Chapter 10: INEQUALITIES

Inequalities are like equations, but instead of having an equals sign, they have an inequality sign. The smaller end of the arrow points to the smaller number.
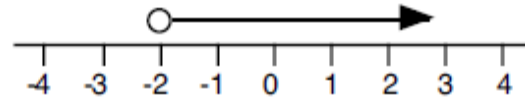
$a < 2$ [a is less than 2]
$b > c$ [b is greater than c, but also c is less than b]
$x \leq 3$ and $3 \geq x$ [both mean that x is the less than or equal to 3]

$a > -2$ can be shown on a number line:
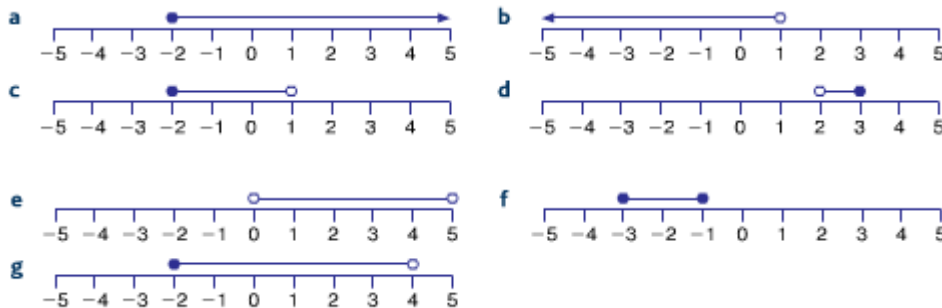[the hollow circle means it cannot be equal to -2]

$-1 \leq x < 3$ can also be shown on a number line:
[the solid circle means it can also be equal to -1]

Exercise A
1. Write down the inequalities shown on the number line:

2. Show the following inequalities on a number line:

(a) $x > 2$ (b) $x < 5$ (c) $x \geq 0$ (d) $x \leq -1$

(e) $x > 1$ and $x < 3$ (f) $x > -1$ and $x \leq 0$ (g) $x \geq -4$ and $x \leq -1$

(h) $-1 < x \leq 3$ (i) $-4 \leq x < 0$ (j) $-5 < x \leq -2$

Solving Linear Inequalities

Treat the inequality as if it is an equals sign, with *one exception* – multiplying or dividing by a negative number will reverse (flip) the inequality sign.

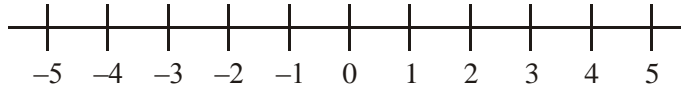### Worked Examples
1. $7 + \frac{1}{2} a \geq 10$ [group a's and numbers together, -7 from both sides]
    $\frac{1}{2} a \geq 3$ [multiply by 2 to get a singular]
    $a \geq 6$

2. $3b - 4 < 5b + 8$ [group b's together, subtract 5b]
    $-2b - 4 < 8$ [group numbers together, add 4]
      $-2b < 12$ [divide by -2 to get b singular, *flip inequality*]

Exercise B

1. (i) Solve the inequality

$$5x - 7 < 2x - 1$$

   (ii) On the number line, represent the solution set to part (i).

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  +---+---+---+---+---+---+---+---+---+---+
 −5  −4  −3  −2  −1   0   1   2   3   4   5
```

Solve the following inequalities:

2. $5x + 12 > 2$

3. $3x + 2 > -7$

4. $4x - 3 < 7$

5. $5x + 3 > 19$

6. $7x - 3 > 17$

7. $3x \geq x + 7$

8. $5x < 2x - 6$

9. $6x < 7 + 4x$

10. $4p - 8 < 7 - p$

11. $7x + 9 > 3x + 1$

12. $5 - 3x > 2(x + 1)$