TMUA Coordinate Geometry

Syllabus

Equation of a straight line; parallel and perpendicular lines; equation of a circle; circle theorems.

1a) Find the coordinates of the point lying between A (2,3) and B $(8, -3)$ which divides the line segment AB in the ratio 1:2.

b) Find the x-coordinate of the point where the perpendicular bisector of the line segment joining the points (2,-6) and (5,4) cuts the x-axis.

c) The perpendicular bisector of the line segment joining the points (3,-5) and (1,1) passes through the point with coordinates $(11,a)$. Find the value of a.

d) The straight line L_1 passes through points A (13,5) and B (9,2) and D.

The straight line L_2 passes through points C (2,3) and D and is perpendicular to L_1

Find the coordinates of D.

e) Find the shortest distance between the parallel lines with equations:

$x + 2y = 10$ and $x + 2y = 20$

f) A line L has equation $y = 4 - 3x$. A second line is perpendicular to L and passes through (-2,0). Find the area of the region enclosed by the two lines and the x-axis.

g) The points A, B and C have coordinates (0,3) and $(2, -1)$ and $(k,1)$ respectively. AB and BC are perpendicular. Find the area of the triangle ABC.

h) The straight line L passes through points (2,5) and $(-2,3)$ and meets the coordinate axes at P and Q. Find the area of a square with side PQ.

i) The points A and B have coordinates $(-1,4)$ and $(3, -2)$ respectively.
A line L is perpendicular to AB and passes through B
Find the area of the region enclosed by L and the coordinate axes

j) The points A and B have coordinates $(-4,5)$ and $(0,4)$ respectively.
The point C lies on the straight line through A and B such that the distance AB is the same as the distance BC. Find the coordinates of C.

k) The points A and B have coordinates $(1,4\sqrt{3})$ and $(-3+\sqrt{3},3)$ respectively.
The straight line L through A and B meets the x-axis at C.
Calculate the acute angle between L and the x-axis

l) The points A and B have coordinates $(8,2)$ and $(11,3)$ respectively.
The point C lies on the straight line with equation $x + y = 14$
Given that the distance AC is twice as large as the distance AB, find the two possible sets of coordinates of C.

2a) The straight line segment joining the points (6,-3) and (14,9) is a diameter of a circle. What is the equation of the circle?

b) The straight line segment joining the points $(-4,3)$ and $(0,5)$ is a chord of a circle with centre on the line with equation $y = 3x + 5$. What is the equation of the circle?

c) Find the equation of the tangent to the circle $x^2 + y^2 - 8x - 14y + 40 = 0$ at the point (8,4)

d) A tangent to the circle $x^2 + y^2 = 36$ passes through the point (10,0) and crosses the positive y-axis. What is the coordinate of the point where the tangent meets the y-axis?

e) Find the radius of the circle with equation $2x^2 + 2y^2 + 12x - 4y + 13 = 0$

f) A circle has equation $x^2 + y^2 - 10x - 12y + 56 = 0$ and C is the centre of the circle.
The tangent to the circle at A (6,4) meets the y-axis at B. Find the area of triangle ABC.

g) A circle has centre (8,k) where k is a constant.
The straight line with equation $y = 3x - 12$ is tangent to the circle at (5,3).
Find the equation of the circle.

h) A circle has centre (5,6).
The straight line which passes through (1,8) and (10,11) is a tangent to the circle.
Find the radius of the circle.

i) A circle has equation $x^2 + y^2 + 2x - 4y + 1 = 0$.
The straight line with equation $y = mx$ is a tangent to the circle.
Find the difference in the possible values of m.

j) A circle has centre at the origin and radius R.
The circle fits wholly inside the circle with equation $x^2 + y^2 - 10x - 24y = 231$.
Find the range of possible value of R.

k) A circle is drawn inside a regular hexagon so that the circle touches each side of the hexagon.
What fraction of the hexagon is covered by the circle?

l) Find the shortest distance between the circle $x^2 + y^2 + 6x + 8y = 75$ and the origin.

m) Find the shortest distance between the line $x + 2y = 2$
and the circle $x^2 + y^2 - 6x - 8y + 21 = 0$

n) Find the shortest distance between the two circle with equations:
$(x - 5)^2 + (y - 9)^2 = 45$ and $(x + 1)^2 + (y + 3)^2 = 5$

o) The two circles with equations below have exactly one point in common.

$(x + 1)^2 + (y - 5)^2 = 36$ and $(x - 8)^2 + (y + 7)^2 = r^2$

Find the two possible values of r

p) The two circles with equations below have exactly one point in common.

$(x + r)^2 + (y + r)^2 = 4r^2$ and $(x - r)^2 + (y - 2)^2 = r^2$

Find the value of r

q) Circle C_1 has equation $(x + 2)^2 + (y - 2)^2 = 7$

Circle C_2 has equation $(x - 6)^2 + (y - 2)^2 = 7$

The straight line L is a tangent to both circles and has a positive gradient.

The angle between L and the x-axis is θ. Find $cos\theta$

r) Circle C_1 has equation $x^2 + y^2 - 10x - 10y + 41 = 0$

Circle C_2 has centre $(k,5)$ and touches both C_1 and the y-axis

Find the difference between the two possible values of k.