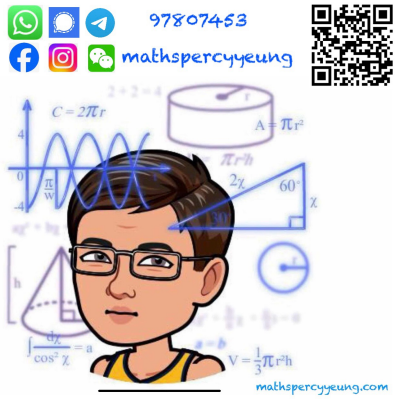
17-18 F.6
1st TERM EXAM
MATH CP
PAPER 2
MC



2017 – 2018
Form 6 First Term Uniform Test

MATHEMATICS Compulsory Part

PAPER 2

30th October, 2017.
10:15 am – 11:15 am (1 hour)

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should insert the information required in the spaces provided.

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 should use an HB pencil to mark all your 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 18 questions in Section A and 18 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. $2^{2n} \cdot 9^n =$

A. 18^{2n}.
B. 18^{3n}.
C. 6^{2n}.
D. 6^{3n}.

2. $6a + 6b - a^2 + b^2 =$

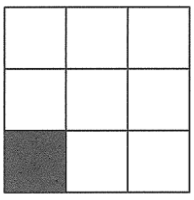
A. $(a + b)(6 - a + b)$.
B. $(a + b)(6 - a - b)$.
C. $(a - b)(6 - a + b)$.
D. $(a - b)(6 - a - b)$.

3. If $x + y = \frac{y}{x} + 2$, $y =$

A. $\frac{x(x-2)}{x-1}$.
B. $\frac{x(x-2)}{1-x}$.
C. $\frac{x^2-2}{x-1}$.
D. $\frac{x^2-2}{1-x}$.

4. In the figure, a square is divided into nine smaller identical squares and one of them is shaded. If one of the eight remaining squares is shaded, how many ways are there such that the resulting figure has reflectional symmetry?

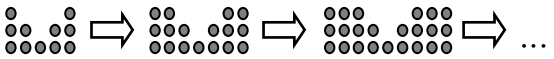
A. 1
B. 2
C. 4
D. 8



5. The lengths of two wires are measured as 20 cm and 4 cm respectively, correct to 1 significant figure. Let x cm be the difference between the actual lengths of two wires. Find the lower limit of the value of x.

A. 10.5
B. 11.5
C. 15
D. 16

6. In the figure, the 1st pattern consists of 11 dots. For any positive integer n, the $(n + 1)^{th}$ pattern is formed by adding 6 dots to the n^{th} pattern. Find the number of dots in the 8th pattern.



A. 35
B. 41
C. 47
D. 53

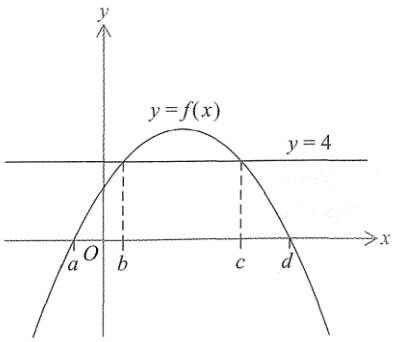
7. Consider the sequence $2, -\frac{2}{3}, \frac{2}{9}, -\frac{2}{27}, \ldots$. Which of the following represents the n^{th} term of the sequence?

A. $-6\left(-\frac{1}{3}\right)^n$
B. $2\left(-\frac{1}{3}\right)^n$
C. $\left(-\frac{2}{3}\right)^{n-1}$
D. $2\left(-\frac{2}{3}\right)^{n-1}$

8. The solution of $3 > 4 - x$ and $1 - \frac{6-x}{2} > -1$ is

A. $x > 1$.
B. $x > 2$.
C. $x > 3$.
D. $x > 4$.

9. The figure shows the graph of $y = f(x)$. The solution of $0 < f(x) < 4$ is

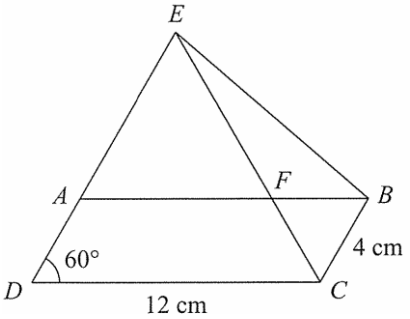


A. $0 < x < d$.
B. $b < x < c$.
C. $0 < x < b$ or $c < x < d$.
D. $a < x < b$ or $c < x < d$.

10. The bearing of town B from town A is N34°W and the bearing of town C from town A is S72°W. If town B and town C have the same distances from town A, find the bearing of town C from town B.

A. N 3°E
B. N 19°E
C. S 3°W
D. S 19°W

11. In the figure, $ABCD$ is a parallelogram. F is a point on AB. CF and DA are produced to meet at E. If the area of ΔAEF is four times the area of ΔBCF, find the area of ΔBEF.



A. $6\sqrt{3}\ \text{cm}^2$
B. $8\sqrt{3}\ \text{cm}^2$
C. $12\sqrt{3}\ \text{cm}^2$
D. $16\sqrt{3}\ \text{cm}^2$

12. The equations of the straight lines L_1 and L_2 are $x + 2y = 0$ and $2x - y = 0$ 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. straight line.
C. pair of parallel lines.
D. pair of perpendicular lines.

13. Three numbers are randomly drawn at the same time from five cards numbered 1, 2, 3, 4 and 5 respectively. Find the probability that the sum of the numbers drawn is an odd number.

A. 0.4
B. 0.5
C. 0.6
D. 0.7

14. It is given that $f(x)$ is partly constant and partly varies inversely as x. If $f(1) = -3$ and $f(2) = 2$, then $f(5) =$

A. 2.
B. 5.
C. 7.
D. 10.

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

A. 25 %.
B. 32.5 %.
C. 48.1 %.
D. 67.5 %.

16. $A(0, 2)$ is a point on the circle $x^2 + y^2 - x + ky - 2 = 0$, where k is a constant. If AB is a diameter of the circle, find the coordinates of B.

A. $(-1, -1)$
B. $(-1, -3)$
C. $(1, -1)$
D. $(1, -3)$

17. If the mode and the median of the ten numbers 2, 4, 0, 3, 6, 1, 7, 9, a and b are 7 and 4.5 respectively, the mean of these ten numbers is

A. 4.3.
B. 4.4.
C. 4.5.
D. 4.6.

18. The stem-and-leaf diagram shows the distribution of a set of data.

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

Three numbers are added to the above set of data. The lower quartile, median and the upper quartile of the distribution become 19, 25 and 37 respectively. If the mean of the three numbers is 29, find the greatest number added.

A. 35
B. 37
C. 40
D. 43

Section B

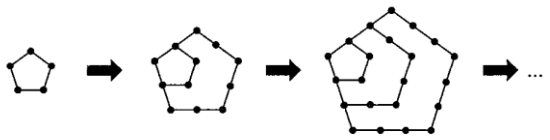
19. If the n^{th} term of the arithmetic sequence $-298, -295, -292, \ldots$ is greater than 16, find the least value of n.

A. 84
B. 92
C. 106
D. 117

20. If $1 - x$, $x - 12$ and $7 - x$ are the first three terms of an arithmetic sequence, find the value of x.

A. 4
B. 6
C. 8
D. 10

21. The figure shows the first three patterns of a series of a pattern.



The 1st pattern consists of 5 dots. The 6th pattern consists of

A. 36 dots.
B. 51 dots.
C. 65 dots.
D. 70 dots.

22. Let a_n be the n^{th} term of a sequence, where $a_n = 3n - 8$. Which of the following are true?

I. The first term of the sequence is -8.

II. $a_1 + a_2 + a_3 + \ldots + a_n = \dfrac{3n^2 - 13n}{2}$.

III. 77 is a term of the sequence.

A. **I** only
B. **II** only
C. **I** and **III** only
D. **II** and **III** only

23. Let a, b and c be positive constants. If $ax^2 + 2bx + c = 0$ has repeated roots, which of the following must be true?

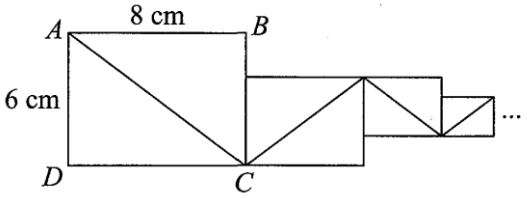
I. $\log a^3$, $\log b^3$ and $\log c^3$ form an arithmetic sequence.

II. $3a$, $3b$ and 3c form a geometric sequence.

III. $a + 3$, $b + 3$ and $c + 3$ form a geometric sequence.

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

24. The figure shows an infinite series of similar rectangles. The first rectangle $ABCD$ has dimensions of $8\text{ cm} \times 6\text{ cm}$. The ratio of the corresponding sides between successive rectangles is $\dfrac{2}{3}$. The diagonals of the rectangles are then joined as shown in the figure. Find the total length of the diagonals.



A. 15 cm
B. 20 cm
C. 30 cm
D. 36 cm

25. Let a_n be the nth term of a geometric sequence. If $a_3 = 96$ and $a_6 = \dfrac{256}{9}$, which of the following must be true?

I. $a_1 = 216$

II. Sum to infinity of the sequence is 648.

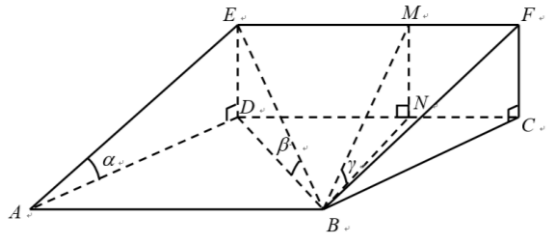
III. $a_2 + a_4 + a_6 + \cdots + a_{20} > 300$

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

26. Find the sum to infinity of $\dfrac{1}{2} - \dfrac{3}{2^2} + \dfrac{1}{2^3} - \dfrac{3}{2^4} + \dfrac{1}{2^5} - \dfrac{3}{2^6} + \ldots$.

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

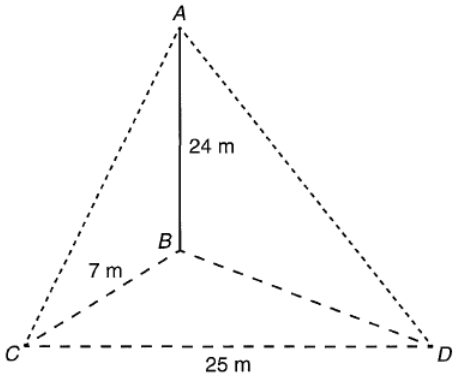
27. The figure shows a right prism $ABCDEF$ with a right-angled triangle as the cross-section. A, B, C and D lie on the same horizontal ground. N is vertically below M. If $\angle EAD = \alpha$, $\angle EBD = \beta$ and $\angle MBN = \gamma$, which of the following is/are true?



I. $\beta < \alpha$
II. $\gamma < \beta$
III. $\alpha = \gamma$

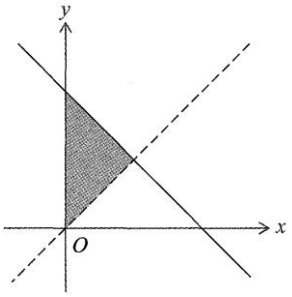
A. **I** only
B. **II** only
C. **I** and **III** only
D. **II** and **III** only

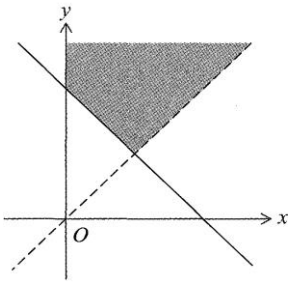
28. In the figure, AB is a vertical pole standing on the horizontal ground BCD, where $\angle CBD = 90°$. If the angle between the plane ACD and the horizontal ground is θ, find the value of $\tan\theta$.

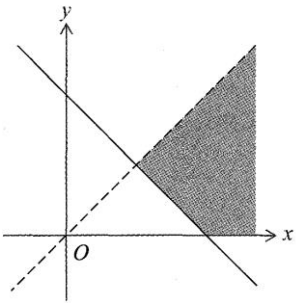


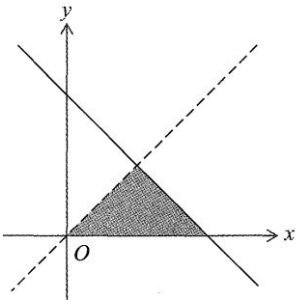
A. $\frac{25}{7}$
B. $\frac{24}{7}$
C. $\frac{7}{24}$
D. $\frac{7}{25}$

29. Which of the following shaded regions can represent the solution of the system of inequalities $\begin{cases} x - y > 0 \\ x + y \geq 5 \\ y > 0 \end{cases}$?

A.


B.


C.


D.


30. Find the range of values of k such that the intersection of the straight lines $2x - y - k = 0$ and $x - y + 3 = 0$ lies inside the circle $x^2 + y^2 - 4x - 6y - 7 = 0$.

A. $k < -1$ or $k > 5$
B. $k < -5$ or $k > 1$
C. $-1 < k < 5$
D. $-5 < k < 1$

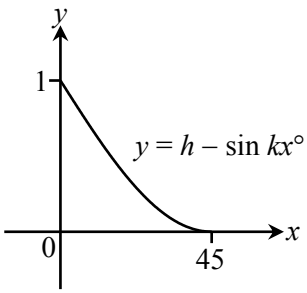
31. 4 boys and 6 girls sit in a row. Find the number of arrangements if there are no boys sitting next to the other boys.

A. 840
B. 17 280
C. 604 800
D. 3 628 800

32. A box contains 4 red balls, 6 yellow balls and 5 blue balls. Alvin repeats drawing one ball at a time randomly from the box without replacement until two balls of the same colour are drawn. Find the probability that he needs exactly three draws.

A. $\frac{4}{9}$
B. $\frac{31}{105}$
C. $\frac{86}{195}$
D. $\frac{77}{225}$

33. The figure shows the graph of $y = h - \sin kx°$, where h and k are constants, and $0 \le x \le 45$. Find the values of h and k.



A. $h = -1$ and $k = \frac{1}{2}$
B. $h = -1$ and $k = 2$
C. $h = 1$ and $k = \frac{1}{2}$
D. $h = 1$ and $k = 2$

34. Find the equation represented by the image which is obtained by translating the graph of $y = 3x^2 - 12x + 13$ upwards by 1 unit and then reflecting the graph with respect to the y-axis.

A. $y = 3x^2 + 12x + 14$
B. $y = 3x^2 + 12x + 12$
C. $y = -3x^2 + 12x - 14$
D. $y = -3x^2 + 12x - 12$

35. A normal distribution of the marks of 2000 candidates has a mean mark of 74 and a standard deviation of 7. If the passing mark is 60, how many candidates failed? (Assume that in a normal distribution, 68%, 95% and 99.7% of the data lie within 1, 2 and 3 standard deviations respectively from the mean.)

A. 3
B. 6
C. 50
D. 100

36. Let m_1 and v_1 be the mean and the variance of the group of numbers $\{x + 1, x + 4, x + 7, x + 10\}$ respectively, and m_2 and v_2 be the mean and the variance of the group of $\{m_1, x + 1, x + 4, x + 7, x + 10\}$ respectively. Which of the following must be true?

A. $m_1 = m_2$ and $v_1 < v_2$
B. $m_1 = m_2$ and $v_1 > v_2$
C. $m_1 > m_2$ and $v_1 < v_2$
D. $m_1 > m_2$ and $v_1 > v_2$

END OF PAPER