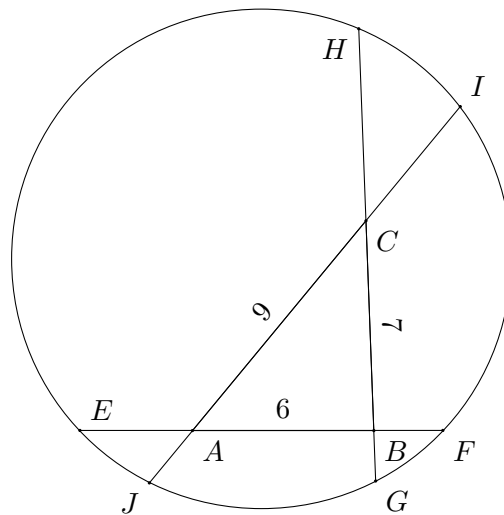


# Tiebreaker Round

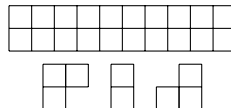
CHMMC 2010

February 20, 2010

- The monic polynomial  $f$  has rational coefficients and is irreducible over the rational numbers. If  $f(\sqrt{5} + \sqrt{2}) = 0$ , compute  $f(f(\sqrt{5} - \sqrt{2}))$ . (A polynomial is *monic* if its leading coefficient is 1. A polynomial is *irreducible* over the rational numbers if it cannot be expressed as a product of two polynomials with rational coefficients of positive degree. For example,  $x^2 - 2$  is irreducible, but  $x^2 - 1 = (x + 1)(x - 1)$  is not.)
- In the following diagram, points  $E, F, G, H, I,$  and  $J$  lie on a circle. The triangle  $ABC$  has side lengths  $AB = 6, BC = 7,$  and  $CA = 9$ . The three chords have lengths  $EF = 12, GH = 15,$  and  $IJ = 16$ . Compute  $6 \cdot AE + 7 \cdot BG + 9 \cdot CI$ .



- Compute the number of ways of tiling the  $2 \times 10$  grid below with the three tiles shown. There is an infinite supply of each tile, and rotating or reflecting the tiles is not allowed.



- Compute the number of positive divisors of 2010.