LESSON MAKER PRO

Model the Costs

Build functions, test assumptions, and solve real decisions.

HIGH SCHOOL · A2S.AF.I

A2S.AF.I "Functions model a wide variety of real situations and can help students understand the processes of making and changing assumptions, assigning variables, and finding solutions to contextual problems."

NAME _____ DATE _____

FROM SITUATION TO FUNCTION

Let x represent a quantity that can change. For a fixed fee plus a charge per item, use C(x) = fixed fee + (charge per item)x. To solve a budget question, set the cost equal to the budget or use an inequality, then check that your answer makes sense in the situation.

WORKED EXAMPLE

A music app charges a $13 signup fee plus $7 per month. How many months cost exactly $55?

1. Let x be the number of months. Write C(x) = 13 + 7x.
2. Set the cost equal to $55: 13 + 7x = 55.
3. Subtract 13 and divide by 7: 7x = 42, so x = 6.

Answer: 6 months

PRACTICE 6 problems

1 A bike rental costs $4 plus $3 per hour. Let x be the number of hours. Write C(x), then find the cost for 5 hours.

ANSWER _____

2 An arcade charges $8 to enter plus $2 per game. Let x be the number of games. Write C(x), then find how many games cost $24 total.

ANSWER _____

3 Gym pass A costs $10 plus $4 per visit. Pass B costs $20 plus $2 per visit. At how many visits do the passes cost the same?

ANSWER _____

4 A print shop charges a $9 setup fee plus $5 per poster. It lowers the price per poster to $3. Let x be the number of posters. Write the new cost function C(x), then find the cost of 4 posters.

ANSWER _____

5 A rectangular display is x feet wide and 3 feet longer than it is wide. Write its area function A(x), then find its width if the area is 40 square feet.

ANSWER _____

6 A club pays $18 to make shirts and earns $3 for each shirt sold. Let x be the number sold. Write the profit function P(x), then find the fewest shirts the club must sell to make at least $12 in profit.

ANSWER _____

APPLY IT Show your work

1 A school dance sells tickets for $12 each. The DJ costs $80, and decorations cost $40. Let x be the number of tickets sold. Write a profit function and find the fewest tickets needed for at least $120 in profit. If the DJ lowers the fee by $20, write the new profit function and find the new minimum.

WORK SPACE

ANSWER _____

2 You and your friends are renting a gaming room. Plan A costs $18 plus $5 per hour. Plan B costs $45 plus $2 per hour. Let x be the number of hours. Write a cost function for each plan. When do the plans cost the same, and which costs less for 12 hours?

WORK SPACE

ANSWER _____

CHALLENGE One step up

An online shop charges $5 per custom pin plus a one-time $24 design fee. If you buy at least 4 pins, a coupon takes $8 off the design fee. Let x be a whole number of pins. Write a cost rule for each case: fewer than 4 pins and at least 4 pins. Then find the most pins you can buy with $56 and explain why your cost rule applies.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A bike rental costs $4 plus $3 per hour. Let x be the number of hours. Write C(x), then find the cost for 5 hours.	**C(x) = 4 + 3x; C(5) = $19**
2	An arcade charges $8 to enter plus $2 per game. Let x be the number of games. Write C(x), then find how many games cost $24 total.	**C(x) = 8 + 2x; 8 games**
3	Gym pass A costs $10 plus $4 per visit. Pass B costs $20 plus $2 per visit. At how many visits do the passes cost the same?	**5 visits**
4	A print shop charges a $9 setup fee plus $5 per poster. It lowers the price per poster to $3. Let x be the number of posters. Write the new cost function C(x), then find the cost of 4 posters.	**C(x) = 9 + 3x; C(4) = $21**
5	A rectangular display is x feet wide and 3 feet longer than it is wide. Write its area function A(x), then find its width if the area is 40 square feet.	**A(x) = x(x + 3); width = 5 feet**
6	A club pays $18 to make shirts and earns $3 for each shirt sold. Let x be the number sold. Write the profit function P(x), then find the fewest shirts the club must sell to make at least $12 in profit.	**P(x) = 3x - 18; 10 shirts**

PART 2 · APPLY IT

1. **P(x) = 12x - 120; 20 tickets. New function: P(x) = 12x - 100; 19 tickets.** The original costs total $120, so 12x - 120 ≥ 120 gives x ≥ 20. With a $100 total cost, 12x - 100 ≥ 120 gives x ≥ 18 1/3, so at least 19 whole tickets are needed.
2. **A(x) = 18 + 5x; B(x) = 45 + 2x. The plans cost the same at 9 hours. Plan B costs less for 12 hours.** Solve 18 + 5x = 45 + 2x to get x = 9. At 12 hours, Plan A costs $78 and Plan B costs $69.

CHALLENGE

For 0 ≤ x < 4, C(x) = 5x + 24. For x ≥ 4, C(x) = 5x + 16. You can buy 8 pins: they cost $56, and buying 8 pins qualifies for the coupon.

Accept equivalent expressions and inequalities. For ticket and shirt minimums, students must round up to a whole number, not to the nearest whole number.