Your name:

No pocket calculators or other electronic tools; no cell phones. **Show your work.** Workspace is provided inside for each problem. If you need more, feel free to use the facing or the following reverse page.

#	keyword from problem	time	points	out of max
1	congruence; different moduli	*		3
2ab	Euler φ function	*, **		6
3	Fact on ring $\mathbb{Z}_n$	*		3
4ab	powers modulo m	**		6
5	homomorphism or not?	**		3
6	GCD of polynomials	**		6
7	determinant and modulo	**		5
8	there can't be an isomorphism	**		4
Σ	total			36

$A \gtrsim 28 > B \gtrsim 24 > C \gtrsim 20 > D \gtrsim 15 > F$