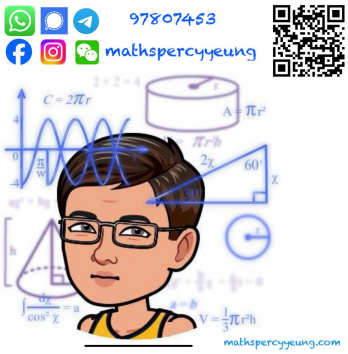
2024-2025 S6
UNIFORM TEST
MATH CP
PAPER 2




2024 – 2025
S6 Uniform Test

# MATHEMATICS Compulsory Part

# PAPER 2

6th December, 2024
(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.** If $\frac{\alpha-3\beta}{2\alpha}=\frac{\beta}{\alpha}-1$, then $\alpha=$

A. $\frac{\beta}{2}$.
B. $2\beta$.
C. $\frac{3\beta}{5}$.
D. $\frac{5\beta}{3}$.

**2.** $\frac{3}{x+3}+\frac{2}{2-x}=$

A. $\frac{x}{(x+3)(2-x)}$.
B. $\frac{x}{(x+3)(x-2)}$.
C. $\frac{x-12}{(x+3)(2-x)}$.
D. $\frac{x-12}{(x+3)(x-2)}$.

**3.** $27^{n+2}\cdot 4^{3n+6}=$

A. $12^{3n+6}$.
B. $12^{4n+8}$.
C. $108^{3n+6}$.
D. $108^{4n+8}$.

**4.** $(x+2y)^2-9z^2=$

A. $(x+2y-3z)^2$ .
B. $(x+2y-3z)(x+2y+3z)$ .
C. $(x-2y-3z)(x-2y+3z)$ .
D. $(x+2y-9z)(x+2y+9z)$ .

**5.** If $p$ and $q$ are constants such that $x^2+px-q\equiv(2-x)(p-x)+4$, then $q=$

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

**6.** The solution of $4-x<2-3x$ or $x+3>2x-5$ is

A. $x<-1$ .
B. $x<8$.
C. $-1<x<8$.
D. $x<-1$ or $x>8$.

**7.** If $z$ = 64.52 (correct to 4 significant figures), find the range of values of $z$.

A. $64.51\le z<64.53$
B. $64.51<z\le 64.53$
C. $64.515\le z<64.525$
D. $64.515<z\le 64.525$

**8.** Let $h(x)=15-3x^2$. If $y$ is a constant, find $h(1-2y)$.

A. $12y^2+12$
B. $12y^2-12y+12$
C. $-12y^2+12$
D. $-12y^2+12y+12$

**9.** Let $f(x)=4x^3+kx+1$, where $k$ is a constant. If $f(x)$ is divisible by $1-2x$, find the remainder when $f(x)$ is divided by $1-x$.

A. 1
B. 2
C. –3
D. –4

**10.** Which of the following statements about the graph of $y=-7+(x-5)^2$ is true?

A. The graph opens downwards.
B. The $x$-intercept of the graph is 5.
C. The $y$-intercept of the graph is –7.
D. The graph passes through the point (5, –7).

**11.** In a sports shop, the price of a football is 20% lower than the price of a basketball, then the price of the basketball is

A. 20% higher than the price of the football.
B. 25% higher than the price of the football.
C. 75% higher than the price of the football.
D. 80% higher than the price of the football.

**12.** The scale of a map is 1 : 8 000. If the actual area of a park is 512 $m^2$, then the area of the park on the map is

A. 0.064 $cm^2$.
B. 0.08 $cm^2$.
C. 640 $cm^2$.
D. 8000 $cm^2$.

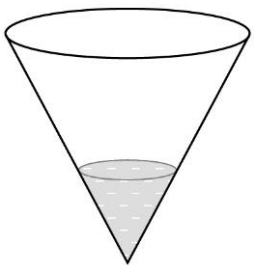
**13.** It is given that $z$ varies directly as $x^2$ and inversely as $\sqrt{y}$. When $x=4$ and $y=4$, $z=4$. When $x=\frac{1}{4}$ and $y=\frac{1}{4}$, $z=$

A. $\frac{1}{16}$.
B. $\frac{1}{8}$.
C. $\frac{1}{4}$.
D. $\frac{1}{2}$.

**14.** Let $a_n$ be the $n$th term of a sequence. If $a_2=2$, $a_5=29$ and $a_{n+2}=a_n+2a_{n+1}$ for any positive integer $n$, then $a_1=$

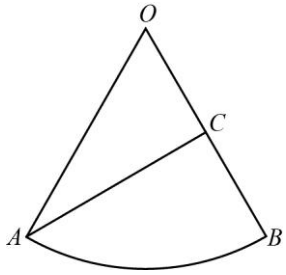
A. 1 .
B. 5 .
C. 11.5 .
D. 25 .

**15.** In the figure, there is 180 $cm^3$ of water in a right circular conical paper cup which is held vertically. It is given that the height of the paper cup and the depth of water are $h$ cm and $\frac{2}{5}h$ cm respectively. How much more water is required to fully fill the paper cup?



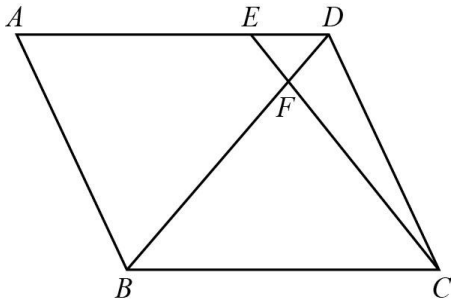
A. 945 $cm^3$
B. 1 125 $cm^3$
C. 2 632.5 $cm^3$
D. 2 812.5 $cm^3$

**16.** In the figure, $O$ is the centre of the sector $OAB$. $C$ is a point lying on $OB$ such that $AC$ is the perpendicular bisector of $OB$. If $BC = 3$ cm, then the area of the sector $OAB$ is



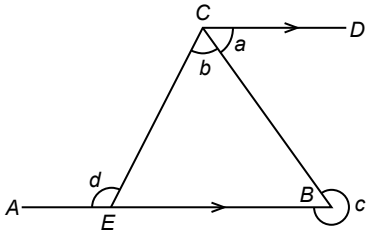

A. $\pi$ cm$^2$.
B. $3\pi$ cm$^2$.
C. $6\pi$ cm$^2$.
D. $36\pi$ cm$^2$.

**17.** In the figure, $ABCD$ is a parallelogram. $E$ is a point lying on $AD$ such that $AE : ED = 3 : 1$. $BD$ and $CE$ intersect at $F$. If the area of $\Delta DEF$ is $8$ cm$^2$, then the area of the quadrilateral $ABFE$ is




A. $120$ cm$^2$ .
B. $128$ cm$^2$ .
C. $152$ cm$^2$ .
D. $160$ cm$^2$ .

**18.** In the figure, $AEB$ is a straight line.

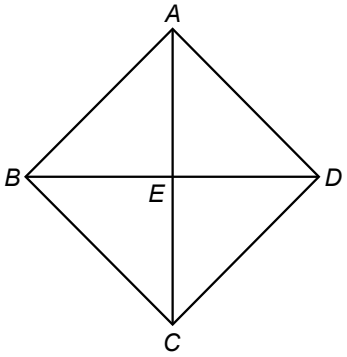



Which of the following must be true?

**I.** $a + b = d$
**II.** $a + c = 360°$
**III.** $c + d = b + 180°$

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

**19.** In the figure, $AC$ and $BD$ intersect perpendicularly at $E$. $AB = AD$ and $AB \,//\, DC$.

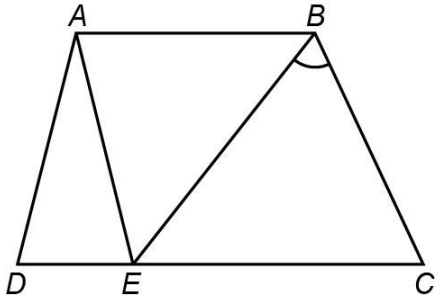



Which of the following must be true?

**I.** $BC = DC$
**II.** $EA = EB$
**III.** $ABCD$ is a rhombus.

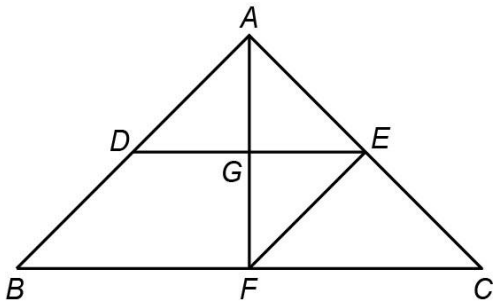
A. **I** only
B. **II** only
C. **I** and **III** only
D. **I**, **II** and **III**

**20.** In the figure, $ABCD$ is a trapezium with $AB // DC$. It is given that $AB = AE$. $E$ is a point lying on $CD$ such that $AD = AE$. If $\angle BCD = 65°$ and $\angle EAD = 28°$, then $\angle CBE =$




A. 39°.
B. 52°.
C. 63°.
D. 65°.

**21.** In the figure, $D$, $E$ and $F$ are points lying on $AB$, $AC$ and $BC$ respectively such that $AF$ cuts $DE$ perpendicularly at $G$.




If $\angle BAF = \angle CAF = \angle AED = \angle FED$, which of the following must be true?

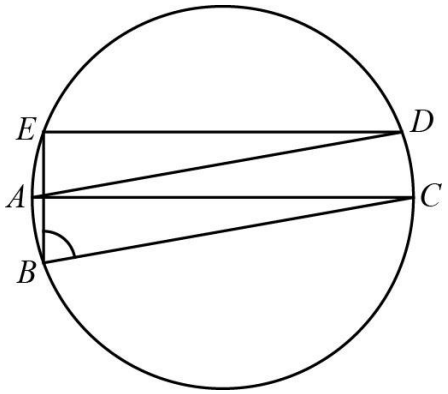
**I.** $\Delta ADG \cong \Delta EFG$

**II.** $\Delta ADG$ is an isosceles triangle.

**III.** $\angle BAC = 90°$

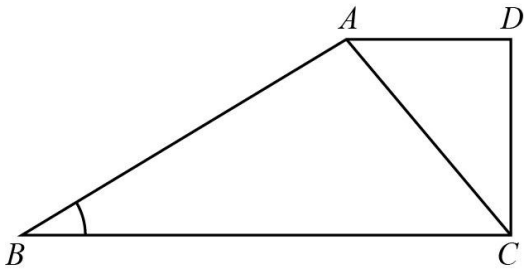
A. **I** and **II** only
B. **I** and **III** only
C. **II** and **III** only
D. **I**, **II** and **III**

**22.** In the figure, $AC$ is a diameter of the circle $ABCDE$. If $AB = AE$ and $\angle ACB = 10°$, then $\angle CBE =$




A. 70°.
B. 80°.
C. 90°.
D. 100°.

**23.** In the figure, $ABCD$ is a trapezium with $AD // BC$. If $AD \perp CD$, $BC = 5$ cm, $CD = 2$ cm and $\angle ACD = 40°$, find $\angle ABC$ correct to the nearest degree.




A. 31°
B. 33°
C. 53°
D. 55°

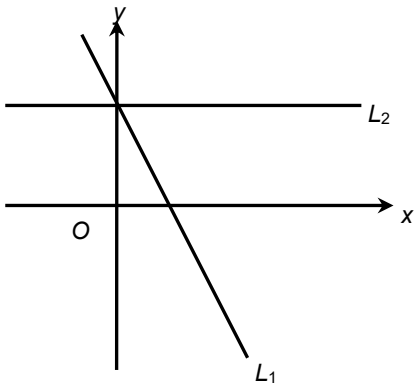
**24.** The polar coordinates of the point $P$ are $(2, 240°)$. If $P$ is rotated clockwise about the pole through 90°, then the rectangular coordinates of its image are

A. $(1, -\sqrt{3})$.
B. $(-1, \sqrt{3})$.
C. $(\sqrt{3}, -1)$.
D. $(-\sqrt{3}, 1)$.

**25.** The straight line $L_2$ is perpendicular to the straight line $L_1 : 4x - 3y + 6 = 0$. If $L_2$ has the same $y$-intercept as $L_1$, then the equation of $L_2$ is

A. $3x + 4y - 8 = 0$ .
B. $3x + 4y + 6 = 0$.
C. $4x - 3y - 8 = 0$.
D. $4x - 3y + 6 = 0$.

**26.** In the figure, the equations of the straight lines $L_1$ and $L_2$ are $ax + by + 1 = 0$ and $cy = 1$ respectively. Which of the following is/are true?




**I.** $a < 0$
**II.** $b < 0$
**III.** $b = c$

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

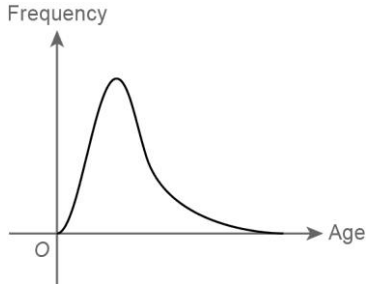
**27.** The equation of the circle $C$ is $3x^2 + 3y^2 - 18x - 6y + 5 = 0$. Which of the following is true?

A. The origin lies inside $C$.
B. The coordinates of the centre of $C$ are $(9, 3)$.
C. The area of $C$ is greater than $\frac{25\pi}{2}$.
D. $C$ lies on the right of the $y$-axis.

**28.** There are five balls numbered '2', '4', '5', '7' and '9' in a box. In a game, two balls are randomly drawn from the box at the same time. If the sum of the two numbers drawn is odd, 15 tokens will be obtained; otherwise, 25 tokens will be obtained. Find the expected number of tokens obtained in the game.

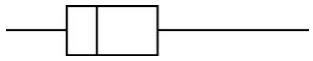
A. 19
B. 19.8
C. 20.2
D. 21

**29.** The frequency curve below shows the distribution of the ages of the members in a fans club.




Which of the following box-and-whisker diagrams may represent the distribution of their ages?

A. 

B. 

C. 

D. 

**30.** The stem-and-leaf diagram below shows the distribution of the waiting times (in minutes) of some customers in a bank.

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

If the mean and the range of the above distribution are 12 and $r$ respectively, which of the following statement(s) is/are true?

**I.** $2 \le a \le 4$

**II.** $1 \le b \le 3$

**III.** $19 \le r \le 23$

A. **I** only

B. **II** only

C. **I** and **III** only

D. **II** and **III** only

**Section B**

**31.** $10000110000_2 =$

A. $2^{10} + 11 \times 2^4$.

B. $2^{11} + 11 \times 2^5$.

C. $2^{10} + 3 \times 2^4$.

D. $2^{11} + 3 \times 2^5$.

**32.** The H.C.F. and the L.C.M. of three expressions are $xy^3$ and $9x^5y^8z^3$ respectively. If the first and the second expressions are $3x^2y^3$ and $x^5y^5z^2$ respectively, then the third expression is

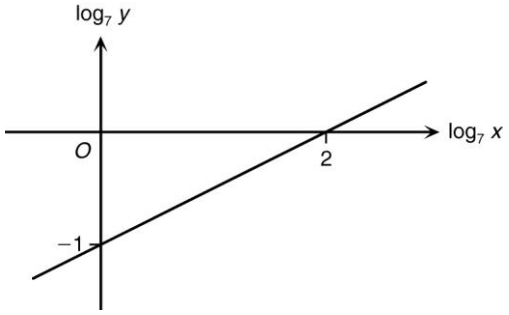
A. $3x^3y^3z^3$.

B. $3xy^8z^3$.

C. $9x^3y^3z^3$.

D. $9xy^8z^3$.

**33.** The graph in the figure shows the linear relation between $\log_7 x$ and $\log_7 y$. If $y = ax^b$, then




A. $a = \frac{1}{7}$ and $b = -\frac{1}{2}$.

B. $a = -\frac{1}{7}$ and $b = -\frac{1}{2}$.

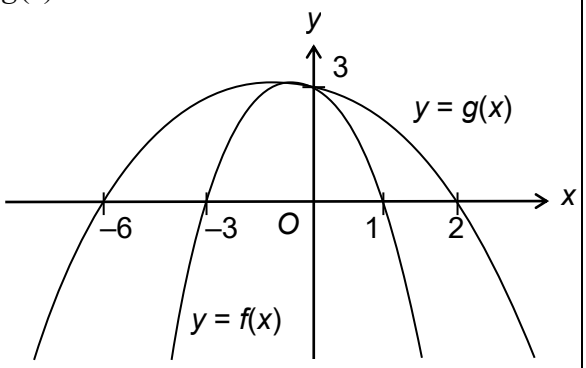
C. $a = \frac{1}{7}$ and $b = \frac{1}{2}$.

D. $a = 7$ and $b = 2$.

**34.** Let $z=\dfrac{3i+k}{1-2i}$, where $k$ is real number. If $z$ is a real number, then $k=$

A. –6.
B. $-\dfrac{3}{2}$.
C. $\dfrac{3}{2}$.
D. 6.

**35.** The figure below shows two quadratic graphs $y=f(x)$ and $y=g(x)$ with the same $y$-intercept. Which of the following may represent the relationship between $f(x)$ and $g(x)$?



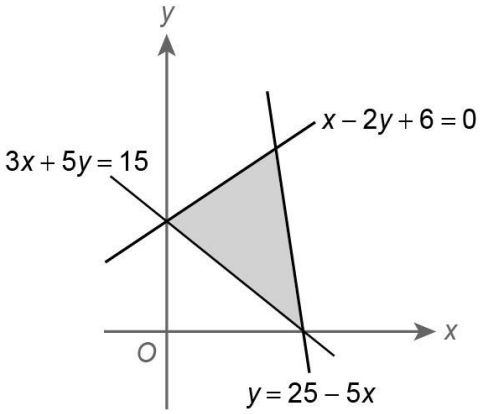

A. $f(x)=g(2x)$
B. $f(x)=2g(2x)$
C. $g(x)=f(2x)$
D. $g(x)=2f(x)$

**36.** The sum of the first $n$ terms of a sequence is $2^{n+1}-2$. Which of the following is/are true?

**I.** The sequence is a geometric sequence.
**II.** 6 is the second term of the sequence.
**III.** The $n$th term of the sequence is $2^{n-1}$.

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

**37.** The figure shows a shaded region (including the boundary).

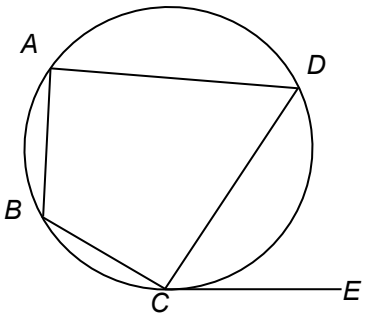



If $(p, q)$ is a point lying in the shaded region, which of the following are true?

**I.** $0\le q\le 5$
**II.** $q\le 25-5p$
**III.** $q\le \dfrac{p}{2}+3$

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

**38.** In the figure, $CE$ is the tangent to the circle at $C$. If $AB = BC$ and $\angle ADC=46°$, then $\angle BCE=$




A. 111°.
B. 134°.
C. 157°.
D. 164°.

**39.** Find the range of values of $m$ such that the circle $x^2 + y^2 + 6x + 5 = 0$ and the straight line $y = mx - 2$ intersect at two distinct points.

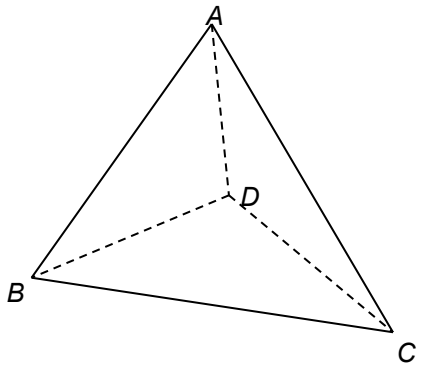
A. $0 < m < \frac{12}{5}$

B. $-\frac{12}{5} < m < 0$

C. $m > \frac{12}{5}$ or $m < 0$

D. $m < -\frac{12}{5}$ or $m > 0$

**40.** In the figure, the volume of the tetrahedron $ABCD$ is 2010 $cm^3$ and the area of $\triangle BCD$ is 335 $cm^2$. If $AB$ = 26 cm, find the angle between $AB$ and the plane $BCD$ correct to the nearest 0.1°.




A. 13.3°

B. 34.7°

C. 43.8°

D. 46.2°

**41.** If the coordinates of the points $A$, $B$ and $C$ are $(2, -2)$, $(2, 8)$ and $(10, 14)$ respectively, then the $x$-coordinate of the circumcentre of $\triangle ABC$ is

A. 3 .

B. 6 .

C. 9 .

D. 12 .

**42.** There are 15 boys and 10 girls in a choir team. If a group of 5 students is selected from the team to participate in a singing contest and the group consists of at least one boy and at least one girl, how many different groups can be formed?

A. 49 875

B. 53 130

C. 242 364

D. 265 650

**43.** When a girl throws a dart, the probability that she hits the target is 0.6. If this girl throws the dart 4 times, find the probability that she hits the target at least 2 times.

A. 0.5248

B. 0.7056

C. 0.8208

D. 0.8464

**44.** The scores of Jackson and Alex in a listening test are 56 marks and 73.5 marks respectively, while their standard scores are –2 and 0.5 respectively. Find the standard deviation of the scores in the test.

A. 7 marks
B. 11.7 marks (corr. to 3 sig. fig.)
C. 49 marks
D. 70 marks

**45.** Let $m_1$, $r_1$ and $v_1$ be the mean, the range and the variance of a group of distinct numbers $\{x_1, x_2, x_3, \ldots, x_{80}\}$ respectively. If $m_2$, $r_2$ and $v_2$ are the mean, the range and the variance of a group of numbers $\{x_1 + 2, x_2 + 2, x_3 + 2, \ldots, x_{80} + 2, m_1 + 2\}$ respectively, which of the following must be true?

**I.** $r_2 > r_1$

**II.** $m_2 > m_1$

**III.** $v_2 > v_1$

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

**END OF PAPER**