

2016

MATHEMATICS

Full Marks – 100

Time – 3 Hours

General Instructions :

- (i) All questions are compulsory.
- (ii) Figures in the margin indicate marks.
- (iii) In question on construction, the drawing should be neat and exactly as per the given measurements.
- (iv) Use of calculator is not allowed.

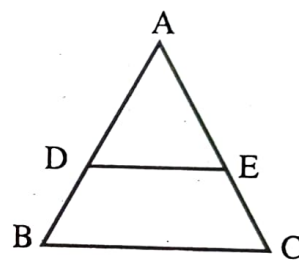
1. Choose the correct answer : 30 × 1 = 30
- (a) The present worth of Rs. 676 due 1 year hence at 8% per annum compounded half yearly is –
 (i) Rs. 676 (ii) Rs. 645 (iii) Rs. 625 ✓ (iv) Rs. 600
- (b) A bus runs at a speed of 72km/hr. Distance covered in 1 second is –
 (i) 10 m (ii) 20 m ✓ (iii) 30 m (iv) 36 m
- (c) A pipe can fill a tank in 16 hours. Due to leakage in the bottom, it is filled in 24 hours. If the tank is full, time taken by the leak to empty the tank is –
 (i) 36 hours (ii) 42 hours (iii) 45 hours (iv) 48 hours ✓
- (d) Two men start from the same point at the rate of 4km/hr and 4.5 km/hr respectively. The distance between them after 4 hours, when they walk in the same direction will be –
 (i) 1 km (ii) 2 km ✓ (iii) 3 km (iv) 4 km
- (e) The 8th term from the end of the AP 14, 11, 8,, – 40 is –
 (i) 25 (ii) 19 (iii) – 25 (iv) – 19 ✓
- (f) The sum of the roots of the equation $x^2 - 6x + 2 = 0$ is –
 (i) – 6 (ii) – 2 (iii) 6 ✓ (iv) 12
- (g) The zeros of the polynomial, $x^2 - x - 6$ are –
 (i) 1 and – 6 (ii) – 1 and 6 (iii) – 2 and 3 ✓ (iv) 2 and – 3
- (h) The solution set of linear equations : $x + y = 16$, $2x - y = 5$ is –
 (i) $x = -7$ and $y = 9$ (ii) $x = 7$ and $y = 9$ ✓
 (iii) $x = 7$ and $y = -9$ (iv) $x = -7$ and $y = -9$

- (i) A system of two linear equations in two unknowns is said to be inconsistent if it has –
- (i) At least one solution (ii) Finite number of solutions
 (iii) Infinite number of solutions ✓ (iv) No solution

- (j) The sum of the first 10 terms of the AP 9,7,5,3.....is –
- (i) 0 ✓ (ii) 144 (iii) -144 (iv) -441

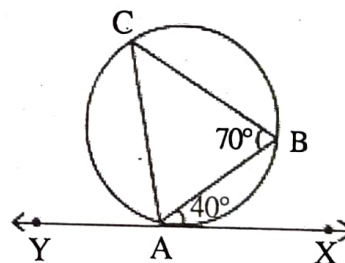
- (k) The sum of opposite angles of a cyclic quadrilateral is –
- (i) 60° (ii) 90° (iii) 180° ✓ (iv) 360°

- (l) In the given figure, in ΔABC , $DE \parallel BC$, so that $AD = 2.4$ cm, $AE = 3.2$ cm and $EC = 4.8$ cm. Then AB is equal to –



- (i) 3.6 cm (ii) 6 cm ✓
 (iii) 6.4 cm (iv) 1.6 cm

- (m) In the given figure, $\angle BAX = 40^\circ$ and $\angle ABC = 70^\circ$.



Then the measure of $\angle BAC$ is –

- (i) 50° (ii) 60°
 (iii) 70° ✓ (iv) 80°

- (n) $\Delta ABC \sim \Delta DEF$ such that $AB = 9.1$ cm and $DE = 6.5$ cm. If the perimeter of ΔDEF is 25 cm, then the perimeter of ΔABC is–

- (i) 31.5 cm (ii) 15.6 cm (iii) 40.6 cm (iv) 35 cm ✓

- (o) The distance of the point $A(2, -1)$ from the origin is –

- (i) $\sqrt{7}$ units (ii) $\sqrt{5}$ units ✓ (iii) $\sqrt{3}$ units (iv) $\sqrt{6}$ units

- (p) The mid-point of the line joining the points $A(-3,4)$ and $B(11, -2)$ is –

- (i) $(4, 1)$ ✓ (ii) $(7, 3)$ (iii) $(0, 4)$ (iv) $(9, 0)$

- (q) The point $P(1,2)$ divides the join of $A(-2, 1)$ and $B(7,4)$ in the ratio –

- (i) 2 : 3 (ii) 2 : 1 (iii) 3 : 2 (iv) 1 : 2 ✓

- (r) The coordinates of the centroid of ΔABC with vertices $A(-1,0)$, $B(5, -2)$ and $C(8, 2)$ is –

- (i) $(0, 6)$ (ii) $(4, 0)$ ✓ (iii) $(6, 0)$ (iv) $(12, 0)$

- (s) $\frac{\cos 80^\circ}{\sin 10^\circ} + \cos 59^\circ \operatorname{cosec} 31^\circ$ is equal to –
- (i) 0 (ii) 2 ✓ (iii) 4 (iv) 3
- (t) $\cot 10^\circ \cot 20^\circ \cot 60^\circ \cot 70^\circ \cot 80^\circ$ is equal to –
- (i) $\frac{1}{\sqrt{3}}$ ✓ (ii) $\sqrt{3}$ (iii) $\frac{\sqrt{3}}{2}$ (iv) $\frac{2}{\sqrt{3}}$
- (u) If $\tan A = \frac{4}{3}$ and A is acute, then the value of $\sin A$ is –
- (i) $\frac{3}{5}$ (ii) $\frac{4}{5}$ ✓ (iii) $\frac{5}{3}$ (iv) $\frac{5}{4}$
- (v) $(1 - \cos^2 A) \sec^2 A$ is equal to –
- (i) $\tan^2 A$ ✓ (ii) $\sin^2 A$ (iii) $\operatorname{cosec}^2 A$ (iv) $\cot^2 A$.
- (w) For a cuboid of length = l , breadth = b , height = h , the lateral surface area is –
- (i) $\{2(b+h) \times l\}$ ✓ (ii) $\{2(l+h) \times b\}$ (iii) $\{2(l+b) \times h\}$ (iv) $2(l+b+h)$
- (x) The length of an arc AB which makes an angle $\theta < 180^\circ$ at the centre of the circle of radius r is –
- (i) $2\pi r\theta$ (ii) $\frac{\pi r\theta}{90}$ (iii) $\frac{\pi r\theta}{360}$ (iv) $\frac{\pi r\theta}{180}$ ✓
- (y) The radius of a circle with area 3850 cm^2 is –
- (i) 35 cm ✓ (ii) 30 cm (iii) 25 cm (iv) 20 cm.
- (z) The radius of the base of a cone is 5cm and its height is 12cm. Its curved surface area is –
- (i) $60\pi \text{ cm}^2$ (ii) $65\pi \text{ cm}^2$ ✓ (iii) $30\pi \text{ cm}^2$ (iv) $35\pi \text{ cm}^2$
- (za) The probability of occurrence of a sure event is –
- (i) $\frac{1}{2}$ (ii) 0 (iii) 1 ✓ (iv) 2
- (zb) A die is thrown once. The probability of getting a number other than 5 is –
- (i) $\frac{1}{6}$ (ii) $\frac{5}{6}$ ✓ (iii) $\frac{2}{3}$ (iv) $\frac{1}{2}$
- (zc) If X is the universal set and $A \subset X$, then $\phi' \cap A$ is –
- (i) ϕ (ii) X (iii) A ✓ (iv) $X - A$
- (zd) If $A = \{2, 4, 6, 8, 10, 12\}$ and $B = \{3, 4, 5, 6, 7, 8\}$ then $(A - B)$ is –
- (i) $\{2, 3, 5, 7\}$ (ii) $\{2, 10, 12\}$ ✓ (iii) $\{3, 5, 7, 10, 12\}$ (iv) $\{8, 10, 12\}$

2. Answer the following questions :

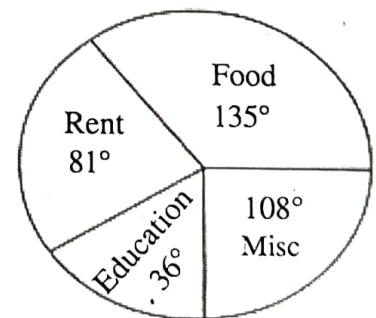
11×2=22

- (a) Pipe A can fill a cistern in 6 hours and pipe B can fill it in 8 hours. Both the pipes are opened and after 2 hours, pipe A is closed. How much time will A take to fill the remaining part of the tank? *2.5h*
- (b) How many terms of the AP 21, 18, 15.... must be added to get the sum 0? *15 terms*
- (c) Simplify : $\frac{4}{x-1} + \frac{5}{x+1} + \frac{6}{x^2-1}$
- (d) Find the values of p for which the quadratic equation $2x^2 + px + 8 = 0$ has real roots. *p > 8*
- (e) Solve for x and y : $4x - 3y = 8$; $x = \frac{8}{2}, y = -\frac{2}{3}$

$$6x - y = \frac{29}{3}$$

- (f) ABC is a triangle in which DE || BC intersecting AB and AC at D and E respectively. If $\angle ADE = \angle ACB$, prove that ΔABC is an isosceles triangle. *AB = AC → ΔABC is isosceles Δ.*
- (g) Prove that $\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} = 2 \operatorname{cosec} \theta$.
- (h) Find the area of a triangle whose vertices are A(2,4), B(-3,7) and C(-4,5). *13/2*
- (i) A hemispherical lead of radius 9cm is cast into a right circular cone of height 72 cm. Find the diameter of the base of the cone. *9cm*
- (j) The given pie chart shows Zovi's monthly expenses on various items. If she spends Rs. 1600 on education per month, answer the following questions :

- (i) Find her total expenditure *16000*
- (ii) How much does Zovi spend on her rent? *3600*



(k) Draw Venn diagram to represent sets A, B and C such that $A \cap C \neq \phi$, $B \cap C = \phi$ and $B \subset A$.

3. A man borrowed certain sum of money at 5% p.a compounded annually. He paid it back in two equal annual instalments of Rs. 4410 each. What sum did he borrow? Also find the total interest paid by him. *620*

*8200/-
Int =*

4

4. (a) Find the HCF and LCM of $3x^4 + 81x$ and $18x^3 + 45x^2 - 27x$. 4

OR

- (b) The perimeter of a rectangular field is 82 m and its area is 400 m^2 . Find the breadth of the rectangle. - $l = 25$ 4
5. Prove that the angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the remaining part of the circle. 4
6. If two chords of a circle intersect outside the circle when produced, prove that the rectangle formed by the two segments of one chord is equal in area to the rectangle formed by the two segments of the other chord. 4
7. (a) Find the coordinates of the points of trisection of the line segment AB whose end points are A(2,1) and B(5,-8). 4

OR

- (b) Show that the points A (6, 2), B(2,1), C(1,5) and D(5,6) are the vertices of a square. 4
8. (a) An aeroplane when 3000 m high passes vertically above another aeroplane at an instance when their angle of elevation at the same observation point are 60° and 45° respectively. How many meters higher is one aeroplane than the other? ($\sqrt{3} = 1.732$). 4

OR

- (b) Two poles of equal heights are standing opposite to each other on either sides of the road which is 80m wide. From a point between them on the road, the angle of elevation of the top of the poles are 60° and 30° respectively. Find the height of each pole. 4
9. Solve graphically the system of equations plotting at least three points for each graph :
 $4x - 3y + 4 = 0$; $4x + 3y - 20 = 0$. Also find the points where the lines meet the x-axis. 6
10. (a) Using ruler and compasses only, construct a ΔABC in which $AB = 4\text{cm}$, $BC = 5\text{cm}$ and $AC = 6\text{cm}$. Now, construct a triangle similar to ΔABC such that each of its sides is $\frac{3}{4}$ the corresponding side of ΔABC . Also write the steps of construction. 6

OR

- (b) Using ruler and compasses only, construct a ΔABC in which $BC = 6\text{cm}$, $\angle A = 60^\circ$ and the altitude through A is 3.2 cm. Also write the steps of construction. 6

11. A tent is in the form of a cylinder of diameter 4.2 m and height 4 m, surmounted by a cone of equal base and height 2.8m. Find the capacity of the tent and the cost of canvas for making the tent at Rs. 100 per square metre. 6
12. Find the (i) median and (ii) mode of the following frequency distribution table : 6

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Frequency	40	32	48	22	8