

**2015 AP<sup>®</sup> STATISTICS FREE-RESPONSE QUESTIONS**

3. A shopping mall has three automated teller machines (ATMs). Because the machines receive heavy use, they sometimes stop working and need to be repaired. Let the random variable  $X$  represent the number of ATMs that are working when the mall opens on a randomly selected day. The table shows the probability distribution of  $X$ .

Number of ATMs working when the mall opens	0	1	2	3
Probability	0.15	0.21	0.40	0.24

- (a) What is the probability that at least one ATM is working when the mall opens?
- (b) What is the expected value of the number of ATMs that are working when the mall opens?
- (c) What is the probability that all three ATMs are working when the mall opens, given that at least one ATM is working?
- (d) Given that at least one ATM is working when the mall opens, would the expected value of the number of ATMs that are working be less than, equal to, or greater than the expected value from part (b) ? Explain.