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

टी.बी.सी. : NYRG-T-MTK

परीक्षण पुस्तिका अनुक्रम

क्रम संख्या

0089926

परीक्षण पुस्तिका
प्रारम्भिक गणित

B

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 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।
- 7100166
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 अंत 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.

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

A solid consisting of a right circular cone of radius x and height $2x$ standing on a hemisphere of radius x (take $\pi = \frac{22}{7}$)

1. The volume of the solid is equal to that of a

- (a) sphere of radius x
- (b) sphere of diameter x
- (c) cylinder of radius x
- (d) cylinder of radius $\sqrt{2}x$

2. What is the approximate total surface area of the solid ?

- (a) $11.2x^2$
- (b) $12.5x^2$
- (c) $13.3x^2$
- (d) $15.1x^2$

3. The solid is placed upright in a right circular cylinder full of water such that it touches the bottom. If the internal radius of cylinder is x and height is $3x$, what is the approximate volume of water left in the cylinder ?

- (a) $5.04x^3$
- (b) $5.09x^3$
- (c) $5.14x^3$
- (d) $5.24x^3$

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

A chord of a circle of radius 2.1 cm subtends an angle of 120° at the centre.

(take $\pi = \frac{22}{7}$ and $\sqrt{3} = 1.732$)

4. What is the approximate area of minor segment of the circle ?

- (a) 2.71 cm^2
- (b) 2.42 cm^2
- (c) 1.91 cm^2
- (d) 1.71 cm^2

5. What is the approximate area of major segment of the circle ?

- (a) 10.05 cm^2
- (b) 10.15 cm^2
- (c) 11.05 cm^2
- (d) 11.15 cm^2

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

ABC is a triangle with sides $AB = 6$ cm, $BC = 10$ cm and $CA = 8$ cm. With vertices A , B and C as centres, three circles are drawn each touching the other two externally.

6. What is the sum of the radii of the circles ?

- (a) 10.4 cm
- (b) 11.2 cm
- (c) 12 cm
- (d) 13 cm

7. What is the length of the altitude of the triangle drawn from vertex A on BC ?

- (a) 2.4 cm
- (b) 3 cm
- (c) 4 cm
- (d) 4.8 cm

8. If P , Q and R are the areas of sectors at A , B and C within the triangle respectively, then which of the following is/are correct ?

1. $P = \pi \text{ cm}^2$
2. $9Q + 4R = 36\pi \text{ cm}^2$

Select the correct answer using the code given below :

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

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

ABC is triangle in which $AB = AC$ and D is any point on BC .

9. Which one of the following is correct ?

- (a) $AB^2 - AD^2 = AD \times BD$
- ~~(b) $AC^2 - AD^2 = BD \times CD$~~
- (c) $AB^2 - AD^2 = 2AD \times BD$
- (d) $AC^2 - AD^2 = 2BD \times CD$

10. If $AD = 5$ cm, $BD = 4$ cm and $CD = 6$ cm, then what is AB equal to ?

- ~~(a) 7 cm~~
- (b) 6.5 cm
- (c) 6 cm
- (d) 5.5 cm

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

ABC is a triangle with $AB = 1.6$ cm, $BC = 6.3$ cm and $CA = 6.5$ cm. Let P and Q be the mid-points of AB and BC respectively.

11. What is $AB^2 + 4BQ^2$ equal to ?

- (a) 41.25 cm^2
- ~~(b) 42.25 cm^2~~
- (c) 43.75 cm^2
- (d) 44.25 cm^2

12. What is $AQ^2 + CP^2$ equal to ?

- (a) AC^2
- (b) $1.2 AC^2$
- ~~(c) $1.25 AC^2$~~
- (d) $1.5 AC^2$

13. What is $4(CP^2 - AQ^2)$ equal to ?

- (a) 101.39 cm^2
- ~~(b) 111.39 cm^2~~
- (c) 121.39 cm^2
- (d) 131.39 cm^2

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

AB is a diameter of a circle with centre O . Radius OP is perpendicular to AB . Let Q be any point on arc PB .

14. What is $\angle BAP$ equal to ?

- (a) 30°
- (b) 40°
- ~~(c) 45°~~
- (d) 60°

15. What is $\angle AQP$ equal to ?

- (a) 30°
- (b) 40°
- ~~(c) 45°~~
- (d) 60°

16. What is the minimum value of $\cos^3\theta + \sec^3\theta$ where $0^\circ \leq \theta < 90^\circ$?

- (a) 0
(b) 1
(c) ~~2~~
(d) None of the above

17. If $14 \sin^2\theta + 10 \cos^2\theta = 11$ where $0^\circ < \theta < 90^\circ$, then what is the value of $\tan\theta + \cot\theta$?

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

18. What is $\frac{\sin^3\theta + \cos^3\theta}{\sin\theta + \cos\theta} + \frac{\sin^3\theta - \cos^3\theta}{\sin\theta - \cos\theta}$ equal to?

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

19. A ladder 10 m long reaches a point 10 m below the top of a vertical flagstaff. From foot of the ladder, the elevation of top of the flagstaff is 60° . What is the height of flagstaff?

- (a) ~~12 m~~
(b) ~~15 m~~
(c) 16 m
(d) 20 m

20. What is the maximum value of $1 + 2 \sin^2\theta \cos^2\theta - \sin^4\theta - \cos^4\theta$ where $0^\circ < \theta < 90^\circ$?

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

21. From an aeroplane flying above a river at an altitude of 1200 m, it is observed that the angles of depression of opposite points on the two banks of a river are 30° and θ . If the width of the river is 3000 m, then which one of the following is correct?

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

22. If $\frac{\cos^2\theta - 3\cos\theta + 2}{\sin^2\theta} = 1$,

where $0^\circ < \theta < 90^\circ$ then what is $\sin^2\theta + \cos\theta$ equal to?

- (a) ~~$\frac{5}{4}$~~
(b) $\frac{3}{2}$
(c) $\frac{7}{4}$
(d) 2

23. Consider the following :

- $\sin^4\theta - \sin^2\theta = \cos^4\theta - \cos^2\theta$
- $\sin^4\theta + \cos^4\theta = 1 + 2 \sin^2\theta \cos^2\theta$
- $\tan^4\theta + \tan^2\theta = \sec^4\theta - \sec^2\theta$

Which of the above are identities?

- (a) 1 and 2 only
(b) 2 and 3 only
(c) ~~1 and 3 only~~
(d) 1, 2 and 3

24. What is the value of
 $\sin 24^\circ \sin 66^\circ - \cos 24^\circ \cos 66^\circ +$
 $\tan 24^\circ \tan 66^\circ - \cot 24^\circ \cot 66^\circ$?

- ~~(a) 0~~
- (b) 1
- (c) 2
- (d) 3

25. If $x = p \sin A \cos B$, $y = p \sin A \sin B$
 and $z = p \cos A$, then what is the value
 of $x^2 + y^2 + z^2$?

- (a) $-p^2$
- (b) 0
- ~~(c) p^2~~
- (d) $2p^2$

26. If $x = m \sec A + n \tan A$ and
 $y = m \tan A + n \sec A$, then what is
 $x^2 - y^2$ equal to ?

- ~~(a) $m^2 - n^2$~~
- (b) $m^2 + n^2$
- (c) $m^2 + n^2 - mn$
- (d) $m^2 - n^2 + mn$

27. If for some θ lying between 0° and
 90° , $\tan \theta = 1$, then what is the value
 of $\sin^2 \theta - 2 \sin \theta \cos \theta$?

- (a) -1
- (b) 0
- (c) $\frac{1}{2}$
- ~~(d) $-\frac{1}{2}$~~

28. What is $\frac{2 \sin^3 \theta - \sin \theta}{\cos \theta - 2 \cos^3 \theta}$, ($0^\circ < \theta < 90^\circ$)

equal to ?

- (a) $\sin \theta$
- (b) $\cos \theta$
- ~~(c) $\tan \theta$~~
- (d) $\cot \theta$

29. If A, B and C are interior angles of a
 triangle ABC , then what is

$$\tan\left(\frac{B+C}{2}\right) + \sin\left(\frac{B+C}{2}\right) -$$

$$\cot\left(\frac{A}{2}\right) - \cos\left(\frac{A}{2}\right)$$

equal to ?

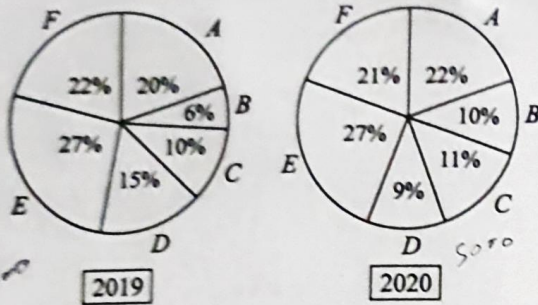
- ~~(a) 0~~
- (b) $\frac{1}{2}$
- (c) $\sin\left(\frac{A+B+C}{4}\right)$
- (d) $\tan\left(\frac{A+B+C}{4}\right)$

30. In a triangle ABC , right-angled at B ,
 $AB + BC = 10(1 + \sqrt{3})$ cm and length
 of the hypotenuse is 20 cm. What is the
 value of $\tan A + \tan C$?

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

Consider the following for the next four (04) items that follow :

The following Pie-Charts show the percentage of different categories (A, B, C, D, E and F) of employees in a company in the year 2019 and 2020. The total number of employees was 4000 in 2019 and 5000 in 2020.



31. There are two categories of employees in 2019 whose total strength remained the same in 2020. What are these two categories ?

- (a) C and B
- (b) E and A
- (c) E and F
- ~~(d) C and D~~

32. In which one of the following categories of employees, the percentage change in number of employees in 2020 was maximum as compared to 2019 ?

- (a) A
- ~~(b) B~~
- (c) C
- (d) D

33. What was the percentage increase of category-E employees in 2020 as compared to that in 2019 ?

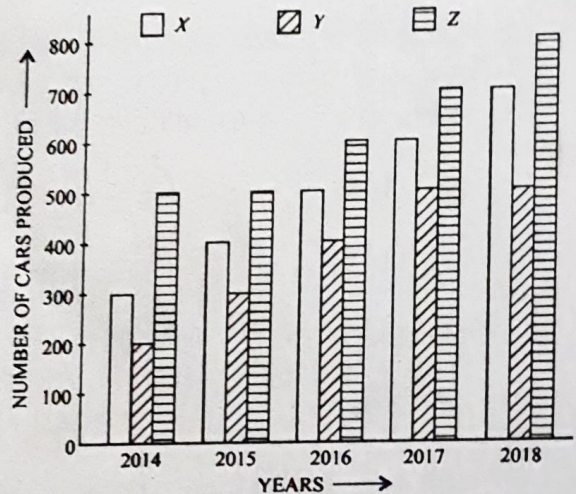
- (a) 20%
- ~~(b) 25%~~
- (c) 30%
- (d) 40%

34. There are two categories of employees whose strength increased by same percentage in 2020. What are the two categories ?

- (a) E and F
- (b) C and E
- (c) A and E
- ~~(d) A and C~~

Consider the following for the next four (04) items that follow :

The following Bar-Chart gives the production of cars by three different companies X, Y and Z in different years :



35. The percentage increase in the total production of cars from 2014 to 2018 was

- (a) 50%
- ~~(b) 100%~~
- (c) 150%
- (d) 200%

36. Consider the production of each company separately. In how many instances was the percentage increase in production of cars over the previous year's production greater than 20%?

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

37. In which year was the percentage increase in production of cars minimum as compared to its previous year?

- (a) 2015
- (b) 2016
- (c) 2017
- (d) 2018

38. In one of the years the percentage increase in production of cars was minimum as compared to its previous year. What was the minimum percentage?

- (a) $11\frac{1}{9}\%$
- (b) $11\frac{2}{9}\%$
- (c) $13\frac{1}{3}\%$
- (d) 20%

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

Collect all the sequences of five consecutive integers such that their product is equal to one of these integers. Let X be the collection of all possible such sequences. Let P be the smallest integer and Q be the largest integer occurring in these sequences.

39. How many such sequences of five consecutive integers are possible?

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

40. What is the arithmetic mean of P and Q ?

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

41. What are distinct prime factors of the number 26381?

- (a) 29, 17, 37
- (b) 31, 17, 47
- (c) 19, 37, 13
- (d) 23, 31, 37

42. Which one of the following is a factor of the polynomial

$$(x-1)(x-2)(x-4) - 90?$$

- (a) $x + 14$
- (b) $x - 14$
- (c) $x - 6$
- (d) $x - 7$

43. What is the square root of $23 - 4\sqrt{15}$?

- (a) $\sqrt{6} - 3\sqrt{2}$
- (b) $7 - 3\sqrt{5}$
- (c) $\sqrt{3} - 2\sqrt{5}$
- (d) $\sqrt{5} - 4\sqrt{3}$

44. What is the remainder after dividing the number 37^{1000} by 9?

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

45. The sum of LCM and HCF of two numbers is 536 and the difference between LCM and HCF is 296. If one of the numbers is 104, then what is the other number ?
- (a) 420
~~(b) 480~~
 (c) 484
 (d) 506
46. 20 men are supposed to complete a work in 10 days. After working for 5 days, they realise that only one-fourth of the work is done. How many more men they need to employ to finish the work on time ?
- ~~(a) 40~~
 (b) 30
 (c) 20
 (d) 15
47. If x is a negative real number, then which of the following are *not* correct ?
1. There is some natural number k such that $kx > 0$
 2. $x^2 + x > 0$ always
 3. $2x < x < -x$
 4. x^2 is always a rational number
- Select the correct answer using the code given below :
- (a) 1, 2 and 3
~~(b) 1, 2 and 4~~
 (c) 1, 3 and 4
 (d) 2, 3 and 4
48. What is the sum of the linear factors (in x and y) of the expression $2x^2 + xy - 3y^2$?
- (a) $2x - 3y$
 (b) $3x - 2y$
~~(c) $3x + 2y$~~
 (d) $2x + 3y$
49. Which one of the following equations does *not* have real roots ?
- (a) $2x^2 + 16x + 3 = 0$
 (b) $2x^2 + 10x - 1 = 0$
 (c) $x^2 - 8x + 1 = 0$
~~(d) $4x^2 + 9x + 6 = 0$~~
50. The sum and the product of the roots of a quadratic equation are 7 and 12 respectively. If the bigger root is halved and the smaller root is doubled, then what is the resulting quadratic equation ?
- (a) $x^2 - 6x + 12 = 0$
~~(b) $x^2 - 8x + 12 = 0$~~
 (c) $x^2 + 8x + 12 = 0$
 (d) $x^2 - 10x + 12 = 0$
51. For which values of k , does the equation $x^2 - kx + 2 = 0$ have real and distinct solutions ?
- (a) $-2\sqrt{2} < k < 2\sqrt{2}$
 (b) $k < -2\sqrt{2}$ only
 (c) $k > 2\sqrt{2}$ only
~~(d) $k < -2\sqrt{2}$ or $k > 2\sqrt{2}$~~
52. If $\alpha + \beta + \gamma = \alpha\beta + \beta\gamma + \gamma\alpha$, then what is $(1 - \alpha)(1 - \beta)(1 - \gamma)$ equal to ?
- ~~(a) $1 - \alpha\beta\gamma$~~
 (b) $1 + \alpha\beta\gamma$
 (c) $\alpha^2 + \beta^2 + \gamma^2$
 (d) $(\alpha - \beta)(\beta - \gamma)(\gamma - \alpha)$
53. If $\log_{10} x + \log_{10} x^2 = 2 \log_{10} x + 1$, then what is the value of x ?
- (a) 1
 (b) 2
 (c) 5
~~(d) 10~~

54. The LCM of two prime numbers p and q is 2231, where $p > q$. What is the value of $p - q$?
- (a) 67
 (b) 70
~~(c) 74~~
 (d) 81
55. Three runners are running in a circular track, and they complete one round in 20, 30 and 35 minutes respectively. When will they next meet at the starting point?
- (a) After 3 hour 30 minutes
 (b) After 4 hour 30 minutes
 (c) After 3 hours
~~(d) After 7 hours~~
56. If one of the roots of the equation $ax^2 - 4ax + 15 = 0$ is $\frac{3}{2}$, then what is the sum of the squares of the roots?
- (a) $\frac{15}{2}$
~~(b) $\frac{17}{2}$~~
 (c) $\frac{19}{2}$
 (d) $\frac{21}{2}$
57. A two-digit number is such that the product of the digits is 8. If 63 is added to this number, the digits interchange their places. What is the sum of the digits in the number?
- (a) 6
 (b) 7
 (c) 8
~~(d) 9~~
58. A motor boat has speed 30 km/hr in still water. It goes 60 km down stream and comes back in $\frac{9}{2}$ hours. What is the speed of the stream?
- (a) 5 km/hr
 (b) 8 km/hr
~~(c) 10 km/hr~~
 (d) 12 km/hr
59. The present age of a father is equal to sum of the ages of his 4 children. After ten years the sum of the ages of the children will be 1.6 times the age of their father. What is the present age of father?
- (a) 36 years
~~(b) 40 years~~
 (c) 42 years
 (d) 45 years
60. The sum of numerator and denominator of a fraction is 10. If the numerator is increased by 3 and denominator is decreased by 1, the fraction becomes 1. What is the difference between numerator and denominator of the fraction?
- (a) 2
 (b) 3
~~(c) 4~~
 (d) 5
61. If the system of equations $7x + ky = 27$ and $kx + 7y = 19$ have unique solution, then which one of the following is correct?
- ~~(a) $k \neq 7$~~
 (b) $k \neq 13$
 (c) $k = 7$
 (d) $k = 13$

62. A sum of money compounded annually doubles itself in 5 years. In how many years will it become four times of itself?

- (a) 10 years
- (b) 12 years
- (c) 15 years
- (d) 20 years

63. Between 3 and 4 O'clock, both hour hand and minute hand will coincide past 3 O'clock between

- (a) 15-16 minutes
- (b) 16-17 minutes
- (c) 17-18 minutes
- (d) 18-19 minutes

64. Sheela can stitch a suit in 2 days, while Meena can stitch a suit in $1\frac{1}{2}$ days. How many days will both take in stitching 30 suits?

- (a) 32 days
- (b) 33 days
- (c) 35 days
- (d) 40 days

65. If $2x - 3y - 7 = 0$, then what is the value of $8x^3 - 36x^2y + 54xy^2 - 27y^3 - 340$?

- (a) -1
- (b) 0
- (c) 1
- (d) 3

66. If p varies directly as q and inversely as square of r , what is the percentage increase in p due to an increase in q by 20% and a decrease in r by 20%?

- (a) 87.5%
- (b) 85%
- (c) 82.5%
- (d) 80%

67. A person agrees to work for 30 days, on a condition that for every day's work he should receive ₹500, and that for every day's absence from work he should forfeit ₹100. At the end of the time he received ₹11,400. How many days did he work?

- (a) 20
- (b) 21
- (c) 24
- (d) 25

68. A person bought a chair and a table for ₹750. He sold the chair at a gain of 5% and the table at a gain of 20%. He gained 16% on the whole. What is original cost of table?

- (a) ₹400
- (b) ₹450
- (c) ₹550
- (d) ₹600

69. A person rode one-third of a journey at 60 km/hr, one-third at 50 km/hr and the rest at 40 km/hr. Had the person ridden half of the journey at 60 km/hr and the rest at 40 km/hr, he would have taken 4 minutes longer to complete the journey. What distance did the person ride?

- (a) 180 km
- (b) 210 km
- (c) 240 km
- (d) 300 km

70. A person saves ₹1000 more than he did the previous year. If he saves ₹2000 in the first year, in how many years will he save ₹170000?

- (a) 16 years
- (b) 17 years
- (c) 18 years
- (d) 19 years

71. The radius of circum-circle of a right-angled triangle is 10 cm and the altitude drawn to the hypotenuse is 8 cm. What is the area of the triangle ?
- (a) 60 cm^2
~~(b) 80 cm^2~~
 (c) 100 cm^2
 (d) 120 cm^2
72. Two circles touch externally. The sum of their areas is 41π square cm. If the distance between their centres is 9 cm, then what is difference between their diameters ?
- (a) 1 cm
 (b) 1.5 cm
~~(c) 2 cm~~
 (d) 4 cm
73. Let p be the area of a square X and q be the area of the square formed on the diagonal of the square X . What is the value of $\frac{p}{q}$?
- (a) $\frac{1}{8}$
 (b) $\frac{1}{4}$
 (c) $\frac{1}{3}$
~~(d) $\frac{1}{2}$~~
74. The area of a rhombus is 336 square cm. If the length of one of its diagonals is 48 cm, then what is the perimeter of the rhombus ?
- ~~(a) 200 cm~~
 (b) 120 cm
 (c) 100 cm
 (d) 90 cm
75. The minute hand of a clock is 21 cm long. What is the area on the face of the clock described by the minute hand between 10-10 a.m and 10-30 a.m ?
 (take $\pi = \frac{22}{7}$)
- (a) 231 cm^2
 (b) 331 cm^2
~~(c) 462 cm^2~~
 (d) 492 cm^2
76. The length and breadth of a room are 21 m and 16 m respectively. If the length of the longest rod that can be placed in the room is 29 m, then what is the height of the room ?
- (a) 10 m
 (b) 11 m
~~(c) 12 m~~
 (d) 13 m
77. A hemispherical bowl of internal radius 18 cm contains a liquid. The liquid is filled in small cylindrical bottles of internal radius 3 cm and internal height 4 cm. What is the number of bottles used to empty the bowl ?
- (a) 54
 (b) 81
~~(c) 108~~
 (d) 135
78. A hollow spherical shell is made of a metal of density 7 g/cm^3 . If its internal and external radii are 3 cm and 6 cm respectively, then what is the mass of the shell ? (take $\pi = \frac{22}{7}$)
- (a) 2772 g
 (b) 3322 g
 (c) 4433 g
~~(d) 5544 g~~

79. A cone of height 16 cm and diameter 14 cm is mounted on a hemisphere of same diameter. What is the volume of the solid thus formed? (take $\pi = \frac{22}{7}$)

- (a) 1540 cm³
- (b) 1078 cm³
- (c) 1048 cm³
- (d) 770 cm³

80. 3 cubes each of volume 343 cm³ are joined end to end. What is the total surface area of the resulting cuboid?

- (a) 343 cm²
- (b) 350 cm²
- (c) 686 cm²
- (d) 700 cm²

81. A cubical block of side 14 cm is surmounted by a hemisphere of radius 7 cm. What is the total surface area of the solid thus formed? (take $\pi = \frac{22}{7}$)

- (a) 1330 cm²
- (b) 1306 cm²
- (c) 1296 cm²
- (d) 1256 cm²

82. How many silver coins, 3.5 cm in diameter and of thickness 4 mm, must be melted to form a cuboid of dimensions 21 cm \times 11 cm \times 7 cm?

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

- (a) 420
- (b) 210
- (c) 200
- (d) 168

83. A tub is in the shape of a frustum of a cone. The radii of two circular ends of the tub are 105 cm and 42 cm. If the vertical height of the tub is 16 cm, what is its slant height?

- (a) 63.5 cm
- (b) 65 cm
- (c) 73.5 cm
- (d) 75 cm

84. ABC is a triangle right-angled at B with $AB = 8$ cm and $BC = 6$ cm. It is made to revolve about its side BC . What is the approximate total surface area of the cone so formed? (take $\pi = \frac{22}{7}$)

- (a) 452 cm²
- (b) 440 cm²
- (c) 432 cm²
- (d) 420 cm²

85. A solid rod consists of a cylinder of height 20 cm and radius 7 cm. It is surmounted by another solid cylinder of height 10 cm and radius 3.5 cm. If 1 cubic metre of rod weighs 10000 kg, what is the mass of the rod?

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

- (a) 34.65 kg
- (b) 31.56 kg
- (c) 3.465 kg
- (d) 3.156 kg

86. 5 pencils, 6 notebooks and 7 erasers cost ₹250; whereas 6 pencils, 4 notebooks and 2 erasers cost ₹180. What is the cost of 2 notebooks and 4 erasers?

- (a) ₹90
- (b) ₹75
- (c) ₹60
- (d) ₹40

87. How many zeros are there in the product $1^{50} \times 2^{49} \times 3^{48} \times \dots \times 50^1$?

- (a) 262
 (b) 261
 (c) 246
 (d) 235

88. If p and q ($p > q$) are the roots of the equation $x^2 - 60x + 899 = 0$, then which one of the following is correct?

- (a) $p - q - 1 = 0$
 (b) $p - 2q + 27 = 0$
 (c) $2p - q - 30 = 0$
 (d) $3p - 2q - 43 = 0$

89. If the roots of the equation

$$x^2 - 4x - \log_{10} N = 0$$

are real, then what is the minimum value of N ?

- (a) 0.1
 (b) 0.01
 (c) 0.001
 (d) 0.0001

90. If $5^{x-1} = (2.5)^{\log_{10} 5}$, then what is the value of x ?

- (a) 1
 (b) $\log_{10} 2$
 (c) $\log_{10} 5$
 (d) $2\log_{10} 5$

91. If $96 - 64a^3 + \frac{8}{a^6} - \frac{48}{a^3} - t^3 = 0$, then

what is $a^2t + 4a^3$ equal to?

- (a) 0
 (b) 1
 (c) 2
 (d) 3

92. If $A + B = \frac{x^2 - 8}{x + 2}$ and

$$A - B = \frac{-x^2 + 2x + 4}{x + 2}, \text{ then what is } B$$

equal to?

- (a) $\frac{x^2 - 4}{x^2 + 4x + 4}$
 (b) $\frac{x^2 - 4}{x^2 - 4x + 4}$
 (c) $\frac{2x^2 - 7x + 3}{2x - 1}$
 (d) $\frac{2x^2 + 7x - 3}{2x - 1}$

93. What is

$$\frac{x^4}{(x^2 - y^2)(x^2 - z^2)} + \frac{y^4}{(y^2 - x^2)(y^2 - z^2)} + \frac{z^4}{(z^2 - x^2)(z^2 - y^2)}$$

equal to?

- (a) -1
 (b) 0
 (c) 1
 (d) $x^2 + y^2 + z^2$

94. If $(2ab - b^2) : (6a^2 - ab) = 1 : 6$, then what is $(a + b) : (a - b)$ equal to?

- (a) 3 only
 (b) 5 only
 (c) -3 or 3
 (d) -5 or 5

95. If $\frac{x}{b+c-a} = \frac{y}{b-c-a} = \frac{z}{a+b-c} = k$,
then what is

$x^2 + y^2 + z^2 - 2xy - 2yz + 2zx$ equal to ?

(a) $k^2(a^2 + b^2 + c^2)$

(b) $k^2(a^2 - b^2 + c^2)$

~~(c) $k^2(a+b+c)^2$~~

(d) $k^2(a-b+c)^2$

96. If three positive numbers are in the ratio 2 : 3 : 5 and the sum of their squares is 1368, then what is sum of the numbers ?

(a) 30

(b) 45

~~(c) 60~~

(d) 75

97. Consider the following inequalities :

1. $\frac{a^2 - b^2}{a^2 + b^2} > \frac{a - b}{a + b}$ where $a > b > 0$

2. $\frac{a^3 + b^3}{a^2 + b^2} > \frac{a^2 + b^2}{a + b}$ only when $a > b > 0$

Which of the above is/are correct ?

(a) 1 only

(b) 2 only

~~(c) Both 1 and 2~~

(d) Neither 1 nor 2

98. Let work done by $(3n - 1)$ men in $(2n + 1)$ days be x and work done by $(3n + 1)$ men in $(4n - 3)$ days be y . If $x : y = 6 : 11$, then what is the value of n ?

(a) 6

~~(b) 7~~

(c) 8

(d) 9

99. If $\frac{ay - bx}{c} = \frac{cx - az}{b} = \frac{bz - cy}{a}$, then which of the following is/are correct ?

1. $\frac{x}{a} = \frac{y}{b}$

2. $\frac{x + y + z}{a + b + c} = \frac{z}{c}$

Select the correct answer using the code given below :

(a) 1 only

(b) 2 only

~~(c) Both 1 and 2~~

(d) Neither 1 nor 2

100. A person wishes to fence 375 m^2 rectangular garden. He has 65 m of barbed wire and is able to fence only three sides of the garden. What is the perimeter of the garden ?

~~(a) 80 m~~

(b) 84 m

(c) 90 m

(d) 100 m

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