Inequalities with negative numbers
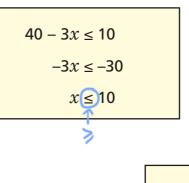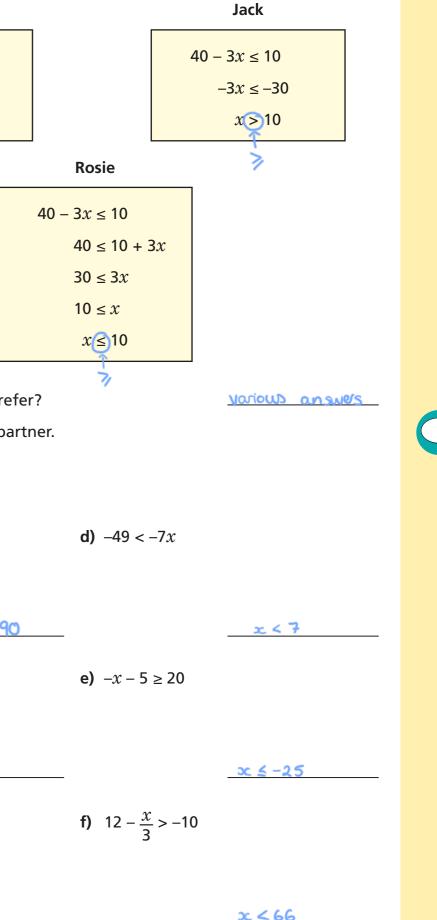
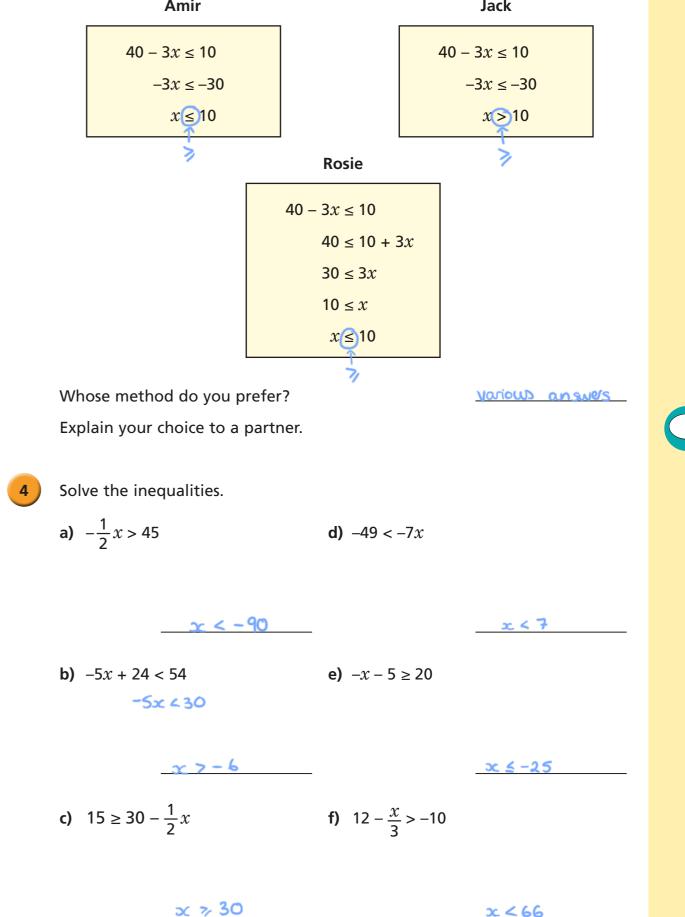**1** Complete the workings to solve the equation and inequality.

$$17 - 4x = 9$$

$+4x$ → $\boxed{17} = 9 + 4x$ ← $+4x$

$\underline{-9}$ → $\boxed{8} = \underline{4x}$ ← -9

$\underline{\div 4}$ → $\boxed{2} = \underline{x}$ ← $\div 4$

$$17 - 4x > 9$$

$+4x$ → $\boxed{17} \bigcirc{>} 9 + 4x$ ← $+4x$

$\underline{-9}$ → $\boxed{8} \bigcirc{>} \underline{4x}$ ← -9

$\underline{\div 4}$ → $\boxed{2} \bigcirc{>} \underline{x}$ ← $\div 4$

2 Match the inequalities to the solutions.

$5x - 8 > 56$	$x \le 6\frac{3}{8}$
$56 - 5x < 8$	$x > 12\frac{4}{5}$
$8x - 5 \le 56$	$x \le 7\frac{5}{8}$
$5 \le 56 - 8x$	$x > 9\frac{3}{5}$

3 Amir, Jack and Rosie have attempted to solve $40 - 3x \le 10$

Find their mistakes and correct them.

Amir

$40 - 3x \le 10$
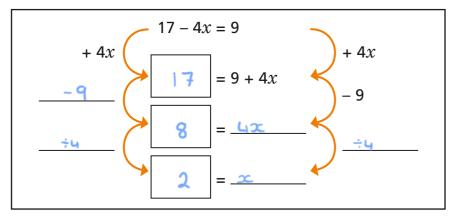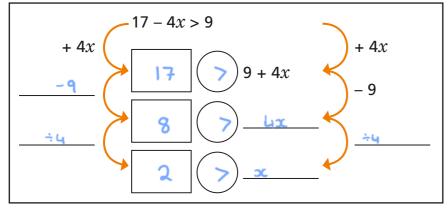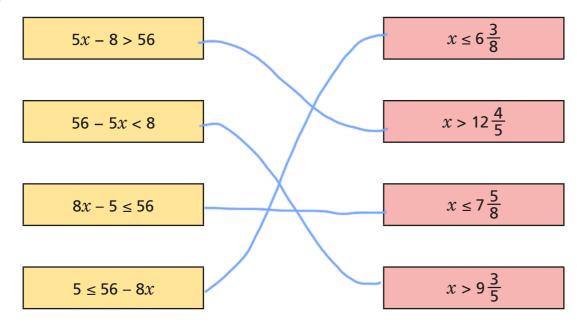
$-3x \le -30$

$x \le 10$ ↑ $\ge$

Jack

$40 - 3x \le 10$

$-3x \le -30$

$x > 10$ ↑ $\ge$

Rosie

$40 - 3x \le 10$

$40 \le 10 + 3x$

$30 \le 3x$

$10 \le x$

$x \le 10$ ↑ $\ge$

Whose method do you prefer?   _various answers_

Explain your choice to a partner.

4 Solve the inequalities.

a) $-\dfrac{1}{2}x > 45$

$\underline{x < -90}$

b) $-5x + 24 < 54$

$-5x < 30$

$\underline{x > -6}$

c) $15 \ge 30 - \dfrac{1}{2}x$

$\underline{x \ge 30}$

d) $-49 < -7x$

$\underline{x < 7}$

e) $-x - 5 \ge 20$

$\underline{x \le -25}$

f) $12 - \dfrac{x}{3} > -10$

$\underline{x < 66}$

5 Rosie solves $3(2 - x) > 15$ and $24 > 12(3 - 2x)$ using two different methods.

a) Complete her workings.

Method 1

$$3(2 - x) > 15$$
$\div 12$ ⟷ $6 - 3x > 15$ ⟷ $+3x$
$+3x$ ⟷ $\underline{6 > 3x + 15}$ ⟷ $+3x$
-15 ⟷ $\underline{-9 > 3x}$ ⟷ -15
$\div 3$ ⟷ $\underline{-3 > x}$ ⟷ $\div 3$
$(x < -3)$

Method 2

$$24 > 12(3 - 2x)$$
$\div 12$ ⟷ $2 > 3 - 2x$ ⟷ $\div 12$
$+2x$ ⟷ $\underline{2x + 2 > 3}$ ⟷ $+2x$
-2 ⟷ $\underline{2x > 1}$ ⟷ -2
$\div 2$ ⟷ $\underline{x > 0.5}$ ⟷ $\div 2$

b) Use your preferred method to solve $24 > 5(13 - 4x)$.

$$\underline{x > 2.05}$$

Compare your choice of method with a partner's.

6 Solve the inequalities.

a) $3(4 - x) > 30$

$$\underline{x < -6}$$

c) $100 > 10(4 - x)$

$$\underline{x > -6}$$

b) $2(x + 13) < 14$

$$\underline{x < -6}$$

d) $-2(x + 5) > 16$

$$\underline{x < -13}$$

7 The perimeter of the rectangle is greater than 63 cm.

If x is an integer, what is the largest possible value of x?

(32 − 5x) cm

2(5 + x) cm

$$\boxed{3}$$

8 Which number line represents the solution to $1 \leq 9 - 2x$? Tick your answer.

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9 Find a value of p that satisfies both of the inequalities.

$$p - 7 > -4 \quad \text{and} \quad 2p - 7 < 5$$

$$\text{e.g.} \quad \boxed{4}$$

Compare answers with a partner.