

Test 2

Show all your work

Name: _____
Number: _____
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Score: ___/36

Problem 1: Answer each question to two decimal place accuracy when appropriate. Write out steps for each.

- a. Convert the fraction $3\frac{7}{8}$ into a percent.

$$3\frac{7}{8} = 3 + \frac{7}{8} = \frac{31}{8} = 3.875 = 387.5\%$$

387.5%

- b. Find 27.5% of 360.

$$0.275 \times 360 = 99$$

99

- c. When Brian buys a 300-dollar couch, how much including taxes does he need to pay the store? Hint: Stores need to charge a 5% GST and 7% PST.

$$12\% \text{ of } \$300 \text{ is } 0.12 \times 300 = 36, \text{ so you have to pay } \$300 + \$36 = \$336.$$

\$336

- d. If there is a 1 in 200 chance that Janette will pick the numbers correctly in CSU's lottery, what is the probability she will NOT pick the numbers correctly?

$$1 - \frac{1}{200} = \frac{199}{200} \approx 0.9950 = 99.50\%$$

0.9950

- e. The residents of a small town and the surrounding areas are divided over the proposed construction of a dog park in town, as shown in the table. A reporter randomly selects a person to interview from a group of residents. If the person selected lives in the surrounding areas, what is the probability that the person supports the dog park?

| | Support dog park | Oppose dog park |
|---------------------------|------------------|-----------------|
| Live in town | 7252 | 6316 |
| Live in surrounding areas | 518 | 461 |

$$\frac{518}{518+461} = \frac{518}{979} \approx 0.5291 = 52.91\%$$

0.5291

- f. When you flip three coins, what is the probability of getting at least one tail?

7/8

$$\text{The chance of zero tails is } \left(\frac{1}{2}\right)^3 = \frac{1}{8}, \text{ so the chance of at least one tail is } 1 - \frac{1}{8} = \frac{7}{8}.$$

- g. When you draw a single card from a deck of 52 cards, what is the probability of getting a black jack?

$$\frac{2}{52} = \frac{1}{26}$$

1/26

- h. Assume that A and B are events. If $P(A \cap B) = 0.20$, $P(A) = 0.40$, and $P(B) = 0.65$, find $P(A \cup B)$.

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.40 + 0.65 - 0.20 = 0.85.$$

0.85

Score: ___/8

Problem 2: Solve for the indicated variable.

a. Solve for r in $A = P(1 + rt)$

If $A = P(1 + rt)$, then $\frac{A}{P} = 1 + rt$, so $rt = \frac{A}{P} - 1$, so

$$r = \frac{\frac{A}{P} - 1}{t} = \frac{\frac{A-P}{P}}{t} = \frac{A-P}{Pt}$$

b. Solve for x in $(1.25)^x = 23$

If $(1.25)^x = 23$, then $\log((1.25)^x) = \log(23)$, so $x \log(1.25) = \log(23)$, so $x = \frac{\log(23)}{\log(1.25)} \approx 14.05$

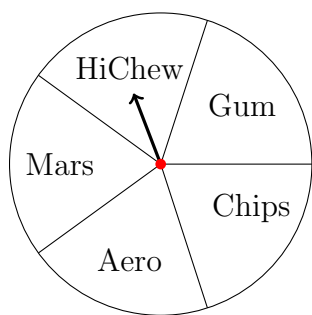
c. Solve for r in $A = P(1 + r/m)^n$

If $A = P(1 + r/m)^n$, then $\frac{A}{P} = (1 + r/m)^n$, so $(A/P)^{1/n} = 1 + r/m$, so $(A/P)^{1/n} - 1 = r/m$, so

$$r = m \left(\left(\frac{A}{P} \right)^{1/n} - 1 \right) = m \sqrt[n]{A/P} - m$$

Score: /5

Problem 3: Dad constructed a spinner with five equal sectors the morning after Halloween for Hamlet and Samlet. Assume that the pointer never lies on a border line, answer the following questions.



a. Find the probability for the event of getting no Aero after two spins.

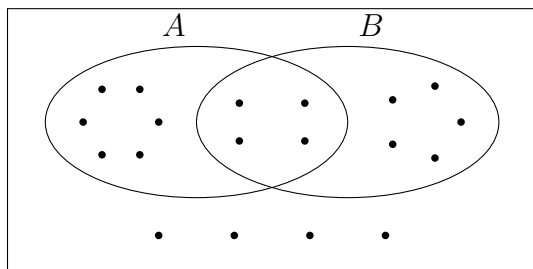
$$\left(\frac{4}{5}\right)^2 = \frac{16}{25} = 0.64 = 64\%$$

b. Find the probability for the event of getting at least one Gum after three spins.

The chance of zero Gums is $\left(\frac{4}{5}\right)^3 = \frac{64}{125}$, so the chance of at least one Gum is $1 - \frac{64}{125} = \frac{61}{125} = 0.488 = 48.8\%$

Score: /4

Problem 4: Dad drew a big rectangle representing a sample space containing two events, A and B . Assume that the outcomes (as dots) were all equally likely, answer the following questions.



a. $P(A)$

$$\frac{10}{19} \approx 52.6\%$$

b. $P(A \cap \bar{B})$

$$\frac{6}{19} \approx 31.6\%$$

c. $P(A | B)$

$$\frac{4}{9} = 44.4\%$$

d. Are A and B mutually exclusive?

$A \cap B \neq \emptyset$, so A and B are *not* mutually exclusive.

Score: /4

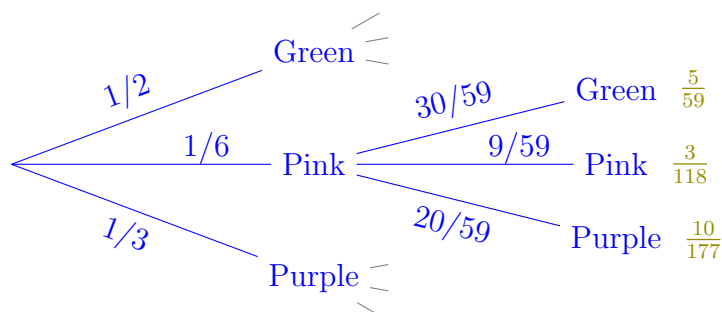
Problem 5: The table relates the amount of time consumers engage in online shopping per month with their annual income. Find the probability that a randomly selected consumer spends 0–2 hours per month shopping online OR has an annual income below \$40 000.

| Annual income | 10 h or more | 3 h–9 h | 0 h–2 h | Total |
|-------------------|--------------|---------|---------|-------|
| Above \$60 000 | 188 | 179 | 129 | 496 |
| \$40 000–\$60 000 | 147 | 216 | 160 | 523 |
| Below \$40 000 | 129 | 188 | 253 | 570 |
| Total | 464 | 583 | 542 | 1589 |

$$\frac{129 + 188 + 253 + 160 + 129}{1589} = \frac{859}{1589} = 0.541 = 54.1\%$$

Score: /2

Problem 6: A candy jar contains 30 green jelly beans, 10 pink jelly beans, and 20 purple jelly beans. Two jelly beans are randomly selected without replacement. Let P be the event *you select a pink jelly bean first*, and let N be the event *the second jelly bean is not purple*. Find $P(N | P)$ with a probability tree.



Therefore,

$$P(N | P) = \frac{P(N \text{ and } P)}{P(P)} = \frac{\frac{5}{59} + \frac{3}{118}}{\frac{1}{6}} = \frac{\frac{13}{118}}{\frac{1}{6}} = \frac{39}{59} \approx 0.661 = 66.1\%$$

Score: /3

Problem 7: Hamlet woke up with a high fever and a bad cough. When Sam brought him to the doctor, a rapid antigen test from a throat swab sample was performed. From the table below, draw a probability tree with probabilities assigned on the branches to answer the probability of HAVING a strep throat given a negative test result.

| | | Streptococcus | |
|---------|---|---------------|------------|
| | | Have Strep A | No Strep A |
| Test | + | 240 | 35 |
| Results | − | 40 | 4560 |

A total of $40 + 4560 = 4600$ people tested negative. Of those, 40 had Strep A, so the chance is $\frac{40}{4600} = \frac{1}{115} \approx 0.870\%$.

Score: /4

Problem 8: Suppose Brian's brother purchased a used boat for \$8000 and agreed to pay off the boat in 24 monthly payments of \$455 each.

- a. Find the total amount of interest charged in this boat loan.

He paid a total of $24 \times \$455 = \$10\,920$, so the interest was $\$10\,920 - \$8000 = \$2920$.

- b. Assume the payments were computed using the add-on interest method, find the annual interest rate applied.

With the add-on method, $I = Prt$, so $r = \frac{I}{Pt} = \frac{\$2920}{\$8000 \times 2} = 0.1825 = 18.25\%$

Score: /3

Problem 9: David's grandparents want to establish a fund for their grandchildren's university education. What lump sum must they deposit at a 5% annual interest rate, compounded monthly, in order to have \$25 000 in the fund at the end of 16 years?

If

$$\$25\,000 = P \left(1 + \frac{5\%}{12} \right)^{16 \times 12} = P(1.004\,167)^{192},$$

then $P = \frac{\$25\,000}{(1.004\,167)^{192}} = \$11\,251.91$.

Score: /3