Solve the equation $52x = 7\ (mod\ 165)$

Problem Solving - What are the terms/strategies I may need? What do I know?

Our previous question solved $52^{-1} = 73$ under mod 165

Solving equations by using the multiplicative inverse.

Definition of mod $a\ (mod\ n)\ = r$ when $a = pn + r$ where $p, r \in Z$ and $0 \leq r < n$

Solve the equation $52x = 7\ (mod\ 165)$

Steps & Process – Try to answer the question writing in many steps to avoid small errors.

Recall that our inverse $52^{-1} = 73$ under mod 165. Using this we get:

$$52x = 7\ (mod\ 165) \quad \Rightarrow \quad (73)52x = (73)7\ (mod\ 165)$$
$$\Rightarrow \quad x = 511\ (mod\ 165)$$

Since $511 = 3(165) + 16$ we have $x = 16\ (mod\ 165)$

Solve the equation $52x = 7\ (mod\ 165)$

Solidify Understanding – Explain why the steps makes sense by connecting to math you know.

Why are finding inverses useful?

When can we guarantee that mod n will always have an inverse for all elements (except 0)?

For Video Please click the link below:

Video