

**MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 4 - JANUARY 2008 SOLUTION KEY**

Round 2

A) $4x^2 + 8ax + 25 = (2x \pm 5)^2 = 4x^2 \pm 20x + 25 \rightarrow 8a = \pm 20 \rightarrow a = \pm \frac{5}{2}$

B) -15 factors as (1)(-15), (-1)(15), (3)(-5), (-3)(5), $\rightarrow a = \pm 14$ or ± 2

The corresponding factorizations are: $14(x^2 + 7)$, $-14(x^2 - 7)$, $2(x^2 + 49)$ and $-2(x^2 - 49)$ and only the latter has two distinct linear factors over the integers. Thus, $a = \underline{-2}$

C) $\frac{2x^2 + x - 1}{x^2 - x - 2} = 1 - 2x \rightarrow \frac{(2x-1)(x+1)}{(x-2)(x+1)} = 1 - 2x$

Clearly, $x = -1$ is not a solution. Canceling, $\frac{(2x-1)}{(x-2)} = 1 - 2x \rightarrow 2x - 1 = (x - 2)(1 - 2x)$

$$2x - 1 = x - 2x^2 - 2 + 4x \rightarrow 2x^2 - 3x + 1 = (x - 1)(2x - 1) = 0 \rightarrow x = \underline{1, \frac{1}{2}}$$