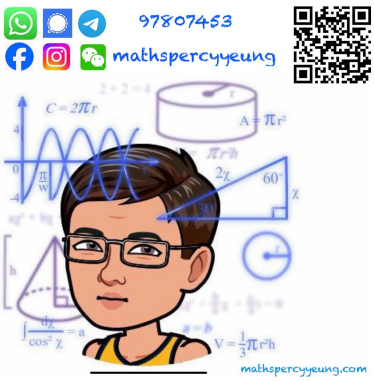
2022-2023 S5
1st TERM EXAM
MATH CP
PAPER 2

MC



2022 – 2023
S5 First Term Examination

MATHEMATICS Compulsory Part

PAPER 2

6th January, 2023
10:30 am – 11:30 am (1 hour)
Total Marks : 36

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 24 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. Simplify $[(x^{-2}y^0)^{-3}]^2$.
   A. $\frac{1}{x^{12}}$
   B. x^{12}
   C. $x^{12}y^6$
   D. $\frac{1}{x^{12}y^6}$

2. 0.0035456789 =
   A. 0.00355 (correct to 6 decimal places).
   B. 0.003545 (correct to 6 decimal places).
   C. 0.003546 (correct to 6 significant figures).
   D. 0.00354568 (correct to 6 significant figures).

3. $p^2+2pq+q^2-p-q=$
   A. $(p+q)(p-q-1)$.
   B. $(p+q)(p+q-1)$.
   C. $(p-q)(p-q+1)$.
   D. $(p-q)(p+q-1)$.

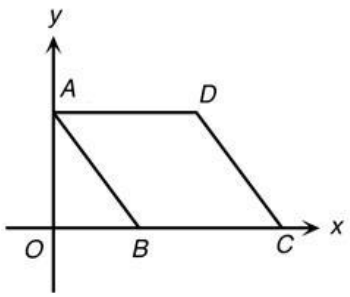
4. If $\frac{b}{x}+\frac{a}{y}=2$, then $x=$
   A. $\frac{ay}{2y-b}$.
   B. $\frac{ay}{b-2y}$.
   C. $\frac{by}{2y-a}$.
   D. $\frac{by}{a-2y}$.

5. Which of the following equations has irrational roots?
   I. $3x-\pi=0$
   II. $6x=11$
   III. $x^2=24$

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

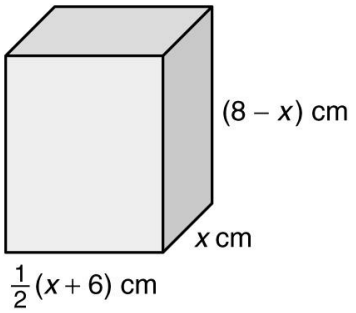
6. A sum of $ 50 000 is deposited at an interest rate of 8 % per annum for 1 year, compounded monthly. Find the interest correct to the nearest dollar.
   A. $ 4 000
   B. $ 4 122
   C. $ 4 143
   D. $ 4 150

7. In the figure, *ABCD* is a parallelogram. If the equations of *AB* and *DC* are $4x+3y-12=0$ and $4x+3y-32=0$ respectively, find the coordinates of *D*.



   A. (5, 4)
   B. (6, 4)
   C. (4, 5)
   D. (4, 6)

8. In the figure, the total surface area of the cuboid is 102 cm^2. Find the volume of the cuboid.



A. 67.5 cm^3
B. 80 cm^3
C. 92.5 cm^3
D. 102 cm^3

9. Consider the function $f(x)=\dfrac{1}{\sqrt{x-1}-\sqrt{x}}$.

Which of the following may be a domain of $f(x)$?

A. All real numbers
B. All real numbers except 0
C. All real numbers greater than or equal to 0
D. All real numbers greater than or equal to 1

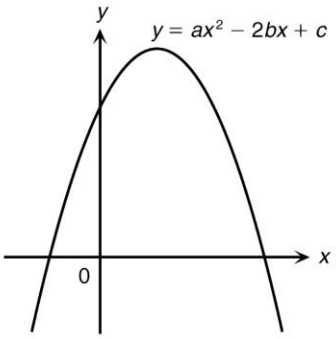
10. It is given that $x^{1984}+k$ is divisible by $x-1$. When $x^{1984}+3k$ is divided by $x+1$, the remainder is

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

11. Solve the compound inequality $2(4x-3)+1\geq 51$ and $x>14-x$.

A. $x>7$
B. $x\geq 7$
C. $x=7$
D. No solutions

12. The figure shows the graph of $y=ax^2-2bx+c$. Which of the following are true?



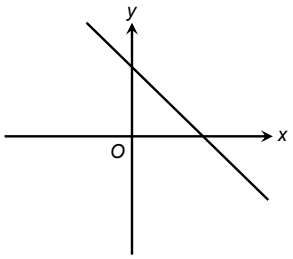
I. $a>0$
II. $c>0$
III. $ac<b^2$

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

13. The coordinates of the point P are $(7,-5)$. P is reflected with respect to the y-axis to the point Q. Q is then rotated clockwise about the origin through 90° to the point R. Find the x-coordinate of R.

A. –7
B. –5
C. 5
D. 7

14. If $a > 0$ and $b < 0$, which of the following graphs may represent the straight line $\frac{x}{a}+\frac{y}{b}+1=0$?

A.


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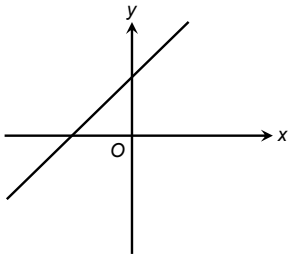

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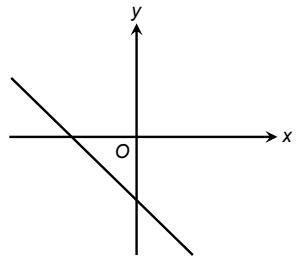
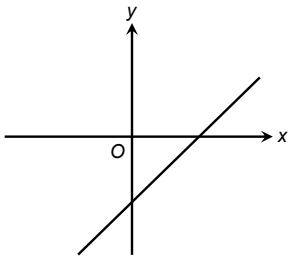


D.


15. It is given that z varies directly as x^3 and inversely as $\sqrt{y}$. Which of the following must be a constant?

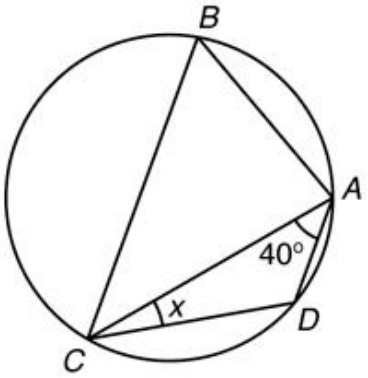
A. $\frac{zy}{x^6}$

B. $\frac{z^2\sqrt{y}}{x^3}$

C. $\frac{z^2y}{x^6}$

D. $\frac{z^2y}{x^3}$

16. In the figure, $\overset{\frown}{AB}:\overset{\frown}{BC}:\overset{\frown}{CD}=1:2:1$ and $\angle CAD = 40°$. Find x.



A. 20°

B. 40°

C. 50°

D. 60°

17. Find the range of values of x that satisfies $(x-2)^2+3(x-2)-10 \geq 0$.

A. $x \geq -3$

B. $x \geq 4$

C. $-3 \leq x \leq 4$

D. $x \leq -3$ or $x \geq 4$

18. Which of the following equations represents a real circle?

A. $x^2-y^2-6x-14y+3=0$

B. $x^2+y^2+2x+3=0$

C. $x^2+y^2-2x+4y+5=0$

D. $2x^2+2y^2+x-y=0$

19. It is given that z varies inversely as x and y^2. If x is increased by 60% and y is decreased by 50%, find the percentage change in z.

A. Decreased by 20%

B. Decreased by 60%

C. Increased by 25%

D. Increased by 150%

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

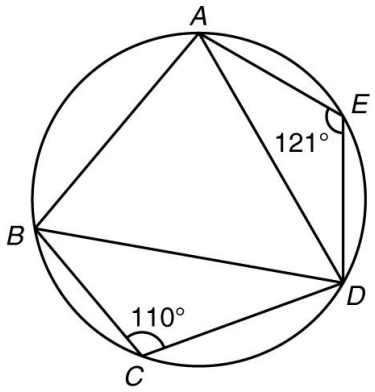
I. C_1 and C_2 are concentric circles.

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

21. In the figure, $\angle AED = 121°$ and $\angle BCD = 110°$. Find $\angle ADB$.



A. 39°
B. 41°
C. 51°
D. 65°

22. If β is a root of the equation $3x^2 + 2x - 3 = 0$, then $6\beta^2 + 4\beta - 7 =$

A. –4.
B. –1.
C. 0.
D. 4.

23. Given two straight lines AB and CD that are perpendicular to each other. If P is a moving point such that it is equidistant from AB and CD, which of the following MUST be true?

I. The locus of P is two straight lines that are perpendicular to each other.

II. The locus of P is two parallel straight lines.

III. The locus of P is the angle bisectors of the angles formed by AB and CD.

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

24. The stem-and-leaf diagram below shows the distribution of the numbers of books read by 20 students in a year.

Stem (tens)	Leaf (units)
2	1 2 2 8
3	a a
4	0 2 4 5 5 7 8
5	3
6	b b 9 9
7	0 8

If the inter-quartile range of the above distribution is at most 25, which of the following must be true?

I. $5 \le a \le 9$

II. $0 \le b \le 4$

III. $1 \le a - b \le 6$

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

Section B

25. If $\frac{9x+2}{(x-7)(x+6)} \equiv \frac{A}{x-7} + \frac{B}{x+6}$, then

A. $A = -5, B = -4$.
B. $A = -5, B = 4$.
C. $A = 5, B = -4$.
D. $A = 5, B = 4$.

26. If k and $\frac{5}{2-i} + ki$ are real numbers, then $k =$

A. –2.
B. –1.
C. 1.
D. 2.

27. Find the H.C.F. and L.C.M. of $5(49x^2 - 28x + 4)$, $42x^2 + 240x - 72$ and $10x^2 + 120x + 360$.

	H.C.F.	L.C.M.
A.	1	$30(7x-2)(x+6)$
B.	1	$30(7x-2)^2(x+6)^2$
C.	30	$(7x-2)(x+6)$
D.	30	$(7x-2)^2(x+6)^2$

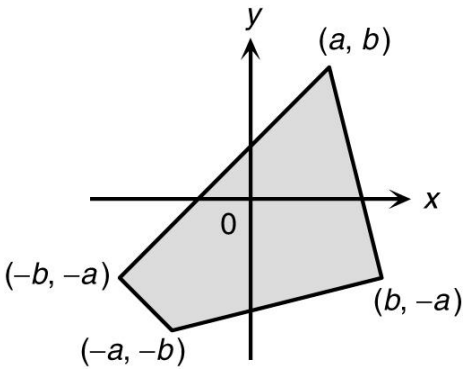
28. If $\begin{cases} \alpha^2 + 6\alpha - 3 = 0 \\ \beta^2 + 6\beta - 3 = 0 \end{cases}$ and $\alpha \neq \beta$, then $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} =$

A. –14.
B. –8.
C. 8.
D. 14.

29. Solve $\begin{cases} 3^{x+2y} = 1 \\ (4^x)(8^y) = 2 \end{cases}$.

A. $x = 2,\ y = 1$
B. $x = -2,\ y = 1$
C. $x = 2,\ y = -1$
D. $x = -2,\ y = -1$

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

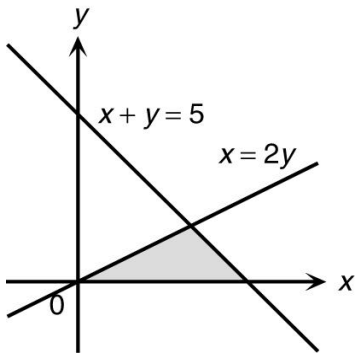


A. (a, b)
B. $(b, -a)$
C. $(-a, -b)$
D. $(-b, -a)$

31. The standard deviation of a set of 100 data $\{x_1, x_2, x_3, \ldots, x_{100}\}$ is σ. Which of the following set of data has a standard deviation σ^2?

A. $\{x_1 + \sigma, x_2 + \sigma, x_3 + \sigma, \ldots, x_{100} + \sigma\}$
B. $\{\sigma x_1, \sigma x_2, \sigma x_3, \ldots, \sigma x_{100}\}$
C. $\{\sigma^2 x_1, \sigma^2 x_2, \sigma^2 x_3, \ldots, \sigma^2 x_{100}\}$
D. $\{x_1 + \sigma^2, x_2 + \sigma^2, x_3 + \sigma^2, \ldots, x_{100} + \sigma^2\}$

32. Which of the following systems of inequalities has its solutions represented by the shaded region in the figure?



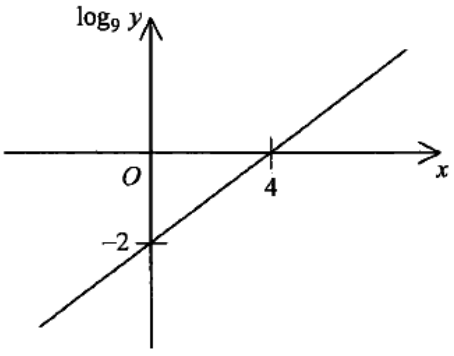
A. $\begin{cases} x \geq 0 \\ x + y \geq 5 \\ x \geq 2y \end{cases}$

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

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

D. $\begin{cases} y \geq 0 \\ x + y \geq 5 \\ x \geq 2y \end{cases}$

33. The graph in the figure shows the linear relation between x and $\log_9 y$. If $y = ab^x$, then $b =$



A. -2.

B. $\frac{1}{81}$.

C. $\frac{1}{2}$.

D. 3.

34. Consider the circle $C: x^2 + y^2 - 2x + 8y + 7 = 0$ and the straight line $L: x + 2y + 1 = 0$. Which of the following is/are true?

I. L and C have two intersections.

II. The centre of C lies in quadrant II.

III. L passes through the centre of C.

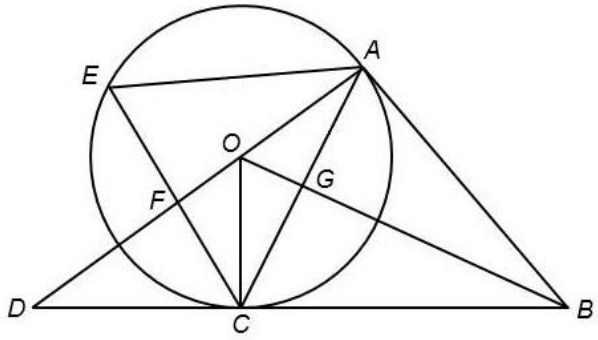
A. I only

B. III only

C. I and II only

D. II and III only

35. In the figure, BA and BD are tangents to the circle at A and C respectively. OB intersects AC at G. $AOFD$ and EFC are straight lines. If $AE = AC$, which of the following must be true?



I. O, F, C and G are concyclic.

II. $\Delta OCD \sim \Delta BAD$

III. AC bisects $\angle ECB$.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

36. The heights of 600 children of the same age are normally distributed with a mean of 120 cm and a standard deviation of 5 cm. How many children are there with heights between 110 cm and 125 cm?

A. 180

B. 408

C. 489

D. 585

END OF PAPER