LESSON MAKER PRO

Plan Check Systems

Build systems, then test which plans work.

HIGH SCHOOL · MA.912.AR.9.7

MA.912.AR.9.7 "Given a real-world context, represent constraints as systems of linear and non-linear equations or inequalities. Interpret solutions to problems as viable or non-viable options."

NAME _____ DATE _____

PART 1: PRACTICE

Turn each limit into an equation or inequality. Use nonnegative integers for counts. A plan is viable only when it meets every constraint, including any nonlinear rule.

WORKED EXAMPLE

A club sells x basic passes at $5 and y VIP passes at $9. It sells 28 passes and earns $196. Find each number of passes.

1. x + y = 28 and 5x + 9y = 196.
2. Multiply x + y = 28 by 5: 5x + 5y = 140.
3. Subtract to get 4y = 56, so y = 14.
4. x = 28 - 14 = 14.

Answer: 14 basic passes and 14 VIP passes

PRACTICE 5 problems

1 x regular items and y premium items total at most 18. Regular items cost $3, premium items cost $6, and spending is at most $72. Write a system.

ANSWER _____

2 Find all nonnegative whole-number solutions: x + y = 11 and xy = 24.

ANSWER _____

3 Is (6, 3) viable for x + y <= 15 and x^2 + y <= 42?

ANSWER _____

4 A shipment has x, y, and z item types. It holds at most 20 items and has weight at most 48 units. Type x weighs 2 units, y weighs 3 units, and z weighs 6 units. Write a system.

ANSWER _____

5 Find the nonnegative whole-number solution: x + y = 10 and y = 2x^2.

ANSWER _____

APPLY IT Show your work

1 A gaming club orders x hoodies and y caps. It needs exactly 10 items. Hoodies cost $11, caps cost $3, and the order must cost exactly $54. A display score x^2 + y must be at most 18. Write a system and find the viable order.

WORK SPACE

ANSWER _____

2 For a club sale, x cookie boxes, y keychains, and z sticker packs are ordered. Cookie boxes cost $3, keychains cost $2, and sticker packs cost $1. The club can order at most 10 items, spend at most $20, and keep a design score x^2 + y at most 12. Write a system, then identify the viable proposals: A = (3, 6, 1), B = (2, 6, 2), C = (3, 3, 3).

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A team must choose nonnegative whole numbers x and y. It needs x + y = 17 and 3x + 2y = 40. A processing limit requires x^2 + y <= 47. Find the plan and explain whether it is viable.

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_____

ANSWER KEY

Plan Check Systems

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	x regular items and y premium items total at most 18. Regular items cost $3, premium items cost $6, and spending is at most $72. Write a system.	**x + y <= 18; 3x + 6y <= 72; x,y are nonnegative integers.**
2	Find all nonnegative whole-number solutions: x + y = 11 and xy = 24.	**(3, 8) and (8, 3)**
3	Is (6, 3) viable for x + y <= 15 and x^2 + y <= 42?	**Viable, because 6 + 3 <= 15 and 6^2 + 3 = 39 <= 42.**
4	A shipment has x, y, and z item types. It holds at most 20 items and has weight at most 48 units. Type x weighs 2 units, y weighs 3 units, and z weighs 6 units. Write a system.	**x + y + z <= 20; 2x + 3y + 6z <= 48; x,y,z are nonnegative integers.**
5	Find the nonnegative whole-number solution: x + y = 10 and y = 2x^2.	**(x, y) = (2, 8)**

PART 2 · APPLY IT

1. **x + y = 10; 11x + 3y = 54; x^2 + y <= 18; x,y are nonnegative integers. The viable order is (3, 7), or 3 hoodies and 7 caps.** Solve the first two equations to get x = 3 and y = 7. The score is 3^2 + 7 = 16, so the order is viable.
2. **x + y + z <= 10; 3x + 2y + z <= 20; x^2 + y <= 12; x,y,z are nonnegative integers. B and C are viable.** Check total items, cost, and design score for each proposal. A fails the cost and score limits, while B and C meet all conditions.

CHALLENGE

x = 6 and y = 11. The plan is viable because 6^2 + 11 = 47, which meets the limit.

Accept equivalent systems with terms reordered. For count contexts, require nonnegative integer values and require every constraint to be checked before calling a plan viable.