MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 2 - NOVEMBER 2009 SOLUTION KEY

Round 6

A) $4x + 2(3x) = 180$ → $x = 18$ → base angle: 54° → exterior angle: **<u>126°</u>**

B) $n(n-3)/2 = 740$ → $n(n-3) = 1480$
Rather than trying to factor this quadratic by trial and error, guess at a value for n. If the result is too low, try a larger value of n; if the result is too high, try a smaller value of n.
$n = 35$ → $35(32) = 1120$ (too low)
$n = 45$ → $45(42) = 1890$ (too high)
Since 1120 is closer to 1480, we'll start at 40 and step down until we find n.

$n = 40$ → $40(37) = 1480$ Bingo!

A regular polygon with 40 sides has exterior angle with $\left(\frac{360}{40}\right) = \underline{9}°$

C) Since $\angle AMD$ and $\angle MNF$ are corresponding angles of parallel lines, we have $7x - 40 = 5x$ → $x = 20$
$m\angle AMD = 100$ → $a + b = 80$ and $c + d = 100$
$m\angle NMP = 3m\angle PMD$ → $b = 3a$
Thus, $(a, b) = (20, 60)$
$m\angle MNP = 4m\angle PNF$ → $c = 4d$
Thus, $(c, d) = (80, 20)$
Finally, $y = 180 - (b + c) = 180 - 140 =$ **<u>40</u>**