

TMUA 2021 Paper 2 Q10

The first seven terms of a sequence of positive integers are:

$$u_1 = 15$$

$$u_2 = 21$$

$$u_3 = 30$$

$$u_4 = 37$$

$$u_5 = 44$$

$$u_6 = 51$$

$$u_7 = 59$$

Consider the following statement about this sequence:

- (*) If n is a prime number, then u_n is a multiple of 3 or u_n is a multiple of 5.

What is the smallest value of n that provides a counterexample to (*)?

- A 1 Statement (*) is relevant for all terms in the sequence, u_n , for which n is prime.
- B 2 These are $u_2 = 21$, $u_3 = 30$, $u_5 = 44$ and $u_7 = 59$
- C 3
- D 4
- E 5 u_2 does not provide a counterexample to (*) because 21 is a multiple of 3
- F 6 u_3 does not provide a counterexample to (*) because 30 is a multiple of 3 and of 5 (note: here we take "or" to be the inclusive or, as specified in the TMUA specification)
- G 7 u_5 does provide a counterexample to (*) because 30 is not a multiple of 3 and is also not a multiple of 5

Therefore the correct answer is option E