PRACTICE 4.4 – Parallel and Perpendicular Lines

* Full, worked solutions can be found in the folder linked on the Course Website ☺

Exercise 4G

1 Find the gradient of a line which is parallel to each line with the given equation:

a $y = -x + 6$ **b** $x = 7$

c $x - 3y = 5$ **d** $y = -\frac{2}{5}(x - 1)$

2 Find the gradient of a line which is perpendicular to each of the following lines:

a $y = -3x + 11$ **b** $-\frac{x}{4} + 2y = 0$

c $y = -3$ **d** $y = \frac{2(x-1)}{3}$

3 L_1 and L_2 are the trajectories of two ships moving in straight lines. Determine whether the ships' trajectories are perpendicular, parallel or neither:

a Line L_1 passes through the points $(0, -4)$ and $(-1, -7)$; and line L_2 passes through the points $(3, 0)$ and $(-3, 2)$.

b Line L_1 has equation $2y - \frac{1}{2}x + 3 = 0$, and line L_2 has equation $y - 3 = 0.25(x - 1)$.

c Line L_1 has equation $y = -\frac{2}{5}x - 1$, and line L_2 has equation $x - \frac{y}{3} = 4$.

4 Determine whether the straight air routes with equations $x - \frac{y}{2} = -3$ and $x = -5$ are intersecting or not. If they are intersecting, find the point of intersection.

5 A ski resort is building two parallel straight ski slopes for children. One of them has a gradient of $\frac{1}{3}$. The other ski slope will pass through points $(2, -3)$ and $(s, -5)$. Find the value of s.

6 A straight connecting street segment is built perpendicular to an existing street with equation $y = \frac{2}{7}x + 3$. Determine the equation of the line of the new street segment, which passes through point $B(-1, -0.2)$.

7 A fish farm builds a breeding basin in the form of a quadrilateral ABCD, with $A(-3, -1)$, $B(2, 0)$, $C(5, 3)$ and $D(0, 2)$. Show that the quadrilateral ABCD is a parallelogram.

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Exercise 4H

1 Two friends, Alison and Bernard, are walking along two different roads. The roads can be represented by the lines with equations $y = -x + 410$ and $y = \frac{1}{2}x - 100$.

Alison is on the first road at the point with coordinates $(0, 410)$ and Bernard is at the point with coordinates $(50, -75)$.

a Verify that Bernard is on the road with equation $y = \frac{1}{2}x - 100$.

b Find the coordinates of the point of intersection of the two roads.

2 Find the equation of the perpendicular bisector of each of the following line segments:

a the line segment joining A(2, 2) and B(4, 6)

b [CD], if the equation of the line passing through C and D is $x + y = 3$ and the midpoint of [CD] is $(2, 1)$.

3 Find the shortest distance from a hotel located at $(2, 4)$ to a straight road with equation $3x + 5y + 8 = 0$.

4 Two towns are located at points $A(2, -2)$ and $B(8, 5)$. A new school is to be built on a straight road with equation $-x + 7y = -4$. Find the location of the school so that it is equidistant from the two towns.

5 A triangular park has vertices at $A(-1, -1)$, $B(4, 4)$ and $C(7, -1)$. A fountain is to be built that is equidistant from all vertices. Find the location D of the fountain.