PP-DSE
MATH CP

PAPER 1

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION

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Candidate Number									

PRACTICE PAPER
MATHEMATICS Compulsory Part
PAPER 1
Question-Answer Book

(2¼ hours)

This paper must be answered in English

INSTRUCTIONS

1. After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3, 5, 7, 9 and 11.

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 Candidate Number, mark the question number box and stick a barcode label on each sheet, and fasten them with string INSIDE this book.

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.

8. No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

* A 0 3 0 E 0 0 1 *

SECTION A(1) (35 marks)

1. Simplify $\dfrac{(m^5n^{-2})^6}{m^4n^{-3}}$ and express your answer with positive indices. (3 marks)

2. Make a the subject of the formula $\dfrac{5+b}{1-a}=3b$. (3 marks)

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3. Factorize

(a) $9x^2 - 42xy + 49y^2$,

(b) $9x^2 - 42xy + 49y^2 - 6x + 14y$.

(3 marks)

4. The cost of a chair is $\$360$. If the chair is sold at a discount of 20% on its marked price, then the percentage profit is 30% . Find the marked price of the chair. (4 marks)

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5. The ratio of the capacity of a bottle to that of a cup is $4:3$. The total capacity of 7 bottles and 9 cups is 11 litres. Find the capacity of a bottle. (4 marks)

6. In a polar coordinate system, the polar coordinates of the points A, B and C are $(13, 157°)$, $(14, 247°)$ and $(15, 337°)$ respectively.

   (a) Let O be the pole. Are A, O and C collinear? Explain your answer.

   (b) Find the area of ΔABC.

   (4 marks)

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7. In Figure 1, BD is a diameter of the circle $ABCD$. If $AB = AC$ and $\angle BDC = 36°$, find $\angle ABD$. (4 marks)

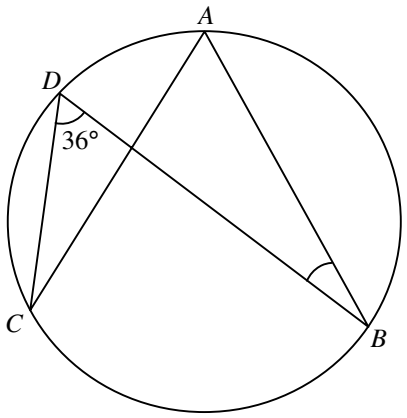

Figure 1

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8. The coordinates of the points A and B are $(-3, 4)$ and $(-2, -5)$ respectively. A' is the reflection image of A with respect to the y-axis. B is rotated anticlockwise about the origin O through 90° to B'.

(a) Write down the coordinates of A' and B'.

(b) Let P be a moving point in the rectangular coordinate plane such that P is equidistant from A' and B'. Find the equation of the locus of P.

(5 marks)

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9. The following table shows the distribution of the numbers of online hours spent by a group of children on a certain day.

Number of online hours	2	3	4	5
Number of children	r	8	12	s

It is given that r and s are positive numbers.

(a) Find the least possible value and the greatest possible value of the inter-quartile range of the distribution.

(b) If $r = 9$ and the median of the distribution is 3, how many possible values of s are there? Explain your answer.

(5 marks)

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SECTION A(2) (35 marks)

10. Let $f(x)$ be a polynomial. When $f(x)$ is divided by $x-1$, the quotient is $6x^2+17x-2$. It is given that $f(1)=4$.

(a) Find $f(-3)$. (3 marks)

(b) Factorize $f(x)$. (3 marks)

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11. Let $\$C$ be the cost of manufacturing a cubical carton of side x cm. It is given that C is partly constant and partly varies as the square of x. When $x = 20$, $C = 42$; when $x = 120$, $C = 112$.

(a) Find the cost of manufacturing a cubical carton of side 50 cm. (4 marks)

(b) If the cost of manufacturing a cubical carton is $\$58$, find the length of a side of the carton. (2 marks)

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12. Figure 2 shows the graphs for Ada and Billy running on the same straight road between town P and town Q during the period 1:00 to 3:00 in an afternoon. Ada runs at a constant speed. It is given that town P and town Q are 16 km apart.

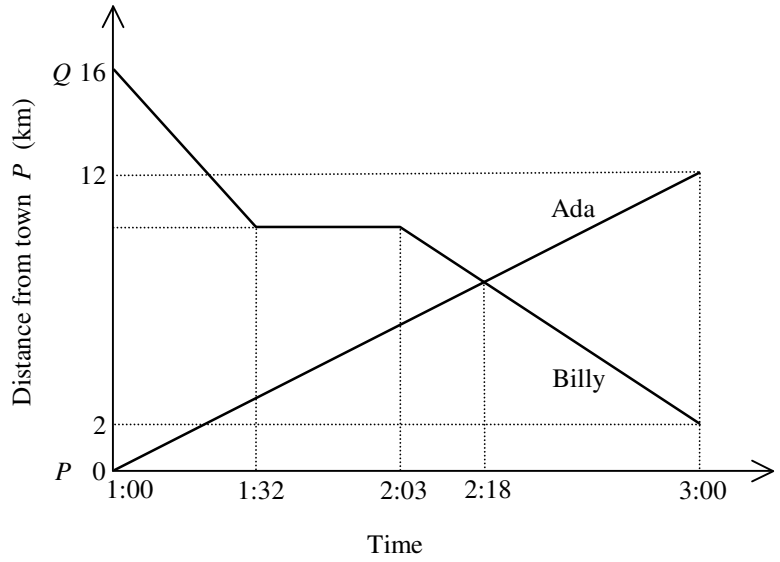

Figure 2

(a) How long does Billy rest during the period? (2 marks)

(b) How far from town P do Ada and Billy meet during the period? (3 marks)

(c) Use average speed during the period to determine who runs faster. Explain your answer. (2 marks)

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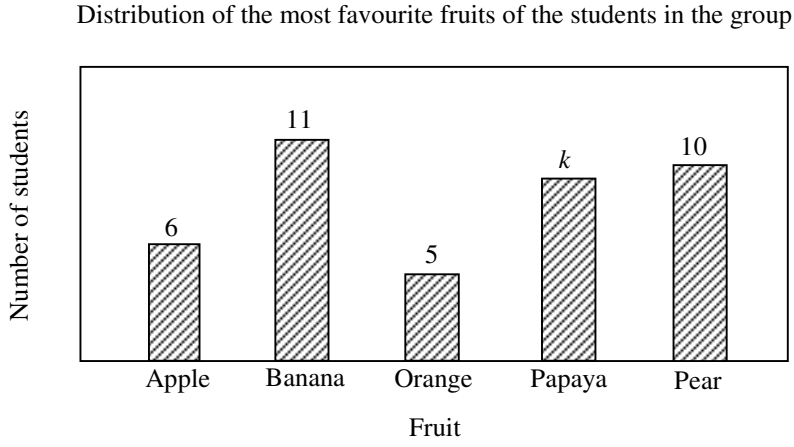
13. The bar chart below shows the distribution of the most favourite fruits of the students in a group. It is given that each student has only one most favourite fruit.



If a student is randomly selected from the group, then the probability that the most favourite fruit is apple is $\frac{3}{20}$.

(a) Find k. (3 marks)

(b) Suppose that the above distribution is represented by a pie chart.

(i) Find the angle of the sector representing that the most favourite fruit is orange.

(ii) Some new students now join the group and the most favourite fruit of each of these students is orange. Will the angle of the sector representing that the most favourite fruit is orange be doubled? Explain your answer.

(4 marks)

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14. In Figure 3, $OABC$ is a circle. It is given that AB produced and OC produced meet at D.

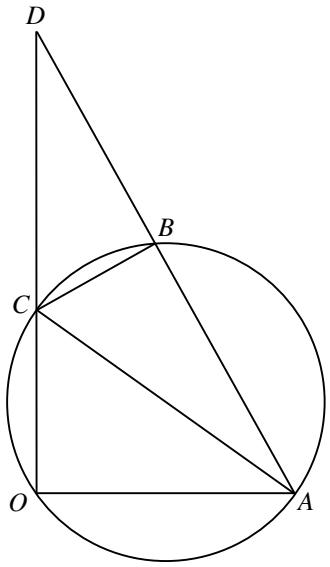

Figure 3

(a) Write down a pair of similar triangles in Figure 3. (2 marks)

(b) Suppose that $\angle AOD = 90°$. A rectangular coordinate system, with O as the origin, is introduced in Figure 3 so that the coordinates of A and D are $(6, 0)$ and $(0, 12)$ respectively. If the ratio of the area of ΔBCD to the area of ΔOAD is $16 : 45$, find

(i) the coordinates of C,

(ii) the equation of the circle $OABC$.

(7 marks)

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SECTION B (35 marks)

15. The mean score of a class of students in a test is 48 marks. The scores of Mary and John in the test are 36 marks and 66 marks respectively. The standard score of Mary in the test is -2.

(a) Find the standard score of John in the test. (2 marks)

(b) A student, David, withdraws from the class and his test score is then deleted. It is given that his test score is 48 marks. Will there be any change in the standard score of John due to the deletion of the test score of David? Explain your answer. (2 marks)

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16. There are 18 boys and 12 girls in a class. From the class, 4 students are randomly selected to form the class committee.

(a) Find the probability that the class committee consists of boys only. (2 marks)

(b) Find the probability that the class committee consists of at least 1 boy and 1 girl. (2 marks)

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17. (a) Express $\frac{1}{1+2i}$ in the form of $a+bi$, where a and b are real numbers. (2 marks)

(b) The roots of the quadratic equation $x^2+px+q=0$ are $\frac{10}{1+2i}$ and $\frac{10}{1-2i}$. Find

(i) p and q,

(ii) the range of values of r such that the quadratic equation $x^2+px+q=r$ has real roots.
(5 marks)

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18. Figure 4 shows a geometric model $ABCD$ in the form of tetrahedron. It is found that $\angle ACB = 60°$, $AC = AD = 20\text{ cm}$, $BC = BD = 12\text{ cm}$ and $CD = 14\text{ cm}$.

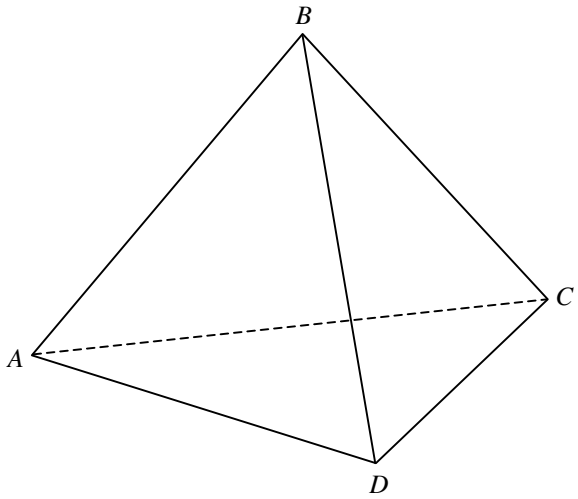

Figure 4

(a) Find the length of AB. (2 marks)

(b) Find the angle between the plane ABC and the plane ABD. (4 marks)

(c) Let P be a movable point on the slant edge AB. Describe how $\angle CPD$ varies as P moves from A to B. Explain your answer. (2 marks)

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19. The amount of investment of a commercial firm in the 1st year is $\$4000000$. The amount of investment in each successive year is $r\%$ less than the previous year. The amount of investment in the 4th year is $\$1048576$.

(a) Find r. (2 marks)

(b) The revenue made by the firm in the 1st year is $\$2000000$. The revenue made in each successive year is 20% less than the previous year.

(i) Find the least number of years needed for the total revenue made by the firm to exceed $\$9000000$.

(ii) Will the total revenue made by the firm exceed $\$10000000$? Explain your answer.

(iii) The manager of the firm claims that the total revenue made by the firm will exceed the total amount of investment. Do you agree? Explain your answer.

(10 marks)

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