UNIT 16   *Inequalities*   **Revision Test 16.1**

30 minutes

1.   Given that $x < 2$ and $x \geq -3$, list the possible values of x when:

   (a) x is an integer   *(2 marks)*

   (b) x is a natural number.   *(1 mark)*

2.   List all the values of x which are prime numbers and which satisfy the following inequality

$$3 \leq \frac{1}{3}x < 7.$$

(4 marks)

3.   (a) z is a factor of 24. Give the value of z if $3 < z < 6$.   *(1 mark)*

   (b) y is a multiple of 3. Give the value of y if $3 < y \leq 6$.   *(1 mark)*

4.   Find the range of values of n for which $n > 2 - n$.   *(2 marks)*

5.   Solve the inequality
$$x - 1 < 10 - 2x.$$

(3 marks)

6.   Solve the inequality
$$2x < 14 < 3x + 5.$$

(3 marks)

7.   Triangle ABC has angle A $= 75°$. If $30° \leq$ angle B $\leq 90°$, find the possible range
   of values of angle C.   *(3 marks)*

Revision Test 16.1

Answers

1.   (a) $-3,\ -2,\ -1,\ 0,\ 1$ (one missing: B1)   B2

       (b) $0,\ 1$ B1   (*3 marks*)

2. $9 \le x < 21$ M1 A1

     $x = 11,\ 13,\ 17,\ 19$ (one missing: B1)   B2   (*4 marks*)

3.   (a) $z = 4$ B1

       (b) $y = 6$ B1   (*2 marks*)

4. $2n > 2$, so $n > 1$ M1 A1   (*2 marks*)

5. $x + 2x < 10 + 1,\ \ 3x < 11$ M1 A1

     $x < \dfrac{11}{3}$ B1   (*3 marks*)

6. $2x < 14\ \Rightarrow\ x < 7$ B1

     $3x + 5 > 14\ \Rightarrow\ 3x > 9\ \Rightarrow\ x > 3$ B1

     i.e. $3 < x < 7$ B1   (*3 marks*)

7.   Angle C $= 180° - 75° -$ angle B $= 105° -$ angle B   B1

     $\left.\begin{array}{l}\text{Angle B} = 30° \ \Rightarrow \ \text{angle C} = 75° \\ \text{Angle B} = 90° \ \Rightarrow \ \text{angle C} = 15°\end{array}\right\}$ $15° <$ angle C $< 75°$ M1 A1   (*3 marks*)

(TOTAL MARKS 20)

UNIT 16 *Inequalities*   **Revision Test 16.2**

40 minutes

1.   Given that $x < 2$ and $x \geq -3$, list the possible values of x when:

(a) x is an integer   *(2 marks)*

(b) x is a natural number.   *(1 mark)*

2.   List all the values of x which are prime numbers and which satisfy the following inequality

$$3 \leq \frac{1}{3}x < 7.$$

(4 marks)

3.   (a) z is a factor of 24. Give the value of z if $3 < z < 6$.   *(1 mark)*

(b) y is a multiple of 3. Give the value of y if $3 < y \leq 6$.   *(1 mark)*

4.   Find the range of values of n for which $n > 2 - n$.   *(2 marks)*

5.   Solve the inequality
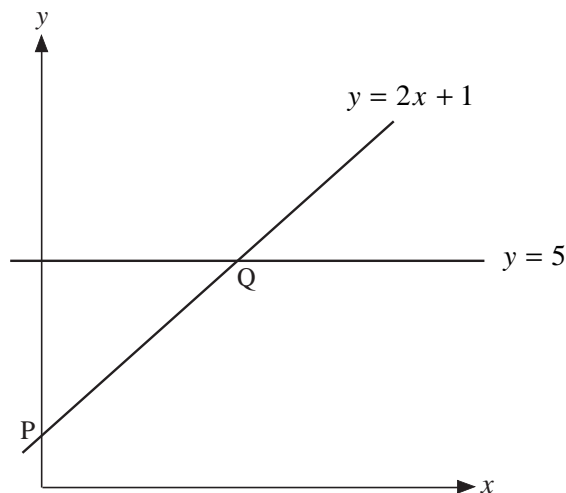
$$x - 1 < 10 - 2x.$$

(3 marks)

6.   Solve the inequality

$$2x < 14 < 3x + 5.$$

(3 marks)

7.   Triangle ABC has angle A $= 75°$. If $30° \leq$ angle B $\leq 90°$, find the possible range
of values of angle C.   *(3 marks)*

Revision Test 16.2
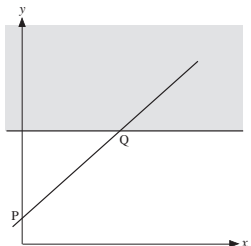
8. The diagram shows a rough sketch of the graphs $y = 2x + 1$ and $y = 5$.
    The lines intersect at Q.

    (a) What are the coordinates of P?   *(1 mark)*

    (b) Calculate the coordinates of Q.   *(2 marks)*

    (c) Calculate the length PQ.   *(2 marks)*

    (d) What is the gradient of the line $y = 2x + 1$?   *(1 mark)*

    (e) On a copy of the diagram shade the region $y > 5$.   *(1 mark)*

9. (a) Draw the graph of $y = x^2 - 3x$ for values of x from -1 to 4.   *(2 marks)*

    (b) By drawing a suitable straight line on the same diagram, estimate,
         correct to one decimal place, the solutions to the equation $x^2 - 2x - 1 = 0$.

         (3 marks)

    (c) By drawing another straight line on the same diagram, solve the inequality

 $$x^2 - 3x \geq 1.$$

         (3 marks)

Revision Test 16.2   Answers

1.   (a) $-3, \ -2, \ -1, \ 0, \ 1$ (one missing: B1)   B2

     (b) $0, \ 1$ B1   (*3 marks*)

2. $9 \le x < 21$ M1 A1

     $x = 11, \ 13, \ 17, \ 19$ (one missing: B1)   B2   (*4 marks*)

3.   (a) $z = 4$ B1

     (b) $y = 6$ B1   (*2 marks*)

4. $2n > 2$, so $n > 1$ M1 A1   (*2 marks*)

5. $x + 2x < 10 + 1, \ \ 3x < 11$ M1 A1

     $x < \dfrac{11}{3}$ B1   (*3 marks*)

6. $2x < 14 \ \Rightarrow \ x < 7$ B1

     $3x + 5 > 14 \ \Rightarrow \ 3x > 9 \ \Rightarrow \ x > 3$ B1

     i.e. $3 < x < 7$ B1   (*3 marks*)

7.   Angle C $= 180° - 75° -$ angle B $= 105° -$ angle B   B1

     $\left. \begin{array}{l} \text{Angle B} = 30° \ \Rightarrow \ \text{angle C} = 75° \\ \text{Angle B} = 90° \ \Rightarrow \ \text{angle C} = 15° \end{array} \right\}$ $15° <$ angle C $< 75°$ M1 A1   (*3 marks*)

8.   (a) $(0, 1)$ B1

     (b) $(2, 5)$ B1 B1

     (c)   Length $= \sqrt{2^2 + (5-1)^2} \ = \ \sqrt{20} \ \ (\approx 4.47)$ M1 A1

     (d) 2 B1

     (e)   B1   (*7 marks*)

Revision Test 16.2

Answers

9. (a)

$y = x^2 - 3x$

$y = 1$

$y = 1 - x$
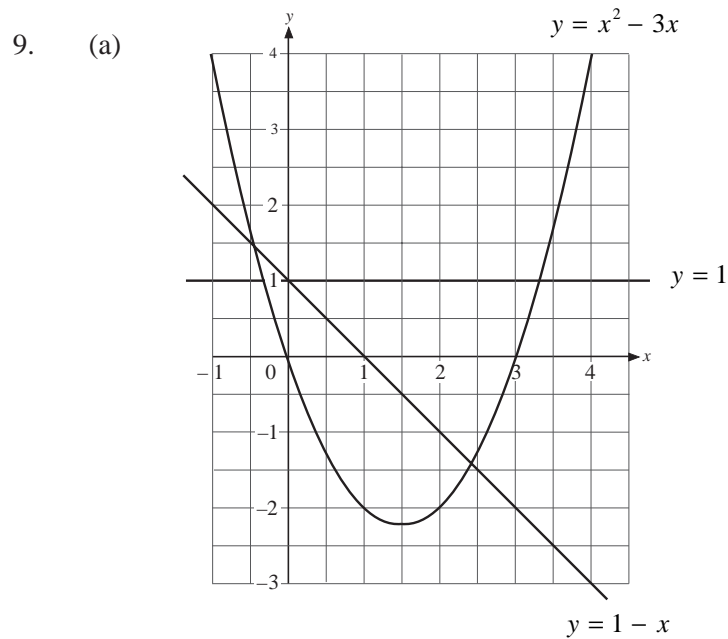
Graph above   (minor mistake: B1)   B2

(b) Graph of $y = 1 - x$ B1

2.4 and 0.4   (allow $\pm\, 0.1$)   B1 B1

(c) $x > 3.3$ or   M1 A1

$x < -0.3$ A1   (*8 marks*)

(TOTAL MARKS 35)

UNIT 16 *Inequalities*

Revision Test 16.3

ONE HOUR

1. Given that $x < 2$ and $x \geq -3$, list the possible values of x when:

    (a) x is an integer *(2 marks)*

    (b) x is a natural number. *(1 mark)*

2. Solve the inequality $2x < 14 < 3x + 5$. *(3 marks)*

3. Triangle ABC has angle A = 75°. If $30° \leq$ angle B $\leq 90°$, find the possible range of values of angle C. *(3 marks)*

4. The diagram shows a rough sketch of the graphs $y = 2x + 1$ and $y = 5$.
    The lines intersect at Q.
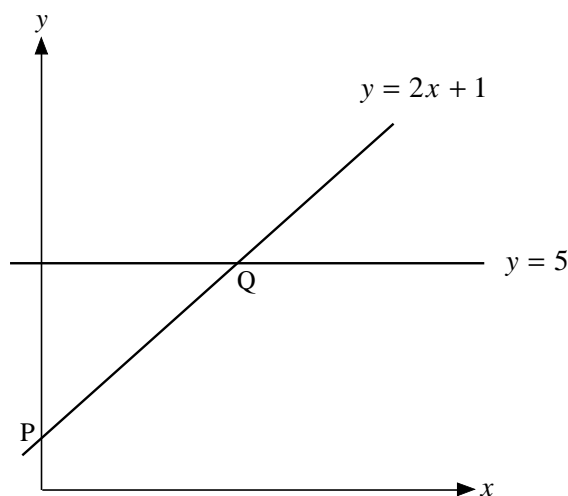
    (a) What are the coordinates of P? *(1 mark)*

    (b) Calculate the coordinates of Q. *(2 marks)*

    (c) Calculate the length PQ. *(2 marks)*

    (d) What is the gradient of the line $y = 2x + 1$? *(1 mark)*

    (e) On a copy of the diagram shade the region $y > 5$. *(1 mark)*

Revision Test 16.3

5.	(a)	Draw the graph of $y = x^2 - 3x$ for values of x from -1 to 4.			*(2 marks)*

	(b)	By drawing a suitable straight line on the same diagram, estimate,
		correct to one decimal place, the solutions to the equation $x^2 - 2x - 1 = 0$.

											(3 marks)

	(c)	By drawing another straight line on the same diagram, solve the inequality

						$x^2 - 3x \geq 1$.

											(3 marks)

6.
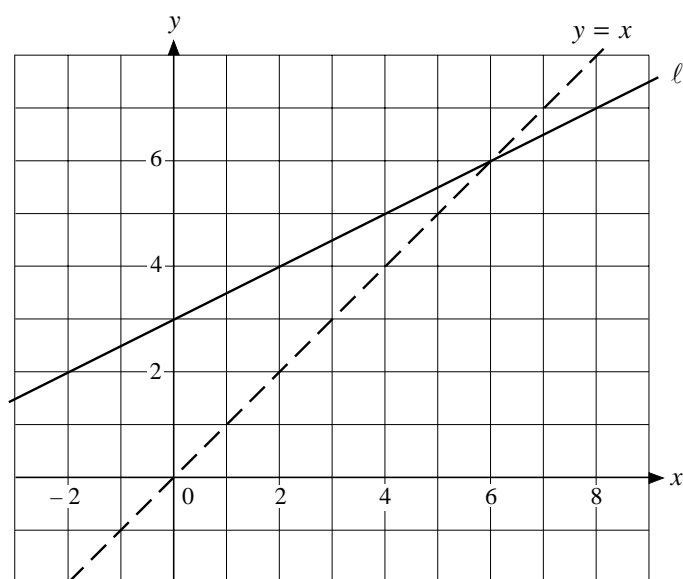
	(a)	Write down the equation of the line ℓ.					*(2 marks)*

	(b)	Write down three inequalities satisfied by all points inside the triangle
		formed by the line $y = x$, the line ℓ and the y-axis.			*(3 marks)*

	(c)	Copy the diagram and draw the reflection of the line ℓ in the line $y = x$.
		Label the image *m*.								*(1 mark)*

	(d)	Write down the equation of the line *m*.					*(2 marks)*

Revision Test 16.3

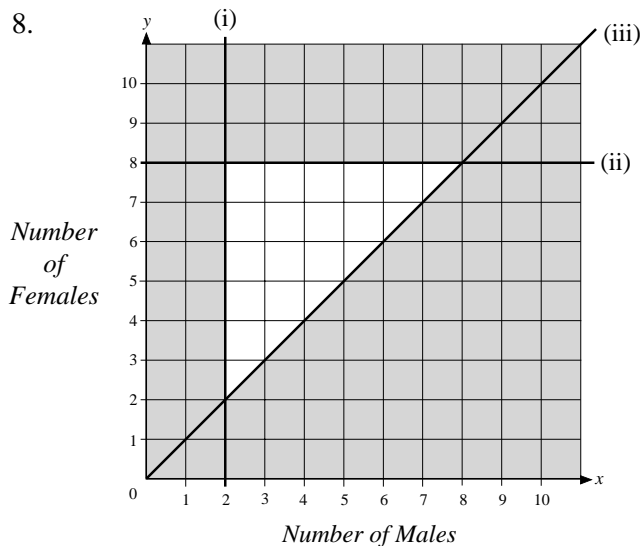7.   The graph below shows the lines $y = x - 2$ and $x + y = 5$.
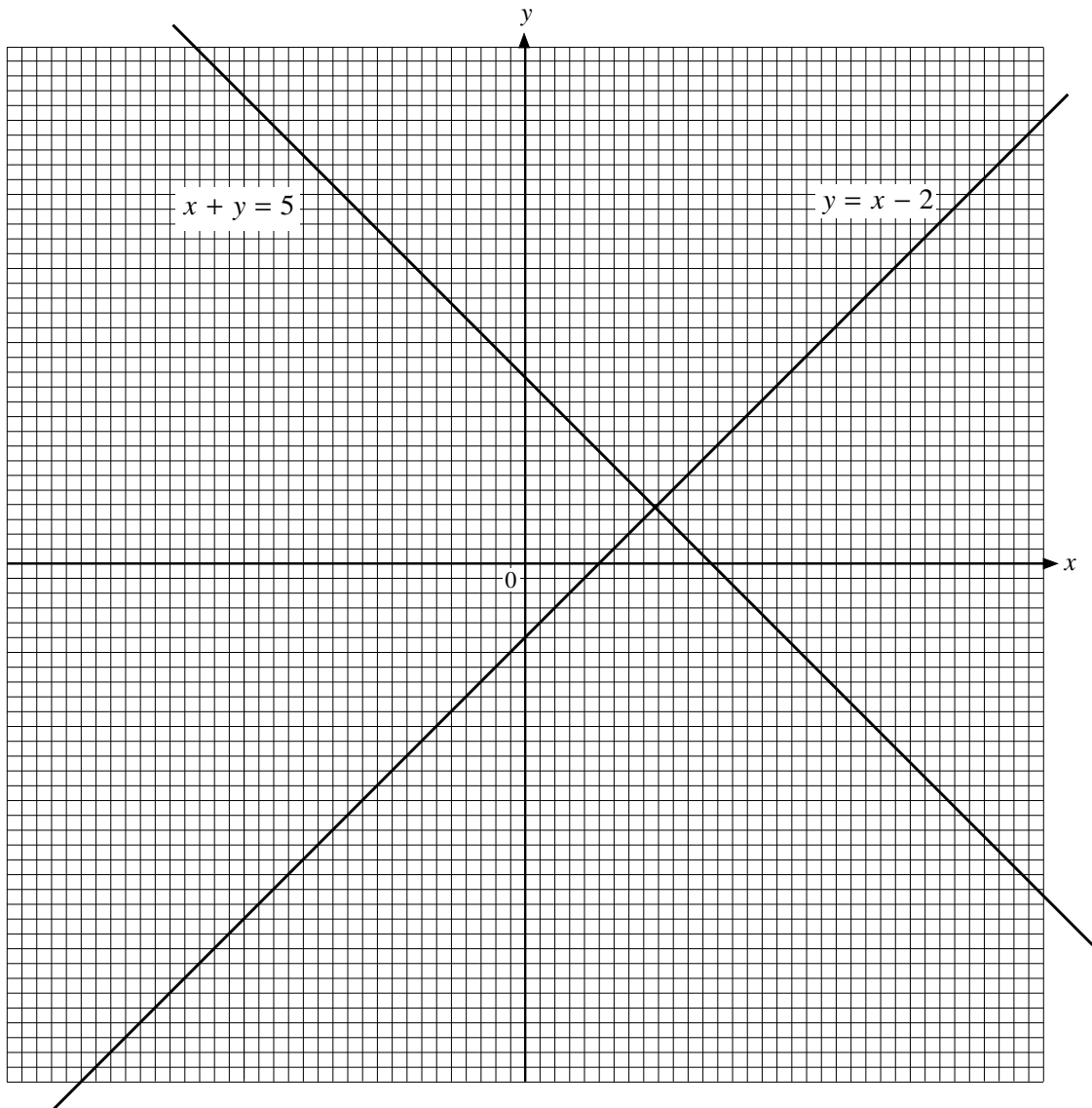
Draw a sketch of the graphs and on your copy shade the region where

$$y < x - 2 \quad \text{and} \quad y > 5 - x.$$

(3 marks)

Revision Test 16.3

8.

Number of Females

Number of Males

Mr. Singh plans to take a group of students to a match. He makes three rules about the numbers of males and females in the group.

The unshaded region on the graph represents these three rules.

(a) Write in words the three rules about the numbers of males and females in the group.

(3 marks)

(b) Write, in terms of x and y, the equations of lines (i) (ii) and (iii).

(3 marks)

9. (a) (i) If $g(x) = 4 - x$, find $g(-5)$. *(2 marks)*

(ii) Copy the diagram below and on it draw the graph of $g(x)$. *(2 marks)*

$f(x) = 2x - 1$
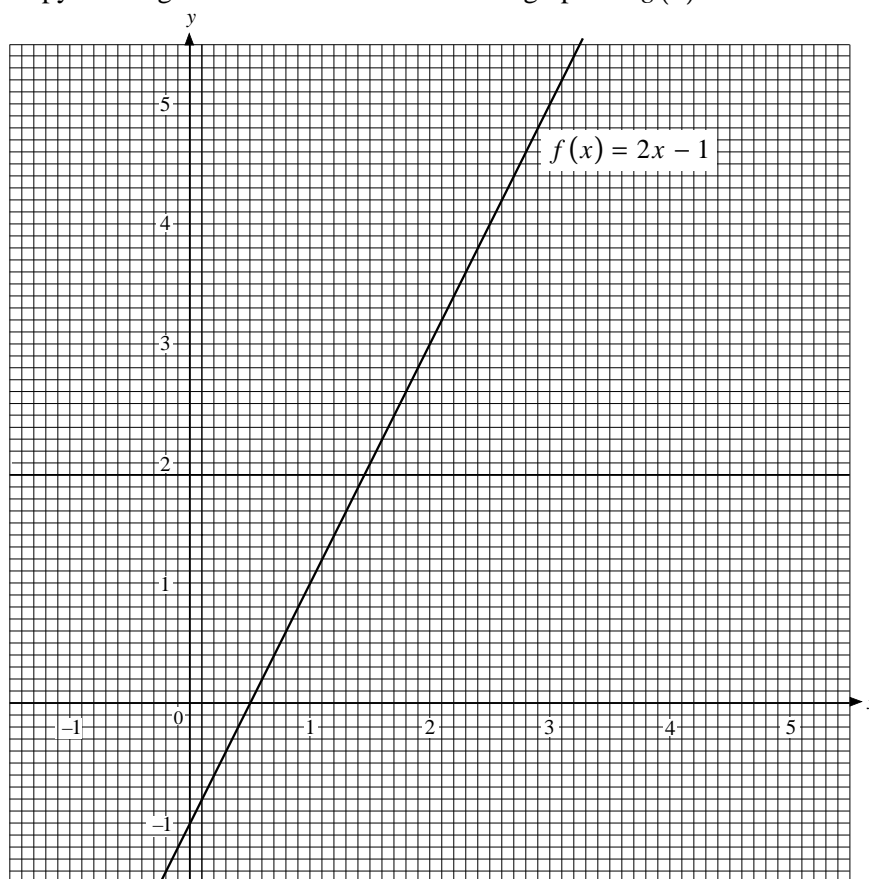
(b) Outline **clearly** the region where $x \geq 0$, $y \geq 2x - 1$ and $y \leq 4 - x$. *(3 marks)*

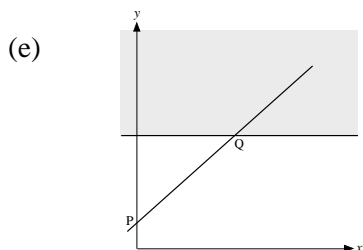(c) State the coordinates of the point where $f(x) = g(x)$. *(2 marks)*

Revision Test 16.3   Answers

1. 1. (a) $-3, \ -2, \ -1, \ 0, \ 1$ (one missing: B1)   B2
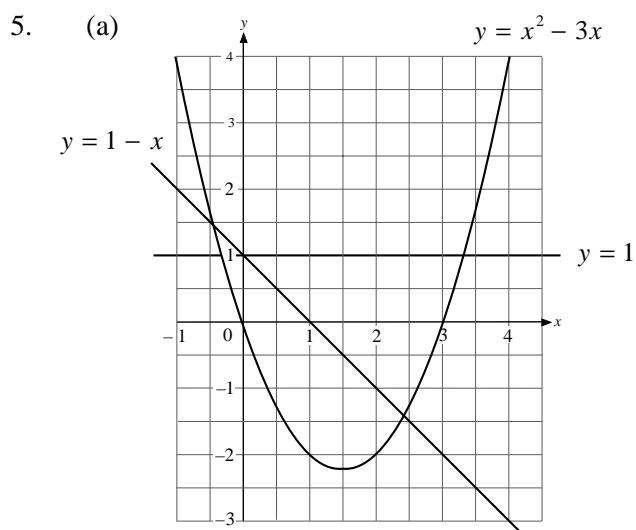
    (b) $0, \ 1$ B1   (*3 marks*)

2. $2x < 14 \ \Rightarrow \ x < 7$ B1

     $3x + 5 > 14 \ \Rightarrow \ 3x > 9 \ \Rightarrow \ x > 3$ B1

     i.e. $3 < x < 7$ B1   (*3 marks*)

3.   Angle C $= 180° - 75° - $ angle B $ = 105° - $ angle B   B1

     Angle B $= 30° \ \Rightarrow \ $ angle C $= 75°$
     Angle B $= 90° \ \Rightarrow \ $ angle C $= 15°$ $\Big\}$ $15° <$ angle C $< 75°$ M1 A1   (*3 marks*)

4.   (a)   (0, 1)   B1

     (b)   (2, 5)   B1 B1

     (c)   Length $= \sqrt{2^2 + (5 - 1)^2} \ = \ \sqrt{20} \ \ (\approx 4.47)$ M1 A1

     (d)   2   B1

     (e)

                                                                              B1   (*7 marks*)

5.   (a)

     Graph above   (minor mistake: B1)   B2

Revision Test 16.3

Answers

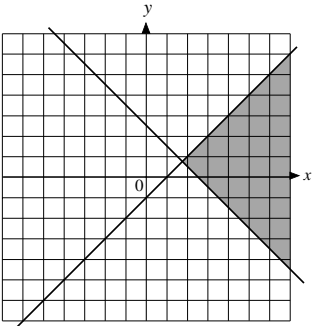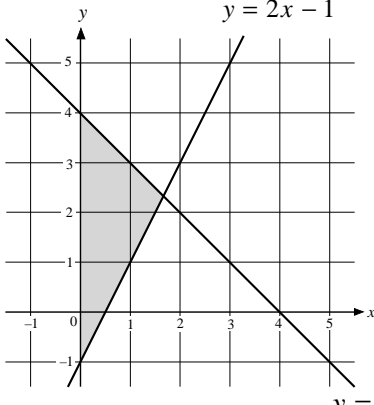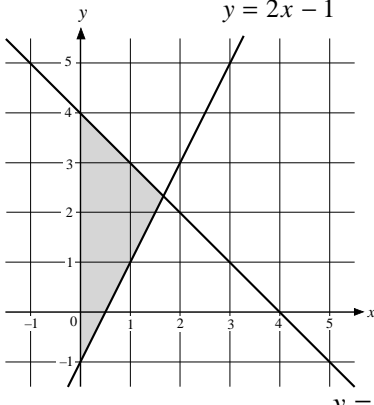(b) Graph of $y = 1 - x$ B1

2.4 and 0.4   (allow ± 0.1)   B1 B1

(c) $x > 3.3$ or   M1 A1
$x < -0.3$ A1   (*8 marks*)

6. (a) $y = 3 + \dfrac{1}{2}x$ B1 for 3,   B1 for $\dfrac{1}{2}x$

(b) $x \geq 0, \ y \geq x, \ y \leq 3 + \dfrac{1}{2}x$ B1 B1 B1

(c) Correct image, *m*   B1

(d) $y = 2x - 6$ B1 for $2x$,   B1 for -6
                                                                       (*8 marks*)

7. (a)

Each corrrect boundary   B1 B1

Overall   B1

(*3 marks*)

8. (a) (i)   2 or more males   B1
(ii)   8 or less females   B1
(iii) More females than males (or equal numbers)   B1

(b) (i) $x \geq 2$ (ii) $y \leq 8$ (iii) $y \geq x$ B1 B1 B1   (*6 marks*)

9. (a) (i) $g(-5) = 4 - (-5) = 9$ M1 A1

(ii)

Correct graph
of $y = 4 - x$ B2

(b)   Correct
boundaries   B1 B1 B1

(c) $x = \dfrac{5}{3}, \ y = \dfrac{7}{3}$ B1 B1   (*9 marks*)

(TOTAL MARKS 50)