

## PROBLEMS USING EULER'S PHI FUNCTION

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On these problems, it is perfectly OK to use a calculator for routine calculations, such as multiplying integers together. But don't use any fancy software. Show your work and explain what you are doing.

**EP1.** Evaluate the following:

- (a)  $\varphi(1000)$
- (b)  $\varphi(1728)$
- (c)  $\varphi(1729)$
- (d)  $\varphi(1194649)$  (See the hint on p. 490, for E6 in Chapter 9D.)

**EP2.** Find the least non-negative residue of the following:

- (a)  $5^{1300} \bmod 1729$
- (b)  $6^{1298} \bmod 1729$
- (c)  $7^{1296} \bmod 1729$
- (d)  $8^{1294} \bmod 1729$

**EP3.** Find the last three digits of the following:

- (a)  $127^{802}$
- (b)  $7^{4003}$
- (c)  $7^{3999}$
- (d)  $7^{3998}$

**EP4.** Find the least non-negative residue of the following:

- (a)  $5^{576} \bmod 1728$
- (b)  $6^{576} \bmod 1728$
- (c)  $2^{576} \bmod 1728$
- (d)  $7^{578} \bmod 1728$
- (e)  $7^{574} \bmod 1728$