CHAPTER 2 EM Simultaneous Linear Inequalities

1) When to flip sign?

a) Divide or multiply by negative no.

eg. $-x > 7$

$x < 7$

$\frac{3}{8} < \frac{4-x}{-5}$ (×(-5) on both sides)

$-15 > 32 - 8x$

$8x > 47$

$x > 5\frac{7}{8}$

b) Swap positions of LHS and RHS

eg. $7 \geqslant x$

$x \leqslant 7$

2) Solving simultaneous inequality

eg. Solve the inequalities $-\frac{11}{5} < \frac{7-3x}{3} \leqslant 4$. Represent your solution on a number line.

$-\frac{11}{5} < \frac{7-3x}{3}$ and $\frac{7-3x}{3} \leqslant 4$

$3(-11) < 5(7-3x)$ | $7-3x \leqslant 12$

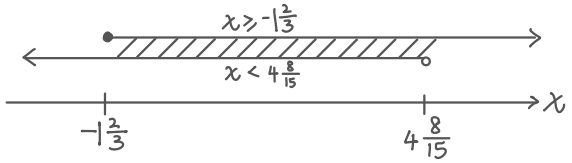
$-33 < 35 - 15x$ | $-3x \leqslant 5$

$15x < 35 + 33$ | $x \geqslant -1\frac{2}{3}$

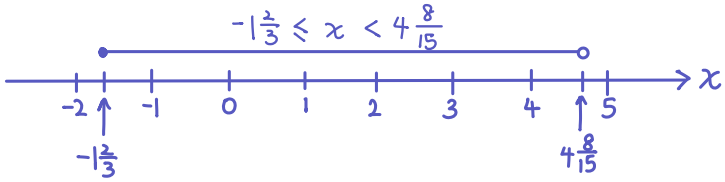
$x < 68$

$x < 4\frac{8}{15}$

This is the working number line to find your solution, which is the overlapping part. You can choose not to draw this.



$\therefore -1\frac{2}{3} \leqslant x < 4\frac{8}{15}$ ← solution



← Number line to represent your solution.

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eg. Solve the inequalities $x + 2 \geqslant \frac{x}{2} > 3$. Represent your solution on a number line.

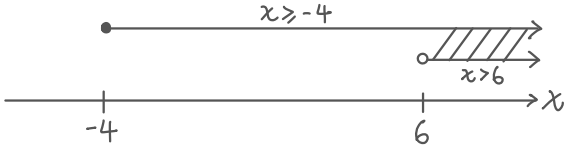
$x + 2 \geqslant \frac{x}{2}$ and $\frac{x}{2} > 3$

$2x + 4 \geqslant x$ | $x > 6$

$x \geqslant -4$

$\therefore x > 6$ ← solution

This is the working number line to find your solution, which is the overlapping part. You can choose not to draw this.



← Number line to represent your solution.

eg. Solve the inequalities $x-1 > \frac{x}{2} \geqslant x+2$.

$x-1 > \frac{x}{2}$ and $\frac{x}{2} \geqslant x+2$

$2x-2 > x$ $\quad x \geqslant 2x+4$

$x > 2$ $\quad -x \geqslant 4$

$x \leqslant -4$

$\therefore$ There is no solution.

This is the working number line to find your solution, which has no overlapping part. You can choose not to draw this.

3) Finding largest / smallest values from the given simultaneous inequalities.

eg. Given that x and y are integers where $-5 \leq x \leq 4$ and $-3 \leq y < 3$, find

a) the greatest possible value of $x-y$.

Largest $x = 4$

Smallest $y = -3$

Greatest $x-y = 4-(-3)$

$= 7$

TIP

You only need to use the maximum, minimum and zero of each variable.

For x : -5 , 0 , 4

For y : -3 , 0 , 2

b) the smallest possible value of xy.

Check extremes :

① $x = -5$, $y = 2$ $\longrightarrow$ $xy = (-5)(2) = -10$

② $x = 4$, $y = -3$ $\longrightarrow$ $xy = (4)(-3) = -12$ ✓

c) the smallest possible value of $x^2 + y^2$

Smallest $x^2 + y^2 = 0^2 + 0^2$

$= 0$

note: squaring a positive or negative number always result in a positive answer.

d) the largest possible value of $x^2 + y^2$

largest $x^2 + y^2 = (-5)^2 + (-3)^2$

$= 34$