Math 123-01
Summer 2025
Dr. Lily Yen

Midterm Two

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Name: _____
Number: _____
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Score: ___/30

Problem 1: For each of the following, give an exact answer when possible, else round to two decimal places.

a. What percentage of 150 is 25?

b. 12 % of which number is 480?

c. What taxes does one pay on a $300 purchase? Hint: B.C. has a 5 % and a 7 % PST.

$\frac{25}{150} = \frac{1}{6} \approx 0.1667 = 16.67\,\%$. If $0.12x = 480$, then $x = \frac{480}{0.12} = 4000$.
$300 \times 0.12 = 36$, so 36 dollars in taxes.

Score: /3

Problem 2: Kristian purchased some Wild Life Conservation stocks for $7500 and 30 months later sold the shares for $10 200. Use simple interest to find the annual interest rate expressed as a percent on the earnings of his investment. Round to two decimal places.

The gain in $\$(10\,200 - 7500) = \$2700$, so $\frac{\$2700}{\$7500} = \frac{9}{25} = 0.36 = 36\,\%$ over 30 months, so $\frac{12}{30} \times 36\,\% = 14.4\,\%$ per year (simple interest).

Score: /3

Problem 3: David takes a $5000 loan from the bank at 4.25 % annual interest rate, to be repaid in 2 years in equal monthly payments. Find his monthly payment and the total interest he pays on this loan. Round to two decimal places.

The total (simple) interest is $2 \times 0.0425 \times \$5000 = \$425$, so the total payment (over all four years) is $\$5000 + \$425 = \$5425$, so the monthly payment is $\$5425 \div 2 \div 12 \approx \$226.04$.

Score: /3

Problem 4: At the end of June, Sasha has a $1100 balance on their credit card which imposes a 21.5 % annual interest rate. What will the finance charge be in the end of July?

The finance charge for July is $\$1100 \times \frac{0.215}{12} \approx \$19.71$.

Score: /1

/10

Problem 5: Janette's grandmother has invested \$15 000 in a savings account that pays 3.8 % annual interest, compounded semi-annually (twice a year). How long would it take to triple (three times) her investment? Round to two decimal places.

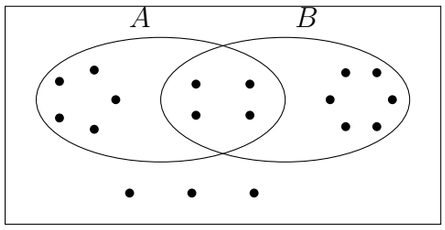
Hint: $A = P\left(1 + \dfrac{r}{m}\right)^{mt}$.

$3 \times 15\,000 = 15\,000\left(1 + \frac{0.038}{2}\right)^{2t}$, so $3 = (1.019)^{2t}$, so $\log(3) = \log(1.019^{2t}) = 2t\log(1.019)$, so

$$t = \frac{\log(3)}{2\log(1.019)} \approx 29.2 \text{ years}$$

Score: /3

Problem 6: Dad drew a big rectangle representing a sample space containing two events, A and B. Assuming that the outcomes (as dots) were all equally likely, answer the following questions with fractions simplified to lowest terms.



a. $P(\overline{B})$ $\boxed{\dfrac{8}{18} = \dfrac{4}{9} \approx 44.4\,\%}$

b. $P(A \cup \overline{B})$ $\boxed{\dfrac{12}{18} = \dfrac{2}{3} \approx 66.7\,\%}$

c. $P(A \mid B)$ $\boxed{\dfrac{4}{10} = \dfrac{2}{5} = 40.0\,\%}$

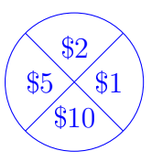
d. Find the odds against event A. $\boxed{\dfrac{9}{9} = 1 = 100\,\%}$

Score: /4

Problem 7: Draw a spinner with four equal sectors labelled \$1, \$2, \$5, and \$10. Provide a sample space for spinning the spinner twice.

a. Find $P(X_1 + X_2 > \$5) = \frac{12}{16} = \frac{3}{4} = 75.0\,\%$.

b. Find $P(X_1 < X_2) = \frac{6}{16} = \frac{3}{8} = 37.5\,\%$.



+	\$1	\$2	\$5	\$10
\$1	2	3	6	11
\$2	3	4	7	12
\$5	6	7	10	15
\$10	11	12	15	20

Score: /3

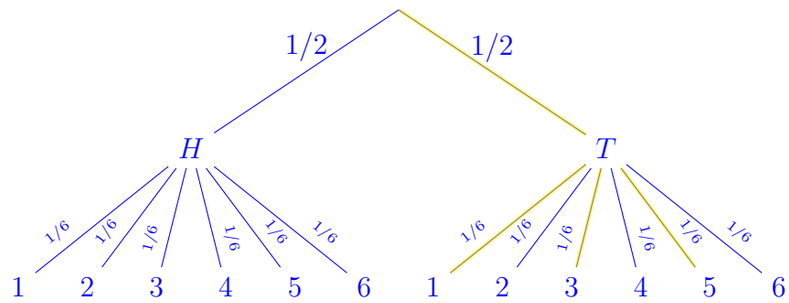
/10

Problem 8: Samlette invented a game of simultaneously flipping a fair coin and rolling a fair cubic die.

a. Draw a probability tree for her game with every branch labelled with its corresponding probability.

b. Highlight the branches which lead to the event that Samlette flipped Tails and rolled an odd number.

c. Find $P(T \cap \text{Odd}) = 3 \times \frac{1}{2} \times \frac{1}{6} = \frac{1}{4} = 25\,\%$.



Score: /4

Problem 9: CapU's Chancellor proposed that all students must take a course in Indigenous Studies as a requirement for graduation. Many among faculty members and students were asked about their opinion on this issue. Their choices are summarized in the following table with three blanks. Fill the blanks and answer the following.

	Favour	Oppose	Neutral	Total
Students	90	110	30	230
Faculty	45	15	10	70
Total	135	125	40	300

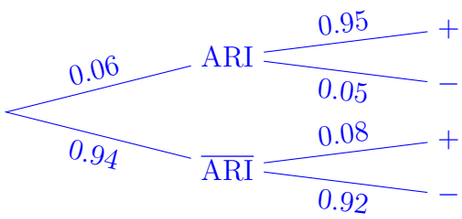
a. Find the probability that a randomly selected person is a faculty AND opposes the taking of Indigenous Studies as a requirement. $\frac{15}{300} = \frac{1}{20} = 5.0\,\%$

b. Given that the person opposed the requirement, find the probability that the person is a member of the faculty. $\frac{15}{125} = \frac{3}{25} = 12.0\,\%$

Score: /2

Problem 10: Assume that 6 % of international visitors arriving at the Vancouver International Airport are sick with ARI (Acute respiratory infections). Suppose a test correctly identifies a visitor sick with ARI 95 % of the time. Also assume that the test falsely identifies a healthy visitor as sick with ARI 8 % of the time. If an international visitor tests negative, what is the probability in PERCENT that the visitor is sick with ARI? Round to 4 decimal places.

Draw a probability tree as part of your steps.



$$P(\text{ARI} \mid -) = \frac{P(\text{ARI} \cap -)}{P(-)} = \frac{0.06 \times 0.05}{0.06 \times 0.05 + 0.94 \times 0.92} \approx 0.003\,457 \approx 0.3457\,\%$$

Score: /4

/10