1.25

a. $17^{183}\ mod\ 256$

183 = 10110111

183 = 128+32+16+4+2+1

$= 2^7 + 2^5 + 2^4 + 2^2 + 2^1 + 2^0$

$17^{183} = 17^{(2^0+2^1+2^2+2^4+2^5+2^7)}$

$= 17^{2^0} * 17^{2^1} * 17^{2^2} * 17^{2^4} * 17^{2^5} * 17^{2^7}$

i	0	1	2	3	4	5	6	7
$17^{2^i}\ mod\ 256$	17	33	65	97	1	1	1	1

= (17 * 33 * 65 * 1 * 1 * 1) mod 256

= 113

b. $2^{477} mod\ 1000$

477 = 111011101

$= 2^8 + 2^7 + 2^6 + 2^4 + 2^3 + 2^2 + 2^0$

$2^{477} = 2^{2^8} * 2^{2^7} * 2^{2^6} * 2^{2^4} * 2^{2^3} * 2^{2^2} * 2^{2^0}$

i	0	1	2	3	4	5	6	7	8
$2^{2^i} mod\ 1000$	2	4	16	256	536	296	616	456	936

= (2 * 16* 256 * 536 * 616 * 456 * 936) mod 1000

= 272

c. $11^{507} mod\ 1237$

507 = 111111011

$= 2^8 + 2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^1 + 2^0$

$11^{507} = 11^{2^8} * 11^{2^7} * 11^{2^6} * 11^{2^5} * 11^{2^4} * 11^{2^3} * 11^{2^1} * 11^{2^0}$

i	0	1	2	3	4	5	6	7	8
$11^{2^i}\ mod\ 1237$	11	121	1034	388	867	830	1128	748	380

= (380 * 748 * 1128 * 830 * 867 * 388 * 121 * 11) mod 1237

=322