In studying the relationship between loan delinquency and borrower characteristics, a bank found the following information: • 80% of borrowers have been employed at their present job for 3 or more years, • Of the borrowers who have been employed at their present job for 3 or more years, 5% are behind in their payments • Of the borrowers who have been employed at their present job for less than 3 years, 15% are behind in their payments.

If a loan account is randomly selected, what is the probability that the borrower has been employed at their present job for less than 3 years AND is behind in their payments?

(a)	0.17	(b)	0.03	(c)	0.20	(d)	0.014	(e)	0.24

If a loan account is randomly selected, what is the probability that the borrower has been employed at their present job for 3 or more years OR is not behind in their payments?

(a)	0.76	(b)	0.744	(c)	0.97	(d)	0.83	(e)	0.96

If a loan account is randomly selected from a borrower who has been employed at their present job for 3 or more years, what is the probability that the borrower is behind in their payments?
(a) 0.5714 (b) 0.05 (c) 0.04 (d) 0.056 (e) 0.07

Solution:

This is a conditional probability problem.

Let the events be as follows:

A – have been employed for 3 or more years,

B – are behind in their payments.

$$P(A) = 0.8$$
$$P(B|A) = 0.05$$
$$P(B|A') = 0.15$$

If a loan account is randomly selected, what is the probability that the borrower has been employed at their present job for less than 3 years AND is behind in their payments? (a) 0.17 (b) 0.03 (c) 0.20 (d) 0.014 (e) 0.24

$P(A' \cap B) = P(A') \cdot P(B|A') = (1 - 0.8) \cdot 0.15 = 0.03$, answer (b).

If a loan account is randomly selected, what is the probability that the borrower has been employed at their present job for 3 or more years OR is not behind in their payments? (a) 0.76 (b) 0.744 (c) 0.97 (d) 0.83 (e) 0.96

$$P(A \cup B') = P(A) + P(B') - P(A \cap B')$$
$$P(A \cap B') = P(A) \cdot P(B'|A) = P(A) \cdot \left(1 - P(B|A)\right) = 0.8 \cdot (1 - 0.05) = 0.76$$
$$P(A \cap B) = P(A) \cdot P(B|A) = 0.8 * 0.05 = 0.04$$
$$P(B) = P(A' \cap B) + P(A \cap B) = 0.03 + 0.04 = 0.07$$
$$P(A \cup B') = 0.8 + (1 - 0.07) - 0.76 = 0.97$$

answer (c).

If a loan account is randomly selected from a borrower who has been employed at their present job for 3 or more years, what is the probability that the borrower is behind in their payments? (a) 0.5714 (b) 0.05 (c) 0.04 (d) 0.056 (e) 0.07

$P(B|A) = 0.05$, answer (b).