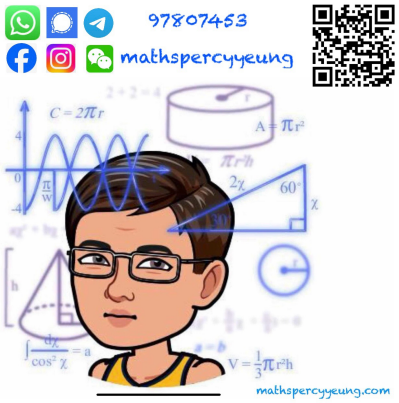
2023-2024 S5
1st TERM EXAM
MATH CP
PAPER 2
MC



2023 – 2024
S5 First Term Examination

MATHEMATICS Compulsory Part

PAPER 2

4th January, 2024
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.

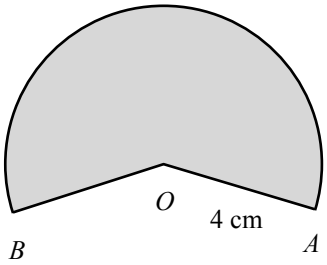
5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

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. In the figure, OAB is a sector of radius 4 cm. If $AB = 15$ cm, find the area of the sector OAB.



A. 15 cm^2
B. 30 cm^2
C. 45 cm^2
D. 60 cm^2

2. Consider the following set of data:
3 9 10 10 11 11 12 m n
It is given that $m \le n$. If the mean and the median of the set of data are 11 and 10 respectively, which of the following must be true?
I. $m \le 10$
II. $n \ge 23$
III. $m + n = 33$

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

3. The radius of a solid sphere and the base radius of a solid right circular cylinder are equal. If the height of the circular cylinder is two times of its base diameter, then the ratio of the surface area of the sphere to the total surface area of the circular cylinder is
A. $1:2$.
B. $1:4$.
C. $2:3$.
D. $2:5$.

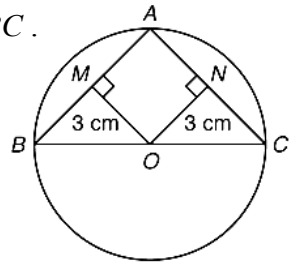
4. If the quadratic equation $3x^2 - ax + a = 3$ has two equal roots, where a is a constant, then $a =$
A. 3 .
B. 6 .
C. 0 or -12 .
D. 0 or 12 .

5. The straight line L is perpendicular to the straight line $3x + 8y - 11 = 0$. If the y-intercept of L is 2, then the equation of L is
A. $3x + 8y - 16 = 0$.
B. $3x + 8y - 6 = 0$.
C. $8x - 3y - 16 = 0$.
D. $8x - 3y + 6 = 0$.

6. Let $f(x) = (x + m)(x + 4) + n$, where m and n are constants. If $f(-3) = f(2) = -11$, find n.
A. -5
B. -3
C. 3
D. 5

7. Let k be a constant such that $2x^3 - kx^2 - 8x + 16$ is divisible by $2x - k$. Find k.
A. -4
B. -2
C. 2
D. 4

8. In the figure, BC is a diameter of the circle. AMB and ANC are straight lines. $OM = ON = 3$ cm , $OM \perp AB$ and $ON \perp AC$. Find $\angle ABC$.



A. 40°
B. 45°
C. 50°
D. 55°

9. How many integral solutions does the compound inequality ' $2x + 5 < 11$ and $3 - 2x \le 7$' have?
A. 3
B. 4
C. 5
D. 6

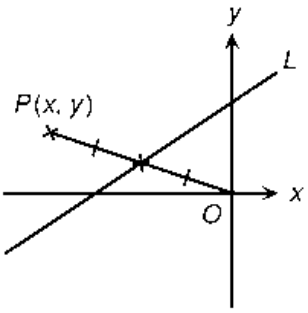
10. Solve $\begin{cases} x + 4 \le 0 \\ \dfrac{x}{4} < 4 \end{cases}$ or $3x \ge -27$.
A. All real numbers
B. $-9 \le x \le -4$
C. $x \le -4$
D. $x \ge -9$

11. Consider a square with perimeter y cm. If its area does not exceed 100 cm^2, find the range of values of y.
A. $10 \le y \le 40$
B. $0 < y \le 10$
C. $0 < y \le 40$
D. $-40 \le y \le 40$

12. Consider two fixed points A and B. P is a moving point such that $AP \perp BP$. The locus of P is
A. a straight line.
B. a pair of straight lines parallel to AB.
C. a circle with AB as diameter.
D. a parabola.

13. The coordinates of the points A and B are $(4, 2)$ and $(-2, -3)$ respectively. Let $P(x, y)$ be a moving point on the rectangular coordinate plane such that $AP = AB$. Find the equation of the locus of P.
A. $x^2 + y^2 + 4x + 2y - 25 = 0$
B. $x^2 + y^2 - 4x - 2y - 25 = 0$
C. $x^2 + y^2 + 8x + 4y - 41 = 0$
D. $x^2 + y^2 - 8x - 4y - 41 = 0$

14. The figure shows straight line $L: 2x - 3y + 6 = 0$. $P(x, y)$ is a point where the mid-point of OP lies on L. Find the equation of the locus of P.
A. $2x - 3y = 0$
B. $2x - 3y - 6 = 0$
C. $2x - 3y + 12 = 0$
D. $2x - 3y - 12 = 0$

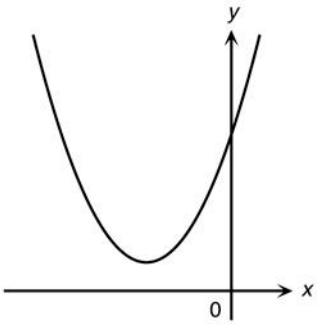


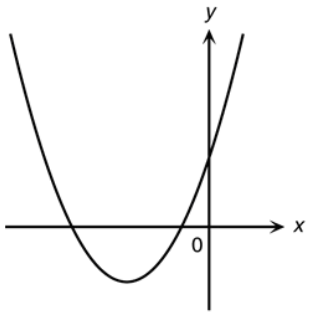
15. Consider the circle $(x + 2)^2 + (y - 5)^2 = 5$. Which of the following is/are true?
I. The coordinates of the centre of the circle is $(-2, 5)$.
II. The radius of the circle is 5.
III. The circle cuts the x-axis at two points.

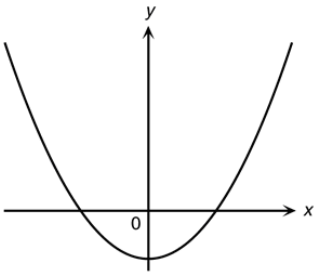
A. I only
B. II only
C. I and III only
D. II and III only

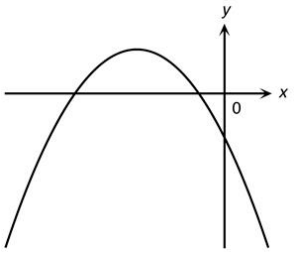
16. It is given that $f(x) = (x + 1)(x + b)$ and $f(2) = f(5)$, then $f(10) =$
A. 22 .
B. 16 .
C. 10 .
D. 7 .

17. Which of the following may represent the graph of $y = 3(x-h)^2 + k$, where $hk < 0$?

A.


B.


C.


D.


18. It is given that z varies directly as x^2 and inversely as $\sqrt{y}$. When $x = 2$ and $y = 4$, $z = 70$. Express z in terms of x and y.

A. $z = \dfrac{35x^4}{y}$

B. $z = \dfrac{35x^2}{\sqrt{y}}$

C. $z = \dfrac{80x^4}{y}$

D. $z = \dfrac{80x^2}{\sqrt{y}}$

19. Which of the following sets of data has the largest range?

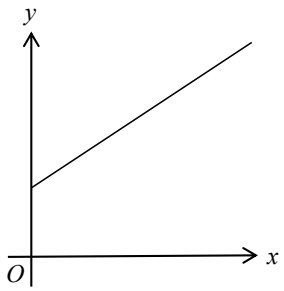
A. {5, 9, 6, 16, 7, 8, 17, 15, 12, 14}

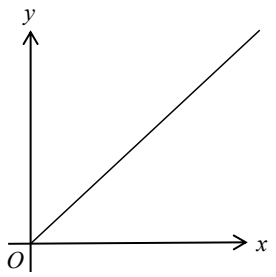
B. {–24, –24, 0, 0, 12, 12, –12, –12}

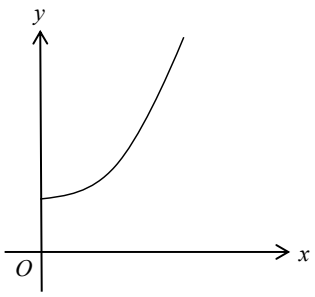
C. {12, 13.5, 14.6, 23.3, 20.8, 29.5, 25.5}

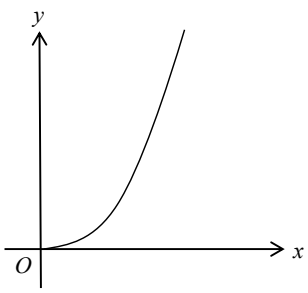
D. {100, 105, 104, 102, 102, 103, 103, 110, 111, 105}

20. It is given that y is partly constant and partly varies directly as x^2. Which of the following graphs shows this relation?

A.


B.


C.


D.


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

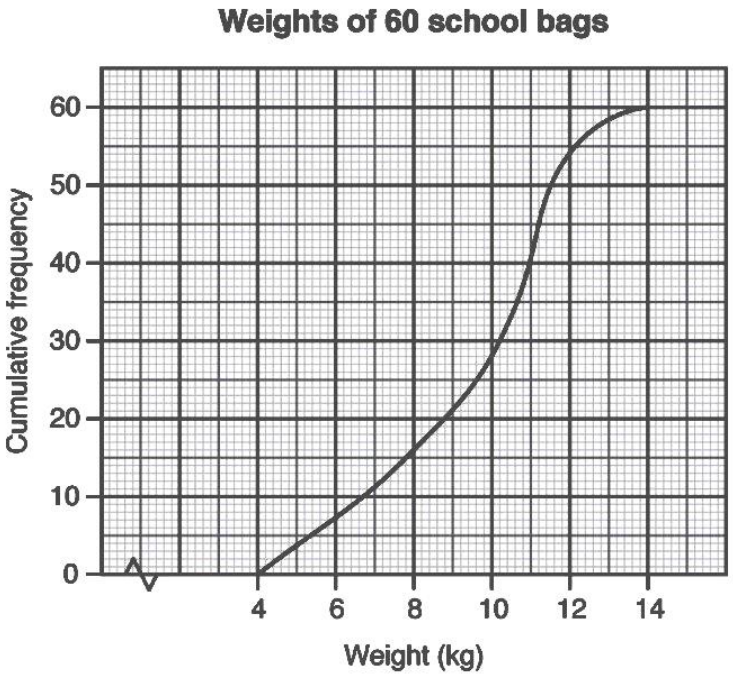
A. $\dfrac{\sqrt{x}}{zy^3}$

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

C. $\dfrac{x}{zy^6}$

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

22. The following cumulative frequency curve shows the distribution of the weights of 60 school bags.



Find the inter-quartile range of the weights of the school bags.

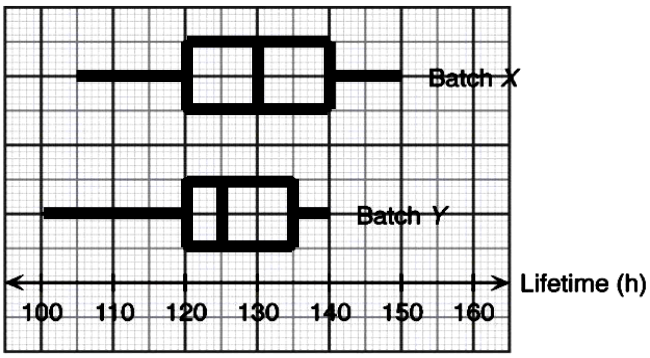
A. 3.4 kg

B. 3.6 kg

C. 3.8 kg

D. 4.0 kg

23. The following box-and-whisker diagrams show the distributions of lifetimes of cutting tools in two batches.



From the diagram above, which of the following is/are true?

I. The range for batch X is larger than that for batch Y.

II. The inter-quartile ranges for batches X and Y are the same.

III. At most 25% of cutting tools in batch X have lifetimes longer than all cutting tools in batch Y.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

24. The stem-and-leaf diagram below shows the weight distribution (in kg) of the actors in a movie.

Weights of the actors in a movie

Stem (10 kg)	Leaf (1 kg)
4	0 6
5	1 3 7 8
6	0 1 2 4 5 6 8 9
7	2 5 7

Find the median of the weight distribution of the actors.

A. 61.4 kg

B. 61.5 kg

C. 62 kg

D. 63 kg

Section B

25. If k is a real number, then $\dfrac{k^2+1}{k-i} =$

A. $k-i$.

B. $k+i$.

C. $1-ki$.

D. $1+ki$.

26. Let k be a constant. If the roots of the quadratic equation $x^2+4x-k=0$ are α and β, then $\alpha^2+\beta^2 =$

A. 16 .

B. $16-2k$.

C. $16+2k$.

D. $16+4k$.

27. It is given that c is a positive constant. The straight line $3x+4y+c=0$ cuts the x-axis and the y-axis at the points A and B respectively. Let C be a point lying on the y-axis such that the x-coordinate of the orthocentre of ΔABC is 12. Find the y-coordinate of C.

A. -16

B. -9

C. 9

D. 16

28. The H.C.F. and the L.C.M. of three expressions are x^4y^5 and $9x^7y^8z^9$ respectively. If the first expression and the second expression are $3x^5y^7z^4$ and $9x^7y^5z^9$ respectively, then the third expression is

A. x^4y^5 .

B. x^4y^8 .

C. $3x^4y^5z^4$.

D. $3x^4y^8z^4$.

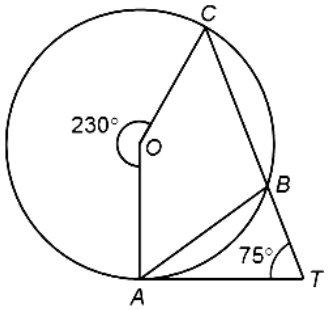
29. In the figure, AT is the tangent to the circle at A. CBT is a straight line. If $\angle BTA = 75°$ and reflex $\angle COA = 230°$, find $\angle OAB$.

A. $40°$

B. $45°$

C. $50°$

D. $55°$



30. A manufacturer produces silver medals and silver cups. Each medal and cup are made of 20 g and 500 g of silver respectively. The number of medals manufactured should not exceed 5 times that of cups. Suppose the manufacturer has at most \$20 000 to buy silver, and the cost is \$1.5 / g. Let x and y be the numbers of medals and cups produced respectively. Write down all the constraints on x and y.

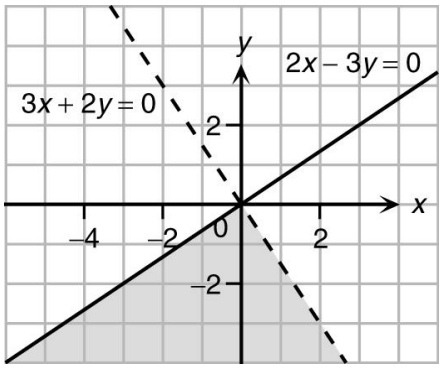
A. $\begin{cases} 3x+75y \le 2000 \\ x \le 5y \\ x \text{ and } y \text{ are non-negative integers.} \end{cases}$

B. $\begin{cases} 3x+75y \le 2000 \\ x \ge 5y \\ x \text{ and } y \text{ are non-negative integers.} \end{cases}$

C. $\begin{cases} 3x+75y \ge 2000 \\ x \le 5y \\ x \text{ and } y \text{ are non-negative integers.} \end{cases}$

D. $\begin{cases} 3x+75y \ge 2000 \\ x \ge 5y \\ x \text{ and } y \text{ are non-negative integers.} \end{cases}$

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



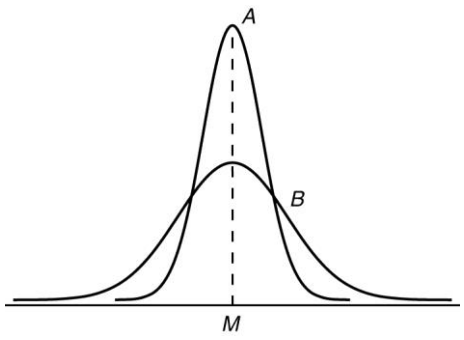
A. $\begin{cases} 2x-3y \geq 0 \\ 3x+2y > 0 \end{cases}$

B. $\begin{cases} 2x-3y \leq 0 \\ 3x+2y > 0 \end{cases}$

C. $\begin{cases} 2x-3y \geq 0 \\ 3x+2y < 0 \end{cases}$

D. $\begin{cases} 2x-3y \leq 0 \\ 3x+2y < 0 \end{cases}$

32. The figure below shows the frequency curves of two normally distributed data sets *A* and *B*. They have the same median *M*. The mean and the standard deviation of data set *A* are m_1 and s_1 respectively while the mean and the standard deviation of data set *B* are m_2 and s_2 respectively. Which of the following is true?



A. $m_1 < m_2$ and $s_1 < s_2$

B. $m_1 > m_2$ and $s_1 < s_2$

C. $m_1 = m_2$ and $s_1 > s_2$

D. $m_1 = m_2$ and $s_1 < s_2$

33. Andrew got 60 marks in a test and his standard score is -0.5. If the standard deviation of the test marks is 10, then the mean mark of the test is

A. 55 .

B. 65 .

C. 70 .

D. 72 .

34. Solve $x^5 + 2x^3 - 24x = 0$.

A. $x = -2$ or 2

B. $x = -6$ or 4

C. $x = -6$ or 0 or 4

D. $x = -2$ or 0 or 2

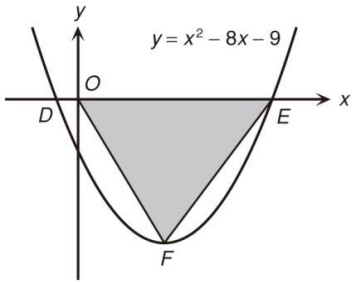
35. The figure shows the graph of $y = x^2 - 8x - 9$ which has *F* as its vertex and cuts the *x*-axis at *D* and *E*. Find the area of ΔOEF .

A. 25 sq. units

B. 50 sq. units

C. 67.5 sq. units

D. 112.5 sq. units



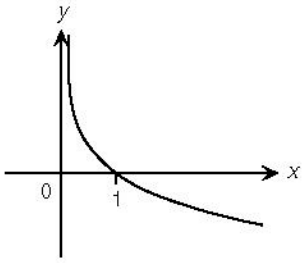
36. Which of the following functions can be represented by the graph as shown?

A. $x = 2^y$

B. $x = \left(\frac{1}{2}\right)^y$

C. $x = \log_2 y$

D. $x = \log_{0.5} y$



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