

# Elementary Mathematics

- The material of a solid cone is converted into the shape of a solid cylinder of equal radius. If the height of the cylinder is 5 cm, what is the height of the cone?
  - 15 cm
  - 20 cm
  - 25 cm
  - 30 cm
- Let  $D, E$  be the points on sides  $AB$  and  $AC$  respectively of a  $\triangle ABC$  such that  $DE$  is parallel to  $BC$ . Let  $AD = 2$  cm,  $DB = 1$  cm,  $AE = 3$  cm and area of triangle  $ADE = 3$  cm<sup>2</sup>. What is  $EC$  equal to?
  - 1.5 cm
  - 1.6 cm
  - 1.8 cm
  - 2.1 cm
- A sum of money on compound interest amounts to ₹ 9680 in 2 yr and to ₹ 10648 in 3 yr. What is the rate of interest per annum?
  - 5%
  - 10%
  - 15%
  - 20%
- The curved surface of a cylinder is 1000 cm<sup>2</sup>. A wire of diameter 5 mm is wound around it, so as to cover it completely. What is the length of the wire used?
  - 22 m
  - 20 m
  - 18 m
  - None of these
- Three congruent circles each of radius 4 cm touch one another. What is the area (in cm<sup>2</sup>) of the portion included between them?
  - $8\pi$
  - $16\sqrt{3} - 8\pi$
  - $16\sqrt{3} - 4\pi$
  - $16\sqrt{3} - 2\pi$
- A man can walk uphill at the rate of 2.5 km/h and downhill at the rate of 3.25 km/h. If the total time required to walk a certain distance up the hill and return to the starting position is 4 h 36 min, what is the distance he walked up the hill?
  - 3.5 km
  - 4.5 km
  - 5.5 km
  - 6.5 km
- What is  $\cot 15^\circ \cot 20^\circ \cot 70^\circ \cot 75^\circ$  equal to?
  - 1
  - 0
  - 1
  - 2
- If  $\sin 3\theta = \cos(\theta - 2^\circ)$  where  $3\theta$  and  $(\theta - 2^\circ)$  are acute angles, what is the value of  $\theta$ ?
  - 22°
  - 23°
  - 24°
  - 25°
- What is  $\frac{\sin^6 \theta - \cos^6 \theta}{\sin^2 \theta - \cos^2 \theta}$  equal to?
  - $\sin^4 \theta - \cos^4 \theta$
  - $1 - \sin^2 \theta \cos^2 \theta$
  - $1 + \sin^2 \theta \cos^2 \theta$
  - $1 - 3 \sin^2 \theta \cos^2 \theta$
- Consider the following
  - $\tan^2 \theta - \sin^2 \theta = \tan^2 \theta \sin^2 \theta$
  - $(\operatorname{cosec} \theta - \sin \theta)(\sec \theta - \cos \theta) = 1$   
( $\tan \theta + \cot \theta = 1$ )
 Which of the above is/are correct?
  - 1 only is the identity
  - 2 only is the identity
  - Both 1 and 2 are the identities
  - Neither 1 nor 2 is the identity
- What is the square root of  $\frac{0.324 \times 064 \times 1296}{0.729 \cdot 1024 \cdot 36}$ ?
  - 4
  - 3
  - 2
  - 1
- What is the number of circles passing through all the vertices of a given triangle?
  - One
  - Two
  - Three
  - Infinite
- Four taps can individually fill a cistern of water in 1 h, 2 h, 3 h and 6 h respectively. If all the four taps are opened simultaneously, the cistern can be filled in how many minutes?
  - 20
  - 30
  - 35
  - 40
- What is the HCF of  $(x^4 - x^2 - 6)$  and  $(x^4 - 4x^2 + 3)$ ?
  - $x^2 - 3$
  - $x - 2$
  - $x + 3$
  - $x^2 + 3$
- If  $\frac{2x - 3y + 1}{2} = \frac{x + 4y + 8}{3} = \frac{4x - 7y + 2}{5}$ , then what is  $(x + y)$  equal to?
  - 3
  - 2
  - 0
  - 2
- Consider the following statements
  - Let  $P$  be a point on a straight line  $L$ . Let  $Q, R, S$  be the points on the same plane containing the line  $L$  such that  $PQ, PR, PS$  are perpendicular to  $L$ . Then there exists no triangle with vertices  $Q, R, S$ .
  - Let  $C$  be a circle passing through three distinct points  $D, E, F$  such that the tangent at  $D$  to the circle  $C$  is parallel to  $EF$ . Then,  $\triangle DEF$  is an isosceles triangle.
 Which of the statements given above is/are correct?
  - 1 only
  - 2 only
  - Both 1 and 2
  - Neither 1 nor 2
- 'X' completes a job in 2 days and 'Y' completes it in 3 days and 'Z' takes 4 days to complete it. If they work together and get ₹ 3900 for the job, then how much amount does 'Y' get?
  - ₹ 1800
  - ₹ 1200
  - ₹ 900
  - ₹ 800
- Water contains  $14\frac{2}{7}\%$  of hydrogen and the rest is oxygen. In 350 g of water, oxygen will be
  - 300 g
  - 250 g
  - 200 g
  - None of these
- What is the number whose 20% is 30% of 40?
  - 90
  - 80
  - 60
  - 50

20. 38 L of milk was poured into a tub and the tub was found to be 5% empty. To completely fill the tub, what amount of additional milk must be poured?

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

21. The income of 'A' is 20% higher than that of 'B'. The income of 'B' is 25% less than that of 'C'. What per cent less is A's income from C's income?

(a) 7% (b) 8%  
(c) 10% (d) 12.5%

22. In an examination, 52% candidates failed in English and 42% failed in Mathematics. If 17% candidates failed in both English and Mathematics, what percentage of candidates passed in both the subjects?

(a) 18% (b) 21%  
(c) 23% (d) 25%

23. If the HCF of three numbers 144,  $x$  and 192 is 12, then the number  $x$  cannot be

(a) 180 (b) 84  
(c) 60 (d) 48

24. What is the HCF of 3.0, 1.2 and 0.06?

(a) 0.6 (b) 0.06  
(c) 6.0 (d) 6.06

25. What is the least number of square tiles required to pave the floor of a room 9 m 99 cm long and 4 m 7 cm broad?

(a) 247 (b) 277  
(c) 297 (d) 307

26. The angle of elevation of the top of a tower at a point on level ground is  $45^\circ$ . When moved 20 m towards the tower, the angle of elevation becomes  $60^\circ$ . What is the height of the tower?

(a)  $10(\sqrt{3} - 1)$  m (b)  $10(\sqrt{3} + 1)$  m  
(c)  $10(3 - \sqrt{3})$  m (d)  $10(3 + \sqrt{3})$  m

27. If  $x^5 - 9x^2 + 12x - 14$  is divisible by  $(x - 3)$ , what is the remainder?

(a) 0 (b) 1  
(c) 56 (d) 184

28. Out of 250 observations, the first 100 observations have mean 5 and the average of the remaining 150 observations is  $\frac{25}{3}$ . What is the average of the whole

group of observations?

(a) 6 (b) 7  
(c) 8 (d) 9

29. Two circles touch each other internally. Their radii are 4 cm and 6 cm. What is the length of the longest chord of the outer circle which is outside the inner circle?

(a)  $4\sqrt{2}$  cm (b)  $4\sqrt{3}$  cm  
(c)  $6\sqrt{3}$  cm (d)  $8\sqrt{2}$  cm

30. The distance between the centres of two circles having radii 4.5 cm and 3.5 cm respectively is 10 cm. What is the length of the transverse common tangent of these circles?

(a) 8 cm (b) 7 cm  
(c) 6 cm (d) None of these

## For the next 02 (two) items to follow

The item-wise expenditure of a Non-Government Organisation for the year 2008-2009 is given below

Item	Expenditure (in lakh rupees)
Salary of employees	6
Social welfare activities	7
Office contingency	3
Vehicle maintenance	4
Rent and hire charges	2.5
Miscellaneous expenses	1.5

The above data are represented by a pie diagram.

31. What is the sectorial angle of the largest sector?

(a)  $120^\circ$  (b)  $105^\circ$   
(c)  $90^\circ$  (d)  $85^\circ$

32. What is the difference in the sectorial angles of the largest and smallest sectors?

(a)  $90^\circ$  (b)  $85^\circ$   
(c)  $82.5^\circ$  (d)  $77.5^\circ$

33. In a  $\triangle ABC$ , a line  $PQ$ , is drawn parallel to  $BC$ , points  $P$ ,  $Q$  being on  $AB$  and  $AC$  respectively. If  $AB = 3AP$ , then what is the ratio of the area of  $\triangle APQ$  to the area of triangle  $ABC$ ?

(a) 1 : 3 (b) 1 : 5  
(c) 1 : 7 (d) 1 : 9

34. What is one of the square roots of  $9 - 2\sqrt{14}$ ?

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

35. What is  $27 \times 1.2 \times 5.5262 \times 0.6$  equal to?

(a) 121.57 (b) 121.75  
(c) 121.75 (d) None of these

36.  $ABC$  is an equilateral triangle inscribed in a circle with  $AB = 5$  cm. Let the bisector of the angle  $A$  meet  $BC$  in  $X$  and the circle in  $Y$ . What is the value  $AX \cdot AY$ ?

(a)  $16 \text{ cm}^2$  (b)  $20 \text{ cm}^2$   
(c)  $25 \text{ cm}^2$  (d)  $30 \text{ cm}^2$

37. Consider the following statements

**Statement I :** Let  $PQR$  be a triangle in which  $PQ = 3$  cm,  $QR = 4$  cm and  $RP = 5$  cm. If  $D$  is a point in the plane of the triangle  $PQR$  such that  $D$  is either outside it or inside it, then

$$DP + DQ + DR > 6 \text{ cm}$$

**Statement II :**  $PQR$  is a right-angled triangle.

Which one of the following is correct in respect of the above two statements?

(a) Both statement I and statement II are individually true and statement II is the correct explanation of statement I.

(b) Both statement I and statement II are individually true and statement II is not the correct explanation of statement I.

- (c) Statement I is true and statement II is false  
 (d) Statement I is false and statement II is true
38. Two unequal circles are touching each other externally at  $P$ .  $APB$  and  $CPD$  are two secants cutting the circles at  $A, B, C$  and  $D$ . Which one of the following is correct?  
 (a)  $ACBD$  is a parallelogram  
 (b)  $ACBD$  is a trapezium  
 (c)  $ACBD$  is a rhombus  
 (d) None of the above
39.  $ABC$  is a triangle right-angled at  $B$  and  $D$  is a point on  $BC$  produced ( $BD > BC$ ), such that  $BD = 2 DC$ . Which one of the following is correct?  
 (a)  $AC^2 = AD^2 - 3CD^2$   
 (b)  $AC^2 = AD^2 - 2CD^2$   
 (c)  $AC^2 = AD^2 - 4CD^2$   
 (d)  $AC^2 = AD^2 - 5CD^2$
40. Let  $LMNP$  be a parallelogram and  $NW$  be perpendicular to  $LP$ . If the area of the parallelogram is six times the area of triangle  $RNP$  and  $RP = 6$  cm, what is  $LR$  equal to?  
 (a) 15 cm (b) 12 cm  
 (c) 9 cm (d) 8 cm

#### For the next 02 (two) items to follow

The following table gives the frequency distribution of life length in hours of 100 electric bulbs having median life 20 h

Life of bulbs (in hours)	Number of bulbs
8 - 13	7
13 - 18	$x$
18 - 23	40
23 - 28	$y$
28 - 33	10
33 - 38	2

41. What is the missing frequency  $x$ ?  
 (a) 21 (b) 27  
 (c) 24 (d) 14
42. What is the missing frequency  $y$ ?  
 (a) 27 (b) 24  
 (c) 14 (d) 11
43. If one root of the equation  $2x^2 + 3x + c = 0$  is 0.5, then what is the value of  $c$ ?  
 (a) -1 (b) -2  
 (c) -3 (d) -4
44. The HCF of two polynomials  $p(x)$  and  $q(x)$  is  $2x(x + 2)$  and LCM is  $24x(x + 2)^2(x - 2)$ . If  $p(x) = 8x^3 + 32x^2 + 32x$ , then what is  $q(x)$  equal to?  
 (a)  $4x^3 - 16x$  (b)  $6x^3 - 24x$   
 (c)  $12x^3 + 24x$  (d)  $12x^3 - 24x$
45. What is the condition that the equation  $ax^2 + bx + c = 0$ , where  $a \neq 0$ , has both the roots positive?  
 (a)  $a, b$  and  $c$  are of same sign  
 (b)  $a$  and  $b$  are of same sign  
 (c)  $b$  and  $c$  have the same sign opposite to that of  $a$   
 (d)  $a$  and  $c$  have the same sign opposite to that of  $b$
46. What is the volume (in  $\text{cm}^3$ ) of a spherical shell with 8 cm and 10 cm as its internal and external diameters respectively?  
 (a)  $\frac{61\pi}{3}$  (b)  $\frac{122\pi}{3}$   
 (c)  $\frac{244\pi}{3}$  (d)  $\frac{250\pi}{3}$
47.  $ABC$  is a triangle and  $AD$  is perpendicular to  $BC$ . It is given that the lengths of  $AB, BC, CA$  are all rational numbers. Which one of the following is correct?  
 (a)  $AD$  and  $BD$  must be rational  
 (b)  $AD$  must be rational but  $BD$  need not be rational  
 (c)  $BD$  must be rational but  $AD$  need not be rational  
 (d) Neither  $AD$  nor  $BD$  need be rational
48. If  $3^x + 27^x = 9^{x+4}$ , then what is  $x$  equal to?  
 (a) 4 (b) 5  
 (c) 6 (d) 7
49. The two diagonals of a rhombus are of lengths 55 cm and 48 cm. If  $p$  is the perpendicular height of the rhombus, then which one of the following is correct?  
 (a)  $36 \text{ cm} < p < 37 \text{ cm}$   
 (b)  $35 \text{ cm} < p < 36 \text{ cm}$   
 (c)  $34 \text{ cm} < p < 35 \text{ cm}$   
 (d)  $33 \text{ cm} < p < 34 \text{ cm}$
50. A toy is in the form of a cone mounted on a hemisphere such that the diameter of the base of the cone is equal to that of the hemisphere. If the diameter of the base of the cone is 6 cm and its height is 4 cm, what is the surface area of the toy in  $\text{cm}^2$ ? (Take  $\pi = 3.14$ )  
 (a) 93.62 (b) 103.62  
 (c) 113.62 (d) 115.50
51. The perimeter of a triangular field is 240 m. If two of its sides are 78 m and 50 m, then what is the length of the perpendicular on the side of length 50 m from the opposite vertex?  
 (a) 43 m (b) 52.2 m  
 (c) 67.2 m (d) 70 m
52. Consider the following statements in respect of a histogram:  
 1. The histogram consists of vertical rectangular bars with a common base such that there is no gap between consecutive bars.  
 2. The height of the rectangle is determined by the frequency of the class it represents.  
 Which of the statements given above is/are correct?  
 (a) 1 only (b) 2 only  
 (c) Both 1 and 2 (d) Neither 1 nor 2
53. A cistern 6 m long and 4 m wide contains water to a depth of 1.25 m. What is the area of wetted surface?  
 (a)  $40 \text{ m}^2$  (b)  $45 \text{ m}^2$   
 (c)  $49 \text{ m}^2$  (d)  $73 \text{ m}^2$