

1



Prove that the sum of five consecutive whole numbers is a multiple of 5.

$$n + (n + 1) + (n + 2) + (n + 3) + (n + 4)$$

$$= 5n + 10 = 5(n + 2)$$

Proof $5(n + 2)$, a multiple of 5

2



Prove that an odd number plus an even number is always odd. Use two different letters.

$$(2m + 1) + 2n$$

$$= 2(m + n) + 1$$

Proof 1 more than an even number

3



$(n + a)^2 - n^2 \equiv 10n + 25$
Find a . Then prove that $(n + a)^2 - n^2$ is always a multiple of 5.

$$2an + a^2 \equiv 10n + 25, \text{ so } a = 5$$

$$10n + 25 = 5(2n + 5)$$

Answer $a = 5; 5(2n + 5)$

4



Ola proves that the sum of two odd numbers is even:
“ $(2n + 1) + (2n + 1) = 4n + 2 = 2(2n + 1)$ ”
Explain what is wrong with her proof, then write a correct one.

she used the same odd number twice

$$(2m + 1) + (2n + 1) = 2m + 2n + 2$$

Reason $2(m + n + 1)$, even

5



Think of a number. Add 3.
Multiply by 4. Take away 12.
Divide by the number you first thought of.
Prove that the answer is always 4.

$$4(n + 3) - 12 = 4n$$

$$\frac{4n}{n} = 4$$

Proof 4

6



Three dates are in a column of a calendar, one under another. Prove that their total is always 3 times the middle date.

M	T	W	T	F	S	S
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

$$n + (n + 7) + (n + 14)$$

$$= 3n + 21 = 3(n + 7)$$

Proof $3 \times \text{the middle date}$

7



Multiply two consecutive whole numbers, then add the larger one. Prove that the answer is always a square number.

$$n(n + 1) + (n + 1)$$

$$= n^2 + 2n + 1 = (n + 1)^2$$

Proof $(n + 1)^2$

8



Prove that the sum of three consecutive odd numbers is always a multiple of 3, but never a multiple of 6.

$$(2n + 1) + (2n + 3) + (2n + 5) = 6n + 9$$

$$= 3(2n + 3), \text{ and } 2n + 3 \text{ is odd}$$

Reason $3 \times \text{odd}$, so odd