

MY P4/5 - Year 10/11

Algebra

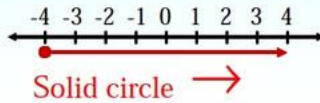
Inequalities

Inequalities

Solve and Graph

$$\begin{array}{r} -6 \leq x - 2 \\ +2 \quad +2 \\ \hline -4 \leq x \\ \text{---} \\ x \geq -4 \end{array}$$

The variable must be on the **left!**



2019-2020

Presenting inequalities on a number line

Suppose our solution to an inequality is $x \geq 4$, so every number which is 4 or greater is a possible value for x . We represent this number line by :



The set of solutions can be written as: $x \in [4, +\infty)$

If our solution is $x < 5$ we represent the number line by:



The set of solutions can be written as: $x \in (-\infty, 5)$

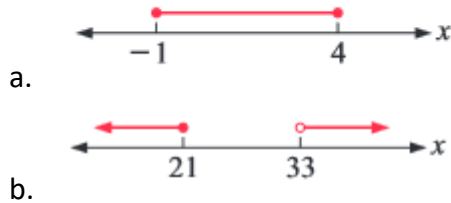
Solving linear inequalities

The method of solution of linear inequalities is identical to that of linear equations with the exception that:

- **Interchanging** sides **reverses** the inequality sign
- **Multiplying or dividing** both sides by a negative number **reverses** the inequality sign.

Exercises

1. Represent the inequality $x \geq 4$ on a number line
2. Represent the inequalities $x < 2$ or $x > 5$ on a number line
3. Represent the inequalities $x < 2$ or $x > 5$ on a number line
4. Represent the inequalities $x > 2$ and $x < 5$ on a number line
5. Write down the inequality used to describe the set of numbers



6. Solve : $3x - 4 \geq 5$ and depict the solution on a number line
7. Solve : $3 - 2x < 7$ and depict the solution on a number line
8. Solve : $\frac{x-4}{3} - \frac{x-1}{2} \geq 2x - \frac{x}{6}$ and depict the solution on a number line
9. Solve the following linear inequalities and depict the solution on a number line
 - a. $x + 4 < 7$
 - b. $t - 3 > 5$
 - c. $p + 2 \geq 12$
 - d. $2x - 3 < 7$
 - e. $4y + 5 \leq 17$
 - f. $3t - 4 > 11$
 - g. $\frac{x}{2} + 4 < 7$
 - h. $\frac{y}{5} + 3 \leq 6$
 - i. $\frac{t}{3} - 2 \geq 4$
 - j. $3(x - 2) < 15$
 - k. $5(2x + 1) \leq 35$
 - l. $2(4t - 3) \geq 34$

10. Write down the largest integer value of x that satisfies each of the following:

- $x - 3 \leq 5$, where x is positive
- $x + 2 < 9$, where x is positive and even
- $3x - 11 < 40$, where x is a square number
- $5x - 8 \leq 15$, where x is positive and odd
- $2x + 1 < 19$, where x is positive and prime

11. Solve the following linear inequalities and represent the solution on a number line

- $\frac{x+4}{2} \leq 3 - x$
- $\frac{x-3}{5} > 7$
- $\frac{2x+5}{3} < 6x - 1$
- $\frac{4x-3}{5} \geq 5$
- $\frac{3t-2}{7} > 4(x-3)$
- $\frac{5y+3}{5} \leq -2(x-2)$

12. Solve the following linear equations and depict the solution on a number line

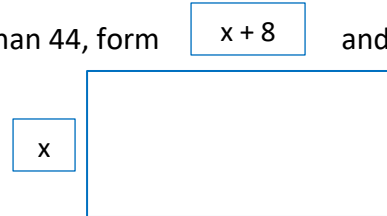
- $7 < 2x + 1 < 13$
- $5 < 3x - 1 < 14$
- $-1 < 5x + 4 \leq 19$
- $1 \leq 4x - 3 < 13$
- $11 \leq 3x + 5 < 17$
- $-3 \leq 2x - 3 \leq 7$

Word Problems

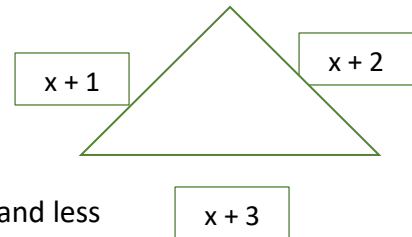
13. A football stadium can hold 20000 people. It is always more than half full. Let x be the number of people in the crowd. Write this information in the form of two inequalities.
14. On a roller coaster ride there are height restrictions. Riders have to be at least 156 cm tall, but less than 2 meters. h is the height of the riders. Write this information in the form of two inequalities.
15. Joe is 4 years older than Mary. Mary is x years old.
- Write an expression for Joe's age.
 - Joe is less than 13 years old. Show this as an inequality.
 - Solve this to show an inequality for Mary's age.
16. John is three times as old as Ben. Ben is h years old.
- Write an expression for John's age.
 - John is older than 12. Show this as an inequality.
 - Show an inequality for Ben's age.
 - Solve the inequalities.
17. A builder is to build a house that is 20 meters long and q meters wide. Planning permission is granted as long as the floor area of the house does not exceed (be bigger than) 200 m^2 .
- Write an expression for the floor area of the house.
 - Show this as an inequality.
 - Solve the inequality for the width of the house.
18. An electrician charges 25 € to visit plus 16€ for every hour's work. He works h hours.
- Write an expression for the amount of money he charges.
 - He says that the job will cost at least 217 €. Show this as an inequality.
 - Show an inequality for the minimum number of hours that you would expect him to work.
19. Robin and Sam are taking a trip to the pet store to buy some things for their new puppy. They know that they need a bag of food that costs 7 €, and they also want to buy some new toys for the puppy. They find a bargain barrel containing toys that cost 2 € each.

- a. Write an expression for the amount of money they will spend if the number of toys they buy is t .
- b. Robin has 30 € with her and Sam has one-third of this amount with him. Use this information and the expression you wrote in part (a) to write an inequality for finding the number of toys they can buy.
- c. Solve the inequality and evaluate your solution.

20. Given that the perimeter of the rectangle shown is less than 44, form $x + 8$ and solve an inequality.



21. The perimeter of the triangle shown is greater than 21 but less than or equal to 30. Form and solve an inequality using this information.



22. The area of a circle must be greater than or equal to 10 m^2 and less than 20 m^2 . Determine an inequality that the radius, r , of the circle must satisfy.