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Problem Solving Set A

Bronze

a) $P(A) = 0.55$

$$x = 0.55 - 0.25$$

$$x = 0.3$$

$$y = 1 - (0.25 + 0.3 + 0.15 + 0.2)$$

$$y = 0.1$$

$$x = 0.3, y = 0.1$$

b) $P(A) \times P(B) = P(A \cap B)$

$$0.55 \times 0.4 = 0.22 \neq 0.3$$

$\therefore A$ and B are not statistically independent.

Silver

a) $P(C) \times P(D) = P(C \cap D)$

$$(0.28 + x)(2x - 0.24) = x$$

$$0.56x - 0.0672 + 2x^2 - 0.24x = x$$

$$2x^2 + 0.32x - x - 0.0672 = 0$$

$$2x^2 - 0.68x - 0.0672 = 0$$

b) $2x^2 - 0.68x - 0.0672 = 0$

$$x = 0.42$$

$$x = -0.08$$

$$y = 1 - (0.28 + 0.42 + (0.42 - 0.24))$$

$$y = 0.12$$

$$x = 0.42, y = 0.12$$

Gold

$$P(A) \times P(B) = P(A \cap B)$$

$$(x + 0.3)(y + 0.3) = 0.3$$

$$x + 0.3 + y + (x - 0.1) = 1$$

$$2x + y + 0.2 = 1$$

$$2x + y = 0.8$$

$$y = 0.8 - 2x$$

$$(x + 0.3)(y + 0.3) = 0.3$$

$$(x + 0.3)(0.8 - 2x + 0.3) = 0.3$$

$$(x + 0.3)(1.1 - 2x) = 0.3$$

$$1.1x - 2x^2 + 0.33 - 0.6x = 0.3$$

$$2x^2 - 0.5x - 0.03 = 0$$

$$x = 0.3$$

$$x = -0.55$$

$$y = 0.8 - 2(0.3)$$

$$y = 0.2$$

$$x = 0.3, y = 0.2$$

c) The other solution gives a negative probability which should be rejected.