Algebraic Proof

SCAN ME

REVISE THIS TOPIC

CHECK YOUR ANSWERS

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1 Prove that $(n + 5)^2 - (3n + 8) = (n + 3)(n + 4) + 5$ **[3 marks]**

2 Prove that $(2n - 1)^2 - (n - 3)^2 = (3n - 1)(n + 1) - 7$ **[3 marks]**

6

3 Prove that $(3n - 5)^2 - 2(4n - 5)(n - 3) = (n + 5)(n - 1)$ **[3 marks]**

4 Prove that $(n - 3)^2 - (15 + n)(15 - n) = 2(n - 12)(n + 9)$ **[3 marks]**

Solutions

5 n is an integer such that $n > 3$

Prove algebraically that $(n - 2)^2 - (n - 5)^2$ is always a multiple of 3. **[3 marks]**

6 n is a positive integer.

Prove algebraically that $(3n + 1)^2 - (3n - 4)^2$ is always a multiple of 15. **[3 marks]**

12

7 n is a positive integer.
Prove algebraically that $(2n + 5)^2 - (2n + 1)^2$ is always a multiple of 8 **[3 marks]**

8 n is a positive integer such that $n > 2$
Prove algebraically that $(2n + 3)^2 + (3 - n)^2 - (n + 5)^2$ is always one more than a multiple of 4. **[4 marks]**

Solutions

9 Prove algebraically that the sum of five consecutive positive integers is always a multiple of 5. **[2 marks]**

10 Arjan says:

"The sum of four consecutive positive integers is always a multiple of 4".

Use an algebraic method to prove that Arjun is incorrect. **[2 marks]**

11

Turn over ►

11 Prove algebraically that the sum of six consecutive positive integers is always a multiple of 3. **[2 marks]**

12 n is a positive integer.

Prove that $(4n - 3)^2 - 3(5n - 3)(n - 1)$ is always a square number. **[3 marks]**

Solutions

13 n is a positive integer.
Prove that $(3n + 1)(9n^2 – 3n + 1)$ is always 1 more than a cube number. **[4 marks]**

14 n is a positive integer.
Prove that $(n + 2)^3 – n^3$ is always even. **[4 marks]**

13

15 n is an integer.
Prove that $n^2 - 6n + 10$ is always positive. **[3 marks]**

16 n is an integer.
Prove that $n^2 + 3n + 3$ is always positive. **[3 marks]**

17 n is an integer.
Prove that $2n - n^2 - 2$ is always negative. **[3 marks]**

Solutions

18 n and m are consecutive integers and $m > n$.
Prove algebraically that $m^2 - n^2$ is always an odd number. **[3 marks]**

19 n and m are consecutive integers and $m > n$.
Prove algebraically that $mn + m$ is always a square number. **[3 marks]**

15

20 Prove algebraically that the sum of three consecutive even numbers is always a multiple of 6. **[2 marks]**

21 Prove algebraically that the difference between the squares of two consecutive even numbers is always a multiple of 4 **[3 marks]**

Solutions

22 Prove algebraically that the sum of the squares of three consecutive integers is one less than a multiple of 3. **[4 marks]**

23 Prove algebraically that the difference between the squares of consecutive integers is equal to the sum of the two integers. **[3 marks]**

12

24 Prove algebraically that the product of two consecutive odd numbers is one less than a multiple of 4. **[3 marks]**

25 Prove algebraically that the product of three consecutive even numbers is always a multiple of 8. **[3 marks]**

Solutions

26 a and b are positive integers.
a is two more than a multiple of 5.
b is two less than a multiple of 5.

Prove that ab is one more than a multiple of 5. **[4 marks]**

27 Prove that the sum of the squares of three consecutive integers is equal to five more than three times the product of the largest and smallest of the three integers.

[3 marks]

13

Solutions