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  Course: Statistical_Inference
  Lesson: Probability1

- Class: text
  Output: "Probability. (Slides for this and other Data Science courses may be found at
  github https://github.com/DataScienceSpecialization/courses. If you care to use them,
  they must be downloaded as a zip file and viewed locally. This lesson corresponds to
  Statistical_Inference/Probability.)"

- Class: text
  Output: In this lesson, we'll review basic ideas of probability, the study of
  quantifying the likelihood of particular events occurring. Note the similarity
  between the words probability and probably. Every time you use the latter word you're
  implying that an event is more likely than not to occur.

- Class: mult_question
  Output: The first step in understanding probability is to see if you understand what
  outcomes of an experiment are possible. For instance, if you were rolling a single,
  fair die once, how many outcomes are possible?
  AnswerChoices: 6; 1; 4; Too many
  CorrectAnswer: 6
  AnswerTests: omnitest(correctVal='6')
  Hint: How many sides or faces does a die (or any cube or box) have?

- Class: mult_question
  Output: The probability of a particular outcome of an experiment is the ratio of the
  number of ways that outcome can occur to all possible outcomes of the experiment.
  Since there are 6 possible outcomes to the experiment of rolling a die, and we assume
  the die is fair, each outcome is equally likely. So what is the probability of
  rolling a 2?
  AnswerChoices: 1/6; 2/6; 1/3; 0
  CorrectAnswer: 1/6
  AnswerTests: omnitest(correctVal='1/6')
  Hint: The '2' is one of six possibilities.

- Class: mult_question
  Output: What is the probability of rolling an even number?
  AnswerChoices: 1/2; 1/3; 0; 1
  CorrectAnswer: 1/2
  AnswerTests: omnitest(correctVal='1/2')
  Hint: Half of the outcomes are even and half are odd. There are three even outcomes
  (2,4, and 6) and three odd (1,3, and 5)

- Class: text
  Output: Since the probability of a particular outcome or event E is the ratio of ways
  that E could occur to the number of all possible outcomes or events, the probability
  of E, denoted P(E), is always between 0 and 1. Impossible events have a probability
  of 0 (since they can't occur) and events that are certain to occur have a probability
  of 1.

- Class: text
  Output: If you're doing an experiment with n possible outcomes, say e1, e2, ..., en,
  then the sum of the probabilities of all the outcomes is 1. If all the outcomes are
  equally likely, as in the case of a fair die, then the probability of each is 1/n.

- Class: text
  Output: If A and B are two independent events then the probability of them both
  occurring is the product of the probabilities. P(A&B) = P(A) * P(B)

- Class: mult_question
  Output: Suppose you rolled the fair die twice in succession. What is the probability
  of rolling two 4's?
  AnswerChoices: 1/36; 2/6; 0; 1/6
  CorrectAnswer: 1/36
  AnswerTests: omnitest(correctVal='1/36')
  Hint: The probability of rolling the first 4 is 1/6. The second roll of the dice
  doesn't depend on the outcome of the first, so that also has a probability of 1/6.
  The probability of both events occurring is 1/6 * 1/6. This makes intuitive sense
  since the probability of 2 such events occurring has to be smaller than the
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    probability of only 1 event.

  - Class: mult_question
    Output: Suppose you rolled the fair die twice. What is the probability of rolling the
    same number two times in a row?
    AnswerChoices: 1/6; 2/6; 0; 1/36
    CorrectAnswer: 1/6
    AnswerTests: omnitest(correctVal='1/6')
    Hint: Since we don't care what the outcome of the first roll is, its probability is
    1. The second roll of the dice has to match the outcome of the first, so that  has a
    probability of 1/6. The probability of both events occurring is 1 * 1/6.

  - Class: mult_question
    Output: Now consider the experiment of rolling 2 dice, one red and one green. Assume
    the dice are fair and not loaded. How many distinct outcomes are possible?
    AnswerChoices: 36; 12; 11; 1
    CorrectAnswer: 36
    AnswerTests: omnitest(correctVal='36')
    Hint: Each of the dice has 6 ways to land, and their outcomes are independent of each
    other. Each way the red die lands can be paired with each way the green die lands.
    For instance, a "1" on the red dice can occur independently of any of the 6 outcomes
    of the green dice.

  - Class: text
    Output: If an event E can occur in more than one way and these ways are disjoint
    (mutually exclusive) then P(E) is the sum of the probabilities of each of the ways in
    which it can occur.

  - Class: mult_question
    Output: Rolling these two dice, what's the probability of rolling a 10?
    AnswerChoices: 3/36; 2/36; 1/6; 0
    CorrectAnswer: 3/36
    AnswerTests: omnitest(correctVal='3/36')
    Hint: Since the highest possible dice roll is a '6', the only combinations which give
    '10' are 4+6 and 5+5. The first occurs in two ways - red dice gets '4' and green gets
    '6' OR red gets '6' and green gets '4'.

  - Class: mult_question
    Output: What sum is the most likely when rolling these two dice?
    AnswerChoices: 7; 2; 12; 9; 1
    CorrectAnswer: 7
    AnswerTests: omnitest(correctVal='7')
    Hint: The choice of '1' is impossible rolling two dice, and '2' and '12' each occur
    in only one possible way (snake-eyes and double 6's, respectively), so '7' and '9'
    are the only reasonable choices. To roll '7' you can use any number from '1' to '6',
    while '9' can only use outcomes of '3' and above.

  - Class: text
    Output: The probability of at least one of two events, A and B, occurring is the sum
    of their individual probabilities minus the probability of their intersection. P(A U
    B) = P(A) + P(B) - P(A&B).

  - Class: text
    Output: It's easy to see why this is. Calculating P(A) and P(B) counts outcomes that
    are in both A and B twice, so they're overcounted. The probability of the
    intersection of the two events, denoted as A&B, must be subtracted from the sum.

  - Class: mult_question
    Output: Back to rolling two dice. Which expression represents the probability of
    rolling an even number or a number greater than 8?
    AnswerChoices: (18+10-4)/36; (18+10)/36; (18+4-2)/36; (18+10-2)/36
    CorrectAnswer: (18+10-4)/36
    AnswerTests: omnitest(correctVal='(18+10-4)/36')
    Hint: The probability of rolling an even number is 1/2 or 18/36. There are 10 ways of
    rolling a number greater than '8' - 4 ways for rolling '9', 3 for '10', 2 for '11'
    and 1 for '12'. How big is the intersection between rolling an even number and those
    greater than '8'?

  - Class: text
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92      Output: It follows that if A and B are disjoint or mutually exclusive, i.e. only one
        of them can occur, then  P(A U B) = P(A)+P(B) .
93
94    - Class: mult_question
95      Output: Which of the following expressions represents the probability of rolling a
        number greater than 10?
96      AnswerChoices: (2+1)/36; (1+1)/36; (3+1)/36; (3+1-1)/36
97      CorrectAnswer: (2+1)/36
98      AnswerTests: omnitest(correctVal='(2+1)/36')
99      Hint: The only outcomes greater than 10 are 11 and 12 which are mutually exclusive.
        The first, 11, can occur in two ways, and the second, 12, can occur only with a roll
        of double 6's.
100
101   - Class: cmd_question
102     Output: Use the answer to the previous question and the fact that the sum of all
        outcomes must sum to 1 to determine the probability of rolling a number less than or
        equal to 10.
103     CorrectAnswer: 11/12
104     AnswerTests: equiv_val(correctVal=11/12)
105     Hint: Subtract the previous answer from 1.
106
107   - Class: figure
108     Output: Now we'll apply the concepts of probability to playing cards.
109     Figure: runCards.R
110     FigureType: new
111
112   - Class: cmd_question
113     Output: A deck of cards is a set of 52 cards, 4 suits of 13 cards each. There are two
        red suits, diamonds and hearts, and two black suits, spades and clubs. Each of the 13
        cards in a suit has a value -  an ace which is sometimes thought of as 1, a number
        from 2 to 10, and 3 face cards, king, queen, and jack. We've created a deck in R for
        you. Type 'deck' to see it now.
114     CorrectAnswer: 'deck'
115     AnswerTests: omnitest(correctExpr='deck')
116     Hint: Type deck at the R prompt.
117
118   - Class: exact_question
119     Output: When drawing a single card, how many outcomes are possible?
120     CorrectAnswer: 52
121     AnswerTests: omnitest(correctVal=52)
122     Hint: How many cards are in the deck?
123
124   - Class: cmd_question
125     Output: What is the probability of drawing a jack?
126     CorrectAnswer: 4/52
127     AnswerTests: equiv_val(1/13)
128     Hint: How many jacks are in the deck? Divide this number by the number of cards in
        the deck.
129
130   - Class: cmd_question
131     Output: If you're dealt a hand of 5 cards, what is the probability of getting all 5
        of the same value?
132     CorrectAnswer: 0
133     AnswerTests: equiv_val(0)
134     Hint: There are only 4 different suits in a deck.
135
136   - Class: cmd_question
137     Output: What is the probability of drawing a face card?
138     CorrectAnswer: 3/13
139     AnswerTests: equiv_val(3/13)
140     Hint: There are 3 face cards in each of the 4 suits in the deck.
141
142   - Class: mult_question
143     Output: Suppose you draw a face card and don't replace it in the deck. What is the
        probability that when you draw a second card it also will be a face card?
144     AnswerChoices: 11/51; 0; 12/51; 11/52
145     CorrectAnswer: 11/51
146     AnswerTests: omnitest(correctVal='11/51')
147     Hint: There are only 51 cards remaining in the deck, and of those, only 11 are face
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      cards.
148
149   - Class: cmd_question
150     Output: Suppose you draw a face card and don't replace it in the deck. What is the
        probability that when you draw a second card it also will be a face card of the same
        suit?
151     CorrectAnswer: 2/51
152     AnswerTests: equiv_val(2/51)
153     Hint: There are 2 face cards of the same suit left in the deck.
154
155   - Class: text
156     Output: Congrats! With probability 1, you've aced this first lesson on basic
        probability.
157
158   - Class: mult_question
159     Output: "Would you like to receive credit for completing this course on
160       Coursera.org?"
161     CorrectAnswer: NULL
162     AnswerChoices: Yes;No
163     AnswerTests: coursera_on_demand()
164     Hint: ""
165
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