

Dinajpur Board 2016

Higher Mathematics

Subject Code :

1	2	6
---	---	---

Full marks — 40

Times — 2 hours 10 minutes

[Read the stems carefully and answer the associated questions. Taking minimum one question from each group answer altogether four questions.]

Group A—Algebra

1. ► $P(x) = x^2 + x - 12$, $Q(x) = 9x + 2$.

a. Find the domain $F(x) = \frac{2x}{x+3}$. 2

b. If $P(x)$ yields the same remainder upon division by $2x - a$ and $2x - b$ where $a \neq b$, show that, $a + b + 2 = 0$ 4

c. Express $\frac{Q(x)}{P(x)}$ as partial fractions. 4

2. ► $K = y^2 - y - 1$, $L = \frac{2m}{m-1}$, $M = \left(1 - \frac{x}{2}\right)^n$, where n is positive integer.

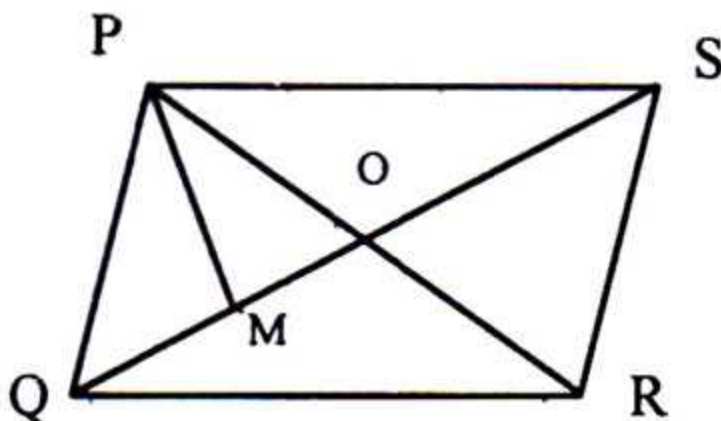
a. If $k = 0$, then find the discriminant of the equation. 2

b. If in the expansion of M co-efficient of x^2 is $\frac{6}{8}$, then find the value of n . 4

c. If $6\sqrt{L} + \frac{5}{\sqrt{L}} - 13 = 0$, then find the value of M . 4

Group B—Geometry and Vector

3. ►



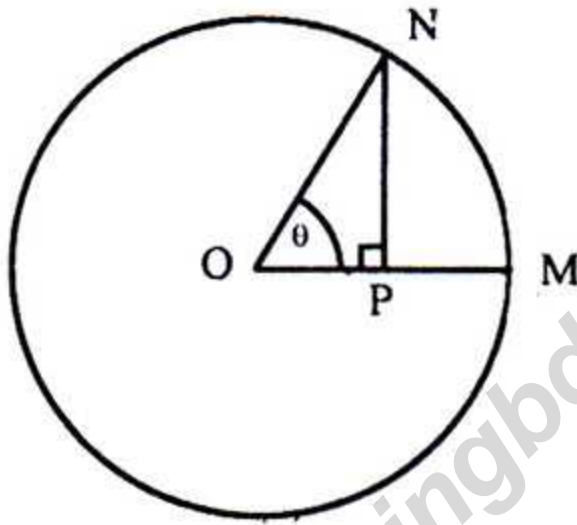
In the figure, PQRS is a Parallelogram.

a. State the Apollonius theorem. 2

- b. Prove that, $PQ^2 + PS^2 = 2(PO^2 + QO^2)$. 4
- c. By vector method prove that, $PO = RO$ and $QO = SO$. 4
4. ► A(2, -3), B(7, -3) and C(2, 3).
- a. Find the slope of the straight line BC. 2
- b. Plot the three point in the graph and then prove that the points are the vertices of a right angled triangle. 4
- c. Find the area of the whole surface of a solid obtained by revolving the triangle ΔABC about AB. 4

Group C— Trigonometry and Probability

5. ►



In the figure, O is the centre of a circle and $OM = \text{arc } MN$

- a. Express θ in degree. 2
- b. Prove that, θ is a constant angle. 4
- c. Determine for what value of θ , $\frac{PN}{ON} + \frac{OP}{ON} = \sqrt{2}$,
where $0 < \theta < 2\pi$. 4

6. ► The last 10 scores of International T-20 innings of Mushfiqur Rahim are given below: —

37, 51, 30, 2, 42, 38, 43, 62, 5, 13

- a. If an unbiased coin is tossed twice, draw a probability tree. 2
- b. Determine the difference of probability of making either half century or not in any innings. 4
- c. Determine the porbability of the scores is an odd number or multiple of 5 in any innings. 4

[N.B — 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.]

- In which case it is possible to draw a right angled triangle when length (cm) of three sides of triangle are given?
 (a) 12, 15, 19 (b) 6, 7, 8
 (c) 3, 4, 5 (d) 5, 6, 7
- Which one is the domain of the function $F(x) = \sqrt{5-x}$?
 (a) $\{x : x \in \mathbb{R} \text{ and } x \leq 5\}$
 (b) $\{x : x \in \mathbb{R} \text{ and } x < 5\}$
 (c) $\{x : x \in \mathbb{R} \text{ and } x \geq 5\}$
 (d) $\{x : x \in \mathbb{R} \text{ and } x > 5\}$
- What is the value of the half of the supplementary angle of 80° ?
 (a) 100° (b) 90° (c) 50° (d) 25°
- What is the discriminant of the equation $4x^2 - 3x - 2 = 0$?
 (a) 41 (b) 23 (c) -23 (d) -41

Answer the questions no. 5 and 6 based on the following information:

$$p(x) = 2x^4 - 6x^3 + 5x - 2.$$

- $p(2) = ?$
 (a) -92 (b) -8 (c) 8 (d) 92
- What is the remainder when $p(x)$ is divided by $2x + 1$?
 (a) -29 (b) $-\frac{29}{8}$ (c) $\frac{29}{8}$ (d) 29
- In the expansion of $\left(x^2 + \frac{1}{x^2}\right)^4$, what is the value of the term independent of x ?
 (a) 4 (b) 6 (c) 8 (d) 10
- What is the distance between the points (2, 2) and (0, -1)?
 (a) 13 (b) 5 (c) $\sqrt{13}$ (d) $\sqrt{5}$

Answer the question no. 9 and 10 based on the following information:

By throwing 6 times of a coin we find head 36 times.

- What is the relative frequency number of head?
 (a) 0.753 (b) 0.735 (c) 0.573 (d) 0.375
- What is the relative frequency number of tail?
 (a) 0.375 (b) 0.50 (c) 0.75 (d) 0.625
- What is the probability getting a prime number and less than 5 on the throw of an unbiased dice?
 (a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{3}{4}$
- The radius of a semi circle is 4 cm. If the semi circle is revolved about its diameter, the obtained solid will be—
 i. a cone
 ii. a sphere

- The area of the surface of the solid is $64\pi \text{ cm}^2$

Which one of the following is correct?

- i and ii
- i and iii
- ii and iii
- i, ii and iii

Answer the question no. 13 and 14 based on the following information:

A spherical ball of circumference 44 cm exactly fits into a cubical box.

- What is the radius of the spherical ball in cm (approximately)?
 (a) 7 (b) 8 (c) 9 (d) 14
- What is the volume of the cube in cubic cm (Approximately)?
 (a) 2744 (b) 3375 (c) 2197 (d) 2932
- If \underline{u} is an any non zero vector and $m \in \mathbb{R}, m > 0$, then—

- Direction of $m\underline{u}$ and that of \underline{u} are opposite
- Direction of $m\underline{u}$ and that of \underline{u} are same
- $m\underline{u} \neq 0$

Which one of the following is correct?

- i and ii
- i and iii
- ii and iii
- i, ii and iii

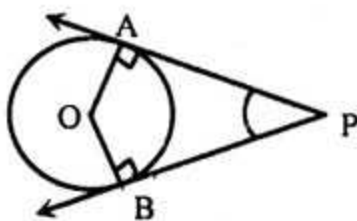
- If the position vector of P is \underline{a} and position vector of Q is \underline{b} , then $\overrightarrow{PQ} = ?$
 (a) $\underline{b} - \underline{a}$ (b) $\underline{b} + \underline{a}$
 (c) $\underline{a} + \underline{b}$ (d) $\underline{a} - \underline{b}$

Answer question no. 17 and 18 based on the following information:

The point $p(x, 3)$ lies on the straight line $y = 4x + 2$.

- Which one of the following is the coordinate of p?
 (a) $\left(\frac{5}{4}, 3\right)$ (b) $\left(\frac{1}{4}, 3\right)$
 (c) $\left(\frac{1}{2}, 3\right)$ (d) (4, 3)
- What is the coordinate of the point on which the straight line intersect x-axis?
 (a) (2, 0) (b) (0, 2)
 (c) $\left(0, -\frac{1}{2}\right)$ (d) $\left(-\frac{1}{2}, 0\right)$
- If $n = 5$, then the coefficients of the expansion of $(1 + y)^n$ are—
 (a) 1 3 3 1 (b) 1 4 6 4 1
 (c) 1 5 10 10 5 1 (d) 1 3 5 3 1
- What is the sum of the opposite angle of a quadrilateral inscribed in a circle in radian?
 (a) $\frac{\pi}{2}$ (b) π (c) $\frac{3\pi}{2}$ (d) 2π

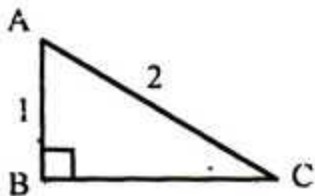
21.



What is the value of $\angle AOB$ in the above figure?

- (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$ (c) $\frac{2\pi}{3}$ (d) $\frac{3\pi}{2}$

Answer question no. 22 and 23 based on the following information:



22. $\sec C = ?$

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

23. What is the value of $\frac{2 \tan A}{1 - \tan^2 A}$

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

24. If $\theta = 360^\circ$, then—

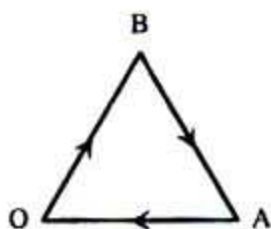
i. $\cos\left(\theta - \frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$ ii. $\cot\left(\theta + \frac{\pi}{6}\right) = \sqrt{3}$

iii. $\tan\left(\theta - \frac{\pi}{4}\right) = 1$

Which one of the following is correct?

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

25.



In the above figure $\vec{OB} + \vec{BA} + \vec{AO} = ?$

- (a) $-\vec{OA}$ (b) \vec{OA}
(c) $\vec{AO} + \vec{AO}$ (d) $\vec{AO} + \vec{OA}$

26. i. $\log_a p = \log_b p \times \log_a b$

ii. $\log_a \sqrt{a} \times \log_b \sqrt{b} \times \log_c \sqrt{c} = \frac{1}{8}$

iii. $\log_a b = \frac{1}{\log_b a}$

Which one of the following is correct?

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

27. How many dimension of a sphere?

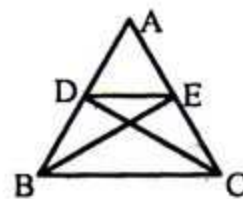
- (a) 2 (b) 3 (c) 4 (d) 1

28. If in the triangle ABC, median AD = 5

and side BC = 6, then $AB^2 + AC^2 = ?$

- (a) 34 (b) 68 (c) 78 (d) 112

29.



In the figure, if $BC \parallel DE$, then—

i. $\frac{AB}{AD} = \frac{AC}{AE}$ ii. $\angle AED = \angle ACB$

iii. The height of $\triangle BDC$ and $\triangle BEC$ are same

Which one of the following is correct?

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

30. If $ax^2 + bx + c = 0$ is a quadratic equation then,

i. $a \neq 0$

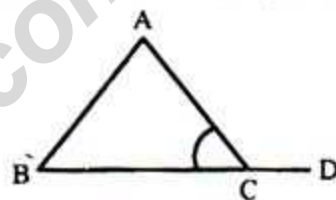
ii. Discriminant = $b^2 - 4ac$

iii. The equation has only one root

Which one of the following is correct?

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

31.



In the above figure, if $AB = AC$; then—

(a) $\sin \angle ACD = \cos 55^\circ$

(b) $\sin \angle ABC = \sin 55^\circ$

(c) $\cos \angle BAC = \sin 40^\circ$

(d) $\sin \angle ACD = \operatorname{cosec} 55^\circ$

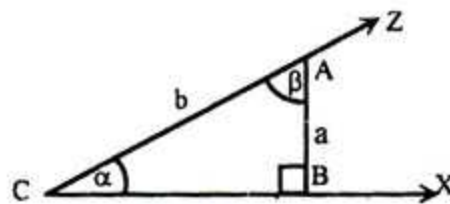
32. Which one of the following is domain of

$f(x) = |x|$?

(a) $\{x \in \mathbb{R} : x < 0\}$ (b) \mathbb{R}^+

(c) $\{x \in \mathbb{R} : x \geq 0\}$ (d) \mathbb{R}

33.



If $U = A \cup B$ and $n(u) = 120$, then what is the value of $2x$ in the above venn-diagram?

- (a) 15 (b) 17 (c) 20 (d) 30

34. $\log_4 2 + \log_6 \sqrt{6} = ?$

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

35. If $(\sqrt{3})^{x+5} = (\sqrt[3]{3})^{2x+5}$, then what is the value of x?

- (a) 7 (b) 6
(c) 5 (d) 4

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