

Group-A: Algebra

(Answer any two of the following questions)

10×2=20

1.▶ Consider the function $f(x) = \frac{5x + 1}{5x - 1}$

a. For what value of x, when $f(x) = \frac{1}{3}$ 2

b. Find the value of $\frac{f\left(\frac{1}{2}\right) + 1}{f\left(\frac{1}{2}\right) - 1}$ 4

c. If $f(x) = \frac{1 + x^3 + x^6}{x^3}$ then show that $f\left(\frac{1}{x^2}\right) = f(x^2)$. 4

2.▶ If $L = \frac{x^a}{x^b}$, $M = \frac{x^b}{x^c}$, $N = \frac{x^c}{x^a}$

a. If $L = 1$ then prove that, $a = b$. 2

b. Prove that, $\sqrt[ab]{L} \sqrt[bc]{M} \sqrt[ca]{N} = 1$. 4

c. Prove that, $\log_k L^{a+b} + \log_k M^{b+c} + \log_k N^{c+a} = 0$. 4

3.▶ The n-th term of a series is $2n - 4$.

a. Find the series. 2

b. Find the 10th term of the series and determine the sum of first 20 terms. 4

c. Considering the first term of the obtained series as 1st term and the common difference as common ratio, construct a new series and find the sum of first 8 terms of the series by applying the formula. 4

Group-B: Geometry

(Answer any two of the following questions)

10×2=20

4.▶ In a right angle triangle $\angle A = 1$ right angle and D is the mid point of BC.

a. Draw a triangle ABC with given information. 2

b. Prove that $AB + AC > 2AD$. 4

c. Prove that, $AD = \frac{1}{2} BC$. 4

5.▶ AB and AC are two chords of the circle with centre O and P and Q are the two mid points of the minor arcs cut by them. The chord PQ intersects the chords AB and AC at the points D and E resp.

a. Draw the figure with the above information. 2

b. Prove that, $AD = AE$. 4

c. Prove that, $\angle BAC = \frac{1}{2}\angle BOC$. 4

6. ▶

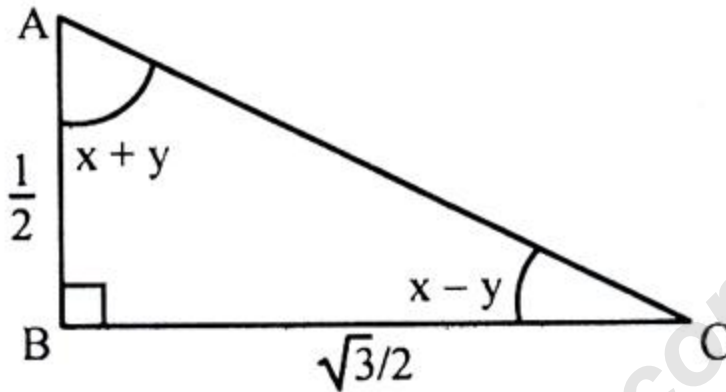
- a. Construct a triangle with area of the triangular region equal to that of a quadrilateral region. (Only Construct). 2
- b. X and Y are the mid points of the sides AB and AC of the triangle ABC. Prove that the area of the triangular region $AXY = \frac{1}{4}$ (Area of the triangular region ABC). 4
- c. ABC is an isosceles triangle, BC is its hypotenuse and P is any point on BC. Show that, $PB^2 + PC^2 = 2PA^2$. 4

Group-C: Trigonometry and Mensuration

(Answer any one of the following questions)

10×1=10

7. ▶



- a. What is the measurement of AC. 2
- b. Find the value of $\cos A + \cos C$. 4
- c. Prove that, $x = 3y$. 4

8. ▶ The length and the breadth of a rectangular region are 12m and 5m respectively. There is a circular region just around the rectangle. The places which are not occupied by the rectangle are planted with grass.

- a. Describe the above information with a figure. 2
- b. Find the diameter of the circular region and also area of the circular region. 4
- c. If the cost of planting grass per square meter is Tk. 50, then find the total cost. 4

Group-D: Statistics (Mandatory)

10×1=10

9. ▶ Marks of students of class X are given below.

61, 99, 62, 65, 98, 95, 81, 85, 90, 70, 77, 80, 75, 66, 68, 69, 75, 77, 82, 85, 87, 90, 92, 68, 70, 71, 72, 77, 78, 80, 83, 85, 75, 77, 81, 85, 75, 77, 81, 78

- a. Make frequency distribution table considering 5 as a class interval. 2
- b. Find the mean from the table in short-cut method. 4
- c. Draw frequency polygon of the presented data. 4

1. (a) $-\frac{2}{5}$ (b) $\frac{5}{2}$	7. (a) 1 (b) $\frac{\sqrt{3}+1}{2}$
3. (a) $-2+0+2+4+6+\dots+(2n-4)$ (b) 16, 340 (c) $-2-4-8-16,\dots$, and -510	8. (b) 13 meter, 132.73 sq. meter (c) Tk. 3636.5 9. (b) 79.25

Multiple Choice Questions

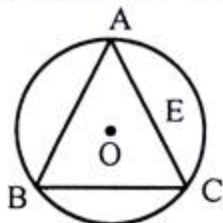
Time — 40 minutes Full marks— 40

Subject Code 1 0 9

[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. $\tan 2A = ?$ when $A = 30^\circ$.
 (a) 0 (b) $\sqrt{3}$ (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1}{\sqrt{2}}$
2. $1 + \sin^2 60^\circ = ?$
 (a) $\frac{1}{2}$ (b) $\frac{3}{5}$ (c) $\frac{7}{4}$ (d) $\frac{1}{\sqrt{2}}$
3. If $\cot\theta = \frac{1}{2}$, which one is the value of $\tan\theta$?
 (a) $\frac{1}{\sqrt{3}}$ (b) 1 (c) $\sqrt{3}$ (d) 2
4. $1 + \sec^2 30^\circ = ?$
 (a) $\frac{1}{2}$ (b) $\frac{3}{5}$ (c) $\frac{7}{3}$ (d) $\frac{1}{\sqrt{2}}$
5. When the value of $\cos 3A$ will be zero.
 (a) $A = 90^\circ$ (b) $A = 60^\circ$
 (c) $A = 45^\circ$ (d) $A = 30^\circ$
6. The length and width of two adjacent sides of a parallelogram are 7 cm, 5 cm, respectively. What is the half of its perimeter in cm.
 (a) 12 (b) 20 (c) 24 (d) 28
7. The length of the side of an equilateral triangle is 6 cm. What is the area (cm^2)?
 (a) $3\sqrt{3}$ (b) $4\sqrt{3}$ (c) $6\sqrt{3}$ (d) $9\sqrt{3}$
8. How many tangent can be drawn outside the circle?
 (a) 1 (b) 2 (c) 3 (d) 4

On the basis of the following information answer the question 9-10.



ABC is a circle with centre O.

9. Which type of circle is ABC of ΔABC
 (a) inscribed circle (b) circumcircle
 (c) ex-circle (d) ellipse.
10. If E is mid point of AC, which of the following is the measurement of $\angle OEC$
 (a) 30° (b) 60° (c) 90° (d) 120°
11. Of the following which one is the class interval?
 (a) The difference between the highest and the lowest data

- (b) The difference between the first and the last data.
- (c) The difference between the highest and the lowest number of each class.
- (d) The sum of the highest and the lowest numbers of each class.
12. 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 classes
 (d) Class frequency.
13. $\sqrt{\frac{27}{48}}$ Which type of number?
 (a) Rational (b) Irrational
 (c) Natural (d) Prime number
14. Divide 0.35 by 1.7, Find?
 (a) 1 (b) 2 (c) 0.2 (d) 0.3
15. If $A = \{a, b\}$, $B = \{b, c\}$ and $C = \{3, 4\}$. How many numbers of elements are in $A \cup B \cup C$?
 (a) 2 (b) 3 (c) 4 (d) 5
16. If $A = \{5, 6, 7, 8, 9, 10, 11, 12, 13, 14\}$. Which one is the set builder method of A?
 (a) $\{x \in \mathbb{N} : 5 < x < 14\}$
 (b) $\{x \in \mathbb{N} : 5 \leq x \leq 14\}$
 (c) $\{x \in \mathbb{N} : 5 \leq x < 14\}$
 (d) $\{x \in \mathbb{N} : 5 < x \leq 14\}$
17. $x^2 - \sqrt{3}x + 1 = 0$ then $x + \frac{1}{x} = ?$
 (a) $\sqrt{3}$ (b) $-\sqrt{3}$
 (c) $\pm\sqrt{3}$ (d) 3
18. Given that
 i. If $x : y = y : z$ then $xz = y^2$.
 ii. If $\frac{a}{b} = \frac{p}{q}$ then $\frac{a+b}{a} = \frac{p+q}{p}$
 iii. If $a : b = x : y$, then $ax = by$
 Which of the following is correct?
 (a) i and ii (b) i and iii
 (c) ii and iii (d) i, ii and iii

Answer to the question (19-21) using the following information $a + \frac{1}{a} = 4$

19. $a^2 + \frac{1}{a^2} = ?$
 (a) 10 (b) 14 (c) 16 (d) 20
20. $\left(a - \frac{1}{a}\right)^2 = ?$
 (a) 8 (b) 12 (c) 14 (d) 16

21. What is the value of $\frac{a}{a^2 + a + 1} = ?$
 (a) $\frac{1}{4}$ (b) $-\frac{1}{4}$ (c) $\frac{1}{5}$ (d) $\frac{1}{6}$
22. If $\frac{x}{y} = \frac{2}{3}$ then what is the value of $\frac{6x + y}{3x + 2y}$?
 (a) 5 (b) 6 (c) $\frac{5}{4}$ (d) 3 : 4
23. If $\frac{1}{3}A = \frac{1}{4}B = \frac{1}{5}C$ then what is the value of A : B : C?
 (a) 4 : 3 : 5 (b) 4 : 3 : 2
 (c) 3 : 4 : 5 (d) 20 : 5 : 12

Answer to the question (24–26) using the following information.

A substance is sold at a loss of 28%

24. If the cost price of the substance is x what is the amount of loss in Tk?

- (a) $x - 28$ (b) $x + 28$
 (c) $28x$ (d) $\frac{7x}{25}$

25. What is the amount of selling price in Tk?

- (a) $x - 28$ (b) 25
 (c) $18x$ (d) $\frac{18x}{25}$

26. What is the ratio of selling price and cost price?

- (a) 18 : 25 (b) 9 : 5
 (c) 3 : 5 (d) 25 : 18

27. Observe the following information:

- i. If $a + (a + d) + (a + 2d) + \dots$ then sum of the first n terms of the series is $\frac{n}{2} \{2a + (n - 1)d\}$

ii. $1 + 2 + 3 + \dots + n = \frac{n(n+1)(2n+1)}{6}$

iii. $1 + 3 + 5 + \dots + (2n - 1) = n^2$

Which of the following is correct?

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

28. Observe the following equation:

i. $2x + 3 = 9$

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

iii. $2x + 1 = 5$

Which are of the above equations equivalent?

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

29. Which one of the following is the solution set of the equation $x^2 - (a + b)x + ab = 0$?

- (a) $\{a, b\}$ (b) $\{a, -b\}$
 (c) $\{-a, b\}$ (d) $\{-a, -b\}$

The digit of tens place of a number consisting of two digits is twice the digit of the units place. In respect of the information.

Answer the 30-32 questions (situation set)

30. If the digit of the units place is x, what is the number?

- (a) $2x$ (b) $3x$ (c) $12x$ (d) $21x$

31. If the place of the digits are interchanged what will be the number?

- (a) $3x$ (b) $4x$ (c) $12x$ (d) $21x$

32. If $x = 2$, what will be the difference between the original number and the number by interchanging their place?

- (a) 18 (b) 20 (c) 34 (d) 36

33. Which one of the following combination of angles allows to construct a isosceles triangle?

- (a) 63° and 36° (b) 30° and 70°
 (c) 40° and 50° (d) 80° and 20°

Answer to the question (34–37) using the following information:

The area of a square is half of the area of a rectangle. And the area of the square is 21 square meter.

34. What is the area of the rectangle?

- (a) 10.5 (b) 12 (c) 24 (d) 42

35. What is the length of the side of the square?

- (a) 2 (b) 4 (c) 21 (d) $\sqrt{21}$

36. What is the perimeter of the square?

- (a) $\sqrt{21}$ (b) $2\sqrt{2}$
 (c) $4\sqrt{21}$ (d) $28\sqrt{7}$

37. What is the length of the rectangle if the breadth is 6m?

- (a) 7 (b) 14 (c) 21 (d) 42

Answer to the question (38–40) using the following information:

ABC is an isosceles triangle where $AB = AC = \frac{5x}{6}$, and $BC = x$, AD is height.

38. AD = ?

- (a) $\frac{x}{3}$ (b) $\frac{2x}{3}$ (c) $\frac{x}{2}$ (d) $\frac{3x}{6}$

39. If the perimeter is 16cm. then $x = ?$

- (a) 6 (b) 5 (c) 4 (d) 2

40. Area of ABC is

- (a) 8 sq. cm (b) 10 sq. cm
 (c) 12 sq. cm (d) 16 sq. cm

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