2022-2023 S5
2nd TERM UT
MATH CP
PAPER 2

MC

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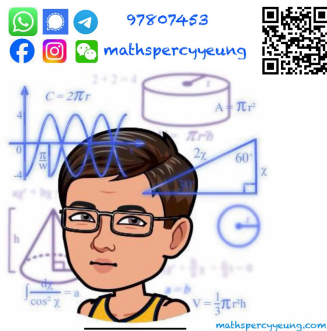
2022 − 2023
S5 Second Term Uniform Test

MATHEMATICS Compulsory Part

PAPER 2

15th May, 2023
Time Allowed: 45 minutes
Total Marks: 27

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should insert the information required in the spaces provided.

2. When told to open this book, you should check that all the questions are there. Look for the words '**END OF PAPER**' after the last question.

3. All questions carry equal marks.

4. **ANSWER ALL QUESTIONS**. You should use an HB pencil to mark all your answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.

5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

6. No marks will be deducted for wrong answers.

There are 15 questions in Section A and 12 questions in Section B.

The diagrams in this paper are not necessarily drawn to scale.

Choose the best answer for each question.

Section A

1. If n is an integer, $\dfrac{3^{3n}}{9^{n-1}} =$

   A. $\dfrac{1}{27}$.

   B. $\dfrac{1}{3^{2n+1}}$.

   C. 3^{n-2}.
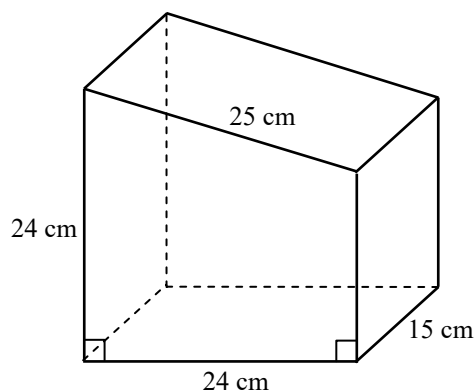
   D. 3^{n+2}.

2. $x^3 - x^2 y - 4x + 4y =$

   A. $(x-y)(x+2)(x-2)$.

   B. $(x+y)(x+2)(x-2)$.

   C. $(x-y)(x^2+4)$.

   D. $(x+y)(x^2+4)$.

3. The figure shows a right prism. Find the volume of the prism.

   A. $6\,480\ \text{cm}^3$

   B. $7\,200\ \text{cm}^3$

   C. $7\,380\ \text{cm}^3$

   D. $8\,820\ \text{cm}^3$

4. Make x the subject of the formula $\dfrac{4}{x-3} - y = 1$.

   A. $x = \dfrac{3y+5}{y+1}$

   B. $x = \dfrac{3y+7}{y+1}$

   C. $x = \dfrac{1-3y}{y+1}$

   D. $x = 4y+7$

5. $\dfrac{\sin(180° + \theta)}{\cos(90° + \theta)} =$

   A. 1.

   B. -1.

   C. $\tan \theta$.

   D. $-\tan \theta$.

6. Find the maximum value of $\dfrac{15}{2\sin x + 3}$.

   A. 1

   B. 3

   C. 5

   D. 15

7. Given two points $A\,(0, 5)$ and $B\,(0, -5)$. P is a moving point such that it can be the centre of a circle which passes through A and B. The locus of P is

   A. the x-axis.

   B. the y-axis.

   C. a circle.

   D. a pair of straight lines.

8. P is a moving point such that the area of $\triangle APB$ remains constant, where A and B are two fixed points. What is the locus of P?

  A. A straight line parallel to AB.
  B. A pair of straight lines parallel to AB.
  C. A straight line perpendicular to AB.
  D. A pair of straight lines perpendicular to AB.

9. The equation of a circle is $2x^2 + 2y^2 - 12x + 16y + 7 = 0$. Which of the following are true?

  I. The area of the circle is 21.5π square units.
  II. The coordinates of the centre of the circle are $(6, -8)$.
  III. The origin lies outside the circle.

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

10. A circle cuts the y-axis at A and B , where $AB = 16$. The centre of the circle lies in the fourth quadrant and on the straight line $3x + y - 16 = 0$. If the radius of the circle is 10 , find the equation of the circle.

  A. $x^2 + y^2 + 12x - 4y - 28 = 0$
  B. $x^2 + y^2 + 12x - 4y - 60 = 0$
  C. $x^2 + y^2 - 12x + 4y - 28 = 0$
  D. $x^2 + y^2 - 12x + 4y - 60 = 0$

11. It is given that the straight line L and the circle $x^2 + y^2 - 10x + 8y + 5 = 0$ intersect at two points P and Q . If the coordinates of the mid-point of PQ are $(4, -8)$, find the y-intercept of L .

  A. -24
  B. -11
  C. -7
  D. -2

12. It is given that $515\star$ is a 4-digit number, where $\star$ is an integer from 0 to 9 inclusive. What is the probability that the number is divisible by 3?

  A. $\dfrac{1}{10}$
  B. $\dfrac{1}{3}$
  C. $\dfrac{3}{10}$
  D. $\dfrac{2}{5}$

13. A box contains five cards numbered 1, 2, 3, 4 and 5 respectively. In a game, two cards are randomly drawn from the box one by one with replacement. The table shows the amount awarded in different cases.

The numbers drawn	both odd	both even	otherwise
Amount awarded	$ 30	$ 50	$ 0

Find the expected value of the amount awarded of the game.

  A. $ 13
  B. $ 18.8
  C. $ 22.8
  D. $ 38

14. The stem-and-leaf diagram below shows the distribution of the working time (in hours) of a group of people in a certain week.

Stem (tens)	Leaf (units)				
2	5	6	6		
3	2	2	5	8	8
4	3	8	8	8	8	9
5	1	1			

If a person is randomly selected from the group, find the probability that the working time of the selected person is less than the upper quartile of the distribution.

A. $\dfrac{1}{4}$

B. $\dfrac{9}{16}$

C. $\dfrac{3}{4}$

D. $\dfrac{13}{16}$

15. Consider the following positive integers

    18 13 17 10 26 35 10 p q r

If the mode and the mean of the above data are 13 and 17 respectively, find the median of the above data.

A. 13

B. 14

C. 15

D. 17

Section B

16. For $0° \le \theta \le 360°$, how many roots does the equation $4 - \cos\theta = 4\sin^2\theta$ have?

A. 2

B. 3

C. 4

D. 5

17. Find the range of values of m such that the straight line $y = mx$ intersects the circle $(x - 10)^2 + y^2 = 36$.

A. $-\dfrac{3}{4} \le m \le \dfrac{3}{4}$

B. $m \le -\dfrac{3}{4}$ or $m \ge \dfrac{3}{4}$

C. $m \le \dfrac{3}{4}$

D. $m \ge \dfrac{3}{4}$

18. $P_1^n + P_2^n =$

A. n^2.

B. $(n + 1)(n - 1)$.

C. $n(2n - 1)$.

D. $n(n + 2)$.

19. A group contains 8 students and 7 teachers. 5 people are selected from the group to form a queue. If the queue must consist of a particular teacher and at least 3 students, how many different queues can be formed?

A. 406

B. 3 696

C. 48 720

D. 443 520

20. 6 different KMB routes, 2 different CTB routes and 3 different NWFB routes are arranged in a row in a bus terminus. If bus routes of the same company should be arranged next to each other, how many different ways of arranging the bus routes are there?

    A. 216

    B. 8 640

    C. 25 920

    D. 51 840

21. A bag contains ten cards numbered 1, 2, 2, 3, 3, 3, 4, 4, 4 and 4 respectively. Gloria repeats drawing one card at a time randomly from the bag without replacement until the number drawn is 2. Find the probability that she needs exactly three draws.

    A. $\dfrac{14}{125}$

    B. $\dfrac{16}{125}$

    C. $\dfrac{7}{45}$

    D. $\dfrac{7}{15}$

22. A shop provides 2 red bicycles, 4 blue bicycles and 6 black bicycles for rental. Anton, Ivan and Ryan rent a bicycle each at random. Find the probability that all of them choose bicycles of the same colour.

    A. $\dfrac{1}{55}$

    B. $\dfrac{6}{55}$

    C. $\dfrac{12}{55}$

    D. $\dfrac{1}{11}$

23. A box contains 50 bulbs and 8 of them are defective. 2 bulbs are drawn at random from the box without replacement. Given that at least one bulb drawn is defective, find the probability that exactly one bulb drawn is defective.

    A. $\dfrac{4}{13}$

    B. $\dfrac{3}{5}$

    C. $\dfrac{4}{5}$

    D. $\dfrac{12}{13}$

24. Find the standard deviation of the five numbers x, x, $x + 1$, $x + 4$, $x + 5$, correct to 3 significant figures.

    A. 1.69

    B. 1.70

    C. 2.09

    D. 2.10

25. Alex and Bella take the same test. Bella gets 57 marks in the test. The standard scores of Alex and Bella in the test are 0.875 and −1.25 respectively. If the standard deviation of the test scores is 8 marks, then the test score of Alex is

    A. 67 marks.

    B. 74 marks.

    C. 77 marks.

    D. 84 marks.

26. The heights of 8000 teenagers are normally distributed with mean 140 cm and standard deviation 5 cm. Find the number of teenagers between 145 cm and 155 cm. (*Assume that in a normal distribution, 68 %, 95 % and 99.7 % of the data lie within one, two and three standard deviations respectively from the mean.*)

A. 1268
B. 1280
C. 2720
D. 2732

27. The variance of a group of numbers $x_1, x_2, x_3, \ldots, x_n$ is 16. Find the variance of the group of numbers $\frac{3x_1}{2} - 1$, $\frac{3x_2}{2} - 1$, $\frac{3x_3}{2} - 1, \ldots, \frac{3x_n}{2} - 1$.

A. 23
B. 24
C. 35
D. 36

END OF PAPER