Math 170: Section 7.4 Lecture

Section 7.4

Modeling Probability: Equally Likely Outcomes In an experiment in which all outcomes are equally likely, the probability of an event E is given by

$$P(E) = \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}} = \frac{n(E)}{n(S)}$$

Example 1 A bag contains four red marbles and two green ones. Upon seeing the bag, Suzan (who has compulsive marble-grabbing tendencies) sticks her hand in and grabs three at random. Find the probability that she will get both green marbles.

4 red 2 green (6 total

E: She gets both green marbles

S: ~~Number~~ Total outcomes of grabbing 3 out of 6 marbles

$n(S) = C(6,3) = 20$

$n(E) = 1 \cdot 4 = 4$

Step 1: Choose the two green

$C(2,2) = 1$

Step 2: Choose 1 other marble

$C(4,1) = 4$

$$P(E) = \frac{n(E)}{n(S)} = \frac{4}{20} = \frac{1}{5}$$

Example 2 After a down day on the stock market, you decide to ignore your broker's cautious advice and purchase three stocks at random from the six most active stocks listed on the New York Stock Exchange at the end of the day's trading.

Company	Symbol	Price	Change
Bank of America	BAC	\$5.80	-\$1.00
PowerShares QQQ	QQQ	\$55.83	-\$1.34
Och-Ziff Capital Mgmt	OZM	\$7.98	-\$0.43
UBS AG Common Stock	USB	\$11.21	-\$0.30
iShares Silver Trust	SLV	\$30.64	-\$2.18
Direxion Small Cap Bull	TNA	\$42.80	-\$1.92

Find the probabilities of the following events:
(a) You purchase BAC and QQQ.
(b) At most two of the stocks you purchase declined in value by more than \$1.

(a) $n(S) = C(6,3) = 20$

E: Purchase BAC & QQQ

Step 1: Purchase BAC

$C(1,1) = 1$

Step 2: Purchase QQQ

$C(1,1) = 1$

Step 3: Purchase something else

$C(4,1) = 4$

$$P(E) = \frac{n(E)}{n(S)} = \frac{4}{20} = \frac{1}{5} = 20\%$$

Work (cont.)

(b) Alternative 1: No stocks you purchase declined by more than $1
>$1

Step 1: Choose 3 stocks that did not decline by more tha $1.

$C(3,3) = 1$

Alternative 2: Exactly 1 declined by > $1.

Step 1: Choose 1 that declined by >$1

$C(3,1) = 3$

Step 2: Choose 2 that did not

$C(3,2) = 3$

Total: $3 \cdot 3 = 9$ possibilities

Alternative 3: Exactly 2 declined by > $1.

Step 1: Choose 2 that declined by >$1

$C(3,2) = 3$

Step 2: Choose 1 that did not

$C(3,1) = 3$

Total: $3 \cdot 3 = 9$ possibilities

3

$n(E) = 1 + 9 + 9 = 19$ $P(E) = \frac{n(E)}{n(S)} = \frac{19}{20} = .95$

(b) E : At most 2 declined m value

E' : At least 3 declined m value by more than \$1.

$n(E')$

Only purchasing 3 total

So

Step 1 : Choose 3 that declined

$C(3,3) = 1$

$n(E') = 1$

$n(E) = n(S) - n(E')$

$= 20 - 1$

$= 19$

→ outcomes are equally likely

Example 3 You are dealt 5 cards from a well-shuffled standard deck of 52. Find the probability that you have a full house. (Recall that a full house consists of 3 cards of one denomination and 2 of another.)

E: You are dealt a full house

$$n(E) = \underbrace{C(13,1)}_{\text{choose 1st denomination}} \cdot \underbrace{C(12,1)}_{\text{choose 2nd denomination}} \cdot C(4,3) \cdot C(4,2)$$

$$= 3,744$$

$$n(S) = C(52,5) = 2,598,960$$

$$P(E) = \frac{3,744}{2,598,960} \approx .00144$$

$$\approx 0.144\%$$