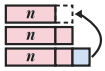
# Algebraic Proof

**1**

Prove that the sum of three consecutive integers is a multiple of 3.

move one square from the longest row to the shortest




three rows of ____

write the numbers using $n$

$n$ + $n+1$ + ____

collect like terms

= ____

factorise to show it

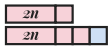
= ____

So it is _____

**2**

Prove that the sum of two consecutive odd numbers is a multiple of 4.

move one square from the longest row to the shortest




two rows of ____

write the numbers using $n$

$2n+1$ + ____

collect like terms

= ____

factorise to show it

= ____

So it is _____

**3**

Prove that the sum of four consecutive integers is even.

write the numbers using $n$

____ + ____ + ____ + ____

collect like terms

= ____

factorise to show it

= ____

So it is _____

**4**

Prove that the sum of three consecutive even numbers is a multiple of 6.

write the numbers using $n$

____ + ____ + ____

collect like terms

= ____

factorise to show it

= ____

So it is _____

**5**

Prove that $(n+3)^2 - n^2$ is a multiple of 3 for every whole number $n$.

expand the brackets

____

collect like terms

= ____

factorise to show it

= ____

So it is _____

**6**

Prove that $(n+1)^2 - (n-1)^2$ is a multiple of 4 for every whole number $n$.

____

= ____

= ____

So it is _____

**7**

Prove that the square of an odd number is odd.

____

= ____

= ____

So it is _____

**8**

Prove that the product of two consecutive odd numbers is odd.

So it is _____

# Algebraic Proof *further practice*

**9**

Prove that the product of two consecutive even numbers is a multiple of 4.

Answer _____

**10**

Prove that the difference between the squares of two consecutive odd numbers is a multiple of 8.

Answer _____

**11**

Mo says that $n^2 - n + 11$ is prime for every whole number $n$. Show that Mo is wrong.

Answer _____

**12**

A square has sides of $(n+1)$ cm.
A rectangle is $(n+3)$ cm by $(n-1)$ cm.
Prove that the area of the square is always 4 cm$^2$ more than the area of the rectangle.

Answer _____

**13**

Seats in a cinema are numbered in rows of 12, as shown. In any 2 by 2 block of seats, multiply the numbers in opposite corners. Prove that the two answers always differ by 12.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |

Answer _____

**14**

Take a two digit number, reverse its digits and subtract the smaller number from the larger.
Prove that the answer is always a multiple of 9.

Answer _____

**15**

Prove that the sum of the squares of three consecutive whole numbers is always 2 more than a multiple of 3.

Answer _____

**16**

Lena works out $1 + 2 + 3 + 4 = 10$,
$2 + 3 + 4 + 5 = 14$ and
$3 + 4 + 5 + 6 = 18$. She says this proves that the sum of four consecutive whole numbers is never a multiple of 4. Explain why this is not a proof. Then prove it.

Answer _____