



SPTA

Higher Homework

Mixed 7

Vectors, Circles & Straight Line



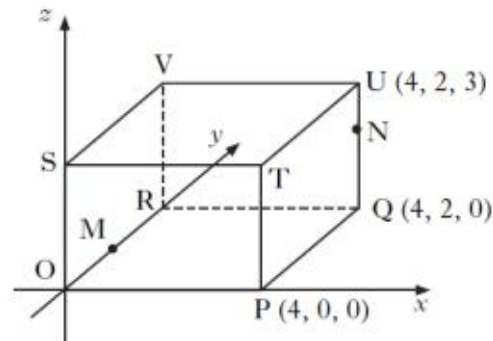
1. The diagram shows a cuboid $OPQR, STUV$ relative to the coordinate axes.

P is the point $(4, 0, 0)$,

Q is $(4, 2, 0)$ and U is $(4, 2, 3)$.

M is the midpoint of OR .

N is the point on UQ such that $UN = \frac{1}{3}UQ$



(a) State the coordinates of M and N .

(b) Express VM and VN in component form.

(c) Calculate the size of angle MVN .

(7)

2. (a) Write down the centre and calculate the radius of the circle with equation

$$x^2 + y^2 + 8x + 4y - 38 = 0$$

(2)

- (b) A second circle has equation $(x - 4)^2 + (y - 6)^2 = 26$

Find the distance between the centres of these two circles and hence show that the circles intersect.

(4)

- (c) The line with equation $y = 4 - x$ is a common chord passing through the points of intersection of the two circles.

Find the coordinates of the points of intersection of the two circles.

(5)

3. (a) Find the equation of l_1 , the perpendicular bisector of the line joining $P(3, -3)$ to $Q(-1, 9)$.

(4)

- (b) Find the equation of l_2 which is parallel to PQ and passes through $R(1, -2)$.

(2)

- (c) Find the point of intersection of l_1 and l_2

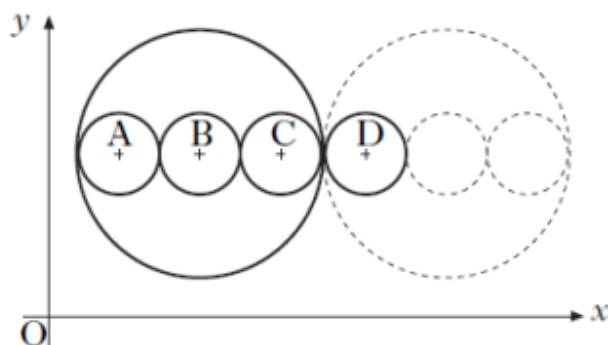
(3)

4. The large circle has equation $x^2 + y^2 - 14x - 16y + 77 = 0$

Three congruent circles with centres A , B and C are drawn inside the large circle with the centres lying on a line parallel to the x -axis.

This pattern is continued, as shown in the diagram.

Find the equation of the circle with centre D .



(5)