7.1 Sample Spaces & Events

Ex: Roll a die; observe the number facing up.

$S = \{1, 2, 3, 4, 5, 6\}$

E = the number rolled is a 5 $= \{5\}$

F = the number rolled is even $= \{2, 4, 6\}$

$E \cup F$ = the number rolled is either a 5 or an even number
$= \{2, 4, 5, 6\}$

H = the number rolled is a multiple of 3
$= \{3, 6\}$

$H \cap F$ = the number rolled is even and a multiple of 3
$= \{6\}$

$E \cap H$ = the number rolled is a 5 and a multiple of 3
$= \emptyset$

If E and H are events, the E and H are said to be disjoint or mutually exclusive if $E \cap H$ is empty.

Let W be the statement "you will use the book's website tonight"

I be the statement "your math grade will improve"

E be the statement "you will use the book's website every night"

"Either your math grade (I) will improve, or (union) you will use (the website tonight (W) but (∩) not every night (complement E))"

$$I \cup (W \cap E')$$

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your couch potato friend likes to watch TV and eat chocolate candies. 4 at a time. You replace one of the chocolates with a cashew (they HATE cashews); there were 20 chocolates total.

How many outcomes are there when he reaches for 4 chocolates the first time?

$$C(20,4) = \frac{20!}{4!(20-4)!} = 4,845$$

How many of these include the cashew?

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cashew — one slot is the cashew.

Step 1: Choose the cashew
$C(1,1) = 1$

Step 2: Choose 3 chocolates
$C(19,3) = 969$

7.2 Relative Frequency

E = From South Carolina

N = Not from South Carolina

E	N
𝍸 ||||	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 |

$S = \{E, N\}$

$n(S) = 40$

E = From SC $\quad n(E) = 9$

Fraction of times someone was from South Carolina: $\frac{9}{40} = .225$

22.5% of the time someone from our class was from SC

relative frequency of event E or estimated probability

When an experiment is performed a number of times, the relative frequency or estimated probability of an event E is the fraction of times that the event E occurs.

If the experiment is performed N times and the event E occurs $fr(E)$ ($fr(E)$) times, then the relative frequency is given by

$$P(E) = \frac{fr(E)}{N}$$

$P(E)$: relative frequency

$fr(E)$: frequency of E

N: number of trials or sample size

Ex: If 10 rolls of a die resulted in the outcomes 2, 1, 4, 4, 5, 6, 1, 2, 2, 1

$N = 10$

$P(E) = \frac{fr(E)}{N}$

Outcome	1	2	3	4	5	6
Rel. frequency	.3	.3	0	.2	.1	.1
	$\frac{3}{10}$	$\frac{3}{10}$	$\frac{0}{10}$	$\frac{2}{10}$	$\frac{1}{10}$	$\frac{1}{10}$