EXAM PAPERS PRACTICE

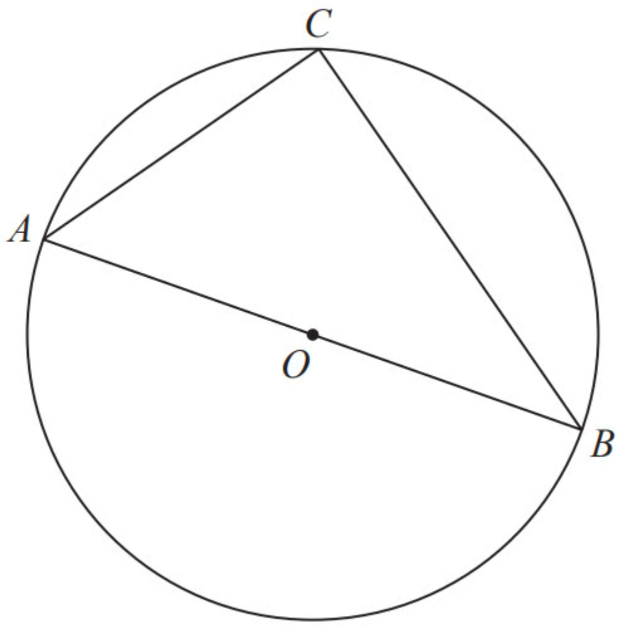
GCSE OCR Math J560

Proof/Reasoning

Question Paper

"We will help you to achieve A Star "

Question 1



A, B and C are points on the circumference of a circle, centre O.
AOB is a diameter of the circle.

Prove that angle ACB is 90°
You must **not** use any circle theorems in your proof.

[4 marks]

Question 2

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

[3 marks]

Question 3

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.

[2 marks]

Question 4

Prove algebraically that

$(2n + 1)^2 - (2n + 1)$ is an even number

for all positive integer values of n.

[3 marks]

Question 5

n is an integer greater than 1

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

[4 marks]

Question 6

The product of two consecutive positive integers is added to the larger of the two integers.

Prove that the result is always a square number.

[3 marks]

Question 7

Prove that

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

for all positive integer values of n.

[3 marks]

Question 8

Prove algebraically that

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

for all positive integer values of n.

[3 marks]

Question 9

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

(ii) t is a positive whole number.

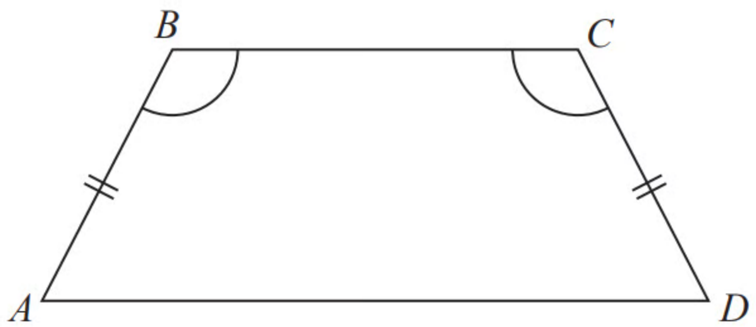
The expression $2t^2 + 5t + 2$ can never have a value that is a prime number.

Explain why.

[3 marks]

Question 10

$ABCD$ is a quadrilateral.



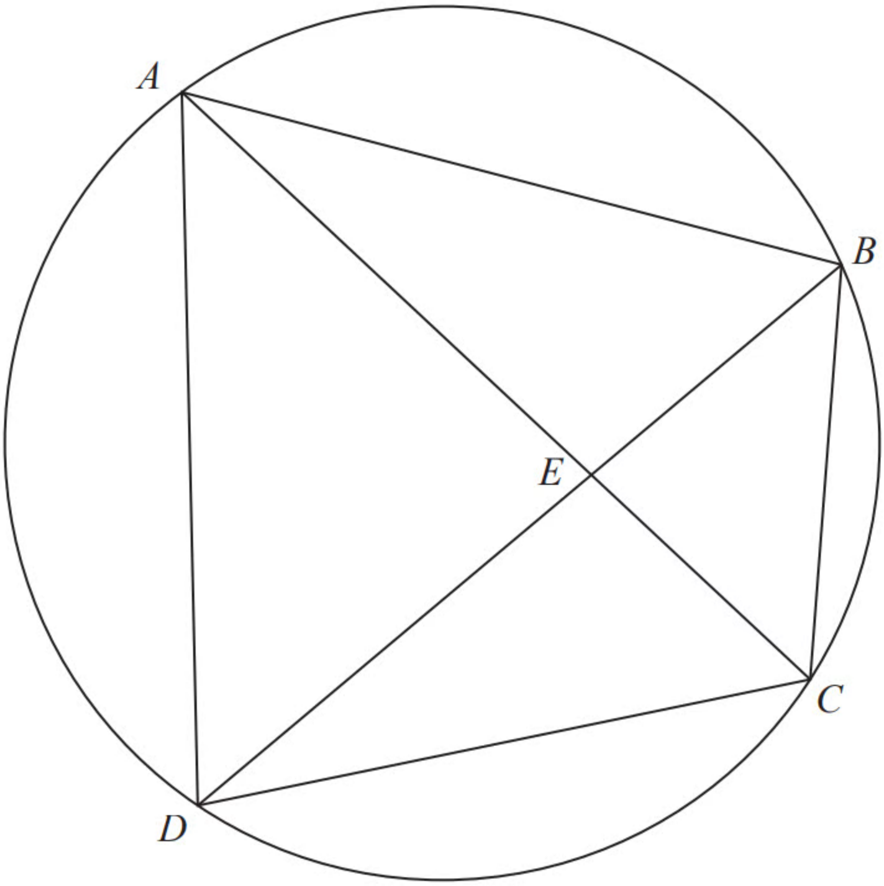
$AB = CD$.
Angle ABC = angle BCD.

Prove that $AC = BD$.

[4 marks]

Question 11

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.

[3 marks]

Question 12

Prove that the square of an odd number is always 1 more than a multiple of 4

[4 marks]

Question 13

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

[5 marks]

Question 14

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

[4 marks]

Question 15

Here are the first five terms of an arithmetic sequence.

7 13 19 25 31

Prove that the difference between the squares of any two terms of the sequence is always a multiple of 24

[6 marks]