# FA1.4: FACTORISATION: DIFFERENCE OF TWO SQUARES

## Difference of two squares (DOTS)

Consider the following expansion:

$$(x+5)(x-5) = x^2 + 5x - 5x - 25$$
$$= x^2 - 25$$

Note that:

- the terms in the brackets differ only in the sign of the second term
- the expansion is the difference of two terms, both of which are perfect squares

In general:

$$\boxed{(a+b)(a-b) = a^2 - b^2}$$

This can be used to factorise expressions of the form $a^2 - b^2$

## Examples

1. $a^2 - 36 = (a)^2 - (6)^2$
   $a^2 - 36 = (a+6)(a-6)$

   expression is the **difference** of two squares

   'DOTS' rule (order of the terms on right hand side is not important)

2. $4x^2 - y^2 = (2x)^2 - (y)^2$
   $4x^2 - y^2 = (2x-y)(2x+y)$

   expression is the **difference** of two squares

   'DOTS' rule

3. $3x^2 - 48 = 3(x^2 - 16)$
   $3x^2 - 48 = 3((x)^2 - (4)^2)$
   $3x^2 - 48 = 3(x+4)(x-4)$

   **not the difference of two squares** but to factorise, take out a common factor of 3

   factorise using 'DOTS' rule

4. $(x+2)^2 - 9 = (x+2)^2 - 3^2$
   $(x+2)^2 - 9 = ((x+2)-3)((x+2)+3)$
   $(x+2)^2 - 9 = (x-1)(x+5)$

   expression is the **difference** of two squares

   'DOTS' rule

   Simplify

5. $y^2 + 36$

   this is **not the difference** of two squares. It is the **sum** of two squares.

   **No real factors**

## Exercise

Factorise the following using the 'DOTS' rule (if possible).

1. $x^2-4$
2. $a^2-100$
3. $49-x^2$
4. $64x^2-1$
5. $121x^2-49y^2$
6. $a^2b^2-25$
7. $5x^2-20$
8. $4a^2+100$
9. $x^2y^3-36y$
10. $(x+2)^2-y^2$
11. $(x-5)^2-36$
12. $(a+1)^2-(b-2)^2$

## Answers

1. $(x-2)(x+2)$
2. $(a+10)(a-10)$
3. $(7+x)(7-x)$
4. $(8x-1)(8x+1)$
5. $(11x+7y)(11x-7y)$
6. $(ab-5)(ab+5)$
7. $5(x+2)(x-2)$
8. Does not factorise
9. $y(xy+6)(xy-6)$
10. $(x-y+2)(x+y+2)$
11. $(x-11)(x+1)$
12. $(a+b-1)(a-b+3)$