

HOK YAU CLUB
HONG KONG MOCK EXAMINATION 2018/19

**MATHEMATICS Compulsory Part
PAPER 2**

12:00 nn — 1:15 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.

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. $9^{333} \times \frac{1}{27^{444}} =$

A. 0 .

B. $\frac{1}{3^{111}}$.

C. $\frac{1}{3^{222}}$.

D. $\frac{1}{3^{666}}$.

2. If $\frac{\alpha}{x+1} = \frac{\beta}{1-x}$, then $x =$

A. $\frac{\alpha + \beta}{\alpha - \beta}$.

B. $\frac{\alpha + \beta}{\beta - \alpha}$.

C. $\frac{\alpha - \beta}{\alpha + \beta}$.

D. $\frac{\beta - \alpha}{\alpha + \beta}$.

3. $p - 2q - p^2 + 4pq - 4q^2 =$

A. $(2q - p)(p - 2q - 1)$.

B. $(p - 2q)(1 + p + 2q)$.

C. $(p - 2q)(1 - p - 2q)$.

D. $(p + 2q)(1 - p + 2q)$.

4. $\frac{1}{2x+5} - \frac{1}{5-2x} =$

A. $\frac{4x}{4x^2 - 25}$.

B. $\frac{4x}{25 - 4x^2}$.

C. $\frac{10}{4x^2 - 25}$.

D. $\frac{10}{25 - 4x^2}$.

5. $\pi^{-4} =$

A. 0.0102 (correct to 3 significant figures) .

B. 0.01027 (correct to 4 decimal places) .

C. 0.0102660 (correct to 7 significant figures) .

D. 0.0102660 (correct to 7 decimal places) .

6. In the figure , the equations of the straight lines L_1 and L_2 are $x + ay = b$ and $cx + 2y = d$ respectively . Which of the following is/are true ?

I. $ac > 2$

II. $2b < ad$

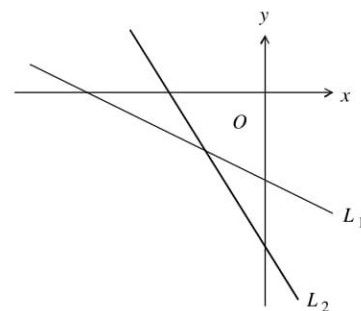
III. $bc < d$

A. I only

B. II only

C. I and II only

D. I and III only

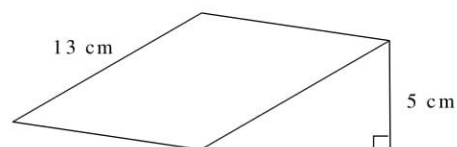


7. Let k be a constant. If $f(x) = 2x^2 - 3x + k$, then $f(k) - f(-k) =$
- 0.
 - $-6k$.
 - $4k^2 + 2k$.
 - $4k^2 - 6k$.
8. Let $g(x) = x^{2019} + ax^3 + b$, where a and b are constants. If $g(x)$ is divisible by $x - 1$, find the remainder when $g(x)$ is divided by $x + 1$.
- 0
 - $2a$
 - $2b$
 - $-2a + 2$
9. If the selling price of 6 pears is equal to the cost of 9 pears, then the percentage profit of selling one pear is
- 30%.
 - $33\frac{1}{3}\%$.
 - 50%.
 - 60%.
10. Let a , b and c be non-zero numbers. If $4a = 3b$ and $b : c = 5 : 6$, then $(a + b) : (b + c) =$
- $7 : 44$.
 - $7 : 432$.
 - $35 : 44$.
 - $35 : 132$.

11. It is given that z varies directly as the cube of x and inversely as y . If x is increased by 20% and y is decreased by 10%, then z
- is decreased by 4%.
 - is increased by $33\frac{1}{3}\%$.
 - is increased by 60%.
 - is increased by 92%.
12. Let a_n be the n th term of a sequence. If $a_2 = 5$, $a_6 = 34$ and $a_{n+2} = a_{n+1} + a_n$ for any positive integer n , then $a_3 =$
- 3.
 - 8.
 - 13.
 - 21.
13. The solution of $x + 3 < \frac{5-x}{2}$ or $8 + 3x > -1$ is
- $x < -\frac{1}{3}$.
 - $x > -3$.
 - $-3 < x < -\frac{1}{3}$.
 - All real numbers.
14. The length and the width of a rectangular paper are measured as 25 cm and 20 cm correct to the nearest cm respectively. The paper is cut into n squares of each side 2 cm correct to the nearest 0.1 cm. Find the least possible value of n .
- 99
 - 108
 - 120
 - 130

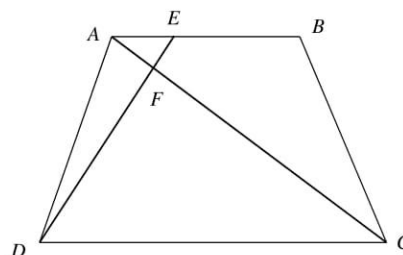
15. The figure shows a solid right triangular prism. If the total surface area of the prism is 660 cm^2 , find the volume of the prism.

- A. 200 cm^3
 B. 400 cm^3
 C. 600 cm^3
 D. 660 cm^3



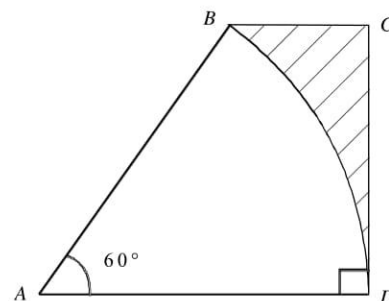
16. In the figure, $ABCD$ is a trapezium with $AB \parallel DC$. E is a point lying on AB such that $AE:EB = 1:2$. AC and DE intersect at the point F . If $AB:DC = 1:2$ and the area of $\triangle ADF$ is 6 cm^2 , then the area of the quadrilateral $BCFE$ is

- A. 14 cm^2 .
 B. 20 cm^2 .
 C. 28 cm^2 .
 D. 36 cm^2 .



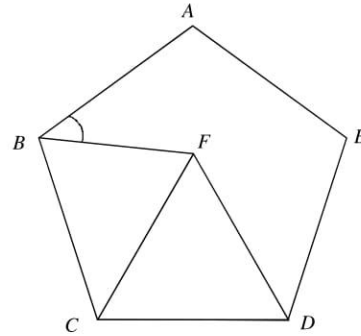
17. In the figure, $ABCD$ is a trapezium with $BC \parallel AD$ and $CD \perp AD$. ABD is a sector, where $AB = 2$ and $\angle BAD = 60^\circ$. Find the area of the shaded region.

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



18. In the figure, $ABCDE$ is a regular pentagon and CDF is an equilateral triangle, then $\angle ABF =$

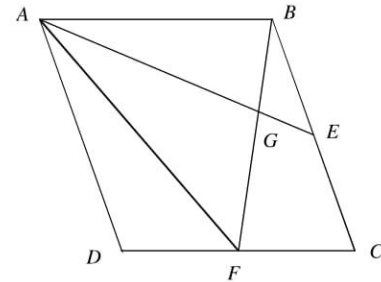
- A. 42° .
- B. 45° .
- C. 54° .
- D. 60° .



19. In the figure, $ABCD$ is a rhombus but not a square. E and F are the mid-points of CB and CD respectively. AE and BF intersect at the point G . Which of the following must **not** be true?

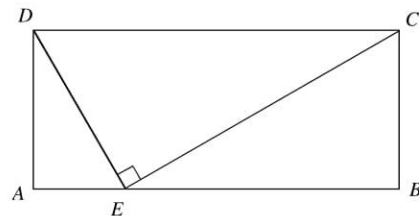
- I. $ABCF$ is a cyclic quadrilateral .
- II. $FA = FB$
- III. $\triangle ABE \cong \triangle BCF$

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



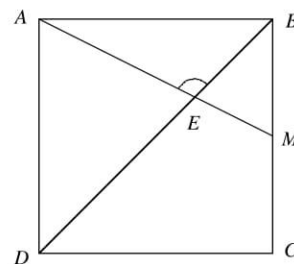
20. In the figure, $ABCD$ is a rectangle. E is a point lying on AB such that $\angle CED = 90^\circ$ and $AE < EB$. If $CD = 20$ and $AD = 8$, then $AE =$

- A. 3 .
- B. 4 .
- C. 6 .
- D. 8 .



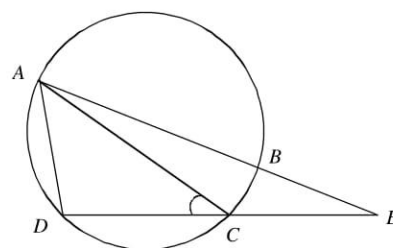
21. In the figure, $ABCD$ is a square. M is the mid-point of BC . AM and BD intersect at the point E . Find $\angle AEB$ correct to the nearest degree.

- A. 105°
- B. 108°
- C. 112°
- D. 114°



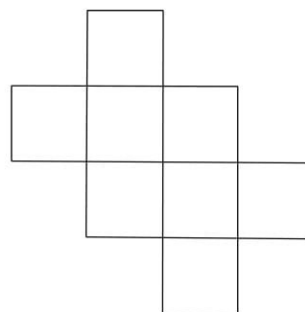
22. In the figure, AB is a diameter of the circle $ABCD$. AB produced and DC produced meet at the point E . It is given that $\angle DAC = 48^\circ$ and $\angle AED = 24^\circ$. Find $\angle ACD$.

- A. 33°
- B. 35°
- C. 38°
- D. 42°



23. The figure below consists of eight identical squares. The number of axes of reflectional symmetry of the figure is

- A. 2
- B. 4
- C. 6
- D. 8



24. The rectangular coordinates of the point A are $(-3\sqrt{3}, 3)$. If A is rotated anticlockwise about the origin through 90° , then the polar coordinates of its image are

- A. $(3, 60^\circ)$
- B. $(3, 240^\circ)$
- C. $(6, 60^\circ)$
- D. $(6, 240^\circ)$

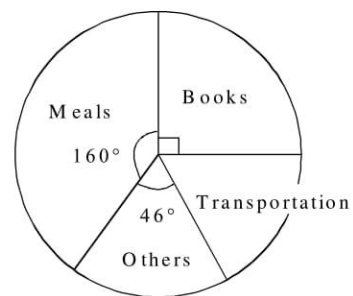
25. The equation of the straight line L_1 is $4x - 3y - 48 = 0$. The straight line L_2 is perpendicular to L_1 and intersect L_1 at a point lying on the x -axis. Find the area of the region bounded by L_1 , L_2 and the y -axis.
- A. 96
- B. 108
- C. 150
- D. 192
26. The equation of the circle C is $2x^2 + 2y^2 - 6x + 10y + 9 = 0$. Which of the following is/are true?
- I. The centre of C is $(3, -5)$.
- II. The radius of C is 2.
- III. C intersects the y -axis at two distinct points.
- A. I only
- B. II only
- C. I and III only
- D. II and III only
27. It is given that A and B are two distinct points lying on the circle $x^2 + y^2 + kx - 8y - 24 = 0$. Let P be a moving point in the rectangular coordinate plane such that $AP = BP$. If the equation of the locus of P is $x - 2y + 5 = 0$, find k .
- A. -26
- B. -11
- C. -6
- D. 6

28. Kristy has six \$10 banknotes , nine \$20 banknotes , three \$50 banknotes and k \$100 banknotes in her wallet . It is given that the price of a book is \$45 . If Kristy takes out one banknote randomly from her wallet , then the probability that she gets enough money to buy the book is $\frac{1}{4}$. Find the value of k .

- A. 2
- B. 3
- C. 4
- D. 6

29. The pie chart below shows the expenditure of Sally in a certain week . It is given that Sally spends \$280 on meals that week . Find her expenditure on transportation that week.

- A. \$80.5
- B. \$112
- C. \$135
- D. \$192.5



30. Consider the following data :

23 34 27 78 36 23 45 94 a b c

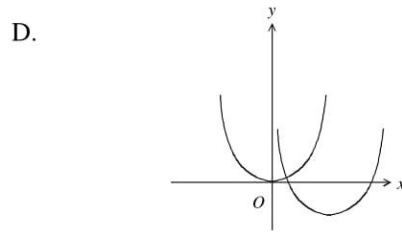
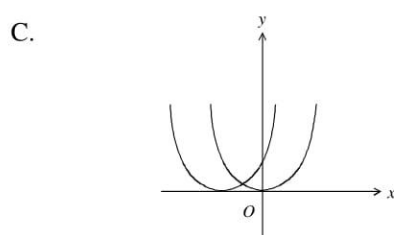
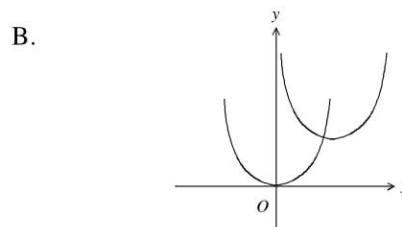
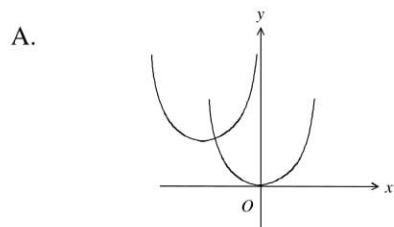
If the mean of the above data is 40 and the modes are 23 and 36 , which of the following can be the median of the above data?

- I. 34
- II. 35
- III. 36

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

Section B

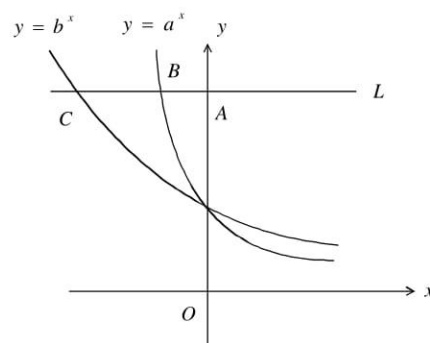
31. Which of the following may represent the graph of $y = f(x)$ and the graph of $y = f(x+1) - 1$ on the same rectangular coordinate system?



32. The figure shows the graph of $y = a^x$ and the graph of $y = b^x$ on the same rectangular coordinate system, where a and b are positive constants. If the horizontal line L cuts the y -axis, the graph of $y = a^x$ and the graph of $y = b^x$ at the points A , B and C respectively, which of the following are true?

- I. $b > a$
 II. $ab < 1$
 III. $\frac{AB}{AC} = \log_b a$

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



33. $42 \times 16^9 + 16^8 + 15 \times 16^5 - 16^4 =$

- A. $2A100EF000_{16}$
 B. $2A10EF0000_{16}$
 C. $2A100EF0000_{16}$
 D. $2A10EF00000_{16}$

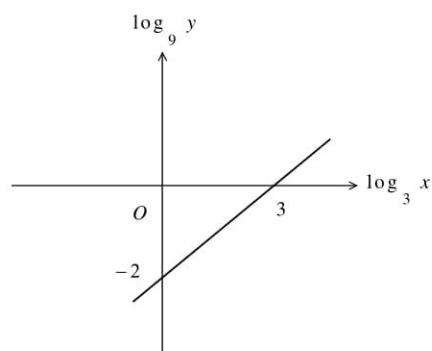
34. The graph in the figure shows the linear relation between $\log_9 y$ and $\log_3 x$. If $y = kx^a$, then $k =$

A. $-\frac{4}{3}$.

B. $\frac{1}{81}$.

C. $\frac{1}{9}$.

D. $\frac{4}{3}$.



35. If a and b are real numbers such that $\frac{1}{a-i} = b+i$, then

A. $a = -1$ and $b = 1$.

B. $a = 0$ and $b = 0$.

C. $a = 1$ and $b = -1$.

D. $a = 1$ and $b = 1$.

36. Let a_n be the n th term of an arithmetic sequence. If $a_4 = -16$ and $a_{15} = 61$, which of the following must be true?

I. a_7 is the first non-negative term of the sequence.

II. $a_{2n} - a_{2n-1} = 7$.

III. There exists a positive integer k such that $a_1 + a_2 + a_3 + \cdots + a_k = 0$.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

37. If $p \neq q$ and $kp - p^2 = kq - q^2 = 5$, where $k \neq 0$, then $\frac{p}{q} + \frac{q}{p} =$

A. $-\frac{k^2 + 10}{5}$.

B. $\frac{10 - k^2}{5}$.

C. $\frac{k^2 - 10}{5}$.

D. $\frac{25 - 2k}{k}$.

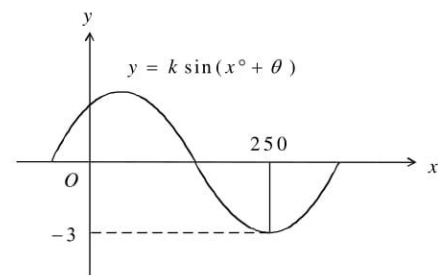
38. Let k be a constant and $-90^\circ < \theta < 90^\circ$. If the figure shows the graph of $y = k \sin(x^\circ + \theta)$, then

A. $k = -3$ and $\theta = -20^\circ$.

B. $k = -3$ and $\theta = 20^\circ$.

C. $k = 3$ and $\theta = -20^\circ$.

D. $k = 3$ and $\theta = 20^\circ$.



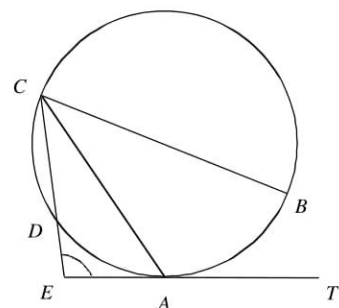
39. In the figure, TA is the tangent to the circle $ABCD$ at the point A . CD produced and TA produced meet at the point E . It is given that BC is a diameter of the circle, $\angle BCA = 43^\circ$ and $\angle ACE = 32^\circ$. Find $\angle CEA$.

A. 91°

B. 95°

C. 97°

D. 101°

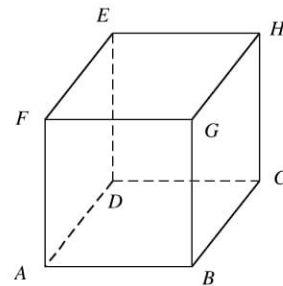


40. Find the distance between the incentre and the orthocentre of the triangle bounded by the straight line $3x + 4y = 24$, the x -axis and the y -axis.

- A. $2\sqrt{2}$
- B. $3\sqrt{2}$
- C. $4\sqrt{2}$
- D. 6

41. In the figure, $ABCDEFGH$ is a cube. Denote the angle between the plane AEG and the plane $ABCD$ by θ . Find $\cos \theta$.

- A. $\frac{1}{\sqrt{3}}$
- B. $\frac{1}{\sqrt{2}}$
- C. $\frac{\sqrt{6}}{2}$
- D. $\sqrt{2}$



42. A volleyball team has Sam, Kenny and 10 players. If 6 players are selected from the volleyball team to participate in a competition such that Sam and Kenny cannot be selected at the same time, how many different teams can be formed?

- A. 429
- B. 714
- C. 792
- D. 924

43. A bag contains 1 red ball , 1 white ball and 5 black balls . Matthew and Lisa take turns to draw a ball randomly from the bag with replacement , the one who first draws a red or white ball wins the game . The game starts with Matthew . Find the probability that Matthew wins the game by drawing a red ball .

- A. $\frac{1}{2}$
- B. $\frac{1}{7}$
- C. $\frac{7}{24}$
- D. $\frac{17}{24}$

44. In a test , the mean is 45 marks and the standard deviation is 5 marks . The standard score of Vincent in the test is 2 . In a mark adjustment , the teacher increases 10% of the test mark and then adds 5 marks to each student . Find the new standard score of Vincent .

- A. 2
- B. 2.2
- C. 7
- D. 7.2

45. There are 9 terms in a geometric sequence . It is given that the first term is 3 and the common ratio is 2 . How many times the variance of the last 3 terms is as large as the variance of the first 3 terms ?

- A. 9 times
- B. 512 times
- C. 1024 times
- D. 4096 times

END OF PAPER