

1. Suppose a red die and a green die are tossed and the numbers on the uppermost sides are observed. What is the probability that the numbers add up to 7 or 11 ?

(a) $\frac{5}{36}$ (b) $\frac{6}{36}$ (c) $\frac{7}{36}$ (d) $\frac{8}{36}$ (e) $\frac{9}{36}$

2. Suppose you are asked to pick one card from a standard 52-card deck. What is the probability that you will pick either a face card (Jack, Queen or King) or a club?

(a) $\frac{25}{52}$ (b) $\frac{9}{26}$ (c) $\frac{11}{26}$ (d) $\frac{121}{169}$ (e) $\frac{11}{13}$

3. Let E and F be independent events, with $P(E) = 0.4$ and $P(F) = 0.6$.
Find $P(E \cup F)$

- (a) 0.24 (b) 0.75 (c) 0.76 (d) 1 (e) 0.8

4. Given that $P(E) = 0.6$, $P(F) = 0.5$ and $P(E \cap F) = 0.2$ find $P(E' | F)$

- (a) $\frac{2}{5}$ (b) $\frac{3}{10}$ (c) $\frac{1}{3}$ (d) $\frac{3}{5}$ (e) $\frac{1}{10}$

5. At a certain college 80% of the students regularly attend football games, while the rest do not. Of those who do not, $\frac{3}{4}$ play tennis and the rest jog indoors during football games. Furthermore, $\frac{3}{4}$ of those who regularly attend football games get sunburn as do half of those who play tennis. Those who jog indoors (obviously!) do not get sunburn. What is the probability that a randomly selected student is sunburned?

- (a) $\frac{1}{2}$ (b) 0.675 (c) $\frac{5}{8}$ (d) 0.670 (e) 0.685

6. A fair coin is tossed independently four times. What is the probability of getting more "heads" than "tails"?

- (a) $\frac{5}{16}$ (b) $\frac{5}{8}$ (c) $\frac{3}{16}$ (d) $\frac{7}{8}$ (e) $\frac{1}{4}$

7. The probability distribution for a random variable X is given below. What is the variance of X ?

k	Pr(X=k)
-1	0.4
0	0.2
1	0.2
2	0.2

- (a) $\sqrt{1.36}$ (b) 0.2 (c) $\sqrt{0.2}$ (d) 1.00 (e) 1.36

8. The probability distribution for a random variable X is given below. You know that $E(X) = -0.1$. What is the variance of X ?

k	Pr(X=k)
-2	0.2
-1	
0	
1	0.2
2	0.2

- (a) $\sqrt{2.09}$ (b) 2.09 (c) $\sqrt{2.10}$ (d) 2.10 (e) 1.85

9. A fair coin is tossed twice and you are told that "heads" has come up at least once. What is the probability that both tosses were "heads"?

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

10. Saabuicks are assembled in three cities, Detroit, Oslo and Turin. Detroit produces 50% of the entire production, Oslo produces 30%, the rest are assembled in Turin. The following tables shows the ratio of "lemons" (defective cars) produced in each city:

City	ratio of "lemons"
Detroit	10%
Oslo	$\frac{1}{3}$
Turin	0.5

You but a Saabuick and find it to be a lemon. What is the probability that it was assembled in Italy?

(a) $\frac{1}{20}$ (b) 0.25 (c) 4% (d) 0.4 (e) $\frac{1}{10}$

14. A certain soccer goal keeper catches 60% of the penalty kicks against her team. Four penalty kicks are shot independently at the goal keeper. What is the probability she catches exactly two?

(a) 0.147

(b) $(0.6)^2$

(c) 0.24

(d) $\binom{4}{2} \cdot (0.36) \cdot (0.4)$

(e) $\binom{4}{2} \cdot (0.6)^2 \cdot (0.4)^2$

15. An experiment consists of tossing a fair coin nine times. What is the probability that the coin shows "heads" no more than once?

(a) $9 \cdot \left(\frac{1}{2}\right)^9$

(b) $\frac{2}{9}$

(c) $\frac{1}{81}$

(d) $10 \cdot \left(\frac{1}{2}\right)^9$

(e) 0

16. The table below shows the percents of total output and of defective output for four factories of microwave ovens. An oven is selected at random from the output and found to be defective. Which factory is most likely to have produced it?

Factory number	percent of total output	percent of defectives
I	50%	10%
II	35%	20%
III	15%	40%

- (a) I (b) II (c) III (d) II and III are equally likely
 (e) none of the above
17. A store has twenty quarts of olive oil. Six of the quarts are defective (expired time code). A shopper inspects three quarts, one at a time at random (she does not inspect the same quart twice!) and will buy the first unexpired quart she finds, if any. Otherwise she will not buy any olive oil. What is the probability she will not buy any olive oil?
- (a) $\frac{1}{57}$ (b) $\frac{47}{1264}$ (c) $\frac{1}{2}$ (d) $\frac{3}{10}$ (e) $\frac{1}{6}$

18. An island contains an equal number of 2-headed, 3-headed and 4-headed dragons. A hunter returns from the island with exactly one dragonhead as her trophy. Assuming the hunter cut at random the first head she could find, what is the probability her trophy came from a 3-headed dragon?

- (a) $\frac{1}{5}$ (b) $\frac{1}{6}$ (c) $\frac{1}{2}$ (d) $\frac{1}{4}$ (e) $\frac{1}{3}$

19. Which of the following four events has the lowest probability?

A = {exactly 3 heads are obtained when a fair coin is tossed 6 times}

B = {exactly 2 heads are obtained when a fair coin is tossed 4 times}

C = {exactly 1 head is obtained when a fair coin is tossed 2 times}

D = {exactly 1 head is obtained when a fair coin is tossed once}

(Assume all tosses are independent of each other.)

- (a) A (b) B (c) C (d) D
(e) the four events have the same probability.

20. Here is a game you are to play. You toss one fair die and are paid twice the amount shown on the top face. How much should you pay to play the game once, in order to break even in the long run?

- (a) \$ 3.50 (b) \$ 5.00 (c) \$ 7.00 (d) \$ 8.50 (e) \$ 10.00