

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2022

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.
- (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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	SECT	TION A(1) (35 marks)	
	1.	Simplify $\frac{(a^3b^{-2})^4}{a^{-5}b^6}$ and express your answer with positive indices.	(3 marks)
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me margms v	2.	Let x and y be two numbers. The sum of x and y is 456 while the product of 7 and	1 x is y.
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Fact	torize	
	$9c^2 - 6c + 1$,	
	$(4c+d)^2 - 9c^2 + 6c - 1.$	
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perce	n is sold at a discount of 30% on its marked price. After selling the fan, the profit is entage profit is 26%. Find the marked price of the fan.	\$78 and the
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Cons	ider the compound inequality	
	$-2(3x+2) > x+10$ or $2x \le -8$ (*).	
(a)	Solve (*).	
(4)		
(b)	Write down the greatest integer satisfying (*).	(4 marks)
		(4 marks)

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antic	coordinates of the points S and T are $(12, -5)$ and $(-3, -7)$ respectively. S is rotated lockwise about O through 90° to S' , where O is the origin. T' is the reflection image of S' respect to the x -axis.
(a)	Write down the coordinates of S' and T' .
(b)	Find the slope of $S'T'$. (4 marks)

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(5 marks)

8. In Figure 1, A is a point lying inside the quadrilateral BCDE such that AC // ED and AD // BC. It is given that $\angle ABC = \angle AED$ and AB = AE.

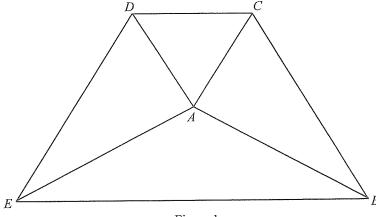


Figure 1

- (a) Prove that $\triangle ABC \cong \triangle AED$.
- (b) If $\angle ABC = 39^{\circ}$ and $\angle DAE = 87^{\circ}$, find $\angle ACD$.

9. The frequency distribution table and the cumulative frequency distribution table below show the distribution of the times taken to complete a 3 km race by a group of students.

Time taken (minutes)	Frequency
10 – 14	а
15 – 19	9
20 – 24	b
25 – 29	3

Time taken less than (minutes)	Cumulative frequency
14.5	3
19.5	x
24.5	У
29.5	20

(a) Write down the value of x.

Answers written in the margins will not be marked.

- (b) Find the mean of the distribution.
- (c) Find the probability that the time taken to complete the 3 km race by a randomly selected student from the group is less than 19.5 minutes.

(5 marks)

SEC	TION A(2) (35 marks)	
10.	It is given that $f(x)$ partly varies as x^2 and partly varies as x . Suppose that and $f(-5) = 15$.	f(4) = 96
	(a) Find $f(x)$.	(3 marks)
	(b) Write down the x-intercept(s) of the graph of $y = 8f(x)$.	(1 mark)
	(c) Let k be a real constant. Find the range of values of k such that the equation $f(x)$ distinct real roots.	= k has two (2 marks)
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11. The stem-and-leaf diagram below shows the distribution of the ages of the players of a football team.

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

The inter-quartile range and the median of the distribution are 14 and 31 respectively.

(a) Find a and b.

(3 marks)

- (b) A player now leaves the football team.
 - (i) Is there any change in the mode of the distribution due to the leaving of the player? Explain your answer.
 - (ii) If the range of the distribution is decreased, find the greatest possible standard deviation of the distribution.

(4 marks)

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(a)	Express, in terms of π , the volume of the smaller sphere. (3 marks)
(b)	The two spheres are melted and recast into two solid right circular cones. Denote these two circular cones by A and B . It is given that the height and the base radius of A are 10 cm and 6 cm respectively. A student finds that the base radius of B is 12 cm. The student claims that A and B are similar. Is the claim correct? Explain your answer. (4 marks)
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(a)	Find a and b .	(3	marks
(b)	Is $x-5$ a factor of $p(x)$? Explain your answer.	(2	marks
(c)	Someone claims that the equation $p(x) = 0$ has two irrational roots. Do Explain your answer.	you (3	agree marks
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	B (35 marks)
There	e are 10 boys and 12 girls in a class. If 4 students are randomly selected from the class to form nittee,
(a)	find the probability that there are 2 boys and 2 girls in the committee; (2 marks
(b)	find the probability that the number of boys and the number of girls in the committee at different. (2 marks
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16.	Let	$g(x) = 3x^2 + 12kx + 16k^2 + 8$, where k is a non-zero real constant.
	(a)	Using the method of completing the square, express, in terms of k , the coordinates of the vertex of the graph of $y = g(x)$. (2 marks)
	(b)	On the same rectangular coordinate system, denote the vertex of the graph of $y = g(x)$ and the vertex of the graph of $y = 2g(-x)$ by A and B respectively. Let M be a point lying on AB such that the area of $\triangle OBM$ is the triple of the area of $\triangle OAM$, where O is the origin. Express, in terms of k , the coordinates of M .
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	c be a real constant. The roots of the equation $x^2 + cx - 9 = 0$ are α and β .
(a)	Express $\alpha^2 + \beta^2$ in terms of c . (3 marks)
(b)	The 1st term, the 2nd term and the 3rd term of an arithmetic sequence are c^2 , $\alpha^2 + \beta^2$ and 85 respectively. Find the least value of n such that the sum of the first n terms of the sequence is greater than 2×10^6 . (4 marks)

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18. In Figure 2, the triangular paper card PQR is held such that PQ lies on the horizontal ground. It is given that PQ = 30 cm, PR = 25 cm and $\angle QPR = 95^{\circ}$.

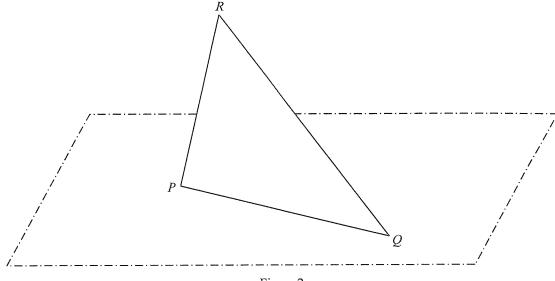


Figure 2

- (a) Find
 - (i) the length of QR,
 - (ii) $\angle PQR$.

(4 marks)

Answers written in the margins will not be marked.

(b) Let M be the mid-point of QR. A craftsman finds that the angle between PR and the horizontal ground is 70° . The craftsman claims that the angle between PM and the horizontal ground exceeds 40° . Is the claim correct? Explain your answer. (3 marks)

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	19.	outsio	centre of the circle C is the point $G(83,112)$. It is found that the point $A(158)$ de C . AP and AQ are the tangents to C at the points P and Q respectively. It is gives through the point $(23,67)$.	. ,
		(a)	Find the equation of the straight line passing through A and G .	(2 marks)
		(b)	Find the coordinates of the point of intersection of AG and PQ .	(3 marks)
		(c)	Find the equation of the inscribed circle of ΔAPQ .	(4 marks)
		(d)	Someone claims that the ratio of the area of the inscribed circle to the area of the circle of ΔAPQ is 1:4. Do you agree? Explain your answer.	cumcircle (3 marks)
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