Algebraic Proof

Question Paper 1

Level	IGCSE
Exam Board	Edexcel
Subject	Mathematics
Topic	Equations, formulae & identities
Sub-Topic	Algebraic Proof
Booklet	Question Paper 1

Time Allowed: **44 minutes**

Score: **/38**

Percentage: **/100**

Grade Boundaries:

9	8	7	6	5	4	3	2	1
>90%	80%	70%	60%	50%	40%	30%	20%	10%

1 Prove that

$$(2n + 3)^2 - (2n - 3)^2 \text{ is a multiple of 8}$$

for all positive integer values of n.

(Total 3 marks)

2 (i) Factorise $2t^2 + 5t + 2$ **(3)**

....

(ii) t is a positive whole number.

The expression $2t^2 + 5t + 2$ can never have a value that is a prime number.

Explain why.

(Total 3 marks)

3 Prove algebraically that the difference between the squares of any two consecutive integers is equal to the sum of these two integers.

(Total 4 marks)

4 Prove algebraically that

$$(2n + 1)^2 - (2n + 1) \quad \text{is an even number}$$

for all positive integer values of n. **(3)**

(Total 3 marks)

5 Show that $(n + 3)^2 – (n – 3)^2$ is an even number for all positive integer values of n.

(Total 3 marks)

6 Prove that, for all positive values of n,

$$\frac{(n+2)^2 - (n+1)^2}{2n^2 + 3n} = \frac{1}{n}$$

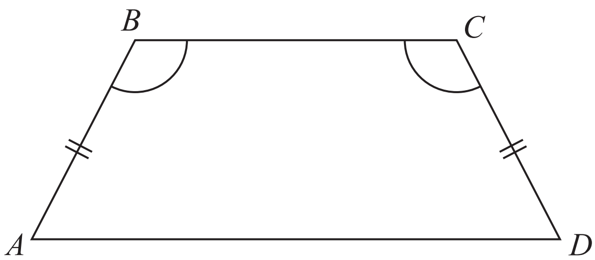
(Total 4 marks)

7 n is an integer greater than 1

Prove algebraically that $n^2 - 2 - (n - 2)^2$ is always an even number.

(Total 4 marks)

8 *ABCD* is a quadrilateral.

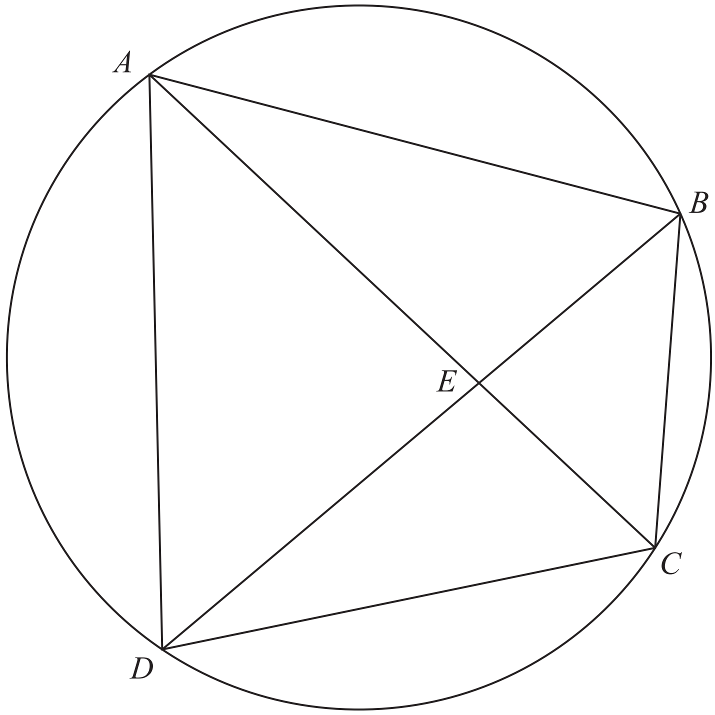


$AB = CD$.
Angle ABC = angle BCD.

Prove that $AC = BD$.

(Total 4 marks)

9 A, B, C and D are four points on the circumference of a circle.



AEC and BED are straight lines.

Prove that triangle ABE and triangle DCE are similar.
You must give reasons for each stage of your working.

(Total 3 marks)

10 n is an integer.

Prove algebraically that the sum of $\frac{1}{2}n(n+1)$ and $\frac{1}{2}(n+1)(n+2)$ is always a square number.

(Total 2 marks)

11 Prove algebraically that the straight line with equation $x - 2y = 10$ is a tangent to the circle with equation $x^2 + y^2 = 20$

(Total 5 marks)