13.1 & 13.2 Honors Advanced Algebra DATE: ________________

Do you get it?

Draw a sample space diagram to represent the scores when two standard dice are thrown. Find the probability of:

a) obtaining a score of 6 b) throwing a double c) score < 6

Sample Space Diagram

	1	2	3	4	5	6
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

10 of them

Let A = "obtain score of 6"

B = "trow double"

C = "score < 6"

$\therefore$ Probability of events A, B, and C are as follows:

a) $P(A) = \frac{5}{36}$

b) $P(B) = \frac{6}{36} = \frac{1}{6}$

c) $P(C) = \frac{10}{36} = \frac{5}{18}$

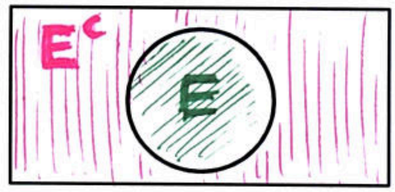
Note: Each event is equally likely to happen

Recall: If E represents an event and E^c represents the complement of an event, then

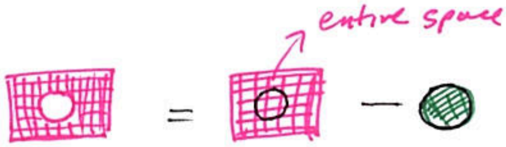
$$\boxed{P(E^c)} = 1 - \boxed{P(E)}$$

In Other Words
For any event, the event either happens or it doesn't. The Complement Rule is used when you know the probability that some event will occur and you want to know the opposite: the chance it will not occur.

Visually, a Venn Diagram can be used to represent the situation.



Think:



$P(E^c) \quad = \quad 1 \quad - \quad P(E)$

Problem: According to the National Gambling Impact Study Commission, 52% of Americans have played state lotteries. What is the probability that a randomly selected American has not played a state lottery?

Let E be event "play lottery". Then probability of "NOT playing lottery" is:

$$P(E^c) = 1 - P(A) = 1 - 0.52 = 0.48 \text{ or } 48\%$$

Problem: The data in Table 7 represent the income distribution of households in the United States in 2006.

Table 7

Annual Income	Number (in thousands)	Annual Income	Number (in thousands)
Less than \$10,000	8,899	\$50,000 to \$74,999	21,222
\$10,000 to \$14,999	6,640	\$75,000 to \$99,999	13,215
\$15,000 to \$24,999	12,722	\$100,000 to \$149,999	12,164
\$25,000 to \$34,999	12,447	\$150,000 to \$199,999	3,981
\$35,000 to \$49,999	16,511	\$200,000 or more	3,817

Source: U.S. Census Bureau

Total?

$8,899 + 6640 + 12,722 + \dots + 3817$

$= 111,528$

(a) Compute the probability that a randomly selected household earned \$200,000 or more in 2006.
(b) Compute the probability that a randomly selected household earned less than \$200,000 in 2006.
(c) Compute the probability that a randomly selected household earned at least \$10,000 in 2006.

a) $P(\$200{,}000 \text{ or more}) = \dfrac{3817}{111{,}528} \approx 0.034$ or 3.4%

b) $P(\text{less than } \$200{,}000) = 1 - P(\$200{,}000 \text{ or more})$

what is opposite of or complement?

$= 1 - 0.034 = 0.966$ or 96.6%

c) $P(\text{at least } \$10{,}000) = 1 - P(\text{less than } \$10{,}000)$

means $x \geq 10{,}000$
what is opposite of

$= 1 - \dfrac{8{,}899}{111{,}528} = 0.920$ or 92%