

POTWI 15 SOLUTION

Split into cases by the parity of n .

Case 1: n even. Then n and $n + 2$ are consecutive even numbers. One of them is a multiple of 4 and the other is a multiple of 2, so $n(n + 2)$ is divisible by $4 \cdot 2 = 8$. Hence *every* even n works. In 1 to 1000 there are 500 even numbers.

Case 2: n odd. Then n and $n + 2$ are odd, so all the factors of 2 must come from $n + 1$. We need $8 \mid n + 1$, i.e. $n + 1 \in \{8, 16, 24, \dots, 1000\}$. That is $1000/8 = 125$ values (namely $n = 7, 15, \dots, 999$).

Total. $500 + 125 = 625$ values of n work out of 1000, so

$$P = \frac{625}{1000} = \frac{5}{8}.$$

Answer: (D) $\frac{5}{8}$
