

**Group-A: Algebra**

(Answer any two of the following questions)

10×2=20

1. ►  $U = \{x : x \in \mathbb{N} \text{ and } x \text{ is an odd number}\}$

$A = \{x \in \mathbb{N} : 2 \leq x \leq 7\}$

$B = \{x \in \mathbb{N} : 3 < x < 6\}$

$C = \{x \in \mathbb{N} : x^2 > 5 \text{ and } x^3 < 130\}$

a. Express the set A in tabular method. 2

b. Determine  $A'$  and  $C - B$ . 4

c. Find  $B \times C$  and  $P(A \cap C)$ . 4

2. ►  $\frac{x}{m} + \frac{x}{n} = 8$  and  $(a + b + c)p = (b + c - a)q = (c + a - b)r =$

$(a + b - c)s$

a. If 1, x and 16 are ordered proportional, what is the value of x? 2

b. Prove that,  $\frac{x + 4m}{x - 4m} + \frac{x + 4n}{x - 4n} = 2$  4

c. Show that,  $\frac{1}{p} + \frac{1}{q} + \frac{1}{r} = \frac{1}{s}$ . 4

3. ► The first term of a geometric series is 'a' common ratio is 'r', the 4<sup>th</sup> term of the series is -2 and 9<sup>th</sup> term of the series is  $8\sqrt{2}$ .

a. Express the above information by two algebraic equations. 2

b. Find the 12<sup>th</sup> term of the series. 4

c. Find the series and sum of first eleven terms of the series. 4

**Group-B: Geometry**

(Answer any two of the following questions)

10×2=20

4. ► i.  $\Delta ABC$  and  $\Delta DEF$  are equiangular.

ii. In  $\Delta ABC$ , X is any point on BC and O is any point on AX.

a. What do you mean by equiangular polygon? 2

b. Show that, in  $\Delta ABC$  the matching sides of  $\Delta ABC$  and  $\Delta DEF$  are proportional. 4

c. From (ii) Prove that  $\Delta AOB : \Delta AOC = BX : XC$ . 4

5. ► Let ABCD is circle with centre O, M and N are the mid points of the chords AB and CD respectively.

a. Draw the figure of given information. 2

b. Prove that,  $OM \perp AB$ . 4

c. If  $OM < ON$ , Prove that,  $AB > CD$ . 4

6. ▶ Two diagonals of a parallelogram are 6 cm, 5 cm and angle between them is  $70^\circ$ .

a. Draw the figure of given information. 2

b. Draw the parallelogram. (Sign and description of drawing essential). 4

c. Considering the smaller diagonal as a radius of a circle, draw the circle and draw a tangent to the circle from any point outside of it. 4

### Group-C: Trigonometry and Mensuration

(Answer any one of the following questions)  $10 \times 1 = 10$

7. ▶ In a right angle triangle  $\angle B = 90^\circ$  and  $BC = x$  and  $AB = y$ .

a. Considering the A an acute angle, Find the trigonometry ratios in terms of  $x$  and  $y$ . 2

b. According to the stem prove that,  $\frac{x \sin A - y \sin A}{x \sin A + y \sin A} = \frac{x^2 - y^2}{x^2 + y^2}$ . 4

c. Prove that,  $\sec^2 A - \tan^2 A = 1$ . 4

8. ▶ The length of a rectangular garden is 150m and breadth is 100 m. In order to nursing the garden there is a path with 3 m. width all along its length and breadth right at the middle of the garden.

a. Show the above information in figure. 2

b. Determined the area of the path. 4

c. How many bricks of 25 cm length and 12.5 cm width will be required to make the path. 4

### Group-D: Statistics (Mandatory) $10 \times 1 = 10$

9. ▶ The frequency distribution table of weight (in kg) of 60 students of a class are.

Class interval	45-49	50-54	55-59	60-64	65-69	70-74
Frequency	4	8	10	20	12	6
Cum. frequency	4	12	22	42	54	60

a. Write down the formula of Arithmetic mean (Short-cut method). 2

b. Find the median of the given data. 4

c. Find the mode of the given data. 4

ANSWERS	1. (a) {3, 5, 7} (b) {1, 9, 11, .....}, {3} (c) {(5, 3), (5, 5)} and {{3, 5}, {3}, {5}, $\phi$ }	7. (a) $\sin A = \frac{x}{\sqrt{x^2 + y^2}}$ , $\cos A = \frac{y}{\sqrt{x^2 + y^2}}$ , $\tan A = \frac{x}{y}$
	2. (a) 4	8. (b) 741 sq. m (c) 23712 pcs
3. (a) $ar^3 = -2$ , $ar^8 = 8\sqrt{2}$ (b) -32	9. (a) $\bar{x} = a + \frac{\sum f_i u_i}{n} \times h$	(b) 62 (c) 62.78 (approx.)
(c) $\frac{1}{\sqrt{2}} - 1 + \sqrt{2} - \dots, \frac{63\sqrt{2} - 62}{2}$		

## Multiple Choice Questions

Time — 40 minutes Full marks— 40

Subject Code 

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*[NB. Answer all the questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer sheet" for multiple choice questions Examination. Candidates are asked not to leave any mark or spot on the question paper.]*

1. If  $f(x) = x^2 - 4x + 4$  then which one of the following is the value of  $f(2)$ ?  
 (a) 4 (b) 2 (c) 1 (d) 0
2. What is the simple profit of tk. 300 in 4 years at the rate of 5%?  
 (a) tk 120 (b) tk 50  
 (c) tk 60 (d) tk 160
3. The ratio of ages of Arif and Akib is 5 : 3. Arif is 20 years old, how many years later the ratio of their ages will be 7 : 5?  
 (a) 5 (b) 6 (c) 8 (d) 10
4. If  $x + y = 6$  and  $2x = 4$ , what is the value of  $y$ ?  
 (a) 2 (b) 4 (c) 6 (d) 8
5. If the side of a square is double, how much times will the area of the square be increased?  
 (a) 2 times (b) 4 times  
 (c) 8 times (d) 6 times
6. Which one indicates the data included in each class when the data are classified?  
 (a) Class limit  
 (b) Mid point of the class  
 (c) Number of the classes  
 (d) Frequency

Answer the question 7 and 8 on the basis of following:

$$\log 2 + \log 4 + \log 8 + \dots$$

7. What is the common difference of the series?  
 (a) 2 (b) 4  
 (c)  $\log 2$  (d)  $2 \log 2$
8. Which one is the 10<sup>th</sup> term of the series?  
 (a)  $\log 128$  (b)  $\log 256$   
 (c)  $\log 1024$  (d) none
9. The perimeter of a square is 40 cm. What is the area of the square?  
 (a) 20 sq. cm. (b) 40 sq. cm.  
 (c) 100 sq. cm. (d) 120 sq. cm.
10. If the three median of triangle is equal then the triangle is .....?  
 (a) Right angled (b) Equilateral  
 (c) Isosceles (d) Scalene
11. What is the value of  $\frac{4^n - 1}{2^n + 1} = ?$   
 (a)  $2^n + 1$  (b)  $2^n - 1$   
 (c)  $2^n + 2$  (d)  $4^n + 1$
12. The sum of a number and its reciprocal proportion is 2. The probable equation may be –

i.  $x + \frac{1}{x} = 2$

ii.  $x^2 + 2x + 1 = 0$

iii.  $x^2 - 2x + 1 = 0$

Which one is correct?

- (a) i and ii (b) i and iii  
 (c) ii and iii (d) i, ii and iii

13.  $\tan 2A = ?$  when  $A = 30^\circ$

- (a) 0 (b)  $\sqrt{3}$  (c)  $\frac{1}{\sqrt{3}}$  (d)  $\frac{1}{\sqrt{2}}$

14. Based on the following which conditions, the system of equation  $a_1x + b_1y = c_1$  and  $a_2x + b_2y = c_2$  is unique. ....

- (a)  $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$  (b)  $\frac{a_1}{a_2} = \frac{b_1}{b_2}$   
 (c)  $\frac{c_1}{c_2} = \frac{b_1}{b_2}$  (d)  $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

15. Observe the following :

- i. A rectangle is a parallelogram  
 ii. A square is a rectangle  
 iii. A rhombus is a square

Which one is correct?

- (a) i and ii (b) i and iii  
 (c) ii and iii (d) i, ii and iii

16. If  $\sin A = \frac{4}{5}$ , what is the value of  $\tan A$ ?

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

17. Observe the following equations :

i.  $2x + 3 = 9$

ii.  $\frac{x}{2} - 2 = -1$

iii.  $2x + 1 = 5$

Which one is correct?

- (a) i and ii (b) i and iii  
 (c) ii and iii (d) i, ii and iii

18. Which of the following is the formula for determining the sum of 1<sup>st</sup> n natural number?

(a)  $\frac{n}{2}\{2a + (n - 1)d\}$  (b)  $\frac{n(n + 1)(2n + 1)}{6}$

(c)  $\frac{n(n + 1)}{2}$  (d)  $\left[\frac{n(n + 1)}{2}\right]^2$

19. If  $\log_x 324 = 4$ , then what is the value of  $x$ ?

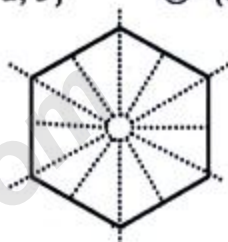
- (a)  $3\sqrt{2}$  (b)  $4\sqrt{2}$   
 (c)  $5\sqrt{2}$  (d)  $2\sqrt{3}$

20.  $ax^2 + bx + c = 0$  is .....
- A quadratic equation of  $x$
  - It has one root
  - It has two roots
- Which one is correct?
- (a) i and ii      (b) i and iii  
(c) ii and iii      (d) i, ii and iii
21. At least how many data are required to construct a quadrilateral?
- (a) 3    (b) 4    (c) 5    (d) 6
22. If the height of a trapezium is 8 cm. and the length of the parallel sides are 11 cm. and 9 cm. What is its area in  $\text{cm}^2$ ?
- (a) 60    (b) 70    (c) 80    (d) 99
23. Which one is the solution of  $x^2 - (p + q)x + pq = 0$
- (a)  $\{p, q\}$       (b)  $\{p, -q\}$   
(c)  $\{-p, q\}$       (d)  $\{-p, -q\}$
24. If  $\log_{10}x = -2$ , what is the value of  $x$ ?
- (a) 0.1    (b) 0.01    (c) 0.02    (d) 0.03
25. The length and width of two adjacent sides of a parallelogram are 7 cm and 5 cm respectively, what is the half of its perimeter in cm?
- (a) 12    (b) 20    (c) 24    (d) 16
26. The height of a trapezium 8 cm and the length of two parallel sides are 9 cm. and 7 cm. respectively. What is its area in  $\text{cm}^2$ ?
- (a) 24    (b) 64    (c) 96    (d) 504
27. What is the complementary angle of the sum of the acute angle in degree?
- (a) 0    (b) 90    (c) 100    (d) 180
28.  $\triangle ABC$  is equilateral triangle,  $AD \perp BC$  and  $AB = 6$  cm. What is the length of  $BD$  in cm.?
- (a)  $\sqrt{2}$     (b) 2    (c) 3    (d) 8
29. If  $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \frac{g}{h}$  then each ratio will be equal to .....
- (a)  $\frac{a+c+e+g}{b+d+f+h}$     (b)  $\frac{b+d+f+g}{a+c+e+g}$   
(c)  $\frac{aceg}{bdfg}$       (d)  $\frac{bdfg}{aceg}$
30. Observe the following:
- The angle of a semi circle is a right angle
  - The angle inscribed in the major arc of a circle is an acute angle
  - The circle drawn with hypotenuse of a right angled triangle as diameter passes

through the vertices of the triangle

Which one is correct?

- (a) i and ii      (b) i and iii  
(c) ii and iii      (d) i, ii and iii
31. One factor of  $a^2 - 11a - 42$  is .....
- (a)  $a - 14$       (b)  $a + 14$   
(c)  $a - 21$       (d)  $a + 21$
32. If  $a = \sqrt{3} - \sqrt{2}$ , what is the value of  $a + \frac{1}{a}$ ?
- (a)  $2\sqrt{3}$       (b)  $2\sqrt{2}$   
(c)  $-2\sqrt{2}$       (d)  $3\sqrt{2}$
33. If  $4^x = 64$ , what is the value of  $x$ ?
- (a) 2    (b) 3    (c) 4    (d) 5
34. Which one is correct set of  $\{x \in \mathbb{Z} : x^2 > 5 \text{ and } x^2 \leq 36\}$ ?
- (a)  $\{4, 7, 8\}$       (b)  $\{3, 7, 8\}$   
(c)  $\{1, 2, 3\}$       (d)  $\{3, 4, 5, 6\}$



35. In the figure above how many lines of symmetry?

- (a) 3    (b) 4    (c) 5    (d) 6

Answer the question 36 and 39 on the basis of following:

In a right angle triangle  $AB = \sqrt{2}a$ ,  
 $AC = a$  and  $\angle ABC = \theta$ .

36. Length of  $BC = ?$

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

37. Angled  $\theta = ?$

- (a)  $60^\circ$       (b)  $45^\circ$   
(c)  $30^\circ$       (d)  $22.5^\circ$

38.  $\sin\theta \cdot \tan\theta = ?$

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

39.  $\sec\theta \cdot \cos(90^\circ - \theta) = ?$

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

40. If  $\angle A = 30^\circ$ , then  $\tan \angle A = ?$

- (a) 0      (b)  $\frac{\sqrt{3}}{2}, \sqrt{3}$   
(c)  $\frac{1}{\sqrt{3}}$       (d) 1

1	(d)	2	(c)	3	(c)	4	(b)	5	(b)	6	(d)	7	(c)	8	(c)	9	(c)	10	(b)	11	(b)	12	(b)	13	(b)	14	(d)	15	(a)	16	(b)	17	(c)	18	(c)	19	(a)	20	(b)
21	(c)	22	(c)	23	(a)	24	(b)	25	(a)	26	(b)	27	(b)	28	(c)	29	(a)	30	(d)	31	(a)	32	(a)	33	(b)	34	(d)	35	(d)	36	(b)	37	(b)	38	(d)	39	(b)	40	(c)