AGA KHAN UNIVERSITY EXAMINATION BOARD

SECONDARY SCHOOL CERTIFICATE

CLASS X

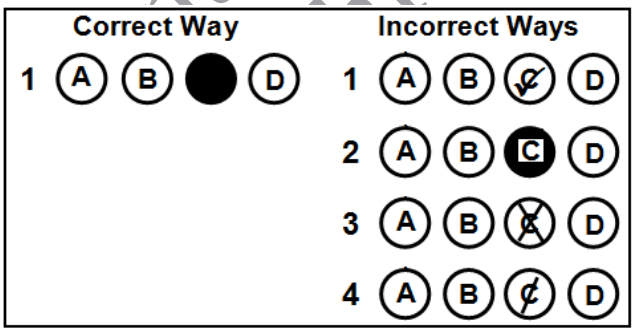
ANNUAL EXAMINATIONS (THEORY) 2023

General Mathematics Paper I

Time: 1 hour 20 minutes Marks: 45

INSTRUCTIONS

1. Read each question carefully.
2. Answer the questions on the separate answer sheet provided. DO NOT write your answers on the question paper.
3. There are 100 answer numbers on the answer sheet. Use answer numbers 1 to 45 only.
4. In each question, there are four choices A, B, C, D. Choose ONE. On the answer grid, black out the circle for your choice with a pencil as shown below.



Candidate's Signature

5. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
6. DO NOT write anything in the answer grid. The computer only records what is in the circles.
7. A formulae list is provided on page 2. You may refer to it during the paper, if you wish.
8. You may use a simple calculator if you wish.

List of Formulae

NOTE:

- The symbols have their usual meanings.

Financial Mathematics

$$I = PT \times \frac{R}{100}$$

Basic Statistics

$$\overline{X} = \frac{\sum x}{n} \qquad \overline{X} = \frac{\sum fx}{n} \quad \text{or} \quad \overline{X} = \frac{\sum fx}{\sum f}$$

$$\text{Median} = l + \frac{1}{f}\left(\frac{n}{2} - c\right) \times h \qquad \text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

$$\sigma^2 = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2 \qquad \sigma = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$$

Quadratic Equations

$$ax^2 + bx + c = 0,\ a \neq 0 \qquad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad \text{Disc} = b^2 - 4ac$$

Algebraic Manipulation

$$(a+b)^2 = a^2 + 2ab + b^2 \qquad (a-b)^2 = a^2 - 2ab + b^2 \qquad a^2 - b^2 = (a+b)(a-b)$$

$$(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca \qquad (a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

$$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$$

Arithmetic and Geometric Sequence

$$a_n = a_1 + (n-1)d \qquad AM = \frac{a+b}{2} \qquad a_n = a_1 r^{n-1} \qquad GM = \pm\sqrt{ab}$$

Area and Volumes

$$\text{Area of a circle} = \pi r^2 \qquad \text{Area of a triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\text{Volume of a cube} = l^3 \qquad \text{Volume of a cuboid} = l \times b \times h \qquad \text{Volume of a sphere} = \frac{4}{3} \times \pi r^3$$

$$\text{Volume of a cone} = \frac{1}{3} \times \pi r^2 \times h \qquad \text{Volume of a cylinder} = \pi r^2 \times h$$

Introduction to Coordinate Geometry

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

1. In April 2022, Sana went to Dubai shopping festival. One Emirati Dirham was equal to 50.52 Pakistani Rupees.

   If she had an amount of Rs 120,000, then the value of the amount in Emirati Dirham would have been

   A. 2285.71
   B. 2375.30
   C. 6,062,400
   D. 6,300,000

2. Saman bought a refrigerator on installments. The detail of the installment plan is given in the table.

Total Price (Rs)	98,000
Down Payment (Rs)	30% of the total price
Number of Monthly Installments	14
Processing Charges in Addition to the Total Price	7% of the total price

   The down payment Saman made was

   A. Rs 2,100
   B. Rs 29,400
   C. Rs 31,458
   D. Rs 68,600

3. A company offers cars to its employees at a certain down payment and on equal monthly instalments. The payment structure is shown in the given table.

Total Cost (Rs)	Down Payment (Rs)
2,000,000	500,000

   If the monthly instalment is Rs 50,000 and additional charges are NOT involved, then the number of instalments will be

   A. 10
   B. 30
   C. 40
   D. 50

4. The given table depicts gas charges for domestic slabs in Karachi for July 2021.

S. No	Units Consumed Monthly (hm^3)	MMBTU ($hm^3 \times 3.25$)	Price per/ MMBTU (Rs)
1	Up to 0.5 hm^3	1.625	121
2	Up to 1 hm^3	3.25	300
3	Up to 2 hm^3	6.5	553
4	Up to 3 hm^3	9.75	738
5	Up to 4 hm^3	13	1,107
6	Above 4 hm^3		1,460

(**Note**: Calculate the bill slab wise starting from the lowest slab. No additional charges are involved.)

If Zeeshan House consumed 1.50 hm^3 of gas in June 2021, then their bill for the month would be

A. Rs 300
B. Rs 450
C. Rs 1,106
D. Rs 1,172

5. The electricity consumption rates (per unit) of a company are shown in the given table.

Slab (units)	1 - 50	51 - 100	101 - 200	201 - 300	301 - 700	700 & above
Charges per unit (Rs)	2	7.36	9.68	12.15	20.82	23.92

If Ahmad consumed 150 units in a particular month and no other charges are applied, then his electricity bill due for the month will be Rs

(**Note**: Calculate the bill slab wise starting from the lowest slab. No additional charges are involved.)

A. 1,452
B. 1,104
C. 952
D. 836

6. Faisal is working in an organisation. His daily consultancy fee is Rs 3,000 for each working day. Due to off on Saturdays and Sundays, he worked 23 days in the month of March.

   His total salary for the month of March will be

   A. Rs 66,000
   B. Rs 69,000
   C. Rs 90,000
   D. Rs 93,000

7. Amina's monthly salary structure is shown in the given table.

Gross Salary (Rs)	Tax (Rs)	Provident Fund (Rs)	Other Deductions (Rs)
90,000	3,000	4,000	1,500

   Based on the given information, Amina's net monthly salary will be

   A. Rs 81,500
   B. Rs 87,000
   C. Rs 87,500
   D. Rs 98,500

8. The given table shows the various age groups of trainees in a musical training centre.

Class intervals	Data	Frequency
11 - 15	14, 14, 14, 15, 15	5
16 - 20	16, 16, 17, 18, 18, 20, 20	7
21 - 25	21, 21, 21, 21, 21, 21, 21, 22, 23, 24, 24, 24, 24	13
26 - 30	27, 28, 28, 28, 29	5

   The total number of trainees in the musical training centre is

   A. 13
   B. 20
   C. 25
   D. 30

9. The median of the numbers 1, 1, 1, 3, 4, 5, 20, 21 is

   A. 1
   B. 3.5
   C. 4.5
   D. 7

10. The mode of the data set 10, 4, 6, 6, 4, 10, and 4 is

A. 4
B. 6
C. 10
D. 4 and 6

11. For the data set 4, 0, 4, 0, the standard deviation will be

A. 0
B. 0.5
C. 2
D. 4

12. The runs scored by batters in a particular cricket tournament is recorded in the given table.

Runs	Number of batters	Cumulative frequency
1 - 10	12	12
11 - 20	20	32
21 - 30	30	62
31 - 40	40	102
41 - 50	10	112
51 - 60	7	119
61 - 70	2	121

According to the information recorded in the given table, the number of batters who scored 30 runs or less is

A. 30
B. 62
C. 102
D. 121

13. The range of the data 5, 10, 2, 7 and 8 is

A. 1
B. 4
C. 5
D. 8

14. The highest common factor (HCF) of the algebraic expressions x^2-1, $x+1$ and $3x+3$ is

A. 1
B. $x+1$
C. $3x+3$
D. $3x^2-3$

15. If the highest common factor (HCF) of two expressions is $x-1$ and the product of these two expressions is $(x-1)^2\times(x^2-1)$, then the least common multiple (LCM) of these expressions will be

A. $(x+1)\times(x^2-1)$.
B. $(x-1)\times(x^2-1)$.
C. $(x-1)\times(x+1)$.
D. $(x+1)^2\times(x-1)$.

16. The positive square root of the expression $\frac{(x-1)(x^2-1)(x+1)}{(x+1)^2}$ is

A. $x+1$
B. $x-1$
C. $\frac{1}{x+1}$
D. $\frac{x-1}{x+1}$

17. On simplification of $\frac{(x-1)^3(x^2-1)}{(x-1)^2(x-1)^2}$, we get

A. 1
B. $x+1$
C. $x-1$
D. $\frac{1}{x-1}$

18. The expression $x-\frac{1}{x^2}$ can also be written as

A. $-\frac{1}{x}$.
B. $\frac{x-1}{x^2}$.
C. $x-1$.
D. $\frac{x^3-1}{x^2}$.

19. For linear equation $\frac{5-x}{5}=0$, the value of x will be

A. 5
B. 0
C. -1
D. -5

20. For the equation $2\sqrt{x-1}=2$, the value of x will be

A. 0
B. 1
C. 2
D. 3

21. For the equation $|x-1|=1$, the values of x will be

I. -1
II. 0
III. 1
IV. 2

A. I and II.
B. II and III.
C. I and IV.
D. II and IV.

22. The solution set of $\frac{3}{2}+\frac{x}{2}<0$, where $x \in R$, will be

A. $\{x | x \in R, x > -3\}$.
B. $\{x | x \in R, x < -3\}$.
C. $\left\{x \middle| x \in R, x < -\frac{3}{4}\right\}$.
D. $\left\{x \middle| x \in R, x > -\frac{3}{4}\right\}$.

23. The solution set of $a - ax < 0$, where $x \in R$, will be

A. $\{x | x \in R, x > 1\}$.
B. $\{x | x \in R, x < 1\}$.
C. $\{x | x \in R, x < -1\}$.
D. $\{x | x \in R, x > -1\}$.

24. If 16 less than 5 times of a number becomes equal to the same number, then the number will be

A. -4
B. $-\frac{8}{3}$
C. $\frac{8}{3}$
D. 4

25. For the equation $px^2 + qx + r = 0$ to be a quadratic equation

I. p must be a non-zero
II. q must be a non-zero
III. r must be a non-zero

A. I only.
B. III only.
C. I and II.
D. II and III.

26. The solution set of the quadratic equation $\frac{x-1}{x+1} = \frac{1}{x-1}$, where $x \neq 1, -1$, is

A. $\{-3, 3\}$.
B. $\{3, -2\}$.
C. $\{0, -3\}$.
D. $\{0, 3\}$.

27. Which of the following equations is a quadratic equation in variable x?

A. $5x^2 + 3 = 0$
B. $5^2x + 3x + c = 0$
C. $5x + 3^2x + 7 = 0$
D. $5x + 3x + 7 = 0$

28. The solution set of the quadratic equation $x^2 - 3x - 1 = 0$ is

A. $\left\{\frac{3 \pm \sqrt{5}}{2}\right\}$.
B. $\left\{\frac{3 \pm \sqrt{13}}{2}\right\}$.
C. $\left\{\frac{-3 \pm \sqrt{13}}{2}\right\}$.
D. $\left\{\frac{-3 \pm \sqrt{5}}{2}\right\}$.

29. If the 6^{th} term is 16 and the 7^{th} term of the sequence is 19, then the common difference of the sequence will be

A. -3
B. -1
C. 1
D. 3

30. If $p = 2$ and $q = \frac{1}{2}p$, then the arithmetic mean of p and q will be

A. 3
B. $\frac{3}{2}$
C. $\frac{5}{2}$
D. 5

31. The 1^{st} term of a geometric progression is x and the common ratio is y, then the 3^{rd} term of the geometric sequence will be

A. x^3y.
B. x^2y.
C. xy^2.
D. xy^3.

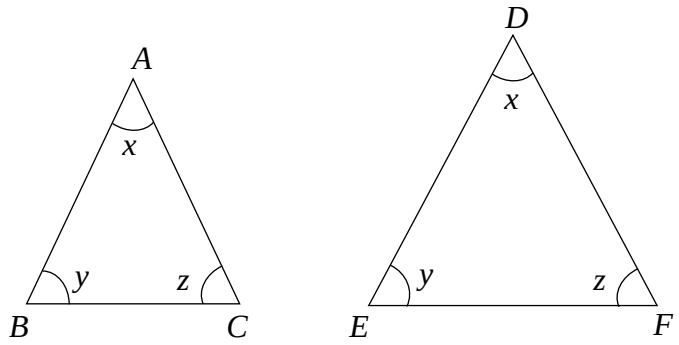
32. The geometric mean between 9 and 36 is

A. ± 18
B. ± 24.5
C. 45
D. 162

33. If the arithmetic mean between $2a - b$ and $4a + b$ is 18, then the value of a is

A. 3
B. 6
C. 9
D. 12

34. The given diagram shows two similar triangles *ABC* and *DEF*.



NOT TO SCALE

For the given triangles, the CORRECT relation between sides is

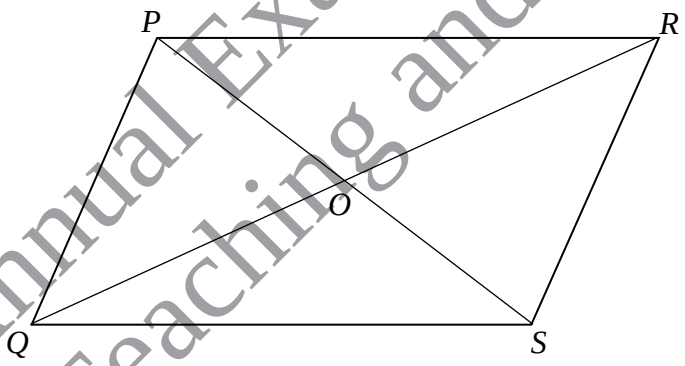
A. $\frac{AB}{DE}=\frac{DE}{AC}$.

B. $\frac{AB}{DE}=\frac{AC}{EF}$.

C. $\frac{AB}{DE}=\frac{BC}{EF}$.

D. $\frac{AB}{DE}=\frac{AB}{BC}$.

35. The given diagram shows a parallelogram *PQSR*.



NOT TO SCALE

In the given parallelogram, the CORRECT relation with reference to its lengths will be

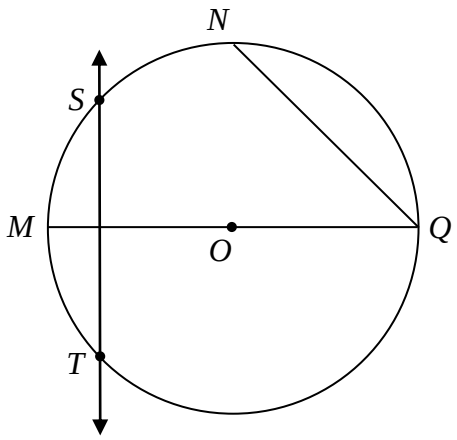
A. $PQ=PR$.

B. $OS=OP$.

C. $OQ=OP$.

D. $OQ=OS$.

36. The given diagram shows a circle having centre at O.

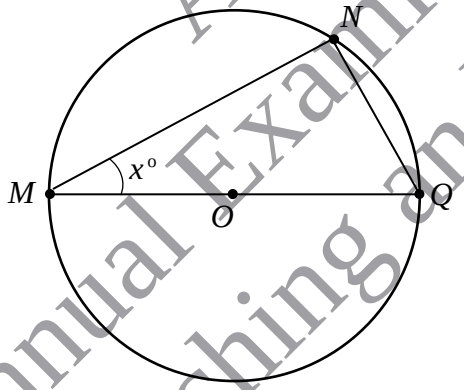


NOT TO SCALE

In the given diagram, the radius of the circle is

A. ST.
B. NQ.
C. OQ.
D. MQ.

37. The given diagram shows a circle with centre at O.

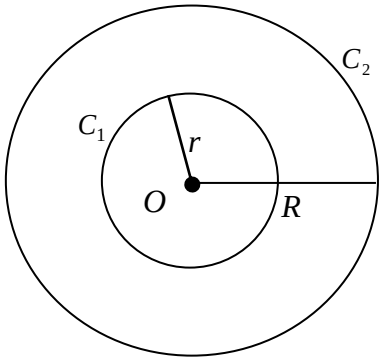


NOT TO SCALE

The measurement of $\angle Q$, in terms of x, will be

A. x°.
B. $(90-x)^{\circ}$.
C. $(180-x)^{\circ}$.
D. $\left(\frac{180-x}{2}\right)^{\circ}$.

38. The given diagram shows two concentric circles C_1 and C_2 with radii r and R respectively.



NOT TO SCALE

If $r + R = 9$, then the area of circle C_2 can be expressed as

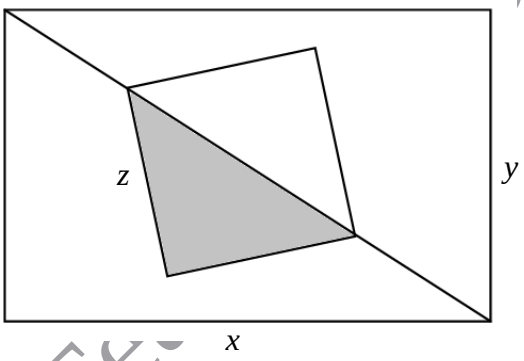
A. $\pi(9-R)^2$ units.

B. $\pi(9-r)^2$ units.

C. $\pi\left(\frac{9}{r}\right)^2$ units.

D. $\pi\left(\frac{9}{R}\right)^2$ units.

39. The diagram shows a square and a rectangle. The length and breadth of the rectangle are x and y respectively and length of the side of the square is z. The area of the shaded region is



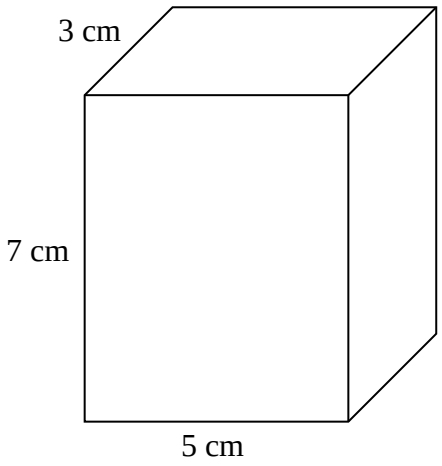
A. $\frac{xy}{4}$.

B. $\frac{z^2}{2}$.

C. $\frac{\sqrt{x^2+y^2}}{2}$.

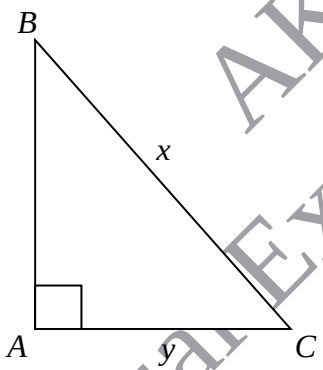
D. $xy - \frac{z^2}{2}$.

40. The diagram shows a cuboid and the lengths of its different sides. The volume of the cuboid is



A. 15 cm
B. 15 cm^3
C. 105 cm
D. 105 cm^3

41. In the given triangle *ABC*, in terms of *x* and *y*, *AB* is equal to

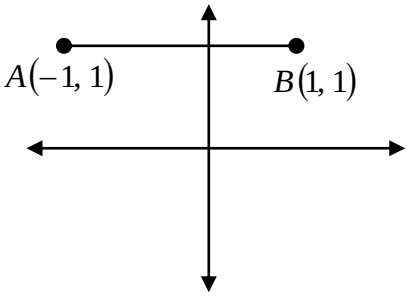


A. $x + y$.
B. $x - y$.
C. $\sqrt{x^2 + y^2}$.
D. $\sqrt{x^2 - y^2}$.

42. If $\frac{\text{volume}}{\text{height}} = \frac{k}{4}$ and the base area of cuboid is 12 square units, then the value of *k* is equal to

A. 48
B. 16
C. 8
D. 3

43. In the given diagram, the distance between point A and point B is



NOT TO SCALE

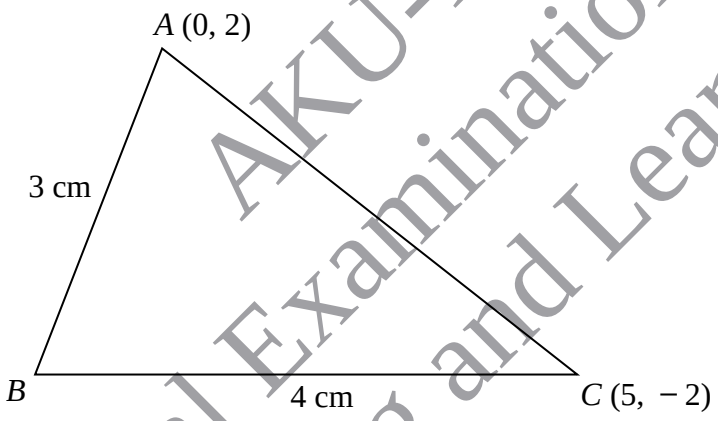
A. 2 units.

B. $2\sqrt{2}$ units.

C. 4 units.

D. 8 units.

44. The lengths of two sides of the given triangle AB and BC are 3 cm and 4 cm respectively.



NOT TO SCALE

If the coordinates of the vertices A and C are (0, 2) and (5, − 2) respectively, then the median from vertex B and intersecting AC will pass through the point

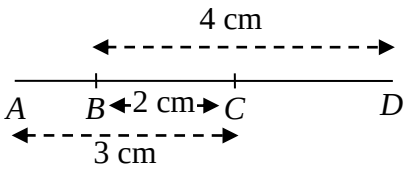
A. $(5, 0)$.

B. $(5, 4)$.

C. $\left(\frac{5}{2}, 0\right)$.

D. $\left(\frac{5}{2}, 4\right)$.

45. In the given figure *A, B, C* and *D* are collinear points. If $AC = 3$ cm, $BD = 4$ cm and $BC = 2$ cm, then AD is



A. 5 cm.
B. 6 cm.
C. 7 cm.
D. 8 cm.

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