SOLVING LINEAR INEQUALITIES

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> means 'is greater than'	≥ means is greater than or equal to'
< means 'is less than'	≤ means 'is less than or equal to'

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You solve a linear inequality in a similar way to solving linear equations.

$3x + 2 > 12$ take 2 from both sides

$3x > 10$ divide both sides by 3

$x > \frac{10}{3}$ change the improper fraction to a mixed number

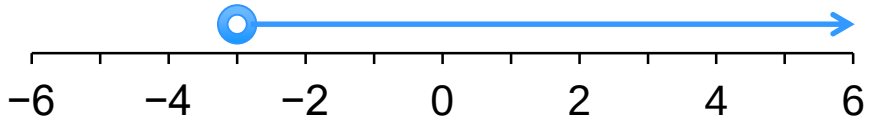
$x > 3\frac{1}{3}$

You need to be careful if you **multiply** or **divide** an inequality by a negative number. You must **reverse the inequality sign**.

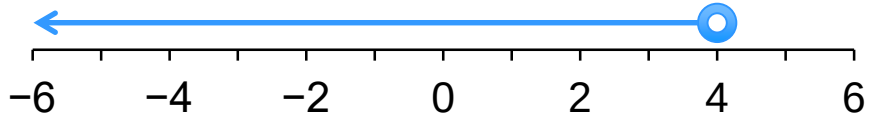
eg $-2 < 5$ multiplying both sides by -1 gives $2 > -5$

Inequalities can be shown on a number line.

$x > -3$

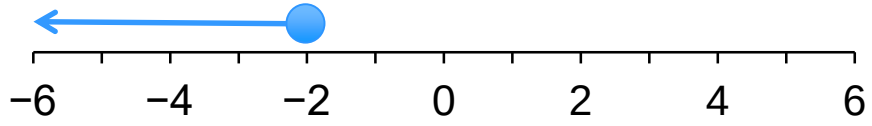


$x < 4$



$x \geq 1$

$x \leq -2$



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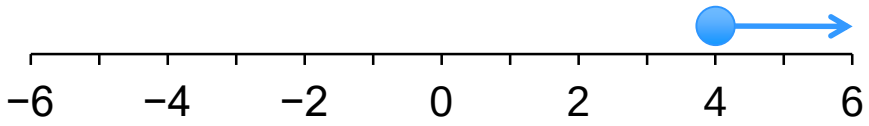
Examples

1 Solve $2x - 5 \geq 3$ and show your answer on a number line.

$2x - 5 \geq 3$ add 5 to both sides

$2x \geq 8$ divide both sides by 2

$x \geq 4$



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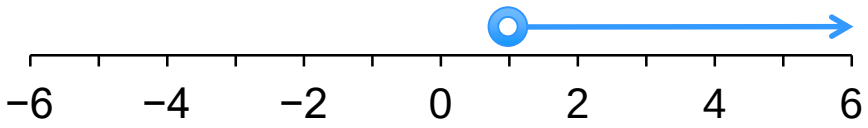
Examples

2 Solve $7 - 2x < 5$ and show your answer on a number line.

$7 - 2x < 5$ take 7 from both sides

$-2x < -2$ divide both sides by −2 (remember to reverse the inequality sign)

$x > 1$



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Examples

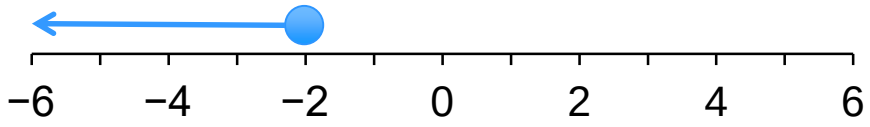
3 Solve $3x - 4 \leq 2(x - 3)$ and show your answer on a number line.

$3x - 4 \leq 2(x - 3)$ expand brackets

$3x - 4 \leq 2x - 6$ take $2x$ from both sides

$x - 4 \leq -6$ add 4 to both sides

$x \leq -2$



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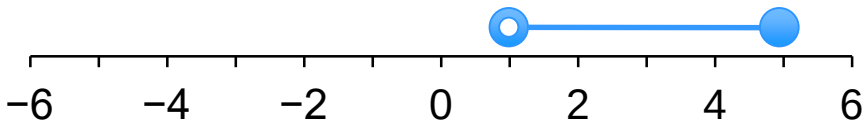
Examples

4 Solve $4 < 3x + 1 \leq 16$ and show your answer on a number line.

$4 < 3x + 1 \leq 16$ take 1

$3 < 3x \leq 15$ divide by 3

$1 < x \leq 5$



Examples

5 Solve $x < 2x + 1 \leq 7$ and show your answer on a number line.

split the inequality into two parts and solve separately

$x < 2x + 1$ take $2x$ from both sides

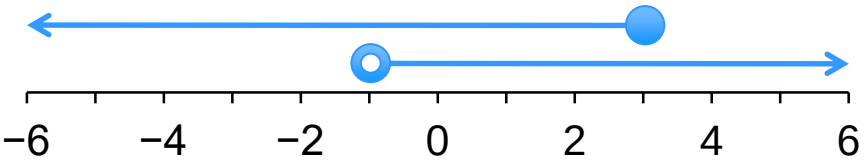
$-x < 1$ multiply both sides by -1

$x > -1$

$2x + 1 \leq 7$ take 1 from both sides

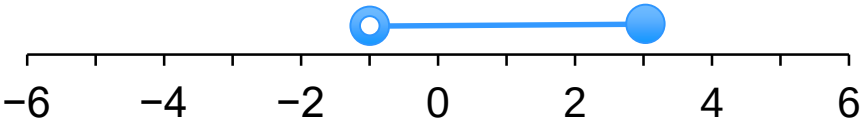
$2x \leq 6$ divide both sides by 2

$x \leq 3$



The numbers that satisfy both inequalities are $-1 < x \leq 3$

This can be shown on a number line as:



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Exercise 14.1

1 Solve each of the following inequalities:

a $15 + 3x < 21$

b $18 \leqslant 7y + 4$

c $19 - 4x \geqslant 27$

d $2 \geqslant \frac{y}{3}$

e $-4t + 1 < 1$

f $1 \geqslant 3p + 10$

2 Solve each of the following inequalities:

a $7 < 3y + 1 \leqslant 13$

b $3 \leqslant 3p < 15$

c $9 \leqslant 3(m - 2) < 15$

d $20 < 8x - 4 < 28$

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