

OXFORD UNIVERSITY PRESS
MOCK 18(I)

MATHEMATICS Compulsory Part
PAPER 2

(1¹/₄ hours)

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet and 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 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.
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. $m^2 - 4m + 12n - 9n^2 =$

- A. $(m - 3n)(m + 3n - 4).$
- B. $(m - 3n)(m + 3n + 4).$
- C. $(m + 3n)(m - 3n - 4).$
- D. $(m + 3n)(m - 3n + 4).$

2. $8^{5n+3} \left(\frac{1}{32^{3n+1}} \right) =$

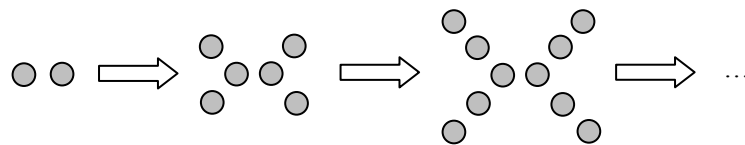
- A. 4.
- B. 16.
- C. $4^{2n+1}.$
- D. $\frac{1}{4^{2n+1}}.$

3. If $\frac{p}{a-b} = \frac{q}{b+1}$, then $b =$

- A. $\frac{qa-p}{p+q}.$
- B. $\frac{qa+p}{p-q}.$
- C. $\frac{pa-q}{p+q}.$
- D. $\frac{pa+q}{p-q}.$

4. $0.098\ 650\ 2 =$
- A. 0.098 (correct to 2 decimal places).
 - B. $0.098\ 6$ (correct to 3 significant figures).
 - C. $0.098\ 65$ (correct to 5 decimal places).
 - D. $0.098\ 650$ (correct to 6 significant figures).
5. If $f(x) = 5x^2 - 4x + 1$, then $f(2n - 1) + f(1) =$
- A. $10n^2 - 8n + 4$.
 - B. $10n^2 - 8n + 12$.
 - C. $20n^2 - 28n + 4$.
 - D. $20n^2 - 28n + 12$.
6. Which of the following statements about the graph of $y = 25 + 4x - x^2$ is true?
- A. The y-intercept of the graph is 20.
 - B. The graph passes through the point $(-3, 22)$.
 - C. The graph cuts the x-axis.
 - D. The graph opens upward.
7. Let $f(x) = x^3 + kx^2 - 4x - 8$, where k is a constant. If $f(x)$ is divisible by $x + k$, find the remainder when $f(x)$ is divided by $x - 1$.
- A. -1
 - B. -7
 - C. -9
 - D. -13
8. The solution of $-3x - 2 > \frac{x+10}{2}$ or $-9 - 2x > -1$ is
- A. $x < -2$.
 - B. $x < -4$.
 - C. $-4 < x < -2$.
 - D. $x < -4$ or $x > -2$.

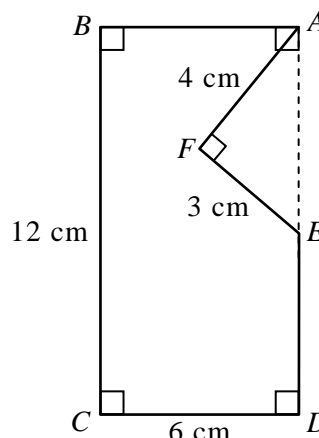
9. A sum of \$30 000 is deposited at an interest rate of 6% per annum for 4 years, compounded quarterly. Find the interest, correct to the nearest dollar.
- A. \$7 200
B. \$7 874
C. \$8 047
D. \$8 070
10. The scale of a map is 1 : 25 000. If the actual area of a farm is 50 000 m², then the area of the farm on the map is
- A. $8 \times 10^{-3} \text{ cm}^2$.
B. $2 \times 10^{-2} \text{ cm}^2$.
C. $8 \times 10^{-1} \text{ cm}^2$.
D. $2 \times 10^{-1} \text{ cm}^2$.
11. It is given that z varies directly as x^2 and inversely as y . If x is decreased by 10% and y is increased by 20%, then z
- A. is decreased by 32.5%.
B. is decreased by 67.5%.
C. is increased by 10%.
D. is increased by $33\frac{1}{3}\%$.
12. In the figure, the 1st pattern consists of 2 dots. For any positive integer n , the $(n + 1)$ th pattern is formed by adding 4 dots to the n th pattern. Find the number of dots in the 8th pattern.



- A. 26
B. 30
C. 32
D. 34

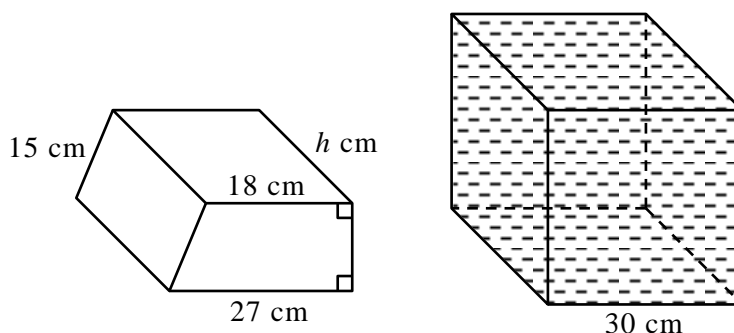
13. In the figure, $ABCDEF$ is a hexagon, where all the measurements are correct to the nearest cm. Let $x \text{ cm}^2$ be the actual area of the hexagon. Find the range of values of x .

- A. $55.375 < x < 73.375$
 B. $55.375 < x < 76.875$
 C. $58.875 < x < 73.375$
 D. $58.875 < x < 76.875$



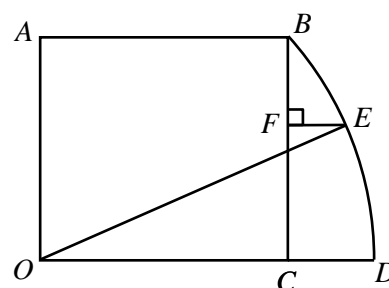
14. The figure shows a solid right prism and a container in the form of a cube. The container is initially filled up with water. The prism is then put into the container and it is totally immersed in the water. If the volume of water remained in the container is $21\,600 \text{ cm}^3$, find the value of h .

- A. 10
 B. 16
 C. 20
 D. 25



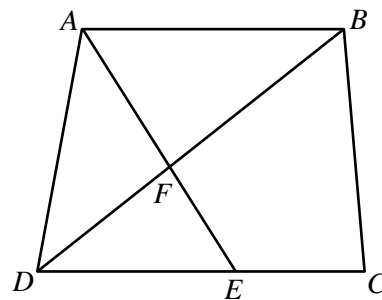
15. In the figure, $OABC$ is a rectangle, where $AB = 32 \text{ cm}$ and $BC = 24 \text{ cm}$. OCD is a straight line and \widehat{BED} is an arc with centre O . F is a point on BC such that $BC \perp EF$. If $BF : FC = 1 : 5$, find the area of the sector ODE , correct to the nearest cm^2 .

- A. 419 cm^2
 B. 515 cm^2
 C. 628 cm^2
 D. 834 cm^2



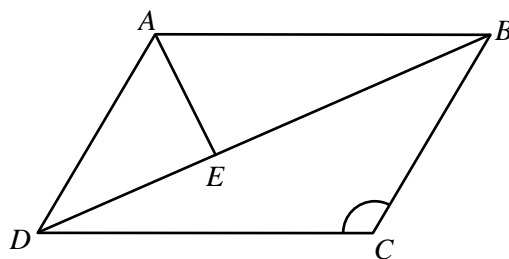
16. In the figure, $ABCD$ is a trapezium, where $AB \parallel DC$ and $AB : DC = 4 : 5$. E is a point on DC such that $DE : EC = 3 : 2$. AE and BD intersect at F . If the area of $\triangle AFD$ is 108 cm^2 , then the area of the quadrilateral $BCEF$ is

- A. 180 cm^2 .
- B. 234 cm^2 .
- C. 261 cm^2 .
- D. 315 cm^2 .



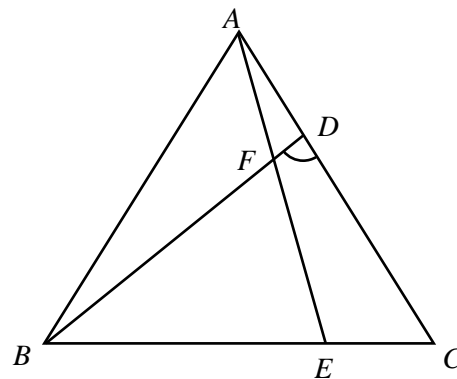
17. In the figure, $ABCD$ is a parallelogram. E is a point on BD such that AE is perpendicular to BD . If $AE = DE$ and $\angle ABE = 36^\circ$, then $\angle BCD =$

- A. 81° .
- B. 99° .
- C. 108° .
- D. 126° .



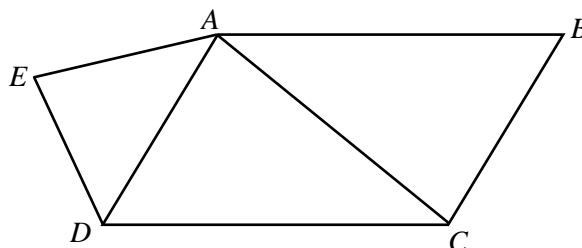
18. In the figure, $\triangle ABC$ is an equilateral triangle. D and E are points on AC and BC respectively such that $AD = CE$. If $\angle FAD = 10^\circ$, find $\angle BDC$.

- A. 60°
- B. 65°
- C. 70°
- D. 80°



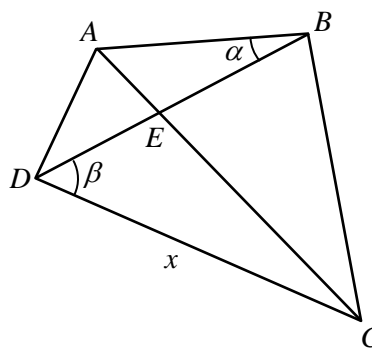
19. In the figure, $ABCD$ is a parallelogram. ADE is a triangle such that AD bisects $\angle CDE$ and $\angle DAE = \angle BAC$. If $AB = 18 \text{ cm}$ and $AD = 12 \text{ cm}$, then $DE =$

- A. 8 cm .
- B. 9 cm .
- C. 10 cm .
- D. 12 cm .



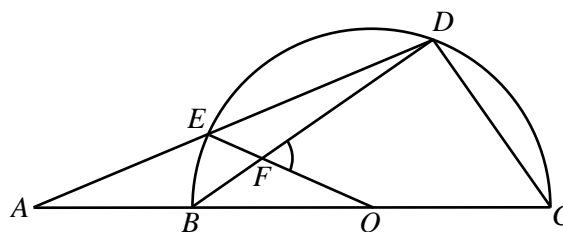
20. In the figure, $ABCD$ is a cyclic quadrilateral with $AD \perp DC$. AC and BD intersect at E . If $\angle ABE = \alpha$, $\angle BDC = \beta$ and $CD = x$, then $BC =$

- A. $\frac{x \cos \beta}{\sin \alpha}$.
 B. $\frac{x \cos \alpha}{\sin \beta}$.
 C. $\frac{x \sin \beta}{\cos \alpha}$.
 D. $\frac{x \sin \alpha}{\cos \beta}$.



21. In the figure, BOC is the diameter of the semi-circle $OCDEB$ with centre O . CB and DE are produced to meet at a point A . BD and OE intersect at F . If $AE = EO$ and $\angle BCD = 54^\circ$, find $\angle DFO$.

- A. 54°
 B. 60°
 C. 63°
 D. 72°



22. If an interior angle of a regular polygon is 2 times its exterior angle, which of the following are true?

- I. Each exterior angle of the polygon is 60° .
 II. The number of folds of rotational symmetry of the polygon is 6.
 III. The sum of the interior angles of the polygon is 720° .

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

23. The polar coordinates of the points P and Q are $(9, 100^\circ)$ and $(12, \theta)$ respectively, where $0^\circ < \theta < 360^\circ$. If $PQ = 15$, then $\theta =$

- A. 10° .
 B. 80° .
 C. 10° or 190° .
 D. 80° or 260° .

24. In the figure, the equations of the straight lines L_1 and L_2 are $5x + py = q$ and $rx + 2y = s$ respectively. Which of the following is/are true?

I. $pr < 10$

II. $5s > qr$

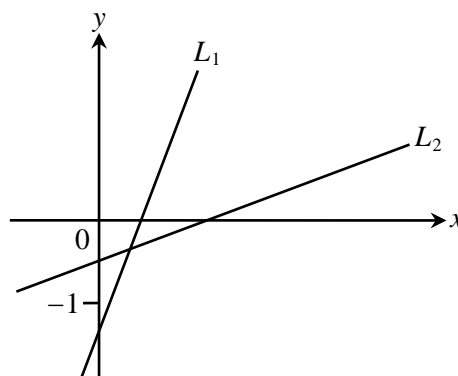
III. $p + q > 0$

A. I only

B. II only

C. I and III only

D. II and III only



25. The straight lines $L_1: hx + ky + 24 = 0$ and $L_2: 3x - 4y - 15h = 0$ are perpendicular to each other. If the y -intercept of L_1 is -8 , then the x -intercept of L_2 is

A. -20 .

B. -15 .

C. 15 .

D. 20 .

26. P is a moving point in the rectangular coordinate plane. If P maintains a fixed distance of 9 from the point $A(-4, 2)$, then the equation of the locus of P is

A. $x^2 + y^2 + 8x - 4y + 11 = 0$.

B. $x^2 + y^2 + 8x - 4y - 61 = 0$.

C. $x^2 + y^2 - 8x + 4y + 11 = 0$.

D. $x^2 + y^2 - 8x + 4y - 61 = 0$.

27. The equation of a circle is $3x^2 + 3y^2 - 24x + 18y + 26 = 0$. Which of the following are true?

I. The coordinates of the centre of the circle are $(4, -3)$.

II. The area of the circle is greater than 16π .

III. The origin lies outside the circle.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

28. The table below shows the distribution of the ages of members in a youth centre. If a member is randomly chosen from the youth centre, find the probability that a member with age above 15 is chosen.

<i>Age</i>	13	14	15	16	17
<i>Number of members</i>	8	10	12	15	5

- A. $\frac{2}{5}$
- B. $\frac{3}{5}$
- C. $\frac{1}{10}$
- D. $\frac{16}{25}$
29. The mean of three positive numbers a , b and c is 9. If h and k are the median and the mean of the nine numbers 6, 27, 28, 29, 31, 32, a , b and c respectively, then
- A. $h = 20$ and $k = 27$.
- B. $h = 27$ and $k = 20$.
- C. $h = 28.5$ and $k = 25.5$.
- D. $h = 31$ and $k = 20$.
30. The stem-and-leaf diagram below shows the distribution of the numbers of cakes sold in a bakery on some days.

<i>Stem (10)</i>	<i>Leaf (1)</i>
1	x 8 9 9 9
2	x x 7 7 8 8 9 9
3	0 1 2 2 3 y y
4	0 2 3 y

If the inter-quartile range of the distribution is greater than 14, which of the following is/are true?

- I. $3 \leq x \leq 7$
- II. $6 \leq y \leq 9$
- III. The range of the distribution is at most 39.
- A. I only
- B. II only
- C. I and III only
- D. II and III only

Section B

31. $20B00CE00000_{16} =$

- A. $523 \times 16^9 + 206 \times 16^5.$
- B. $524 \times 16^9 + 223 \times 16^5.$
- C. $523 \times 16^{10} + 206 \times 16^6.$
- D. $524 \times 16^{10} + 223 \times 16^6.$

32. Let $a > b > 0$. Which of the following must be true?

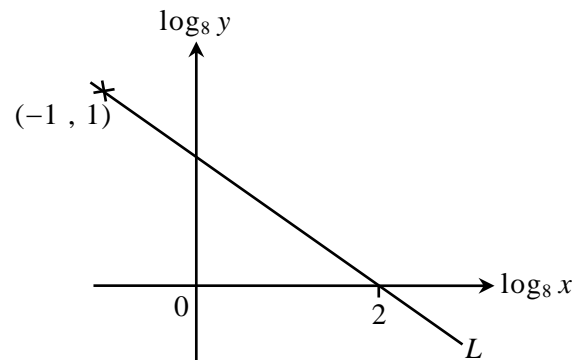
- I. $a^k > b^k$, where $k > 0$.
- II. $\log_a k < \log_b k$, where $k > 1$.
- III. $\log_k \frac{a}{b} > 0$, where $k > 1$.

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

33. In the figure, the straight line L shows the relation between $\log_8 x$ and $\log_8 y$.

If $y = kx^a$, then $k =$

- A. 4.
- B. 8.
- C. 16.
- D. 64.



34. Let k be a real number. The imaginary part of $\frac{ki^{10} + 2ki^{11} + 4ki^{12}}{1+i}$ is

- A. $\frac{k}{2}$.
- B. $\frac{5k}{2}$.
- C. $-\frac{k}{2}$.
- D. $-\frac{5k}{2}$.

35. Consider the following system of inequalities:

$$\begin{cases} x \geq 2 \\ y \leq 8 \\ 2x + y \leq 20 \\ x - 3y \leq -4 \end{cases}$$

Let S be the region which represents the solution of the above system of inequalities.

If (x, y) is a point lying in S , then the least value of $3y - 7x + 1$ is

- A. -49 .
- B. -43 .
- C. -17 .
- D. 11 .

36. Let a_n be the n th term of a sequence. The sum of the first n terms of the sequence is $3n^2 + 8n$.

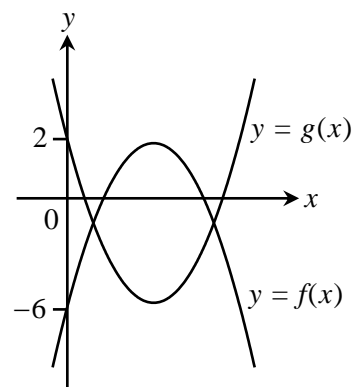
Which of the following are true?

- I. 95 is a term of the sequence.
- II. The sequence is an arithmetic sequence.
- III. $a_1 + a_3 + a_5 + \cdots + a_{2019} \leq 7 \times 10^5$

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

37. Let $f(x)$ and $g(x)$ be quadratic functions. The figure shows the graphs of $y = f(x)$ and $y = g(x)$. Which of the following may represent the relation between $f(x)$ and $g(x)$?

- A. $g(x) = f(3x)$
- B. $g(x) = f(-3x)$
- C. $g(x) = -f(x) + 4$
- D. $g(x) = -f(x) - 4$

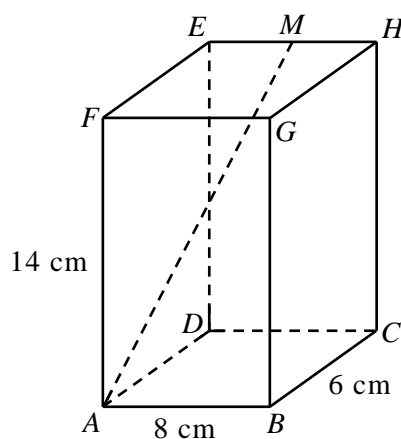


38. In $\triangle ABC$, $\sin A : \sin B : \sin C = 4 : 5 : 6$. Find $\cos A$.

- A. $\frac{3}{4}$
- B. $\frac{1}{8}$
- C. $\frac{9}{16}$
- D. $\frac{19}{240}$

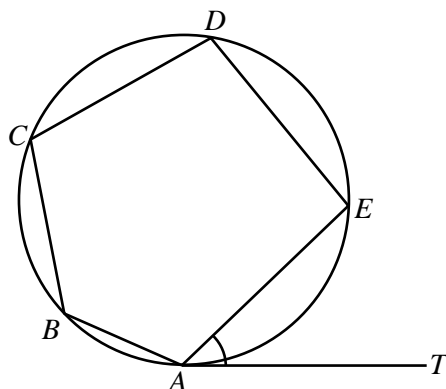
39. In the figure, $ABCDEFGH$ is a cuboid, where $AB = 8$ cm, $BC = 6$ cm and $AF = 14$ cm. If M is the mid-point of EH , find the angle between the line AM and the plane $EFGH$, correct to the nearest degree.

- A. 27°
- B. 36°
- C. 54°
- D. 63°



40. In the figure, $ABCDE$ is a pentagon inscribed in a circle and AT is the tangent to the circle at A , where $\widehat{AB} : \widehat{BC} : \widehat{CD} : \widehat{DE} = 3 : 4 : 5 : 6$. If $\angle BCD = 108^\circ$, then $\angle TAE =$

- A. 24° .
- B. 36° .
- C. 48° .
- D. 72° .



41. Let O be the origin. The coordinates of the points A and B are $(30, 0)$ and $(0, 40)$ respectively. If P is the in-centre of $\triangle OAB$, on which of the following straight lines does P lie?

- A. $x + y - 30 = 0$
- B. $3x - y - 20 = 0$
- C. $4x - y - 40 = 0$
- D. $5x + 4y - 160 = 0$

42. There are 16 boys and 12 girls in a debating society. If 5 students are selected from the society to form a team with at least 3 girls, how many different teams can be formed?

- A. 8 712
- B. 26 400
- C. 35 112
- D. 63 168

43. There are 52 balls numbered 1 to 52 in a box. In a game, Daisy and Elaine take turns to draw a ball randomly from the box with replacement, until one of them gets a multiple of 4 or a multiple of 13. Daisy draws a ball first. Find the probability that Daisy gets a multiple of 4 in the game.
- A. $\frac{1}{4}$
- B. $\frac{13}{16}$
- C. $\frac{13}{17}$
- D. $\frac{169}{352}$
44. The score of John in a test is 54 and his standard score is -1.5 . The score of Icy in the test is 65 and her standard score is 1.25. The standard deviation of the scores of the test is
- A. 3.
- B. 4.
- C. 16.
- D. 60.
45. $x_1, x_2, x_3, \dots, x_{81}$ is an arithmetic sequence, where the 81 numbers are all different. Let v_1 be the variance of the three numbers x_1, x_4 and x_7 , and v_2 be the variance of the three numbers $2x_3, 2x_6$ and $2x_9$. Find $\frac{v_1}{v_2}$.
- A. 4
- B. 2
- C. $\frac{1}{2}$
- D. $\frac{1}{4}$

END OF PAPER