

MOCK EXAM 1
MATHEMATICS Compulsory Part
PAPER 2

(1 $\frac{1}{4}$ hours)

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet.
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.

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. $(-3n^2)^{-4} =$

A. $-\frac{1}{12n^2}$.

B. $\frac{1}{12n^{16}}$.

C. $\frac{1}{81n^8}$.

D. $-\frac{1}{81n^8}$.

2. If $\frac{a+x}{b+x} = \frac{c}{d}$, then $x =$

A. $\frac{c}{d} - \frac{a}{b}$.

B. $\frac{a-c}{b-d}$.

C. $\frac{ad-bc}{c-d}$.

D. $\frac{bc-ad}{c-d}$.

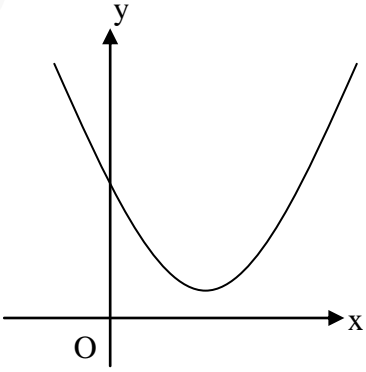
3. $x^2(x-1) - x + 1 =$

A. $(x+1)^2(x-1)$.

B. $(x+1)(x-1)^2$.

C. $x^2(x-1)^2$.

D. $x^3 + 1$.

4. Let $f(x) = x^3 - 3x^2 - 5x + 1$. Find the remainder when $f(x)$ is divided by $x + 2$.
- A. -9
B. -5
C. 5
D. 9
5. Let a be a constant. If the quadratic equation $x^2 + ax + a = -8$ has equal roots, then $a =$
- A. 0 or -4 .
B. 0 or 4 .
C. -8 or 4 .
D. 8 or -4 .
6. The figure shows the graph of $y = ax^2 + 2x + b$, where a and b are constants. Which of the following is/are true?
- I. $a > 0$
II. $b < 0$
III. $ab < 1$
- A. I only
B. II only
C. I and III only
D. II and III only
- 

7. The solution of $2x - 18 > 0$ and $13 < 2x - 3 < 21$ is
- A. $x > 8$.
B. $x > 9$.
C. $8 < x < 12$.
D. $9 < x < 12$.

8. The price of 3 digital cameras and 2 mobile phones is \$15 300. If the price of 4 digital cameras and the price of 3 mobile phones are the same, then the price of a mobile phone is
- A. \$2 550.
 - B. \$2 700.
 - C. \$3 400.
 - D. \$3 600.
9. When A sells a product to B, A makes a profit of 25%. When B sells it to C, B makes a profit of 30%. If B makes a profit of \$600, find the profit made by A.
- A. \$350
 - B. \$400
 - C. \$450
 - D. \$500
10. If the surface area of a sphere is increased by 21%, then its volume is increased by
- A. 31.5%.
 - B. 33.1%.
 - C. 42%.
 - D. 72.8%.
11. If $x : y = 3 : 4$ and $y : z = 6 : 1$, then $(x + y) : (y + z) =$
- A. 1 : 8.
 - B. 1 : 1.
 - C. 3 : 2.
 - D. 9 : 5.

12. $\sqrt{2016} =$

- A. 44.89(correct to 2 decimal places).
 B. 44.900(correct to 3 significant figures).
 C. 44.8999(correct to 6 significant figures).
 D. 44.9000(correct to 4 decimal places).

13. If z varies directly as x^2 and inversely as y , which of the following must be a constant?

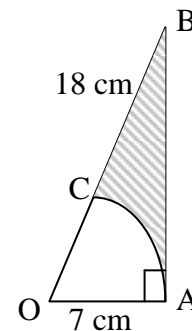
- A. $\frac{x}{y^2z}$
 B. $\frac{x^2y}{z}$
 C. $\frac{y}{x^2z}$
 D. $\frac{x^2}{yz}$

14. Let a_n be the n th term of a sequence. If $a_4 = 34$, $a_6 = 89$ and $a_{n+2} = a_{n+1} + a_n$ for any positive integer n , then $a_7 =$

- A. 144.
 B. 133.
 C. 123.
 D. 55.

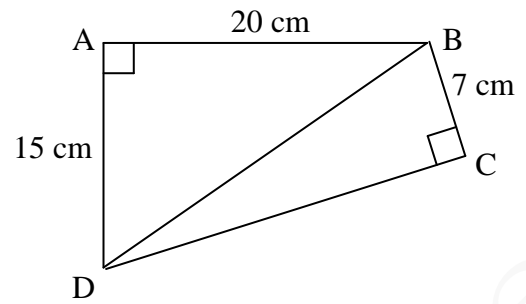
15. In the figure, OAC is a sector of radius 7 cm. OAB is a right-angled triangle and $BC = 18$ cm. Find the area of the shaded region.

- A. 153.9 cm^2
 B. 84 cm^2
 C. 52.5 cm^2
 D. 31.5 cm^2



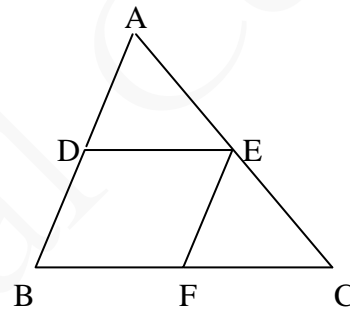
16. In the figure, the area of quadrilateral ABCD is

- A. 234 cm^2 .
- B. 318 cm^2 .
- C. 384 cm^2 .
- D. 468 cm^2 .



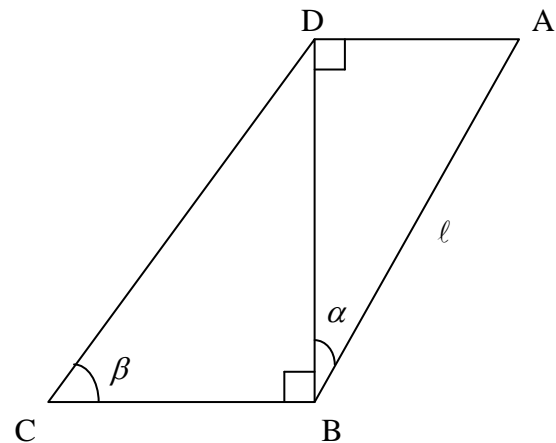
17. In the figure, BDEF is a parallelogram. D and F are points lying on AB and BC respectively such that $AD : DB = 4 : 5$. If the area of $\triangle EFC$ is 5 cm^2 , then the area of $\triangle ABC$ is

- A. 11.2 cm^2 .
- B. 12.2 cm^2 .
- C. 16.2 cm^2 .
- D. 19 cm^2 .



18. In the figure, $AB = \ell$, then $CD =$

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

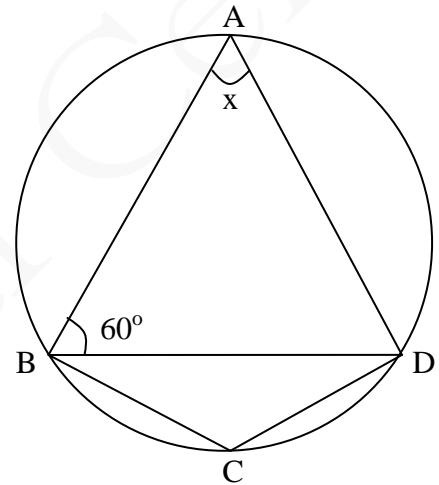


19. $(\sin(270^\circ + \theta) + 1)(\cos(360^\circ - \theta) + 1) =$

- A. $\sin^2 \theta$.
- B. $\cos^2 \theta$.
- C. $-\sin^2 \theta$.
- D. $-\cos^2 \theta$.

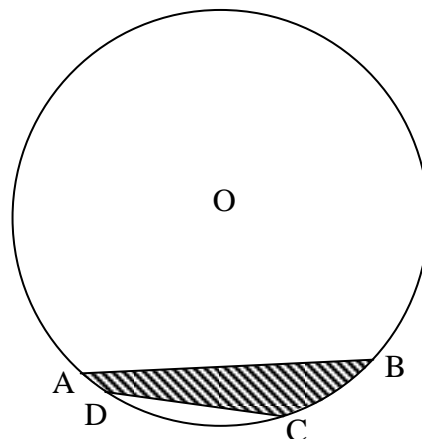
20. In the figure, $\widehat{BC} : \widehat{CD} : \widehat{DA} = 3 : 3 : 4$. If $\angle ABD = 60^\circ$, find x .

- A. 30°
- B. 45°
- C. 60°
- D. 90°



21. In the figure, O is the centre of the circle ABCD. If $OA = CD = 6$ cm and $\angle AOB = 90^\circ$, then the area of the shaded region is

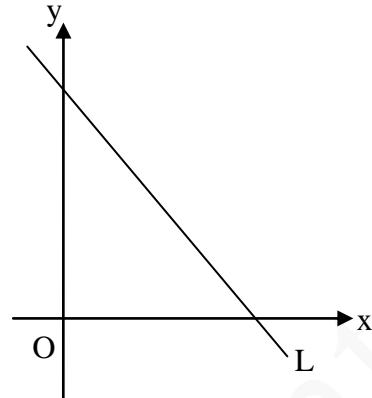
- A. $(3\pi + 18 - 9\sqrt{3})\text{cm}^2$.
- B. $(3\pi - 18 + 9\sqrt{3})\text{cm}^2$.
- C. $(3\pi + 9)\text{cm}^2$.
- D. $(3\pi - 9)\text{cm}^2$.



22. If an interior angle of a regular n -sided polygon is 3 times an exterior angle of the polygon, which of the following are true?
- I. The value of n is 9.
 - II. Each exterior angle of the polygon is 45° .
 - III. The number of axes of reflectional symmetry of the polygon is 8.
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III
23. The rectangular coordinates of the point P are $(-\sqrt{3}, -1)$. If P is rotated clockwise about the origin through 90° , then the polar coordinates of its image are
- A. $(2, 120^\circ)$.
 - B. $(2, 150^\circ)$.
 - C. $(4, 120^\circ)$.
 - D. $(4, 150^\circ)$.
24. The equations of the straight lines L_1 and L_2 are $x + y - 3 = 0$ and $2x + y + 6 = 0$ respectively. If P is a moving point in the rectangular coordinate plane such that the perpendicular distance from P to L_1 is equal to the perpendicular distance from P to L_2 , then the locus of P is a
- A. circle.
 - B. parabola.
 - C. pair of straight lines.
 - D. straight line.

25. The figure shows the straight line L: $x + by + c = 0$. Which of the following are true?

- I. $b > 0$
 - II. $c > 0$
 - III. $bc < 0$
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III



26. If the radius of the circle $x^2 + y^2 + 4kx - 20y - 59k = 0$ is 20, then $k =$

- A. 4.
- B. $\frac{15}{2}$.
- C. $\frac{15}{2}$ or -10 .
- D. 4 or $-\frac{75}{4}$.

27. Two numbers are randomly drawn at the same time from five cards numbered 1, 2, 3, 4, and 5. Find the probability that the sum of the numbers drawn is a prime number.

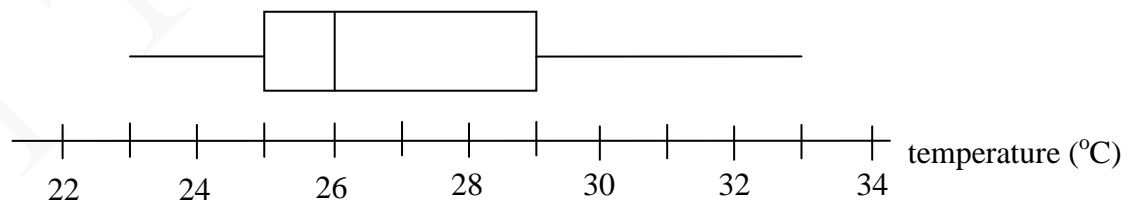
- A. $\frac{1}{4}$
- B. $\frac{2}{5}$
- C. $\frac{1}{2}$
- D. $\frac{3}{5}$

28. The mean weight of 40 teachers and 160 students is 57 kg. If the mean weight of the teachers is 65 kg, then the mean weight of the students is
- 56 kg.
 - 55 kg.
 - 54.5 kg.
 - 53 kg.
29. The stem-and-leaf diagram below shows the distribution of the number of English books owned by a class of students.

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

A student is randomly selected from the class. Find the probability that the selected student has no more than 22 books.

- 0.24
 - 0.32
 - 0.68
 - 0.76
30. The box-and-whisker diagram drawn below shows the distribution of the temperatures in a month. Which of the following is/are true?



- The inter-quartile range is 4 °C.
 - The temperature of the coolest day is 23 °C.
 - More than half of the days have the temperature higher than 28 °C.
- I and II only
 - I and III only
 - II and III only
 - I, II and III

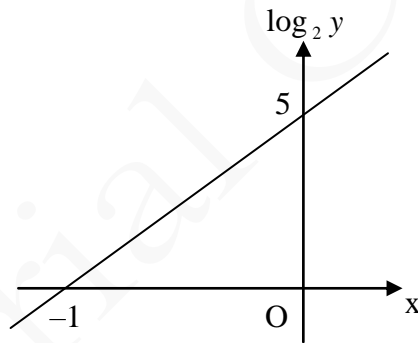
Section B

31. The L.C.M. of $4x^3y^2z$, $6xy^3$ and $8x^2yz^3$ is

- A. $2xy$.
- B. $2xyz$.
- C. $24x^3y^3z^3$.
- D. $24x^6y^6z^4$.

32. The graph in the figure shows the linear relation between $\log_2 y$ and x . If $y = ab^x$, then $b =$

- A. $\frac{1}{2}$
- B. 2
- C. 25
- D. 32



33. $12 \times 16^{12} + 14 \times 16^2 + 15 =$

- A. C000000000DE₁₆
- B. C000000000EF₁₆
- C. C000000000D0E₁₆
- D. C000000000E0F₁₆

34. Let $f(x)$ be a quadratic function. If the coordinates of the vertex of the graph of $y = f(x)$ are $(-3, 6)$, which of the following must be true?

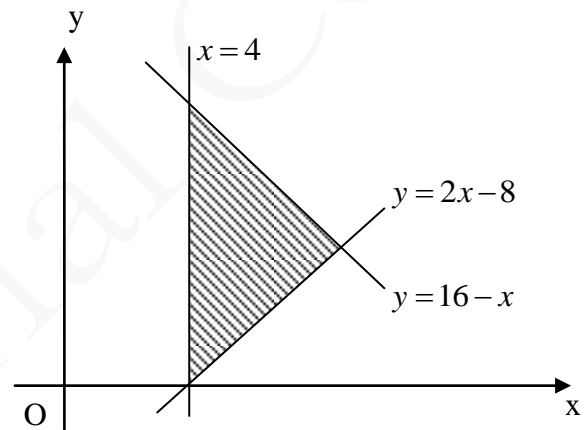
- A. The roots of the equation $f(x) = 0$ are nonreal numbers.
- B. The roots of the equation $f(x) + 3 = 0$ are real numbers.
- C. The roots of the equation $f(x) + 6 = 0$ are real numbers.
- D. The roots of the equation $f(x) - 6 = 0$ are real numbers.

35. If β is a real number, then $\frac{\beta^2 + 9}{\beta - 3i} =$

- A. $\beta - 3i$.
- B. $\beta + 3i$.
- C. $3 + \beta i$.
- D. $3 - \beta i$.

36. The figure shows a shaded region. If (h, k) is a point lying in the shaded region, which of the following are true?

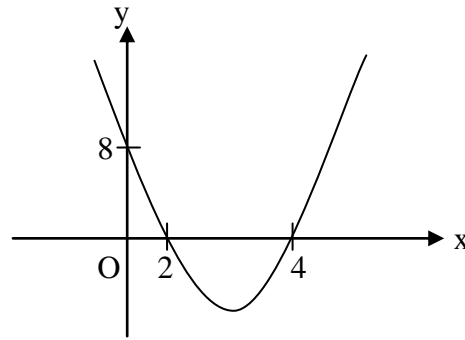
- I. $h \geq 4$
 - II. $2h - k \leq 8$
 - III. $h + k \geq 16$
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III



37. Let a_n be the n th term of an arithmetic sequence. If $a_{16} = 27$ and $a_{28} = -21$, which of the following are true?

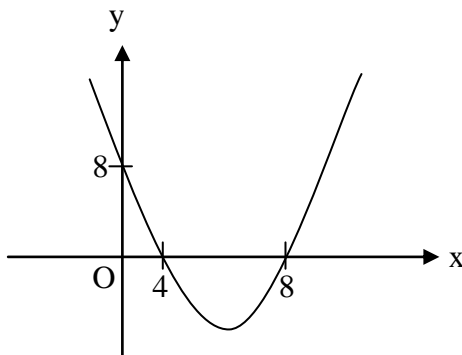
- I. $a_2 - a_1 < 0$
 - II. $a_{21} > 0$
 - III. $a_{12} + a_{13} + a_{14} + \dots + a_{33} > 0$
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

38.

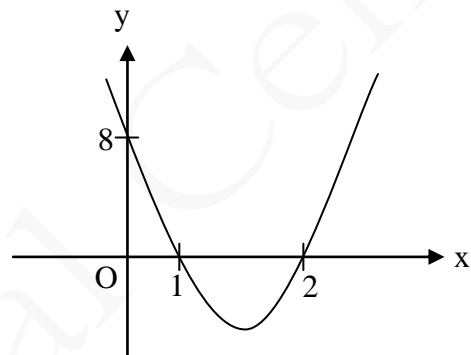


The figure above shows the graph of $y = f(x)$. If $g(x) = f(2x)$, which of the following may represent the graph of $y = g(x)$?

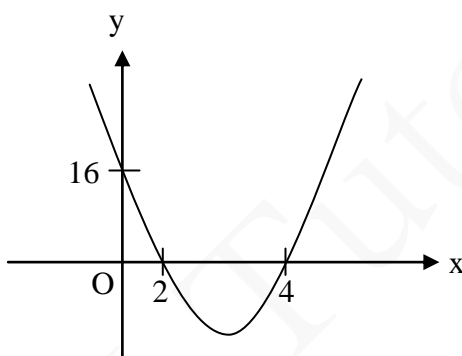
A.



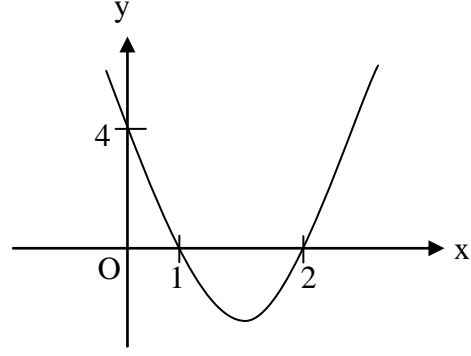
B.



C.

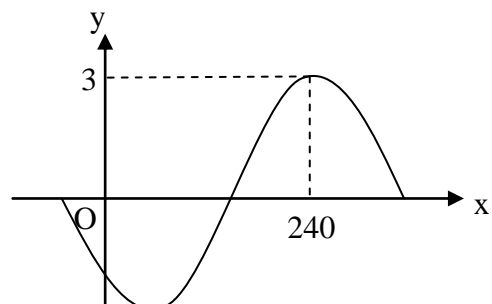


D.



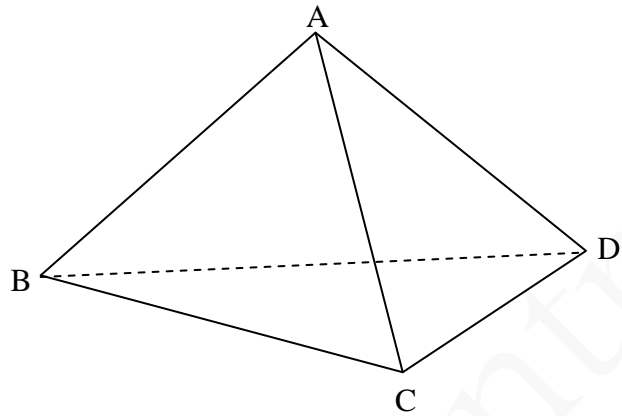
39. Let k be a constant and $-90^\circ < \theta < 90^\circ$. If the figure shows the graph of $y = k \cos(x^\circ + \theta)$, then

- A. $k = 3, \theta = 60^\circ$.
- B. $k = 3, \theta = -60^\circ$.
- C. $k = -3, \theta = 60^\circ$.
- D. $k = -3, \theta = -60^\circ$.



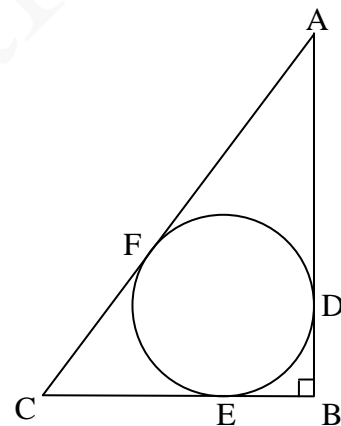
40. The figure shows a regular tetrahedron ABCD. If the angle between AB and the plane BCD is θ , then $\cos\theta =$

- A. $\frac{\sqrt{3}}{3}$
 B. $\frac{\sqrt{2}}{2}$
 C. $\frac{\sqrt{3}}{2}$
 D. $\frac{1}{2}$



41. In the figure, AB, BC and AC are the tangents to the circle at D, E and F respectively. If $\angle ABC = 90^\circ$, $BC = 8$ cm and $AD = 12$ cm, then the diameter of the circle is

- A. 3 cm.
 B. 4 cm.
 C. 5 cm.
 D. 6 cm.



42. If the straight line $x - ky - 1 = 0$ does not intersect with the circle $x^2 + y^2 + 2ky + 2 = 0$, find the range of values of k .
- A. $-\sqrt{3} < k < \sqrt{3}$
 B. $k < -\sqrt{3}$ or $k > \sqrt{3}$
 C. $k = -\sqrt{3}$ or $\sqrt{3}$
 D. $k > \sqrt{3}$

43. There are 15 girls and 12 boys in a singing club. If a team of 3 boys and 5 girls is selected from the club to participate in a singing contest, how many different teams can be formed?
- A. 360 360
 - B. 660 660
 - C. 2 220 075
 - D. 475 675 200
44. In a Mathematics test, John gets 81 marks and his standard score is 2 while Sue gets 60 marks and her standard score is -1.5 . Find the standard deviation of the test scores.
- A. 4.5 marks
 - B. 6 marks
 - C. 8 marks
 - D. 69 marks
45. Two sets of numbers are given: $\{x - 4, x - 2, x, x + 2, x + 4\}$ and $\{y - 4, y - 2, y, y + 2, y + 4\}$ where $x > y$. μ_1 and μ_2 are their means respectively and σ_1 and σ_2 are their standard deviations respectively. Which of the following must be true?
- I. $\mu_1 = \mu_2$
 - II. $\sigma_1 = \sigma_2$
 - III. $\mu_1 > \mu_2$
 - IV. $\sigma_1 > \sigma_2$
- A. I and II
 - B. II and III
 - C. I and IV
 - D. III and IV

END OF PAPER