

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2013

MATHEMATICS Compulsory Part PAPER 1

Question-Answer Book

8.30 am - 10.45 am (2% 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.
- 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.

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(a) Describe the geometric relationship between L and $\angle AOB$. (b) Find the polar coordinates of the point of intersection of L and AB .	(a)	Solve the inequality $\frac{19-7x}{3} > 23-5x$.
are $(26,10^{\circ})$ and $(26,130^{\circ})$ respectively. Let L be the axis of reflectional symmetry of ΔOAB . (a) Describe the geometric relationship between L and $\angle AOB$. (b) Find the polar coordinates of the point of intersection of L and AB .	(b)	Find all integers satisfying both the inequalities $\frac{19-7x}{3} > 23-5x$ and $18-2x \ge 0$. (4 mark
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7. In Figure 1, ABCD is a quadrilateral. The diagonals AC and BD intersect at E. It is given that BE = CE and $\angle BAC = \angle BDC$.

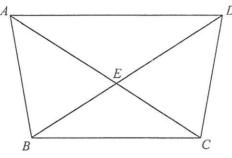


Figure 1

(a) Prove that $\triangle ABC \cong \triangle DCB$.

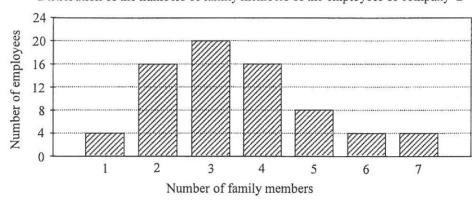
Answers written in the margins will not be marked.

- (b) Consider the triangles in Figure 1.
 - (i) How many pairs of congruent triangles are there?
 - (ii) How many pairs of similar triangles are there?

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9. The bar chart below shows the distribution of the numbers of family members of the employees of company \mathcal{D} .

Distribution of the numbers of family members of the employees of company D



- (a) Find the mean, the inter-quartile range and the standard deviation of the above distribution.
- (b) An employee leaves company D. The number of family members of this employee is 7. Find the change in the standard deviation of the numbers of family members of the employees of company D due to the leaving of this employee.

(5 marks)

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	(a)	Write	down t	he mediai	n and th	e mode	of the ag	es of the	e memb	ers of Co	ommittee	e A.	(2 marks)
	(b)	The s	tem-an nittee <i>E</i>	d-leaf di 3 . It is gi	agram ven tha	below :	shows th	ne distri distribu	ibution ution is	of the 47.	ages of	f the r	nembers of
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one	weight of a tray of perimeter ℓ metres is W grams. It is given that W is the part varies directly as ℓ and the other part varies directly as ℓ^2 . When $\ell=1$ n $\ell=1$, $\ell=1$ when $\ell=1$ is $\ell=1$.	
(a)	Find the weight of a tray of perimeter 1.2 metres.	(4 marks)
(b)	If the weight of a tray is 594 grams, find the perimeter of the tray.	(2 marks)
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(a)	Find a , b and c .	(4 marks
(b)	Someone claims that all the roots of the equation $f(x) = 0$ are real numbers. Explain your answer.	Do you agree (3 marks

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re	cast	workshop, 2 identical solid metal right circular cylinders of base radius R cm are melted and into 27 smaller identical solid right circular cylinders of base radius r cm and height 10 cm. It en that the base area of a larger circular cylinder is 9 times that of a smaller one.
(a) .	Find
		(i) $r:R$,
		(ii) the height of a larger circular cylinder. (5 marks)
(t)	A craftsman claims that a smaller circular cylinder and a larger circular cylinder are similar. Do you agree? Explain your answer. (2 marks)

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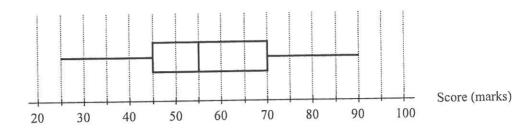
			ircle C is $x^2 + y^2 - 12x - 34y + 225 = 0$. Denote the centre of C by R.	
(a)	Write	down th	the coordinates of R . (1 m)	ark
(b)	The e	quation ect. Let	of the straight line L is $4x+3y+50=0$. It is found that C and L do P be a point lying on L such that P is nearest to R .	no
	(i)	Find th	ne distance between P and R .	
	(ii)	Let Q	be a moving point on C . When Q is nearest to P ,	
		(1)	describe the geometric relationship between P , Q and R ;	
		(2)	find the ratio of the area of $\triangle OPQ$ to the area of $\triangle OQR$, where O is origin. (8 ms	

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SECTION B (35 marks)

15. The box-and-whisker diagram below shows the distribution of the scores (in marks) of the students of a class in a test. Susan gets the highest score while Tom gets 65 marks in the test. The standard scores of Susan and Tom in the test are 3 and 0.5 respectively.



(a) Find the mean of the distribution.

(2 marks)

Answers written in the margins will not be marked.

(b) Susan claims that the standard scores of at least half of the students in the test are negative. Do you agree? Explain your answer. (2 marks)

	box contains 5 white cups and 11 blue cups. If 6 cups are randomly drawn from the time,	box at th
(2	find the probability that at least 4 white cups are drawn;	(2 marks
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- Let $f(x) = 36x x^2$. Using the method of completing the square, find the coordinates of the 17. (a) (2 marks) vertex of the graph of y = f(x).
 - The length of a piece of string is 108 m . A guard cuts the string into two pieces. One piece is (b) used to enclose a rectangular restricted zone of area $A \,\mathrm{m}^2$. The other piece of length $x \,\mathrm{m}$ is used to divide this restricted zone into two rectangular regions as shown in Figure 2.

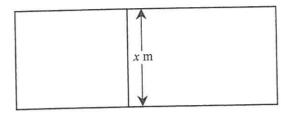


Figure 2

- Express A in terms of x. (i)
- The guard claims that the area of this restricted zone can be greater than 500 m^2 . Do (ii) you agree? Explain your answer.

(4 marks)

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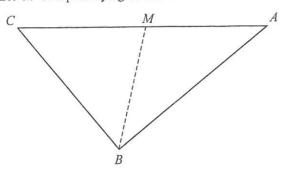


Figure 3(a)

Find

- (i) $\angle BCM$,
- (ii) CM.

(3 marks)

Answers written in the margins will not be marked.

(b) Peter folds the triangular paper card described in (a) along BM such that AB and BC lie on the horizontal ground as shown in Figure 3(b). It is given that $\angle AMC = 107^{\circ}$.

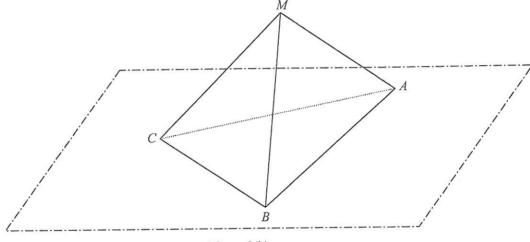


Figure 3(b)

- (i) Find the distance between A and C on the horizontal ground.
- (ii) Let N be a point lying on BC such that MN is perpendicular to BC. Peter claims that the angle between the face BCM and the horizontal ground is $\angle ANM$. Do you agree? Explain your answer.

(5 marks)

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of the previous year, where r is a constant, and the total floor area of public housing flats pulled down each year is $3 \times 10^5 \text{ m}^2$. It is found that the total floor area of all public housing flats at the end of the 3rd year is $1.026 \times 10^7 \text{ m}^2$. (a) (i) Express, in terms of r , the total floor area of all public housing flats at the end of the 2nd year. (ii) Find r . (4 mark) (b) (i) Express, in terms of n , the total floor area of all public housing flats at the end of the n th year. (iii) At the end of which year will the total floor area of all public housing flats find exceed $4 \times 10^7 \text{ m}^2$? (5 mark) (c) It is assumed that the total floor area of public housing flats needed at the end of the n th year is $(a(1.21)^n + b) \text{ m}^2$, where a and b are constants. Some research results reveal the following information: $ \boxed{n} \text{The total floor area of public housing flats needed at the end of the nth year (m^2)} 1 1 1 1063×107 A research assistant claims that based on the above assumption, the total floor area of all public housing flats will be greater than the total floor area of public housing flats needed at the end of the needed $	public	c housir	ment of public housing in a city is under study. It is given that the total floor area of all ag flats at the end of the 1st year is 9×10^6 m ² and in subsequent years, the total floor area using flats built each year is r % of the total floor area of all public housing flats at the end	
the 3rd year is 1.026×10 ⁷ m ² . (a) (i) Express, in terms of r, the total floor area of all public housing flats at the end of the 2nd year. (ii) Find r. (4 mark) (b) (i) Express, in terms of n, the total floor area of all public housing flats at the end of the nth year. (iii) At the end of which year will the total floor area of all public housing flats finexceed 4×10 ⁷ m ² ? (5 mark) (c) It is assumed that the total floor area of public housing flats needed at the end of the nth year is (a(1.21) ⁿ + b) m ² , where a and b are constants. Some research results reveal the following information: n	of the	nrevio	us year where r is a constant, and the total floor area of public housing flats pulled down	
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