LESSON MAKER PRO

Trends Into Tomorrow

Build linear functions from observations and use them to predict.

HIGH SCHOOL · MM.D3D.B

MM.D3D.B "Functions can be used to represent general trends in conditions that change over time and to predict future conditions based on present observations."

NAME _____ DATE _____

MODEL A TREND

When a quantity changes at a roughly constant rate, a linear function can model its trend. Divide the change in the quantity by the change in time to find the rate. Use one observation to write the function, then substitute a later time to make a prediction.

WORKED EXAMPLE

A stream monitoring team measures a water depth of 17 cm at hour 2 and 29 cm at hour 5. Assume the trend is linear. Write a function h(t) for the depth at hour t, then predict the depth at hour 9.

1. Rate = (29 - 17)/(5 - 2) = 4 cm per hour.
2. Write h(t) = 4t + b. Use hour 2: 17 = 4(2) + b, so b = 9.
3. Substitute hour 9: h(9) = 4(9) + 9 = 45.

Answer: h(t) = 4t + 9; the predicted depth at hour 9 is 45 cm.

PRACTICE 6 problems

1 A tank holds 80 L at hour 0 and 64 L at hour 8. Assuming a linear trend, what is its rate of change in liters per hour?

ANSWER _____

2 A club has 18 members at week 0 and gains 6 members each week. Write a function M(t) for its membership at week t.

ANSWER _____

3 The table shows the number of reusable bottles sold by a school store. Assuming a linear trend, write a function B(t) for the number sold by week t.

REUSABLE BOTTLES SOLD

Week t	Bottles sold
0	24
6	48

ANSWER _____

4 The function P(t) = 70 - 6t models an e-bike battery's percent charge after t hours. What percent charge does it predict after 7 hours?

ANSWER _____

5 A school compost bin contains 16 kg of material on day 0. It gains 7 kg each day. Assuming the trend continues, predict its mass on day 6.

ANSWER _____

6 A tree nursery has 42 seedlings at week 6 and 54 seedlings at week 8. Assuming a linear trend, predict the number of seedlings at week 11.

ANSWER _____

APPLY IT Show your work

1 Your school counts how many students bike to school each Friday. Assume the counts follow a linear trend. Write a function C(t) for the count at week t, then predict the count at week 8.

STUDENTS BIKING TO SCHOOL

Week t	Students
0	26
1	30
6	50

ANSWER _____

2 Your media club tracks the total data used while streaming a live event. Assume data use follows a linear trend. Write a function D(t) for the total gigabytes used after t hours, then predict the total after 7 hours.

STREAMING DATA USE

Hour t	Total data used (GB)
1	14
4	32
6	44

ANSWER _____

CHALLENGE One step up

Two school water refill stations track the total liters they have dispensed. On tracking day 0, station A has dispensed 38 L and station B has dispensed 62 L. A then adds 6 L per day to its total, while B adds 4 L per day. Assuming these trends continue, on what day will their modeled totals match, and what will the common total be? Explain using functions.

WORK SPACE AND ANSWER

Trends Into Tomorrow

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A tank holds 80 L at hour 0 and 64 L at hour 8. Assuming a linear trend, what is its rate of change in liters per hour?	**-2 L per hour**
2	A club has 18 members at week 0 and gains 6 members each week. Write a function M(t) for its membership at week t.	**M(t) = 18 + 6t**
3	The table shows the number of reusable bottles sold by a school store. Assuming a linear trend, write a function B(t) for the number sold by week t.	**B(t) = 24 + 4t**
4	The function P(t) = 70 - 6t models an e-bike battery's percent charge after t hours. What percent charge does it predict after 7 hours?	**28%**
5	A school compost bin contains 16 kg of material on day 0. It gains 7 kg each day. Assuming the trend continues, predict its mass on day 6.	**58 kg**
6	A tree nursery has 42 seedlings at week 6 and 54 seedlings at week 8. Assuming a linear trend, predict the number of seedlings at week 11.	**72 seedlings**

PART 2 · APPLY IT

1. **C(t) = 26 + 4t; 58 students at week 8.** The count rises by 4 students per week, and C(0) = 26. Substitute t = 8 to get C(8) = 58.
2. **D(t) = 8 + 6t; 50 GB after 7 hours.** Data use rises by (32 - 14)/(4 - 1) = 6 GB per hour. Since D(1) = 14, the starting value is 8 GB, so D(7) = 50.

CHALLENGE

A(t) = 38 + 6t and B(t) = 62 + 4t. Setting them equal gives 38 + 6t = 62 + 4t, so t = 12. On day 12, each modeled total is 110 L.

Accept equivalent function forms. Predictions assume the observed linear trends continue.