

MATH 113 SPRING 2023 DECISION REVIEW DAY PROBLEMS

Use this table for the problems on taxes.

A.G.I. (adjusted gross income)	Taxes Owed
\$0 to \$9,875	10% of income
\$9,876 to \$40,125	\$987.50, plus 12% of the amount beyond \$9,875
\$40,126 to \$85,525	\$4,617.50, plus 22% of the amount beyond \$40,125
\$85,526 to \$163,300	\$14,605.50, plus 24% of the amount beyond \$85,525
\$163,301 to \$207,350	\$33,271.50, plus 32% of the amount beyond \$163,300
\$207,351 to \$518,400	\$47,367.50, plus 35% of the amount beyond \$207,350
Over \$518,400	\$162,456, plus 37% of the amount beyond \$518,400

- 0.1. **Problem 1.** Your friend remembers that she owes \$14,000 in taxes, as 14 is her favorite number, a fun coincidence. Using the tax schedule, what is her adjusted gross income (A.G.I.)?
- 0.2. **Problem 2.** If you made \$66,250 in income this year:
- How much money will you owe in taxes?
 - How much of your income will you get to keep? Express your answer as a percentage.
- 0.3. **Problem 3 (student problem).** Suppose a city's total power usage in 2010 was 15,372,000 mWh (Megawatt-hours). If the total power usage increased to 17,251,000 mWh in 2020, what is the percent increase in total energy used between the two years? Round your answer to the nearest tenth of a percent.
- 0.4. **Problem 4.** Your hospital bill from treatment from a disease comes out to be 6400 dollars. Your medical insurance plan has a 1700 dollar deductible, and then you cover 25 percent of the remaining expenses after that.
- How much money do you have to pay?
 - How much money does your insurance provider pay?
 - If you increase the size of the deductible but the total hospital bill amount stays the same, will the total amount you pay increase, decrease, or stay the same?

- 0.5. **Problem 5.** Which of the following is/are an example(s) of the balance fallacy?
- A. One of two teams in a soccer game kicks the ball out of bounds, and you assume that there is a 50 percent chance it was the blue team that did it.
 - B. One of two teams in a soccer game kicks the ball out of bounds, and you conclude one of the two teams should be penalized.
 - C. One of two teams in a soccer game kicks the ball out of bounds, and you assume that there is a 50 percent chance it was the red team that did it.
 - D. You flip a fair coin many times and observe the Law of Large Numbers taking place.
- 0.6. **Problem 6.** An engagement ring is pawned at a pawn shop for 500 dollars (yes this is a pitiful rate) and the interest rate the pawn shop charges is 12 percent per month (simple interest). How much money must you repay the pawn shop if you wait:
- a. 2 months after pawning the ring
 - b. 4 months after pawning the ring
- 0.7. **Problem 7.** Explain in words why compound interest grows faster than simple interest.
- 0.8. **Problem 8.** You invest P dollars in a bank and earn 22 percent interest compounded quarterly (yikes), over a time period of 5 years. There is now 2000 dollars in the account. How much money was in the account to start with?
- 0.9. **Problem 9.** Which of the following fairness attributes is described by, "If one wins, and then if there is a re-election, if all changes favor that one, then that one should still win."
- A. Monotonicity
 - B. Majority
 - C. Condorcet
 - D. Independence
- 0.10. **Problem 10.** A group of four people ranked their favorite meal from best to worst in the following way:
- 1 person ranked lunch, dinner, breakfast
 - 2 people ranked breakfast, dinner, lunch
 - 1 person ranked dinner, lunch, breakfast
- a. Which meal wins with plurality?
 - b. What happens if you try to find a winner with plurality with elimination?
- 0.11. **Problem 11.** If any person has a 40 percent chance of deciding to get a flu vaccine, and a vaccine costs 30 dollars, what is the expected amount a person spends on a flu vaccine? Note: I do not guarantee these numbers to be realistic.