School Name
Mathematics Test 2017

Year 10 **Simultaneous Equations** Non Calculator

Skills and Knowledge Assessed:

- Solve linear simultaneous equations, using algebraic and graphical techniques including using digital technology (ACMNA237)

Name_____

Section 1 Short Answer Section

Write all working and answers in the spaces provided on this test paper.

1. Find the point of intersection of the lines $5x - 3y + 19 = 0$ and $x = -2$ without drawing a graph.

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2. Solve simultaneously: $7x + 5y + 21 = 0$ and $y = -2x$.

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3. What is the x value of the point of intersection of $8x + 3y = 17$ and $5x - 3y = 22$.

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4. Solve the simultaneous equations: $6d + 2e = 19$ and $d + 2e = 9$.

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5. Find the values of u and v for which $3u - 6v = 39$ and $u + 8v = 8$.

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6. Find the point of intersection of $y = 3x - 11$ and $3x - 2y - 7 = 0$.

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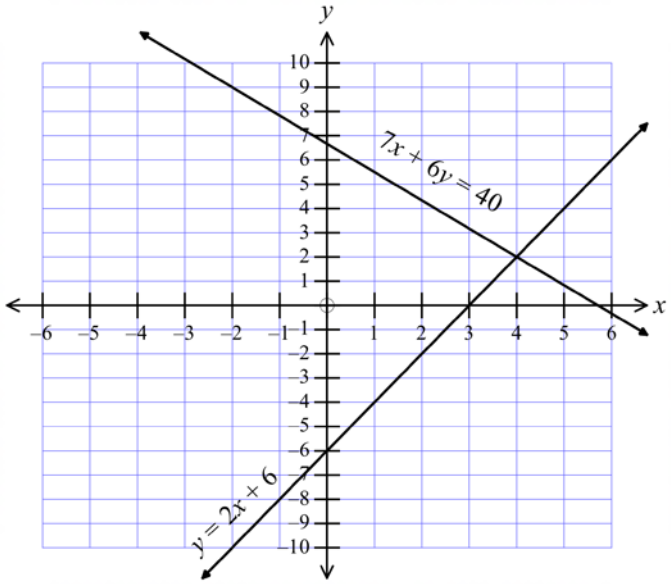
Questions 7 – 12 refer to the graph below which shows the lines $7x + 6y = 40$ and $y = 2x + 6$. .



7. Solve simultaneously: $\begin{cases} y = 2x + 6 \\ 7x + 6y = 40 \end{cases}$

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8. Sketch $x + y + 6 = 0$ on the graph above

9. Sketch $13x + 3y - 1 = 0$ on the graph above.

10. Solve simultaneously: $\begin{cases} y = 2x + 6 \\ x + y + 6 = 0 \end{cases}$

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11. Solve simultaneously: $\begin{cases} 13x + 3y - 1 = 0 \\ 7x + 6y = 40 \end{cases}$

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12. Estimate the simultaneous solution to: $\begin{cases} 13x + 3y - 1 = 0 \\ x + y + 6 = 0 \end{cases}$

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Section 2 Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.

1. Solve simultaneously $5x - 3y = 2$ and $y = 2x$.

   A. $(-4, -8)$ B. $(-2, -4)$ C. $(0, 0)$ D. $(2, 4)$

2. Tim intends to solve the simultaneous equations below, using the substitution method.

$$\begin{cases} 4x + 3y + 6 = 0 & ① \\ y = 8 - 2x & ② \end{cases}$$

Which line would follow?

A. $4x + 3(8 - 2x) + 6 = 0$ ③ sub ① in ②

B. $4(8 - 2x) + 3x + 6 = 0$ ③ sub ① in ②

C. $4x + 3(8 - 2x) + 6 = 0$ ③ sub ② in ①

D. $4(8 - 2x) + 3x + 6 = 0$ ③ sub ② in ①

Questions 3 and 4 refer to the following:

A partially completed solution to a pair of simultaneous equations is shown:

$2x - 5y = 2$ ..... ①
$4x + 3y = 30$..... ②
$4x - 10y = 4$ ..... ③ Reason
$13y = 26$ ..... ④ ② − ③
$y = 2$..... ⑤ ④ ÷ 13
$2x - 10 = 2$ Sub ⑤ into ①
$2x =$
$x =$
Solution (,)

3. What is the missing reason which should be given for equation ③?

A. ① × 2 B. ① × ② C. ② – ① D. ① + ②

4. What is the final solution to the simultaneous equations?

A. (2, 0.4) B. (2, 6) C. (6, 0.4) D. (6, 2)

5. What ordered pair is a solution to the simultaneous equations below?

$$\begin{cases} 3x - 5y - 7 = 0 \\ 3x + y - 17 = 0 \end{cases}$$

A. (–9, –4) B. (–9, 4) C. (9, 4) D. (–4, 9)

6. What is the value of a when the equations below are solved simultaneously?

$$\begin{cases} 4a + 3b - 11 = 0 \\ b = -2a + 2 \end{cases}$$

A. $a = -5$ B. $a = -2\frac{1}{2}$ C. $a = -1\frac{1}{2}$ D. $a = 1\frac{1}{2}$

7. What is the x value, when the equations below are solved simultaneously?

$$\begin{cases} 4x + 5y = 15 \\ 3x - 10y = 3 \end{cases}$$

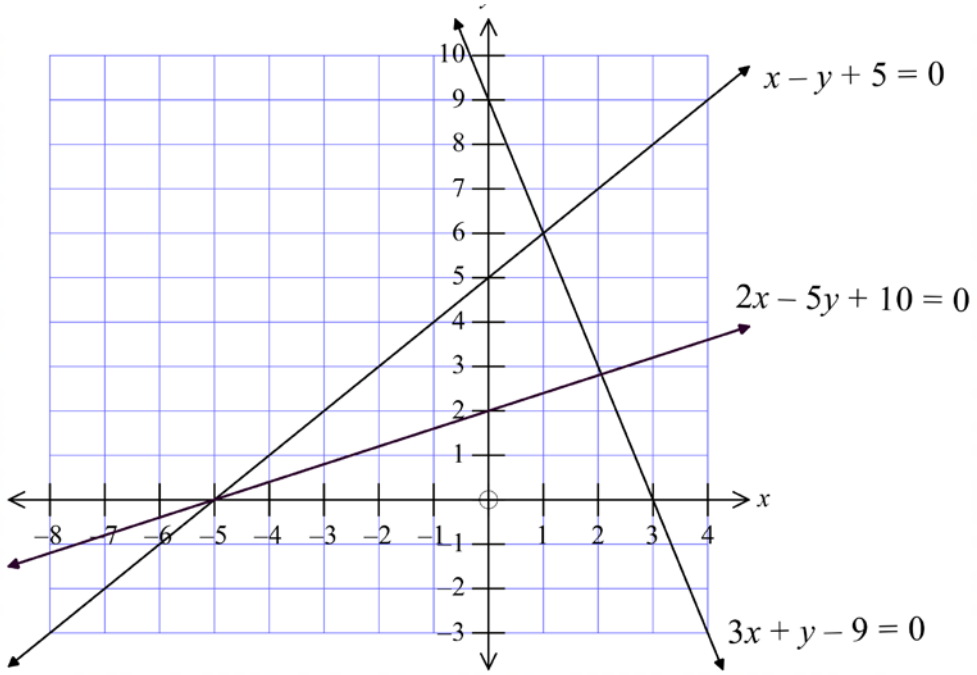
A. $x = -3$

B. $x = -2$

C. $x = 2$

D. $x = 3$

Question 8 – 9 refer to the graph below.



8. Solve $\begin{cases} 3x + y - 9 = 0 \\ x - y + 5 = 0 \end{cases}$

A. $(-5, 0)$ B. $\left(0, \frac{1}{2}\right)$ C. $(2, 3)$ D. $(1, 6)$

9. Solve $\begin{cases} 2x - 5y + 10 = 0 \\ x - y + 5 = 0 \end{cases}$

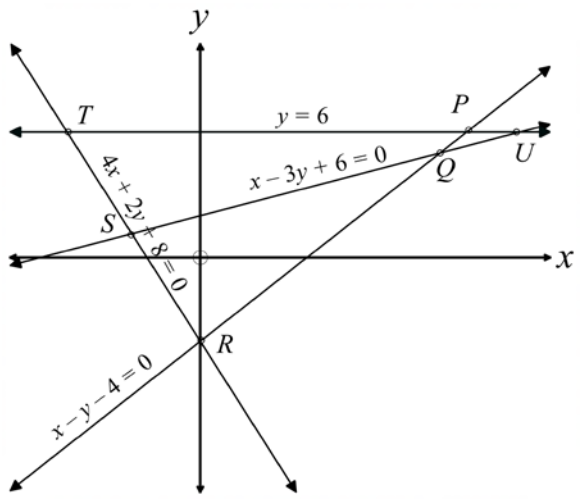
A. $(-5, 0)$ B. $\left(0, \frac{1}{2}\right)$ C. $(2, 3)$ D. $(1, 6)$

Questions 10 – 12 refer to the following.

The number plane shows the lines

$y = 6$ ①
$x - 3y + 6 = 0$ ②
$x - y - 4 = 0$ ③
$4x + 2y + 8 = 0$ ④

The points of intersection of these lines are labelled on the graph.



10. The point S is the solution to which pair of simultaneous equations?

A. ① and ④

B. ② and ③

C. ② and ④

D. ③ and ④

11. Which point is the simultaneous solution to equations ① and ③ ?

A. Point P B. Point Q C. Point T D. Point U

12. What are the coordinates of the point T ?

A. (-10, 6) B. (-5, 6) C. (-4, 6) D. (10, 6)

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Section 3 Longer Answer Section

Write all working and answers in the spaces provided on this test paper.

Marks

1. (a) Solve simultaneously: $\begin{cases} y = -2x + 5 \\ y = x + 11 \end{cases}$ **3**

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Marks

(b) Solve simultaneously: $\begin{cases} 2x + y - 6 = 0 \\ -x + y + 9 = 0 \end{cases}$ **3**

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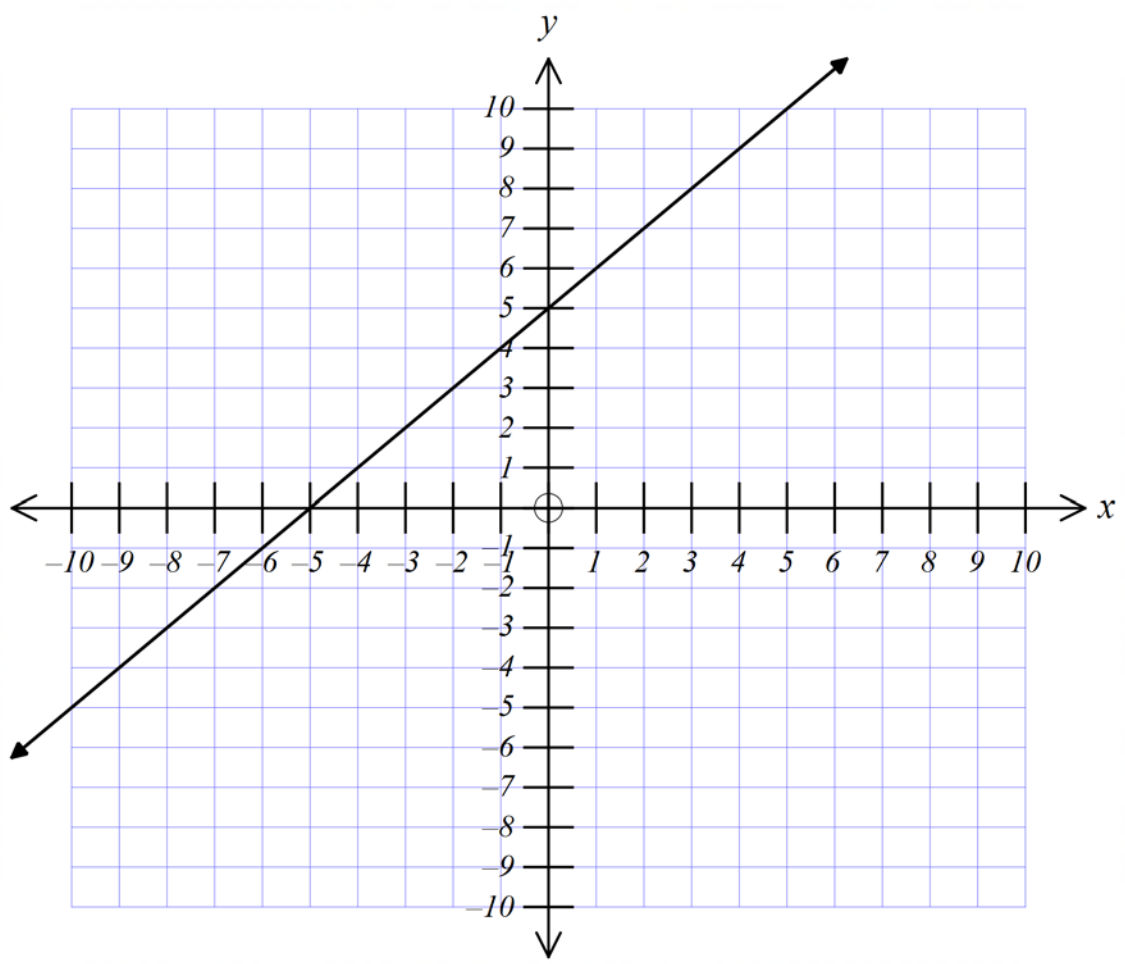
Marks

2. The line $y = x + 5$ is shown on the graph below.



(a) Draw the lines $y = 3 - 3x$ and $2x - y + 3 = 0$ on the same graph. **2**

(b) Solve $y = x + 5$ simultaneously with $2x - y + 3. = 0$ **1**

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(c) Solve $y = 3 - 3x$ simultaneously with $2x - y + 3. = 0$ **1**

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Multiple Choice Answer Sheet

Simultaneous Equations

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Completely fill the response oval representing the most correct answer.

1. A ⬭ B ⬭ C ⬭ D ⬭
2. A ⬭ B ⬭ C ⬭ D ⬭
3. A ⬭ B ⬭ C ⬭ D ⬭
4. A ⬭ B ⬭ C ⬭ D ⬭
5. A ⬭ B ⬭ C ⬭ D ⬭
6. A ⬭ B ⬭ C ⬭ D ⬭
7. A ⬭ B ⬭ C ⬭ D ⬭
8. A ⬭ B ⬭ C ⬭ D ⬭
9. A ⬭ B ⬭ C ⬭ D ⬭
10. A ⬭ B ⬭ C ⬭ D ⬭
11. A ⬭ B ⬭ C ⬭ D ⬭
12. A ⬭ B ⬭ C ⬭ D ⬭

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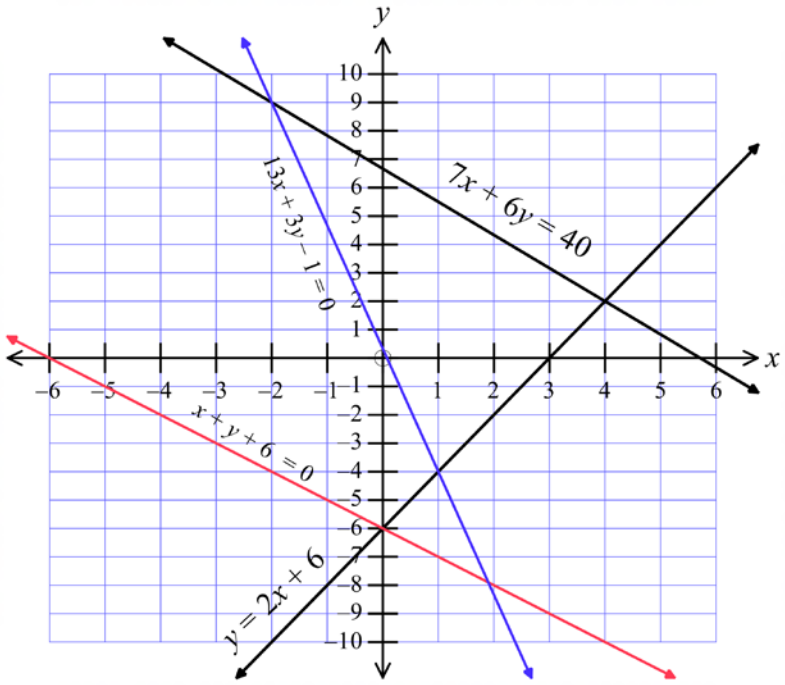
Simultaneous Equations

Non Calculator Section

ANSWERS

Question	Working and Answer
1.	$5x - 3y + 19 = 0$ ① $x = -2$ ② Sub $x = -2$ into ① $5(-2) - 3y + 19 = 0$ $-10 - 3y + 19 = 0$ $-3y = -9$ $y = -\frac{9}{-3}$ $y = -3$ Point is $(-2, -3)$
2.	$7x + 5y + 21 = 0$ ① $y = -2x$ ② Sub ② into ① $7x + 5(-2x) + 21 = 0$ $7x - 10x = -21$ $-3x = -21$ $x = \frac{-21}{-3} = 7$ $y = -2(7) = -14$ Solution $(7, -14)$
3.	$8x + 3y = 17$ ① $5x - 3y = 22.$ ② $13x = 39$ ① + ② $x = \frac{39}{13} = 3$

Question	Working and Answer
4.	$6d + 2e = 19$ ① $d + 2e = 9$ ② $5d = 10$ ① − ② $d = \frac{10}{5} = 2$ Sub into ② $2 + 2e = 9$ $2e = 7$ $e = \frac{7}{2}$ $e = -3\frac{1}{2}$ Solution $d = 2$, $e = 3\frac{1}{2}$
5.	$3u - 6v = 39$ ① $u + 8v = 8$ ② $3u + 24v = 24$ ③ ② × 3 $30v = -15$ ③ − ① $v = -\frac{15}{30} = -\frac{1}{2}$ Sub in ① $3u - 6\left(-\frac{1}{2}\right) = 39$ $3u + 3 = 39$ $3u = 36$ $u = \frac{36}{3} = 12$ Solution $u = 12$ and $v = -\frac{1}{2}$
6.	$y = 3x - 11$ ① $3x - 2y - 7 = 0$ ② Sub ① into ② $3x - 2(3x - 11) - 7 = 0$ $3x - 6x + 22 - 7 = 0$ $-3x = -15$ $x = \frac{-15}{-3} = 5$ Sub into ① $y = 3(5) - 11 = 4$ Point is (5, 4)

Question	Working and Answer
	
7.	(4, 2) from graph.
8.	See graph above
9.	See graph above
10.	(0, –6) from graph.
11.	(–2, 9) from graph.
12.	(1.9, –7.9) from graph.

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ANSWERS

Question	Working	M C Answer
1.	$5x - 3y = 2$ ① $y = 2x$ ② Sub ② into ① $5x - 3(2x) = 2$ $-x = 2$ $x = -2$ $y = 2(-2) = -4$ Solution $(-2, -4)$	**B**
2.	As equation ② already has y as the subject, substitute this into ① in place of y. $4x + 3(8 - 2x) + 6 = 0$ ③ sub ② in ①	**C**
3.	$2x - 5y = 2$ ..... ① $4x + 3y = 30$..... ② $4x - 10y = 4$ ..... ③ ① × 2 $13y = 26$ ..... ④ ② − ③ $y = 2$..... ⑤ ④ ÷ 13 $2x - 10 = 2$ Sub ⑤ into ① $2x = 12$ $x = 6$ Solution $(6, 2)$	**A**
4.	See above	**D**

5.	$3x - 5y - 7 = 0$ ① $3x + y - 17 = 0$ ② $6y - 24 = 0$ ③ ② − ① $6y = 24$ $y = 4$ ④ Solve ③ $3x - 5(4) - 7 = 0$ ⑤ Sub ④ into ① $3x = 27$ $x = \frac{27}{3} = 9$ Solution (9, 4)	**C**
6.	$4a + 3b - 11 = 0$ ① $b = -2a + 2$ ② $4a + 3(-2a + 2) - 11 = 0$ ④ Sub ② into ① $4a - 6a + 6 - 11 = 0$ $-2a = 5$ $a = -2\frac{1}{2}$ ⑤ Solve ④	**B**
7.	$4x + 5y = 15$ ① $3x - 10y = 3$ ② $8x + 10y = 30$ ③ ① × 2 $11x = 33$ $x = \frac{33}{11} = 3$	**D**
8.	(1, 6)	**D**
9.	(-5, 0)	**A**
10.	$x - 3y + 6 = 0$ and $4x + 2y + 8 = 0$ so equations ② and ④ .	**C**
11.	Equations ① and ③ are $y = 6$ and $x - y - 4 = 0$, so intersection is P.	**A**

12.	For point T $y = 6$ ① $4x + 2y + 8 = 0$ ④ Sub ① into ④ $4x + 2(6) + 8 = 0$ $4x + 12 + 8 = 0$ $4x = -20$ $x = \frac{-20}{4} = -5$ Solution T is $(-5, 6)$	**B**

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Completely fill the response oval representing the most correct answer.

1.	A ○	B ●	C ○	D ○
2.	A ○	B ○	C ●	D ○
3.	A ●	B ○	C ○	D ○
4.	A ○	B ○	C ○	D ●
5.	A ○	B ○	C ●	D ○
6.	A ○	B ●	C ○	D ○
7.	A ○	B ○	C ○	D ●
8.	A ○	B ○	C ○	D ●
9.	A ●	B ○	C ○	D ○
10.	A ○	B ○	C ●	D ○
11.	A ●	B ○	C ○	D ○
12.	A ○	B ●	C ○	D ○

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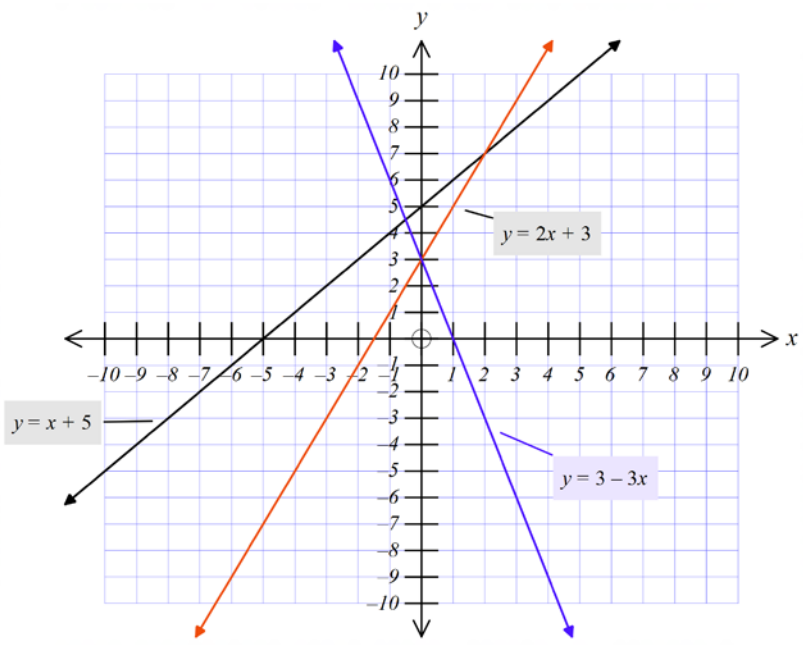
Longer Answer Section

ANSWERS

Question	Working and Answer	Marks
1.	(a) $y = -2x + 5$ ① $y = x + 11$ ② Sub ① in ② $-2x + 5 = x + 11$ $-3x = 6$ $x = \frac{6}{-3} = -2$ $y = -(-2) + 11$ $= -2 + 11$ $= 9$ Solution $(-2, 9)$	**3 marks for correct answer with working.** **2 marks for almost complete partial answer, or incorrect answer with only minor errors** **1 mark for some basic working on the right course**
	(b) $2x + y - 6 = 0$ ① $-x + y + 9 = 0$ ② $-2x + 2y + 18 = 0$ ③ ② × 2 $y + 2y - 6 + 18 = 0$ ③ + ① $3y = -12$ $y = -\frac{12}{3} = -4$ Sub into ① $2x + (-4) - 6 = 0$ $2x = 10$ $x = 5$ Solution $(5, -4)$	**3 marks for correct answer with working.** **2 marks for almost complete partial answer, or incorrect answer with only minor errors** **1 mark for some basic working on the right course**

Question	Working and Answer	Marks
2.	(a)  	**1 mark for each of the red and blue lines on this graph**
	(b) (2, 7)	**1 mark for correct point read from graph**
	(c) (0, 3)	**1 mark for correct point read from graph**