Q1. [Jun 2005, Q4]
A line has equation $3x + 5y = 12$. Find its gradient and the coordinates of the points where it crosses the axes.

$$5y = 12 - 3x \Rightarrow y = \frac{12}{5} - \frac{3}{5}x \Rightarrow \text{grad} = -\frac{3}{5}$$

Let $x = 0 \Rightarrow y = \text{intercept} = \frac{12}{5} \Rightarrow (0, \frac{12}{5})$

Let $y = 0 \Rightarrow 3x + 5(0) = 12 \Rightarrow x = 4 \Rightarrow (4, 0)$

Q2. [Jun 2006, Q3]
Find the coordinates of the point of intersection of the lines $y = 3x + 1$ and $x + 3y = 6$.

$$y = 3x + 1 \Rightarrow x + 3(3x + 1) = 6 \Rightarrow 10x = 3 \Rightarrow x = \frac{3}{10}$$

Let $x = \frac{3}{10} \Rightarrow y = 3\left(\frac{3}{10}\right) + 1 = \frac{19}{10} \Rightarrow \left(\frac{3}{10}, \frac{19}{10}\right)$

Q3. [Jan 2007, Q1]
Find, in the form $y = ax + b$, the equation of the line through $(3, 10)$ which is parallel to $y = 2x + 7$.

$$m = 2 \Rightarrow (x_1, y_1) = (3, 10)$$

$$y - 10 = 2(x - 3) \Rightarrow y - 10 = 2x - 6 \Rightarrow y = 2x + 4$$

Q4. [Jan 2008, Q5]
(i) Find the gradient of the line $4x + 5y = 24$.

(ii) A line parallel to $4x + 5y = 24$ passes through the point $(0, 12)$. Find the coordinates of its point of intersection with the x-axis.

$$\frac{5y}{5} = \frac{24 - 4x}{5} \Rightarrow y = \frac{24}{5} - \frac{4}{5}x \Rightarrow \text{grad} = -\frac{4}{5}$$

$m = -\frac{4}{5}$, $c = 12 \Rightarrow y = -\frac{4}{5}x + 12$

Let $y = 0 \Rightarrow 0 = -\frac{4}{5}x + 12 \Rightarrow \frac{4}{5}x = 12 \Rightarrow x = 15 \Rightarrow (15, 0)$
Q5. (Jun 2008, Q2)
(i) Find the points of intersection of the line $2x + 3y = 12$ with the axes.

(ii) Find also the gradient of this line.

\[
\begin{align*}
\text{i/ y-intercept: let } x &= 0 \Rightarrow 3y = 12 \Rightarrow y = 4 \quad \therefore (0, 4) \\
\text{x-intercept: let } y &= 0 \Rightarrow 2x = 12 \Rightarrow x = 6 \quad \therefore (6, 0)
\end{align*}
\]

ii/ $3y = 12 - 2x \Rightarrow y = 4 - \frac{2}{3}x \quad \therefore m = -\frac{2}{3}$

Q6. (Jun 2008, Q12i)
Find the equation of the line passing through A $(-1, 1)$ and B $(3, 9)$.

\[
m = \frac{9 - 1}{3 - (-1)} = \frac{8}{4} = 2
\]

\[
\therefore y - 9 = 2(x - 3) \Rightarrow y - 9 = 2x - 6 \Rightarrow y = 2x + 3
\]

Q7. (Jan 2009, Q2)
Find the equation of the line passing through $(-1, -9)$ and $(3, 11)$. Give your answer in the form $y = mx + c$.

\[
m = \frac{11 - (-9)}{3 - (-1)} = \frac{20}{4} = 5
\]

\[
y - 11 = 5(x - 3) \Rightarrow y - 11 = 5x - 15
\]

\[
\therefore y = 5x - 4
\]

Q8. (Jun 2009, Q1)
A line has gradient $-4$ and passes through the point $(2, 6)$. Find the coordinates of its points of intersection with the axes.

\[
m = -4 \quad \Rightarrow y - 6 = -4(x - 2)
\]

\[
\Rightarrow y - 6 = -4x + 8
\]

\[
\Rightarrow y = -4x + 14
\]

\[
\therefore y \text{-int } = (0, 14)
\]

\[
\text{x-int: let } y = 0 \Rightarrow -4x + 14 = 0
\]

\[
\Rightarrow 4x = 14 \Rightarrow x = \frac{7}{2} \quad \therefore (\frac{7}{2}, 0)
\]
(i) Find the coordinates of the point where the line $5x + 2y = 20$ intersects the x-axis. [1]

Let $y = 0 \implies 5x = 20 \implies x = 4 \therefore (4, 0)$

(ii) Find the coordinates of the point of intersection of the lines $5x + 2y = 20$ and $y = 5 - x$. [3]

Since $y = 5 - x \implies 5x + 2(5 - x) = 20 \implies 5x + 10 - 2x = 20 \implies 3x = 10 \implies x = \frac{10}{3}$

$\therefore y = 5 - \frac{10}{3} = \frac{5}{3} \therefore \left(\frac{10}{3}, \frac{5}{3}\right)$

Q10. (Jun 2010, Q1)

Find the equation of the line which is parallel to $y = 3x + 1$ and which passes through the point with coordinates $(4, 5)$. [3]

$m = 3 \implies y - 5 = 3(x - 4)$

$\implies y - 5 = 3x - 12 \implies y = 3x - 7$