HOK YAU CLUB
HONG KONG MOCK EXAMINATION 2016/17

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. $(-3)^{2017}(\frac{1}{9})^{1009} =$

      A. -3.

      B. $-\frac{1}{3}$.

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

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

2. $(x-2)(x^2-2x+4) =$

      A. x^3-8.

      B. $(x-2)^3$.

      C. x^3-4x^2+8x-8.

      D. x^3+4x^2-8x-8.

3. If $2m+n+1 = m-2n+5 = -1$, then $m+n =$

      A. -2.

   B. 0.

      C. 2.

      D. 4.

4. If $0.74496 < x < 0.74505$, which of the following must be true?

      A. $x = 0.8$ (correct to 1 significant figure) .

      B. $x = 0.74$ (correct to 2 decimal places) .

      C. $x = 0.745$ (correct to 3 significant figures) .

      D. $x = 0.7450$ (correct to 4 decimal places) .

5. If p and q are constants such that $(x+2)^2 + p \equiv (x-1)(x+q) + 3$, then $p =$

      A. 5 .

      B. -2 .

      C. -4 .

      D. -6 .

6. The solution of $-2x + 5 < 13 < 5x - 2$ is

      A. $x > -4$.

      B. $x > 3$.

      C. $-4 < x < 3$.

      D. $x < -4$ or $x > 3$.

7. If the roots of the equation $2x^2 - x + k = 0$ are -1 and β , then $11 + 2\beta - 4\beta^2 =$

      A. 5 .

      B. 9 .

      C. 13 .

      D. 17 .

8. The figure shows the graph of $y = px^2 + qx - 5$, 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 $q > 0$
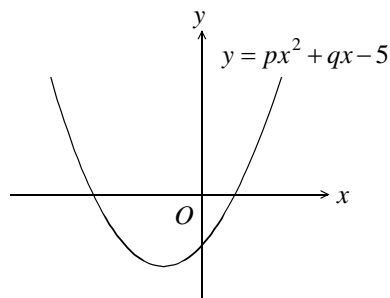
9. The weight of Sunny is 20% heavier than that of Clara and 20% lighter than that of Kenny. Then

    A.   Kenny is 20% heavier than Sunny.

    B.   Kenny is 40% heavier than Clara.

    C.   Clara is 50% lighter than Kenny.

    D.   Kenny is 50% heavier than Clara.

10. $\$50\ 000$ is deposited at an interest rate of 2.4% per annum, compounded half-yearly for 3 years. Another $\$50\ 000$ is deposited at a simple interest rate of 2.5% per annum for 3 years. Find the difference between the two interests obtained correct to the nearest dollar.

    A. $\$40$

    B. $\$63$

    C. $\$1\ 928$

    D. $\$3\ 896$

11. Let a , b and c are non-zero numbers. If $\dfrac{1}{2}a = 2b = 3c$, then $\dfrac{1}{a} : \dfrac{1}{b} : \dfrac{1}{c} =$

    A. $12 : 3 : 2$.

    B. $6 : 4 : 1$.

    C. $2 : 3 : 12$.

    D. $1 : 4 : 6$.

12. It is given that z varies directly as the square of x and inversely as y. If x is increased by 20% and y is decreased by 25%, then z

       A.   is increased by 8%.

       B.   is increased by 60%.

       C.   is increased by 92%.

       D.   is decreased by 10%.

13. In the figure, the 1st pattern consists of 3 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding $n+3$ dots to the nth pattern. Find the number of dots in the 6th pattern.

       A.   19

   B.   25

       C.   33

       D.   42
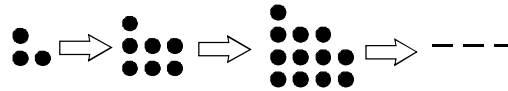
14. There is a bag of salt. The weight of salt in the bag is measured as 8 kg correct to the nearest kg. If the bag of salt is packed into n packets such that the weight of salt in each packet is measured as 15 g correct to the nearest g, find the least possible value of n.

       A.   483
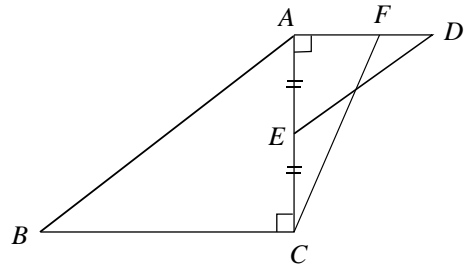
       B.   484

       C.   517

       D.   548

15. In the figure, $ABCDE$ is a regular pentagon and $CDFG$ is a square, $\angle ABG =$

       A. $18°$.
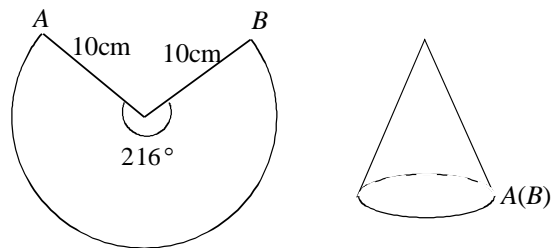
       B. $24°$.

       C. $25°$.

       D. $27°$.
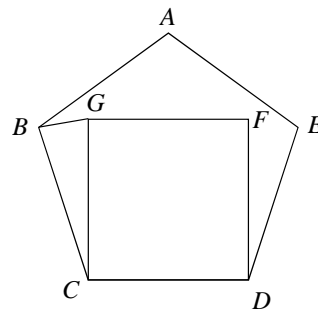
16. In the figure, E is the mid-point of AC and F is a point lying on AD . If $AB = 20\,\text{cm}$, $DE = 10\,\text{cm}$, $FD = 3\,\text{cm}$ and $CF = 13\,\text{cm}$, then the area of $\triangle ABC$ is

   A. $48\,\text{cm}^2$.

   B. $96\,\text{cm}^2$.

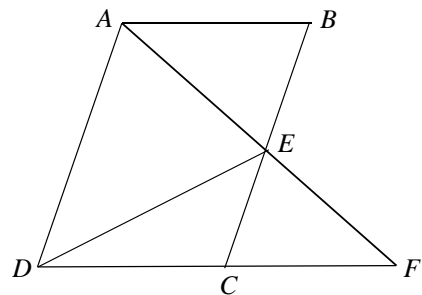   C. $160\,\text{cm}^2$.

   D. $192\,\text{cm}^2$.

17. In the figure, the sector is folded to form a circular cone. Find the volume of the circular cone.

   A. $96\pi\,\text{cm}^3$

   B. $120\pi\,\text{cm}^3$

   C. $288\pi\,\text{cm}^3$

   D. $360\pi\,\text{cm}^3$
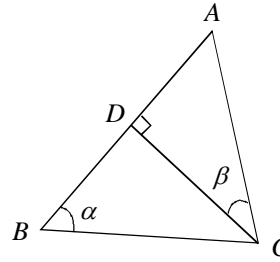
18. In the figure, $ABCD$ is a parallelogram. E is a point lying on BC such that $BE:EC = 3:2$. If the area of $\triangle ECF$ is $96\,\text{cm}^2$, then the area of $\triangle ADE$ is

   A. $144\,\text{cm}^2$.

   B. $192\,\text{cm}^2$.

   C. $216\,\text{cm}^2$.

   D. $360\,\text{cm}^2$.

19. In the figure, $\dfrac{AC}{DB} =$

    A. $\sin\beta\tan\alpha$.

    B. $\cos\beta\tan\alpha$.

    C. $\dfrac{\tan\alpha}{\sin\beta}$.
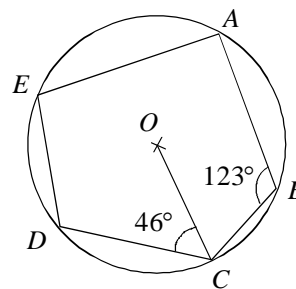
    D. $\dfrac{\tan\alpha}{\cos\beta}$.

20. $\dfrac{\cos 0° + \cos(90° - \theta)}{\sin(90° + \theta)} - \dfrac{\cos(180° + \theta)}{1 - \sin(360° - \theta)} =$

    A. $\dfrac{\cos\theta}{2}$.

    B. $\dfrac{2}{\sin\theta}$.

    C. $\dfrac{2}{\cos\theta}$.

    D. $\dfrac{2}{\cos\theta(1-\sin\theta)}$.

21. In the figure, O is the centre of the circle $ABCDE$. If $\angle OCD = 46°$ and $\angle ABC = 123°$, then $\angle AED =$

    A. $80°$.

    B. $101°$.

    C. $103°$.

    D. $123°$.

22. If the sum of the interior angles of a regular polygon is 1 440° , which of the following are true?

    I.   Each interior angle of the polygon is 135° .

    II.   The number of diagonals of the polygon is 35 .

    III.   The number of folds of rotational symmetry of the polygon is 10 .

    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 $(1,-\sqrt{3})$. If P is reflected with respect to the x -axis and then rotated clockwise about the origin through 270° , then the polar coordinates of its image are

    A. $(1,120°)$.

    B. $(1,150°)$.

    C. $(2,120°)$.

    D. $(2,150°)$.

24. The coordinates of the points A and B are $(6,0)$ and $(0,8)$ respectively. If P is a moving point in the rectangular coordinate plane such that $PA \perp PB$, then the locus of P is

    A.   the perpendicular bisector of AB .

    B.   the straight line which passes through A and B .

    C.   the angle bisector of $\angle AOB$, where O is the origin .

    D.   the circle with AB as a diameter , excluding the points A and B .

25. If straight lines $2x - y + 4 = 0$ and $mx + ny + 2 = 0$ are perpendicular to each other at a point on the x-axis, then $n =$

    A. -2.

    B. -1.

    C. 1.

    D. 2.

26. The equation of the circle is $\dfrac{1}{2}x^2 + \dfrac{1}{2}y^2 - 3x + 5y + 9 = 0$. Which of the following are true?

    I.   The coordinates of the centre of the circle are $(3, -5)$.

    II.   The circle and the y-axis intersect at two distinct points.

    III. The origin lies inside the circle.

         A.   I and II only

         B.   I and III only

         C.   II and III only

         D.   I, II and III

27. There are four balls numbered 1 , 4 , 6 and 15 in a bag. If two balls are randomly drawn from the bag, find the probability that the product of the numbers drawn is *not* a multiple of 3 .

         A. $\dfrac{1}{6}$

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

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

         D. $\dfrac{5}{6}$

28. There are five $20 paper notes, four $50 paper notes and one $500 paper note in a wallet. A paper note is randomly drawn from the wallet. Find the expected value of the paper note.

        A.   20 dollars

        B.   50 dollars

        C.   80 dollars

        D.   190 dollars

29. The scatter diagram below shows the relation between x and $\dfrac{1}{y}$. Which of the following represents the relation between x and y ?

        A.   When x increases, y decreases.

        B.   When x increases, y increases.

        C. y varies directly as x .

        D. y varies inversely as x .
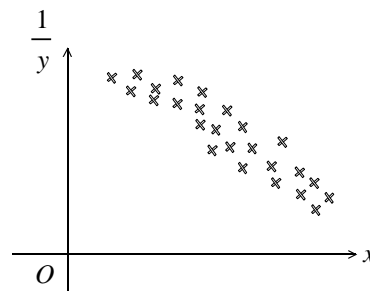
30. Consider the following data :

        11   18   12   14   14   20   7   16   10 p q

If the mean and the median of the above data both are 14 , which of the following must be true?

    I. $p+q=32$

    II. $p \geq 14$

    III. $q \leq 18$

        A.   I only

        B.   I and II only

        C.   I and III only

        D.   I, II and III

Section B

31. $\dfrac{1}{x^2-2x+1}-\dfrac{1}{x^2-1}=$

    A. 0 .

    B. $\dfrac{2}{(x-1)(x+1)}$.

    C. $\dfrac{2}{(x-1)^2(x+1)}$.

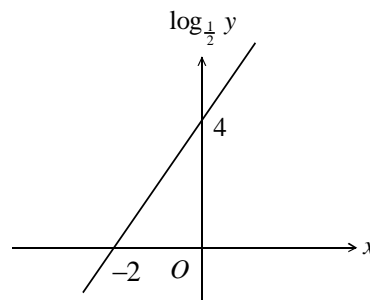   D. $\dfrac{2x}{(x-1)^2(x+1)}$.

32. The graph in the figure shows the linear relation between x and $\log_{\frac{1}{2}} y$. If $y=ab^x$, then $a=$

    A. $\dfrac{1}{16}$.

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

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

    D. 16 .

33. $5\times2^7+2^5+17=$

    A. 1001110001_2 .

    B. 1001101001_2 .

    C. 1010101001_2 .

    D. 1010110001_2 .

34. Let $u = \dfrac{i}{a+i}$ and $v = \dfrac{i}{a-i}$, where a is a real number. Which of the following must be true?

    I. uv is a real number.

    II.   The imaginary part of u is equal to the imaginary part of v .

    III. The real part of $\dfrac{1}{u}$ is equal to the real part of $\dfrac{1}{v}$.

        A.   I only

        B.   II only

        C.   I and II only

        D.   II and III only

35. Which of the following systems of inequalities will make $p = 2x - 3y$ have both maximum and minimum values?

    A. $\begin{cases} x \geq 0 \\ y \geq 0 \\ 3x - 2y \leq 6 \end{cases}$
        B. $\begin{cases} x \leq 0 \\ y \leq 0 \\ 3x - 2y \geq 6 \end{cases}$

    C. $\begin{cases} x \geq 0 \\ y \geq 0 \\ 3x - 2y \geq 6 \end{cases}$
        D. $\begin{cases} x \geq 0 \\ y \leq 0 \\ 3x - 2y \leq 6 \end{cases}$

36. Let a , b and c be positive numbers and $b^2 = ac$. Which of the following must be true?

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

    II. 2^a , 2^b , 2^c is a geometric sequence.

    III. a^m , b^m , c^m is a geometric sequence, where m is a positive integer.
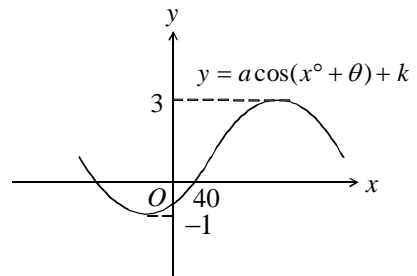
        A.   I and II only

        B.   I and III only

        C.   II and III only

        D.   I, II and III

37. For $0° \leq x \leq 360°$, how many roots does the equation $\sin x(3\cos^2 x + 4\cos x - 4) = 0$ have?

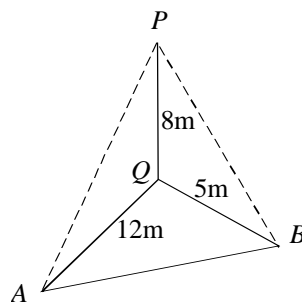   A.   2

      B.   3

      C.   4

      D.   5

38. Let a and k be constants and $-90° < \theta < 90°$. The figure shows the graph of $y = a\cos(x° + \theta) + k$. Find the values of a , θ and k .

|	a	θ	k
A.	2	20°	1
B.	2	50°	1
C.	−2	20°	1
D.	−2	20°	3

39. In the figure, PQ is a vertical pole standing on the horizontal ground AQB , where $\angle AQB = 90°$. If the angle between the plane PAB and the horizontal plane is θ , then $\tan \theta =$

      A. $\dfrac{2}{3}$.

      B. $\dfrac{15}{26}$.

      C. $\dfrac{8}{5}$.

      D. $\dfrac{26}{15}$.

13

Go on to the next page

40. In the figure, AB is a diameter of the circle. TP touches the circle at P. ABR and PQR are straight lines. If $\angle ARP = 24°$ and $\angle RPT = 44°$, then $\angle AQP =$

    A. 22°.

    B. 35°.

    C. 46°.

    D. 48°.
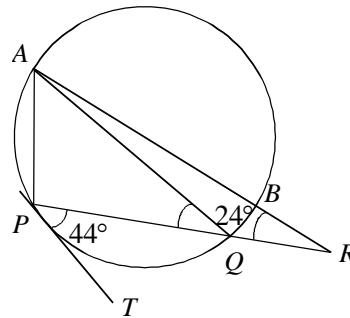
41. Find the equation of the circle with its centre at the point $(3, -1)$ and touching the straight line $3x + 4y + 5 = 0$.

    A. $x^2 + y^2 + 6x - 2y + 6 = 0$

    B. $x^2 + y^2 - 6x + 2y + 6 = 0$

    C. $x^2 + y^2 - 6x + 2y + 8 = 0$

    D. $x^2 + y^2 - 6x + 2y + 9 = 0$

42. Bag A contains 3 red balls and 2 white balls while bag B contains 2 red balls and 4 white balls. If one ball is randomly drawn from bag A and put into bag B, then one ball is randomly drawn from bag B and put into bag A. Now, a ball is randomly drawn from bag A, the probability of drawing a red ball is

    A. $\dfrac{43}{175}$.

    B. $\dfrac{51}{175}$.

    C. $\dfrac{97}{175}$.

    D. $\dfrac{3}{5}$.

43. 5 girls and 4 boys sit in a row. If only two boys sit next to each other , find the number of permutation.

      A.   43 200

      B.   86 400

      C.   172 800

      D.   362 880

44. The stem-and-leaf diagram below shows the distribution of the scores (in marks) of a group of students in a test.

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

Which of the following are true?

I.   The inter-quartile range of the distribution is 22 marks.

II.   There is no student with standard score less than -2 .

III. There are 3 students whose standard scores are above 1.3 .

      A.   I and II only

      B.   I and III only

      C.   II and III only

      D.   I, II and III

45. The standard deviation of the five numbers $-3a+b$, $-3a+5b$, $-3a-3b$, $-3a+9b$ and $-3a-7b$, where $b>0$, is

      A. $4\sqrt{2}b$.

      B. $2\sqrt{10}b$.

      C. $\dfrac{24}{5}b$.

      D. $32b$.

END OF PAPER