क्रम संख्या **1063836**

टी. बी. सी. : **JNBY-D-MTK**

परीक्षण पुस्तिका अनुक्रम

D

परीक्षण पुस्तिका

प्रारम्भिक गणित

समय : *दो घण्टे*

पूर्णांक : 100

अनुदेश

1. परीक्षा प्रारम्भ होने के तुरन्त बाद, आप इस परीक्षण पुस्तिका की पड़ताल अवश्य कर लें कि इसमें कोई बिना छपा, फटा या छूटा हुआ पृष्ठ अथवा प्रश्नांश, आदि *न* हो । यदि ऐसा है, तो इसे सही परीक्षण पुस्तिका से बदल लीजिए ।

2. कृपया ध्यान रखें कि OMR उत्तर-पत्रक में, उचित स्थान पर, रोल नम्बर और परीक्षण पुस्तिका अनुक्रम A, B, C या D को, ध्यान से एवं बिना किसी चूक या विसंगति के भरने और कूटबद्ध करने की ज़िम्मेदारी उम्मीदवार की है । किसी भी प्रकार की चूक/विसंगति की स्थिति में उत्तर-पत्रक निरस्त कर दिया जाएगा ।

3. इस परीक्षण पुस्तिका पर साथ में दिए गए कोष्ठक में आपको अपना अनुक्रमांक लिखना है । परीक्षण पुस्तिका पर *और कुछ न* लिखें ।

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4. इस परीक्षण पुस्तिका में 100 प्रश्नांश (प्रश्न) दिए गए हैं । प्रत्येक प्रश्नांश *हिन्दी* और *अंग्रेज़ी* दोनों में छपा है । प्रत्येक प्रश्नांश में चार प्रत्युत्तर (उत्तर) दिए गए हैं । इनमें से एक प्रत्युत्तर को चुन लें, जिसे आप उत्तर-पत्रक पर अंकित करना चाहते हैं । यदि आपको ऐसा लगे कि एक से अधिक प्रत्युत्तर सही हैं, तो उस प्रत्युत्तर को अंकित करें जो आपको सर्वोत्तम लगे । प्रत्येक प्रश्नांश के लिए *केवल एक ही* प्रत्युत्तर चुनना है ।

5. आपको अपने सभी प्रत्युत्तर अलग से दिए गए उत्तर-पत्रक पर *ही* अंकित करने हैं । उत्तर-पत्रक में दिए गए निर्देश देखिए ।

6. *सभी* प्रश्नांशों के अंक समान हैं ।

7. इससे पहले कि आप परीक्षण पुस्तिका के विभिन्न प्रश्नांशों के प्रत्युत्तर उत्तर-पत्रक पर अंकित करना शुरू करें, आपको प्रवेश प्रमाण-पत्र के साथ प्रेषित अनुदेशों के अनुसार कुछ विवरण उत्तर-पत्रक में देने हैं ।

8. आप अपने सभी प्रत्युत्तरों को उत्तर-पत्रक में भरने के बाद तथा परीक्षा के समापन पर *केवल उत्तर-पत्रक* अधीक्षक को सौंप दें । आपको अपने साथ परीक्षण पुस्तिका ले जाने की अनुमति है ।

9. कच्चे काम के लिए पत्रक, परीक्षण पुस्तिका के अंत में संलग्न हैं ।

10. **ग़लत उत्तरों के लिए दण्ड :**
    वस्तुनिष्ठ प्रश्न-पत्रों में उम्मीदवार द्वारा दिए गए ग़लत उत्तरों के लिए दण्ड दिया जाएगा ।

    (i) प्रत्येक प्रश्न के लिए चार वैकल्पिक उत्तर हैं । उम्मीदवार द्वारा प्रत्येक प्रश्न के लिए दिए गए एक ग़लत उत्तर के लिए प्रश्न हेतु नियत किए गए अंकों का **एक-तिहाई** दण्ड के रूप में काटा जाएगा ।

    (ii) यदि कोई उम्मीदवार एक से अधिक उत्तर देता है, तो इसे **ग़लत उत्तर** माना जाएगा, यद्यपि दिए गए उत्तरों में से एक उत्तर सही होता है, फिर भी उस प्रश्न के लिए उपर्युक्तानुसार ही उसी तरह का दण्ड दिया जाएगा ।

    (iii) यदि उम्मीदवार द्वारा कोई प्रश्न हल नहीं किया जाता है, अर्थात् उम्मीदवार द्वारा उत्तर नहीं दिया जाता है, तो उस प्रश्न के लिए **कोई दण्ड नहीं** दिया जाएगा ।

Note : English version of the instructions is printed on the back cover of this Booklet.

*For the next **ten** (10) items that follow :*

Each item contains a Question followed by two Statements. Answer each item using the following instructions :

(a) Choose this option if the Question can be answered by one of the Statements alone but not by the other.

(b) Choose this option if the Question can be answered by either Statement alone.

(c) Choose this option if the Question can be answered by using both the Statements together, but cannot be answered by using either Statement alone.

(d) Choose this option if the Question cannot be answered even by using both Statements together.

1. A number 277XY5 (where X, Y are digits) is divisible by 25.

Question : What is the value of X ?

Statement I : The given number is divisible by 9.

Statement II : X > 5.

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(3 – D)

2. *Question :* What are the unique values of a, b and c if 2 is a root of the equation $ax^2 + bx + c = 0$?

Statement I : Ratio of c to a is 1.

Statement II : Ratio of b to a is $(-5/2)$.

3. *Question :* Is m > n, where m, n are non-zero numbers ?

Statement I : $\dfrac{m}{n} > 1$.

Statement II : m > 2n.

4. *Question :* Can a circle be drawn through the points A, B and C ?

Statement I : AB = 5 cm, BC = 5 cm, CA = 6 cm.

Statement II : AB = 3 cm, BC = 4 cm, CA = 7 cm.
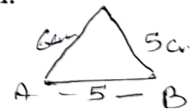
5. x and y are consecutive odd integers.

Question : Can the value of (x + y) be determined uniquely ?

Statement I : $(x + y)^4 = 256$.

Statement II : $(x + y)^3 < 16$.

6. *Question :* Is $p^2 + q^2 + q$ odd, where p, q are positive integers ?

Statement I : $2p + q$ is odd.

(c)

Statement II : $q - 2p$ is odd.

7. *Question :* What is the area of the circle C ?

Statement I : An arc of length 7 cm subtends an angle 30° at the centre of C.

(a)

Statement II : A chord of length 10 cm subtends an angle 90° at the centre of C.

8. *Question :* Is triangle Δ right angled ?

Statement I : The length of the line segment joining the mid-points of two sides of Δ is half of the third side of Δ.

(a)

Statement II : The angles of Δ are in the ratio 1 : 2 : 3.

9. The lengths of two longer sides of the triangle Δ are 25 cm and 24 cm.

Question : What is the length of the shortest side ?

Statement I : The angles of Δ are in the ratio 1 : 2 : 3.

(a)

Statement II : The length of the perpendicular drawn on the longest side of Δ from its opposite vertex is 6·72 cm.

$\dfrac{\sqrt{3}}{2} =$

10. A chord PQ of the circle C divides it into two segments such that 3 times the area of the major segment is 4 times the area of the minor segment.

Question : What is the radius of C ?

Statement I : Area of the minor segment is 66 square cm.

Statement II : Area of the major segment is 88 square cm.

(c)

11. What is the area of the circle (approximately) inscribed in a triangle with side lengths 12 cm, 16 cm and 20 cm ?

(a) 48 square cm

(b) 50 square cm

(c) 52 square cm

(d) 54 square cm

12. Two times the total surface area of a solid right circular cylinder is three times its curved surface area. If h is the height and r is the radius of the base of the cylinder, then which one of the following is correct ?

(a) $h = r$

(b) $h = 2r$

(c) $2h = 3r$

(d) $3h = 4r$

13. A floor of a big hall has dimensions 30 m 60 cm and 23 m 40 cm. It is to be paved with square tiles of same size. What is the minimum number of tiles required ?

(a) 30

(b) 36

(c) 169

(d) 221

14. How long will a man take to walk around the boundary of a square field of area 25 hectares at the rate of 5 km/hr ?

(a) 36 minutes

(b) 30 minutes

(c) 24 minutes

(d) 18 minutes

15. Let x be the area of a square inscribed in a circle of radius r and y be the area of an equilateral triangle inscribed in the same circle. Which one of the following is correct ?

(a) $9x^2 = 16y^2$

(b) $27x^2 = 64y^2$

(c) $36x^2 = 49y^2$

(d) $16x^2 = 21y^2$

16. If the length of a rectangle is increased by $66\frac{2}{3}\%$, then by what percent should the width of the rectangle be decreased in order to maintain the same area ?

(a) 50%

(b) 45%

(c) 40%

(d) 35%

17. What is the maximum area that can be covered by three non-intersecting circles drawn inside a rectangle of sides 8 cm and 12 cm ?

(a) 16π square cm

(b) 18π square cm

(c) 20π square cm

(d) 24π square cm

8. ABCD is a square field with AB = x. A vertical pole OP of height 2x stands at the centre O of the square field. If ∠APO = θ, then what is cot θ equal to ?

(a) $\sqrt{2}$

(b) 2

(c) $2\sqrt{2}$

(d) $3\sqrt{2}$
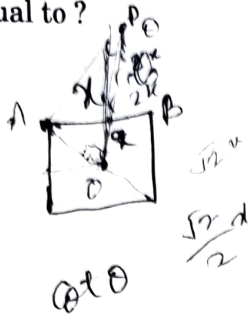
19. A solid iron ball is melted and 64 smaller solid balls of equal size are made using the entire volume of iron. What is the ratio of the surface area of the larger ball to the sum of the surface areas of all the smaller balls ?

(a) 0·25

(b) 0·5

(c) 0·75

(d) 1

20. A triangle ABC has been divided into four smaller triangles P, Q, R, S whose perimeters are 16 cm, 12 cm, 4 cm and 12 cm respectively. P, R and S contain the vertices A, B and C respectively. What is the perimeter of the triangle ABC ?

(a) 18 cm

(b) 20 cm

(c) 22 cm

(d) 24 cm

Consider the following data for the next two (02) items that follow :

Class	0 – 30	30 – 60	60 – 90	90 – 120
Frequency	4	5	7	4

21. What is the mode of the distribution ?

(a) 60

(b) 72

(c) 75

(d) 80

22. If the median (P) and mode (Q) satisfy the relation 7(Q – P) = 9R, then what is the value of R ?

(a) 6

(b) 5

(c) 3

(d) 1

Consider the following data for the next two (02) items that follow :

Class	40 – 50	50 – 60	60 – 70	70 – 80
Frequency	4	3	1	2

23. What is the mean of the distribution ?

(a) 51

(b) 52

(c) 54

(d) 56

(9 – D)

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24. If M is the median, then what is the value of 3M ?

(a) $53\frac{1}{3}$

(b) 60

(c) 160

(d) 180

25. The plinth of a house has an area of 200 square metres. It is rectangular in shape and its length and breadth are in the ratio 2 : 1. The owner of the house extends the terrace by 1 m on each side. What is the percentage of area that has increased in the terrace relative to the plinth ?

(a) 40%

(b) 32%

(c) 20%

(d) 15·5%

26. A square sheet of side length 44 cm is rolled along one of its sides to form a cylinder by making opposite edges just to touch each other. What is the volume of the cylinder ? (Take $\pi = \frac{22}{7}$)

(a) 6776 cubic cm

(b) 6248 cubic cm

(c) 5896 cubic cm

(d) 5680 cubic cm

27. The volume of a cuboid is 3600 cubic cm. The areas of two adjacent faces are 225 square cm and 144 square cm. What is the area of the other adjacent face ?

(a) 400 square cm

(b) 360 square cm

(c) 320 square cm

(d) 300 square cm

28. The perimeter and the area of a right-angled triangle are 36 cm and 54 square cm respectively. What is the length of the hypotenuse ?

(a) 12 cm

(b) 14 cm

(c) 15 cm

(d) 16 cm

29. Let
X = {x | x = 2 + 4k, where k = 0, 1, 2, 3, ... 24}.
Let S be a subset of X such that the sum of no two elements of S is 100. What is the maximum possible number of elements in S ?

(a) 10

(b) 11

(c) 12

(d) 13

30. The perimeter of a sector of a circle of radius 5·2 cm is 16·4 cm. What is the area of the sector ?

(a) 15·6 square cm

(b) 15 square cm

(c) 14·4 square cm

(d) 14·1 square cm

31. What is the value of $\dfrac{\cos^2 32° + \cos^2 58°}{\sec^2 50° - \cot^2 40°} +$

$\qquad 4 \tan 13° \tan 37° \tan 53° \tan 77°$?

(a)   2

(b)   3

(c)   4

(d)   5

32. What is the value of

$(1 + \cot^2 \theta)(1 + \cos \theta)(1 - \cos \theta) -$

$\qquad (1 + \tan^2 \theta)(1 + \sin \theta)(1 - \sin \theta)$?

(a) -1

(b)   0

(c)   1

(d)   2

33. If $2 \cos^2 \theta + \sin \theta - 2 = 0$, $0 < \theta \le \dfrac{\pi}{2}$, then what is the value of θ ?

(a) $\dfrac{\pi}{6}$

(b) $\dfrac{\pi}{4}$

(c) $\dfrac{\pi}{3}$

(d) $\dfrac{\pi}{2}$

34. A person on the top of a vertical tower observes a car moving at a uniform speed coming directly towards it. If it takes 6 minutes for the angle of depression to change from 30° to 45°, and further t minutes to reach the tower, which one of the following is correct ?

(a) $7.7 < t < 8$

(b) $8 < t < 8.3$

(c) $8.3 < t < 8.6$

(d) $8.6 < t < 8.9$

35. A woman is standing on the deck of a ship, which is h (in metres) above water level. She observes the angle of elevation of the top of a tower as 60° and the angle of depression of the base of the tower as 30°. What is the height of the tower ?

(a)   2h

(b)   3h

(c)   4h

(d)   5h

36. Let ABC be a right-angled triangle with sides 5 cm, 12 cm and 13 cm. If p is the length of the perpendicular drawn from vertex A on the hypotenuse BC, then what is the value of 13p ?

(a)   24

(b)   48

(c)   60

(d)   90
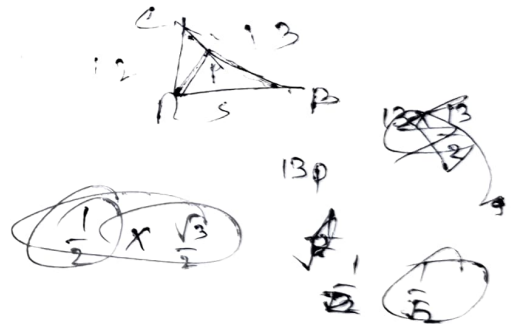
37. OABC is a rhombus whose three vertices lie on a circle with centre at O. If the area of the rhombus is $32\sqrt{3}$ square cm, then what is the radius of the circle ?

(a)   4 cm

(b)   6 cm

(c)   8 cm

(d)   16 cm

(13 – D)

38. The surface area of a cube is increased by 25%. If p is the percentage increase in its length, then which one of the following is correct ?

(a) $16 < p < 18$

(b) $14 < p < 16$

(c) $12 < p < 14$

(d) $10 < p < 12$

39. A solid cube is cut into two cuboids of equal volume. What is the ratio of total surface area of the given cube to that of one of the cuboids ?

(a) $2 : 1$

(b) $3 : 2$

(c) $4 : 3$

(d) $5 : 3$

40. The length of a diagonal of a cuboid is 11 cm. The surface area is 240 square cm. What is the sum of its length, breadth and height ?

(a) 16 cm

(b) 17 cm

(c) 18 cm

(d) 19 cm

*Consider the following for the next **three (03)** items that follow :*

In the triangle ABC, AB = 6 cm, BC = 8 cm and AC = 10 cm. The perpendicular dropped from B meets the side AC at D. A circle of radius BD (with centre B) cuts AB and BC at P and Q respectively as shown in the figure.
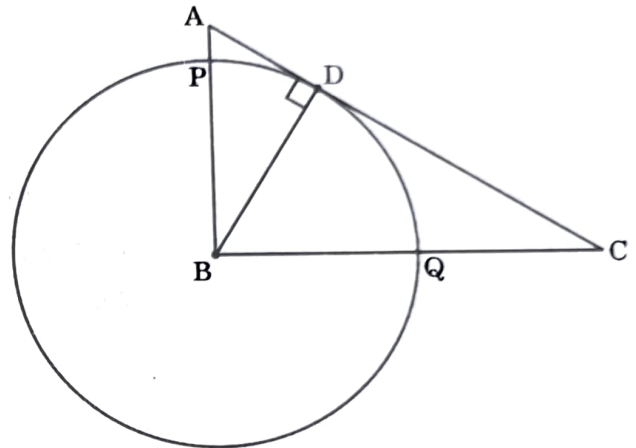
41. What is the length of QC ?

(a) 4·4 cm

(b) 4·2 cm

(c) 3·6 cm

(d) 3·2 cm

42. If $\angle ABD = \theta$, then what is $\sin \theta$ equal to ?

(a) 0·4

(b) 0·5

(c) 0·6

(d) 0·8

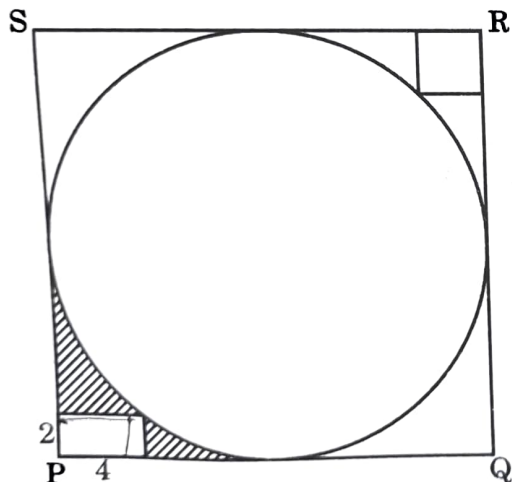**43.** What is the radius of the circle ?

  (a)   5 cm

  (b)   4·8 cm

  (c)   4·4 cm

  (d)   4 cm

*Consider the following for the next **three (03)** items that follow :*

In the figure given below, a circle is inscribed in a square PQRS. A rectangle at the corner P that measures 4 cm × 2 cm and a square at the corner R are drawn.

44. What is the area of the circle ?

  (a) 100π square cm

  (b) 96π square cm

  (c) 50π square cm

  (d) 48π square cm

45. What is the area of the smaller square ?

  (a) $50\,(3 - \sqrt{2}\,)$ square cm

  (b) $25\,(3 - 2\sqrt{2}\,)$ square cm

  (c) $25\,(3 + 2\sqrt{2}\,)$ square cm

  (d) $50\,(3 - 2\sqrt{2}\,)$ square cm

46. What is the area of the shaded region ?

  (a) $(96 - 25\pi)$ square cm

  (b) $(92 - 25\pi)$ square cm

  (c) $(96 - 16\pi)$ square cm

  (d) $(92 - 16\pi)$ square cm

*Consider the following for the next **two (02)** items that follow :*

In the following figure, a rectangle ABCD is inscribed in a circle of radius r. Given $\angle\,DAE = 30°$ and $\angle\,ACD = 30°$.
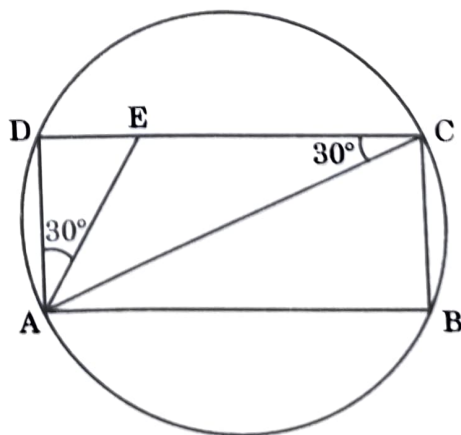
47. What is the ratio of the area of the circle to the area of the rectangle ?

(a) $\dfrac{\pi}{\sqrt{2}}$

(b) $\dfrac{\pi}{\sqrt{3}}$

(c) $\dfrac{2\pi}{\sqrt{3}}$

(d) $\dfrac{3\pi}{\sqrt{2}}$

48. What is the area of $\triangle$ AEC ?
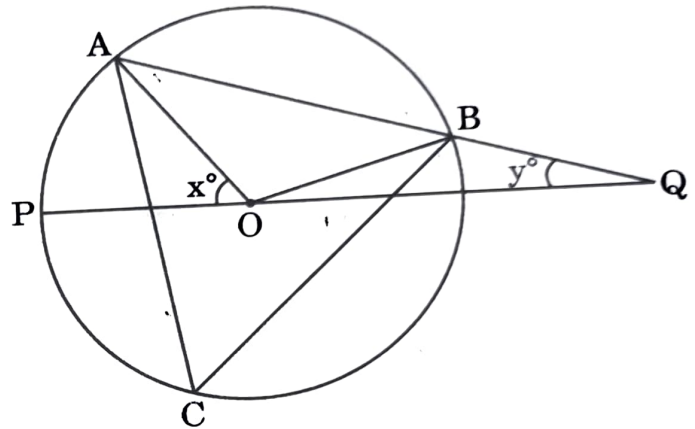
(a) $\dfrac{r^2}{\sqrt{3}}$

(b) $\dfrac{r^2}{2\sqrt{3}}$

(c) $\dfrac{r^2}{3\sqrt{3}}$

(d) $\dfrac{2r^2}{\sqrt{3}}$

*Consider the following for the next **two** (02) items that follow :*

In the following figure, a triangle ABC is inscribed in a circle with centre at O. Let $\angle$ POA $= x°$ and $\angle$ OQB $= y°$. Further, OB = BQ.

49. What is the relation between x and y ?

(a) $x = y$

(b) $2x = 3y$

(c) $x = 3y$

(d) $3x = 4y$

50. If y = 15, then what is $\angle$ ACB equal to ?

(a) 30°

(b) 40°

(c) 45°

(d) 60°

51. What is the largest number which divides both $2^{35} - 1$ and $2^{91} - 1$?

(a)   34

(b)   90

(c)   127

(d)   129

52. What is the largest power of 10 that divides the product $29 \times 28 \times 27 \times \ldots 2 \times 1$?

(a)   4

(b)   5

(c)   6

(d)   7

53. What is the remainder when 65^{99} is divided by 11 ?

(a)   0

(b)   5

(c)   9

(d)   10

54. If the roots of the equation $x^2 - bx + c = 5$ differ by 5, then which one of the following is correct ?

(a) $b^2 = 4c + 5$

(b) $c^2 = 4b - 5$

(c) $b^2 + c^2 = 5$

(d) $b^2 - c^2 = 5$

55. In a party of 150 persons, 75 persons take tea, 60 persons take coffee and 50 persons take milk. 15 of them take both tea and coffee, but no one taking milk takes tea. If each person in the party takes at least one drink, then what is the number of persons taking milk only ?

(a)   50

(b)   40

(c)   30

(d)   20

56. A, B, C, D and E enter into a business. They invest money in the ratio 2 : 3 : 4 : 5 : 6. However, the time invested by them is in the ratio 6 : 5 : 4 : 3 : 2. If the profit distributed is directly proportional to time and money invested, then who receives the highest amount of profit ?

(a)   C

(b)   Both B and D

(c)   Both C and D

(d)   All get equal profit

57. Consider the following numbers :

1.   437

2.   797

3.   1073

How many of the above numbers are prime ?

(a)   Only one

(b)   Only two

(c)   All three

(d)   None

58. A can do a certain work at twice the speed of B. Further, B can do the same work at 1·5 times the speed of C. All of them together can finish the work in 12 days. In how many days can C alone finish the work ?

(a) 36 days

(b) 45 days

(c) 60 days ✓

(d) 66 days

59. The sum of digits of a 2-digit number is 12. When the digits are reversed, the number becomes greater by eighteen. What is the difference between the digits in the number ?

(a) 1

(b) 2

(c) 3 ✓

(d) 4

60. The time taken by a train to cross a man travelling in another train is 10 seconds, when the other train is travelling in the opposite direction. However, it takes 20 seconds, if both the trains are travelling in the same direction. The length of the first train is 200 m and that of the second train is 150 m. What is the speed of the first train ?

(a) 60 km/hr ✓

(b) 56 km/hr

(c) 54 km/hr

(d) 52 km/hr

61. If α and β are the roots of the equation $x^2 - 7x + 1 = 0$, then what is the value of $\alpha^4 + \beta^4$?

(a) 2207

(b) 2247

(c) 2317

(d) 2337 ✓

62. Consider the following statements in respect of all factors of 360 :

1. The number of factors is 24.

2. The sum of all factors is 1170.

Which of the above statements is/are correct ?

(a) 1 only ✓   *360*

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

63. Consider a 6-digit number of the form XYXYXY. The number is divisible by :

(a) 3 and 7 only

(b) 7 and 13 only

(c) 3, 13 and 37 only ✓

(d) 3, 7, 13 and 37

64. What is the HCF of $3^{29} - 9$ and $3^{38} - 9$?

    (a) $3^9 - 1$

    (b) $3^{11} - 1$

    (c) $3^{11} - 3$

    (d) $3^{11} - 9$

65. If $x = \sqrt{4\sqrt{4\sqrt{4\sqrt{4 \ldots}}}}$, then what is the value of x ?

    (a)   2

    (b)   4

    (c)   8

    (d)   16

66. Let m and n be natural numbers. What is the minimum value of (m + n) such that 33m + 22n is divisible by 121 ?

    (a)   3

    (b)   4

    (c)   5

    (d)   10

67. The product of two numbers is 2160 and their HCF is 12. If the sum of the squares of the two numbers is 4896, then what is the mean of the two numbers ?

    (a)   24

    (b)   36

    (c)   48

    (d)   96

68. The age of Q exceeds the age of P by 3 years. The age of R is twice the age of P and the age of Q is twice the age of S. Further, the age difference of R and S is 30 years. What is the sum of the ages of P and Q ?

    (a)   35 years

    (b)   38 years

    (c)   39 years

    (d)   45 years

69. If a, b and c are the sides of a triangle ABC, then $\sqrt{a} + \sqrt{b} - \sqrt{c}$ is always :

    (a)   Negative

    (b)   Positive

    (c)   Non-negative

    (d)   Non-positive

70. There are four bells which ring at an interval of 15 minutes, 25 minutes, 35 minutes and 45 minutes respectively. If all of them ring at 9 A.M., how many more times will they ring together in the next 72 hours ?

    (a)   0

    (b)   1

    (c)   2

    (d)   3

71. If a, b, c, d, e and f satisfy

2a = 3b = 6c = 9d = 12e = 18f, then what is the value of (a + b)/(c + d + e + f) ?

(a) 4/7

(b) 2

(c) 5/2

(d) 9/2

72. If a, b, c are non-zero real numbers such that a + b + c = 0, then what are the roots of the equation $ax^2 + bx + c = 0$?

(a) 2, 1 + (c/a)

(b) 1, a/c

(c) 1, c/a

(d) 2, (c/a) – 1

73. Twelve percent of bananas bought by a fruit vendor got lost during transportation. On selling the remaining bananas, the vendor's overall profit turned out to be 4%. If the vendor had not lost any bananas and had sold them at the price of the remaining bananas, what would have been his profit percentage ?

(a) $8\dfrac{1}{9}$ %

(b) $9\dfrac{1}{11}$ %

(c) $18\dfrac{2}{11}$ %

(d) None of the above

74. If the positive square root of $(5 + 3\sqrt{2})(5 - 3\sqrt{2})$ is α, then what is the positive square root of $8 + 2\alpha$?

(a) $2 + \sqrt{3}$

(b) $3 - \sqrt{2}$

(c) $\sqrt{7} - 1$

(d) $\sqrt{7} + 1$

75. When every even power of every odd integer (greater than 1) is divided by 8, what is the remainder ?

(a) 3

(b) 2

(c) 1

(d) The remainder is not necessarily 1.

76. Consider the following statements :

1. If n is a natural number, then the number $\dfrac{n(n^2 + 2)}{3}$ is also a natural number.

2. If m is an odd integer, then the number $\dfrac{m^4 + 4m^2 + 11}{16}$ is an integer.

Which of the statements given above is/are correct ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

77. It is given that 5 does not divide n − 1, n and n + 1, where n is a positive integer. Which one of the following is correct ?

(a) 5 divides $(n^2 + 1)$

(b) 5 divides $(n^2 − 1)$

(c) 5 divides $(n^2 + n)$

(d) 5 divides $(n^2 − n)$

78. What is the largest 5-digit number, which leaves remainder 7, when divided by 18 as well as by 11 ?

(a) 99981

(b) 99988

(c) 99997

(d) 99999

79. In a business dealing, A owes B ₹ 20,000 payable after 5 years, whereas B owes A ₹ 12,000 payable after 4 years. They want to settle it now at the rate of 5% simple interest. Who gives how much money in this settlement ?

(a) Both are at par

(b) B gives ₹ 6,000 to A

(c) A gives ₹ 6,000 to B

(d) A gives ₹ 4,000 to B

80. Average marks in Mathematics of Section A comprising 30 students is 65 and that of Section B comprising 35 students is 70. What are the average marks (approximately) of both the sections if it was detected later that an entry of 47 marks was wrongly made as 74 ?

(a) 67·28

(b) 67·58

(c) 68·11

(d) 68·63

81. What is the difference between simple interest and compound interest on ₹ 10,000 for two years at 20% per annum compounded half-yearly ?

(a) ₹ 842

(b) ₹ 756

(c) ₹ 641

(d) ₹ 542

82. Consider the following statements in respect of the polynomial $a(b − c)(x − b)(x − c) + b(c − a)(x − c)(x − a) + c(a − b)(x − a)(x − b)$:

1. The coefficient of x^2 is 0.

2. The coefficient of x is $(a − b)(b − c)(c − a)$.

Which of the statements given above is/are correct ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

83. Consider the following statements in respect of the polynomial $1 - x - x^n + x^{n+1}$, where n is a natural number :

1. It is divisible by $1 - 2x + x^2$.

2. It is divisible by $1 - x^n$.

Which of the statements given above is/are correct ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

84. For what values of m, is $mx^2 + mx + 8x + 9$ a perfect square ?

(a) 1, 4

(b) 4, 9

(c) 9, 16

(d) 4, 16

85. If $x = a + b + \dfrac{(a-b)^2}{4a+4b}$ and $y = \dfrac{a+b}{4} + \dfrac{ab}{a+b}$, then what is the value of $(x-a)^2 - (y-b)^2$?

(a) a^2

(b) b^2

(c) ab

(d) $a^2 b^2$

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86. Consider the following :

1. $\cos^4\theta - \sin^4\theta = \dfrac{2\tan\theta}{1-\tan^2\theta}$, $0 < \theta < \dfrac{\pi}{2}$

2. $\operatorname{cosec}\theta + \cot\theta = \dfrac{1}{\operatorname{cosec}\theta - \cot\theta}$, $0 < \theta < \dfrac{\pi}{2}$

3. $\cos^2\theta - \sin^2\theta = \dfrac{1-\tan^2\theta}{1+\tan^2\theta}$, $0 < \theta < \dfrac{\pi}{2}$

Which of the above equations are identities ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

87. If $\sin\theta = \dfrac{12}{13}$, then what is the value of $(\tan\theta + \sec\theta)^2 (\operatorname{cosec}\theta - \cot\theta)^{-2}$, $0 < \theta < \dfrac{\pi}{2}$?

(a) $\dfrac{121}{4}$

(b) $\dfrac{169}{9}$

(c) $\dfrac{196}{9}$

(d) $\dfrac{225}{4}$

(31 – D)

88. If $\tan^8 \theta + \cot^8 \theta = m$, then what is the value of $\tan \theta + \cot \theta$?

(a) $\sqrt{\sqrt{m+2}+2}$

(b) $\sqrt{\sqrt{\sqrt{m+4}+2}}$

(c) $\sqrt{\sqrt{\sqrt{m+2}+2}+2}$

(d) $\sqrt{\sqrt{\sqrt{m+4}+2}+2}$

89. What is the minimum value of $6 - 4 \sin \theta$, $0 \le \theta \le \dfrac{\pi}{2}$?

(a) 1

(b) 2

(c) 4

(d) 6

6 - 4 sin θ

90. What is the value of x that satisfies

$4 \cos^2 30° + 2x \sin 30° - \cot^2 30° - 6 \tan 15° \tan 75° = 0$?

(a) 1

(b) 2

(c) 3

(d) 6

$4 \times \frac{3}{4} + 2x \times \frac{1}{2} - 3$

$12 + x - 9$

91. Let a, b, c and d be four positive integers such that $a + b + c + d = 200$. If $S = (-1)^a + (-1)^b + (-1)^c + (-1)^d$, then what is the number of possible values of S ?

(a) One

(b) Two

(c) Three

(d) Four

a b c d

0, 1, 2, 3, 4

92. The number $97^{30} - 14^{30}$ is divisible by :

(a) 37 but not 83

(b) 83 but not 37

(c) Both 37 and 83

(d) Neither 37 nor 83

$x^b + y^b$

93. Consider the following statements :

1. $\log_{10} 50$ is a rational number.

2. $\log_{100} 10$ is an irrational number.

Which of the statements given above is/are correct ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

$\log_{10} \times \log_{10} 5$

(33 – D)

4. If 17 women and 24 men can do a piece of work in 5 days and 12 women and 23 men can do it in 6 days, then which one of the following is correct ?

(a) Efficiency of 13 women = Efficiency of 18 men

(b) Efficiency of 11 women = Efficiency of 16 men

(c) Efficiency of 13 women = Efficiency of 17 men

(d) Efficiency of 11 women = Efficiency of 15 men

$17w + 24m = 6$

$12w + 23m = 5$

95. Three taps A, B and C together can fill a tank in 6 hours. Tap C alone can fill the tank in 12 hours. To fill the tank, when it is empty, all the three taps are started together. After working t hours, tap C is closed and the tank is filled in 8 more hours. What is t equal to ?

(a) 1

(b) 2

(c) 4

(d) 6
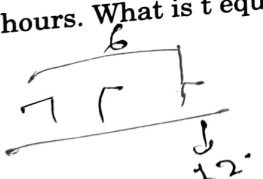
96. A, B and C can complete a work in x, 1·5x and 2x days respectively. If they complete the work together, in what ratio should they be paid ?

(a) 2 : 3 : 4

(b) 6 : 4 : 3

(c) 3 : 2 : 1

(d) 4 : 3 : 2

$1 \quad \frac{3}{2} \quad 2$

$x \quad 1.5x \quad 2x$

$S = \frac{\Omega}{T}$
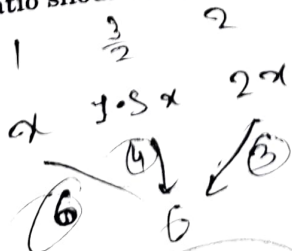
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97. Consider the following statements :

1. $n^3 - n$ is divisible by 6.
2. $n^5 - n$ is divisible by 5.
3. $n^5 - 5n^3 + 4n$ is divisible by 120.

Which of the statements given above are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

$\frac{n(n^2 - n)}{6}$

$(n \cdot n)$

$32 - 40 + 8$

$g^2 = 81$

$9^9 \times 3^5$

98. What is the last digit of the sum $S = 9^{27} + 27^9$?

(a) 3

(b) 6

(c) 7

(d) 9

$a^b \neq a^c$

(3^{27})

$9^2 = 81$

$(9)^{27} + (3)^{44} + (3)^{44}$

99. If $x = \dfrac{\sqrt{3}+1}{\sqrt{3}-1}$ and $y = \dfrac{\sqrt{3}-1}{\sqrt{3}+1}$, then what is the value $x^3 - y^3$?

(a) 60

(b) $45\sqrt{3}$

(c) $30\sqrt{3}$

(d) 90

$x^3 - \frac{1}{x^3}$

$4 + 2\sqrt{3}$ over 2

$x - \frac{1}{x} = (3)^{81}$

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

100. The speed of a boat in still water is 15 km/hr. If it can travel 42 km downstream and 28 km upstream in the same time, then what is the speed of the stream ?

(a) 2·5 km/hr

(b) 3 km/hr

(c) 4·5 km/hr

(d) 6 km/hr

$\frac{42}{15+x} = \frac{28}{15-x}$

$90 - 6x = 60 + 4x$

$10x = 30$

$x = 3$

(35 – D)