MC

HOK YAU CLUB
HONG KONG MOCK EXAMINATION 2015/16

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. $3a^2(a+a) =$

   A. $3a^4$.

   B. $6a^3$.

   C. $9a^3$.

   D. $3a^3 + 3a^2$.

2. $u^2 + 2u - 2uv - 4v =$

   A. $(u+2v)(u+2)$.

   B. $(u+2v)(u-2)$.

   C. $(u-2v)(u+2)$.

   D. $(u-2v)(u-2)$.

3. If $x^2 - 6x + 1 \equiv (x+a)^2 + b$, then $a+b =$

   A. -11.

   B. 3.

   C. 5.

   D. 8.

4. $0.03654941 =$

A. 0.04 (round off to 1 decimal place) .

B. 0.037 (round down to 2 significant figures) .

C. 0.0366 (round up to 3 decimal places) .

D. 0.036550 (round up to 5 significant figures) .

5. Let k be a non-zero constant. If the quadratic equation $kx^2 + kx + 1 = k$ has equal real roots, then $k =$

A. -4 .

B. $-\frac{1}{2}$.

C. $\frac{4}{5}$.

D. 4 .

6. The solution of $8 + 3x > 2$ or $3 - 2x < 13$ is

A. $x > -5$.

B. $x > -2$.

C. $x < -5$ or $x > -2$.

D. any real number.

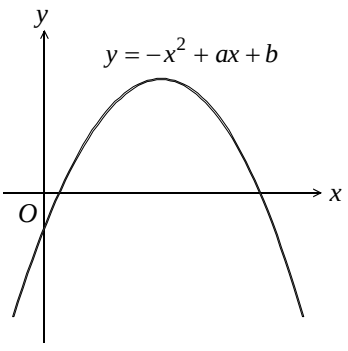
7. The figure shows the graph of $y = -x^2 + ax + b$, where a and b are constants. Which of the following is true?

A. $a > 0$ and $b > 0$

B. $a > 0$ and $b < 0$

C. $a < 0$ and $b > 0$

D. $a < 0$ and $b < 0$



Go on to the next page

8. Let k be a constant. Solve the equation $(x+k-1)(x-k+1)=x-k+1$.

A. $x=1-k$

B. $x=2-k$

C. $x=1-k$ or $x=k-1$

D. $x=2-k$ or $x=k-1$

9. Let $f(x)=x^{2015}-3x+k$, where k is a constant. If $f(x)$ is divisible by $x+1$, find the remainder when $f(x)$ is divided by $1-x$.

A. –4

B. –2

C. 0

D. 4

10. If the perimeter of an equilateral triangle is increased by 20%, then the area of the triangle is increased by

A. 20%.

B. 40%.

C. 44%.

D. 60%.

11. A sum of \$60 000 is deposited at an interest rate of 6% per annum for 2 years, compounded monthly. Find the amount correct to the nearest dollar.

A. \$67 200

B. \$67 416

C. \$67 530

D. \$67 630

12. If $2a:3b:4c=1:3:5$, then $a:b:c=$

A. $1:2:10$.

B. $2:4:5$.

C. $2:9:20$.

D. $4:9:10$.

13. It is given that z varies directly as x and inversely as y^2. If x is decreased by 10% and y is increased by 20% , then z

A. is decreased by 37.5%.

B. is decreased by 62.5%.

C. is increased by 37.5%.

D. is increased by 62.5%.

14. Let a_n be the nth term of a sequence. If $a_2=4$, $a_4=28$ and $a_{n+2}=(a_{n+1})(a_n)$ for any positive integer n , then $a_6=$

A. 7.

B. 112.

C. 196.

D. 5488.

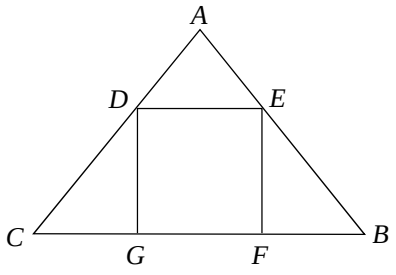
15. In the figure, the square $DEFG$ is inscribed in the right-angled isosceles triangle ABC. If the area of the square $DEFG$ is 96cm^2 , then the area of ΔABC is

A. 120cm^2.

B. 144cm^2.

C. 192cm^2.

D. 216cm^2.



Go on to the next page

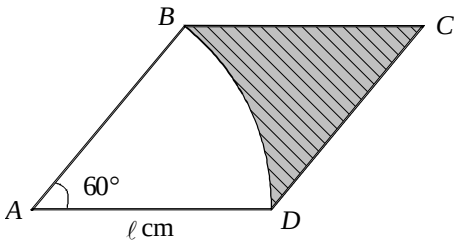
16. In the figure, $ABCD$ is a rhombus with side length ℓ cm and ABD is a sector. It is given that $\angle BAD = 60°$. Find the area of the shaded region.

A. $\left(\frac{\sqrt{3}}{2} - \frac{\pi}{12}\right)\ell^2$ cm^2

B. $\left(\frac{\sqrt{3}}{2} - \frac{\pi}{6}\right)\ell^2$ cm^2

C. $\left(\sqrt{3} - \frac{\pi}{12}\right)\ell^2$ cm^2

D. $\left(\sqrt{3} - \frac{\pi}{6}\right)\ell^2$ cm^2



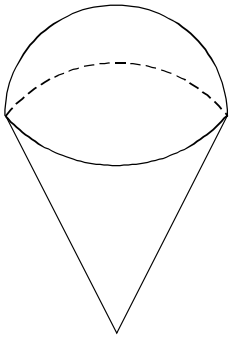
17. In the figure, the solid consists of a right circular cone and a hemisphere with a common base. The base radius and the curved surface area of the cone are 6 cm and 60π cm^2 respectively. Find the volume of the solid.

A. 240π cm^3

B. 264π cm^3

C. 384π cm^3

D. 408π cm^3



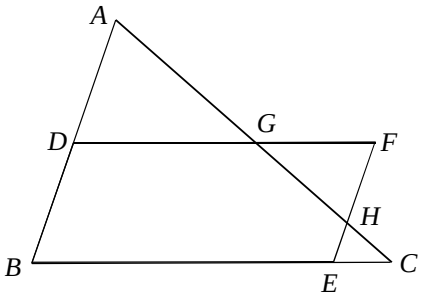
18. In the figure, D and E are points lying on the sides AB and BC of ΔABC respectively. $DFEB$ is a parallelogram. DF and AC intersect at G, FE and AC intersect at H. It is given that D is the mid-point of AB and $DG : GF = 3 : 2$. If the area of ΔADG is 36 cm^2, then the area of pentagon $BDGHE$ is

A. 96 cm^2.

B. 104 cm^2.

C. 112 cm^2.

D. 120 cm^2.



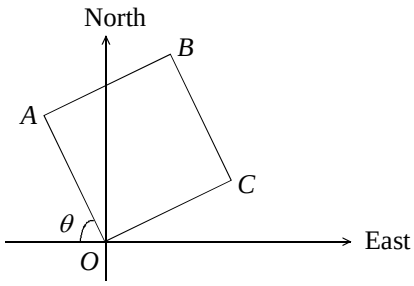
19. In the figure, $OABC$ is a square, where $\theta = 63°$. Find the bearing of A from C.

A. S 72° E

B. S 108° E

C. N 72° W

D. N 82° W



20. $\dfrac{\sin 210°}{\cos(360° - \theta) - 1} + \dfrac{\cos 240°}{1 - \sin(270° - \theta)} =$

A. $\dfrac{1}{\sin^2 \theta}$.

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

C. $\dfrac{\sin \theta}{\tan^2 \theta}$.

D. $\dfrac{1}{\sin \theta \tan \theta}$.

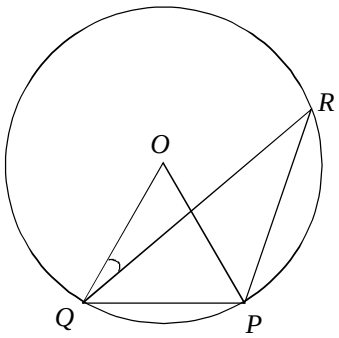
21. In the figure, O is the centre of the circle. It is given that $\angle PRQ = 36°$ and $PQ = PR$. Find $\angle OQR$.

A. 16°

B. 18°

C. 20°

D. 24°



Go on to the next page

22. If an interior angle of a regular polygon is greater than an exterior angle of the polygon by $140°$, which of the following are true?

I. Each exterior angle of the polygon is $40°$.
II. The number of diagonals of the polygon is 135.
III. The number of folds of rotational symmetry of the polygon is 18.

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 point P are $(6, 210°)$. If P is rotated anticlockwise about the origin through $90°$, then the rectangular coordinates of its image are

A. $(-3\sqrt{3}, 3)$.

B. $(-3, 3\sqrt{3})$.

C. $(3, -3\sqrt{3})$.

D. $(3\sqrt{3}, -3)$.

24. The coordinates of the points A and B are $(0, 3)$ and $(4, 0)$ respectively. If P is a moving point in the rectangular coordinate plane such that $AP \perp BP$, which of the following is/are true?

I. The locus of P is the perpendicular bisector of AB.
II. The locus of P is the circle with AB as a diameter.
III. The locus of P passes through the origin.

A. I only

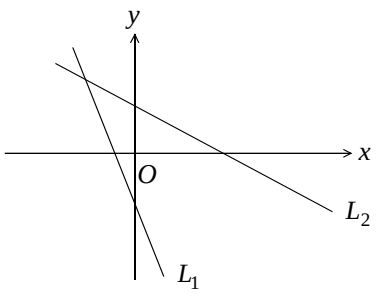
B. II only

C. I and III only

D. II and III only

25. In the figure, the equations of the straight lines L_1 and L_2 are $x+ay=b$ and $x+cy=d$ respectively. Which of the following are true?

I. $a>0$
II. $a>c$
III. $b<d$
IV. $ad>bc$



A. I, II and III only

B. I, II and IV only

C. I, III and IV only

D. II, III and IV only

26. The equation of the circle C is $x^2+y^2-8x+ay+k=0$, where a and k are constants. Given that a straight line $2x-y-11=0$ cuts C into two equal parts and the radius of C is equal to 3. Find k.

A. –16

B. –6

C. 6

D. 16

27. There are four cards numbered 2, 5, 6 and 8 in a bag. If two cards are randomly drawn from the bag, find the probability that the difference of the numbers drawn is a multiple of 3.

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

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

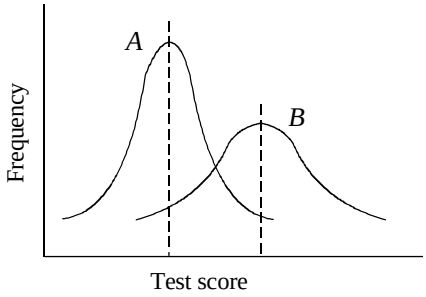
C. $\frac{1}{4}$

D. $\frac{1}{6}$

Go on to the next page

28. The figure below shows the frequency curves of two Mathematics test score distribution A and B of a class. If two curves are symmetrical distribution, which of the following are true?

I. Mode of B > Mode of A
II. Median of B > Median of A
III. Standard deviation of B > Standard deviation of A



A. I and II only

B. I and III only

C. II and III only

D. I, II and III

29. Consider the following data: 8 , 11 , 14 , 12 , 8 , 10 , 10 , 9 , 13 , p and q, where p and q are integers with $p < q$. Given that both the mean and the median of the above data are 11. How many pairs of possible values of p and q are there?

A. 2

B. 3

C. 4

D. 5

30. The stem-and-leaf diagram below shows the scores of 10 students in a Mathematics test. If the mean of the score is 73 marks, find the possible values of x and y.

Stem (10 marks)	Leaf (1 mark)
6	5 5 7 9
7	3 3 x 5
8	4 y

A. $x = 3$, $y = 5$

B. $x = 3$, $y = 6$

C. $x = 4$, $y = 6$

D. $x = 5$, $y = 5$

Section B

31. The L.C.M. of $x^2+3x-10$ and x^3-4x^2+4x is

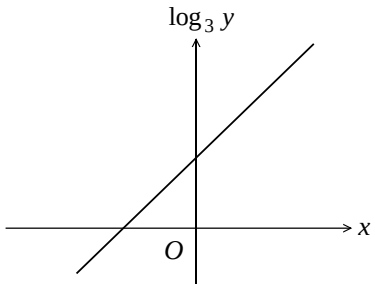
A. $x-2$.

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

C. $x(x+5)$.

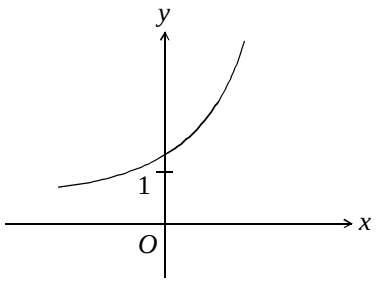
D. $x(x+5)(x-2)^2$.

32.

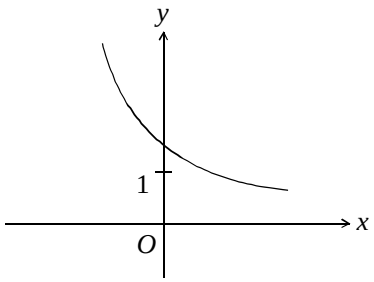


The figure above shows the linear relation between x and $\log_3 y$. Which of the following graphs may represent the relation between x and y ?

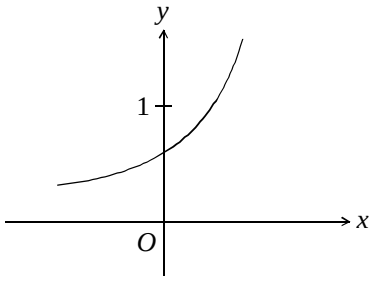
A.



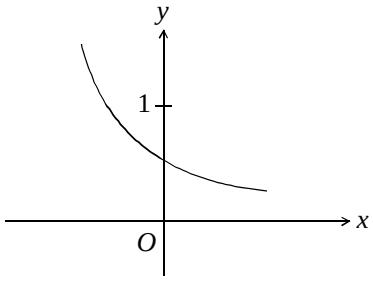
B.



C.



D.



Go on to the next page

33. In the hexadecimal number AF , the place value of ' A ' is

A. 10 .

B. 16 .

C. 160 .

D. 175 .

34. Given that α and β are the roots of the quadratic equation $4x^2 - 8x + 1 = 0$. Find the value of $\log_2 \alpha + \log_2 \beta$.

A. –2

B. $-\frac{1}{2}$

C. 1

D. 2

35. Consider the following system of inequalities:

$$\begin{cases} x \le 3 \\ y \ge -1 \\ 4x + y \ge 3 \\ 2x + 3y \le 9 \end{cases}$$

Let R be the region which represents the solution of the above system of inequalities. If (x, y) is a point lying in R , then the minimum value of $3x + 2y - 5$ is

A. –4 .

B. 1 .

C. 2 .

D. 6 .

36. Let $z=(a+3)i^{4n+1}-(a-6)i^{4n+2}$, where n is a positive integer and a is a real number. If z is a pure imaginary number, then $a=$

A. -6.

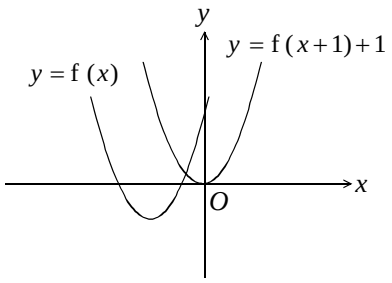
B. -3.

C. 3.

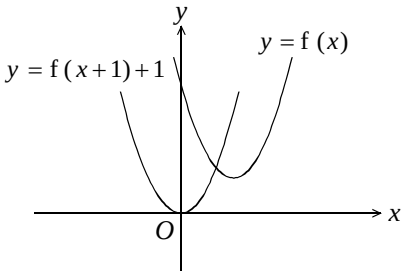
D. 6.

37. Which of the following may represent the graph of $y=\mathrm{f}(x)$ and the graph of $y=\mathrm{f}(x+1)+1$ on the same rectangular coordinate system?

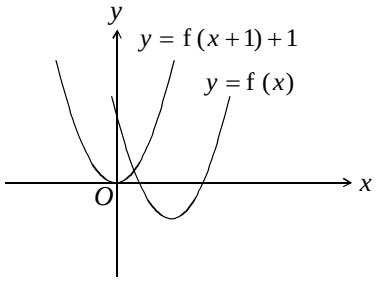
A.



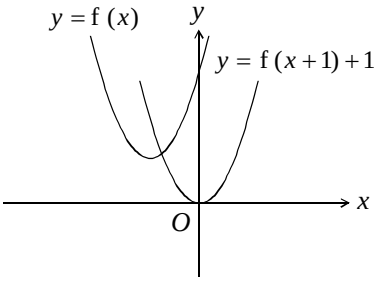
B.



C.



D.



38. If the sum of the first n terms of an arithmetic sequence is $-2n^2+n$, then the 13th term of the sequence is

A. -325.

B. -53.

C. -49.

D. 53.

Go on to the next page

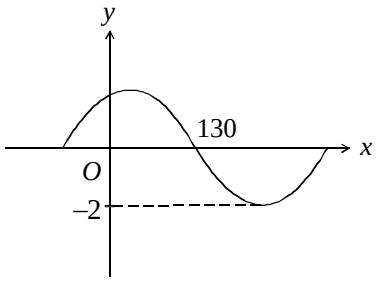
39. Let k be a constant and $-90° < \theta < 90°$. If the figure shows the graph of $y = k\cos(x° + \theta)$, then

A. $k = 2$ and $\theta = 40°$.

B. $k = 2$ and $\theta = -40°$.

C. $k = -2$ and $\theta = 40°$.

D. $k = -2$ and $\theta = -40°$.



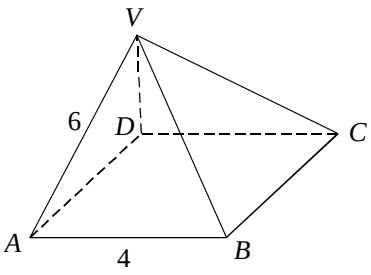
40. The figure shows a right pyramid $VABCD$ with a square base $ABCD$. Given that $AB = 4$ and $VA = 6$. Find the angle between the plane VAB and the plane VCD.

A. 38.9°

B. 41.4°

C. 60°

D. 97.2°



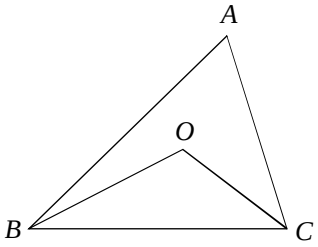
41. In the figure, O is the circumcentre of ΔABC. It is given that $\angle BOC = 122°$. Find $\angle A$.

A. 54°

B. 58°

C. 61°

D. 64°



42. A circle intersects the x-axis at P and Q with $PQ = 8$. If the coordinates of the centre of the circle are $(7, 3)$, then the equation of the circle is

A. $x^2 + y^2 - 14x - 6y + 33 = 0$.

B. $x^2 + y^2 - 14x - 6y + 42 = 0$.

C. $x^2 + y^2 + 14x + 6y + 33 = 0$.

D. $x^2 + y^2 + 14x + 6y + 42 = 0$.

43. Four digits are chosen from the seven digits 0 , 1 , 2 , 3 , 4 , 5 and 6 without repetition. How many four-digit even number can be formed?

A. 300

B. 400

C. 420

D. 480

44. There are four boxes, in which one of them contains a diamond ring. The boxes are being opened one by one. Find the probability that the diamond ring can be found without opening all the four boxes.

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

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

C. $\frac{2}{3}$

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

45. A set of data consists of a datum with the same value to the mean. If this datum is removed from the set, which of the following must be true?

I. Mean remains unchanged.
II. Median will not decrease.
III. Variance will not decrease.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

END OF PAPER