

Final Draft (w/ missing working
not from before)

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Grap 8.6

Determine the number of incongruent solutions for each of the following congruences.

a) $72x \equiv 47 \pmod{200}$

We first find the $\gcd(72, 200)$ to see if it divides 47, if not then we have no solutions, if it does then we will have the same number of solutions as the \gcd .

We find the \gcd through maple to be 8.

Since 8 does not divide 47, we will have no solutions.

b) $4183x \equiv 5781 \pmod{15087}$

So, we once again find the $\gcd(4183, 15087)$, then divide by 5781 to see if we will have solutions or not.

We find the \gcd through maple to be 47.

We find that $47 \mid 5781 = 123$ therefore this congruency will have 123 incongruent solutions.

c) $1537x \equiv 2863 \pmod{6731}$

Same idea as before.

We find the $\gcd(1537, 6731)$ through maple to be 53.

Since 53 does not divide 2863, we will have no solutions here as well.

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Extension: Let's look at a random example, not given in the book, and see how it works out.

$$51x \equiv 22 \pmod{29}$$

So first we of course find the $\gcd(51, 29)$. For a little change, we do it out by hand rather than with the use of maple.

$$51 = 29 \cdot 1 + 22$$

$$29 = 22 \cdot 1 + 7$$

$$22 = 7 \cdot 3 + 1$$

$$7 = 1 \cdot 7 + 0$$

So we find 1 to be our \gcd .

One will of course divide 22 so we will have one incongruent solution.

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```
[> restart;
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```
[> gcd(72,200) ;
```

```
8
```

```
[> gcd(4183,15087) ;
```

```
47
```

```
[> gcd(1537,6731) ;
```

```
53
```

```
[>
```