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TUTGATHER PRACTICE PAPER

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2027

Candidate Number

MATHEMATICS Compulsory Part
PAPER 1

Question-Answer Book

TUTGATHER
PRACTICE PAPER · NOT AN OFFICIAL HKEAA PAPER

1 hour 5 minutes

This paper must be answered in English

Topic practice: Loci

INSTRUCTIONS

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

(2) Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins.

(3) Unless otherwise specified, all working must be clearly shown.

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

(5) The diagrams in this paper are not necessarily drawn to scale.

(6) Calculators and mathematical drawing instruments may be used.

(7) The marks for each question are shown in brackets.

(8) No extra time will be given after the 'Time is up' announcement.

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SECTION A(1) (16 marks)

1. In the rectangular coordinate plane, $A(1, 2)$ and $B(5, 6)$ are two fixed points. A point $P(x, y)$ moves such that $PA = PB$. Describe the locus of P geometrically and find its equation. **(3 marks)**

2. A point P moves in the rectangular coordinate plane such that its distance from the point $C(2, -1)$ is always 5 units. Find the equation of the locus of P. **(3 marks)**

3. A point $P(x, y)$ moves such that its distance from the line $L: 3x + 4y - 10 = 0$ is always 2 units. Find the equations of the possible loci of P. **(4 marks)**

Answers written in the margins will not be marked.

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4. The locus Γ_1 is the circle $x^2 + y^2 - 6x - 8y + 16 = 0$. The locus Γ_2 is the straight line $x + y - 4 = 0$. **(6 marks)**

(a) Find the centre and radius of Γ_1.

(b) Find the coordinates of the intersection points of Γ_1 and Γ_2.

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SECTION A(2) (24 marks)

5. In the rectangular coordinate plane, $A(-2, 1)$ and $B(4, 5)$ are two fixed points. A point $P(x, y)$ moves such that $PA = PB$. **(7 marks)**

(a) Find the equation of the locus of P.

(b) The locus of P intersects the x-axis at C and the y-axis at D. Find the area of $\triangle OCD$, where O is the origin.

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6. A point $P(x, y)$ moves such that its distance from $A(1, 2)$ is always twice its distance from $B(4, -1)$. **(8 marks)**

(a) Show that the locus of P is a circle.

(b) Find the centre and radius of this circle.

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7. In the rectangular coordinate plane, $A(0, 6)$ and $B(8, 0)$ are two fixed points. A point $P(x, y)$ moves such that the perpendicular distance from P to the line AB is always equal to the perpendicular distance from P to the x-axis. **(9 marks)**

(a) Find the equation of the line AB.

(b) Show that the locus of P consists of two straight lines, and find their equations.

(c) Describe the geometric meaning of these two lines in relation to $\angle OAB$ and $\angle OBA$, where O is the origin.

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SECTION B (10 marks)

8. Let Γ_1 be the circle $x^2 + y^2 - 4x - 6y + 9 = 0$ and Γ_2 be the circle $x^2 + y^2 - 10x - 2y + 21 = 0$. **(10 marks)**

(a) Find the centres and radii of Γ_1 and Γ_2.

(b) Find the coordinates of the intersection points of Γ_1 and Γ_2.

(c) A point P moves such that its power with respect to Γ_1 equals its power with respect to Γ_2. Show that the locus of P is a straight line and find its equation.

(d) Hence, or otherwise, find the equation of the common chord of Γ_1 and Γ_2.

END OF PAPER

Answers written in the margins will not be marked.

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