LESSON MAKER PRO

Model the Moment

Write an equation or inequality, then solve it.

GRADE 8 · 8A.AF.E.13

8A.AF.E.13 "Create equations and inequalities in one variable and use them to solve problems in context, either exactly or approximately. Extend from contexts arising from linear functions to those involving quadratic, exponential..."

NAME _____ DATE _____

CHOOSE A MODEL

Let x stand for the unknown, then use the details of the situation to write an equation or inequality. A squared quantity can lead to a quadratic equation, repeated multiplication can lead to an exponential equation, and distance from a target can use absolute value. Check that your solution makes sense in the situation.

WORKED EXAMPLE

A square mural has an area of 49 square feet. Let x be its side length in feet. Write an equation and find x.

1. Area = side × side, so $x^2 = 49$.
2. Solve: x = 7 or x = -7.
3. A side length must be positive, so x = 7.

Answer: $x^2 = 49$; the side length is 7 feet.

PRACTICE 6 problems

1 A rectangular phone wallpaper has an area of 60 square centimeters. Its width is x centimeters, and its length is x + 4 centimeters. Write an equation and find the width.

ANSWER _____

2 A toy rocket's height in meters after x seconds is $10x - 5x^2$. It starts on the ground. Write an equation and find when it returns to the ground after launch.

ANSWER _____

3 A digital pet starts with 5 energy points. Its energy doubles each hour. After x hours, it has 40 points. Write an equation and find x.

ANSWER _____

4 A video has 3 shares. Its total shares triple each hour. After x hours, it has 81 shares. Write an equation and find x.

ANSWER _____

5 A device is exactly 5°C away from its target temperature of 20°C. Let x be its actual temperature. Write an absolute value equation and find both possible temperatures.

ANSWER _____

6 A streaming app charges $4 per movie plus a $6 sign-up fee. You can spend at most $22. Let x be the number of movies. Write an inequality and find the greatest whole number of movies you can rent.

ANSWER _____

APPLY IT Show your work

1 A gaming club sells custom shirts for $12 each. It pays a one-time $48 design fee and $4 to print each shirt. The club wants a profit of at least $80. Let x be the number of shirts sold. Write an inequality and find the fewest shirts it must sell.

WORK SPACE

ANSWER _____

2 In a game, your score starts at 6 points and doubles after each completed round. You need at least 96 points to unlock a badge. Let x be the number of rounds completed. Write an inequality and find the fewest rounds needed.

WORK SPACE

ANSWER _____

CHALLENGE One step up

You aim to finish a speedrun in 30 minutes. Your time, x minutes, must be no more than 4 minutes from your target. Write an absolute value inequality, solve for all allowed times, and explain why the endpoints are included.

WORK SPACE AND ANSWER

ANSWER KEY

Model the Moment

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A rectangular phone wallpaper has an area of 60 square centimeters. Its width is x centimeters, and its length is x + 4 centimeters. Write an equation and find the width.	**x(x + 4) = 60; x = 6 centimeters.**
2	A toy rocket's height in meters after x seconds is $10x - 5x^2$. It starts on the ground. Write an equation and find when it returns to the ground after launch.	**$10x - 5x^2 = 0$; x = 2 seconds after launch.**
3	A digital pet starts with 5 energy points. Its energy doubles each hour. After x hours, it has 40 points. Write an equation and find x.	**$5 \times 2^x = 40$; x = 3 hours.**
4	A video has 3 shares. Its total shares triple each hour. After x hours, it has 81 shares. Write an equation and find x.	**$3 \times 3^x = 81$; x = 3 hours.**
5	A device is exactly 5°C away from its target temperature of 20°C. Let x be its actual temperature. Write an absolute value equation and find both possible temperatures.	**$\lvert x - 20 \rvert = 5$; x = 15°C or x = 25°C.**
6	A streaming app charges $4 per movie plus a $6 sign-up fee. You can spend at most $22. Let x be the number of movies. Write an inequality and find the greatest whole number of movies you can rent.	**$4x + 6 \leq 22$; the greatest whole number is 4 movies.**

PART 2 · APPLY IT

1. **$12x - (48 + 4x) \geq 80$; at least 16 shirts.** Subtract the design and printing costs from the sales revenue. Solving $8x - 48 \geq 80$ gives $x \geq 16$.
2. **$6 \times 2^x \geq 96$; at least 4 rounds.** Divide by 6 to get $2^x \geq 16$. Since $2^4 = 16$, the fewest number of rounds is 4.

CHALLENGE

$\lvert x - 30 \rvert \leq 4$, so $26 \leq x \leq 34$. The endpoints are included because a time exactly 4 minutes from the target is allowed.

Accept equivalent equations or inequalities and correct answers with appropriate units. For the rocket, x = 0 is the launch time, not the return time.