LESSON MAKER PRO

Limits That Matter

Build and check systems of constraints.

HIGH SCHOOL · FA.F.25

FA.F.25 "Identify when systems of equations and inequalities have constraints. (A-CED.3)"

NAME _____ DATE _____

THE BIG IDEA

A constraint limits which values can work. Use an inequality for a maximum or minimum, then check that a choice satisfies every constraint. Counts of items must be nonnegative whole numbers.

WORKED EXAMPLE

Task A takes x minutes and task B takes y minutes per item. Use the table to decide whether making 2 of A and 3 of B fits the time limit.

TIME PER ITEM

Task A	Task B	Time limit
7 minutes	9 minutes	70 minutes

1. Write the limit: 7x + 9y <= 70.
2. Substitute: 7(2) + 9(3) = 41.
3. Compare: 41 <= 70.

Answer: Yes. The plan fits the time limit.

PRACTICE 4 problems

1 A concert hall seats at most 120 people. Let x be student tickets and y be adult tickets. Write the seating constraint and state what values x and y can take.

ANSWER _____

2 A bakery has at most 90 ounces of dough. Each muffin uses 6 ounces, and each roll uses 5 ounces. Let x be muffins and y be rolls. Write the dough constraint.

ANSWER _____

3 Does (x, y) = (6, 8) satisfy both 5x + 4y <= 55 and x + y >= 12? State why.

ANSWER _____

4 A booth must pack at least 36 prizes but has room for at most 50. Let x and y count two kinds of prizes. Write both constraints.

ANSWER _____

APPLY IT Show your work

1 You have $48 for arcade games and snacks. Games cost $6 each, snacks cost $4 each, and you want at least 8 items total. Let x be games and y be snacks. Write the constraints. Can you buy 6 games and 4 snacks?

WORK SPACE

ANSWER _____

2 A club sells $5 pins and $8 tote bags. It can carry at most 18 items and wants at least $100 in sales. Let x be pins and y be bags. Write the constraints. Would 8 pins and 8 bags work?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A festival sells $6 and $10 wristbands. It can admit at most 25 people and needs at least $200 in sales. If it must sell at least 15 of the $6 wristbands, can it meet its goal? Explain.

WORK SPACE AND ANSWER

ANSWER KEY

Limits That Matter

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A concert hall seats at most 120 people. Let x be student tickets and y be adult tickets. Write the seating constraint and state what values x and y can take.	**x + y <= 120; x and y are nonnegative integers.**
2	A bakery has at most 90 ounces of dough. Each muffin uses 6 ounces, and each roll uses 5 ounces. Let x be muffins and y be rolls. Write the dough constraint.	**6x + 5y <= 90**
3	Does (x, y) = (6, 8) satisfy both 5x + 4y <= 55 and x + y >= 12? State why.	**No. 5(6) + 4(8) = 62, which is greater than 55.**
4	A booth must pack at least 36 prizes but has room for at most 50. Let x and y count two kinds of prizes. Write both constraints.	**x + y >= 36 and x + y <= 50**

PART 2 · APPLY IT

1. **6x + 4y <= 48; x + y >= 8; x and y are nonnegative integers. No.** The choice has 10 items, but it costs $52, which exceeds the budget.
2. **x + y <= 18; 5x + 8y >= 100; x and y are nonnegative integers. Yes.** The choice has 16 items and brings in $104, so it meets both limits.

CHALLENGE

No. With 15 of the $6 wristbands, it can sell at most 10 of the $10 wristbands, for $190. Selling more $6 wristbands cannot increase that maximum.

Accept equivalent systems and clear explanations. For item counts, accept any wording that requires nonnegative integers.