MC

HOK YAU CLUB
HONG KONG MOCK EXAMINATION 2019/20

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.

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. $(\frac{9}{27^{n-1}})^4 =$

   A. 3^{1-4n} .

   B. 3^{4-4n} .

   C. 3^{12-12n} .

   D. 3^{20-12n} .

2. $m^2 + 2m - 4n^2 - 4n =$

   A. $(m-2n)(m+2n+2)$.

   B. $(m-2n)(m+2n-2)$.

   C. $(m+2n)(m-2n+2)$.

   D. $(m+2n)(m+2n-2)$.

3. If $3x - 2y = 11 = x + 4y - 2$, then $x - y =$

   A. -3 .

   B. 2 .

   C. 3 .

   D. 5 .

4. If α and β are constants such that $(3x+4)(x-\alpha) \equiv 3x^2 + \beta(x+1)$, then $\beta =$

   A. -16 .

   B. -4 .

   C. 4 .

   D. 16 .

5. If $k=\frac{6}{5-h}-3$, then $h=$

A. $\frac{5k+9}{k-3}$.

B. $\frac{5k+21}{k-3}$.

C. $\frac{5k+9}{k+3}$.

D. $\frac{5k+21}{k+3}$.

6. $\sqrt{2019}+\sqrt{2020}=$

A. 89 （correct to 2 significant figures）.

B. 90.0 （correct to 3 significant figures）.

C. 89.88 （correct to 4 significant figures）.

D. 89.877 （correct to 5 significant figures）.

7. The least integer satisfying the compound inequality $\frac{3-2x}{4}<-1$ or $3x+7\geq 1$ is

A. -3 .

B. -2 .

C. -1 .

D. 4 .

8. If $\mathrm{f}(x)=3x^2-4x-1$, then $\mathrm{f}(2c-1)=$

A. $6c^2-20c+6$.

B. $12c^2-14c+6$.

C. $12c^2-20c-2$.

D. $12c^2-20c+6$.

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9. If the equation $9x^2+(k+1)x+1=0$ has equal positive real roots, then $k=$

A. -7.

B. -5.

C. 5.

D. -7 or 5.

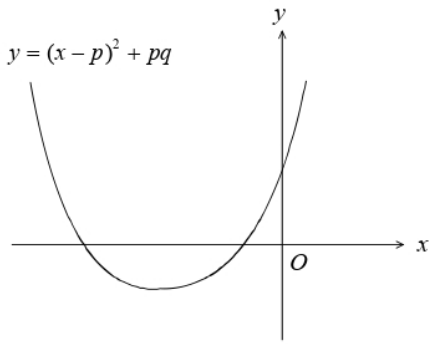
10. The figure shows the graph of $y=(x-p)^2+pq$, where p and q are constants. Which of the following is true?

A. $p<0$ and $q<0$

B. $p<0$ and $q>0$

C. $p>0$ and $q<0$

D. $p>0$ and $q>0$



11. A sum of \$50000 is deposited at an interest rate of $x\%$ per annum, compounded half-yearly. The amount after 4 years is \$56325, correct to the nearest dollar. Find x.

A. 2.5

B. 3

C. 3.5

D. 4

12. The scale of a map is $1:k$. The area of a park on the map is 9 cm^2, it is given that the actual area of the park is 22500 m^2. Find k.

A. 5000

B. 35000

C. 50000

D. 350000

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

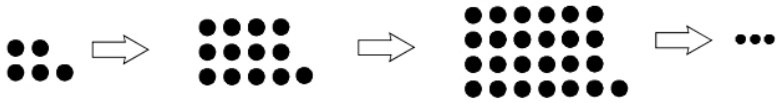
A. $\frac{x}{y^2z}$

B. $\frac{x}{y^4z^2}$

C. $\frac{y^2z^2}{x}$

D. $\frac{yz^2}{x^4}$

14. In the figure, the 1st pattern consists of 5 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding $4(n+1)$ dots to the nth pattern. Find the number of dots in the 8th pattern.



A. 85

B. 113

C. 145

D. 181

15. The circumference of the base of a solid right circular cone is 10π cm. If the height of the circular cone is 12 cm, then the total surface area of the circular cone is

A. 25π cm^2.

B. 65π cm^2.

C. 90π cm^2.

D. 100π cm^2.

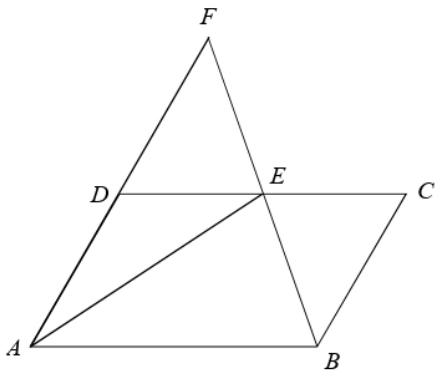
16. In the figure, $ABCD$ is a parallelogram. E is a point lying on CD such that $CE : ED = 2 : 3$. AD produced and BE produced meet at the point F. If the sum of the area of ΔDEF and ΔBCE is $78\ \text{cm}^2$, then the area of ΔABE is

A. $24\ \text{cm}^2$.

B. $48\ \text{cm}^2$.

C. $54\ \text{cm}^2$.

D. $60\ \text{cm}^2$.



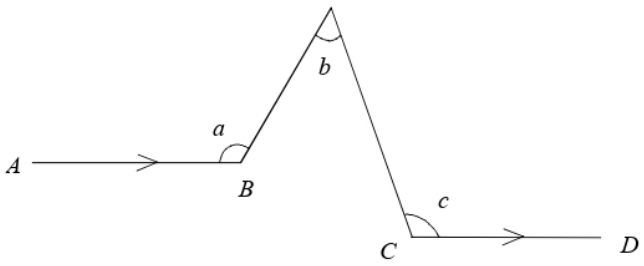
17. In the figure, $AB // CD$, which of the following must be true?

A. $a - b + c = 180°$

B. $a + b - c = 180°$

C. $a + b + c = 270°$

D. $a + b + c = 360°$



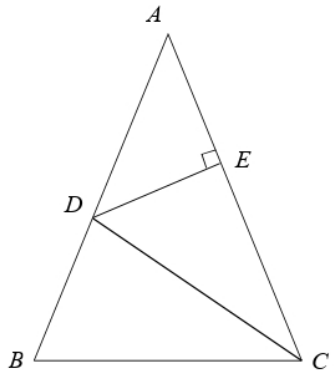
18. In the figure, ABC is an isosceles triangle and $AB = AC$. D is a point lying on AB such that $DC = BC$. E is a point lying on AC such that $DE \perp AC$. If $\angle BAC = 30°$ and $AD = 6\ \text{cm}$, then $DB =$

A. $\sqrt{3}\ \text{cm}$.

B. $3\sqrt{3} - 3\ \text{cm}$.

C. $3\ \text{cm}$.

D. $3\sqrt{3}\ \text{cm}$.



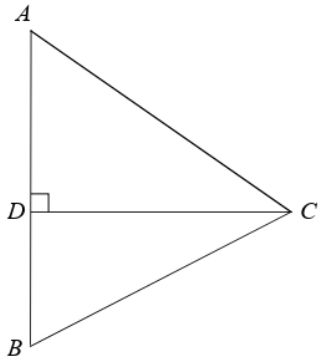
19. In the figure, D is a point lying on AB such that $CD \perp AB$. It is given that $AB = 42$ cm, $CD = 36$ cm. If the area of ΔADC is greater than the area of ΔBDC by $216\ \text{cm}^2$, then the perimeter of ΔABC is

A. 90 cm.

B. 108 cm.

C. 120 cm.

D. 126 cm.



20. In the figure, $ABCD$ is a rhombus. E is a point lying on BC such that ED bisects $\angle BDC$. If $AE = AD$, which of the following are true?

I. $ADCE$ is an isosceles trapezium.

II. DE bisects $\angle AEC$.

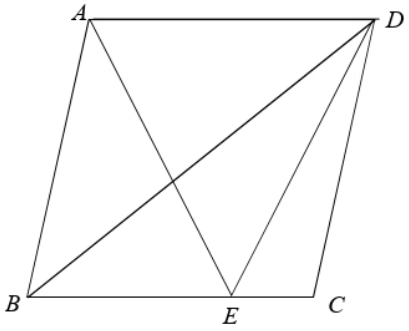
III. DB bisects the line segment AE.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III



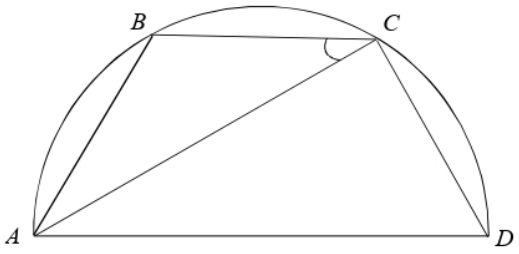
21. In the figure, $ABCD$ is a semi-circle. If $CB = CD$ and $\angle ABC = 122°$, then $\angle ACB =$

A. 22°.

B. 24°.

C. 26°.

D. 28°.



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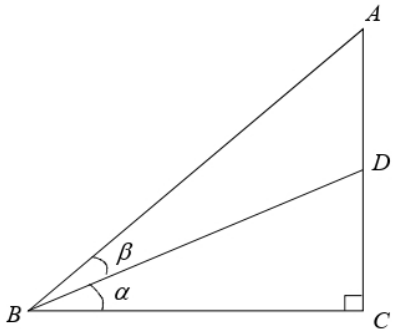
22. In the figure , ABC is a right-angled triangle, D is a point lying on AC . Find $\frac{AB}{DC}$.

A. $\frac{1}{\tan\alpha\sin(\alpha+\beta)}$

B. $\frac{1}{\tan\alpha\cos(\alpha+\beta)}$

C. $\frac{\tan\alpha}{\sin(\alpha+\beta)}$

D. $\frac{\tan\alpha}{\cos(\alpha+\beta)}$



23. In the figure, the equation of the straight line L is $ax+by=6$. Which of the following are true?

I. $a>-2$

II. $b<3$

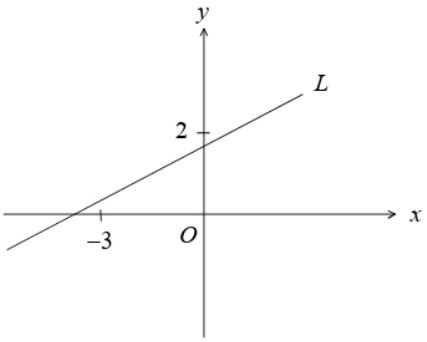
III. $a+b>0$

A. I and II only

B. I and III only

C. II and III only

D. I , II and III



24. The equation of the straight line L_1 is $3x+4y-96=0$. The straight line L_2 is perpendicular to L_1 and intersects L_1 at a point on the y -axis. Find the area of the region bounded by L_1 , L_2 and the x -axis.

A. 600

B. 720

C. 768

D. 1200

25. The coordinates of the point A are $(-1, 3\sqrt{3})$. A is rotated anticlockwise about the origin through $270°$ to the point B, then B is translated downwards by 4 units to the point C. Find the polar coordinates of C.

A. $(3, 210°)$

B. $(3, 330°)$

C. $(6, 210°)$

D. $(6, 330°)$

26. The equation of the straight line L_1 is $2x - y - 3 = 0$, and the equation of the straight line L_2 is $x + 3y - 5 = 0$. 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. the point $(2, 1)$.

B. a parabola.

C. a pair of parallel lines.

D. a pair of perpendicular lines.

27. The equations of the circle C_1 and C_2 are $x^2 + y^2 + 16x + 12y + 75 = 0$ and $4x^2 + 4y^2 - 24x - 32y + 75 = 0$ respectively. Let X_1 and X_2 be the centres of C_1 and C_2 respectively. Denote the origin by O. Which of the following is/are true?

I. X_1OX_2 is a straight line.

II. $OX_1 = 2OX_2$

III. The area of C_1 is four times that of C_2.

A. II only

B. I and III only

C. II and III only

D. I, II and III

Go on to the next page

28. Two numbers are randomly drawn at the same time from eight cards numbered 2, 3, 4, 5, 6, 7, 8 and 9 respectively. Find the probability that the two numbers drawn are prime numbers.

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. $\frac{3}{14}$

D. $\frac{11}{14}$

29. Which of the following **CANNOT** be obtained from a cumulative frequency polygon?

I. Mean

II. Standard deviation

III. Inter-quartile range

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

30. Consider the following positive integers :

$23 \quad 18 \quad 19 \quad 15 \quad 31 \quad 46 \quad 15 \quad p \quad q \quad r$

If the mode and the mean of the above data are 23 and 22 respectively, then the median of the above data is

A. 19.

B. 21.

C. 22.

D. 23.

.

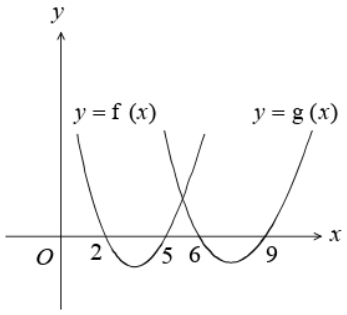
Section B

31. The figure below shows the graph of $y = f(x)$ and $y = g(x)$. Which of the following is/are ture?

I. $g(x) = f(x-4)$

II. $g(x) = f(3x)$

III. $g(x) = f(-x+11)$



A. I only

B. III only

C. I and II only

D. I and III only

32. $32^3 + 32^9 =$

A. 200000008000_{16} .

B. 200000080000_{16} .

C. 800000002000_{16} .

D. 800000008000_{16} .

33. If $2\log x - \dfrac{3}{\log x} = 5$, then $\log \dfrac{1}{x} =$

A. -2 or $\dfrac{1}{3}$.

B. $-\dfrac{1}{2}$ or 3 .

C. $\dfrac{1}{2}$ or -3 .

D. 2 or $-\dfrac{1}{3}$.

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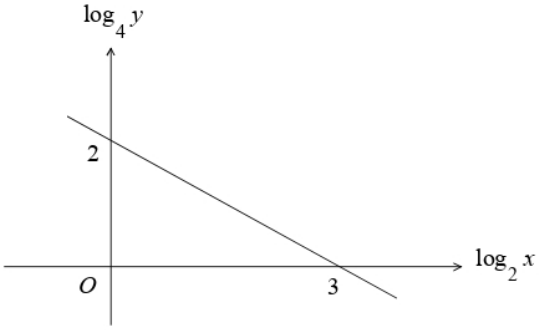
34. The graph in the figure shows the linear relation between $\log_4 y$ and $\log_2 x$. Which of the following must be true?

A. $x^{-4}y^3 = 64$

B. $x^3y^4 = 4096$

C. $x^4y^3 = 64$

D. $x^4y^3 = 4096$



35. Let $z = \dfrac{3ai + 6i^{10}}{1-i}$, where a is a real number. If z is a pure imaginary number, then $a =$

A. -2.

B. 0.

C. $\dfrac{1}{2}$.

D. 2.

36. If the positive numbers a, b and c is an arithmetic sequence, which of the following must be true?

I. $\log a$, $\log b$, $\log c$ is an arithmetic sequence.

II. 3^a, 3^b, 3^c is a geometric sequence.

III. a^n, b^n, c^n is an arithmetic sequence, where n is a positive integer.

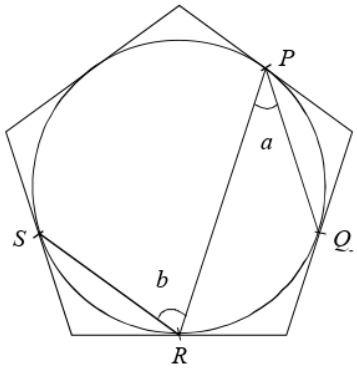
A. I only

B. II only

C. I and II only

D. II and III only

37. In the figure, a circle is inscribed in a pentagon. P, Q, R and S are the points of contact. Let $\angle QPR = a$ and $\angle SRP = b$. Find $b - a$.



A. 30°

B. 33°

C. 36°

D. 42°

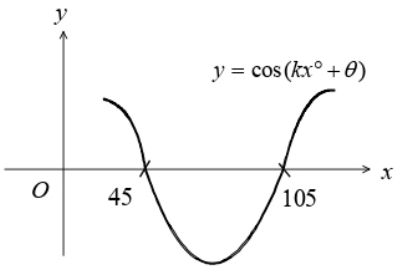
38. Let k and θ be constants. If the figure shows the graph of $y = \cos(kx° + \theta)$, then

A. $k = \frac{1}{3}$ and $\theta = -45°$.

B. $k = 3$ and $\theta = -15°$.

C. $k = 3$ and $\theta = -45°$.

D. $k = 3$ and $\theta = 45°$.



39. Two tangents touch the circle $x^2 + y^2 = 10$ from point $P(5, 5)$ which lies outside the circle. One of the tangents is $3x - y - 10 = 0$. Find the equation of another tangent.

A. $x - 3y - 10 = 0$

B. $x - 3y + 10 = 0$

C. $x + 3y - 20 = 0$

D. $3x + y - 20 = 0$

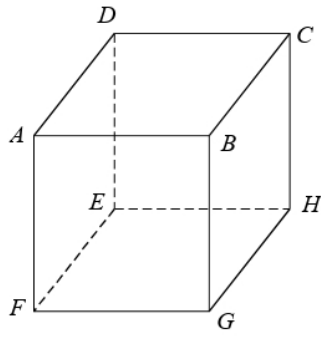
40. The figure shows a cube $ABCDEFGH$. Find the angle between the plane AEG and the plane CEG, correct to the nearest degree.

A. 45°

B. 60°

C. 70°

D. 71°



41. If ΔABC is an obtuse angled triangle and $\angle ABC > 90°$, which of the following are true?

I. The circumcentre of ΔABC lies outside ΔABC.

II. The orthocentre of ΔABC lies outside ΔABC.

III. The circumcentre and the orthocentre of ΔABC lie on the same side of AC.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

42. If a four-digit number is formed from the six digits 0, 4, 5, 6, 7 and 8, how many numbers can be divisible by 5?

A. 60

B. 108

C. 120

D. 144

43. A bag contains 2 red balls , 3 white balls and 4 black balls. 3 balls are drawn from the bag at the same time. Find the probability that 2 red balls are not drawn at the same time.

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

B. $\frac{1}{12}$

C. $\frac{5}{12}$

D. $\frac{11}{12}$

44. The mean of the weights of a class of students is 50 kg . It is given that the weights of Betty and Candy are 54 kg and 48 kg respectively, and the standard score of Betty is greater than the standard score of Candy by 1. Find the standard deviation of the weights of the group of students.

A. 2 kg

B. 4 kg

C. 5 kg

D. 6 kg

45. Let m_1, r_1 and v_1 be the median, the range and the variance of a group of numbers $\{x_1, x_2, x_3 \cdots, x_9\}$ respectively. If m_2, r_2 and v_2 are the median, the range and the variance of the group of numbers $\{x_1, x_2, x_3 \cdots, x_9, m_1\}$ respectively, which of the following must be true?

A. $m_1 = m_2$

B. $r_2 > r_1$

C. $v_1 = v_2$

D. $v_1 > v_2$

END OF PAPER