

# National Defence Academy And Naval Academy Exam September 2000

## Paper I : Mathematics

1.  $\cos 60^\circ - \sin 30^\circ + \tan 45^\circ$  is equal to

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

2.  $\frac{1}{\cos 80^\circ} - \frac{\sqrt{3}}{\sin 80^\circ}$  is equal to

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

3. If  $(x + 1)\tan^2 \frac{\pi}{4} = 2 \sec^2\left(\frac{\pi}{3}\right) \operatorname{cosec}^2\left(\frac{\pi}{6}\right)$ ,

then x is equal to

- (a) 30 (b) 31  
(c) 31.5 (d) 32

4. The equation  $\tan \theta + \frac{1}{\tan \theta} = 2$

holds good for  $\theta$  equal to

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

5.  $\sin 81^\circ + \tan 81^\circ$  is equal to

- (a)  $\sin 9^\circ + \cos 9^\circ$  (b)  $\cos 9^\circ + \tan 9^\circ$   
(c)  $\sin 9^\circ + \cot 9^\circ$  (d)  $\cos 9^\circ + \cot 9^\circ$

6.  $\tan 1^\circ \tan 2^\circ \tan 3^\circ \dots \tan 89^\circ$

is

- (a) Equal to 0 (b) Equal to 1  
(c) Equal to  $\frac{1}{\sqrt{2}}$  (d) Indeterminate

7.  $\operatorname{cosec}^2 \frac{\pi}{4} + 3 \sec^2 \frac{\pi}{6} - \tan \frac{\pi}{4}$   
 $- 3 \sin^2 \frac{\pi}{2} - 2 \cos^3 0^\circ$

is equal to

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

8.  $\frac{2 \cos^2 \theta - \sin^2 \theta + 1}{\cos \theta}$  is equal to

- (a)  $\cos \theta$  (b)  $2 \cos \theta$   
(c)  $3 \cos \theta$  (d)  $1 + \cos \theta$

9. If  $\cot \theta = m$ , then  $\cos \theta$  is equal to

- (a)  $\frac{1}{\sqrt{m^2 + 1}}$  (b)  $\frac{m}{\sqrt{m^2 + 1}}$

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

10.  $\tan 75^\circ$  is equal to

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

11. If  $\sin \theta + \operatorname{cosec} \theta = 2$ , then  $\sin^2 \theta + \operatorname{cosec}^2 \theta$  is equal to

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

12.  $\theta$  eliminant of  $x = a \cos^3 \theta$ ,  
 $y = a \sin^3 \theta$  is

- (a)  $x^2 + y^2 = a^2$   
(b)  $x^{1/3} + y^{1/3} = a^{1/3}$   
(c)  $x^{2/3} + y^{2/3} = a^{2/3}$   
(d)  $x^{2/3} - y^{2/3} = a^{2/3}$

13.  $\sqrt{\frac{1 - \sin \theta}{1 + \sin \theta}}$  is equal to

- (a)  $\sin \theta - \cos \theta$  (b)  $\tan \theta - \cot \theta$   
(c)  $\sec \theta - \tan \theta$  (d)  $\operatorname{cosec} \theta - \cot \theta$

14.  $\frac{1}{(\operatorname{cosec} 10^\circ - \sqrt{3} \sec 10^\circ)^2}$  is equal to

- (a)  $\frac{1}{3}$  (b) 1 (c)  $\frac{1}{16}$  (d) 16

15.  $\sin 15^\circ$  is equal to

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

16. If the angle of elevation of the top of a tower from a distance of 100 m is  $30^\circ$ , then the height of the tower will be

- (a)  $\frac{100}{\sqrt{3}}$  m (b)  $100\sqrt{3}$  m  
 (c)  $\frac{\sqrt{3}}{100}$  m (d) 100 m

17. The foot of a 90 cm ladder leaning against a wall rests on level ground 45 cm from the base of the wall. The angle of inclination of the ladder is

- (a)  $30^\circ$  (b)  $45^\circ$   
 (c)  $60^\circ$  (d)  $75^\circ$

18. If the angle of elevation of a flagtop changes from  $30^\circ$  to  $60^\circ$  as an observer advances 75 m towards its base, then the height of the flagpole will be

- (a) 37 m (b) 37.5 m  
 (c) 38 m (d) 38.5 m

19. Angle of elevation of the top of a tower from a certain point on the ground is  $30^\circ$ . If a distance of 30 m is travelled towards the tower, then the angle of elevation of the top of the tower becomes  $45^\circ$ . Height of the tower is

- (a)  $15(\sqrt{3} + 2)$  m  
 (b)  $15(\sqrt{3} + 1)$  m  
 (c)  $30(\sqrt{3} + 1)$  m  
 (d)  $\frac{15}{2}(\sqrt{3} + 1)$  m

20. Consider the following statements :  
 Before undertaking the work of collecting data for a properly determined and defined objective, the scope of the statistical enquiry will be to

1. Ensure the collection of proper information.
2. Spare the expenses.
3. Stop accumulation of irrelevant and useless data.

Which of the above statements are correct ?

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

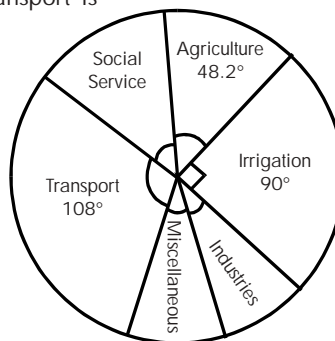
21. Consider the following statements regarding secondary data :

1. The investigator obtains them from someone else's records.
2. They have been treated earlier statistically in some form or the other.
3. They are collected for the first time by the investigator.

Which of the above statements are correct ?

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

22. Sector-wise expenditure of a State Government is shown in the given figure. The expenditure incurred on transport is



- (a) 25% (b) 30%  
 (c) 32% (d) 35%

23. Match List I with List II and select the correct answer using the codes given below the Lists :

<i>List I</i>		<i>List II</i>	
A. Secondary data		1. Cumulative frequency	
B. Ogive		2. Data collected from published records	
C. Histogram		3. Diagrammatic representation of frequency distribution	
D. Frequency polygon		4. Diagram obtained by erecting bars proportional to the frequency over the class-interval	

	A	B	C	D
(a)	2	1	3	4
(b)	2	1	4	3
(c)	1	3	4	2
(d)	4	1	2	3

24. If the algebraic sum of deviation of 20 observations measured from 30 is 20, then the mean of the observations is

- (a) 30                      (b) 30.1  
(c) 29                      (d) 31

25. The mean monthly salary of all the employees in a certain factory is Rs. 500. The mean monthly salaries of male and female employees are respectively Rs. 510 and Rs. 460. The percentage of male employees in the factory is

- (a) 60    (b) 70    (c) 80    (d) 90

**Directions (Qs. 26 to 28) :** The following three items consist of two statements, one labelled the 'Assertion A' and the other labelled the 'Reason R'. You are to examine these two statements carefully and decide if the Assertion A and the Reason R are individually true and if so,

whether the reason is a correct explanation of the Assertion. Choose your answers to these items using the codes given below :

- (a) Both A and R are true and R is the correct explanation of A.  
(b) Both A and R are true but R is not the correct explanation of A  
(c) A is true but R is false  
(d) A is false but R is true

26. **Assertion (A) :** If HCF of two numbers is 18 and their product is 7200, then their LCM is 400.

**Reason (R) :** Product of two numbers is equal to the product of their LCM and HCF.

27. ABC is a triangle in which AB = AC. Let D be the midpoint of BC. If the perpendiculars drawn from D to AB and AC meet them at E and F respectively, then

**Assertion (A) :** BE = FC.

**Reason (R) :** Triangles BED and DFC are congruent.

28. **Assertion (A) :** The angle subtended by a minor arc of a circle at a point on the remaining part of the circle is an acute angle.

**Reason (R) :** An angle inscribed in a semicircle is a right angle.

29. Consider the following statements :

1. A number of the form  $\frac{p}{q}$ , where p and q are integers, is called a rational number.
2. Every integer is a rational number.
3. Between any two distinct rational numbers, we can find irrational numbers.

Which of the above statement(s) is/are correct ?

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

30. The value of

$\sqrt{4 + 2\sqrt{3}} + \sqrt{4 - 2\sqrt{3}}$  is equal to

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

31. If a train running at a speed of 36 km/hr crosses a pole in 25 sec, then the length of the train is

- (a) 200 m (b) 250 m  
(c) 300 m (d) 350 m

32. If  $2^{2^{2^{\dots^{n \text{ steps}}}}} + 1$  is a prime number (where n is a positive integer), then for n = 2, the corresponding prime number will be

- (a) 101 (b) 31  
(c) 23 (d) 17

33. 6 men or 10 boys can complete a piece of work in 15 days. If 7 men and x boys complete the same piece of work in 9 days, then x is equal to

- (a) 4 (b) 5  
(c) 6 (d) 7

34. The cost of an apple, a banana and an orange is Rs. 5.00, Re. 0.50 and Re. 1.00 respectively. A customer has Rs. 100 only and wants to purchase the fruits of each variety in such a way as to spend all his money. The number of apples, bananas and oranges that he purchases will be in the ratio of

- (a) 9 : 40 : 1 (b) 20 : 71 : 9  
(c) 1 : 8 : 1 (d) 1 : 2 : 1

35. A shop owner gives a discount of 20% on silk sarees. To attract more customers, he offers an additional discount of 10%. If a customer buys a silk saree with printed price tag of Rs. 1000, then he/she saves

- (a) Rs. 280 (b) Rs. 260  
(c) Rs. 240 (d) Rs. 220

36. It is observed that the population of a city increases at the rate of 8% per annum. If the present population of the city is 1,25,000, then the population of the city after 2 years will be

- (a) 1,45,000 (b) 1,45,800  
(c) 1,54,000 (d) 1,54,800

37. The compound interest on Rs. 2000

at the rate of 20% p.a. for  $1\frac{1}{2}$  years calculated on six-monthly basis will be

- (a) Rs. 662 (b) Rs. 664  
(c) Rs. 760 (d) Rs. 762

38. The ratio of the monthly income to the savings of a family is 9 : 2. If the monthly income of the family is Rs. 2700, then its monthly expenditure will be

- (a) Rs. 1800 (b) Rs. 2209.09  
(c) Rs. 2100 (d) Rs. 1600

39. A number x, when divided by 7, leaves a remainder 1 and another number y, when divided by 7, leaves the remainder 2. If x + y is divided by 7, then the remainder will be

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

40. In 40 litres of a mixture, the ratio of milk to water is 7 : 1. In order to make the ratio of milk to water as 3 : 1, the quantity of water that should be added to the mixture will be

- (a) 6 litres (b)  $6\frac{1}{2}$  litres

- (c)  $6\frac{2}{3}$  litres (d)  $6\frac{3}{4}$  litres

41. If the sum of eleven consecutive numbers is 56782, then the third number in the series is

- (a) 5157 (b) 5159  
(c) 5161 (d) 5163

**42.** Consider the following statements regarding prime numbers  $p$  and  $q$  :

1.  $p + 1$  is a composite number.
2.  $pq + 1$  is a composite number.

Which of the above statement(s) is/ are correct ?

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

**43.** Consider the following statements :

1. Every prime number is odd.
2. Product of two prime numbers is odd.

Which of the above statement(s) is/ are correct ?

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

**44.** If  $\log_{10}(x - 9) + \log_{10}x = 1$ , then the value of  $x$  will be

- (a) 10      (b) 3      (c) 1      (d) 0

**45.** If  $3x^3 - 9x^2 + kx - 12$  is divisible by  $x - 3$ , then it is also divisible by

- (a)  $3x - 4$       (b)  $3x^2 + 4$   
(c)  $3x^2 - 4$       (d)  $x + 3$

**46.** If  $a$ ,  $b$  and  $c$  are any three consecutive positive integers, then  $\log(1 + ac)$  is equal to

- (a)  $\log b$       (b)  $2 \log b$   
(c)  $\log(2b)$     (d)  $\log(abc)$

**47.** If the function  $f(x) = x^3 + 3x^2 + 3x + 3$  is divided by  $x + 1$ , then the remainder will be

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

**48.** If  $\log_{10}(\log_{10} x^{10}) = 1$ , then the value of  $x$  is

- (a) 20      (b) 10      (c) 30      (d) 15

**49.** If  $\frac{1}{2} \log_{10}(11 + 4\sqrt{7}) = \log_{10}(2 + x)$ , then  $x$  is equal to

- (a)  $\frac{7}{2} + 2\sqrt{7}$       (b)  $9 + 4\sqrt{7}$

- (c)  $2\sqrt{7}$       (d)  $\sqrt{7}$

**50.**  $x^{(\log y - \log z)} \cdot y^{(\log z - \log x)} \cdot z^{(\log x - \log y)}$  is equal to

- (a) 0      (b) 1

(c)  $\log(xyz)$       (d)  $x^{y/z} \cdot y^{z/x} \cdot z^{x/y}$

**51.** If  $\log_{10} 2 + \log_{10} x + \log_{10} 5 = 3$ , then the value of  $x$  is

- (a) 20      (b) 30      (c) 50      (d) 100

**52.** If  $\log_{10} 3 = 0.4771$ , then the number of digits in  $3^{43}$  is

- (a) 20      (b) 21      (c) 22      (d) 43

**53.** The sum of the squares of the first ten natural numbers is

- (a) 375      (b) 385  
(c) 475      (d) 485

**54.** If  $A$ ,  $B$  and  $C$  are integers such that  $B^2 = C^2$ , then  $(A + B + C)(B + A - C)(C + B - A)(C + A - B)$  is equal to

- (a)  $2A^2B^2 - A^4$       (b)  $4A^2C^2 - A^4$   
(c)  $4A^2BC - A^4$       (d)  $2A^2C^2 + A^4$

**55.** Which one of the following polynomials over  $R$  is monic ?

(a)  $(7 - 4x - x^2 + 8x^3)\left(1 + \frac{1}{8}x\right)$

(b)  $(7 - 4x - x^2 + 8x^3)\left(1 + \frac{8}{x}\right)$

(c)  $(7 - 4x - x^2 + 8x^3)\left(1 - \frac{8}{x}\right)$

(d)  $(7 - 4x - x^2 + x^3)\left(1 + \frac{1}{8}x\right)$

**56.** Consider the following polynomials :

1.  $5x^4 - 2x^3 + 5x^2 - 7x + 8$

2.  $3 + 4x + 5x^2y + 6x^3y^2z - 3x^2y^5z^4$

3.  $x^3 + x + \frac{1}{3}$

4.  $x^2 - 3x^5 + x^7 - \frac{1}{7}$

The correct sequence of the above polynomials in ascending order of their degrees is

- (a) 3, 4, 2, 1      (b) 3, 1, 4, 2

- (c) 4, 1, 2, 3      (d) 4, 1, 3, 2

**57.** Consider the following four quadratic expressions :

1.  $x^2 - 5x + 6$     2.  $x^2 + 8x + 15$   
 3.  $4x^2 - 4x + 1$     4.  $2x^2 - 3x + 4$

Which of these functions have linear factors ?

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

**58.** Consider the following factors :

1.  $x$             2.  $x + 1$         3.  $x - 1$

Which of these is/are the factor(s) of the polynomial  $3x^3 + x^2 - 3x - 1$  ?

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

**59.** If  $x + 6$  is a factor of  $x^3 + 3x^2 + 4x + k$ , then the value of  $k$  is

- (a) 112                (b) 122  
 (c) 132                (d) 142

**60.** Which one of the following pairs of expressions and factors is correctly matched ?

- (a)  $x^3 + 4x^2 + 3x - 8$     ....  $x - 1$   
 (b)  $x^2 + 8x - 20$         ....  $x + 2$   
 (c)  $x^3 - 3x^2 - 10x + 24$  ....  $x + 4$   
 (d)  $a^2(b - c) + b^2(c - a) + c^2(a - b)$  ....  $b + c$

**61.** The HCF of

$x^3 - 8$ ,  $x^2 - 4x + 4$  and  $x^4 - 16$  is

- (a)  $(x + 2)$             (b)  $(x - 2)$   
 (c)  $(x + 2)(x - 2)$     (d)  $(x^2 + 4)$

**62.** The product of two expressions is  $x^3 + x^2 - 44x - 84$ .

If the HCF of those two expressions is  $x + 6$ , then their LCM will be

- (a)  $(x + 2)(x + 7)$     (b)  $(x + 2)(x - 7)$   
 (c)  $(x - 2)(x + 7)$     (d)  $(x - 2)(x - 7)$

**63.** Consider the following statements :

- Every polynomial is a rational expression.
- Every rational expression is a polynomial.
- The degree of  $7x^5 - 2x + 3$  is 5.

Which of the above statements are correct ?

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

**64.** The solution set of

$$x^2 - 5x + 6 > 0$$

for  $x \in \mathbb{R}$  is

- (a)  $\{x \in \mathbb{R} : 2 < x < 3\}$   
 (b)  $\{x \in \mathbb{R} : x < 2\} \cup \{x \in \mathbb{R} : x > 3\}$   
 (c)  $\{x \in \mathbb{R} : x < 2\} \cap \{x \in \mathbb{R} : x > 3\}$   
 (d)  $\{x \in \mathbb{R} : x > 2\}$

**65.** The solution to the system of equations  $|x + y| = 1$ ,  $x - y = 0$  is given by

(a)  $x = y = \frac{1}{2}$

(b)  $x = y = -\frac{1}{2}$

(c)  $x = 1, y = 0$

(d)  $x = y = \frac{1}{2}$  or  $x = y = -\frac{1}{2}$

**66.** Anupama gets 3 marks for each correct sum and loses 2 marks for each wrong sum. She attempts 30 sums and obtains 40 marks. The number of sums that she has solved correctly is

- (a) 10    (b) 15    (c) 20    (d) 25

**67.** Two bus stations are 60 km apart.

Two buses start simultaneously from these two bus stations. If the buses move in opposite directions, they meet after 2 hours from the time of their departure. If they move in the same direction, they meet after 6 hours from the time of their departure. The speed of the bus with the greater speed is

- (a) 10 km/hour    (b) 20 km/hour  
 (c) 30 km/hour    (d) 40 km/hour

**68.** The sum of the base angles of a triangle is  $140^\circ$  and their difference is  $40^\circ$ . The angles of the triangle are

- (a)  $90^\circ, 50^\circ$  and  $40^\circ$   
 (b)  $100^\circ, 40^\circ$  and  $40^\circ$   
 (c)  $80^\circ, 40^\circ$  and  $60^\circ$   
 (d)  $110^\circ, 30^\circ$  and  $40^\circ$

69. A room with a square base is of height 3 m. If it costs Rs. 1700 for painting its interior at the rate of Rs. 20 per sq m, then the length of the side of the base of the room is

- (a) 13 m (b) 6.5 m  
(c) 5 m (d) 2.5 m

70. In the  $xy$ -plane, the inequality  $x^2 + y^2 + 2x + 3y < 5$  represents

- (a) A circle  
(b) The interior of a circle  
(c) The exterior of a circle  
(d) A system of circles

71. If  $a^3 = b^3$  and  $a \neq b$ , then the sum of the roots of the equation  $x^2 - (a^2 + ab + b^2)x + k = 0$  is equal to

- (a)  $k$  (b)  $b^2$   
(c) 0 (d)  $a^2$

72. If  $0 < a < 4$ , then the equation  $ax(1 - x) = 1$  has

- (a) Two equal roots  
(b) One positive root and one negative root  
(c) Two irrational roots  
(d) No real roots

73. If  $3^{x+5} = 3^{x+3} + \frac{8}{3}$ , then  $x$  is equal to

- (a) 4 (b) 3  
(c) -4 (d)  $\frac{9}{8}$

74. Let  $m, n$  be natural numbers with  $n > 3$ . If  $(\sqrt{2})^{m^n} = ((\sqrt{2})^m)^n$ , then  $m$  is equal to

- (a)  $(n-1)^{\frac{1}{n}}$  (b)  $n^{\frac{1}{n}}$   
(c)  $n^{(n-1)}$  (d)  $n^{1/(n-1)}$

75. If set  $A$  contains 3 elements and another set  $B$  contains 6 elements, then the number of elements in the set  $A \cup B$  would be

- (a) 9  
(b) Either 8 or 9  
(c) Either 7 or 8 or 9  
(d) Either 6 or 7 or 8 or 9

76. If  $A = \{2x : x \in \mathbb{N}\}$ ,  
 $B = \{3x : x \in \mathbb{N}\}$ ,

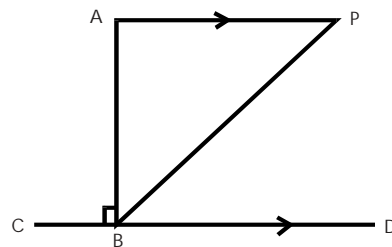
where  $\mathbb{N}$  is the set of all natural numbers, then  $A \cap B$  is

- (a)  $\{6, 10, 12, 18, 20, 24, \dots\}$   
(b)  $\{6, 12, 18, 24, \dots\}$   
(c)  $\{6, 12, 30, \dots\}$   
(d)  $\{2, 3, 4, 5, 8, \dots\}$

77. If  $A = \{2, 4, \{5, 6\}, 8\}$ , then which one of the following statements is not correct?

- (a)  $\{5, 6\} \subseteq A$  (b)  $\{5, 6\} \in A$   
(c)  $\{2, 4, 8\} \subseteq A$  (d)  $2, 4, 8 \in A$

78. In the given figure, if  $AB$  is perpendicular to  $CD$ ,  $AP \parallel CD$ ,  $\angle CBP = 128^\circ$ , then  $\angle APB$  is



- (a)  $52^\circ$  (b)  $38^\circ$   
(c)  $32^\circ$  (d)  $45^\circ$

79. If  $X, Y, Z$  are non-collinear points, then which one of the following gives possibly the correct set of distances?

- (a)  $XY = 10, YZ = 10, XZ = 20$   
(b)  $XY = 5, YZ = 20, XZ = 15$   
(c)  $XY = 20, YZ = 15, XZ = 5$   
(d)  $XY = 20, YZ = 20, XZ = 10$

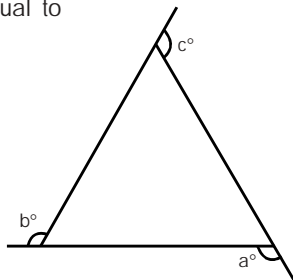
80. If in a regular polygon, an interior angle is equal to five times the exterior angle, then the number of sides in the polygon is

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

**81.** If two angles of a convex polygon are right angles and each of the other angles is  $120^\circ$ , then the number of sides of the polygon is

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

**82.** In the given figure  $a^\circ + b^\circ + c^\circ$  is equal to

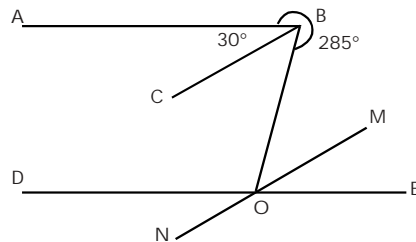


- (a) 1 right angle (b) 2 right angles  
(c) 3 right angles (d) 4 right angles

**83.**  $n$  coplanar straight lines meet in a point. The angles between consecutive lines are  $\alpha^\circ, 2\alpha^\circ, \dots, n\alpha^\circ$ . In order that the maximum angle is  $80^\circ$ , the value of  $n$  should be

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

**84.** In the given diagram,  $AB$  is parallel to  $DE$ ,  $BC$  is parallel to  $MN$ . If  $\angle ABC = 30^\circ$  and  $\angle OBA = 285^\circ$ , then  $\angle BOM$  is



- (a)  $15^\circ$  (b)  $30^\circ$   
(c)  $45^\circ$  (d)  $60^\circ$

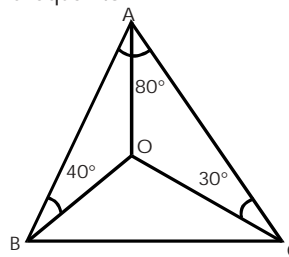
**85.**  $AB$  and  $CD$  are parallel line segments of length 8 cm and 9 cm respectively. If  $AD$  and  $BC$  intersect at  $O$  such that  $AO = 16$  cm, then  $OD$  is equal to

- (a) 18 cm (b) 20 cm  
(c) 24 cm (d) 28 cm

**86.** The internal bisectors of the angles of a parallelogram form a

- (a) Square (b) Parallelogram  
(c) Rectangle (d) Rhombus

**87.** In the given figure, if  $\angle A = 80^\circ$ ,  $\angle ABO = 40^\circ$ ,  $\angle ACO = 30^\circ$ , then  $\angle BOC$  is equal to



- (a)  $110^\circ$  (b)  $120^\circ$   
(c)  $140^\circ$  (d)  $150^\circ$

**88.** The median  $AD$  of a triangle  $ABC$  is produced to  $E$  such that  $AD = DE$ . If  $\angle BAD = \angle DAC$ , then which one of the following is not correct?

- (a)  $\angle BED = \angle DEC$   
(b)  $\angle BAC$  must be equal to  $\angle ACB$   
(c)  $A, O, D$  are collinear where  $O$  is the orthocentre of the triangle  $ABC$   
(d)  $AB = AC = CE = BE$

**89.** If  $ABCDE$  is a regular pentagon, then

- (a)  $\triangle AED$  is not similar to  $\triangle EDC$   
(b)  $\triangle AED$  is congruent to  $\triangle EDC$   
(c)  $AD$  and  $EC$  are bisected at their point of intersection  
(d)  $\angle DCE \neq \angle DAE$

**90.**  $ABC$  is a triangle. From a point  $X$  on  $AB$ ,  $XY$  is drawn parallel to the base  $BC$  to meet  $AC$  in  $Y$ . If the ratio of the area of  $\triangle AXY$  and area of figure  $XBCY$  is  $4 : 5$ , then  $AX$  and  $XB$  will be in the ratio of

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

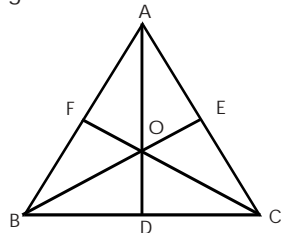
91. L and M are the points on PQ and PR respectively in  $\Delta PQR$  such that  $\angle PML = \angle PQR$ . If  $PL = 9$  cm,  $LQ = 11$  cm,  $QR = 10$  cm,  $PM = 12$  cm and  $MR = 3$  cm, then  $LM$  is equal to

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

92. The area of a triangle  $ABC$  is 60 sq. cm.  $BD$  is the perpendicular drawn from  $B$  on side  $AC$ . If  $AD = 3$   $CD$ , then the area of  $\Delta BCD$  is

- (a)  $6$  cm<sup>2</sup> (b)  $15$  cm<sup>2</sup>  
(c)  $20$  cm<sup>2</sup> (d)  $30$  cm<sup>2</sup>

93. If the three medians  $AD$ ,  $BE$  and  $CF$  of  $\Delta ABC$  meet at  $O$ , as shown in the given figure, then which one of the following statements is not correct?



- (a) Area  $OAC =$  Area  $OCB =$  Area  $OBA$   
(b)  $2$   $OE = BO$   
(c) Area  $OEC = \frac{1}{6}$  Area  $ABC$

(d) The perpendiculars drawn from  $O$  to the three sides of the  $\Delta ABC$  are of equal length.

94. The diagonals  $\overline{AC}$  and  $\overline{BD}$  of a quadrilateral  $ABCD$  bisect each other orthogonally at  $O$ . Consider the following statements in this regard :

1.  $ABCD$  is a square.
2.  $\Delta ABO \cong \Delta CBO$ .
3.  $\Delta ABO \cong \Delta CDO$ .
4.  $AO = OD$ .

Which of the above statements are correct ?

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

95. If one of the diagonals of a quadrilateral is the perpendicular bisector of the other, then the quadrilateral is

- (a) A rectangle  
(b) A square  
(c) A rhombus  
(d) Not necessarily any of the above

96. If  $A$  is the area of a trapezium and lengths of the parallel sides are ' $a$ ' and ' $b$ ', then the distance between the parallel sides of the trapezium is

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

97. Given that  $ABCD$  is a cyclic quadrilateral, match List I with List II and select the correct answer using the codes given below the lists :

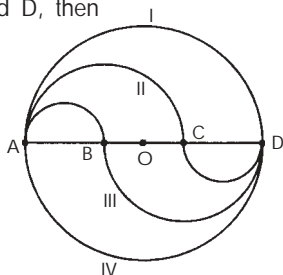
- |                 |                              |
|-----------------|------------------------------|
| List I          | List II                      |
| A. $\angle BAD$ | 1. $\angle BAC + \angle ACB$ |
| B. $\angle ABC$ | 2. $\angle CBD + \angle CDB$ |
| C. $\angle BCD$ | 3. $\angle CAD + \angle ACD$ |
| D. $\angle CDA$ | 4. $\angle ADB + \angle ABD$ |

- |       |   |   |   |
|-------|---|---|---|
| A     | B | C | D |
| (a) 1 | 3 | 2 | 4 |
| (b) 2 | 1 | 4 | 3 |
| (c) 4 | 2 | 3 | 1 |
| (d) 2 | 3 | 4 | 1 |

98. A point  $P$  is in the exterior of a circle of radius  $r$ . A line passing through a point  $P$  touches the circle at a point  $A$ . If  $AP = 3$  m and the shortest distance from the point  $P$  to the circle is 1 m, then the radius  $r$  of the circle is equal to

- (a) 5 m (b) 4 m  
(c) 3 m (d) 1 m

99. In the given circle, the diameter AD is divided into three equal parts by the points B and C. All the arcs in the figure are semicircles. If I, II, III and IV denote four curved lines which connect A and D, then



- (a) Curve II is longer than curve I
- (b) Curve II is shorter than curve I
- (c) Curves I, II, III and IV are of equal length
- (d) Curve II and curve III are of equal length but not equal to the length of curve I or curve IV

100. The locus of a point, which moves in a plane such that its distance from a given straight line  $l$  remains constant, is a

- (a) Straight line perpendicular to  $l$
- (b) Circle whose centre lies on  $l$
- (c) Straight line parallel to  $l$
- (d) Pair of straight lines parallel to  $l$

101. The altitude of an equilateral triangle of side  $4\sqrt{3}$  cm is

- (a) 6 cm
- (b) 6.2 cm
- (c)  $6\sqrt{3}$  cm
- (d) 6.6 cm

102. If the perimeter of a rectangular field is 200 m and its breadth is 40 m, then its area will be

- (a) 1200 m<sup>2</sup>
- (b) 2400 m<sup>2</sup>
- (c) 4800 m<sup>2</sup>
- (d) 6000 m<sup>2</sup>

103. If the radius of a circle is decreased by 50%, then its area will decrease by

- (a) 25%
- (b) 50%
- (c) 75%
- (d) None of these

104. If slabs are not to be broken, then the least number of square slabs of equal size that will cover the floor of a room measuring 10 m by 8 m is

- (a) 10
- (b) 20
- (c) 30
- (d) 40

105. The number of carpets ( $1.5 \text{ m} \times 2 \text{ m}$ ) required to cover the floor of a hall ( $15 \text{ m} \times 6 \text{ m}$ ) will be

- (a) 24
- (b) 26
- (c) 28
- (d) 30

106. A footpath of uniform width runs all around the inside of a rectangular field measuring 36 m by 30 m and occupies 360 sq m. The width of the footpath is

- (a) 3 m
- (b) 12 m
- (c) 15 m
- (d) 30 m

107. If the diagonals of a rhombus are 112 cm and 66 cm, then the length of its side is

- (a) 33 cm
- (b) 56 cm
- (c) 65 cm
- (d) 68 cm

108. If the area of a sector measures 840 sq m and the radius is 30 m, then the length of the sector will be

- (a) 26 m
- (b) 30 m
- (c) 56 m
- (d) 60 m

109. If the perimeter of one face of a cube is 40 cm, then the volume of the cube is

- (a) 1600 cm<sup>3</sup>
- (b) 1000 cm<sup>3</sup>
- (c) 800 cm<sup>3</sup>
- (d) 160 cm<sup>3</sup>

110. If six cubes, each of 10 cm edge, are joined end to end, then the surface area of the resulting solid will be

- (a) 3600 cm<sup>2</sup>
- (b) 3000 cm<sup>2</sup>
- (c) 2600 cm<sup>2</sup>
- (d) 2400 cm<sup>2</sup>

111. A cube of lead with side 6 cm is melted down and recast into a rectangular solid of square section. If the side of the square is 3 cm, then the height of the rectangular solid will be

- (a) 9 cm
- (b) 12 cm
- (c) 24 cm
- (d) 30 cm

**112.** If the radius and the height of a right circular cone are  $\frac{3}{\pi}$  cm and  $\frac{4}{\pi}$  cm respectively, then the curved surface area of the right circular cone is

- (a)  $\frac{5}{\pi}$  cm<sup>2</sup>                      (b)  $\frac{12}{\pi}$  cm<sup>2</sup>  
 (c)  $\frac{15}{\pi}$  cm<sup>2</sup>                      (d)  $\frac{20}{\pi}$  cm<sup>2</sup>

**113.** The ratio of the volumes of two right circular cones is 3 : 1. If the radii of their bases are also in the ratio of 3 : 1, then the ratio of their heights is

- (a) 1 : 2                              (b) 1 : 3  
 (c) 1 : 6                              (d) 1 : 9

**114.** If the height and the base radius of a right circular cone are increased by 100%, then the increase in volume will be

- (a) 200%                              (b) 400%  
 (c) 500%                              (d) 700%

**115.** Consider two right circular cones. One has a height equal to twice the base radius. The other has a base radius twice that of the base radius of the first cone. If the height of the second cone is half of the first, then the ratio of their volumes is

- (a) 1 : 2                              (b) 1 : 3  
 (c) 1 : 4                              (d) 1 : 8

**116.** The area of the base of a right circular cone is 78.5 sq.cm. If the height of the cone is 12 cm, then the volume of the right circular cone will be ( $\pi = 3.14$ )

- (a) 258 cm<sup>3</sup>                              (b) 314 cm<sup>3</sup>  
 (c) 356 cm<sup>3</sup>                              (d) 412 cm<sup>3</sup>

**117.** Each solid sphere has a diameter of 6 cm. The number of such solid spheres required to be melted to form a solid metal cylinder of height 40 cm and radius 3 cm will be

- (a) 12                                      (b) 10  
 (c) 8                                        (d) 6

**118.** The area of the base of a circular cylinder is 35 cm<sup>2</sup> and its height is 12 cm. Its volume will be

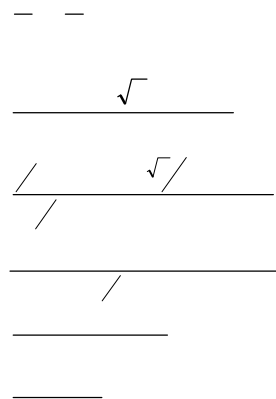
- (a) 420 cm<sup>3</sup>                              (b) 210 cm<sup>3</sup>  
 (c) 140 cm<sup>3</sup>                              (d) None of these

**119.** If  $\pi$  cm<sup>3</sup> of metal is stretched to a wire of length 3600 m, then the diameter of the wire will be

- (a)  $\frac{1}{600}$  cm                              (b)  $\frac{1}{300}$  cm  
 (c)  $\frac{1}{200}$  cm                              (d)  $\frac{1}{100}$  cm

**120.** Total surface area of a right circular cylinder is 1540 cm<sup>2</sup>. If the height is four times the radius, then its volume will be

- (a) 4312 cm<sup>3</sup>                              (b) 4321 cm<sup>3</sup>  
 (c) 4123 cm<sup>3</sup>                              (d) 4213 cm<sup>3</sup>







20. (d) 21. (a)

22. (b) : Expenditure incurred on transport

$$= \frac{108}{360} \times 100 = 30\%$$

23. (b)

24. (d) :  $\sum(x_i - 30) = 20$  ( $n = 20$ )

$$\Rightarrow \sum x_i - 30 \times 20 = 20$$

$$\Rightarrow \sum x_i = 20 + 20 \times 30$$

$$= 20 + 600 = 620$$

$$\therefore \text{Mean} = \frac{\sum x_i}{n} = \frac{620}{20} = 31$$

25. (c) : Let number of males = x and

number of females = y

$$\therefore 510x + 460y = 500(x + y)$$

$$\Rightarrow 10x = 40y$$

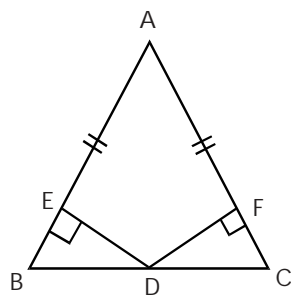
$$\Rightarrow \frac{x}{y} = \frac{4}{1} = 4 : 1$$

$\therefore$  Percentage of males

$$= \frac{4}{5} \times 100 = 80$$

26. (a)

27. (a)



28. (a)

29. (c) : q must be nonzero for (1) to be correct.

$$\begin{aligned} 30. (b) : \sqrt{4 + 2\sqrt{3}} &= \sqrt{a} + \sqrt{b} \\ \Rightarrow 4 + 2\sqrt{3} &= a + b + 2\sqrt{ab} \\ \Rightarrow a + b &= 4 \text{ and } ab = 3 \\ \Rightarrow a &= 3, b = 1 \end{aligned}$$

$$\therefore \sqrt{4 + 2\sqrt{3}} = \sqrt{3} + 1$$

$$\sqrt{4 - 2\sqrt{3}} = \sqrt{3} - 1$$

$$\Rightarrow \text{Given expression} = 2\sqrt{3}$$

31. (b) :  $36 \text{ km/hr} \Rightarrow 36000 \text{ m} / 3600 \text{ sec.}$

$$\Rightarrow 10 \text{ m/sec} \Rightarrow 250 \text{ m} / 25 \text{ sec.}$$

32. (d) : Prime number for  $n = 2$

$$= 2^{2^2} + 1 = 2^4 + 1$$

$$= 16 + 1 = 17$$

33. (b) :  $6M = 10B \Rightarrow 1M = \frac{5}{3}B$

$$\Rightarrow 7M = \frac{35}{3}B$$

Since 10 boys complete the work in 15 days and

$\left(\frac{35}{3} + x\right)$  boys complete the work in 9 days, therefore

$$\left(\frac{35}{3} + x\right) \times 9 = 10 \times 15$$

$$\Rightarrow 9x = 150 - 105 \Rightarrow x = 5$$

34. (c) : Let x = No. of apples,

y = No. of bananas and

z = No. of oranges purchased.

$$\therefore 5x + \frac{1}{2}y + z = 100$$

$$\Rightarrow 10x + y + 2z = 200$$

$$\Rightarrow x : y : z = 1 : 8 : 1$$

(by verification)

35. (a) : S.P. of the saree after two successive discounts

$$= 1000 \times \frac{80}{100} \times \frac{90}{100} = \text{Rs. } 720$$

$$\therefore \text{Savings} = 1000 - 720 = \text{Rs. } 280$$

36. (b) : Population after 2 years

$$= 125000 \left(1 + \frac{8}{100}\right)^2$$

$$= \text{Rs. } 145800$$

37. (a) :

$$\text{C.I.} = \text{Rs. } 2000 \left[1 + \frac{10}{100}\right]^3 - 2000$$

$$= \text{Rs. } (2662 - 2000) = \text{Rs. } 662$$

38. (c) : Let x be the savings of the family.

$$\frac{9}{2} = \frac{2700}{x} \Rightarrow x = 600$$

$\therefore$  Monthly expenditure = 2700 - 600 = Rs. 2100

39. (c)

40. (c) : Quantity of milk in the mixture

$$= 40 \times \frac{7}{8} = 35 \text{ litres}$$

$\therefore$  Quantity of water = 5 litres

$$\therefore \frac{35}{5+x} = \frac{3}{1}$$

$$\Rightarrow x = \frac{20}{3} = 6 \frac{2}{3} \text{ litres}$$

41. (b) : Middle number (6th)

$$= \frac{56782}{11} = 5162$$

$\therefore$  3rd number = 5159

42. (d) :  $2 + 1 = 3$ , which is prime  
 $2 \times 3 + 1 = 7$ , which is prime

43. (d) : 2 is even prime number  
 $2 \times 3 = 6$ , i.e. product of two prime numbers can be even number.

$$\begin{aligned} 44. (a) : \log_{10}(x-9) &= 1 \\ \Rightarrow x^2 - 9x &= 10^1 \\ \Rightarrow x^2 - 9x - 10 &= 0 \\ \Rightarrow (x-10)(x+1) &= 0 \\ \Rightarrow x &= 10, -1 \end{aligned}$$

$$45. (b) : f(3) = 81 - 81 + 3k - 12 = 0$$

$$\Rightarrow k = 4$$

$$\therefore (3x^3 - 9x^2 + 4x - 12) + (x - 3) = 3x^2 + 4$$

46. (b) : If a, b, c are any three consecutive positive integers, then  $ac = b^2 - 1$

$$\Rightarrow ac + 1 = b^2$$

$$\therefore \log(1 + ac) = \log b^2 = 2 \log b$$

47. (c) : Remainder =  $f(-1) = -1 + 3 - 3 + 3 = 2$

48. (b) :  $\log_{10}(\log_{10} x^{10}) = 1$   
 $\Rightarrow \log_{10} x^{10} = 10^1$

$$\begin{aligned} \Rightarrow 10 \log_{10} x &= 10 \Rightarrow \log_{10} x = 1 \\ \Rightarrow \log x &= \log 10 \Rightarrow x = 10 \end{aligned}$$

$$49. (d) : \sqrt{11+4\sqrt{7}} = 2+x$$

$$2+x = \sqrt{11+2\sqrt{28}} = \sqrt{a} + \sqrt{b} \dots (1)$$

$$\therefore 11+2\sqrt{28} = a+b+2\sqrt{ab}$$

$$\Rightarrow a+b = 11, ab = 28$$

$$\Rightarrow a-b = 3$$

$$\Rightarrow a = 7, b = 4$$

$\therefore$  From (1),

$$2+x = \sqrt{a} + \sqrt{b} = \sqrt{7} + \sqrt{4} = \sqrt{7} + 2$$

$$\Rightarrow x = \sqrt{7}$$

50. (b) : Let

$$x^{\log y - \log z} \cdot y^{\log z - \log x} \cdot z^{\log x - \log y} = p$$

Taking log of both sides, we get

$$\log p = \log x^{(\log y - \log z)} + \log y^{(\log z - \log x)} + \log z^{(\log x - \log y)}$$

$$= (\log y - \log z) \log x + (\log z - \log x) \log y + (\log x - \log y) \log z = 0$$

$$\therefore \log p = 0 \Rightarrow p = 1$$

$$51. (d) : \log_{10}[2 \times x \times 5] = 3$$

$$\Rightarrow 10x = 10^3 \Rightarrow x = 100$$

$$52. (b) : \log 3^{43}$$

$$= 43 \log 3 = 43 \times 0.4771$$

$$= 20.5153$$

$\therefore$  Number of digits in  $3^{43}$  is 21.

$$53. (b) : \Sigma n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\Rightarrow \Sigma 10^2 = \frac{10 \times 11 \times 21}{6} = 385$$

$$54. (b) : [(A+B) + C] [(A+B) - C]$$

$$[C - (A-B)] [C + (A-B)]$$

$$= [(A+B)^2 - C^2]$$

$$[C^2 - (A-B)^2]$$

$$= [A^2 + B^2 + 2AB - B^2]$$

$$[B^2 - A^2 - B^2 + 2AB]$$

$$[\therefore B^2 = C^2]$$

$$= (A^2 + 2AB)(2AB - A^2)$$

$$= 4A^2B^2 - A^4 = 4A^2C^2 - A^4$$

$$[\because B^2 = C^2]$$

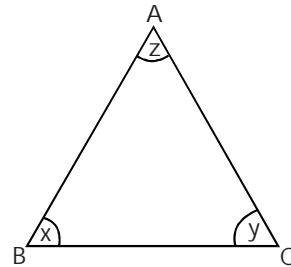
55. (a)
56. (b) : Degrees of the polynomials 3, 1, 4 and 2 are 3, 4, 7 and 11 respectively.
57. (c) : In other cases,  $b^2 - 4ac > 0$ .  
For (c),  $b^2 - 4ac < 0$
58. (b) :  $f(-1) = 0$  &  $f(1) = 0$
59. (c) :  $f(-6) = -216 + 108 - 24 + k = 0$   
 $\Rightarrow k = 132$
60. (a) :  $x = 1$  satisfies the polynomial  
 $x^3 + 4x^2 + 3x - 8$
61. (b) :  $x^3 - 8 = (x - 2)(x^2 + 2x + 4)$   
 $x^2 - 4x + 4 = (x - 2)(x - 2)$   
 $x^4 - 16 = (x^2 + 2)(x + 2)(x - 2)$   
 $\therefore$  H.C.F. =  $x - 2$
62. (b) : LCM =  $(x^3 + x^2 - 44x - 84)$   
 $\div (x + 6)$   
 $= x^2 - 5x - 14$   
 $= (x - 7)(x + 2)$
63. (b)
64. (b) :  $x^2 - 5x + 6 > 0$   
 $\Rightarrow (x - 3)(x - 2) > 0$   
 $\Rightarrow x < 2$  or  $x > 3$
65. (d) :  $x - y = 0 \Rightarrow x = y$   
 $\therefore |x + y| = 1 \Rightarrow |2x| = 1$   
 $\Rightarrow 2x = 1$  or  $2x = -1$   
 $\Rightarrow x = \frac{1}{2}$  or  $x = -\frac{1}{2}$
66. (c) : Let number of sums solved correctly =  $x$   
Let number of sums solved wrongly =  $y$   
 $\therefore x + y = 30$  and  $3x - 2y = 40$   
 $\Rightarrow x = 20, y = 10$
67. (b) : Let speed of the 1st bus =  $x$  km/hr.  
Let speed of the 2nd bus =  $y$  km/hr

$$\therefore x + y = \frac{60}{2} = 30$$

$$x - y = \frac{60}{6} = 10$$

$$\Rightarrow x = 20, y = 10$$

68. (a) :



$$x + y = 140 \text{ and } x - y = 40^\circ$$

$$\Rightarrow x = 90, y = 50$$

$$\therefore z = 180 - (x + y) = 40$$

69. (c) :

Let length =  $x$  meters  
Internal Area  
 $= 2(x + x) \times 3 + x \times x$   
 $= 12x + x^2$   
 $\therefore x^2 + 12x = \frac{1700}{20} = 85$   
 $\Rightarrow x^2 + 12x - 85 = 0$   
 $\Rightarrow (x + 17)(x - 5) = 0$   
 $\Rightarrow x = 5$

70. (b)

71. (c) :  $a^3 = b^3$   
 $\Rightarrow a^3 - b^3 = 0$   
 $\Rightarrow (a - b)(a^2 + ab + b^2) = 0$   
 $\therefore a \neq b \Rightarrow a^2 + ab + b^2 = 0$   
 $\Rightarrow$  Sum of the roots  
 $= \frac{a^2 + ab + b^2}{1} = 0$

72. (d) :

$$ax(1 - x) = 1$$

$$\Rightarrow ax - ax^2 = 1$$

$$\Rightarrow ax^2 - ax + 1 = 0$$

For real roots,  $a^2 - 4a > 0$   
 $\Rightarrow a(a - 4) > 0$   
 $\Rightarrow a < 0$  or  $a > 4$   
 $\therefore$  If  $0 < a < 4$ , then the given equation has no real roots.

73. (c) :  $3^x \cdot 3^5 = 3^x \cdot 3^3 + \frac{8}{3}$   
 Let  $3^x = y$   
 $\Rightarrow 243y = 27y + \frac{8}{3}$   
 $\Rightarrow 216y = \frac{8}{3}$   
 $\Rightarrow y = \frac{1}{81} = 3^{-4}$   
 $\therefore 3^x = 3^{-4} \Rightarrow x = -4$
74. (d) :  $(\sqrt{2})^m = (\sqrt{2})^{mn}$   
 $\Rightarrow m^n = mn$   
 $\Rightarrow m^{n-1} = n$   
 $\Rightarrow m = n^{\frac{1}{n-1}}$
75. (d) : If  $A \subset B$ , then  $n(A \cup B) = 6$   
 If  $A \cap B = \phi$ , then  $n(A \cup B) = 9$
76. (b) :  $A = \{2, 4, 6, 8, 10, 12 \dots\}$   
 $B = \{3, 6, 9, 12, \dots\}$   
 $A \cap B = \{6, 12, 18 \dots\}$
77. (b)
78. (c) :  $\angle ABP = 128^\circ - 90^\circ = 38^\circ$   
 $\angle APB = 90^\circ - 38^\circ = 52^\circ$
79. (d) : Sum of any two sides of a triangle is always greater than the third.
80. (d) : Let exterior angle =  $x$ . Then  
 internal angle =  $5x$ .  
 $\therefore 5x = 180 - x \Rightarrow x = 30^\circ$   
 Number of sides  
 $= \frac{360}{30} = 12$
81. (a) : Let number of sides =  $x$   
 Also sum of interior angles  
 $= (2x - 4)$  right angles  
 $\Rightarrow 180 + 120(x - 2)$   
 $= (2x - 4) \times 90$   
 $\Rightarrow x = 5$
82. (d) : Sum of exterior angles  
 $= 4$  right angles
83. (d) :  $\alpha + 2\alpha + \dots + n\alpha = 360$   
 $\Rightarrow (1 + 2 + 3 + \dots + n)\alpha = 360$

$$\Rightarrow \frac{n(n+1)}{2} \alpha = 360$$

$$\Rightarrow a \times n \times (n+1) = 720$$

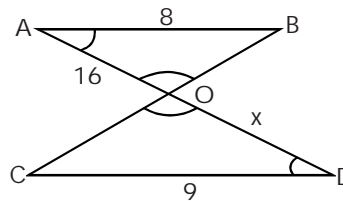
$$\Rightarrow 80(n+1) = 720$$

$$(\therefore \text{Maximum angle} = n\alpha = 80^\circ)$$

$$\Rightarrow n+1 = 9 \Rightarrow n = 8$$

84. (c) :  $\angle CBO = 360^\circ - [285^\circ + 30^\circ]$   
 $= 45^\circ$   
 $\therefore \angle BOM = 45^\circ$   
 $[\therefore \angle CBO = \angle BOM \text{ (alt. angles)}]$

85. (a) : Let  $OD = x$

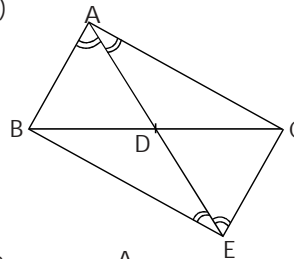


$$\therefore \frac{x}{16} = \frac{9}{8} \Rightarrow x = 18$$

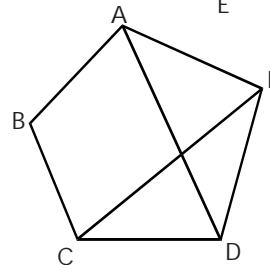
86. (c)

87. (d) :  $\angle BOC + \angle OCB$   
 $= 180^\circ - (80^\circ + 40^\circ + 30^\circ) = 30^\circ$   
 $\therefore \angle BOC = 180^\circ - 30^\circ = 150^\circ$

88. (b)



89. (b)

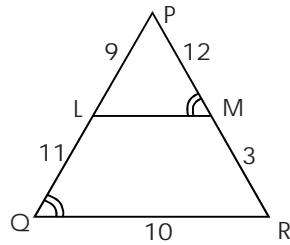


90. (c) :  $\frac{\text{Area of } (\Delta AXY)}{\text{Area of } (\Delta BXY)} = \frac{4}{5} \Rightarrow \frac{\text{Ar}(\Delta AXY)}{\text{Ar}(\Delta ABC)} = \frac{4}{9}$

We have  $\frac{(p+q)^2}{p^2} = \frac{9}{4}$

$\Rightarrow \frac{p+q}{p} = \frac{3}{2} \Rightarrow \frac{p}{q} = 2 : 1$

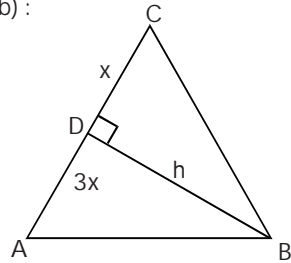
91. (b) :  $\Delta PML \sim \Delta PQR$



$\frac{PM}{PQ} = \frac{ML}{QR} \Rightarrow \frac{12}{20} = \frac{ML}{10}$

$\Rightarrow ML = 6$

92. (b) :

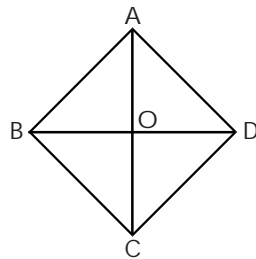


Area ( $\Delta ABC$ )

$= \frac{1}{2} \times h \times 3x = 15 \text{ cm}^2$

93. (d)

94. (d) : Rhombus

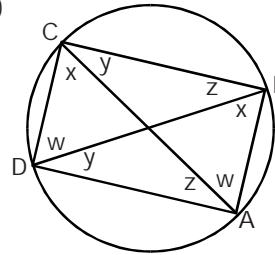


95. (c)

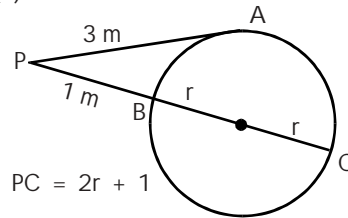
96. (b) :  $A = \frac{1}{2}(a+b) \times h$ , where h is the distance between the parallel sides a and b.

$\Rightarrow h = \frac{2A}{a+b}$

97. (d)



98. (b) :



$PC = 2r + 1$

$PB \times PC = PA^2$   
 $\Rightarrow 1 \times (2r + 1) = (3)^2$   
 $\Rightarrow 2r + 1 = 9 \Rightarrow r = 4$

99. (c)

100. (c)

101. (a) : Altitude  $= \frac{\sqrt{3}}{2} \times \text{side}$   
 $= \frac{\sqrt{3}}{2} \times 4\sqrt{3} = 6 \text{ cm.}$

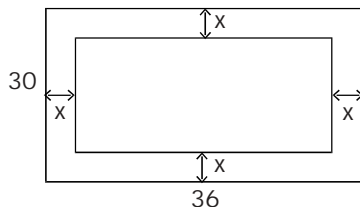
102. (b) :  $2(l+b) = 200 \Rightarrow l+b = 100$   
 $\Rightarrow l = 60 \quad (\because b = 40)$   
 $\therefore \text{Area} = 60 \times 40 = 2400 \text{ m}^2$

103. (c) : Let original radius =  $2r$   
 $\Rightarrow \text{Area of the circle} = 4\pi r^2$   
 $\therefore \text{Reduced Radius} = r$   
 $\Rightarrow \text{Area of the circle} = \pi r^2$   
 $\therefore \text{Reduction in area}$   
 $= \frac{3\pi r^2}{4\pi r^2} \times 100 = 75$

104. (d) : L.C.M. of 10 and 8 is 40.

105. (d) : No. of carpets  
 $= \frac{15 \times 6}{1.5 \times 2} = 30$

106. (a) :



$$36 \times 30 - (36 - 2x)(30 - 2x) = 360$$

$$\Rightarrow x^2 - 33x + 90 = 0$$

$$\Rightarrow (x - 30)(x - 3) = 0$$

$$\Rightarrow x = 3$$

107. (c) : Side =  $\sqrt{(56)^2 + (33)^2}$   
 $= \sqrt{4225} = 65$  cm.

108. (c) : Area of the sector  
 $= \frac{\pi r^2 \theta}{360} = 840$   
 $\Rightarrow \frac{\pi r \theta}{180} = \frac{840 \times 2}{r}$   
 $\therefore$  Length of the sector  
 $= \frac{\pi r \theta}{180} = \frac{840 \times 2}{30} = 56$  m

109. (b) : Side of the cube  
 $= \frac{40}{4} = 10$  cm

$$\Rightarrow \text{Volume of the cube} = (10)^3 = 1000 \text{ cm}^3$$

110. (c) :  $l = 6 \times 10 = 60$   
 $b = 10, h = 10$   
 $\therefore$  Surface Area  
 $= 2[60 \times 10 + 10 \times 10 + 10 \times 60]$   
 $= 2600 \text{ cm}^2$

111. (c) : Volume of the cube =  $(6)^3 = 216 \text{ cm}^3$   
 Let  $h$  be the height of the rectangular solid.  
 $\therefore 3 \times 3 \times h = 216$   
 $\Rightarrow h = 24$

112. (c) :  $r = \frac{3}{\pi}, h = \frac{4}{\pi}$

$$l = \sqrt{\frac{9}{\pi^2} + \frac{16}{\pi^2}} = \frac{5}{\pi}$$

Curved Surface Area =  $\pi r l$

$$= \pi \left( \frac{3}{\pi} \right) \left( \frac{5}{\pi} \right) = \frac{15}{\pi} \text{ cm}^2$$

113. (b) : Let radii of the bases of the two cones be  $3r$  and  $r$  respectively.

Let  $H$  &  $h$  be their heights respectively.

$$\therefore \frac{\pi(3r)^2 H}{\pi r^2 h} = \frac{3}{1} \Rightarrow \frac{9H}{h} = \frac{3}{1}$$

$$\Rightarrow \frac{H}{h} = \frac{1}{3}$$

114. (d) : Original volume =  $\pi r^2 h$   
 Increased volume =  $\pi(2r)^2(2h)$   
 $= 8\pi r^2 h$

$\therefore$  Increase in volume

$$= \frac{7\pi r^2 h}{\pi r^2 h} \times 100 = 700\%$$

115. (a) : Ratio of the volumes

$$= \frac{\frac{1}{3} \pi r^2 (2r)}{\frac{1}{3} \pi (2r)^2 (r)} = \frac{1}{2}$$

116. (b) : Volume =  $\frac{1}{3} \pi r^2 h$

$$= \frac{1}{3} \times 78.5 \times 12 = 314 \text{ cm}^3$$

117. (b) :  $\frac{\pi \times (3)^2 \times 40}{\frac{4}{3} \pi \times (3)^3} = 10$

118. (a) : Volume =  $\pi r^2 h$   
 $= 35 \times 12 = 420 \text{ cm}^3$

$$\begin{aligned}
 119. (b) : h &= 3600 \text{ m} = 360000 \text{ cm} \\
 &= \text{height of the cylinder} \\
 \text{Volume of the wire} &= \pi r^2 \times 360000 = \pi \\
 \Rightarrow r^2 &= \frac{1}{360000} \\
 \Rightarrow r &= \frac{1}{600} \\
 \Rightarrow \text{Diameter} &= \frac{1}{300}
 \end{aligned}$$

$$\begin{aligned}
 120. (a) : 2\pi r h + 2\pi r^2 &= 1540 \\
 \text{and } h &= 4r \\
 \Rightarrow 8\pi r^2 + 2\pi r^2 &= 1540 \\
 \Rightarrow 10\pi r^2 &= 1540 \\
 \Rightarrow \pi r^2 &= 154 \\
 \Rightarrow r &= 7 \text{ and } h = 28 \\
 \therefore \text{Volume} &= \pi r^2 h \\
 &= \frac{22}{7} \times 49 \times 28 = 4312 \text{ cm}^3
 \end{aligned}$$