# Week 7: Systems Applications & Inequalities

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## Session 7 Quiz

**7.1: Systems Word Problems Mixture, Motion, Break-Even**

**7.2: Systems of Inequalities**

**7.3: Linear Modeling & Fit-by-Eye**

# Session 7 Quiz: Systems Applications & Inequalities

## Quick Reference: Key Formulas

### Mixture Problems

$$(\text{concentration}_1)(\text{volume}_1) + (\text{concentration}_2)(\text{volume}_2) = (\text{concentration}_{\text{final}})(\text{volume}_{\text{final}})$$

### Motion Problems

$$\text{distance} = \text{rate} \times \text{time} \qquad (d = rt)$$

### Break-Even Problems

Total Cost = Total Revenue

### Residuals

Residual = Actual value - Predicted value

## 7.1 Problem 1: Mixture Problem

A chemist needs to prepare 100 mL of a 16 mg/mL saline solution.

She has solution "A", which is a 10 mg/mL solution.

She has solution "B", which is a 20 mg/mL solution.

How much of each should she mix?

## 7.1 Problem 2: Motion Problem

Two cars leave the same parking lot at the same time.

They travel in opposite directions.

Car A travels at 50 mph.

Car B travels at 70 mph.

After how many hours will they be 240 miles apart?

## 7.1 Problem 3: Break-Even Problem

A sandwich shop makes sandwiches.

The costs include a fixed cost of $6000 per month,

plus a cost of $2 per sandwich to produce.

The revenue from each sandwich is $8.

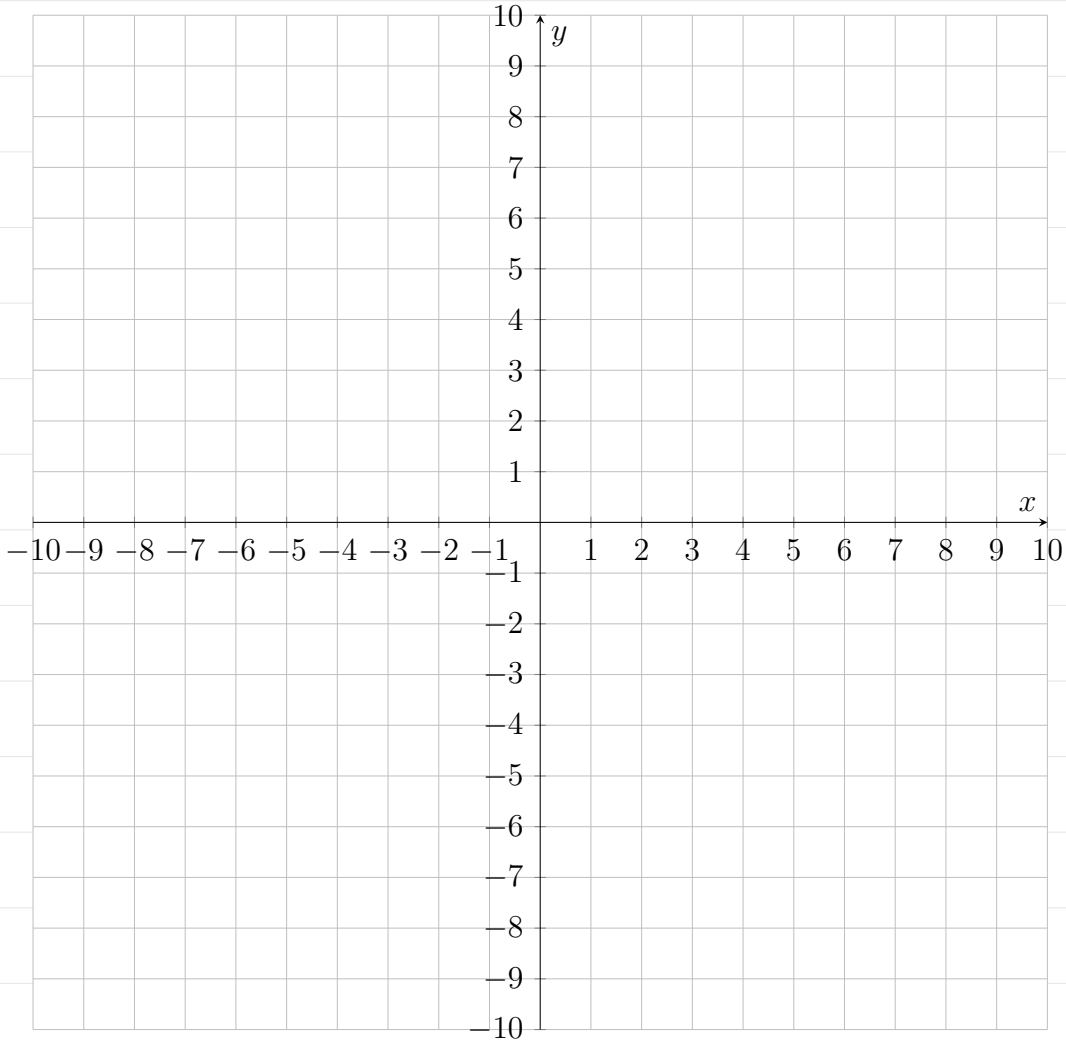
How many sandwiches must be sold to break even?

## 7.2 Problem 4: Basic System

**Graph the system of inequalities:**

$y \geq 2x - 3$

$y < -3x + 7$

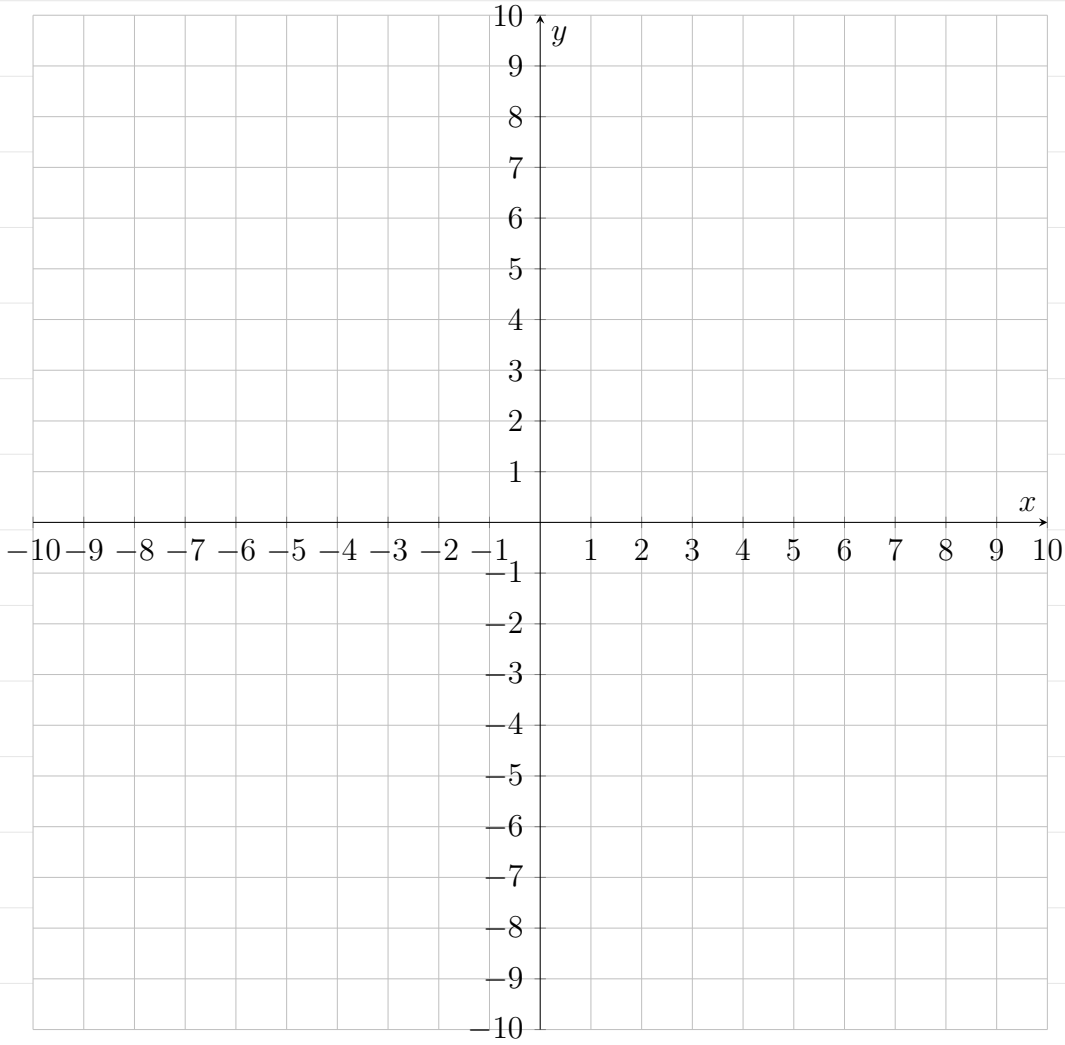


## 7.2 Problem 5: Bounded Inequalities

**Graph the system of compound inequalities:**

$2 < x < 7$

$-1 \leq y \leq 3$



## 7.2 Problem 6: Inequality Application

A bakery makes cookies and brownies.

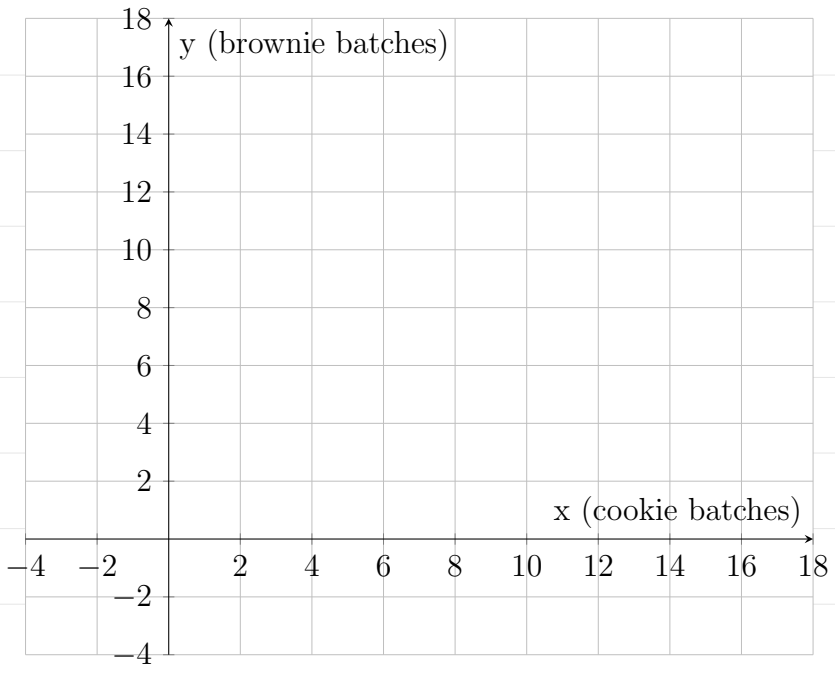
Each cookie batch requires 2 hours of labor.

Each brownie batch requires 3 hours of labor.

The bakery has at most 30 hours of labor per day.

They must make at least 2 cookie batches per day.

Write and graph a system of inequalities.



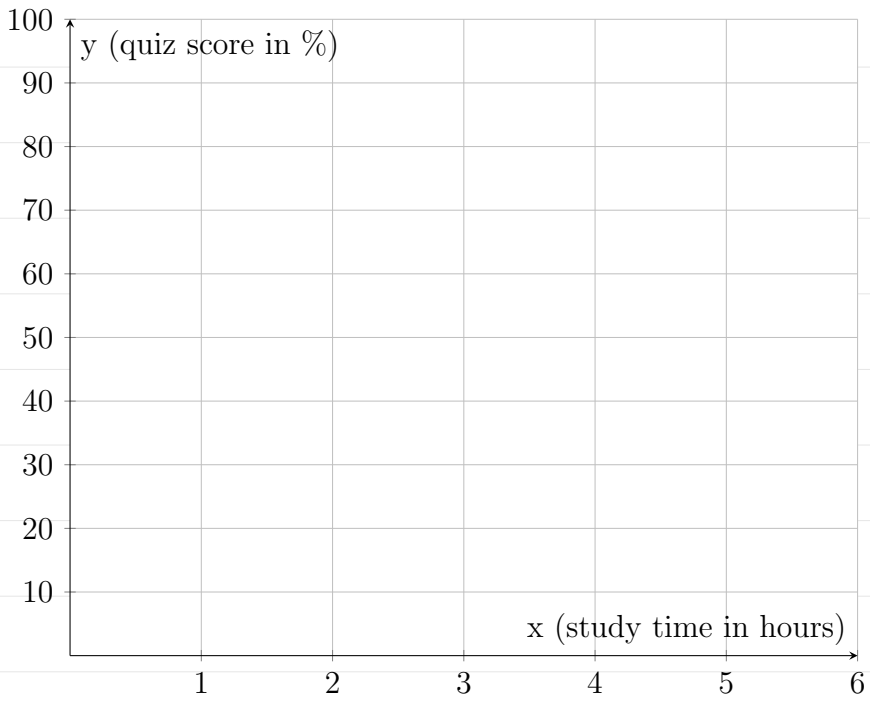
## 7.3 Problem 7: Study Time and Quiz Score

A teacher tracks student study time and quiz scores.

| Study Time (hours) | Quiz Score (%) |
|---|---|
| 1 | 60 |
| 2 | 68 |
| 3 | 76 |
| 4 | 83 |
| 5 | 90 |

**Part A**

Plot the points.



**Part B**

Find the equation of the line of best fit.

**Part C**

Calculate the residual for $x = 3$ hours of study time:

**Part D**

Use your model to predict the quiz score for someone who studies 8 hours.

Is this prediction reasonable? Why or why not?