
Q1. Use Fermat's Little Theorem to calculate

(i). $3^{302} \pmod 5$

(ii). $3^{302} \pmod 7$

(iii). $3^{302} \pmod{11}$

(iv). $5^{2003} \pmod 7$

(v). $5^{2003} \pmod{11}$

(vi). $2^{100} \pmod{13}$

(vii). $2^{1000} \pmod{13}$

(viii). $2^{500} \pmod{17}$

(ix). $5^{2000} \pmod{17}$

(x). $7^{2222} \pmod{29}$

(xi). $2^{100} \pmod{29}$

(xii). $5^{217} \pmod{217}$

Q2*. Use Fermat's Little Theorem to show that if p is prime and $p \nmid a$ then a^{p-2} is the inverse of a modulo p.

Answers

Q1.

(i). 4

(ii). 2

(iii). 9

(iv). 3

(v). 4

(vi). 3

(vii). 3

(viii). 16

(ix). 1

(x). 24

(xi). 25

(xii). 5

Q2. FLT implies that $a^{p-1} \equiv 1 \pmod{p}$ so $aa^{p-2} \equiv 1 \pmod{p}$ hence a^{p-2} is the inverse of a.