

Earth's Birthday Project

AMAZING BUGS®



Pre/Post Questions: Hornworm

Introduction

Pre/Post Questions are tools for guiding inquiry and assessing student learning. Students answer the questions before they do the activities in the Amazing Bugs kit (pre) and again after the activities are completed (post).

Students are not expected to score high points the first time they answer the questions. The Amazing Bugs activities will give them many chances to practice the skills needed to improve their answers in the second round.

Contents

Questions are presented on one-page, reproducible handouts. Each handout is followed by easy instructions, including quick prep and a rubric or answer key for grading. Use one or two questions, or all four—the more time you invest, the more students learn and the more opportunities you have for assessment.

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Scheduling, Time, Materials

Schedule the first round (pre) a few days in advance of the arrival of your live hornworms. Plan on 10–20 minutes for each question in the first round (pre), and 10–25 minutes in the second round (post). The only materials you'll need are two copies of each question, and a pencil, for each student.

Standards and Benchmarks

The teacher's instruction for each question includes New Mexico science and/or math benchmarks.

For more information: earthsbirthday.org/nm

OK to duplicate for use with students!

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Hornworm Growth

Table 1: Hornworm Growth	
Day	Length (inches)
1	$\frac{3}{4}$
2	1
3	$1\frac{1}{2}$
4	$2\frac{1}{2}$
5	$3\frac{1}{2}$

1. How long was the hornworm on Day 3?
Write your answer in the box.

2. Write two other things that the table tells you about the hornworm.

a) _____

b) _____

Question 1: Teacher Instruction

Math Benchmarks

- Number and Operations, 1 – Understand numbers, ways of representing numbers, relationships among numbers, and number systems.
- Data Analysis and Probability, 1 – Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

Teacher Prep

Make two copies of Hornworm Handout Q 1 for each student—one for Pre, one for Post.

Pre (First Round)

Instructions to students: *Write how long the hornworm was on Day 3 in the box. Then write two more things you know about the hornworm from reading the table.*

Allow about 15 minutes to complete the handout.

Post (Second Round)

Have students complete the handout again, after they have done all the Amazing Bugs activities. Allow about 10 minutes.

Grading

The maximum possible score is 4 points.

For 1, score 1 point for $1\frac{1}{2}$, 2 points for $1\frac{1}{2}$ inches.

For 2, score 1 point for each of two answers (a and b). Some possible correct answers include: It was $\frac{3}{4}$ (or $\frac{3}{4}$ inches) on the first day. It was $4\frac{1}{2}$ (or $4\frac{1}{2}$ inches) on the last day. It grew a lot! It grew almost 3 inches. It grew $2\frac{1}{2}$ inches from Day 2 to Day 5.

Hornworm Data

Jon and Sally observed a hornworm for two weeks. They measured it and counted its *fras* (the little balls of digested food that the hornworm leaves in its habitat).

Jon and Sally's List

Day 1	$\frac{3}{4}$ inches long		fras balls
Day 3	$1\frac{1}{4}$ inches long		fras balls
Day 6	2 inches long		fras balls
Day 9	$2\frac{1}{2}$ inches long	 	fras balls
Day 10	$3\frac{1}{4}$ inches long		fras balls
Day 12	$3\frac{1}{2}$ inches long	 	fras balls
Day 14	$3\frac{3}{4}$ inches long	 	fras balls

Jon and Sally started a table to display their numbers, but they did not finish it.

Complete the Table

1. Fill in the names of columns 1 and 3.
2. Convert the tally marks to numbers.
3. Fill in the numbers that belong in each column.

Data Table: Hornworm Length and Fras

1. _____	2. Length (inches)	3. _____

Question 2: Teacher Instruction

Science Benchmarks

- Scientific Thinking and Practice, Standard I, K–4 Benchmark II – Use scientific thinking and knowledge and communicate findings.
- Scientific Thinking and Practice, Standard I, K–4 Benchmark III – Use mathematical skills and vocabulary to analyze data, understand patterns and relationships, and communicate findings.

Math Benchmark

- Data Analysis and Probability, 1 – Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

Teacher Prep

Make two copies of Hornworm Handout Q 2 for each student—one for Pre, one for Post.

Pre (First Round)

Instructions to students: *Read the handout.* [You may wish to read together as a class to make sure that everyone understands the questions.] *There are three things you must do to complete the table. First, fill in the names of columns 1 and 2. Second, convert the tally marks to numbers. Third, fill in the numbers that belong in each column.*

Allow 20–25 minutes.

Post (Second Round)

Have students complete the table again, two or three weeks later, after they have done the Amazing Bugs hornworm activities. Allow about 15 minutes.

Grading

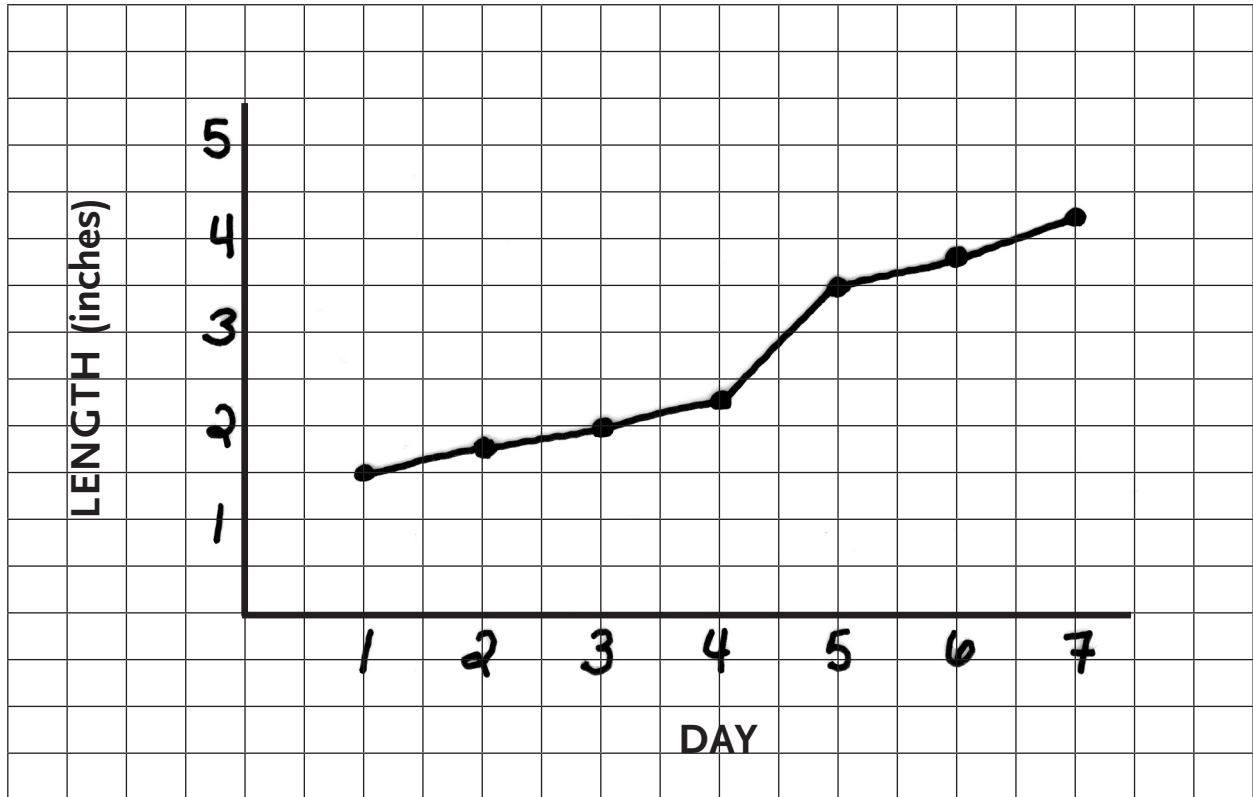
Below is a copy of the table on the handout with column names and numbers filled in. Rubric: Score **3 points** for mostly correct column names and numbers, including correct conversion of tally marks to numbers; **2 points** for roughly half of items correctly filled in, indicating that student understood but was not able to carry through to completion; **1 point** if student was able to complete most of the table or convert the tally marks, but not both; **0 points** if table and tally mark conversions are mostly incomplete or incorrect.

Data Table: Hornworm Length and Fras		
1. Day	2. Length (in)	3. Frs
1	$\frac{3}{4}$	3
3	$1\frac{1}{4}$	3
6	2	4
9	$2\frac{1}{2}$	5
10	$3\frac{1}{4}$	3
12	$3\frac{1}{2}$	6
14	$3\frac{3}{4}$	5

Hornworm Graph

Ben observed a hornworm for one week. He collected some data and made a graph. Read the graph

and answer the questions. Write your answers in the boxes next to the questions.



1. How long was the hornworm on the Day 1? _____ inches
2. How long was the hornworm on Day 5? _____ inches
3. How many inches did the hornworm grow from Day 1 to Day 5? _____ inches
4. How many inches did the hornworm grow from Day 1 to Day 7? _____ inches

Question 3: Teacher Instruction

Science Benchmark

- Scientific Thinking and Practice, Standard I, K–4 Benchmark III – Use mathematical skills and vocabulary to analyze data, understand patterns and relationships, and communicate findings.

Math Benchmarks

- Algebra, 3 – Use mathematical models to represent and understand quantitative relationships.
- Data Analysis and Probability, 2 – Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

Teacher Prep

Make two copies of Hornworm Handout Q 3 for each student—one for Pre, one for Post.

Pre (First Round)

Instructions to students: *The answers to questions 1 and 2 are displayed on the graph. You will need to do a little math to answer questions 3 and 4.*

Allow 15 minutes to answer all four questions.

Post (Second Round)

Have students complete the table again, after they have done the Amazing Bugs hornworm activities. Allow 10 minutes.

Grading

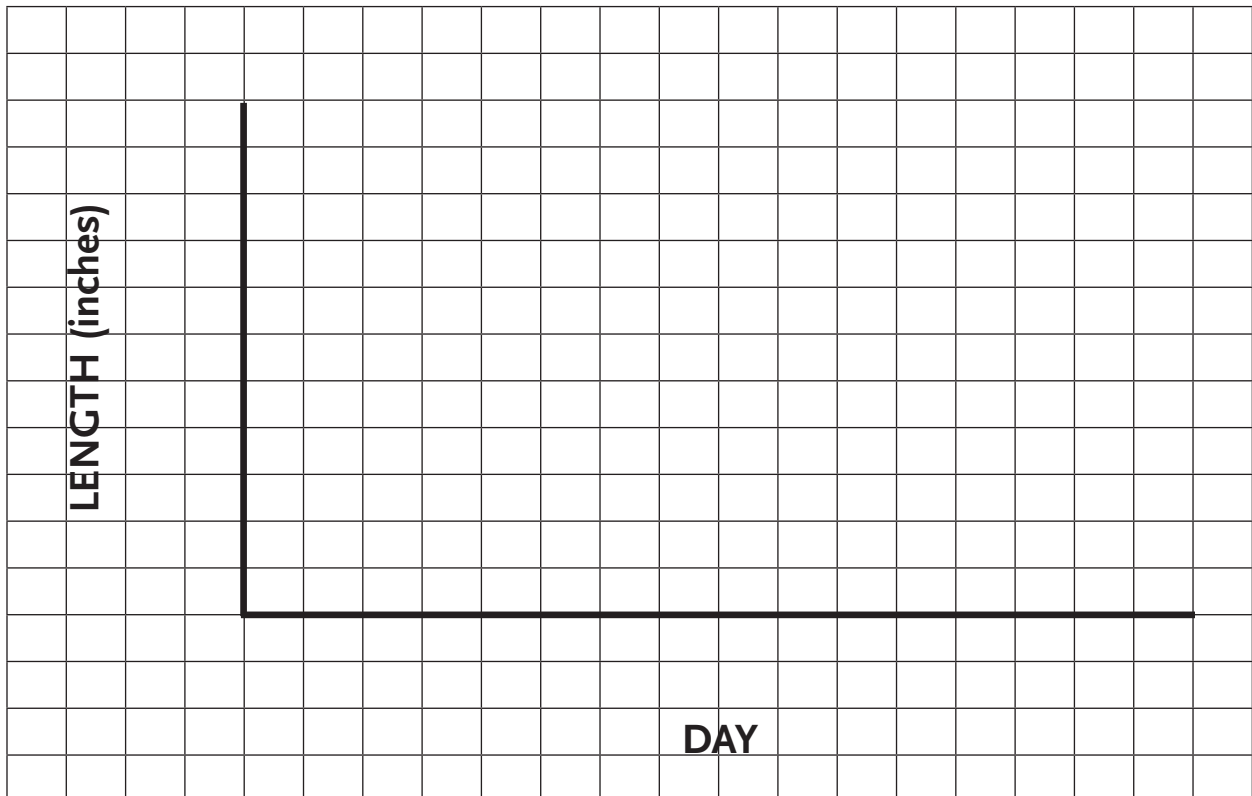
Score 1 point for each correct answer; the maximum possible score is 4 points.

Answer Key	
Question	Answer
1	1 ½ inches
2	3 ½ inches
3	2 inches
4	4 inches

Super Challenge

Day	Length (inches)
1	$\frac{3}{4}$
2	$1\frac{1}{4}$
3	$1\frac{3}{4}$
4	$2\frac{1}{2}$
5	$3\frac{3}{4}$
6	$4\frac{1}{4}$
7	$4\frac{1}{2}$
8	$4\frac{3}{4}$

Use the numbers on the table to make **Graph 2: Hornworm Growth**.



Question 4: Teacher Instruction

Science & Math Benchmarks

- Scientific Thinking and Practice, Standard I, K–4 Benchmark II – Use scientific thinking and knowledge, and communicate findings.
- Scientific Thinking and Practice, Standard I, K–4 Benchmark III – Use mathematical skills and vocabulary to analyze data, understand patterns and relationships, and communicate findings.
- Data Analysis and Probability, K–8 Benchmark – Formulate questions that can be addressed with data, and collect, organize, and display relevant data to answer them.

Teacher Prep

Make two copies of Hornworm Handout Q 4 for each student—one for Pre, one for Post.

Pre (First Round)

Suggestion: Students may find it easier to do this activity using the graph on handout Q 3 as a guide.

Instructions to students: *This is called “Super Challenge” for a reason. It’s going to take all you know about making graphs to finish it. Be sure to write the names of all of the parts of your graph, and write the title at the top. Count the squares very carefully. Don’t worry if you feel that you’re not doing a good job this time. Just do the best you can. You will have another opportunity to make this graph in a few weeks.*

Allow about 30 minutes.

Post (Second Round)

Have students make the graph again in two or three weeks, after they have done the graphing included in the Amazing Bugs hornworm activities. Allow 25 minutes.

Grading

The maximum possible score is 4 points. Based on the version of the graph below, **score 1 point for each of the following:** (1) x-axis correctly numbered, 1–8, (2) y-axis correctly numbered, 1–5, (3) points plotted mostly correctly, (4) line drawn to connect the points.

Graph 2: Hornworm Growth

