

MATH 120: Quiz 4 - 3/11/2022

A slot machine has 4 wheels that spin independently. Each has 10 equally likely symbols: 4 bars, 3 lemons, 2 cherries, and a bell. If you play, what is the probability you get:

- (a) All lemons?
- (b) No bars?
- (c) At least one bell?

Be sure to show steps/reasons for every answer.

Solution

Since the wheels spin independently, we can treat the outcome of each as independent events.

For convenience, I'll denote the events as: L = lemon, B = bar, BE = bell.

(a) All lemons: $P(L \text{ and } L \text{ and } L \text{ and } L) = P(L) \times P(L) \times P(L) \times P(L)$ [\because independent]
 $= (0.3)^4 = \boxed{0.0081}$ [because $P(L) = 3/10 = 0.3$]

(b) No bars: $P(\sim B \text{ and } \sim B \text{ and } \sim B \text{ and } \sim B)$
 $= P(\sim B) \times P(\sim B) \times P(\sim B) \times P(\sim B) = (0.6)^4 = \boxed{0.1296}$
Note that we get $P(\sim B) = (10 - 4)/10 = 0.6$.

(c) At least one bell: This can occur in many different ways, making it nearly impossible to compute it directly. So we use the complement.

Complement of "At least one bell" is "No bells."

$$P(\text{No bells}) = P(\sim BE) \times P(\sim BE) \times P(\sim BE) \times P(\sim BE) = (0.9)^4$$

Therefore, the probability of at least one bell $= 1 - (0.9)^4 = \boxed{0.3439}$

Grading: Total points possible = 6.

2 points each for (a), (b) and (c).

For (a) and (b): 1pt for correct answer; 1pt for reasonable steps.

For (c): 0.5pt=attempt a complement strategy, even if incorrectly.

0.5+0.5pt=state the correct complement event + find its probability

0.5pt=get answer by subtracting complement probability correctly.