Student Name: _____	**Grade**: _____
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7 Year 9 Term 4 Week 7 Homework

7.1 Co-ordinate geometry

7.1.1 The equation of a line given by two points

The equation of the straight line that passes through the points (x_1, y_1) and (x_2, y_2) is given by:

$$\frac{y-y_1}{x-x_1} = \frac{y_2-y_1}{x_2-x_1}$$

Exercise 7.1.1

1. *Determine, in general form, the equation of the line that passes through the points P(9, 20) and Q(3, 12).*

2. *Show that the points A(4, -2), B(10, 7) and C(3, $-3\frac{1}{2}$) are collinear.*

3. *Find the value of **t** given that the points U(2, 7), V(-1, -11) and W($-\frac{2}{3}$, t) are collinear.*

4. *Find the co-ordinates of E, the point of intersection of the lines $y = 2x + 1$ and $y = -2x + 3$. Hence find the equation of the line that passes through E and the points (-2, -6).*

7.1.2 Parallel lines

If the line $\boldsymbol{l}_1$ has gradient m_1 and the line $\boldsymbol{l}_2$ has gradient m_2 , then the lines $\boldsymbol{l}_1$ and $\boldsymbol{l}_2$ are parallel if $m_1 = m_2$.

Exercise 7.1.2 State whether or not these lines are parallel.

1. $y = 4x + 9$ *and* $y = 4x - 7$

2. $y = 6 - 2x$ *and* $y = 2x - 6$

3. $y = \frac{1}{3}x + 4$ *and* $y = 2 + \frac{1}{3}x$

Exercise 7.1.3 Find, in the general form, the equation of the line that is parallel to:

1. $y = x - 2$ *and passes through P(2, 4)*

2. $y = \frac{1}{4}x - 2$ *and passes through Q(3, -4)*

3. $3x - 8y = 32$ *and passes through R(-3, -2)*

7.1.3 Perpendicular lines

If the line $\boldsymbol{l}_1$ has gradient m_1 and the line $\boldsymbol{l}_2$ has gradient m_2 , then the lines $\boldsymbol{l}_1$ and $\boldsymbol{l}_2$ are perpendicular if $m_1 \times m_2 = -1$.

Exercise 7.1.4 State whether or not these lines are perpendicular.

1. $y = 3x - 2$ *and* $y = 4 - 3x$

2. $y = 5x + 2$ *and* $y = \frac{1}{5}x - 2$

3. $y = -\frac{2}{5}x + 3$ *and* $y = \frac{5}{2}x + 9$

Exercise 7.1.5 Find the equation of the line that is perpendicular to:

1. $y = x + 4$ *and cuts the y-axis at 2*

2. $y = 2 - \frac{1}{5}x$ *and has a y-intercept of 8*

3. $y = -\frac{2}{5}x + 5$ *and meets the y-axis at 6*

7.2 Miscellaneous Exercise

Exercise 7.2.1

1. *A is the midpoint of PQ with P(-3, 1) and Q(7, 5). B is the midpoint of SR with R(-10, -4) and S(-2, 2). Find the equation of the line that is parallel to AB and cuts the y-axis at 13.*

2. *Express each of the following equations in the gradient-intercept form, then determine whether the lines are parallel.*

   (a) $x = 4y - 4 = 0$ *and* $y = 8 - 4x$

   (b) $3x - 5y = 10$ *and* $y = -\frac{3}{5}x - 10$

   (c) $5x - 2y + 6 = 0$ *and* $2y + -5x + 6 = 0$

3. *Find in the general form the equation of the line that is parallel to* $y = \frac{1}{3}x - 2$ *and passes through A(-3, 4).*

4. *This question outlines an alternate method for finding the equation of a line that passes through a given point and its parallel to a given line. It is often referred to as the k-method for parallel lines:*

   (a) Show that the lines $ax + by + x = 0$ *and* $ax + by + k = 0$ *are parallel.*

   (b) Write down the equation of the line l_1 *with constant term k that is parallel to* $3x + 2y + 8 = 0$.

   (c) If l_1 *passes through (1. -4), find the value of k.*

   (d) Hence, find in the general form the equation of l_1*, the line that is parallel to* $3x+2y+8 = 0$ *and passes through (1, -4).*

5. *Find the gradient of each line and hence determine the value of k given that the line:*

   (a) $y = (k-7)x + 1$ *is perpendicular to* $y = \frac{1}{4}x + 6$

   (b) $y = \frac{1}{3}x - 3$ *is perpendicular to* $3x - ky + 9 = 0$

   (c) $kx + 4y - 2 = 0$ *is perpendicular to* $kx - 9y - 4 = 0$

6. *Express each equation in the gradient-intercept form, then determine whether the lines are perpendicular.*

   (a) $y = \frac{1}{2}x - 3$ *and* $2x + y + 4 = 0$

   (b) $4x - 6y - 3 = 0$ *and* $6x + 9y + 2 = 0$

   (c) $x + y - 4 = 0$ *and* $y = -x$

7. *This question outlines an alternate method for finding the equation of a line that passes through a given point and is perpendicular to given line. It is often referred to as k-method for perpendicular lines.*

   (a) *Show that the lines* $ax + by + c = 0$ *and* $bx - ay + k = 0$ *are perpendicular.*

   (b) *Write down the equation of the line* l_1 *with constant k that is perpendicular to* $4x + 5y - 7 = 0$.

   (c) *If* l_1 *passes through (2, 3), find the value of k.*

   (d) *Hence, find in the general form the equation of* l_1*, the line that is perpendicular to* $4x + 5y - 7 = 0$. *and pases through (2, 3).*

   (e) *Use the k-method outlined above to find in the general form the equation of the line that passes through the point (-1, -8) and is perpendicular to the line* $2x + 5y - 8 = 0$.