

जब तक आपको यह परीक्षण पुस्तिका खोलने को न कहा जाए तब तक न खोलें

टी.बी.सी. : XVWS-T-MTK

परीक्षण पुस्तिका अनुक्रम

क्रम संख्या

1088040

परीक्षण पुस्तिका

प्रारम्भिक गणित



समय : दो घण्टे

पूर्णांक : 100

अ नु दे श

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 लें।
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 जिम्मेदारी 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। 0808456
4. इस परीक्षण पुस्तिका में 100 प्रश्नांश (प्रश्न) दिए गए हैं। प्रत्येक प्रश्नांश हिन्दी और अंग्रेजी 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 देखें।
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 अन्त में संलग्न हैं।
10. गलत उत्तरों के लिए दण्ड :  
वस्तुनिष्ठ प्रश्न-पत्रों में उम्मीदवार द्वारा दिए गए गलत उत्तरों के लिए दण्ड दिया जाएगा।  
(i) प्रत्येक प्रश्न के लिए चार वैकल्पिक उत्तर हैं। उम्मीदवार द्वारा प्रत्येक प्रश्न के लिए दिए गए एक गलत 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 गलत 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।

जब तक आपको यह परीक्षण पुस्तिका खोलने को न कहा जाए तब तक न खोलें

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

1. A cloth of 3 m width is used to make a conical tent 12 m in diameter with a slant height of 7 m. What is the length of the cloth? (Take  $\pi = \frac{22}{7}$ )

- (a) 21 m
- (b) 28 m
- (c) 44 m
- (d) 66 m

2. A sphere of diameter 6 cm is dropped into a cylindrical vessel partly filled with water. The radius of the vessel is 6 cm. If the sphere is completely submerged in water, then by how much will the surface level of water be raised?

- (a) 0.5 cm
- (b) 1 cm
- (c) 1.5 cm
- (d) 2 cm

3. A sector is cut from a circle of radius 21 cm. If the length of the arc of the sector is 55 cm, then what is the area of the sector?

- (a) 577.5 cm<sup>2</sup>
- (b) 612.5 cm<sup>2</sup>
- (c) 705.5 cm<sup>2</sup>
- (d) 725.5 cm<sup>2</sup>

4. A wire is in the form of a circle of radius 70 cm. If it is bent in the form of a rhombus, then what is its side length?

(Take  $\pi = \frac{22}{7}$ )

- (a) 55 cm
- (b) 75 cm
- (c) 95 cm
- (d) 110 cm

5. If the perimeter of a semicircular park is 360 m, then what is its area? (Take  $\pi = \frac{22}{7}$ )

- (a) 3850 m<sup>2</sup>
- (b) 7700 m<sup>2</sup>
- (c) 11550 m<sup>2</sup>
- (d) 15400 m<sup>2</sup>

6. In a trapezium ABCD, AB is parallel to DC. The diagonals AC and BD intersect at P. If  $AP : PC = 4 : (4x - 4)$  and  $BP : PD = (2x - 1) : (2x + 4)$ , then what is the value of x?

- (a) 4
- (b) 3
- (c)  $\frac{3}{2}$
- (d) 2

7.  $\triangle ABC$  is similar to  $\triangle DEF$ . The perimeters of  $\triangle ABC$  and  $\triangle DEF$  are 40 cm and 30 cm respectively. What is the ratio of  $(BC + CA)$  to  $(EF + FD)$  equal to?

- (a) 5 : 4
- (b) 4 : 3
- (c) 3 : 2
- (d) 2 : 1

8. Two isosceles triangles have equal vertical angles and their areas are in the ratio  $4.84 : 5.29$ . What is the ratio of their corresponding heights?

- (a)  $11 : 23$
- (b)  $23 : 25$
- (c)  $22 : 23$
- (d)  $484 : 529$

9.  $ABC$  is a triangle right angled at  $A$  and  $AD$  is perpendicular to  $BC$ . If  $BD = 8$  cm and  $DC = 12.5$  cm, then what is  $AD$  equal to?

- (a)  $7.5$  cm
- (b)  $8.5$  cm
- (c)  $9$  cm
- (d)  $10$  cm

10. The surface area of a cube is equal to that of a sphere. If  $x$  is the volume of the cube and  $y$  is the volume of the sphere, then what is  $x^2 : y^2$  equal to?

- (a)  $\pi : 6$
- (b)  $6 : \pi$
- (c)  $\pi : 3$
- (d)  $3 : \pi$

11. A cone and a hemisphere have equal bases and equal volumes. What is the ratio of the height of the cone to the radius of the hemisphere?

- (a)  $1 : 1$
- (b)  $2 : 1$
- (c)  $3 : 2$
- (d)  $4 : 3$

12. A solid sphere of diameter  $60$  mm is melted to stretch into a wire of length  $144$  cm. What is the diameter of the wire?

- (a)  $0.5$  cm
- (b)  $1$  cm
- (c)  $1.5$  cm
- (d)  $2$  cm

13. The ratio of the radius of base to the height of a cylinder is  $2 : 3$ . If the volume of the cylinder is  $1617$   $\text{cm}^3$ , then what is the curved surface area of the cylinder? (Take  $\pi = \frac{22}{7}$ )

- (a)  $242$   $\text{cm}^2$
- (b)  $385$   $\text{cm}^2$
- (c)  $462$   $\text{cm}^2$
- (d)  $770$   $\text{cm}^2$

14. The difference between the outside and the inside surface area of a cylindrical pipe  $14$  cm long is  $44$   $\text{cm}^2$ . The pipe is made of  $99$   $\text{cm}^3$  of metal. If  $R$  is the outer radius and  $r$  is the inner radius of the pipe, then what is  $(R+r)$  equal to? (Take  $\pi = \frac{22}{7}$ )

- (a)  $9$  cm
- (b)  $7.5$  cm
- (c)  $6$  cm
- (d)  $4.5$  cm

[ P.T.O. ]

15. A metal solid cube of edge 24 cm is melted and made into three small cubes. If the edges of two small cubes are 12 cm and 16 cm, then what is the surface area of the third small cube?

(a)  $1200 \text{ cm}^2$

(b)  $1800 \text{ cm}^2$

(c)  $2400 \text{ cm}^2$

(d)  $3600 \text{ cm}^2$

16. A conical vessel whose internal radius is 5 cm and height 24 cm is full of water. The water is emptied into a cylindrical vessel with internal radius 10 cm. What is the height to which the water rises?

(a) 1 cm

(b) 2 cm

(c) 3 cm

(d) 4 cm

17. A metal solid cube of side 22 cm is melted to make a cone of height 21 cm. What is the radius of the base of the cone? (Take  $\pi = \frac{22}{7}$ )

(a) 11 cm

(b) 16.5 cm

(c) 22 cm

(d) 27.5 cm

18. A cone of height 24 cm has a curved surface area  $550 \text{ cm}^2$ . What is the ratio of its radius to slant height? (Take  $\pi = \frac{22}{7}$ )

(a)  $\frac{5}{12}$

(b)  $\frac{5}{13}$

(c)  $\frac{7}{25}$

(d)  $\frac{7}{27}$

19. A rectangular paper is 44 cm long and 22 cm wide. Let  $x$  be the volume of the largest cylinder formed by rolling the paper along its length and  $y$  be the volume of the largest cylinder formed by rolling the paper along its width. What is the ratio of  $x$  to  $y$ ? (Take  $\pi = \frac{22}{7}$ )

(a) 1:1

(b) 2:1

(c) 1:2

(d) 3:2

20. A hollow spherical shell is made up of a metal of density  $3 \text{ g/cm}^3$ . If its internal and external radii are 5 cm and 6 cm respectively, then what is the mass of the shell? (Take  $\pi = \frac{22}{7}$ )

(a) 1144 g

(b) 1024 g

(c) 840 g

(d) 570 g

[ P.T.O. ]

21. The sides of a right angled triangle are in the ratio  $x : (x - 1) : (x - 18)$ . What is the perimeter of the triangle?

- (a) 28 units
- (b) 42 units
- (c) 56 units
- (d) 84 units

22.  $ABC$  is a triangle right angled at  $B$ . Let  $M$  and  $N$  be two points on  $AB$  such that  $AM = MN = NB$ . Let  $P$  and  $Q$  be two points on  $AC$  such that  $PM$  is parallel to  $QN$  and  $QN$  is parallel to  $CB$ . If  $BC = 12$  cm, then what is  $(PM + QN)$  equal to?

- (a) 10 cm
- (b) 11 cm
- (c) 12 cm
- (d) 13 cm

23.  $AB$  and  $CD$  are the diameters of a circle which intersect at  $P$ . Join  $AC, CB, BD$  and  $DA$ . If  $\angle PAD = 60^\circ$ , then what is  $\angle BPD$  equal to?

- (a)  $30^\circ$
- (b)  $60^\circ$
- (c)  $90^\circ$
- (d)  $120^\circ$

24. An equilateral triangle  $ABC$  and a scalene triangle  $DBC$  are inscribed in a circle on same side of the arc. What is  $\angle BDC$  equal to?

- (a)  $30^\circ$
- (b)  $45^\circ$
- (c)  $60^\circ$
- (d)  $90^\circ$

25. The sides of a triangle  $ABC$  are 4 cm, 6 cm and 8 cm. With the vertices of the triangle as centres, three circles are drawn each touching the other two externally. What is the sum of the radii of the three circles?

- (a) 6 cm
- (b) 7 cm
- (c) 9 cm
- (d) 10 cm

26. Let  $PAB$  be a secant to a circle intersecting the circle at  $A$  and  $B$ . Let  $PT$  be the tangent segment. If  $PA = 9$  cm and  $PT = 12$  cm, then what is  $AB$  equal to?

- (a) 5 cm
- (b) 6 cm
- (c) 7 cm
- (d) 9 cm

[ P.T.O. ]

27. If the perimeter of a right-angled triangle is 30 cm and the hypotenuse is 13 cm, then what is the area of the triangle?

(a)  $24 \text{ cm}^2$

(b)  $27 \text{ cm}^2$

(c)  $30 \text{ cm}^2$

(d)  $36 \text{ cm}^2$

28.  $ABC$  is a triangle right angled at  $C$ . Let  $p$  be the length of the perpendicular drawn from  $C$  on  $AB$ . If  $BC = 6 \text{ cm}$  and  $CA = 8 \text{ cm}$ , then what is the value of  $p$ ?

(a)  $5.4 \text{ cm}$

(b)  $5 \text{ cm}$

(c)  $4.8 \text{ cm}$

(d)  $4.2 \text{ cm}$

29.  $ABCD$  is a trapezium in which  $AB$  is parallel to  $DC$  and  $2AB = 3DC$ . The diagonals  $AC$  and  $BD$  intersect at  $O$ . What is the ratio of the area of  $\Delta AOB$  to that of  $\Delta DOC$ ?

(a)  $2:1$

(b)  $3:2$

(c)  $4:1$

(d)  $9:4$

30. A circle touches all the four sides of a quadrilateral  $ABCD$ . If  $AB = 9 \text{ cm}$ ,  $BC = 8 \text{ cm}$  and  $CD = 12 \text{ cm}$ , then what is  $DA$  equal to?

(a)  $14 \text{ cm}$

(b)  $13 \text{ cm}$

(c)  $12 \text{ cm}$

(d)  $11 \text{ cm}$

31. Consider the following inequalities :

1.  $\sin 1^\circ < \cos 57^\circ$
2.  $\cos 60^\circ > \sin 57^\circ$

Which of the above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

32. If  $p = \sec\theta - \tan\theta$  and  $q = \operatorname{cosec}\theta + \cot\theta$ , then what is  $p + q(p - 1)$  equal to?

- (a) -1
- (b) 0
- (c) 1
- (d) 2

33. If  $\operatorname{cosec}\theta - \cot\theta = m$ , then what is  $\operatorname{cosec}\theta$  equal to?

- (a)  $m + \frac{1}{m}$
- (b)  $m - \frac{1}{m}$
- (c)  $\frac{m}{2} + \frac{2}{m}$
- (d)  $\frac{m}{2} + \frac{1}{2m}$

34. Let  $ABC$  be a triangle right angled at  $C$ , then what is  $\tan A + \tan B$  equal to?

- (a)  $\frac{a}{bc}$
- (b)  $\frac{a^2}{bc}$
- (c)  $\frac{b^2}{ca}$
- (d)  $\frac{c^2}{ab}$

35. Let  $\cos\alpha + \cos\beta = 2$  and  $\sin\alpha + \sin\beta = 0$ , where  $0 \leq \alpha \leq 90^\circ$ ,  $0 \leq \beta \leq 90^\circ$ . What is the value of  $\cos 2\alpha - \cos 2\beta$ ?

- (a) 0
- (b) 1
- (c) 2
- (d) Cannot be determined due to insufficient data

36. If  $\sec\theta + \cos\theta = \frac{5}{2}$ , where  $0 \leq \theta \leq 90^\circ$ , then what is the value of  $\sin^2\theta$ ?

- (a)  $\frac{1}{4}$
- (b)  $\frac{1}{2}$
- (c)  $\frac{3}{4}$
- (d) 1

37. What is  $(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \tan\theta + \sec\theta)$  equal to?

- (a) 4
- (b) 3
- (c) 2
- (d) 1

38. If  $6 + 8 \tan \theta = \sec \theta$  and  $8 - 6 \tan \theta = k \sec \theta$ , then what is the value of  $k^2$ ?

- (a) 11  
 (b) 22  
 (c) 77  
 (d) 99

39. A pole on the ground leans at  $60^\circ$  with the vertical. At a point  $x$  metre away from the base of the pole on the ground, two halves of the pole subtend the same angle. If the pole and the point are in the same vertical plane, then what is the length of the pole?

- (a)  $\sqrt{2}x$  metre  
 (b)  $\sqrt{3}x$  metre  
 (c)  $2x$  metre  
 (d)  $2\sqrt{2}x$  metre

40. A vertical tower standing at the corner of a rectangular field subtends angles of  $60^\circ$  and  $45^\circ$  at the two nearer corners. If  $\theta$  is the angle that the tower subtends at the farthest corner, then what is  $\cot \theta$  equal to?

- (a)  $\frac{1}{2}$   
 (b) 2  
 (c)  $\frac{2}{\sqrt{3}}$   
 (d)  $\frac{4}{\sqrt{3}}$

41. Consider the following data with regard to production of cars (in lakhs) :

	Year 2015	Year 2016
Country A	35	38
Country B	45	47
Country C	88	93
Country D	75	79
Country E	58	60.9

In which of the countries, the production of cars has increased by more than or equal to 5% in 2016 over 2015?

- (a) B and E  
 (b) A, C and D only  
 (c) A, C, D and E  
 (d) A, D and E only

42. The following table shows the marks of 90 students in a test of 80 marks :

Marks	Number of students
1-10	5
11-20	8
21-30	10
31-40	13
41-50	18
51-60	17
61-70	12
71-80	7

The percentage of students who have obtained less than or equal to 50% marks is

- (a) 30%  
 (b) 40%  
 (c) 45%  
 (d) 60%



43. What is the median of the following data?

2, 3, -1, 2, 6, 8, 9

(a) 2

(b) 3

(c) 4

(d) 5

44. What is the arithmetic mean of the first ten composite numbers?

(a) 8.5

(b) 9.5

(c) 10.2

(d) 11.2

45. The marks obtained by 5 students are 21, 27, 19, 26, 32. Later on 5 grace marks are added to each student. What are the average marks of the revised marks of the students?

(a) 26

(b) 30

(c) 31

(d) 32

46. Let  $p$  be the mean of  $m$  observations and  $q$  be the mean of  $n$  observations, where  $p \leq q$ . If the combined mean of  $(m+n)$  observations is  $c$ , then which one of the following is correct?

(a)  $c \leq p$

(b)  $c \geq q$

(c)  $p \leq c \leq q$

(d)  $q \leq c \leq p$

**Directions :**

For the next **four (4)** items, consider the following data with regard to different types (I, II, III, IV, V) of multivitamin tablets produced in a company (in lakhs) :

Year	I	II	III	IV	V
2000	160	80	70	90	75
2001	200	150	85	160	100
2002	135	35	44	95	85
2003	240	95	120	80	120
2004	180	110	85	95	115
2005	210	150	100	92	110

47. Which product is produced least over the years 2000-2005?

(a) Type II

(b) Type III

(c) Type IV

(d) Type V

48. In which one of the following pairs of years, the difference in total number of tablets produced between them is minimum?

- (a) (2003, 2005)
- (b) (2001, 2005)
- (c) (2003, 2004)
- (d) (2000, 2002)

49. The ratio of percentage drop in total production in 2004 compared to 2001 to that in 2000 compared to 2001, is

- (a)  $\frac{1}{3}$
- (b)  $\frac{1}{4}$
- (c)  $\frac{1}{2}$
- (d)  $\frac{1}{5}$

50. In which year, the production of Type I is more than the sum of the production of Type III and Type IV?

- (a) 2001
- (b) 2002
- (c) 2003
- (d) 2004

51. If the number 413283P759387 is divisible by 13, then what is the value of P?

- (a) 3
- (b) 6
- (c) 7
- (d) 8

52. What is the remainder when  $2^{1000000}$  is divided by 7?

- (a) 1
- (b) 2
- (c) 4
- (d) 6

53. How many pairs of  $(x, y)$  can be chosen from the set  $\{2, 3, 6, 8, 9\}$  such that  $\frac{x}{y} + \frac{y}{x} = 2$ , where  $x \neq y$ ?

- (a) Zero
- (b) One
- (c) Two
- (d) Three

1. 54. Consider the pairs of prime numbers  $(m, n)$  between 50 and 100 such that  $m - n = 6$ . How many such pairs are there?

(a) 2

(b) 3

(c) 4

(d) 5

55. How many terms are there in the following product?

$$(a_1 + a_2 + a_3)(b_1 + b_2 + b_3 + b_4)(c_1 + c_2 + c_3 + c_4 + c_5)$$

(a) 15

(b) 30

(c) 45

(d) 60

56. What is the remainder when  $27^{27} - 15^{27}$  is divided by 6?

(a) 0

(b) 1

(c) 3

(d) 4

57. If  $a + b + c = 0$ , then which of the following are correct?

1.  $a^3 + b^3 + c^3 = 3abc$

2.  $a^2 + b^2 + c^2 = -2(ab + bc + ca)$

3.  $a^3 + b^3 + c^3 = -3ab(a + b)$

Select the correct answer using the code given below.

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

58. If

$$p = \frac{\sqrt{3q+2} + \sqrt{3q-2}}{\sqrt{3q+2} - \sqrt{3q-2}}$$

then what is the value of  $p^2 - 3pq + 2$ ?

(a) 0

(b) 1

(c) 2

(d) 3

59. What is the unit digit in the expansion of  $67^{32}$ ?

- (a) 1
- (b) 3
- (c) 7
- (d) 9

60. What is the value of  $x$ , if

$$\frac{b + \sqrt{b^2 - 2bx}}{b - \sqrt{b^2 - 2bx}} = a?$$

- (a)  $\frac{ab}{(a+b)}$
- (b)  $\frac{2ab}{(a+1)}$
- (c)  $\frac{2ab}{(a+1)^2}$
- (d)  $\frac{ab}{(a+b)^2}$

61. For how many real values of  $k$  is  $6kx^2 + 12kx - 24x - 16$  a perfect square for every integer  $x$ ?

- (a) Zero
- (b) One
- (c) Two
- (d) Four

62. If  $x + \frac{1}{x} = \frac{5}{2}$ , then what is  $x^2 - \frac{1}{x^2}$  equal to?

- (a)  $\frac{195}{16}$
- (b)  $\frac{255}{16}$
- (c)  $\frac{625}{16}$
- (d) 0

63. If the equation  $4x^2 - 2kx - 3k = 0$  has equal roots, then what are the values of  $k$ ?

- (a) 4, 12
- (b) 4, 8
- (c) 0, 12
- (d) 0, 8

64. If the sum as well as the product of the roots of the equation  $px^2 - 6x - q = 0$  is 6, then what is  $(p+q)$  equal to?

- (a) 8
- (b) 7
- (c) 6
- (d) 5

65.  $4x^3 + 12x^2 - x - 3$  is divisible by

(a)  $(2x + 1)$  only

(b)  $(2x - 1)$  only

(c) Both  $(2x + 1)$  and  $(2x - 1)$

(d) Neither  $(2x + 1)$  nor  $(2x - 1)$

66. Which one of the following fractions will have minimum change in its value if 3 is added to both the numerator and the denominator of all the fractions?

(a)  $\frac{2}{3}$

(b)  $\frac{3}{4}$

(c)  $\frac{4}{5}$

(d)  $\frac{5}{6}$

67. Let the average score of a class of boys and girls in an examination be  $p$ . The ratio of boys and girls in the class is 3:1. If the average score of the boys is  $(p + 1)$ , then what is the average score of the girls?

(a)  $(p - 1)$

(b)  $(p - 2)$

(c)  $(p - 3)$

(d)  $p$

68. The incomes of A, B and C are in the ratio 7:9:12 and their expenditures are in the ratio 8:9:15. If A's saving is one-fourth of his income, then the ratio of savings of A, B and C is

(a) 56:99:69

(b) 99:56:69

(c) 69:56:99

(d) 99:69:56

69. A train 200 m long passes a platform 100 m long in 10 seconds. What is the speed of the train?

(a) 40 m/s

(b) 30 m/s

(c) 25 m/s

(d) 20 m/s

70. If

$$\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots + \frac{1}{n(n+1)} = \frac{99}{100}$$

then what is the value of  $n$ ?

(a) 98

(b) 99

(c) 100

(d) 101

71. The expression

$$\frac{(x^3 - 1)(x^2 - 9x + 14)}{(x^2 + x + 1)(x^2 - 8x + 7)}$$

simplifies to

(a)  $(x - 1)$

(b)  $(x - 2)$

(c)  $(x - 7)$

(d)  $(x + 2)$

72. What should be added to  $\frac{1}{(x-2)(x-4)}$  to get  $\frac{2x-5}{(x^2-5x+6)(x-4)}$ ?

(a)  $\frac{1}{(x^2 - 7x + 12)}$

(b)  $\frac{1}{(x^2 + 7x + 12)}$

(c)  $\frac{1}{(x^2 - 7x - 12)}$

(d)  $\frac{1}{(x^2 + 7x - 12)}$

73. The expression  $\frac{(x^2 - 1)(x^2 - 4)}{(x^2 + 1)(x^2 - 9)}$  simplifies to

(a)  $\frac{1}{2}$

(b)  $\frac{1}{3}$

(c)  $\frac{1}{6}$

(d)  $\frac{1}{1}$

74. If  $(x - k)$  is the HCF of  $x^2 - ax - b$  and  $x^2 + cx + d$ , then what is the value of  $k$ ?

(a)  $\frac{d-b}{c-a}$

(b)  $\frac{d-b}{a-c}$

(c)  $\frac{d+b}{c+a}$

(d)  $\frac{d-b}{c+a}$

75. Consider the following statements :

1. If  $x$  is directly proportional to  $z$  and  $y$  is directly proportional to  $z$ , then  $(x^2 - y^2)$  is directly proportional to  $z^2$ .
2. If  $x$  is inversely proportional to  $z$  and  $y$  is inversely proportional to  $z$ , then  $(xy)$  is inversely proportional to  $z^2$ .

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

76. What is the HCF of  $x^3 - 19x + 30$  and  $x^2 - 5x + 6$ ?

- (a)  $(x+2)(x-3)$
- (b)  $(x-2)(x+3)$
- (c)  $(x+2)(x-1)$
- (d)  $(x-3)(x-2)$

77. What is

$$\frac{8x}{1-x^4} - \frac{4x}{x^2+1} + \frac{x+1}{x-1} - \frac{x-1}{x+1}$$

equal to?

- (a) 0
- (b) 1
- (c) 2
- (d) 4

78. For what integral value of  $x$  is

$$\frac{12}{7 - \frac{6}{7 - \frac{3}{5-x}}} = x?$$

- (a) 4
- (b) 3
- (c) 2
- (d) 1

79. If  $x(x-1)(x-2)(x-3) + 1 = k^2$ , then which one of the following is a possible expression for  $k$ ?

- (a)  $x^2 - 3x + 1$
- (b)  $x^2 - 3x - 1$
- (c)  $x^2 + 3x - 1$
- (d)  $x^2 - 2x - 1$

80. What is

$$\frac{1}{bc(a-b)(a-c)} + \frac{1}{ca(b-c)(b-a)} + \frac{1}{ab(c-a)(c-b)}$$

equal to?

- (a)  $a+b+c$
- (b) 3
- (c)  $ab+bc+ca$
- (d) 0

[P.T.O.]

81. What is  $\log_{10} 31.25$  equal to?

(a)  $3 - 5\log_{10} 2$

(b)  $3 - 2\log_{10} 2$

(c)  $5 - 5\log_{10} 2$

(d)  $5 - 3\log_{10} 2$

82. What is the square root of  $15 - 4\sqrt{14}$ ?

(a)  $2\sqrt{2} - \sqrt{7}$

(b)  $3\sqrt{2} - 2\sqrt{7}$

(c)  $\sqrt{15} - \sqrt{7}$

(d)  $\sqrt{5} - \sqrt{3}$

83. The sum of the reciprocals of two alternate natural numbers is  $\frac{7}{24}$ . What is the sum of the numbers?

(a) 12

(b) 13

(c) 14

(d) 16

84. If  $n$  is any natural number, then  $5^{2n} - 1$  is always divisible by how many natural numbers?

(a) One

(b) Four

(c) Six

(d) Eight

85. If  $5^{x-3} = 8$ , then what is  $x$  equal to?

(a)  $\frac{3}{1 - \log_{10} 2}$

(b)  $\frac{3}{1 + \log_{10} 2}$

(c)  $\frac{2}{1 - \log_{10} 2}$

(d)  $\frac{5}{1 - \log_{10} 2}$

86. What is the least value of  $3\sin^2 \theta + 4\cos^2 \theta$ ?

(a) 5

(b) 4

(c) 3

(d) 2

87. If  $\sin \theta \cos \theta = k$ , where  $0 \leq \theta \leq \frac{\pi}{2}$ , then which one of the following is correct?

(a)  $0 \leq k \leq 1$

(b)  $0 \leq k \leq 0.5$  only

(c)  $0.5 \leq k \leq 1$  only

(d)  $0 < k < 1$



88. If  $p = \sin^2 \theta + \cos^4 \theta$  for  $0 < \theta < \frac{\pi}{2}$ , then consider the following statements :

1.  $p$  can be less than  $\frac{3}{4}$ .
2.  $p$  can be more than 1.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

89. What is the ratio of the greatest to the smallest value of  $2 - 2\sin x - \sin^2 x$ ,  $0 \leq x \leq \frac{\pi}{2}$ ?

- (a) -3
- (b) -1
- (c) 1
- (d) 3

90. If the equation  $x^2 + y^2 - 2xy\sin^2 \theta = 0$  contains real solution for  $x$  and  $y$ , then

- (a)  $x = y$
- (b)  $x = -y$
- (c)  $x = 2y$
- (d)  $2x = y$

91. A trader gives a discount of 20% on the marked price of an article. He still makes a profit of 10%. What is the marked price of the article?

- (a) 110%
- (b) 120%
- (c) 125%
- (d) 130%

92. A sum of money was invested at a rate of interest of 10% per annum. Had it been invested at a rate of 12% per annum, it would have earned ₹ 1,200 more. What was the principal amount?

- (a) ₹ 2,000
- (b) ₹ 1,800
- (c) ₹ 1,600
- (d) ₹ 1,200

93. The difference between the compound interest compounded annually and the simple interest on a certain sum of money at 12% per annum for 2 years is ₹ 72. What is the principal amount?

- (a) ₹ 6,500
- (b) ₹ 6,000
- (c) ₹ 5,500
- (d) ₹ 5,000

94. A train travels 600 km in 5 hours and the next 900 km in 10 hours. What is the average speed of the train?

- (a) 80 km/hr
- (b) 90 km/hr
- (c) 100 km/hr
- (d) 120 km/hr

95. Walking at  $\frac{4}{5}$ th of his usual speed, a man is 12 minutes late for his office. What is the usual time taken by him to cover that distance?

- (a) 48 minutes
- (b) 50 minutes
- (c) 54 minutes
- (d) 60 minutes

96. The cost price of 100 mangoes is equal to the selling price of 80 mangoes. What is the profit percentage?

- (a) 16%
- (b) 20%
- (c) 24%
- (d) 25%

97. X sells his goods 25% cheaper than Y and 25% dearer than Z. How much percentage is Z's goods cheaper than Y?

- (a)  $\frac{100}{3}\%$
- (b) 40%
- (c) 50%
- (d)  $\frac{200}{3}\%$

98. In a mixture of 80 litres of a liquid and water, 25% of the mixture is the liquid. How much water should be added to the mixture so that the liquid becomes 20% of the mixture?

- (a) 15 litres
- (b) 20 litres
- (c) 24 litres
- (d) 25 litres

99. If 20 persons can clean 20 floors in 20 days, then in how many days can 16 persons clean 16 floors?

- (a) 25 days
- (b) 24 days
- (c) 20 days
- (d) 16 days

100. Let the work done by  $(x-1)$  men in  $(x+1)$  days be  $y$ . Let the work done by  $(x+2)$  men in  $(x-1)$  days be  $z$ . If  $y:z = 9:10$ , then what is the value of  $x$ ?

- (a) 8
- (b) 9
- (c) 10
- (d) 12