MOCK EXAM 6

MATHEMATICS Compulsory Part

PAPER 1

Question-Answer Book

Name: _____

(2 1/4 hours)

This paper must be answered in English

INSTRUCTIONS

1. Write your name in the space provided on Page 1.

2. This paper consists of **THREE** sections, A(1), A(2), and B.

3. Attempt **ALL** questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.

4. Graph paper and supplementary answer sheets will be supplied on request. Write your name on the graph paper and supplementary answer sheets.

5. Unless otherwise specified, all working must be clearly shown.

6. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.

7. The diagrams in this paper are not necessarily drawn to scale.

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SECTION A(1) (35 marks)

1. Simplify $\frac{(m^{-2}n)^3}{m^2n^{-4}}$ and express your answer with positive indices. (3 marks)

2. Make b the subject of the formula $a(b - 5) = 2a - 3b$. (3 marks)

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3. Set *A* has 4 cards numbered 2, 3, 5 and 7 respectively while Set *B* has 6 cards numbered 2, 3, 4, 6, 8 and 9 respectively. One card is randomly drawn from each set of the cards. Find the probability that the sum of the two numbers is larger than 10. (3 marks)

4. Factorize

   (a) $m^3 - 2m^2n + m^2$,

   (b) $m^3 - 2m^2n + m^2 - 4m + 8n - 4$. (4 marks)

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5. The ratio of the weight of a desk to that of a chair is 12 : 5. The total weight of 5 desks and 7 chairs is 57 kg. Find the weight of a desk. (4 marks)

6. The marked price of a toy is higher than its cost by $50. The toy is sold at a discount of 40% on its marked price. After selling the toy, the percentage loss is 20%. Find the cost of the toy. (4 marks)

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7. Figure 1 shows an ice-cream in the shape of a hemisphere of radius r cm put on a right circular cone of height 16 cm and base radius r cm. It is given that the volume of the right circular cone is twice the volume of the ice-cream.

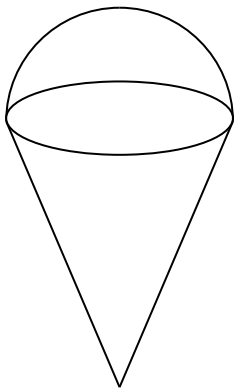

Figure 1

(a) Find r.

(b) Find the volume of the ice-cream in terms of π. (4 marks)

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8. The area of a sector with a radius of 8 cm is 24π cm^2.

(a) Find the angle of the sector.

(b) Find the perimeter of the sector in terms of π. (5 marks)

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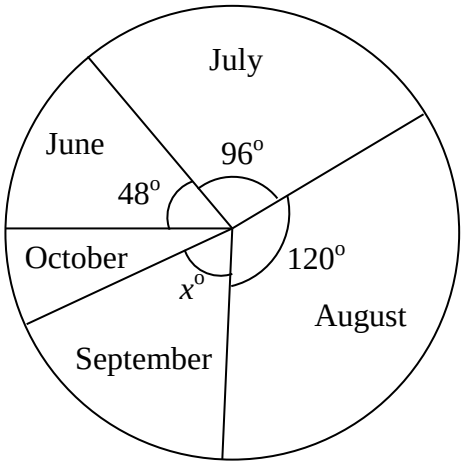
9. In Figure 2, the pie chart shows the distribution of the number of typhoons occurred in Hong Kong in a certain year. In that year, the number of typhoons occurred in June is 25% less than that occurred in September.



The distribution of the number of typhoons occurred in Hong Kong in a certain year

Figure 2

(a) Find x.

(b) Is the total number of typhoons occurred in June and October more than the number of typhoons occurred in September? Explain your answer. (5 marks)

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SECTION A(2) (35 marks)

10. Let $\$C$ be the cost of publishing books. It is given that C is partly a constant and partly varies as the number of books(n) published. When $n = 75$, $C = 5\,900$; when $n = 100$, $C = 7\,700$.

    (a) Find the cost of publishing 90 books. (4 marks)

    (b) Can the cost of publishing books be \$7 880? Explain your answer. (2 marks)

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11. Let $f(x) = (x - 3)^2(x + h) + k$, where h and k are constants. It is given that $f(x)$ is divisible by $x - 1$ and $f(4) = 30$.

(a) Find h and k. (3 marks)

(b) Someone claims that all the roots of the equation $f(x) = 0$ are integers. Do you agree? Explain your answer. (3 marks)

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12. The table below shows the distribution of the numbers of books read by a group of students in a summer holiday

Number of books	1	2	3	4	5	6
Number of students	6	4	4	12	8	2

(a) Find the mean of the distribution. (2 marks)

(b) Are the median and the mode of the distribution equal? Explain your answer. (2 marks)

(c) If n more students join the group and each of them reads 1 book, write down

(i) the value of n such that the mean of the distribution is decreased by 1;

(ii) the least value of n such that the median of the distribution is decreased by 2;

(iii) the greatest value of n such that the mode of the distribution remains unchanged.

(3 marks)

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13. In Figure 3, $\triangle ABC$ and $\triangle CDE$ are equilateral triangles. AB = 15 cm, CD = 12 cm and AD = 9 cm.

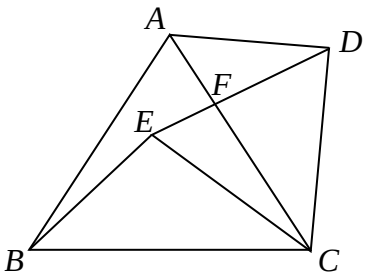

Figure 3

(a) Prove that $\triangle EBC \cong \triangle DAC$. (2 marks)

(b) Is $\triangle EBC$ a right-angled triangle? Explain your answer. (2 marks)

(c) Find the area of $ABCD$. (3 marks)

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14. The circle C passes through $A(4, -2)$ and $B(32, -6)$. P is a moving point in the rectangular coordinate plane such that $AP = BP$. Denote the locus of P by Γ. G is the centre of the circle C. It is given that the y-coordinate of G is k.

(a) (i) Find the equation of Γ.

(ii) Find the equation of C in terms of k. (6 marks)

(b) If C passes through $Q(28, -34)$, find k and the diameter of C. (3 marks)

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SECTION B (35 marks)

15. In a mathematics test, the mean score is 55 marks while the standard deviation is 10 marks. The standard score of Amy in the test is 1.2.

(a) Find the test score Amy gets. (2 marks)

(b) In a science test, the mean score is 61 marks while the standard deviation is 9 marks. Amy gets 70 marks in the science test. In which test does she perform better? Explain your answer. (2 marks)

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16. There are 5 English books, 4 Chinese books and 6 comics on a book shelf. 5 books are randomly selected from these books.

(a) Find the probability that exactly 2 comics are selected. (2 marks)

(b) Find the probability that at least 2 comics are selected. (2 marks)

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17. The general term of an arithmetic sequence is denoted by $A(n)$ where n is a positive integer. It is given that $A(3) = 25$ and $A(8) = 55$.

(a) Let $S(n) = A(1) + A(2) + ... + A(n)$. Find $S(n)$ in terms of n. (3 marks)

(b) Let $B(n) = 10^{6n + 7}$, where n is a positive integer. Find the largest possible value of n such that $\log [B(1)B(2)... B(n)] \leq 8\,000$. (3 marks)

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18. Let $f(x) = x^2 - 4kx + 3k^2 - 1$.

(a) Does the graph of $y = f(x)$ intersect with the x-axis? Explain your answer. (2 marks)

(b) Using the method of completing the square, find the coordinates of the vertex of the graph of $y = f(x)$ in terms of k. (2 marks)

(c) O is the origin. Let $g(x) = f(-x + 2)$. Let S and T be the vertices of the graph of $y = f(x)$ and $y = g(x)$ respectively. Someone claims that the x-coordinate of the circumcentre of $\triangle OST$ is 0. Do you agree? Explain you answer. (4 marks)

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19. Figure 4(a) shows a piece of paper card $ABCDEF$. It is given that $AB = AE = AF$, $AC = AD$, $BC = ED$, $CD = EF$, $AB = 50$ cm, $BC = 30$ cm and $\angle ABC = 60^o$.

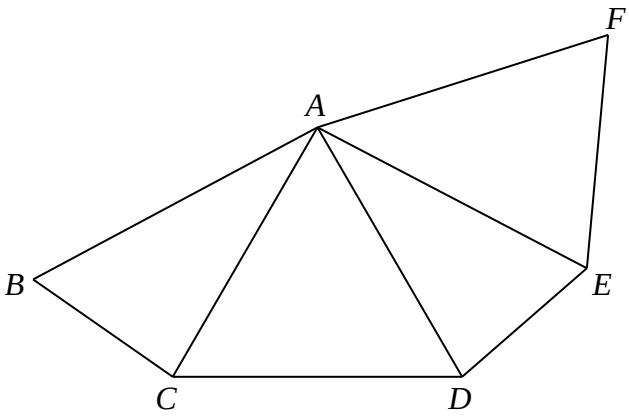

Figure 4(a)

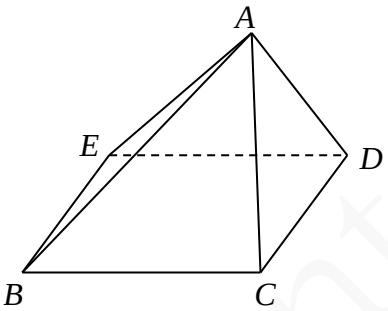

Figure 4(b)

(a) (i) Find AC.

(ii) Find $\angle ACB$.

(iii) Describe how the area of the paper card varies as $\angle BCD$ changes from 100° to 150°.

(7 marks)

(b) The paper card is folded into a pyramid with a rectangular base as shown in Figure 4(b). If $\angle ACD = 50^o$, find the volume of the pyramid. (6 marks)

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END OF PAPER

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