

Constraint Check

Model limits and test viable options.

HIGH SCHOOL • AI-A.CED.3

AI-A.CED.3 "Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context."

NAME _____

DATE _____

MODEL EVERY LIMIT

Translate each limit into an inequality. A solution is viable only when it satisfies every inequality in the system.

WORKED EXAMPLE

A club needs at least 18 members and can have no more than 30 members. Let x be the number of members.

1. At least 18 means $x \geq 18$.
2. No more than 30 means $x \leq 30$.
3. Combine the limits: $18 \leq x \leq 30$.

Answer: $18 \leq x \leq 30$; whole-number values from 18 through 30 are viable.

PRACTICE 4 problems

- 1** A library can lend at most 14 tablets. Let x be the number of tablets lent. Write an inequality.

ANSWER _____

- 2** A phone plan charges \$9 plus \$4 per whole gigabyte. You can spend at most \$37. Let x be the number of gigabytes. Write and solve an inequality.

ANSWER _____

- 3** A fundraiser sells tickets for \$6 each and needs at least \$48. Let x be the number of tickets. Write and solve an inequality.

ANSWER _____

- 4** A team needs at least 5 practice jerseys. Jerseys cost \$4 each, and the team can spend at most \$28. Let x be the number of jerseys. Write a system and list the viable whole-number values.

ANSWER _____

APPLY IT Show your work

- 1** You have \$12 saved for a festival pass and save \$5 each week. You need at least \$47, but you do not want your savings to exceed \$72. Let x be whole weeks. Write a system and list all viable values of x .

WORK SPACE

ANSWER _____

- 2** Your esports club has 240 minutes for a tournament. Setup takes 15 minutes, each match takes 25 minutes, and the club wants at least 6 matches. Let x be the number of matches. Write a system and list viable whole-number values of x .

WORK SPACE

ANSWER _____

CHALLENGE One step up

A student has \$24 toward headphones costing \$96. They earn \$9 per hour and can work at most 7 hours. Let x be whole hours. Write a system, then explain whether buying the headphones is viable.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A library can lend at most 14 tablets. Let x be the number of tablets lent. Write an inequality.	$x \leq 14$
2	A phone plan charges \$9 plus \$4 per whole gigabyte. You can spend at most \$37. Let x be the number of gigabytes. Write and solve an inequality.	$4x + 9 \leq 37$; $x \leq 7$, so 0 through 7 whole gigabytes are viable.
3	A fundraiser sells tickets for \$6 each and needs at least \$48. Let x be the number of tickets. Write and solve an inequality.	$6x \geq 48$; $x \geq 8$.
4	A team needs at least 5 practice jerseys. Jerseys cost \$4 each, and the team can spend at most \$28. Let x be the number of jerseys. Write a system and list the viable whole-number values.	$x \geq 5$ and $4x \leq 28$; $x = 5, 6, \text{ or } 7$.

PART 2 • APPLY IT

- $12 + 5x \geq 47$ and $12 + 5x \leq 72$; $x = 7, 8, 9, 10, 11, \text{ or } 12$.** Solve each inequality: $x \geq 7$ and $x \leq 12$. The viable whole-week values are their intersection.
- $15 + 25x \leq 240$ and $x \geq 6$; $x = 6, 7, 8, \text{ or } 9$.** The time limit gives $x \leq 9$. Combine this with $x \geq 6$.

CHALLENGE

$24 + 9x \geq 96$ and $x \leq 7$. The first inequality requires $x \geq 8$, so no whole-number value satisfies both constraints. Buying the headphones is non-viable.

Accept equivalent inequality forms and systems. For counts, weeks, matches, and hours, accept only nonnegative whole-number solutions.