

Advanced Higher Maths
SQA 2019 Paper
Question 11



Let n be a positive integer.

- (a) Find a counterexample to show that the following statement is false.

$$n^2 + n + 1 \text{ is always a prime number.}$$

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- (b) (i) Write down the contrapositive of:

$$\text{If } n^2 - 2n + 7 \text{ is even then } n \text{ is odd.}$$

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- (ii) Use the contrapositive to prove that if $n^2 - 2n + 7$ is even then n is odd.

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Answers:

- (a) $n = 4$, for example.

- (b) (i) If n is even, then $n^2 - 2n + 7$ is odd.

- (ii) From marking instructions:

<ul style="list-style-type: none">•³ write down appropriate form for n AND substitute ^{1,3,4,5,9}•⁴ show $n^2 - 2n + 7$ is odd ^{1,6,7,9}•⁵ communicate ^{1,8,9}	<ul style="list-style-type: none">•³ $n = 2k, k \in \mathbb{N}$ and $(2k)^2 - 2(2k) + 7$•⁴ eg $2(2k^2 - 2k + 3) + 1$ which is odd since $2k^2 - 2k + 3 \in \mathbb{N}$•⁵ contrapositive statement is true AND therefore original statement is true
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