TURN and TALK

Question 1 (Standard)

Solve the simultaneous inequalities:

$$x^2 - 5x + 6 \leq 0$$

$$x^2 - x - 6 > 0$$

Question 2 (Stretch & Challenge)

Find the values of x satisfying:

$$2x^2 - 7x - 4 < 0$$

$$x^2 - 4x + 3 \geq 0$$

Q1

$x^2 - 5x + 6 \leq 0$

$$(x-2)(x-3) \leq 0 \Rightarrow 2 \leq x \leq 3$$

$x^2 - x - 6 > 0$

$$(x-3)(x+2) > 0 \Rightarrow x < -2 \text{ or } x > 3$$

Intersection: none at $x = 3$ (strict inequality excludes it)

$$\boxed{\varnothing}$$

Q2

$2x^2 - 7x - 4 < 0$

$$(2x+1)(x-4) < 0 \Rightarrow -\tfrac{1}{2} < x < 4$$

$x^2 - 4x + 3 \geq 0$

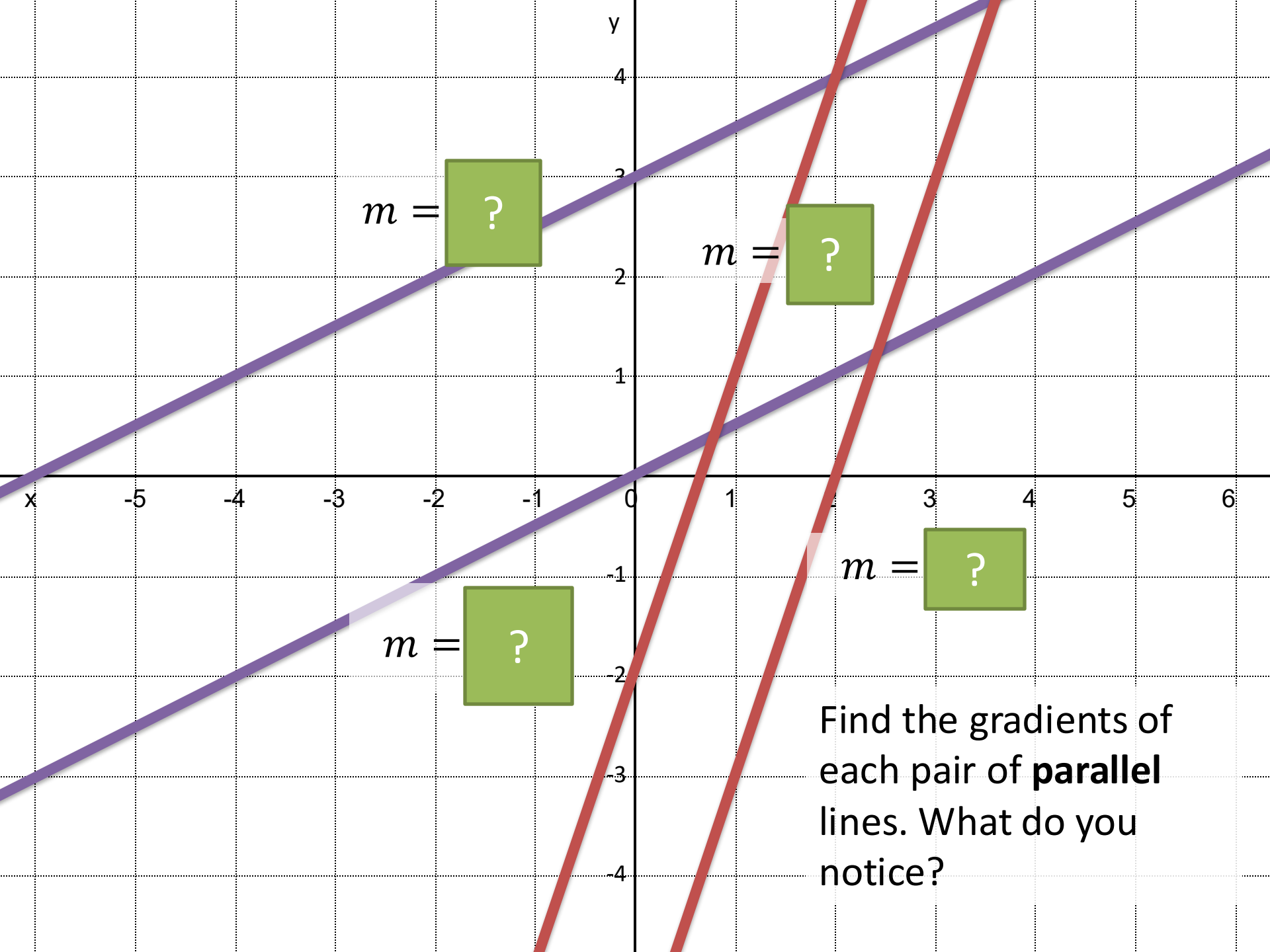
$$(x-1)(x-3) \geq 0 \Rightarrow x \leq 1 \text{ or } x \geq 3$$

Intersection:

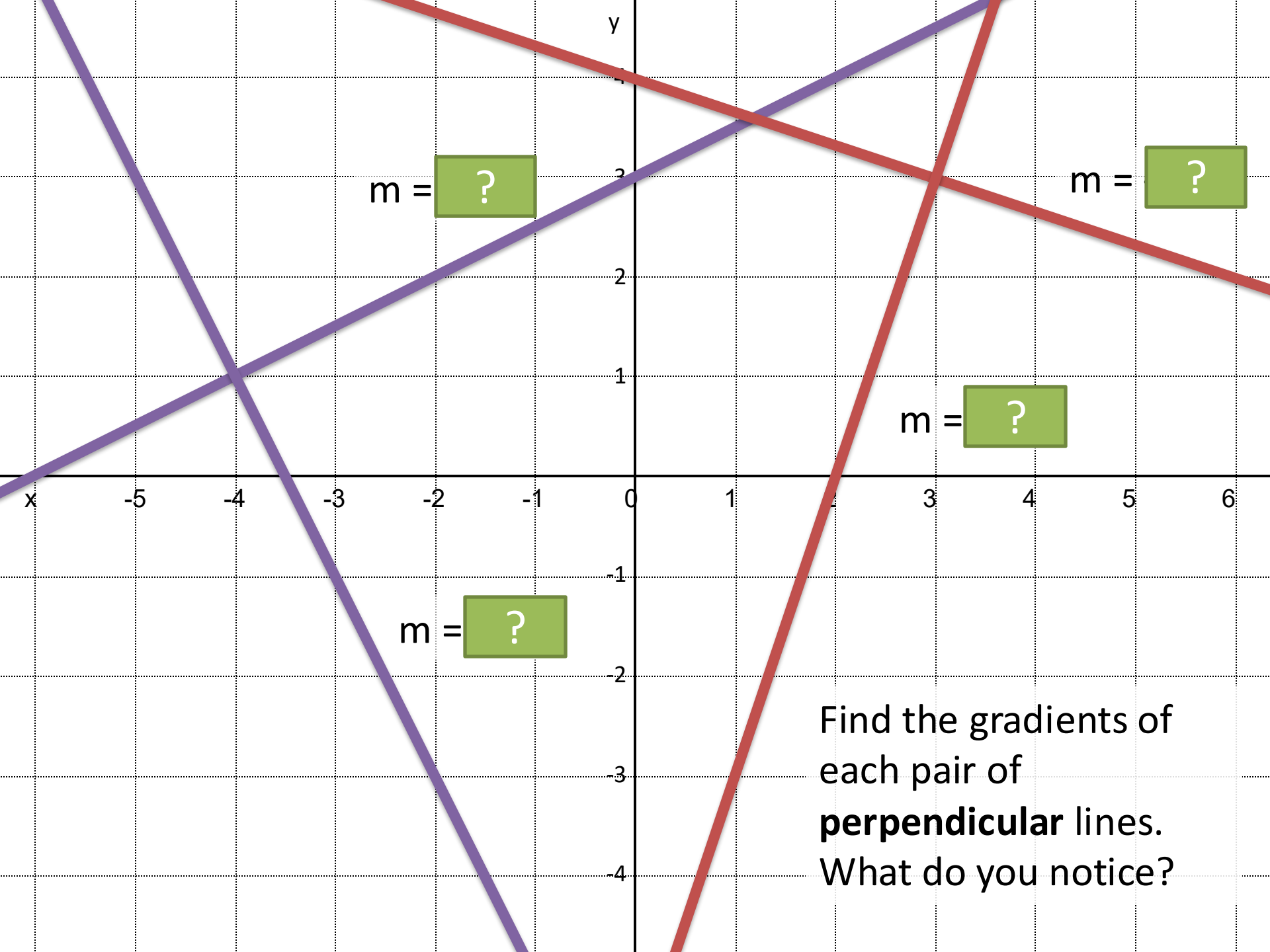
$$\boxed{\left(-\tfrac{1}{2}, 1\right] \cup [3, 4)}$$

Part 5

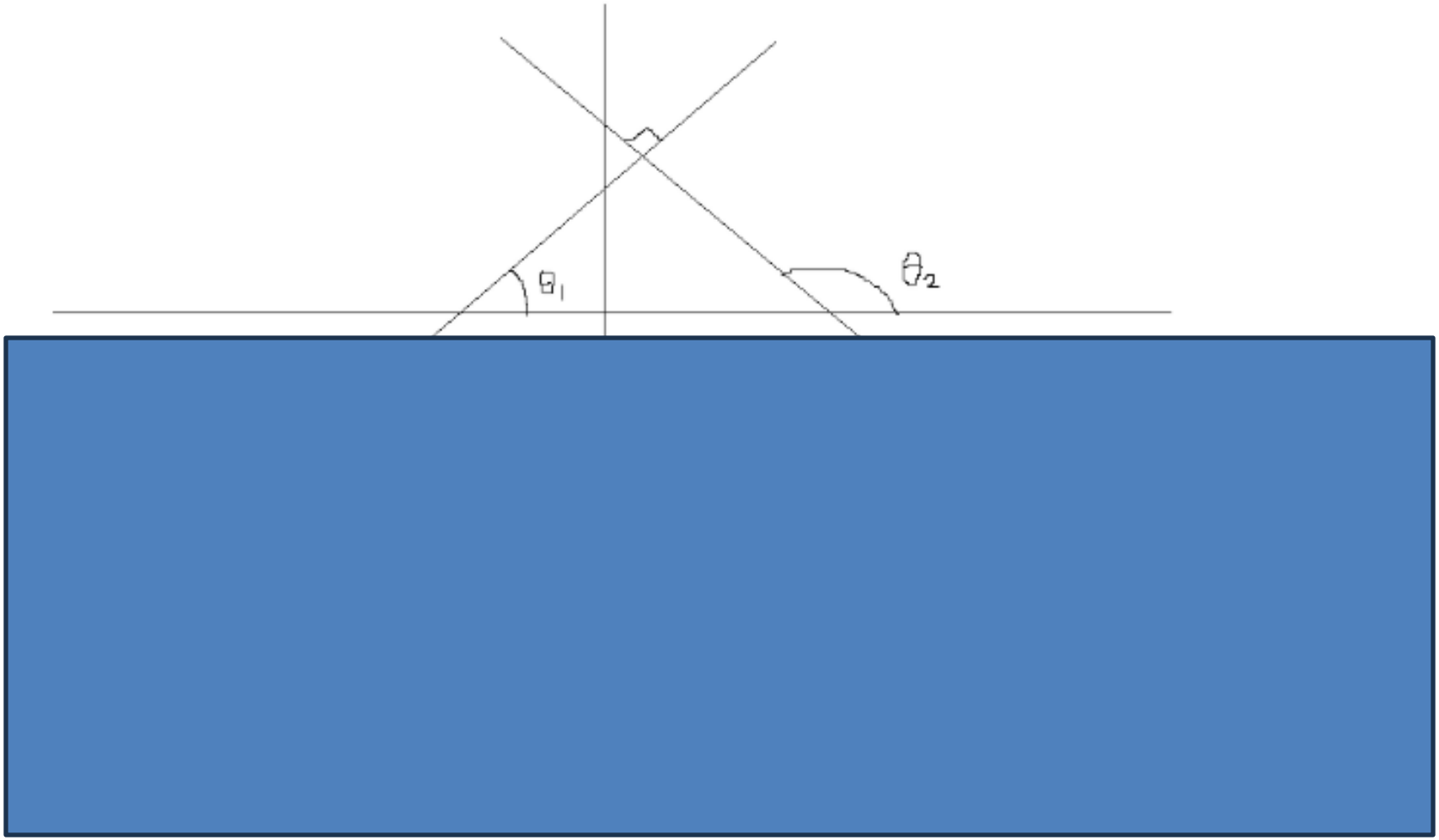
Perpendicular and parallel lines



Find the gradients of each pair of **parallel** lines. What do you notice?



Find the gradients of each pair of **perpendicular** lines. What do you notice?


θ1
θ2

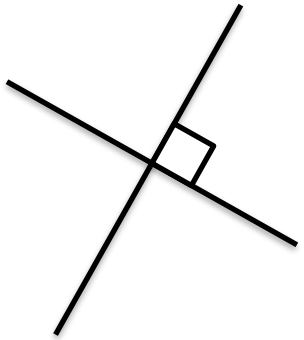
Perpendicular Lines

The gradients of parallel lines are equal.
If two lines are perpendicular, then the gradient of one is the **negative reciprocal** of the other.

$$m_1 = -\frac{1}{m_2}$$

To **show** that two lines are perpendicular:

$$m_1 m_2 = -1$$



Gradient	Gradient of Perpendicular Line
2	?
-3	?
$\frac{1}{4}$	?
5	?
$-\frac{2}{7}$	?
$\frac{7}{5}$	?

Example Problems

1. A line is goes through the point (9,10) and is perpendicular to another line with equation $y = 3x + 2$. What is the equation of the line?

?

2. A line L_1 goes through the points $A(1,3)$ and $B(3,-1)$. A second line L_2 is perpendicular to L_1 and passes through point B. Where does L_2 cross the x-axis?

?

3. Are the following lines parallel, perpendicular, or neither?

$$y = \frac{1}{2}x$$

$$2x - y + 4 = 0$$

?

Putting in the form $ax + by = c$ or $ax + by + c = 0$

Sometimes a question might ask you to put your equation in a particular form.

…Leave your answer in the form $ax + by = c$, where a, b, c are integers.

$$y = \frac{1}{2}x - 2$$

?

?

We want whole numbers not fractions, so what should we do to both sides of the equation?

I tend to put everything on the side that makes x positive, but it doesn't hugely matter.

…Leave your answer in the form $ax + by + c = 0$, where a, b, c are integers.

$$y = \frac{2}{3}x + 4$$

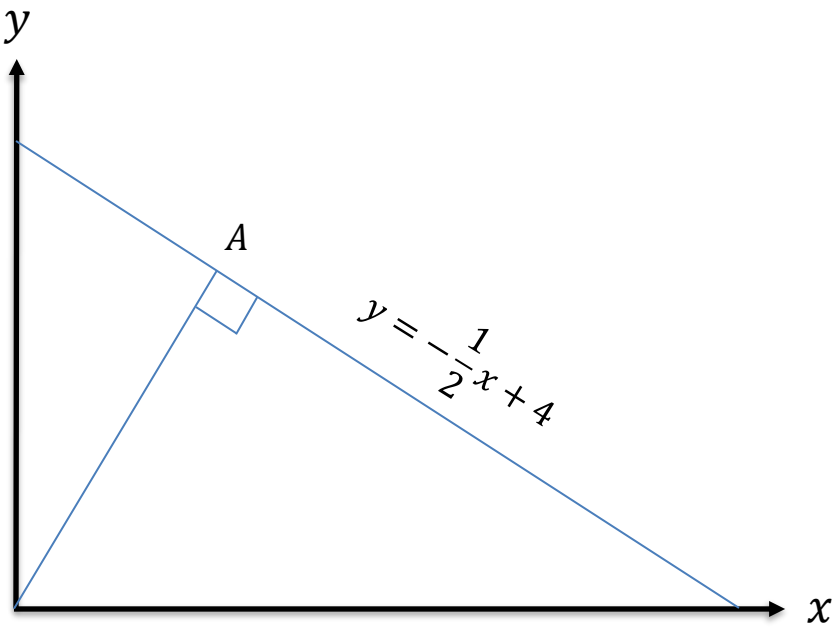
?

Test Your Understanding

1 A line is goes through the point (4,7) and is perpendicular to another line with equation $y = 2x + 2$. What is the equation of the line? Put your answer in the form $ax + by + c = 0$, where a, b, c are integers.

?

2 Determine the point A.



?

Exercise 5

(On provided sheet)

1 Are the following lines parallel, perpendicular or neither?

$y = 2x + 3, \quad y = 2x$

$y = 3x - 4, \quad y = -3x + 1$

$y = \frac{1}{2}x + 1, \quad y = -2x$

?

?

?

2 A line is parallel to $y = 2x + 3$ and goes through the point $(4,3)$. What is its equation?

?

3 A line l_1 goes through the indicated point and is perpendicular to another line l_2. Determine the equation of l_1 in each case.

$(2,5) \quad l_2: y = 2x + 1$?

$(-6,3) \quad l_2: y = 3x$?

$(0,6) \quad l_2: y = -\frac{1}{2}x - 1$?

$(-9,0) \quad l_2: y = -\frac{1}{3}x + 1$?

$(10,10) \quad l_2: y = -5x + 5$?

4 $A(2,5)\ B(4,9)$

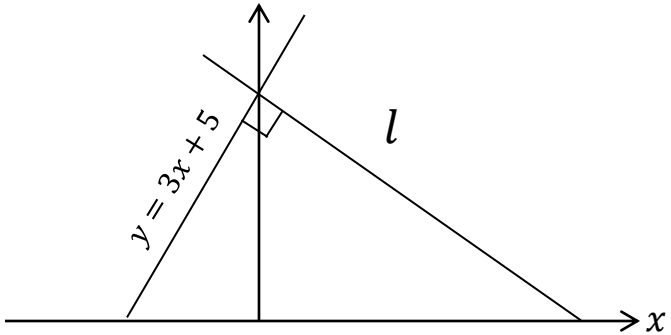
Find the equation of the line which passes through B, and is perpendicular to the line passing through both A and B.

?

5 Line l_1 has the equation $2y + 3x = 4$. Line l_2 goes through the points $(2,5)$ and $(5,7)$. Are the lines parallel, perpendicular, or neither?

?

6



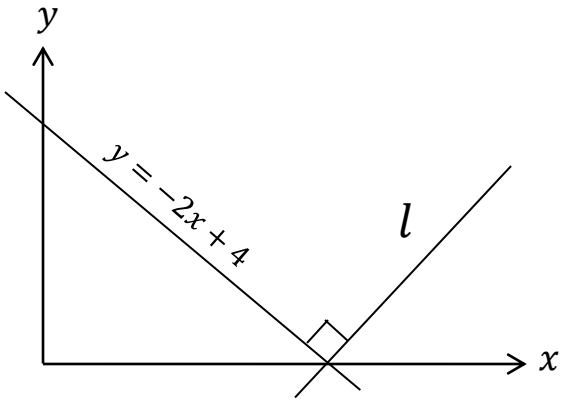
Determine the equation of the line l.

?

Exercise 5

(On provided sheet)

7



Determine the equation of the line l.

?

8

$A(3,7), B(5,13)$

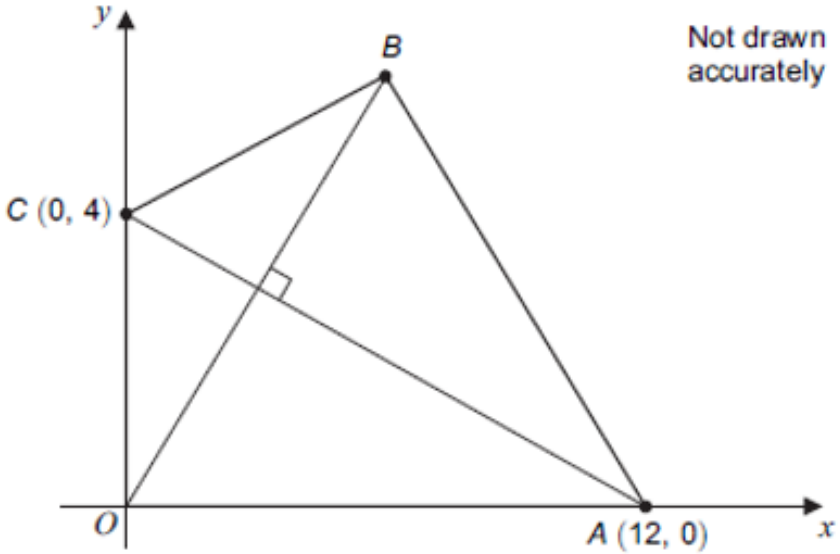
Find the equation of the line passing through B and is perpendicular to the line passing through A and B, giving your answer in the form $ax + by + c$, where a, b, c are integers.

?

9

[AQA IGCSEFM June 2012 Paper 1 Q11]

$OABC$ is a kite.



a) Work out the equation of AC.

?

b) Work out the coordinates of B.

?

Exercise 5

(On provided sheet)

Suppose O is the origin, and $A(1,2), B(4,2), C(2.2, -0.4)$.
Prove that $OABC$ is a kite.
(Hint: you need to prove **two** things as part of this.)

?

Exercise 6 – Mixed Exercises

(On provided sheet)

1 Line l_1 passes through the points $(4,5)$ and $(7,11)$. Line l_2 has the equation $2y = 3x - 1$. Do the lines intersect?

?

2 A is the point $(4, -1)$ and B is the point $(7,7)$.

a) Find the coordinates of the midpoint of AB.

?

b) Find the distance AB to 2 dp.

?

3 Line l_1 has the equation $y = 2x + 1$ and line l_2 the equation $y = 4x - 3$. Find the coordinates of the point at which they intersect.

?

4 a) Find the gradient of the line with equation $3x - 4y = 12$.

?

b) Prove that $3x - 4y = 12$ and $3y = 12 - 4x$ are perpendicular.

?

5 A line passes through the points $(0,4)$ and $(6,1)$. Find the equation of the line in the form:

a) $y = mx + c$

?

b) $ax + by = c$ where a, b, c are integers.

?

6 Find the coordinates of the points where $2x - 3y = 6$ crosses:

a) The x-axis.

?

b) The y-axis.

?

Exercise 6 – Mixed Exercises

(On provided sheet)

7 [Edexcel]

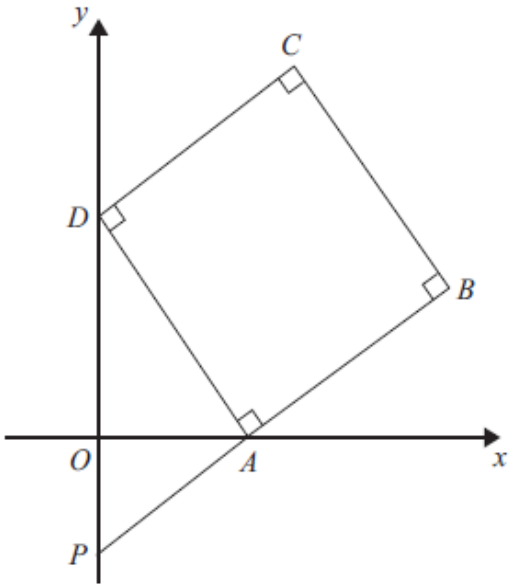
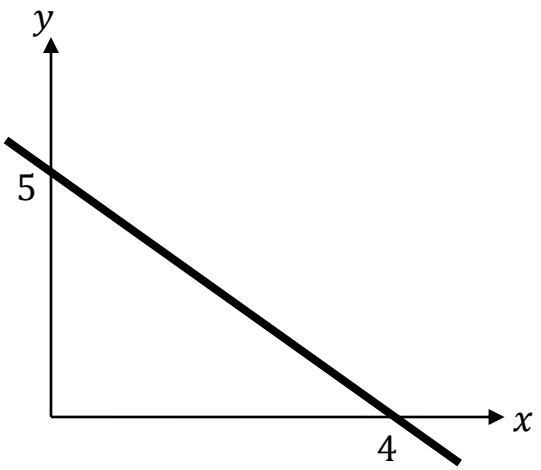


Diagram **NOT** accurately drawn

$ABCD$ is a square. P and D are points on the y-axis. A is a point on the x-axis. PAB is a straight line. The equation of the line that passes through the points A and D is $y = -2x + 6$. Find the length of PD.

?

8



Determine the equation of this line, putting your answer in the form $ax + by + c = 0$, where a, b, c are integers.

?

Exercise 6 – Mixed Exercises

(On provided sheet)

9 A triangle consists of the points $P(3, k)$, $Q(6,8)$ and $R(10,10)$. PQR is a right angle.
Determine the equation of the line passing through P and R, leaving your answer in the form $ax + by = c$, where a, b, c are integers.