Day 1 Exercises: Problem Solving Sessions 1 and 2

This handout combines both Day 1 problem-solving sessions.

Session 1

This session builds quick fluency with basic models, linear relationships, and optimization language. Focus on setting up expressions clearly and interpreting answers in context.

1. A ride costs $C = 2x + 3$. Find cost for $x = 0, 4, 9$ miles.
2. A data plan charges $P = 0.4g$. Find price for $g = 5, 12, 20$ GB.
3. Explain slope and intercept for $y = 5x + 10$ in words.
4. Write a proportional model for paint use if each wall needs 1.8 liters.
5. Revenue is $R = 12n$, cost is $C = 80 + 7n$. Write profit $P(n)$.
6. Evaluate your profit model from Problem 5 at $n = 10, 20, 30$.
7. A model gives outputs $6, 9, 12, 11, 8$ for tested inputs $1, 2, 3, 4, 5$. Which tested input is best?
8. Give one real-world situation where "best" means smallest value, not largest.
9. A club can make either 40, 60, or 80 sandwiches. Profit values are $110, 170, 165$. Which choice is best? What tradeoff might explain why 80 is not best?

Session 2

This session mixes linear modeling and optimization decisions. Focus on comparing options and explaining how assumptions affect conclusions.

1. Parking fee model: $C = 5 + 1.5h$. Find C for $h = 3, 7$.

2. Which is proportional: $y = 3x$, $y = 3x + 2$, $y = 2x - 1$?

3. In your own words, what is optimization?

4. A club tests selling $n = 10, 20, 30, 40$ items with profits $30, 90, 120, 100$. Best tested choice?

5. Give one assumption in a snack-stand profit model and explain why it matters.

6. Compare plans: $C_A = 2x + 5$, $C_B = 1.5x + 11$. Find the break-even input x.

7. Use your answer from Problem 6: which plan is cheaper at $x = 2$? at $x = 20$?

8. You have a budget of \$70 and model $C = 2x + 6$. What is the largest whole-number x you can afford?

9. Reflection: write two sentences that separate "math result" from "real-world decision" for one problem above.