

Year 11 Math Homework

Student Name: _____	Grade: _____
Date: _____	Score: _____

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7 Year 11 Topic 7 — Coordinate Geometry Part 2

7.1 Coordinate Geometry – Straight Lines

7.1.1 Further Equations of Lines

- Point-gradient form: $y - y_1 = m(x - x_1)$

- Two-point formula: $\frac{y-y_1}{x-x_1} = \frac{y_2-y_1}{x_2-x_1}$

- Two-intercept form: $\frac{x}{a} + \frac{y}{b} = 1$

Exercise 7.1.1 Use point-gradient form $y - y_1 = m(x - x_1)$ to find the general form of the line:

1. through (1, 2) with gradient 2,

2. through (-3, 2) with gradient $-\frac{1}{3}$,

3. with gradient -1 through (3, -4).

Exercise 7.1.2 Given the points $A(1, -2)$ and $B(-3, 4)$, find the general form of the equation of:

1. the line AB,

2. the line through A perpendicular to AB.

Exercise 7.1.3

1. Find the point of intersection M of the lines $\ell_1 : x + y = 2$ and $\ell_2 : 4x - y = 13$.

2. Show that M lies on $\ell_3 : 2x - 5y = 11$, and hence that ℓ_1 , ℓ_2 , and ℓ_3 are concurrent.

Exercise 7.1.4 On a number plane plot the points $A(4, 3)$, $B(0, -3)$ and $C(4, 0)$.

1. Find the equation of BC .

2. What shape best describes the quadrilateral $OABC$?

3. Find the area of $OABC$ and the length of the diagonal AB .

Exercise 7.1.5 Triangle ABC has vertices $A(1, 0)$, $B(6, 5)$ and $C(0, 2)$.

1. Show that it is right-angled.

2. Find the equation of each side.

Exercise 7.1.6 Find k if the lines $\ell_1 : x + 3y + 13 = 0$, $\ell_2 : 4x + y - 3 = 0$ and $\ell_3 : kx - y - 10 = 0$ are concurrent.

Exercise 7.1.7 Find the point of intersection of $px + qy = 1$ and $qx + py = 1$, and explain why these lines intersect on the line $y = x$.

Exercise 7.1.8

1. Write down, in general form, the equation of a line parallel to $2x - 3y + 1 = 0$.

2. Hence find the equation of the line if it passes through:

(a) $(-1, 2)$

(b) $(2, -1)$

Exercise 7.1.9

1. Write down, in general form, the equation of a line perpendicular to $3x + 4y - 3 = 0$.

2. Hence find the equation of the line if it passes through:

(a) $(-1, 4)$

(b) $(-2, -2)$

7.1.2 Perpendicular Distance

- *Perpendicular Distance from the Origin:* $p = \frac{|c|}{\sqrt{a^2+b^2}}$
- *Perpendicular Distance Formula:* $p = \frac{|ax_1+by_1+c|}{\sqrt{a^2+b^2}}$

Exercise 7.1.10 Find the perpendicular distance between each point and line:

1. $(-2, 1)$ and $3x + 4y - 2 = 0$

2. $(-3, 2)$ and $4x - y - 3 = 0$

3. $(1, 3)$ and $2x + 4y + 1 = 0$

Exercise 7.1.11

1. The line $y - 2x + h = 0$ is $2\sqrt{5}$ units from the point $(1, -3)$. Find the possible values of h .

2. The line $y - x + k = 0$ is more than $\frac{1}{\sqrt{2}}$ units from the point $(2, 7)$. What range of values may k take?

7.1.3 Distance between parallel lines

The distance between two parallel lines can be found by choosing any point on one line and finding its perpendicular distance from the second line.

Exercise 7.1.12 Use a point on the first line to find the distance between each pair of parallel lines:

1. $x - 3y + 5 = 0$ and $x - 3y - 2 = 0$

2. $4x + y + 8 = 0$ and $4x + y - 2 = 0$

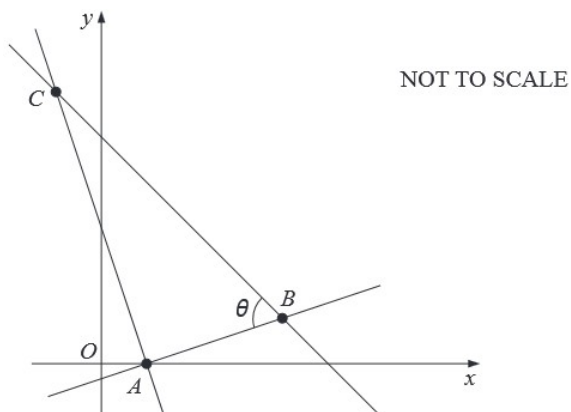
Exercise 7.1.13

1. Write down the centre and radius of the circle with equation $(x + 2)^2 + (y + 3)^2 = 4$, then find the distance from the line $2y - x + 8 = 0$ to the centre.

2. Hence determine the length of the chord cut off from the line by the circle.

7.2 Practical Exam Questions

Exercise 7.2.1 The diagram shows points $A(1, 0)$, $B(4, 1)$ and $C(-1, 6)$ in the Cartesian plane. $\angle ABC = \theta$.



1. Show that A and C lie on the line $3x + y = 3$.

2. Show that the gradient of AB is $\frac{1}{3}$.

3. Show that the length of AB is $\sqrt{10}$.

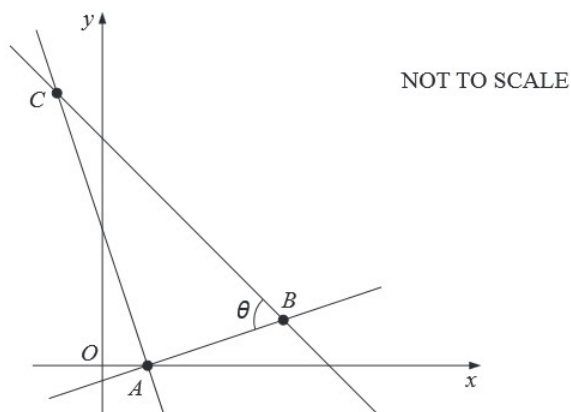
4. Show that AB and AC are perpendicular.

5. Find $\tan \theta$.

6. Find the equation of the circle with centre A that passes through B .

7. The point D is not shown on the diagram. The point D lies on the line $3x + y = 3$ between A and C , and $AD = AB$. Find the coordinates of D .

8. On your diagram, shade the region satisfying the inequality $3x + y \leq 3$.



Exercise 7.2.2 Let **A** and **B** be the points **(0, 1)** and **(2, 3)** respectively.

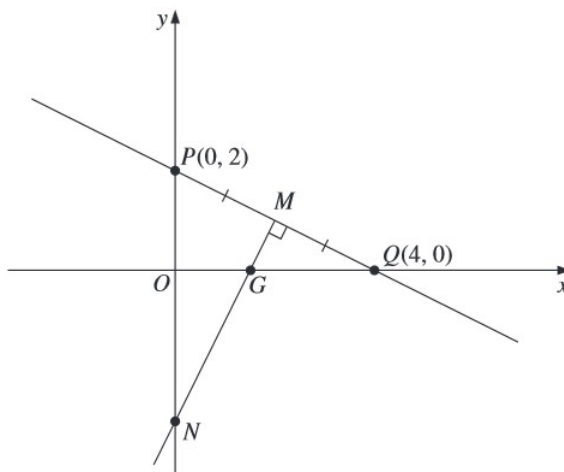
1. Find the coordinates of the midpoint of AB .

2. Find the slope of the line AB .

3. Find the equation of the perpendicular bisector of AB .

4. The point P lies on the line $y = 2x - 9$ and is equidistant from A and B . Find the coordinates of P .

Exercise 7.2.3 The diagram shows the points $P(0, 2)$ and $Q(4, 0)$. The point M is the midpoint of PQ . The line MN is perpendicular to PQ and meets the x -axis at G and the y -axis at N .



1. Find the gradient of PQ .

2. Find the coordinates of M and N .

3. Find the equation of line MN .

4. Find the coordinates of N .

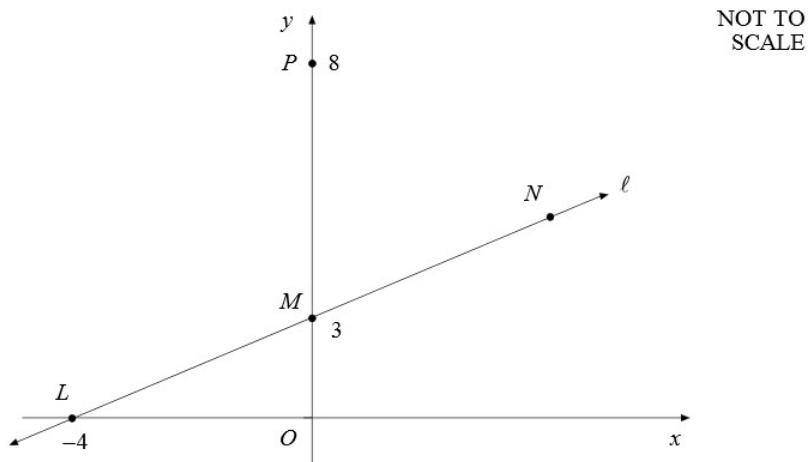
5. Find the distance of NQ .

6. Find the equation of the circle with centre N and radius NQ .

7. Hence show that the circle in part 5 passes through the point P .

8. The point R lies in the first quadrant, and $PNQR$ is a rhombus. Find the coordinates of R .

Exercise 7.2.4 The line ℓ cuts the x -axis at $L(-4, 0)$ and the y -axis at $M(0, 3)$ as shown in the diagram below. N is a point on the line ℓ and P is the point $(0, 8)$.



1. Find the equation of the line ℓ .

2. Show that the point $(16, 15)$ lies on the line ℓ .

3. By considering the length of ML and MP , show that $\triangle LMP$ is isosceles.

4. Find the gradient of the line PL .

5. M is the midpoint of the interval LN . Find the coordinates of the point N .

6. Show that $\angle NPL$ is a right angle.

7. Find the equation of the circle that passes through the point N , P and L .
