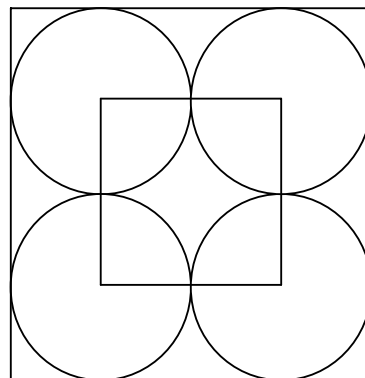


**MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 6 - MARCH 2008 SOLUTION KEY**

Round 5

A) $AB = 10, \triangle ADE \sim \triangle ABC \rightarrow \frac{AD}{AB} = \frac{DE}{BC} \rightarrow \frac{4}{10} = \frac{8}{BC}$
 $\rightarrow 4(BC) = 8(10) \rightarrow BC = \underline{20}$

B) $4r^2 - \pi r^2 = 12 - 3\pi \rightarrow r^2 = 3 \rightarrow \text{Area}_{\text{small square}} = 12$ and
 $\text{Area}_{\text{large square}} = 48 \rightarrow \text{required area} = \underline{36}$



C) $AF = FC = 8$. The measure of an interior angle of a regular octagon is
 $\frac{6(180)}{8} = 135^\circ$.

$m\angle EFC = m\angle GFA = 45^\circ$, so $m\angle AFC = 45^\circ$ also.

Draw $\overline{AJ} \perp \overline{FC}$. Then $\triangle AFJ$ is 45° - 45° - 90° and $AJ = 4\sqrt{2}$

Area of $\triangle AFC = \frac{1}{2}(FC)(AJ) = \frac{1}{2}(8)(4\sqrt{2}) = \underline{16\sqrt{2}}$

Alternate method: $\text{Area}(\triangle AFC) = \frac{1}{2}(AF)(FC)\sin(\angle AFC)$

$$= \frac{1}{2}(8)(8)\sin(45^\circ) = 32 \cdot \frac{\sqrt{2}}{2} = \underline{16\sqrt{2}}$$

