1.) Consider a basket containing 5 yellow and 7 black kittens. Close your eyes, reach in, and pick two kittens without replacement. What is the probability that
   a.) the 1st kitten is black ?
   b.) the 2nd kitten is black given that the 1st kitten is yellow ?
   c.) the 2nd kitten is yellow ?
   d.) the 2nd kitten is yellow given that the 1st kitten is yellow ?
   e.) the 2nd kitten is black ?

2.) Consider a standard 52-card deck of playing cards. A face card is any Jack, Queen, or King. Pick three cards without replacement from the deck. What is the probability that
   a.) the 1st card is a face card ?
   b.) the 2nd card is a face card given that the first card is a face card ?
   c.) the 2nd card is a not face card ?
   d.) the 3rd card is not a face card given that the first card is a face card ?
   e.) the 3rd card is a face card ?
   f.) the 3rd card is not a face card given that the 2nd card is not a face card ?

3.) A bag contains 1 blue, 2 white, and 3 red balls. Select 3 balls without replacement. What is the probability that the
   a.) the 1st ball is red ?
   b.) the 2nd ball is red given that the 1st ball is white ?
   c.) the second ball is red ?
   d.) the third ball is white given that the second ball is blue ?
   e.) the 3rd ball is red ?
   f.) the 3rd ball is blue ?

4.) Randomly select 2 cards one at a time from a standard deck of playing cards. Let A be the event that the 1st card is a 3 or 4. Let B be the event that the 2nd card is a Jack, Queen, or King. Determine if A and B are independent events.
   a.) Assume that the two cards are selected one at a time WITHOUT replacement.
   b.) Assume that the two cards are selected one at a time WITH replacement.

5.) Assume that the probability a newborn is a boy is exactly 1/2 and the probability it’s a girl is exactly 1/2. If gender outcomes from child to child are independent, what is the probability that a family of 7 children will consist
   a.) of all girls ?
   b.) of 4 boys and 3 girls ?
   c.) of 5 girls and 2 boys ?
   d.) at least 1 girl ?
   e.) at most 5 boys ?
6.) LeBron James of the Miami Heat shoots field goals at the rate of 0.510. Assuming that his shots are independent events, what is the probability that he will
   a.) make 5 shots in a row?
   b.) miss 4 shots in a row?
   c.) make exactly 5 out of 6 shots?
   d.) make exactly 12 out of 21 shots?
   e.) make at least 1 out of 10 shots?

7.) In an NBA playoff game against the Oklahoma City Thunder power forward Dirk Nowitzki of the Dallas Mavericks made 24 out of 24 free throws! Dirk shoots free throws at the rate of 0.892. Assuming that his shots are independent events, what is the probability that he will
   a.) make 24 out of 24 shots?
   b.) miss 4 shots in a row?
   c.) make exactly 4 out of 6 shots?
   d.) make at most 8 out of 10 shots?

8.) You have 15 decks of standard playing cards. Randomly select 1 card from each deck. What is the probability that there will be at least 1 matching pair (same suit and same face value)?

9.) A blood test for the HIV virus shows a positive (+) result in 98% of all cases when the virus is actually present in an individual and in 6% of all cases when the virus is NOT present in an individual (false positive). Assume that 1 out of every 250 people are carriers of the virus.

   a.) What is the probability that a person tests positive for the HIV virus?
   b.) What is the probability that a person tests negative for the HIV virus?
   c.) What is the probability that a person is a carrier given that the person tests positive?
   d.) What is the probability that a person is a non-carrier given that the person tests positive?
   e.) What is the probability that a person tests positive given that the person is a carrier of the HIV virus? Assuming that these tests are independent events, what is the probability that a carrier tests positive twice? three times?
   f.) What is the probability that a person tests positive given that the person is a non-carrier of the HIV virus? Assuming that these tests are independent events, what is the probability that a non-carrier tests positive twice? three times?

   g.) (challenging) What is the probability that a random person tests positive twice? three times?
   h.) (challenging) What is the probability that a person is a carrier given that the person tests positive twice? three times?
   i.) (challenging) What is the probability that a person is a non-carrier given that the person tests negative twice? three times?
10.) (Genetics—Mendel’s First Law) Gregor Mendel (Austria 1856) studied pea plants and the color of their flowers determined by two genes in their chromosomes. Assume that the following genotypes are possible: CC, Cc (same as cC), and cc, where types CC and Cc produce red flowers and type cc produces white flowers. Suppose that you have a batch of red- and white-flowering pea plants, where all three genotypes CC, Cc, and cc are represented. Assume that 15% of the plants are type CC, 30% of the plants are type Cc, and 55% of the plants are type cc. You will pick 1 parent plant at random from the batch and cross it with a pea plant of genotype cc.

a.) What is the probability that the offspring will have red flowers? white flowers?

b.) What is the probability that the batch parent plant was of genotype Cc given that offspring had red flowers?

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"Gravitation is not responsible for people falling in love.” — Albert Einstein