HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2025

MATHEMATICS Compulsory Part
PAPER 2

11:30 am – 12:45 pm (1¼ hours)

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking on the barcode label after the 'Time is up' announcement.

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 are advised to use an HB pencil to mark all the 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.

Not to be taken away before the end of the examination session

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. $\dfrac{(27x)^5}{(3x^{-2})^4} =$

   A. 3^2x^3 .

   B. 3^4x^3 .

   C. $3^{11}x^{13}$.

   D. $3^{14}x^{13}$.

2. $36-(3m+4n)^2 =$

   A. $(6+3m+4n)(6-3m+4n)$.

   B. $(6+3m+4n)(6-3m-4n)$.

   C. $(6+3m-4n)(6-3m+4n)$.

   D. $(6+3m-4n)(6-3m-4n)$.

3. If a and b are constants such that $(x+8)(x+a)+b \equiv x^2+5a(x+3)$, then $b =$

   A. -14 .

   B. -2 .

   C. 2 .

   D. 14 .

4. If $(3c+1)(d-4)=2d(5c-1)$, then $c=$

A. $\dfrac{3d-4}{7d+12}$.

B. $\dfrac{3d+4}{7d-12}$.

C. $\dfrac{7d-12}{3d+4}$.

D. $\dfrac{7d+12}{3d-4}$.

5. Let k be a constant. Solve the equation $x^2+4x=k^2-2k-3$.

A. $x=k-3$ or $x=-k-1$

B. $x=k-3$ or $x=-k+1$

C. $x=k+3$ or $x=-k-1$

D. $x=k+3$ or $x=-k+1$

6. If $x=5.67$ (correct to 2 decimal places), find the range of values of x.

A. $5.66<x\leq 5.68$

B. $5.66\leq x<5.68$

C. $5.665<x\leq 5.675$

D. $5.665\leq x<5.675$

7. The solution of $4y+1<5y-3\leq 8y-9$ is

A. $y>-4$.

B. $y\geq -2$.

C. $y\geq 2$.

D. $y>4$.

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8. Let $f(x)=x^2+7x+k$, where k is a constant. If $f(4)+f(-4)=38$, find k.

A. -6

B. -3

C. 3

D. 6

9. Let $p(x)=nx^3-3nx+36$, where n is a constant. If $x+3$ is a factor of $p(x)$, then $p(3)=$

A. -2.

B. 0.

C. 2.

D. 72.

10. A sum of \$40 000 is deposited at an interest rate of 3% per annum for 5 years, compounded half-yearly. Find the amount correct to the nearest dollar.

A. \$46 000

B. \$46 371

C. \$46 422

D. \$46 465

11. If α, β and γ are non-zero constants such that $(\alpha+2\beta):(\beta+2\gamma):(\gamma+2\alpha)=4:9:5$, then $\alpha:\beta=$

A. 2 : 5.

B. 5 : 2.

C. 128 : 149.

D. 149 : 128.

12. It is given that z varies directly as the cube of x and inversely as the square of y. When $x=3$ and $y=6$, $z=3$. When $x=5$ and $y=2$, $z=$

A. 5.

B. 25.

C. 125.

D. 243.

13. Let a_n be the nth term of a sequence. If $a_2=3$, $a_5=41$ and $a_{n+2}=2a_{n+1}+a_n$ for any positive integer n, then $a_6=$

A. 99.

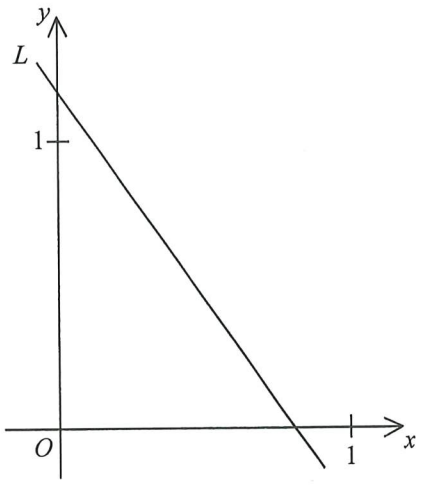
B. 101.

C. 239.

D. 243.

14. In the figure, the equation of the straight line L is $px+qy=7$. Which of the following is/are true?

I. $p>7$
II. $q>7$
III. $q>p$



A. I only

B. II only

C. I and III only

D. II and III only

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15. The perimeter of the sector OMN is 12π cm , where O is the centre of the sector OMN. If the radius of the sector OMN is 3π cm , which of the following are true?

I. The area of the sector OMN is $9\pi^2$ cm^2 .
II. The perimeter of ΔOMN is less than 35 cm .
III. The angle of the sector OMN is greater than $100°$.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

16. The height and the total surface area of a solid right circular cylinder are 35 cm and 492π cm^2 respectively. If the radius of a solid sphere is equal to the base radius of the circular cylinder, then the volume of the sphere is

A. 144π cm^3 .

B. 288π cm^3 .

C. 576π cm^3 .

D. 864π cm^3 .

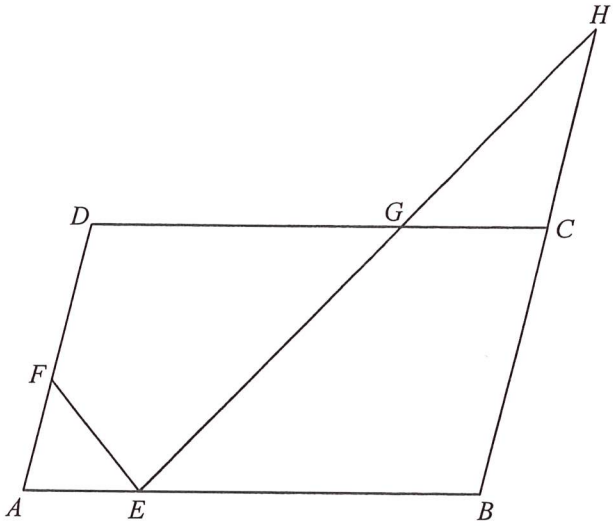
17. In the figure, $ABCD$ is a parallelogram. Let E , F and G be points lying on AB , AD and CD respectively such that $BE = 3AE$, $2DF = 3AF$ and $DG = 2CG$. It is given that BC produced and EG produced meet at the point H . If the area of ΔCGH is 16 cm^2 , then the area of the quadrilateral $DFEG$ is

A. 46 cm^2 .

B. 49 cm^2 .

C. 105 cm^2 .

D. 115 cm^2 .



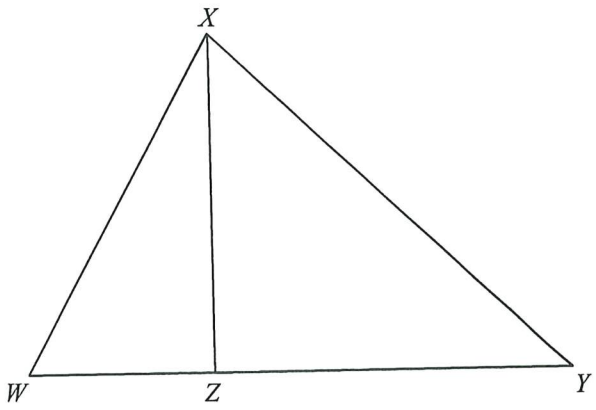
18. The figure shows the triangle WXY. Let Z be a point lying on WY such that $WY : XY = XY : YZ$. If $WX = 65$ cm, $WZ = 25$ cm and $XZ = 60$ cm, then $XY =$

A. 131 cm.

B. 144 cm.

C. 156 cm.

D. 169 cm.



19. In the figure, $ABCD$ is a square. Let E be a point such that $CDEF$ is a rhombus, where F is a point lying on AC produced. DF is produced to the point G such that $AF // BG$. Which of the following are true?

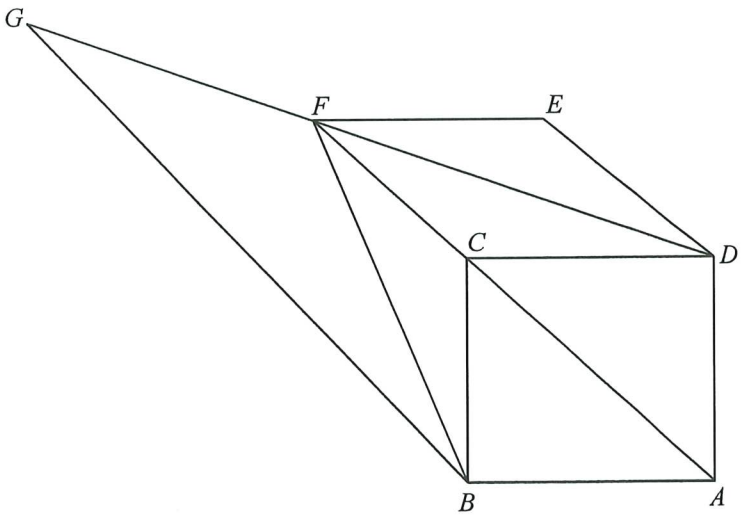
I. $DF = FG$
II. $\Delta BFG \sim \Delta DEF$
III. $\angle ABG + \angle BFD = 180°$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III



20. It is given that $PQRS$ is a trapezium with $PQ // SR$. If $PS = 41$ cm, $RS = 53$ cm, $\angle PSR = 120°$ and $\angle QRS = 150°$, then $PQ =$

A. 82 cm.

B. 100 cm.

C. 106 cm.

D. 135 cm.

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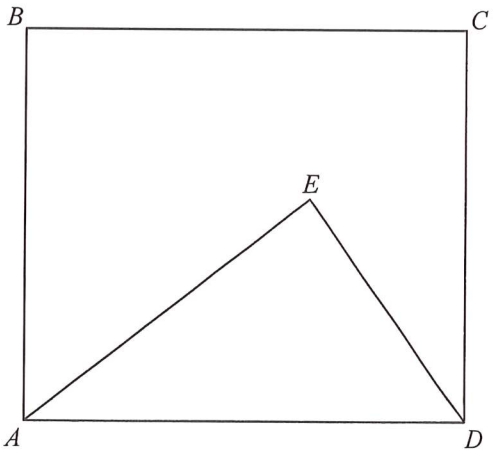
21. In the figure, $ABCD$ is a rectangle. It is given that $AE = 20$ cm and $\angle AED = 90°$. If the area of ΔADE is $150\ \text{cm}^2$, then the perpendicular distance from E to CD is

A. 8 cm .

B. 9 cm .

C. 12 cm .

D. 15 cm .



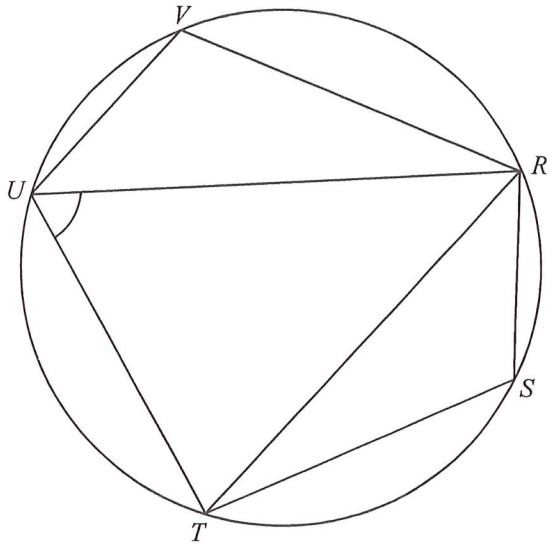
22. In the figure, $RSTUV$ is a circle. It is given that $RT // VU$ and RT is the angle bisector of $\angle SRU$. If $\angle RTS = \angle URV = 33°$, then $\angle RUT =$

A. 36° .

B. 49° .

C. 65° .

D. 71° .



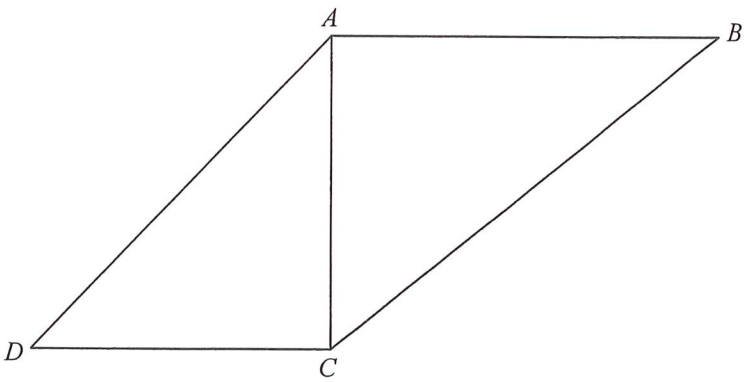
23. The figure shows the quadrilateral $ABCD$. If $\angle ABC + \angle ADC = \angle ACD = \angle BAC = 90°$, which of the following must be true?

A. $\tan \angle ACB = \dfrac{AB}{AD}$

B. $\tan \angle ACB = \dfrac{AB}{CD}$

C. $\tan \angle ADC = \dfrac{BC}{AD}$

D. $\tan \angle ADC = \dfrac{BC}{CD}$



24. The polar coordinates of the points X, Y and Z are $(1, 20°)$, $(2, 80°)$ and (r, θ) respectively, where $20° < \theta < 80°$. If ΔXYZ is an equilateral triangle, find r.

A. $\sqrt{3}$

B. $\sqrt{5}$

C. $\sqrt{7}$

D. $\sqrt{10}$

25. Denote the origin by O. The coordinates of the point A are $(a, 2a)$, where $a > 0$. Let P be a moving point in the rectangular coordinate plane such that $AP = OA$. The locus of P is a

A. point.

B. circle.

C. rhombus.

D. straight line.

26. The straight lines L_1 and L_2 are perpendicular to each other. The equations of L_1 and L_2 are $3x + 4y - 20 = 0$ and $mx + ny - 20 = 0$ respectively, where m and n are constants. Suppose that L_1 and L_2 cut the x-axis at the points A and B respectively. Let C be the point of intersection of L_1 and L_2. It is given that C lies above the x-axis. If the area of ΔABC is 6, find n.

A. -12

B. -9

C. 9

D. 12

27. The coordinates of the centre of the circle C are $(7, -5)$. If C cuts the x-axis at the points P and Q such that $PQ = 24$, then the equation of C is

A. $x^2 + y^2 - 14x + 10y - 95 = 0$.

B. $x^2 + y^2 + 14x - 10y - 95 = 0$.

C. $x^2 + y^2 - 14x + 10y - 119 = 0$.

D. $x^2 + y^2 + 14x - 10y - 119 = 0$.

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28. A box contains six cards numbered 2 , 2 , 2 , 3 , 4 and 5 respectively. In a game, a number is randomly drawn from the box and a certain number of tokens will be got according to the following table:

Number drawn	2	3	4	5
Number of tokens got	10	15	25	50

Find the expected number of tokens got in the game.

A. 3

B. 4

C. 20

D. 25

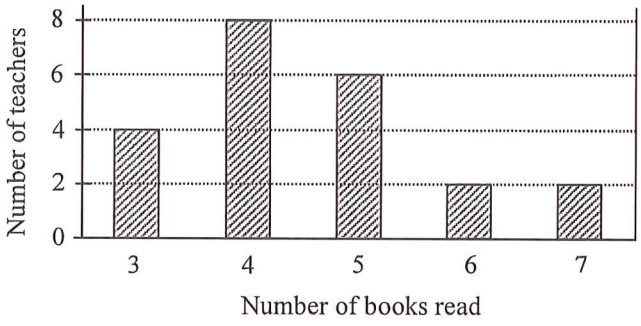
29. The bar chart below shows the distribution of the numbers of books read by some teachers in a certain month. Find the inter-quartile range of the distribution.

A. 1

B. 2

C. 3

D. 4



30. Consider the following data:

α β -4 -3 1 1 1 4

Denote the mode and the median of the above data by s and t respectively. If the mean and the range of the above data are 0 and 10 respectively, which of the following are true?

I. $s = 1$
II. $t = -1$
III. $\alpha + \beta = 0$

A. I and II only

B. I and III only

C. II and III only

D. I , II and III

Section B

31. $3E000000000000_{16} =$

A. $2^{16}+2^{15}+2^{14}+2^{13}+2^{12}$.

B. $2^{17}+2^{16}+2^{15}+2^{14}+2^{13}$.

C. $2^{52}+2^{51}+2^{50}+2^{49}+2^{48}$.

D. $2^{53}+2^{52}+2^{51}+2^{50}+2^{49}$.

32. The L.C.M. of p^2-4q^2 , p^3-8q^3 and $(p+2q)(p^2-4q^2)$ is

A. $p-2q$.

B. p^2-4q^2 .

C. $(p+2q)^2(p^3-8q^3)$.

D. $(p+2q)(p^2-4q^2)(p^3-8q^3)$.

33. It is given that $\log_5 y$ is a linear function of $\log_{25} x$. The intercepts on the vertical axis and on the horizontal axis of the graph of the linear function are 12 and 2 respectively. If $y=mx^n$, then $n=$

A. -12 .

B. -4 .

C. -3 .

D. -1 .

Go on to the next page

34. On the same rectangular coordinate system, the graph of $y = \log_a x$ cuts the graph of $y = a^x$ and the x-axis at the points P and Q respectively, where a is a positive constant. Denote the origin by O. Which of the following are true?

I. $a < 1$

II. $OQ > a$

III. $\angle POQ = 45°$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

35. $i^9 + i^{10} + i^{11} + \cdots + i^{999} =$

A. -1.

B. 0.

C. 1.

D. i.

36. Consider the following system of inequalities:

$$\begin{cases} x \leq 11 \\ 4x + 5y - 19 \geq 0 \\ 7x - 6y + 11 \leq 0 \end{cases}$$

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 greatest value of $8x - 6y + 11$ is

A. 1.

B. 11.

C. 15.

D. 129.

37. Let p, q and r be non-zero real numbers. If p, q, r is an arithmetic sequence, which of the following must be true?

I. $3^p, 3^q, 3^r$ is a geometric sequence.

II. $\frac{5}{p}, \frac{5}{q}, \frac{5}{r}$ is a geometric sequence.

III. $p-q, q-r, r-p$ is an arithmetic sequence.

A. I only

B. II only

C. I and III only

D. II and III only

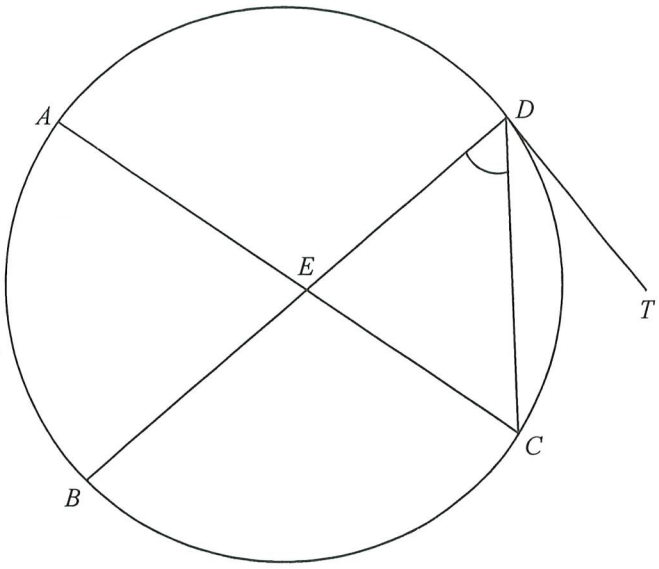
38. In the figure, AC is a diameter of the circle $ABCD$. Denote the point of intersection of AC and BD by E. It is given that TD is the tangent to the circle at D. If $\angle BEC = 96°$ and $\angle CDT = 41°$, then $\angle CDE =$

A. $47°$.

B. $48°$.

C. $52°$.

D. $55°$.



39. For $90° < \theta < 270°$, how many roots does the equation $\tan^3\theta = 2\tan\theta$ have?

A. 2

B. 3

C. 4

D. 5

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40. $PQRS$ is a regular tetrahedron. Find the angle between PQ and ΔQRS correct to the nearest degree.

A. $35°$

B. $55°$

C. $60°$

D. $71°$

41. Denote the origin by O. The coordinates of the point U are $(20, 0)$. Let V be a point lying on the positive y-axis such that the x-coordinate of the in-centre of ΔOUV is 6. Find the area of ΔOUV.

A. 70

B. 87

C. 210

D. 250

42. A committee is formed by 2 managers, 4 officers and 12 clerks. If 7 members are selected from the committee to form a working group consisting of at least 1 manager, how many different working groups can be formed?

A. 16 016

B. 20 384

C. 22 880

D. 31 824

43. There are 9 cans of apple juice and 4 cans of grape juice in a bag. If 6 cans are randomly chosen from the bag at the same time, find the probability that at most 3 cans of grape juice are chosen.

A. $\frac{9}{13}$

B. $\frac{133}{143}$

C. $\frac{140}{143}$

D. $\frac{714}{715}$

44. The standard scores of a boy and a girl in a Mathematics test are -2 and z respectively. The standard deviation of the scores of the Mathematics test is 2 marks. If the difference of the test score of the boy and the test score of the girl is 6 marks, find z.

A. -5 or 1

B. -5 or 3

C. -3 or 1

D. -3 or 3

45. It is given that a, b, c and d are four distinct real numbers. Let m_1, r_1 and v_1 be the mean, the range and the variance of the group of numbers $\{a, b, c, d\}$ respectively while m_2, r_2 and v_2 be the mean, the range and the variance of the group of numbers $\{2a, 2b, 2c, 2d\}$ respectively. Denote the mean, the range and the variance of the group of numbers $\{a+3, b+3, c+3, d+3\}$ by m_3, r_3 and v_3 respectively. Which of the following are true?

I. $m_1 + m_3 > m_2$

II. $r_1 + r_3 = r_2$

III. $v_1 + v_3 < v_2$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

END OF PAPER