Proof By Induction (Divisibility) Exam Questions (Edexcel)

Q1.

Prove by induction that, for $n \in \mathbb{Z}^+$,

$$f(n) = 8^n - 2^n$$

is divisible by 6

(6)

(Total 6 marks)

(Q07 6667/01, June 2014)

Q2.

Prove by induction that, for $n \in \mathbb{Z}^+$,

$f(n) = 2^{2n-1} + 3^{2n-1}$ is divisible by 5.

(6)

(Total 6 marks)

(Q07 6667/01, June 2012)

Q3.

Prove by induction that, for $n \in \mathbb{Z}^+$,

$f(n) = 5^n + 8n + 3$ is divisible by 4,

(7)

(Total 7 marks)

(Q07 6667/01, June 2009)

Q4.

Prove by induction, that for $n \in \mathbb{Z}^+$,

$f(n) = 7^{2n-1} + 5$ is divisible by 12.

(6)

(Total 12 marks)

(Q07 6667/01, June 2011)

Q5.

Prove by induction that for $n \in \mathbb{Z}^+$

$$f(n) = 4^{n+1} + 5^{2n-1}$$

is divisible by 21

(6)

(Total for question = 12 marks)

(Q08 8FM0/01, June 2018)

Q6.

Given that

$$f(n) = 3^{4n} + 2^{4n+2},$$

(a) show that, for $k \in \mathbb{Z}^+$, $f(k + 1) - f(k)$ is divisible by 15,

(4)

(b) prove that, for $n \in \mathbb{Z}^+$, $f(n)$ is divisible by 5,

(3)

(c) show that it is not true that, for all positive integers n, $f(n)$ is divisible by 15.

(1)

(Total 8 marks)

(Q04 6676/01, June 2007)