

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2016

## MATHEMATICS Compulsory Part PAPER 1

## **Question-Answer Book**

8.30 am – 10.45 am (2½ 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.

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	lify $\frac{2}{4x-5} + \frac{3}{1-6x}$ .	(3 ma
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Factor (a)	5m-10n,	
	$m^2 + mn - 6n^2 ,$	
(c)	$m^2 + mn - 6n^2 - 5m + 10n .$	(4 n
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In a are	polar coordinate system, $O$ is the pole. The polar coordinates of the points $A$ and $(12,75^{\circ})$ and $(12,135^{\circ})$ respectively.
(a)	Find $\angle AOB$ .
(b)	Find the perimeter of $\triangle AOB$ .
(c)	Write down the number of folds of rotational symmetry of $\Delta AOB$ . (4 mark
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(a)	Find $f(x)$ .	
(b)	Solve the equation $f(x) = 90$ .	
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9.	The frequency distribution table and the cumulative frequency distribution table below show	the
	distribution of the heights of the plants in a garden.	

Height (m)	Frequency
0.1 - 0.3	а
0.4 - 0.6	4
0.7 - 0.9	b
1.0 – 1.2	С
1.3 – 1.5	15
1.6 1.8	3

Height less than (m)	Cumulative frequency
0.35	2
0.65	x
0.95	13
1.25	У
1.55	37
1.85	z

- (a) Find x, y and z.
- (b) If a plant is randomly selected from the garden, find the probability that the height of the selected plant is less than 1.25 m but not less than 0.65 m. (5 marks)

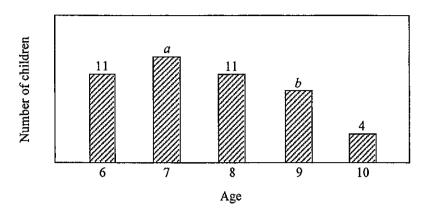
JION A	(2) (35 marks)
point	oordinates of the points $A$ and $B$ are $(5,7)$ and $(13,1)$ respectively. Let $P$ be a moving in the rectangular coordinate plane such that $P$ is equidistant from $A$ and $B$ . Denote the locus by $\Gamma$ .
(a)	Find the equation of $\Gamma$ . (2 marks)
(b)	$\Gamma$ intersects the x-axis and the y-axis at $H$ and $K$ respectively. Denote the origin by $O$ . Let $C$ be the circle which passes through $O$ , $H$ and $K$ . Someone claims that the circumference of $C$ exceeds 30. Is the claim correct? Explain your answer. (3 marks)
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milk	overted right circular conical vessel contains some milk. The vessel is held vertically in the vessel is 12 cm. Peter then pours $444\pi$ cm <sup>3</sup> of milk into the vessel without ow finds that the depth of milk in the vessel is 16 cm.	The depth of at overflowing.
(a)	Express the final volume of milk in the vessel in terms of $\pi$ .	(3 marks)
(b)	Peter claims that the final area of the wet curved surface of the vessel is at least you agree? Explain your answer.	800 cm <sup>2</sup> . Do
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12. The bar chart below shows the distribution of the ages of the children in a group, where a > 11 and 4 < b < 10. The median of the ages of the children in the group is 7.5.

Distribution of the ages of the children in the group



(a) Find a and b.

(3 marks)

- (b) Four more children now join the group. It is found that the ages of these four children are all different and the range of the ages of the children in the group remains unchanged. Find
  - (i) the greatest possible median of the ages of the children in the group,
  - (ii) the least possible mean of the ages of the children in the group.

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- (b) Suppose that AD = 15 cm, BD = 7 cm and DE = 18 cm.
  - (i) Find AM.
  - (ii) Is  $\triangle ABE$  a right-angled triangle? Explain your answer.

(5 marks)

Answers written in the margins will not be marked.

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(a)	Find $l$ , $m$ and $n$ .	(5 m
(b)	How many real roots does the equation $p(x) = 0$ have? Explain your answer.	(5 m
(0)	110 in many rout roots doos the equation $p(x) = 0$ have. Explain your answer.	(5 111
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If 4 boys and 5 gii the queue.	rls randomly form a queue, find the probability that no boys are next to each of
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and the range of the an	arounding at most 39	marks. Is the clair	n correct? Explain you	ir answer.
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(a)	the common difference of the sequence, (2 marks
(b)	the greatest value of $n$ such that the sum of the first $n$ terms of the sequence is positive. (3 marks
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(a)	Using the method of completing the square, find the coordinates of the vertex of the grap.
	of $y = f(x)$ . (2 marks
(b)	The graph of $y = g(x)$ is obtained by translating the graph of $y = f(x)$ vertically. If the graph of $y = g(x)$ touches the x-axis, find $g(x)$ . (2 marks
(c)	Under a transformation, $f(x)$ is changed to $\frac{-1}{3}x^2 - 12x - 121$ . Describe the geometric
	meaning of the transformation. (2 marks
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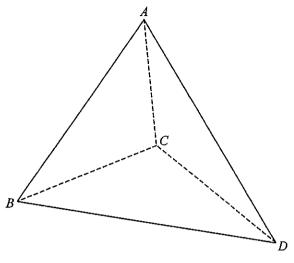


Figure 2

(a) Find  $\angle ABD$  and CD.

Answers written in the margins will not be marked.

(4 marks)

(b) A craftsman claims that the angle between AB and the face BCD is  $\angle ABC$ . Do you agree? Explain your answer. (2 marks)

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	$\triangle OPQ$ is an obtuse-angled triangle. Denote the in-centre and the circumcentre of $\triangle OPQ$ by $I$ and $J$ respectively. It is given that $P$ , $I$ and $J$ are collinear.					
(a)	Prove	e that $OP = PQ$ . (3 marks)				
(b)	A rectangular coordinate system is introduced so that the coordinates of $O$ and $Q$ are and $(40,30)$ respectively while the y-coordinate of $P$ is $19$ . Let $C$ be the circle passes through $O$ , $P$ and $Q$ .					
	(i)	Find the equation of $C$ .				
	(ii)	Let $L_1$ and $L_2$ be two tangents to $C$ such that the slope of each tangent is $\frac{3}{4}$ and				
		the y-intercept of $L_1$ is greater than that of $L_2$ . $L_1$ cuts the x-axis and the y-axis at S				
		and $T$ respectively while $L_2$ cuts the x-axis and the y-axis at $U$ and $V$ respectively. Someone claims that the area of the trapezium $STUV$ exceeds 17 000. Is the claim correct? Explain your answer.				
		(9 marks)				
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