1. An experiment consists of first rolling a six-sided die, and then flipping a coin and observing the outcomes. How many elements are there in the sample space?

(a) 8 (b) 12 (c) 36 (d) 64 (e) 6

2. Which of the columns of the following table can serve as a probability distribution for an experiment with the sample space $\{s_1, s_2, s_3, s_4\}$?

	(a)	(b)	(c)	(d)	(e)
s_1	.1	.3	1.2	1	.4
s_2	.2	.3	-.3	1	.4
s_3	.3	.3	0	0	.4
s_4	.4	.3	.1	0	-.2

3. Let E and F be independent events and assume that $\Pr(E) = \frac{1}{4}$ and $\Pr(F) = \frac{1}{2}$. Find $\Pr(E \cup F)$. (a) 1 (b) $\frac{3}{4}$ (c) $\frac{5}{8}$ (d) $\frac{1}{2}$ (e) $\frac{1}{4}$

4. A box contains 4 red balls and 2 green balls. Three balls are drawn at random <u>without</u> replacement. What is the probability that all balls drawn are of the same color?

(a) $\frac{3}{4}$ (b) $\frac{1}{3}$ (c) $\frac{2}{3}$ (d) $\frac{1}{2}$ (e) $\frac{1}{5}$

5. A box contains 4 red balls and 2 green balls. Three balls are drawn at random <u>with</u> replacement. What is the probability that all balls drawn are of the same color? (Do not confuse this with problem #4.) (a) $\frac{2}{3}$ (b) $\frac{1}{3}$ (c) $\frac{2}{9}$ (d) $\frac{3}{4}$ (e) 1

6. Suppose that $\Pr(E) = 0.6$, $\Pr(F) = 0.5$ and $\Pr(E \cap F) = 0.2$.
Calculate $\Pr(E' \mid F)$. (a) $\frac{1}{3}$ (b) $\frac{3}{10}$ (c) $\frac{1}{10}$ (d) $\frac{3}{5}$ (e) $\frac{2}{5}$

7. Urn #1 contains 3 red balls and 1 white ball. Urn #2 contains 3 red balls and 3 white balls. A person rolls a die. If it comes up 1 or 2, she picks a ball at random from Urn #1. If it comes up 3, 4, 5 or 6, she picks a ball at random from Urn #2. What is the probability that she ends up with a red ball? (a) $\frac{1}{4}$ (b) $\frac{3}{5}$ (c) $\frac{7}{12}$ (d) $\frac{7}{8}$ (e) $\frac{3}{8}$

8. Only three horses are running in a race. The probability that Horse #1 will win is $\frac{1}{2}$ and the probability that Horse #2 will win is $\frac{1}{4}$. Find the odds that Horse #3 will win.

(a) 1 to 2 (b) 3 to 1 (c) 1 to 4 (d) 4 to 1 (e) 1 to 3

9. Jack finds a partial deck of 9 cards in a drawer. He discovers that if a card is drawn at random from this partial deck, the probability of getting a 7 or less is $\frac{2}{3}$ and the probability of getting a 7 or more is also $\frac{2}{3}$. How many 7's are there in the deck?

(a) 0 (b) 3 (c) 2 (d) 1 (e) 6

10. A college received 500 applications, 350 of which came from male applicants. It accepted 300 students, 200 of whom were male. Given that an applicant is female, what is the probability that she was accepted? (a) $\frac{1}{5}$ (b) $\frac{3}{5}$ (c) $\frac{2}{7}$ (d) $\frac{2}{3}$ (e) $\frac{1}{3}$

11. What is the probability of being dealt a flush in poker? (A flush consists of 5 cards all of the same suit.) (a) $\frac{5}{13}$ (b) $\frac{4\cdot\binom{13}{5}}{\binom{52}{5}}$ (c) $\frac{1}{4}$ (d) $\frac{\binom{13}{5}}{\binom{52}{5}}$ (e) $\frac{P(13,5)}{\binom{52}{5}}$

12. At a certain college, $\frac{3}{4}$ of the students go home for Spring Break and $\frac{1}{4}$ travel. Of those who travel, $\frac{1}{2}$ go to Florida, $\frac{1}{4}$ go to California and $\frac{1}{4}$ go to Alaska. Furthermore, $\frac{3}{4}$ of those travelling to Florida get sunburns and $\frac{1}{2}$ of those travelling to California get sunburns, but none of those travelling to Alaska or going home get sunburns. After Spring Break, a student is selected at random and is found <u>not</u> to have a sunburn. What is the probability that she went home for Spring Break?

(a) $\frac{1}{3}$ (b) $\frac{3}{4}$ (c) $\frac{7}{8}$ (d) $\frac{6}{7}$ (e) $\frac{1}{2}$

13. On each attempt, a bowler has a probability of $\frac{1}{3}$ of getting a strike. In a certain contest, he bowls until either he fails to get a strike or he has bowled 3 times. The number of strikes is observed. What is the probability distribution for this experiment? (k = number of strikes)

(a)

k	Pr(X = k)
0	$\frac{2}{3}$
1	$\frac{2}{9}$
2	$\frac{2}{27}$
3	$\frac{1}{27}$

(b)

k	Pr(X = k)
0	$\frac{2}{3}$
1	$\frac{4}{27}$
2	$\frac{4}{27}$
3	$\frac{1}{27}$

(c)

k	Pr(X = k)
0	$\frac{2}{3}$
1	$\frac{5}{27}$
2	$\frac{1}{9}$
3	$\frac{1}{27}$

(d)

k	Pr(X = k)
0	$\frac{2}{3}$
1	$\frac{1}{6}$
2	$\frac{1}{6}$
3	0

(e)

k	Pr(X = k)
0	$\frac{1}{3}$
1	$\frac{1}{9}$
2	$\frac{2}{9}$
3	$\frac{1}{3}$

14. John and Mary play the following game. Two dice are rolled. If the numbers are the same, Mary pays John $4. If they are different, John pays Mary $2. Who does the game favor and what are his or her expected winnings?

(a) it's an even game. (b) $1 for John (c) $1 for Mary (d) $3 for John (e) $3 for Mary

15. Suppose that a random variable X has probability distribution given by the following table:

k	Pr(X = k)
−1	.1
0	.2
1	.3
2	.4

Find the probability distribution of the random variable $(X^2 - 1)$.

(a)

k	$\Pr(X^2 - 1 = k)$
−1	.1
0	.2
3	.7

(b)

k	$\Pr(X^2 - 1 = k)$
−1	.2
0	.4
3	.4

(c)

k	$\Pr(X^2 - 1 = k)$
−1	.1
0	.2
1	.3
2	.4

(d)

k	$\Pr(X^2 - 1 = k)$
0	.4
1	.2
2	.4

(e)

k	$\Pr(X^2 - 1 = k)$
−1	.1
0	.5
3	.4

16. The registrar chooses at random five people who were born in the month of June (which has 30 days). What is the probability that at least two of the five were born on the same date in June? (a) $\dfrac{30 \cdot 29 \cdot 28 \cdot 27 \cdot 26}{30^5}$ (b) $1 - \dfrac{30 \cdot 29 \cdot 28 \cdot 27 \cdot 26}{365 \cdot 364 \cdot 363 \cdot 362 \cdot 361}$

(c) $\dfrac{\binom{30}{2}}{\binom{30}{5}}$ (d) $1 - \dfrac{30 \cdot 29 \cdot 28 \cdot 27 \cdot 26}{30^5}$ (e) $1 - \dfrac{\binom{30}{2}}{30 \cdot 29 \cdot 28 \cdot 27 \cdot 26}$

17. From a high school class of 20 boys and 30 girls, 6 are chosen at random to give a report. What is the probability that 3 are boys and 3 are girls?

(a) $\frac{\binom{20}{3}\binom{30}{3}}{\binom{50}{6}}$ (b) $\frac{P(20,3)P(30,3)}{P(50,6)}$ (c) $\frac{20!30!}{50!}$ (d) $\frac{\binom{20}{3}+\binom{30}{3}}{\binom{50}{6}}$

(e) $\frac{1}{2}$

18. Mom, Dad and their 4 children line up in a random order to have a picture taken. What is the probability that Mom and Dad do not wind up next to each other?

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{3}{4}$ (e) $\frac{2}{3}$

19. A company produces light bulbs using three machines. Machine I produces $\frac{1}{2}$ of the company's bulbs, Machine II produces $\frac{1}{5}$ and Machine III produces $\frac{3}{10}$. Of the bulbs produced by Machine I, $\frac{1}{10}$ are defective. Of the bulbs produced by Machine II, $\frac{1}{4}$ are defective. Of the bulbs produced by Machine III, $\frac{1}{2}$ are defective. A bulb is selected at random and is found to be defective. What is the probability that it came from Machine I? (a) $\frac{1}{20}$ (b) $\frac{1}{2}$ (c) $\frac{1}{5}$ (d) $\frac{1}{10}$ (e) $\frac{1}{4}$

20. Let X be a random variable with probability distribution given by the following table:

k	Pr
7	.3
8	0
9	.4
10	.2
11	0
12	0
13	.1

Find the standard defiation.

a. 1 b. 3 c. 5 d. 7 e. 9