Exercise 3D

1 a $2x < 5 + 3$
$2x < 8$
$x < 4$

b $5x \geq 39 - 4$
$5x \geq 35$
$x \geq 7$

c $6x - 2x > 7 + 3$
$4x > 10$
$x > 2\frac{1}{2}$

d $5x + x \leq -12 - 6$
$6x \leq -18$
$x \leq -3$

e $-x > 4 - 15$
$-x > -11$
$x < 11$

f $21 - 8 > 3x + 2x$
$13 > 5x$
$5x < 13$
$x < 2\frac{3}{5}$

g $x - 3x < 25 - 1$
$-2x < 24$
$x > -12$

h $7x + 7x < 7 + 7$
$14x < 14$
$x < 1$

i $-0.5x \geq 1 - 5$
$-0.5x \geq -4$
$x \leq 8$

j $5x + 2x > 12 - 4$
$7x > 8$
$x > 1\frac{1}{7}$

2 a $2x - 6 \geq 0$
$2x \geq 6$
$x \geq 3$

b $8 - 8x > x - 1$
$8 + 1 > x + 8x$
$9 > 9x$
$1 > x$
$x < 1$

c $3x + 21 \leq 8 - x$
$3x + x \leq 8 - 21$
$4x \leq -13$
$x \leq -3\frac{1}{4}$

d $2x - 6 - x - 12 < 0$
$2x - x < 6 + 12$
$x < 18$

e $1 + 22 - 11x < 10x - 40$
$1 + 22 + 40 < 10x + 11x$
$63 < 21x$
$3 < x$
$x > 3$

f $2x - 10 \geq 12 - 3x$
$2x + 3x \geq 12 + 10$
$5x \geq 22$
$x \geq 4\frac{2}{5}$

g $12x - 3x + 9 < 45$
$12x - 3x < 45 - 9$
$9x < 36$
$x < 4$

h $x - 10 - 4x < 11$
$x - 4x < 11 + 10$
$-3x < 21$
$x > -7$

2 i $x^2 - 4x \geq x^2 + 2$

$x^2 - x^2 - 4x \geq 2$

$-4x \geq 2$

$x \leq -\frac{1}{2}$

j $5x - x^2 \geq 3 + x - x^2$

$5x - x - x^2 + x^2 \geq 3$

$4x \geq 3$

$x \geq \frac{3}{4}$

k $3x + 2x^2 - 6x \leq 10 + 2x^2$

$-3x \leq 10$

$x \geq -\frac{10}{3}$

l $2x^2 - 5x \leq \frac{4x^2 + 12x}{2} - 9$

$4x^2 - 10x \leq 4x^2 + 12x - 18$

$18 \leq 22x$

$x \geq \frac{9}{11}$

3 a $3x - 6 > x - 4$

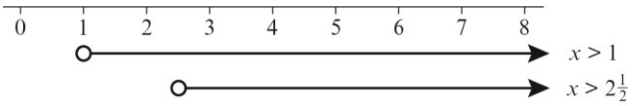
$2x > 2$

$x > 1$

$4x + 12 > 2x + 17$

$2x > 5$

$x > 2\frac{1}{2}$



So the required set of values is $x > 2\frac{1}{2}$

$\{x: x > 2\frac{1}{2}\}$

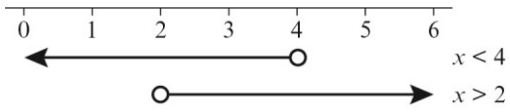
b $2x - 5 < x - 1$

$x < 4$

$7x + 7 > 23 - x$

$8x > 16$

$x > 2$



So the required set of values is $2 < x < 4$

$\{x: 2 < x < 4\}$

c $2x - 3 > 2$

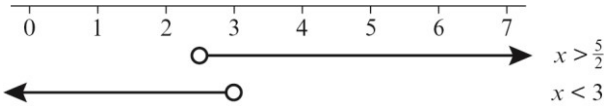
$2x > 5$

$x > \frac{5}{2}$

$3x + 6 < 12 + x$

$2x < 6$

$x < 3$



So the required set of values is $\frac{5}{2} < x < 3$

$\{x: \frac{5}{2} < x < 3\}$

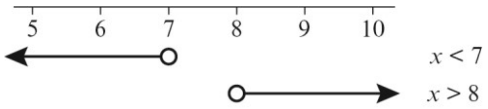
d $15 - x < 22 - 2x$

$x < 7$

$15x - 5 > 12x + 19$

$3x > 24$

$x > 8$



So there are no values that satisfy both inequalities.

e $3x + 8 \leq 20$

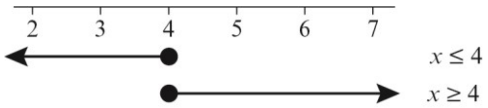
$3x \leq 12$

$x \leq 4$

$6x - 14 \geq x + 6$

$5x \geq 20$

$x \geq 4$



So the required set of values is $x = 4$

$\{x: x = 4\}$

3 f $5x + 3 < 9$

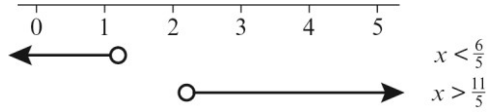
$5x < 6$

$x < \frac{6}{5}$

$10x + 5 > 27$

$10x > 22$

$x > \frac{11}{5}$



So the required set of values is

$x < \frac{6}{5}$ or $x > \frac{11}{5}$

$\{x: x < \frac{6}{5}\} \cup \{x: x > \frac{11}{5}\}$

g $12x + 28 \leq 20$

$12x \leq -8$

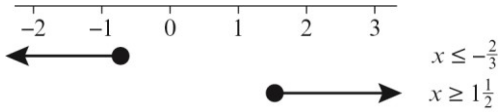
$x \leq -\frac{2}{3}$

$6x - 10 \geq \frac{7 - 6x}{2}$

$12x - 20 \geq 7 - 6x$

$18x \geq 27$

$x \geq 1\frac{1}{2}$



So the required set of values is

$x \leq -\frac{2}{3}$ or $x \geq 1\frac{1}{2}$

$\{x: x \leq -\frac{2}{3}\} \cup \{x: x \geq 1\frac{1}{2}\}$

Challenge

A: $3x + 5 > 2$

$3x > -3$

$x > -1$

B: $\frac{x}{2} + 1 \leq 3$

$\frac{x}{2} \leq 2$

$x \leq 4$

C: $11 < 2x - 1$

$12 < 2x$

$x > 6$

$p = -1, q = 4, r = 6$