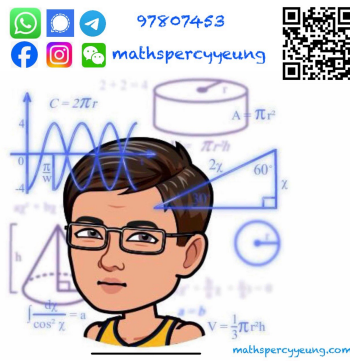


2022-2023 S5
2nd TERM EXAM
MATH CP
PAPER 2

MC



2022 – 2023
S5 Second Term Examination

MATHEMATICS Compulsory Part

PAPER 2

16th June, 2023
11:00 am – 12:15 pm (1 hour 15 minutes)
Total Marks: 45

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 30 questions in Section A and 15 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. $(16 \cdot 4^{n+1})^n =$
 - A. 2^{3n+6} .
 - B. 2^{2n^2+6n} .
 - C. 4^{3n+2} .
 - D. 4^{2n^2+2} .

2. If $4(3p+q) = 3(p-2q)$, then $p =$
 - A. $-\frac{10q}{9}$.
 - B. $-\frac{2q}{9}$.
 - C. $-\frac{q}{3}$.
 - D. $-\frac{2q}{3}$.

3. $x^2 - y^2 + x - y =$
 - A. $(x-y)(x-y+1)$.
 - B. $(x-y)(x+y+1)$.
 - C. $(x-y)(x+y-1)$.
 - D. $(x+y)(x+y+1)$.

4. If $(x+2)(x+A) - 4 \equiv x^2 + B$, then $B =$
 - A. -8 .
 - B. -4 .
 - C. -2 .
 - D. 0 .

5. If $a = 0.25$ (correct to 2 decimal places), find the range of a .
 - A. $0.24 \leq a < 0.25$
 - B. $0.24 < a \leq 0.25$
 - C. $0.245 \leq x < 0.255$
 - D. $0.245 < x \leq 0.255$

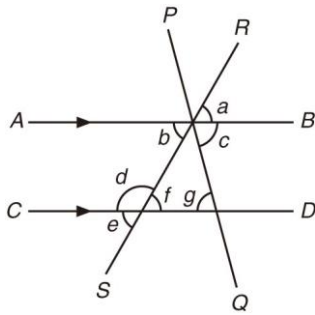
6. If $f(x) = (x+1)(x+b)$ and $f(2) = f(5)$, then $f(10) =$
 - A. 7.
 - B. 10.
 - C. 16.
 - D. 22.

7. It is given that $x^{1357} + k$ is divisible by $x+1$. When $x^{1357} - k$ is divided by x , the remainder is
 - A. -2 .
 - B. -1 .
 - C. 0 .
 - D. 1 .

8. Solve $3x - 4 \leq 2x + 1 < 5x + 10$.
 - A. $x < -3$ or $x \geq 5$
 - B. $-3 < x \leq 5$
 - C. $x < -3$
 - D. $x \geq 5$

9. Candy deposits \$92 000 in a bank at 8% p.a. compounded half-yearly. Find the compound interest she will receive after 3 years. (Give your answer correct to the nearest integer.)
- A. \$11 487
 B. \$22 080
 C. \$23 893
 D. \$24 409
10. The point $P(3, 1)$ is translated leftwards by 2 units to the point Q . If Q is rotated clockwise about the origin through 90° to the point R , then the polar coordinates of R are
- A. $(1, 135^\circ)$.
 B. $(1, 315^\circ)$.
 C. $(\sqrt{2}, 135^\circ)$.
 D. $(\sqrt{2}, 315^\circ)$.
11. a , b and c are non-zero numbers. If $a : b = 5 : 2$ and $2a - b = 3c$, then $b : c =$
- A. $2 : 3$.
 B. $2 : 5$.
 C. $3 : 4$.
 D. $4 : 3$.
12. It is given that z varies directly as x^3 and inversely as \sqrt{y} . Which of the following must be a constant?
- A. $\frac{z^2 y}{x^6}$
 B. $\frac{z^2 \sqrt{y}}{x^3}$
 C. $\frac{zy}{x^6}$
 D. $\frac{z^2 y}{x^3}$
13. It is given that A , B and C are solid spheres. If the ratio of the volume of A to that of B is $8 : 27$ and the ratio of the surface area of A to that of C is $49 : 25$, then the radius of B : the radius of $C =$
- A. $21 : 10$.
 B. $27 : 25$.
 C. $189 : 40$.
 D. $343 : 200$.
14. Find the volume of a right circular cone of slant height 10 cm and height 8 cm.
- A. $32\pi \text{ cm}^3$
 B. $60\pi \text{ cm}^3$
 C. $96\pi \text{ cm}^3$
 D. $288\pi \text{ cm}^3$
15. The coordinates of the vertex and the y -intercept of the graph of $y = ax^2 + bx + c$ are $(-2, -5)$ and 7 respectively. Which of the following must be true?
- I. The axis of symmetry is $x = 2$.
 II. The graph opens downwards.
 III. $b^2 > 28a$
- A. I only
 B. II only
 C. III only
 D. I and III only

16. In the figure, PQ , RS , AB and CD are straight lines, where $AB \parallel CD$. Which of the following are true?



- I. $a = e$
 II. $a + c = b + g$
 III. $b + d = 180^\circ$

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

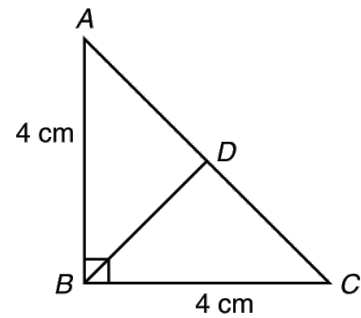
17. A coin is tossed three times. Find the probability of getting at least one tail?

- A. $\frac{1}{8}$
 B. $\frac{3}{8}$
 C. $\frac{5}{8}$
 D. $\frac{7}{8}$

18. 2 fair dice are rolled. Find the probability that the product of the two numbers is greater than 24.

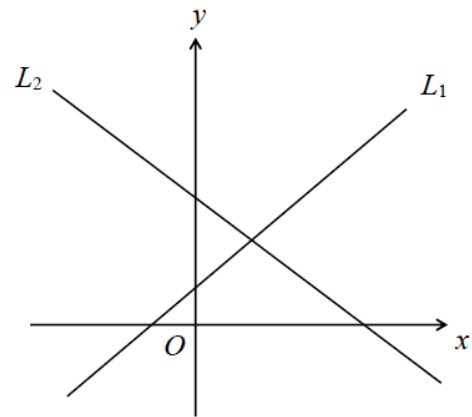
- A. $\frac{1}{12}$
 B. $\frac{1}{9}$
 C. $\frac{1}{6}$
 D. $\frac{1}{4}$

19. In the figure, D is a point on AC such that BD is a median of $\triangle ABC$. $AB \perp BC$ and $AB = BC = 4$ cm. Find the length of BD .



- A. $\sqrt{8}$ cm
 B. 3 cm
 C. 4 cm
 D. $\sqrt{32}$ cm

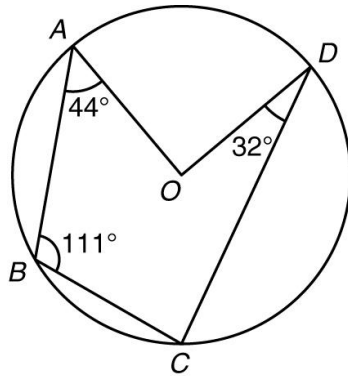
20. In the figure, the equations of the straight lines L_1 and L_2 are $x - ay + b = 0$ and $bx + y - c = 0$ respectively. Which of the following are true?



- I. $c > 0$
 II. $ab > -1$
 III. $ac < b$

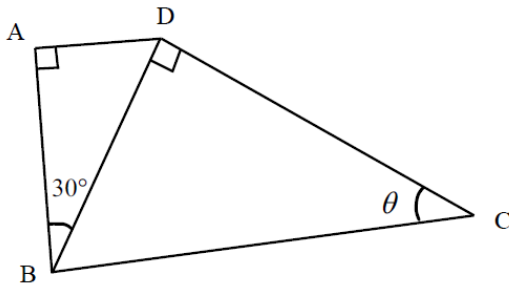
- A. I and II only
 B. I and III only
 C. II and III only
 D. I, II and III

21. In the figure, $\angle ABC = 111^\circ$, $\angle BAO = 44^\circ$ and $\angle CDO = 32^\circ$. Find $\angle BCD$.



- A. 53°
 B. 99°
 C. 104°
 D. 136°

22. In the figure, $\frac{AB}{DC} =$



- A. $\frac{1}{2} \tan \theta$.
 B. $\frac{\sqrt{3}}{2} \tan \theta$.
 C. $\frac{1}{2 \tan \theta}$.
 D. $\frac{\sqrt{3}}{2 \tan \theta}$.

23. If the circle $C : x^2 + y^2 - 8x + 4y - 4k = 0$ is a real circle, find the range of possible values of k .

- A. $k < 5$
 B. $k \leq 5$
 C. $k > -5$
 D. $k \geq -5$

24. The coordinates of the points Q and R are $(4, -2)$ and $(2, 8)$ respectively. If P is a moving point on the rectangular coordinate plane such that $PQ \perp PR$, then the locus of P is

- A. the circle with QR as a diameter, excluding Q and R .
 B. the angle bisector of $\angle QOR$, where O is the origin.
 C. the straight line which passes through Q and R .
 D. the perpendicular bisector of QR .

25. Consider two circles $C_1 : x^2 + y^2 + 8x - 6y - 25 = 0$ and $C_2 : 2x^2 + 2y^2 - 16x + 12y - 50 = 0$. Which of the following are true?

- I. C_1 and C_2 are concentric circles.
 II. The lengths of diameters of C_1 and C_2 are the same.
 III. Both C_1 and C_2 cut the y -axis at two points.

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

26. It is given that two straight lines $L_1 : ax + by + 1 = 0$ and $L_2 : 5x - 3y + 6 = 0$ do not intersect. If another straight line $L_3 : 10x + 5y - 1 = 0$ has the same x -intercept as L_1 , find the values of a and b .

- A. $a = 5, b = 3$
 B. $a = 6, b = -10$
 C. $a = 8, b = -4$
 D. $a = -10, b = 6$

27. Find the domain of the function $y = \log(4-x) + \sqrt{x+9}$.
- A. $-9 \leq x < 4$
 B. $x \geq -9$
 C. $x < 4$
 D. All real numbers except -9 and 4

28. Find the maximum and minimum values of the function $y = \frac{3}{4 - \cos^2 x}$ for $0^\circ \leq x \leq 360^\circ$.

	<u>Maximum value</u>	<u>Minimum value</u>
A.	1	$\frac{3}{5}$
B.	1	$\frac{3}{4}$
C.	2	$\frac{3}{5}$
D.	2	$\frac{3}{4}$

29. Find the inter-quartile range of data set $\{4, 4-x, 2, 1, x+4, 2x\}$, where $x \geq 4$.
- A. 1
 B. 3
 C. $3-x$
 D. $x+3$

30. A class is split into two groups, A and B , to attend a Mathematics examination. The following table shows the means and the standard deviations of the marks of the two groups of students in the Mathematics examination.

	Mean mark	Standard deviation
Group A	55	6
Group B	65	6

Which of the following must be true?

- I. The mean mark of the whole class is between 55 and 65.
 II. The standard deviation of the marks of the whole class is 6.
 III. The student who got the lowest mark belongs to group A .
- A. I only
 B. II only
 C. I and III only
 D. II and III only

Section B

31. Find the H.C.F. and L.C.M. of $48x^2(x^2 - 1)$ and $120x(x - 1)^2$.

H.C.F.

L.C.M.

- | | |
|-----------------|--------------------------|
| A. $6x$ | $120x^2(x - 1)^2(x + 1)$ |
| B. $24x$ | $240x^2(x - 1)^2(x + 1)$ |
| C. $6x(x + 1)$ | $120x^2(x - 1)^2(x + 1)$ |
| D. $24x(x - 1)$ | $240x^2(x - 1)^2(x + 1)$ |

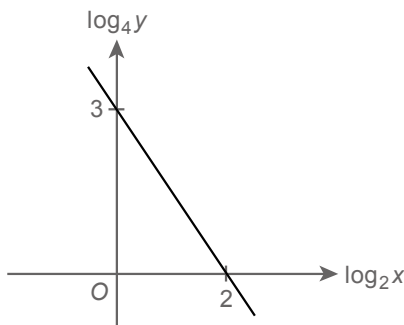
32. Which of the following is the smallest?

- A. 200^{300}
- B. 300^{200}
- C. 50^{1000}
- D. $1\ 000^{50}$

33. If $\begin{cases} 2^{x+3y} = 32 \\ 2^{3x+y} = \frac{1}{2} \end{cases}$, then $x + y =$

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

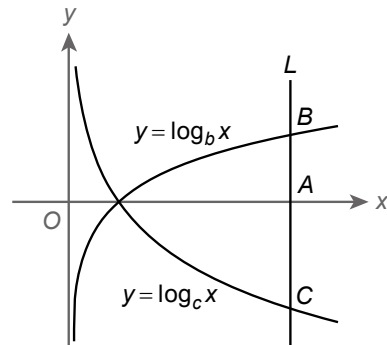
34. The figure shows a linear relation between $\log_4 y$ and $\log_2 x$.



If $y = Ax^k$, then $k =$

- A. -3 .
- B. $-\frac{3}{2}$.
- C. 2 .
- D. 64 .

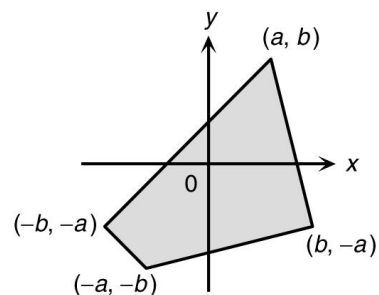
35. The figure shows the graph of $y = \log_b x$ and the graph of $y = \log_c x$ on the same rectangular coordinate plane, where b and c are constants. If a vertical line L cuts the x -axis, the graph of $y = \log_b x$ and the graph of $y = \log_c x$ at A , B and C respectively, which of the following must be true?



- I. $bc > 0$
- II. $b + c < 1$
- III. $\frac{AB}{AC} = \log_b c$

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

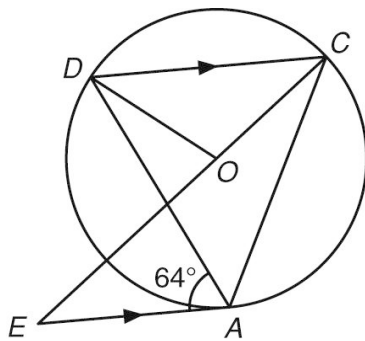
36. In the figure, at which point in the shaded region does $P = -ax - by + 3$ attain its minimum value?



- A. $(-b, -a)$
- B. $(-a, -b)$
- C. $(b, -a)$
- D. (a, b)

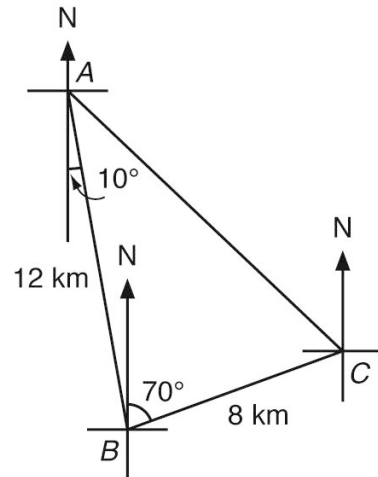
37. It is given that $y = \frac{16 - xi}{2 - 3i}$, where x is a real number. If the real part of y is 5, then find x .
- A. 2
B. 3
C. 11
D. 16

38. In the figure, AE is the tangent to the circle at A . COE is a straight line. If $DC \parallel EA$ and $\angle DAE = 64^\circ$, find $\angle DOE$.



- A. 64°
B. 74°
C. 76°
D. 80°
39. How many distinct solutions are there for the equation $\sin x(2 \sin x - 1) = 0$ where $0^\circ \leq x < 360^\circ$?
- A. 2
B. 3
C. 4
D. 5

40. In the figure, find the compass bearing of A from C , correct to the nearest 0.1° .



- A. $N63.4^\circ W$
B. $N46.6^\circ W$
C. $S63.4^\circ E$
D. $S46.6^\circ E$
41. A road safety patrol of 4 members are from 10 girls and 8 boys. In how many ways can the patrol be formed if there are at least 2 girls in the patrol?
- A. 1260
B. 2220
C. 2340
D. 2430
42. If the graph of $y = f(x)$ is reflected with respect to the y -axis and then enlarged to 3 times the original along the y -axis, find the function represented by the image.
- A. $y = -3f(x)$
B. $y = 3f(-x)$
C. $y = f(-3x)$
D. $y = \frac{1}{3}f(-x)$

43. 5 different English story books and 2 different Chinese story books are arranged in a row randomly. Given that all English story books are put together, find the probability that the Chinese story books are also put together.

- A. $\frac{1}{21}$
- B. $\frac{2}{21}$
- C. $\frac{2}{7}$
- D. $\frac{2}{3}$

44. The variance of the six numbers $5a+1$, $5a+3$, $5a+5$, $5a+7$, $5a+9$, $5a+11$ is

- A. 3.42
- B. 5
- C. $\frac{35}{3}$
- D. $5a+6$

45. Let x_1 , y_1 and z_1 be the mean, range and standard deviation of a set of data $\{a, b, c, d\}$ respectively, where a , b , c and d are not entirely the same. If x_2 , y_2 and z_2 are the mean, range and standard deviation of a set of data $\{x_1, a, b, c, d\}$ respectively, which of the following must be true?

- I. $x_1 = x_2$
- II. $y_1 < y_2$
- III. $z_1 > z_2$

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

END OF PAPER