Philadelphia University

Department of Basic Sciences

Exam 2 **Number Theory** **24–04–2012**

Solutions must be complete in order to receive full credit.

1. Find a reduced residue system (RRS) modulo 16 consisting of prime numbers.
2. Evaluate $3^{634} \% 49$ with the help of Euler's theorem.
3. Suppose that $|a|_n = 24$. Find $|a^{30}|_n$.
4. Find all the primitive roots modulo 10.
5. Which one has primitive roots, modulo $n = 162$ or $n = 275$? How many?
6. Solve the discrete logarithm problem $10^x \equiv 12 \pmod{13}$ using the primitive root $g = 2$.
7. (Bonus) Prove: if $g^8 \equiv 16 \pmod{17}$, then g is a primitive root modulo 17.

–Amin Witno

The list of primes below 200.

2	3	5	7	11	13	17	19	23	29
31	37	41	43	47	53	59	61	67	71
73	79	83	89	97	101	103	107	109	113
127	131	137	139	149	151	157	163	167	173
179	181	191	193	197	199				