

2017

## MATHEMATICS

Full Marks – 80

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 :

24×1=24

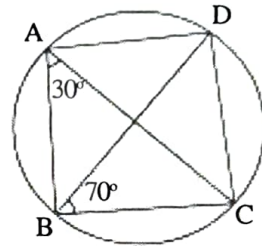
- (a) The sum of the present values (or the principals) of all instalments is equal to –  
(i) Amount (ii) Interest (iii) Sum borrowed (iv) Instalments
- (b) A speed of 54 km/hr equals –  
(i) 16 m/s (ii) 15 m/s (iii) 5 m/s (iv) 1 m/s
- (c) A and B can do a piece of work in 10 days, B and C in 15 days, C and A in 30 days. In how many days can they do it all working together ?  
(i) 10 days (ii) 11 days (iii) 15 days (iv) 18 days
- (d) The multiplicative inverse of  $\frac{x-1}{x+5}$  is –  
(i)  $\frac{x-1}{x+5}$  (ii)  $\frac{x+5}{x-1}$  (iii)  $\frac{-(x-1)}{x+5}$  (iv)  $\frac{-(x+5)}{x-1}$
- (e) In a two digit number, if 'a' is the digit in the unit's place and 'b' in the ten's place, then the two-digit number must be –  
(i) ab (ii) 10ab (iii) 10a+b (iv) 10b+a
- (f) The roots of the equation  $x^2+px+q=0$  are equal if –  
(i)  $p^2=2q$  (ii)  $p^2=-2q$  (iii)  $p^2=4q$  (iv)  $p^2=-4q$

P.T.O.

- (g) The 6<sup>th</sup> term from the end of an A.P. 17, 14, 11, ..., -40 is –  
 (i) 25                      (ii) -25                      (iii) 35                      (iv) -35
- (h) The areas of two similar triangles ABC and DEF are in the ratio 9:16. If BC = 4.5 cm, then EF is equal to –  
 (i) 5.5 cm                      (ii) 6 cm                      (iii) 12.5 cm                      (iv) 25 cm

- (i) In the given figure, the measure of  $\angle BCD$  is –

- (i)  $30^\circ$                       (ii)  $70^\circ$   
 (iii)  $80^\circ$                       (iv)  $100^\circ$



- (j) From a point Q outside the circle, the length of tangent to a circle is  $2\sqrt{7}$  cm and the distance of Q from the centre is 8 cm. The radius of the circle is –  
 (i) 6 cm                      (ii) 11 cm                      (iii) 15 cm                      (iv) 34 cm

- (k) The two vertices of a  $\Delta ABC$  are given by A (-1, 0) and B (5, -2), its centroid is G (4, 0). The coordinates of the third vertex C is –  
 (i) (6, 0)                      (ii) (12, 0)                      (iii) (2, 8)                      (iv) (8, 2)

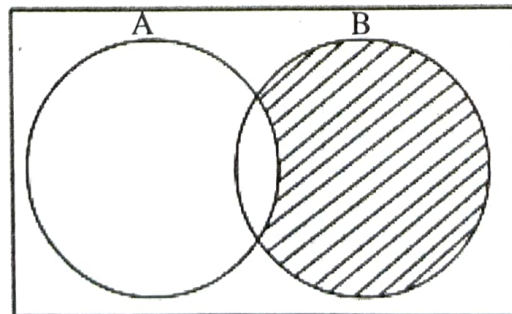
- (l) The mid-point of the line segment joining A (2, -3) and B (-4, 7) lies in –  
 (i) I Quadrant                      (ii) II Quadrant                      (iii) III Quadrant                      (iv) IV Quadrant

- (m) The distance of the point P (-6, 8) from the origin is –  
 (i) 10 units                      (ii) 8 units                      (iii) 6 units                      (iv)  $2\sqrt{7}$  units

- (n)  $9 \cot^2 \theta - 9 \operatorname{cosec}^2 \theta$  is equal to –  
 (i) 0                      (ii) 1                      (iii) 9                      (iv) -9

- (o) The value of  $\tan 22^\circ \tan 32^\circ \tan 45^\circ \tan 58^\circ \tan 68^\circ$  is –  
 (i) 0                      (ii) 1                      (iii) 2                      (iv) -2

- (p) The circumference of a circle is 1232 cm, then, the radius of the circle is –  
 (i) 176 cm      (ii) 186 cm      (iii) 196 cm      (iv) 198 cm
- (q) The formula for finding the total surface area of a right circular cone is –  
 (i)  $\pi \ell(r+h)$       (ii)  $\pi h(r+\ell)$       (iii)  $\pi r(\ell+h)$       (iv)  $\pi r(\ell+r)$
- (r) The area of sector of a circle with central angle  $45^\circ$  and radius 14 cm is –  
 (i)  $18 \text{ cm}^2$       (ii)  $28 \text{ cm}^2$       (iii)  $31 \text{ cm}^2$       (iv)  $77 \text{ cm}^2$
- (s) The radii of the ends of a frustrum of a cone 16 cm high are 20 cm and 8 cm. Its slant height is –  
 (i) 20 cm      (ii) 28 cm      (iii)  $20\sqrt{5}$  cm      (iv)  $33\sqrt{5}$  cm
- (t) If two hemispheres of same base radius 'r' are joined together along their bases, then, the curved surface area of this new solid is –  
 (i)  $6\pi r^2$       (ii)  $4\pi r^2$       (iii)  $3\pi r^2$       (iv)  $2\pi r^2$
- (u) Which of the following can be the probability of an event ?  
 (i)  $-0.005$       (ii) 1.006      (iii)  $\frac{18}{25}$       (iv)  $\frac{9}{8}$
- (v) If  $U = \{ 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$   
 $X = \{ 1, 2, 3, 4 \}$ ,  $Y = \{ 2, 3, 6, 10 \}$   
 then,  $(X - Y)'$  is –  
 (i)  $\{ 1, 4 \}$       (ii)  $\{ 2, 3 \}$       (iii)  $\{ 6, 10 \}$       (iv)  $\{ 2, 3, 5, 6, 7, 8, 9, 10 \}$
- (w) In the given figure, A and B are two sets. The shaded portion represents –

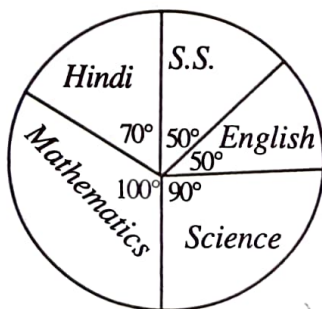


- (i)  $A - B$       (ii)  $B - A$       (iii)  $A \cup B$       (iv)  $A \cap B$
- (x) In a group of 65 people, 40 like apples, 10 like both apples and bananas. How many like bananas only ?  
 (i) 25      (ii) 35      (iii) 50      (iv) 75

2. Answer the following questions :

10×2=20

- (a) A can do a piece of work in 25 days and B can finish the same work in 20 days. They worked together for 5 days and then A leaves. In how many days will B finish the remaining work ?
- (b) Reduce  $\frac{x^2 + 7x + 12}{x^2 - 6x - 27}$  to its lowest term.
- (c) Solve :  $2x^2 - 9x + 9 = 0$
- (d) Which term of the A.P. 6,9,12,15..... will be 48 more than its 23<sup>rd</sup> term ?
- (e) In a right triangle ABC;  $\angle A = 90^\circ$ . If AD is drawn perpendicular to BC, then prove that  $AB^2 + CD^2 = BD^2 + AC^2$ .
- (f) Prove that the tangents drawn at the ends of a chord of a circle make equal angles with the chord.
- (g) If the points A(1, -1), B (-1,3) and C (5,1) are the vertices of  $\Delta ABC$ , find the length of the median through B.
- (h) If  $\sin 3\theta = \cos (\theta - 26^\circ)$ , where  $3\theta$  is an acute angle, find the value of  $\theta$ .
- (i) How many spherical lead shots each of 4.2 cm in diameter can be obtained from a rectangular solid of lead with dimension 66 cm × 42 cm × 21 cm ?
- (j) The adjoining pie-chart shows the marks scored in an examination by a student in different subjects. If the student obtained 105 marks in Hindi, find the total marks obtained by the student and the marks obtained in S.S.



3. A motor cycle was sold by a shopkeeper for a cash down payment of Rs. 34,000 along with two equal annual instalments of Rs. 12,000 each. If the rate of interest charged was 25 % per annum compounded annually, find the cash price of the motor cycle.

3



4. (a) Find the HCF and LCM of the following – 3  
 $f(x) = 2x^3 - 5x^2 - 3x$  and  $g(x) = x^4 - 27x$ .

OR

- (b) Solve:  $\frac{1}{x-1} - \frac{1}{x+5} = \frac{6}{7}, x \neq 1, -5$ . 3
5. (a) Using ruler and compasses only, construct a  $\triangle ABC$  in which  $BC = 6.5$  cm,  $\angle A = 60^\circ$  and the median from A on BC is 5 cm long. (Steps of construction is not required). 3
- OR
- (b) Using ruler and compasses only, draw a circle of radius 2.9 cm and take a point P outside it. Without using the centre of the circle, draw two tangents from the point P. (Steps of construction is not required) 3

6. If A (-5, 7), B (-4, -5), C (-1, -6) and D (4,5) are the vertices of a quadrilateral ABCD, find the area of quadrilateral ABCD. 3

7. Prove that:  $\frac{1 + \cos\theta}{1 - \cos\theta} = (\operatorname{cosec}\theta + \cot\theta)^2$  3

8. From a point P on the ground the angle of elevation of a 10 m high building is  $30^\circ$ . A flag is hoisted at the top of the building and the angle of elevation of the top of the flagstaff from the point P is  $45^\circ$ . Find the length of the flagstaff and the distance of the point P from the building. (Take  $\sqrt{3} = 1.732$ ) 3

9. (a) A vessel is in the form of a hemispherical bowl mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the capacity of the vessel. 3

OR

- (b) A bucket is in the form of a frustrum of a cone. Its depth is 24 cm and the diameter of the top and the bottom are 30 cm and 10 cm respectively. Find the cost of milk which can completely fill the bucket at the rate of Rs. 20 per litre. (Use  $\pi = 3.14$ ) 3

10. Solve the following system of linear equations graphically :

5

$$x + 3y = 6, 2x - 3y = 12.$$

Also, find the area bounded by these lines and the y-axis.

11. (a) State and prove the Pythagoras theorem.

5

OR

(b) If BL and CM are the medians of a  $\Delta ABC$  right angled at A, prove that  $4(BL^2 + CM^2) = 5BC^2$ .

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12. Find the mean of the following data :

C.I	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Frequency	12	16	6	7	9

Also, find the median by using the relation,  $\text{Mode} = 3 \text{ Median} - 2 \text{ Mean}$ , if mode of the above data is 12.85.

5