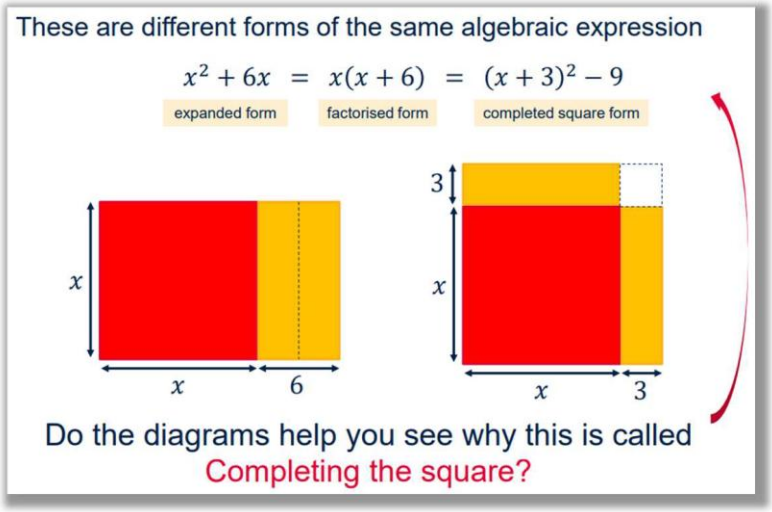
# HNC @ HOME
## 2026

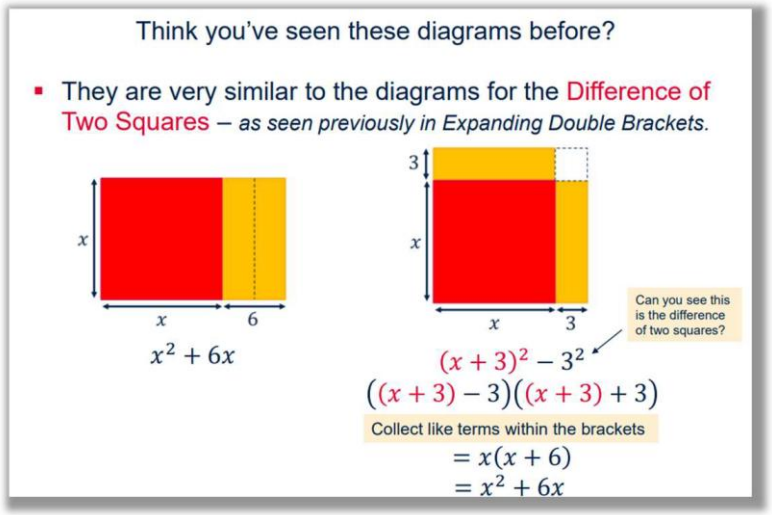
## A Level Mathematics – *Activity 1*

**Show your work!**

Part 1
This is a set of algebra questions involving completing the square. I am sure you have heard 'show your working out' before, but communication and correct mathematical language/notation is extremely important at A Level.

Have a look at the diagrams which show completing the square pictorially.



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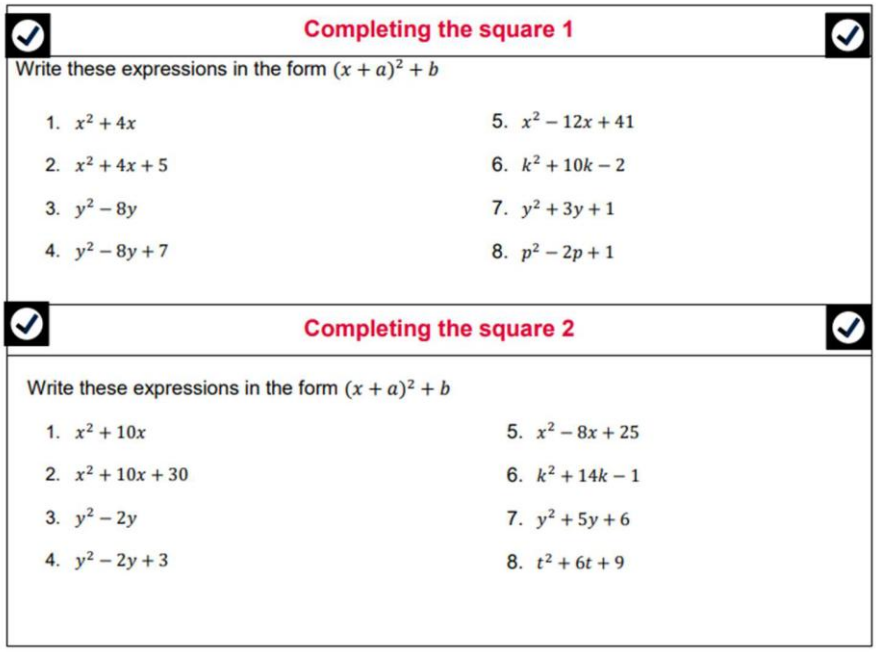
Solving a quadratic equation

Part 2 - watch this video:
https://www.youtube.com/watch?v=voZOpLt89wE&list=PL5pdglZEO3NhOCf8AVW78hQvJkmF8-am&index=5

Part 3 - try these showing full mathematical solutions.



**Completing the square 1**

Write these expressions in the form $(x + a)^2 + b$

1. $x^2 + 4x$
2. $x^2 + 4x + 5$
3. $y^2 - 8y$
4. $y^2 - 8y + 7$
5. $x^2 - 12x + 41$
6. $k^2 + 10k - 2$
7. $y^2 + 3y + 1$
8. $p^2 - 2p + 1$

**Completing the square 2**

Write these expressions in the form $(x + a)^2 + b$

1. $x^2 + 10x$
2. $x^2 + 10x + 30$
3. $y^2 - 2y$
4. $y^2 - 2y + 3$
5. $x^2 - 8x + 25$
6. $k^2 + 14k - 1$
7. $y^2 + 5y + 6$
8. $t^2 + 6t + 9$

Part 4 – mark your work in a different colour with the following solutions

Complete the square 1 solutions

1. $x^2 + 4x \rightarrow = (x + 2)^2 - 4$
2. $x^2 + 4x + 5 \rightarrow = (x + 2)^2 + 1$
3. $y^2 - 8y \rightarrow = (y - 4)^2 - 16$
4. $y^2 - 8y + 7 \rightarrow = (y - 4)^2 - 9$
5. $x^2 - 12x + 41 \rightarrow = (x - 6)^2 + 5$
6. $k^2 + 10k - 2 \rightarrow = (k + 5)^2 - 27$
7. $y^2 + 3y + 1 \rightarrow = \left(y + \frac{3}{2}\right)^2 - \frac{5}{4}$
8. $p^2 - 2p + 1 \rightarrow = (p - 1)^2$

Complete the square 2 solutions

1. $x^2 + 10x \rightarrow = (x+5)^2 - 25$
2. $x^2 + 10x + 30 \rightarrow = (x+5)^2 + 5$
3. $y^2 - 2y \rightarrow = (y-1)^2 - 1$
4. $y^2 - 2y + 3 \rightarrow = (y-1)^2 + 2$
5. $x^2 - 8x + 25 \rightarrow = (x-4)^2 + 9$
6. $k^2 + 14k - 1 \rightarrow = (k+7)^2 - 50$
7. $y^2 + 5y + 6 \rightarrow = \left(y + \frac{5}{2}\right)^2 - \frac{1}{4}$
8. $t^2 + 6t + 9 \rightarrow = (t+3)^2$

Part 5

## Different Forms

It is important to be able to convert expressions between the different forms:

expanded form  factorised form  completed square form

In this problem there are 4 sets of three equivalent expressions, however, some expressions are missing. Match the sets and find the 3 missing expressions.

| | | |
|---|---|---|
| $a^2 - 2a - 8$ |  | $a^2 - 8a + 15$ |
|  | $a^2 + 2a - 15$ | $(a+2)(a+4)$ |
| $(a+1)^2 - 16$ | $(a-3)(a-5)$ |  |
| $(a+5)(a-3)$ | $(a-1)^2 - 9$ | $(a+3)^2 - 1$ |

## Extra Puzzle 1

What is the value of

$$\frac{\frac{(5^2-3^2)}{5+3} + \frac{(4^2-2^2)}{4+2} + \frac{(3^2-1^2)}{3+1}}{2} \; ?$$