1. Q — Use the **Euclidean Algorithm** to find integers a and b such that $70a + 182b = 28$. Are the integers c and d such that $70c + 182d = 30$?

A —

Original Pair	Division Expression	GCD
$(182, 70)$	$182 = 2 \cdot 70 + \mathbf{42}$	$(70, 42)$
$(70, 42)$	$70 = 1 \cdot 42 + \mathbf{28}$	$(42, 28)$
$(42, 28)$	$42 = 1 \cdot 28 + \mathbf{14}$	$(28, 14)$
$(28, 14)$	$28 = 2 \cdot 14 + \mathbf{0}$	$\mathbf{14}$

Substituting the GCD (**14**) into the penultimate Division Expression:

$$\begin{aligned}
14 &= 42 - \mathbf{(1)}(28) \\
&= 42 - \mathbf{(1)}(70 - \mathbf{(1)}(42)) \\
&= \mathbf{(\text{-}1)}(70) + \mathbf{(2)}(42) \\
&= \mathbf{(\text{-}1)}(70) + \mathbf{(2)}(182 - \mathbf{(2)}(70)) \\
&= \mathbf{(\text{-}1)}(70) + \mathbf{(2)}(182) - \mathbf{(4)}(70) \\
&= \mathbf{(2)}(182) - \mathbf{(5)}(70) \\
\therefore 28 &= \mathbf{(4)}(182) - \mathbf{(10)}(70)
\end{aligned}$$

Since **30** does not appear in the remainders in the table above, it is **not** possible to attain $70c + 182d = 30$ with integers, c and d.