Quiz 1: Probability Theory

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Question Notes:

1. Q1:
$$E[X] = 0 \times 0.1 + 1 \times 0.3 + 2 \times 0.4 + 3 \times 0.2 = 1.7$$
$$E[2X + 3] = 2E[x] + 3 = 2 \times 1.7 + 3 = 6.4$$

2. Q2:
$$P(Red) = P(A)P(Red|A) + P(B)P(Red|B)$$
$$= \frac{1}{3} \times \frac{2}{5} + \frac{2}{3} \times \frac{1}{5}$$
$$= \frac{4}{15}$$

3. Q3:
$$P(A|Blue) = \frac{P(Blue|A)P(A)}{P(Blue)}$$

where:
$$P(Blue|A) = \frac{3}{5}$$
$$P(A) = \frac{1}{2}$$
$$P(Blue) = P(A)P(Blue|A) + P(B)P(Blue|B) = \frac{7}{10}$$
$$P(A|Blue) = \frac{\frac{3}{5} \times \frac{1}{2}}{\frac{7}{10}} = \frac{3}{7}$$

4. Q5:
$$P(A, B, C, D, E) = P(A)P(B)P(C|A, B, D)P(D|B)P(E|C) = 0.0192$$