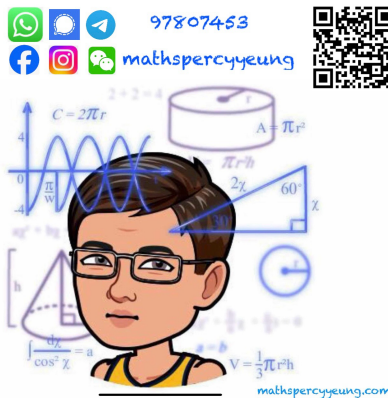


2021-2022 S6  
1st TERM UT  
MATH CP  
PAPER 2

MC



2021 – 2022  
S6 First Term Uniform Test

## MATHEMATICS Compulsory Part

### PAPER 2

11<sup>th</sup> November, 2021  
9:25 am – 10:20 am (55 minutes)

#### 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 20 questions in Section A and 13 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.  $(16 \cdot 8^{n-1})^2 =$

- A.  $2^{6n+2}$ .
- B.  $2^{6n+6}$ .
- C.  $2^{12n+2}$ .
- D.  $2^{12n+6}$ .

2. If  $\frac{2+x}{a} = \frac{2-x}{b}$ , then  $x =$

- A.  $\frac{2b-2a}{a+b}$ .
- B.  $\frac{2a-2b}{a+b}$ .
- C.  $\frac{a+b}{2b-2a}$ .
- D.  $\frac{a+b}{2a-2b}$ .

3.  $a^2 - 4b^2 - a - 2b =$

- A.  $(a+2b)(a-2b+1)$ .
- B.  $(a+2b)(a-2b-1)$ .
- C.  $(a-2b)(a+2b+1)$ .
- D.  $(a-2b)(a+2b-1)$ .

4.  $\frac{9\pi}{2021} =$

- A. 0.014 . (correct to 2 decimal places)
- B. 0.014 . (correct to 3 significant figures)
- C. 0.01399 . (correct to 4 decimal places)
- D. 0.013990 . (correct to 5 significant figures).

5. The solution of  $6-5x < \frac{2+x}{3}$  or  $2x-1 \geq 0$  is

- A.  $x \geq \frac{1}{2}$  .
- B.  $x > 1$  .
- C.  $x \leq \frac{1}{2}$  or  $x > 1$  .
- D.  $\frac{1}{2} \leq x < 1$  .

6.  $\frac{1}{2x+5} + \frac{1}{2x-5} =$

- A.  $\frac{10}{4x^2-25}$ .
- B.  $\frac{10}{25-4x^2}$ .
- C.  $\frac{4x}{4x^2-25}$ .
- D.  $\frac{4x}{25-4x^2}$ .

7. The length of a cube is measured as 5 cm correct to the nearest cm. Let  $x \text{ cm}^2$  be the actual total surface area of the cube. Find the range of values of  $x$ .

- A.  $121.5 < x \leq 181.5$  .
- B.  $121.5 \leq x < 181.5$  .
- C.  $149.5 < x \leq 150.5$  .
- D.  $149.5 \leq x < 150.5$  .

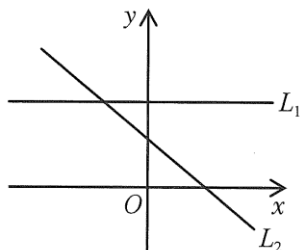
8. Cathy sells two watches for \$1955 each. She gains 15% on one and loses 15% on the other. After two transactions, Cathy

A. gains \$293.25 .  
 B. loses \$44.95 .  
 C. loses \$90 .  
 D. has no gain and no loss .

9. If  $\alpha$  and  $\beta$  are non-zero real numbers such that  $(\alpha + 2\beta) : (2\alpha - \beta) = 5 : 3$ , then  $\alpha : \beta = ?$

A. 1 : 13 .  
 B. 13 : 1 .  
 C. 7 : 11 .  
 D. 11 : 7 .

10. In the figure, the equations of the straight lines  $L_1$  and  $L_2$  are  $y = a$  and  $x + by = c$  respectively.



Which of the following must be true?

A.  $ab < c$  and  $b > 0$  .  
 B.  $ab < c$  and  $b < 0$  .  
 C.  $ab > c$  and  $b > 0$  .  
 D.  $ab > c$  and  $b < 0$  .

11. It is given that  $A$  and  $B$  are two distinct points on the circle  $x^2 + y^2 + kx - 6y + 45 = 0$ , where  $k$  is a constant. Let  $P$  be a moving point in the rectangular coordinate plane such that  $AP = BP$ . The equation of the locus of  $P$  is  $x - 5y + 8 = 0$ . Find the value of  $k$ .

A. -14  
 B. -7  
 C. 7  
 D. 14

12. It is given that  $z$  varies inversely as both  $x^2$  and  $\sqrt{y}$ . When  $x = 3$  and  $y = 4$ ,  $z = 2$ . When  $x = -1$  and  $z = 9$ , what is  $y = ?$

A. 2  
 B. 4  
 C. 16  
 D. 36

13. Let  $a_n$  be the  $n$ th term of a sequence. If  $a_2 = 7$ ,  $a_4 = 32$  and  $a_{n+2} = a_{n+1} - 2a_n$  for any positive integer  $n$ , then  $a_6 =$

A. 46 .  
 B. -4 .  
 C. -60 .  
 D. -124 .

14. If the 3rd term and the 7th term of an arithmetic sequence are -12 and 18 respectively, find the first term of the sequence.

A. -15  
 B. -17  
 C. -22  
 D. -27

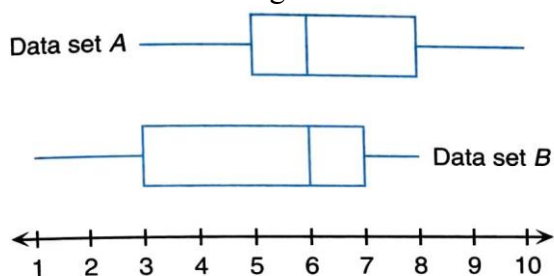
15. Find the number of terms in the geometric sequence  $\frac{1}{9}, \frac{1}{3}, 1, \dots, 243$ .

A. 6  
B. 7  
C. 8  
D. 9

16. Suppose  $z$  varies directly as  $\sqrt{x}$  and inversely as  $y^3$ . If  $x$  is increased by 10% and  $y$  is decreased by 10%, find the percentage change in  $z$  correct to 3 significant figures.

A. -23.5%  
B. -19.8%  
C. +22.2%  
D. +43.9%

17. The box-and-whisker diagrams show the distributions of two data sets  $A$  and  $B$ . Which of the following is / are correct?



- I. Median of  $A$  = Median of  $B$   
II. Range of  $A$  > Range of  $B$   
III. Inter-quartile range of  $A$  > Inter-quartile range of  $B$

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

18. Consider the following integers:

1, 2, 3, 3, 3,  $m$ , 5, 6, 7, 8,  $n$

It is known that  $3 \leq m \leq 5$  and  $n \geq 8$ . Let  $p$ ,  $q$  and  $r$  be the mean, the median and the mode of the above integers respectively.

Which of the following must be true?

- I.  $p > q$   
II.  $p > r$   
III.  $q > r$

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

19. Which of the following statements about the circle  $4x^2 + 4y^2 + 12x - 20y - 1 = 0$  is/are true?

- I. The centre of the circle is  $(-6, 10)$ .  
II. The circle cuts the  $x$ -axis at two points.  
III. The origin lies inside the circle.

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

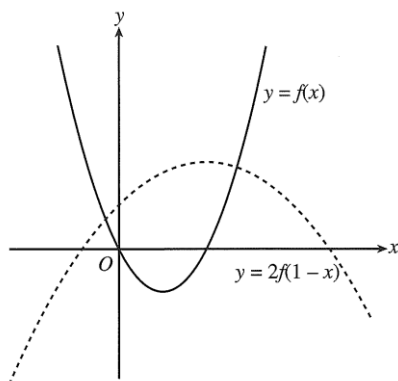
20. A box contains seven balls marked with the numbers  $-3$ ,  $-2$ ,  $-1$ , 1, 2, 3 and 4 respectively. If two balls are drawn randomly from the box at the same time, find the probability that product of the numbers on the balls drawn is positive.

A.  $\frac{5}{42}$   
B.  $\frac{1}{6}$   
C.  $\frac{2}{7}$   
D.  $\frac{3}{7}$

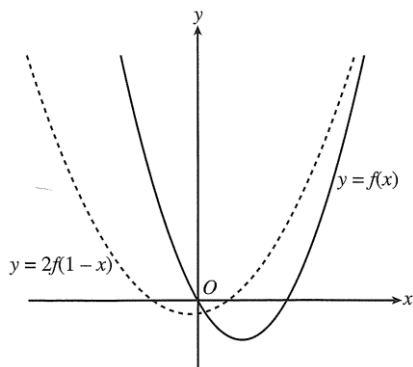
## Section B

21. Which of the following may represent the graphs of  $y = f(x)$  and  $y = 2f(1-x)$  on the same rectangular coordinate plane?

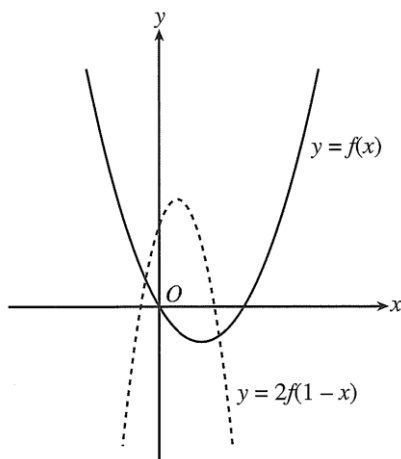
A.



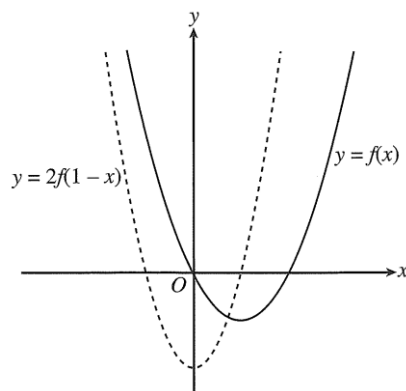
B.



C.



D.



22.  $2^{12} + 11 =$

A.  $1000000000011_2$  .

B.  $1000000000111_2$  .

C.  $1000000001011_2$  .

D.  $100000001011_2$  .

23. Consider the following system of inequalities:

$$\begin{cases} x \geq 0 \\ 0 \leq y \leq 2 \\ x + 3y \geq 3 \\ x + 2y \leq 5 \end{cases}$$

Let  $D$  be the region which represents the solution of the above system of inequalities. If  $(x, y)$  is a point lying in  $D$ , then the least value of  $4y - 3x + 2$  is

A.  $-19$  .

B.  $-13$  .

C.  $7$  .

D.  $10$  .

24. Find the sum of the first 7 terms of the geometric sequence  $-1, 4, -16, \dots$  .

A.  $-5\,461$  .

B.  $-3\,277$  .

C.  $3\,046$  .

D.  $3\,277$  .

25. The general term of a sequence is  $6 + 4n$ . If the sum of first  $m$  terms is at least 1000, find the least value of  $m$ .

- A. 11 .
- B. 12 .
- C. 20 .
- D. 21 .

26. Find the sum to infinity of the series

$$\frac{1}{3} + \frac{2}{3^3} + \frac{1}{3^5} + \frac{2}{3^7} + \dots$$

- A.  $\frac{11}{27}$  .
- B.  $\frac{33}{80}$  .
- C.  $\frac{39}{80}$  .
- D.  $\frac{11}{24}$  .

27. If  $a$ ,  $b$  and  $c$  form an arithmetic sequence, then which of the following must be true?

- I.  $a = 2b - c$
- II.  $a + b = b + c$
- III.  $1 - 3c, 1 - 3b, 1 - 3a$  also form an arithmetic sequence.

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

28. For  $0^\circ \leq \theta \leq 360^\circ$ , how many root(s) does the equation  $2\cos^2 \theta + 5\cos \theta + 3 = 0$  have?

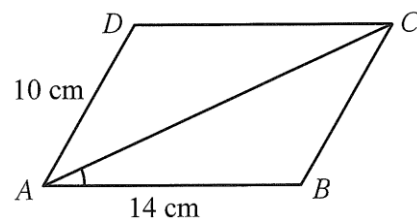
- A. 1
- B. 2
- C. 3
- D. 4

29. Let  $z = \frac{4i^6 + 2ai}{1-i}$ , where  $a$  is a real number.

If  $z$  is a purely imaginary number, then  $a =$

- A.  $-2$  .
- B.  $0$  .
- C.  $2$  .
- D.  $3$  .

30. In the figure,  $ABCD$  is a parallelogram with  $\angle DAB = 60^\circ$ ,  $AD = 10$  cm and  $AB = 14$  cm. Find  $\angle CAB$  correct to the nearest degree.



- A.  $23^\circ$  .
- B.  $25^\circ$  .
- C.  $28^\circ$  .
- D.  $30^\circ$  .

31. Bag  $A$  has 4 gold coins and 5 silver coins, while bag  $B$  has 2 gold coins and 8 silver coins. A coin is randomly drawn from bag  $A$  and put into bag  $B$ . Then a coin is randomly drawn from bag  $B$  and put into bag  $A$ . Find the probability that the number of gold coins is more than that of silver coin in bag  $A$ .

- A.  $\frac{1}{9}$  .
- B.  $\frac{2}{5}$  .
- C.  $\frac{9}{11}$  .
- D.  $\frac{10}{99}$  .

32. There are 26 students in class  $A$  and 27 students in class  $B$ . If 5 students are selected from the two classes to form a team consisting of at least 3 students in class  $A$ , how many different teams can be formed?

- A. 912 600
- B. 1 382 030
- C. 1 406 925
- D. 1 487 655

33. The mean and variance of the set of data  $\{x_1, x_2, x_3, x_4\}$  are  $m_1$  and  $v_1$  respectively. If  $m_2$  and  $v_2$  are the mean and the variance of the set of data  $\{x_1, x_2, x_3, x_4, m_1\}$  respectively, then

- A.  $m_1 = m_2$  and  $v_1 = \frac{5}{4}v_2$  .
- B.  $m_1 = m_2$  and  $v_1 = \frac{3}{16}v_2$  .
- C.  $m_1 = \frac{5}{4}m_2$  and  $v_1 = \frac{5}{4}v_2$  .
- D.  $m_1 = \frac{5}{4}m_2$  and  $v_1 = \frac{3}{16}v_2$  .

**END OF PAPER**

