# BUDHA DAL PUBLIC SCHOOL PATIALA SECOND TERM EXAMINATION (5 December 2024) Class - X

# Paper-Mathematics Basic (Set-A)

Time: 3hrs.

**General Instructions:** 

1. This Question Paper has 5 Sections A, B, C, D and E.

- 2. Section A has 20 MCQs carrying 1 mark each
- 3. Section B has 5 questions carrying 02 marks each.
- 4. Section C has 6 questions carrying 03 marks each.
- 5. Section D has 4 questions carrying 05 marks each.

6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-

parts of the values of 1, 1 and 2 marks each respectively.

## Section-A

- 1. The distance of the point (-6, 8) from X-axis is
  - a) 6 units b) -6 units c) 8 units d) 10 units
- 2. What is the ratio in which the line segment joining (2, -3) and (5, 6) is divided by x-axis
  - a) 1:2 b) 2:1 c) 2:5 d) 5:2
- 3. If  $\sin \theta = \cos \theta$ , then value of  $(\sec \theta, \sin \theta)$  is

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

- 4.  $\left[\frac{3}{4} \tan^2 30^\circ \sec^2 45^\circ + \sin^2 60^\circ\right]$  is equal to
  - a) -1 b)  $\frac{5}{6}$  c)  $\frac{-3}{2}$  d)  $\frac{1}{6}$
- 5. If a 30m ladder is placed against 15m wall such that it just reaches the top of the wall, then the elevation of the wall is equal to

a) 45° b) 30° c) 60° d) 50°

 In figure TP and TQ are tangents drawn to the circle with centre at O

if 
$$\angle POQ = 115^{\circ}$$
 then  $\angle PTQ$  is

a) 115° b) 57.5° c) 55° d) 65°

7. If  $\cos \theta = \frac{\sqrt{3}}{2}$  and  $\sin \theta = \frac{1}{2}$  then  $tan(\theta + \phi) =$ a)  $\sqrt{3}$  b)  $\frac{1}{\sqrt{3}}$  c) 1 d) not defined



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- 8. Which of the following is not defined b) tan 45 c) sec 90° a) cos 0<sup>0</sup> d) sin 90°
- 9. The circumference of two circles are in the ratio 4 : 5. The ratio of their radii is

b) 25: 16 c) 2: √5 a) 16:25 d) 4:5

10. The radius of a circle whose circumference is equal to the sum of the circumferences of the two circles of diameters 36 cm and 20 cm is

a) 56cm b) 42cm c) 28cm d) 16cm

11. Total surface area of a cube is

a)  $a^3$ b)  $4a^2$ c) 6a<sup>2</sup> d) 4a<sup>3</sup>

12. Which formula is used to find volume of a cone

a)  $\pi r^2 h$  b)  $\frac{1}{2}\pi r^2 h$  c)  $\frac{4}{3}\pi r^3$  d)  $\frac{2}{3}\pi r^3$ 

13. The slant height of a cone having height 24cm and radius 7cm is

a) 16 b) 25 c) 36 d) 10

14. Ice cream cone is made up of (i) a cylinder (ii) a cone (iii) a sphere (iv) a hemisphere

a) (i) and (iii) b) (ii) and (iii) c) (ii) and (iv) d) (i) and (iv)

15. After an examination, a teacher wants to know the marks obtained by maximum number of students in her class. She required to calculate \_\_\_\_\_ of marks.

a) median b) mode c) mean d) range

16. If the mean and the median of a data is 13 and 11 respectively then its mode is

a) 15 b) 14 c) 7 d) 6

17. Consider the frequency of 45 observations

Class	0-10	10-20	20-30	30-40	40-50
Frequency	5	9	15	10	6

The lower limit of the modal class is

a) 20 b) 10 c) 30 d) 40

8. The distance of point P(x, y) from origin is

a)  $\sqrt{x^2 + y^2}$  b) x + y c)  $\sqrt{x^2 + y^2}$  d) x - y

Direction: In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R).

- a) Both A and R are true and Reason (R) is correct explanation of A
- b) Both A and R are true but Reason (R) is not the correct explanation of A
- c) A is true but R is false
- d) A is false but R is true

(2) Statement A (Assertion) : The tangents drawn at the end points of a diameter of a circle, are Statement R (Reason) : Diameter of a circle is the longest chord.

 $\mathcal{M}$  Statement A (Assertion) : Volume of sphere of radius 6 cm is  $\frac{6336}{7}$  cm<sup>3</sup> Statement R (Reason): sphere is round object shaped like a ball, whose surface area is  $4\pi r^2$ 

## Section - B

- 21. In what ratio does y axis divide the line segment joining the points (-4, 7) and (3, -7)
- Prove that tangents drawn at the ends of a diameter of a circle are parallel.
- 23. Evaluate 2 (sin<sup>2</sup>45<sup>0</sup> + cot<sup>2</sup>30<sup>0</sup>) − 6 (cos<sup>2</sup>45<sup>0</sup> ± tan<sup>2</sup>30<sup>0</sup>)

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### OR

If sin(A + B) = 1 and  $cos(A - B) = \frac{\sqrt{3}}{2}$   $0^0 < A + B \le 90^0$  and A > B, then find A and B

- 24. Find the area of the sector of a circle of radius 6cm whose central angle is 30°. (Take  $\pi = 3.14$ )
- 25. A building casts a shadow of length  $5\sqrt{3}m$  on the ground, when the sun's elevation is 60 Find the height of the building.

### Section - C

26. Find the mode of the following frequency distribution:

Class- Interval	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	8	10	10	16	12	6	7

- 27. In what ratio does the point (-4, 6) divide the line segment joining the point A(-6, 10) and B(3, -8)?
- 28. Prove that the lengths of two tangents drawn from an external point to a circle are equal.
- 29. Show that  $\frac{\sin \theta 2 \sin^3 \theta}{2 \cos^3 \theta \cos \theta} = \tan \theta$

## OR

In a right triangle ABC, right angled at B if  $\tan A = 1$ , the verify that  $2 \sin A \cos A = 1$ 

- 30. In a circle of radius 21cm, an arc subtends an angle of 60° at the centre. Find
  - a) The length of the arc
  - b) Area of the segment formed by the corresponding chord.

*A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14cm and the total height of the vessel is 13cm. Find the inner surface area of the vessel. (use \pi = \frac{22}{7})* 

### Section - D

- 32. Prove that  $\frac{\cos A \sin A + 1}{\cos A + \sin A 1} = \csc A + \cot A$ , using the identity  $\csc^2 A = 1 + \cot^2 A$
- 33. The angles of depression of the top and the bottom of 8m tall building from the top of a multistoreyed building are 30<sup>o</sup> and 45<sup>o</sup> respectively. Find the height of the multi-storeyed building and the distance between the two buildings.
- 34. The median of the following data is 50. Find the values of 'p' and 'q', if the sum of all frequencies is 90.

Marks obtained	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of students	р	15	25	20	q	8	10

35. A cubical block of side 7cm is surmounted by a hemisphere. What is the greatest diameter the hemisphere can have? Find the surface area of the solid.

### Section - E

## 36. Case Study : 1

Shown below is a town plan on a coordinate grid, where 1 unit = 1 km. Consider the coordinates of each building to be the point of intersection of the respective grid lines.



Based on the above information answer the following questions.

- (i) Write the coordinates of hospital.
- (a) What is the distance between the School and House 1 along the path shown?

OR

(b) What is the ratio in which House 1 divides the path joining House 3 and the police station?

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 $\dot{f}(iii)$  Write the y-coordinate of House  $H_2$ .



wires from a point O. Distance between the base of the tower and point O is 36 cm. From point O, the angle of elevation of the top of the Section B is 30° and the angle of elevation of the top of Section A is 45°.

Based on the above information, solve the following questions:

45°

36 m

- (i) Find the length of the wire from the point O to the top of Section B.
- (ii) Find the height of the Section A from the base of the tower.
- (iii) Find the distance AB.

OR

Find the area of  $\triangle OPB$ .

# Case Study 🕉

For the inauguration of 'Earth day' week in a school, badges were given to volunteers. Organisers purchased these badges from an NGO, who made these badges in the form of a circle inscribed in a square of side 8 cm.



O is the centre of the circle and  $\angle AOB = 90^\circ$ .



Based on the given information, answer the following questions: [CBSE 2023]

- Q1. What is the area of square ABCD?
- Q 2. What is the length of diagonal AC of square ABCD?
- Q 3. Find the area of sector OPROO.

OR

Find the area of remaining part of square ABC when area of circle is excluded.

# BUDHA DAL PUBLIC SCHOOL PATIALA SECOND TERM EXAMINATION (5 December 2024) Class – X Paper-Mathematics Basic (Set-B)

# Time: 3hrs.

# General Instructions:

1. This Question Paper has 5 Sections A, B, C, D and E.

2. Section A has 20 MCQs carrying 1 mark each

3. Section B has 5 questions carrying 02 marks each.

4. Section C has 6 questions carrying 03 marks each.

5. Section D has 4 questions carrying 05 marks each.

6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-

parts of the values of 1, 1 and 2 marks each respectively.

# Section-A

1. The coordinate of the point which is reflection of the point (-3, 5) from x-axis is

a) (3, 5) b) (3, -5) c) (-3, -5) d) (-3, 5)

2. AD is a median of  $\triangle ABC$  with vertices A (5, -6), B (6, 4) and C (0, 0) length of AD is

a)  $\sqrt{68}$  units b)  $2\sqrt{15}$  units c)  $\sqrt{101}$  units d) 10 units

3.  $\frac{\cos^2\theta}{\sin^2\theta} - \frac{1}{\sin^2\theta}$ , in simplified form is

a)  $tan^2\theta$  b)  $sec^2\theta$  c) 1 d) -1

- 4.  $\left(\frac{2\tan 30^{\circ}}{1+\tan^2 30^{\circ}}\right)$  is equal to
  - a)  $\sin 60^{\circ}$  b)  $\cos 60^{\circ}$  c)  $\tan 60^{\circ}$  d)  $\sin 30^{\circ}$

5. If a pole 6m high casts a shadow  $2\sqrt{3}m$  long on the ground, then sun's elevation is

c) 30º b) 45º a) 60° d) 90°

6. In figure of PA and PB are tangents to the circle with centre O such that  $\angle APB = 50^{\circ}$ , then  $\angle OAB$  is equal to

a)  $25^{\circ}$  b)  $30^{\circ}$  c)  $40^{\circ}$  d)  $50^{\circ}$ 7. If  $4 \sec \theta - 5 = 0$ , then the value of  $\cot \theta$  is a)  $\frac{3}{4}$  b)  $\frac{4}{5}$  c)  $\frac{5}{3}$  d)  $\frac{4}{3}$ 



M.M. 80

8. For  $0^{\circ} < \theta < 90^{\circ}$ , the maximum value of  $\frac{1}{\sec \theta}$  is

a) 1 b) 0 c) undefined d)  $\sqrt{3}/2$ 

9. What is the area of a semi circle of diameter 'd'?

a)  $\frac{1}{16} \pi d^2$  b)  $\frac{1}{4} \pi d^2$  c)  $\frac{1}{8} \pi d^2$  d)  $\frac{1}{2} \pi d^2$ 

- 10. The diameter of the circle whose area is equal to the sum of the areas of the two circles of radii 24cm and 7cm is
  - a) 31*cm* b) 25*cm* c) 62*cm* d) 50cm
- 11. Curved surface area of a cube is

a)  $4a^2$  b)  $6a^2$  c)  $6a^3$  d)  $a^3$ 

12. Which formula is used to find volume of a cylinder

a)  $\frac{1}{3}\pi r^2 h$  b)  $\pi r^2 h$  c)  $\frac{4}{3}\pi r^3$  d)  $\frac{2}{3}\pi r^3$ 

13. The ratio of total surface area of a solid hemisphere to the square of its radius is

a)  $2\pi$ : 1 b)  $4\pi$ : 1 c)  $3\pi$ : 1 d) 1:  $4\pi$ 

14. Surface area a cylinder closed at both ends is equal to sum of which of the following:

(i)  $2\pi rh$  (ii)  $2\pi r^2 h$  (iii)  $2\pi r^2$  (iv)  $4\pi rh$ 

- a) (iii) & (iv) b) (i) & (iv) c) (iii) & (ii) d) (i) & (iii)
- 15. After an examination, a teacher wants to know the marks obtained by maximum number of students in her class. She required to calculate \_\_\_\_\_ of marks.

a) median b) mode c) mean d) range

16. If the mean and the median of a data is 12 and 15 respectively then its mode is

a) 13.5 b) 21 c) 6 d) 14

17. Consider the frequency of 45 observations

Class	0-10	10-20	20-30	30-40	40-50
Frequency	5	9	15	10	6

The upper limit of the modal class is

a) 20 b) 10 c) 30 d) 40

18. The distance of point P(x, y) from origin is

a)  $\sqrt{x^2 + y^2}$  b) x + y c)  $\sqrt{x^2 + y^2}$  d) x - y

Direction: In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R).

- a) Both A and R are true and Reason (R) is correct explanation of A
- b) Both A and R are true but Reason (R) is not the correct explanation of A
- c) A is true but R is false
- d) A is false but R is true

B.2

19. Statement A (Assertion) : Volume of sphere of radius 6 cm is  $\frac{6336}{7}$  cm<sup>3</sup>

Statement R (Reason): sphere is round object shaped like a ball, whose surface area is  $4\pi r^2$ 

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20. Statement A (Assertion) : The tangents drawn at the end points of a diameter of a circle, are parallel. Statement R (Reason) : Diameter of a circle is the longest chord.

#### Section - B

- 21. If the coordinates of centre of a circle is (-2, 5) and coordinate of the one end of its diameter is (2, 3). Find the coordinates of other end.
- 22. From a point Q, the length of the tangent to a circle is 12cm and the distance of Q from the centre is 13cm. Find the radius of the circle.
- 23. Evaluate  $\frac{3}{2} \tan^2 30^\circ 2\cos^2 90^\circ \frac{1}{2} \csc^2 30^\circ$

#### OR

If  $\tan(A + B) = \sqrt{3}$  and  $\tan(A - B) = \frac{1}{\sqrt{3}}$ ,  $0^0 < A + B \le 90^0$  and A > B, then find A and B

- 24. The length of the minute hand of a clock is 7cm. Find the area swept by the minute hand in 10 minutes. (Use  $\pi = \frac{22}{7}$ )
- 25. The angle of elevation of the top of a tower from a point on the ground which is 30m away from foot of tower is 30°. Find the height of the tower.

### Section - C

26. Find the mode of the following frequency distribution:

Class- Interval	5-15	15-25	25-35	35-45	45-55	55-65	65-75
Frequency	2	3	5	7	4	2	2

- 27. Find the ratio in which the line segment joining the points (-3, 10) and (6, -8) is divided by (-1, 16)
- Prove that the parallelogram circumscribing a circle is a rhombus.

29. If 
$$\cos \theta = \frac{3}{5}$$
, find the value of  $\frac{5 \operatorname{cosec} \theta - 4 \tan \theta}{\sec \theta + \cot \theta}$ 

## OR

Prove that  $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta \ cosec \ \theta$ 

30. A chord of a circle of radius 15cm subtends an angle of 60° at the centre. Find the areas of corresponding minor and major segments of the circle. ( $use\pi = 3.14 \text{ and } \sqrt{3} = 1.73$ )

A vessel is in the form of a hemispherical bowl mounted by a hollow cylinder. The diameter of the hemisphere is 14cm and the total height of the vessel is 13cm. Find the capacity of the vessel.  $\left(use \pi = \frac{22}{7}\right)$ 

#### Section - D

- 32. From a point on a bridge across a river the angle of depression of the banks on opposite sides of the river are 30° and 45° respectively. If the bridge is at a height of 3m from the banks, find the width of the river.
- 33. Prove that  $\frac{\cos A \sin A + 1}{\cos A + \sin A 1} = \csc A + \cot A$ , using the identity  $\csc^2 A = 1 + \cot^2 A$
- 34. Following frequency distribution gives the monthly consumption of electricity in a locality of 80 families. If the median is 206, find the missing frequencies x and y.

Monthly consumption of Electricity (in units)	170-180	180-190	190-200	200-210	210-220	220-230	230-240	240-250
No. of families	4	x	12	15	13	у	14	6

35. A hemispherical depression is cut out from one face of a cubical wooden block such that the diameter 'l' of the hemisphere is equal to the edge of the cube. Determine the surface area of the remaining solid.

### Section – E

45

36 m

### 36. Case Study : 1

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Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure. On a similar concept, a radio station tower was built in two Sections A and

B. Tower is supported by wires from a point O. Distance between the base

of the tower and point O is 36 cm. From point O, the angle of elevation of the top of the Section B is 30° and the angle of elevation of the top of Section A is 45°.

Based on the above information, solve the following questions:

- (i) Find the length of the wire from the point O to the top of Section B.
- (ii) Find the height of the Section A from the base of the tower.
- (iii) Find the distance AB.

OR

Find the area of  $\triangle OPB$ .

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# . Case Study 名

For the inauguration of 'Earth day' week in a school, badges were given to volunteers. Organisers purchased these badges from an NGO, who made these badges in the form of a circle inscribed in a square of side 8 cm.



O is the centre of the circle and  $\angle AOB = 90^{\circ}$ .



Based on the given information, answer the following questions: [CBSE 2023]

- Q 1. What is the area of square ABCD?
- Q 2. What is the length of diagonal AC of square ABCD?

Q 3. Find the area of sector OPRQO. OR

Find the area of remaining part of square ABCD when area of circle is excluded.

2

Case Study-3

Shown below is a town plan on a coordinate grid, where 1 unit = 1 km. Consider the coordinates of each building to be the point of intersection of the respective grid lines.

7 S School S W Water Tank 6 P Pond Police Fire Fire Station Police-**Police Station** 5 н Hospital H1 House 1 4 H2 House 2 H2 H3 House 3 H4 House 4 3 H5 House 5 H6 House 6 H5 HA H7 2 House 7 H8 House 8 1 H8 0 2 3 1 5 6



Based on the above information answer the following questions.

(i) Write the coordinates of hospital.

## OR

(b) What is the ratio in which House 1 divides the path joining House 3 and the police station? Wiii) Write the y-coordinate of House  $H_2$ .