10. (5 pts)Prove that if n is $\boxed{\text{any}}$ integer that is not divisible by 2 or 3, then $n^2 \bmod 12 = 1$.

Let $n=5$ which is not divisible by 2 or 3

$n^2 = 25$

$25 \bmod 12 = 1$

$25 = 12(q) + 1$

$25 = 12(2) + 1$ $\quad q=2 \quad r=1$

$\therefore$ If n is any integer not divisible by 2 or 3,

then $n^2 \bmod 12 = 1$

4. (5 pts) Carefully prove: the quotient of any two nonzero rational numbers is rational.

Let a and b be the quotient of any nonzero rational numbers hah?

Let $a = \frac{1}{2}$

$b = \frac{3}{4}$

$\frac{a}{b} = \frac{\frac{1}{2}}{\frac{3}{4}}$

$= \frac{4}{6} = \frac{2}{3}$ which is rational

A of E

10. (5 pts)Prove that if n is $\boxed{\text{any}}$ integer that is not divisible by 2 or 3, then n^2 mod 12 = 1.

$n = qd + r$

5 7 11 13 17 19 23 29

$n \bmod d = r$	def of mod
$n = qd + r$	Quotient remainder theorem
$n^2 = 12q + 1$	substitution
let $n = 5$	substitution of $\boxed{\text{a}}$ number not divisible by 2 or 3
$5^2 = 12q + 1$	Basic Algebra
$25 = 12q + 1$	Basic Algebra
$24 = 12q$	Basic Algebra
$q = 2$	Basic Algebra

Know and show confusion

Arguing from Example

using the Quotient remainder theorem and plugging in a number not divisible by 2 or 3 we obtained q that divided evenly into n.

10. (5 pts)Prove that if n is any integer that is not divisible by 2 or 3, then n^2 mod 12 = 1.

X

n - not divisible by 2 or 3

- not divisible by two if last digit is not a multiple of 2 UA
- not divisible by 3 if last two digits don't add up to a multiple of 3.

let n be 17 → not divisible by 2 or 3 A from E.

ex1

17^2 mod 12 = x

289 mod 12 = 1

$$\begin{array}{r} 24 \\ 12\overline{)289} \\ 24 \\ \hline 49 \\ 48 \\ \hline 1 \end{array}$$

div

mod 1

remainder of 1

ex2

35 not divisible by 2 or 3

35^2 mod 12 = x

1225 mod 12 = x

$$\begin{array}{r} 102 \\ 12\overline{)1225} \\ 12 \\ \hline 025 \\ 24 \\ \hline 1 \end{array}$$

div

mod = 1