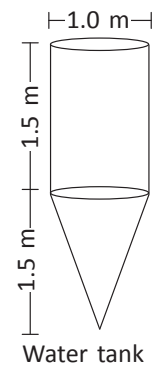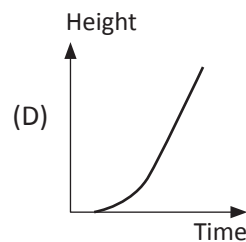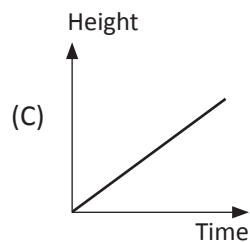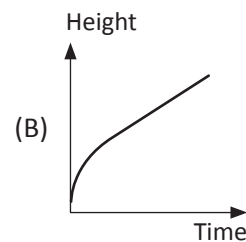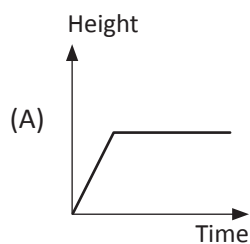
50. A documentary was broadcast about earthquakes and how often earthquakes occur. It included a discussion about the predictability of earthquakes. A geologist stated: "In the next twenty years, the chance that an earthquake will occur in Zed City is two out of three."

    Which of the following best reflects the meaning of the geologist's statement?

    (A) $\dfrac{2}{3} \times 20 = 13.3$, so between 13 and 14 years from now there will be an earthquake in Zed City.

    (B) $\dfrac{2}{3}$ is more than $\dfrac{1}{2}$, so you can be sure there will be an earthquake in Zed city at some time during the next 20 years.

    (C) The likelihood that there will be an earthquake in Zed City at some time during the next 20 years is higher than the likelihood of no earthquake.

    (D) You cannot tell what will happen, because nobody can be sure when an earthquake will occur.