Table of Activities

Part 1: Problem Design (4 sessions)

Students learn the meaning of linear programming and how it can be applied to solve real-world problems. They read about Problem A—Media Selection, a problem about choosing media to use in the promotion of a youth festival. Students work with partners to generate ideas for formulating their own linear programming problem.

Activity 1A: Media Selection

1A.1: ***Introduction to the Unit***	Students are introduced to the problem-solving approach of linear programming and the unit activities.
1A.2: ***Student Reading: Problem A—Media Selection***	In preparation for setting up a linear programming problem, students read about a youth media group and its efforts to promote public awareness for an upcoming event.
1A.3: ***What Is an Objective Function?***	Students gain a conceptual understanding of an *objective function*, the expression that represents the optimization goal in a linear programming problem.

Activity 1B: Functions and Linearity

1B.1: ***Revisiting Problem A—Media Selection***	Students read more about Problem A—Media Selection and use a graphic organizer to organize the information.
1B.2: ***Functions and Constant Rates of Change***	Students write expressions and linear equations to represent information in Problem A—Media Selection. They graph linear equations on the coordinate plane and interpret the graphs' meaning in the context of the problem.

Activity 1C: Introduction to the Unit Portfolio

1C.1: ***The Unit Portfolio***	Students are introduced to the required elements of their portfolios and receive a preview of assessment criteria.
1C.2: ***Partner Work***	Students work with partners to brainstorm ideas for their own linear programming problem.

Part 2: Working with Constraints (3 sessions)

Students continue to learn about the problem-solving approach of linear programming by working with another, simpler optimization problem, Problem B—Profit Maximization. Students then apply the concepts learned in Problem B to Problem A—Media Selection.

Students represent both problems mathematically, graphing constraints as inequalities and finding the values of the decision variables that satisfy all of the constraints in each problem. This work prepares students for Part 3, where they find the optimal solution for both linear programming problems.

Activity 2A: Organizing the Constraints

2A.1: Making Sense of Constraints	Students are introduced to another linear programming problem, Problem B—Profit Maximization. They identify decision variables and constraints in the problem. Students represent the constraints mathematically as linear inequalities and work with partners to graph the inequalities on the coordinate plane.
2A.2: Constraints in Problem A—Media Selection	Students return to Problem A—Media Selection. The class creates a mathematical model for the problem by choosing decision variables, identifying an objective function, and representing the problem's constraints in terms of the decision variables.
2A.3: Partner Work—Problem Formulation	Students work in pairs as they practice formulating linear programming problems.

Activity 2B: The Feasible Region

2B.1: The Complete Graph and the Feasible Region: Problem B—Profit Maximization	Students work together to find all of the possible solutions, or the feasible region, for maximizing profit in Problem B—Profit Maximization.
2B.2: The Complete Graph and the Feasible Region: Problem A—Media Selection	Students work on their own to find the feasible region, or all the possible solutions for maximizing reach in Problem A—Media Selection.
2B.3: Partner Work	Student pairs formulate objectives and identify constraints in their own linear programming problem.

Part 3: Getting to a Solution (3 sessions)

Students determine how they can choose the best solution within the feasible region of a linear programming problem.

First, students use the objective function in Problem B—Profit Maximization to find the combination of drawings and collages that maximizes profit. Students then use the objective function in Problem A—Media Selection to find the mix of media vehicles that reaches the greatest number of people.

Finally, students examine whether it makes sense to implement these optimal solutions.

Activity 3A: How Can You Obtain the Best Solution?

3A.1: Optimal Solution: Problem B—Profit Maximization	Students find the optimal solution to Problem B—Profit Maximization. Students see that the optimal solution to a linear programming problem occurs at one or more corner points of the feasible region.
3A.2: Optimal Solution: Problem A—Media Selection	Students find the optimal solution to Problem A—Media Selection. They identify the corner points of the feasible region, find the coordinates of the point that maximizes reach, and determine whether the optimal solution makes sense in the real world.

Activity 3B: Completing the Unit Portfolio

Students assemble their portfolios and write a reflection about their work in the unit.