

## Answer Key and National Student Data for NAEP Here Comes the Sun Interactive Science Task

In this 20-minute task, students use a time lapse simulation to make observations about the path of the Sun as it relates to the amount of daylight. Students use this knowledge to determine the better of two locations for growing tomatoes.

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### Question 1

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#### Part A

Look at the clock and record the time of sunrise on January 1 below. Be sure to include AM or PM in your answer (EXAMPLE: 7:20 AM).

**Your answer:**

**Sample Complete Student Response:** 7:50am

#### Scoring Guide

This item was scored in 4 parts.

Part A: Sunrise in winter

Part B: Sunset in winter

Part C: Sunrise in summer

Part D: Sunset in summer

#### Complete:

Student response gives a correct time of sunrise in the range from 7:49 AM – 7:54 AM. Colon may be missing or replaced with another symbol.

#### Partial:

Student response gives a correct time of sunrise in the range from 7:49 – 7:54 without including AM or written in hours and minutes (7 hours 49 minutes). PM cannot be included.

OR

Student response gives a time of sunrise in the range from 7:44 AM – 7:48 AM or from 7:55 AM – 7:58 AM. AM may be missing, but PM cannot be included.

#### Unsatisfactory/Incorrect

Student response is inadequate or incorrect.

## Part B

Record the time of sunset on January 1 below. Be sure to include AM or PM in your answer (EXAMPLE: 7:20 AM).

**Your answer:**

**Sample Complete Student Response:** 5:05pm

### Scoring Guide

#### Complete:

Student response gives a correct time of sunset in the range from 5:02 PM – 5:07 PM. Colon may be missing or replaced with another symbol.

#### Partial:

Student response gives a correct time of sunset in the range from 5:02 PM – 5:07 PM without including PM or written in hours and minutes (5 hours 2 minutes). AM cannot be included.

OR

Student response gives a time of sunset in the range from 4:55 PM – 5:01 PM or from 5:08 PM – 5:11 PM. PM may be missing, but AM cannot be included.

#### Unsatisfactory/Incorrect:

Student response is inadequate or incorrect.

## Part C

Record the sunrise and sunset times for July 1 below. Remember to include AM or PM in your answers (EXAMPLE: 7:20 AM).

July 1 sunrise:

**Your answer:**

**Sample Complete Student Response:** 5:55pm

### Scoring Guide

#### Complete:

Student response gives a correct time of sunrise in the range from 5:54 AM – 5:59 AM. Colon may be missing or replaced with another symbol.

#### Partial:

Student response gives a correct time of sunrise in the range from 5:54 AM – 5:59 AM without including AM or written in hours and minutes (5 hours 54 minutes). PM cannot be included.

OR

Student response gives a time of sunrise in the range from 5:49 AM – 5:53 AM or from 6:00 AM – 6:03 AM. AM may be missing, but PM cannot be included.

#### Unsatisfactory/Incorrect:

Student response is inadequate or incorrect.

**Part D**

Record the sunrise and sunset times for July 1 below. Remember to include AM or PM in your answers (EXAMPLE: 7:20 AM).

**July 1 sunset:**

**Your answer:**

**Scoring Guide**

**Complete:**

Student response gives a correct time of sunset in the range from 8:57 PM – 9:03 PM. Colon may be missing or replaced with another symbol.

**Partial:**

Student response gives a correct time of sunset in the range from 8:57 PM – 9:03 PM without including PM or written in hours and minutes (8 hours 57 minutes). AM cannot be included.

OR

Student response gives a time of sunset in the range from 8:55 PM – 8:56 PM or from 9:04 PM – 9:07 PM. PM may be missing, but AM cannot be included.

**Unsatisfactory/Incorrect:**

Student response is inadequate or incorrect.

**Composite Score:** Student response received one of five possible composite scores (Complete, Satisfactory, Essential, Partial, Unsatisfactory/Incorrect) based on the student’s combined performance on Parts A, B, C, and D of the item. For example, a student response Complete for Part A, Complete for Part B, Complete for Part C, and Partial for Part D received a composite score of Satisfactory.

Composite score	Score for Parts A, B, C, D
Complete	Complete for all 4 parts
Satisfactory	Complete for 3 parts and Partial for 1 part
	Complete for 2 parts and Partial for 2 parts
	Complete for 3 parts and Unsatisfactory/Incorrect
Essential	Complete for 1 part and Partial for 3 parts
	Complete for 2 parts, Partial for 1 part, and Unsatisfactory/Incorrect for 1 part
	Partial for 4 parts
	Complete for 1 part, Partial for 2 parts, and Unsatisfactory/Incorrect for 1 part
	Complete for 2 parts and Unsatisfactory/Incorrect for 2 parts
	Partial for 3 parts and Unsatisfactory/Incorrect for 1 part
	Complete for 1 part, Partial for 1 part, and Unsatisfactory/Incorrect for 2 parts
Partial	Complete for 1 part and Unsatisfactory/Incorrect for 3 parts
	Partial for 2 parts and Unsatisfactory/Incorrect for 2 parts
	Partial for 1 part and Unsatisfactory/Incorrect for 3 parts
Unsatisfactory/Incorrect	Unsatisfactory/Incorrect for 4 parts

Percentage of fourth-grade students in each response category: 2009

Complete	Satisfactory	Essential	Partial	Unsatisfactory/Incorrect	Omitted
18	15	20	14	33	1

NOTE: Detail may not sum to totals because of rounding.

## Question 2

Another student made the observations you did and recorded the data shown below.

Date	Time of Sunrise	Time of Sunset
January 1	8:38 AM	5:22 PM
July 1	5:34 AM	8:26 PM

Based on the data in the table, which statement is true?

- A. January 1 has more hours of daylight.
- B. July 1 has more hours of daylight.
- C. Both days have the same amount of daylight.
- D. You cannot tell the amount of daylight.

Your answer:

Correct answer: B

Percentage of fourth-grade students in each response category: 2009

Choice A	Choice B	Choice C	Choice D	Omitted
19	63	9	8	1

## Question 3

On which day do you think the Sun will be lowest in the sky at 12:00 noon?

- A. January 1
- B. July 1
- C. Sometimes it is January 1 and sometimes July 1
- D. It will rise to the same height on both days

Your answer:

Correct Answer: A

Percentage of fourth-grade students in each response category: 2009

Choice A	Choice B	Choice C	Choice D	Omitted
57	20	14	4	5

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## Question 4

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Describe two differences you observe about the paths of the Sun on January 1 and July 1.

Difference 1

**Your answer:**

Difference 2

**Your answer:**

**Sample Complete Student Response:**

**Difference 1:** On July 1st it reached to 7 on the grid lines and for January 1st it only reached two on the grid lines.

**Difference 2:** For July 1st the sun goes diagonally upwards and on January 1st it makes a half circle when it is in the air.

**Scoring Guide**

**Complete:**

Student response gives two correct differences between the paths of the Sun in January and July.

Valid differences include:

- The path is higher in July than in January.
- The path is longer in July than in January.
- The shape of the path in July is a steeper bell-shape (or similar shape) compared to a half-circle (or similar shape) in January.

**Partial:**

Student response gives one correct difference between the paths of the Sun in January and July.

**Unsatisfactory/Incorrect:**

Student response is inadequate or incorrect.

**Percentage of fourth-grade students in each response category:**

**2009**

Complete	Partial	Unsatisfactory/Incorrect	Omitted
6	56	34	2

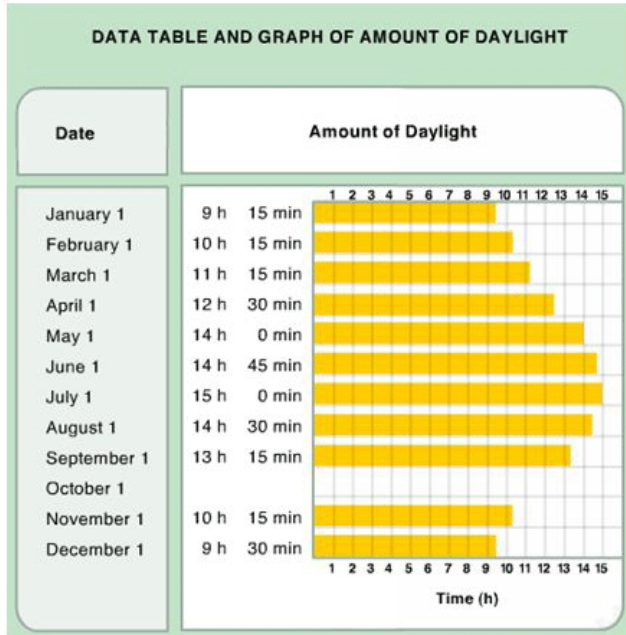
NOTE: Detail may not sum to totals because of rounding.

### Question 5

Last year a student observed the amount of daylight where she lives.

On the first day of each month, she determined the amount of daylight in hours (h) and minutes (min).

Her results, data table and graph of the amount of daylight, are shown below.



Based on the results, about how many hours of daylight do you think there were on October 1?

**Your answer:**

Explain how you used the results to get your answer.

**Your answer:**

**Sample Complete Student Response:**

Hours of daylight on October 1: 12 hours.

Explanation: Because starting from January 1 it starts getting longer but when it hits July 1 it get shorter so I guessed that it would be in the middle of September 1 and November 1.

#### Scoring Guide

##### Complete:

Student response estimates the number of hours and minutes of daylight to be in the range from 11 h 15 min – 12 h 15 min, and provides a correct explanation based on the pattern of the amount of sunlight in the data table. Explanation indicates understanding either that the amount of daylight on October 1 must be about the same amount of daylight as on March 1 (11 h 15 min, third bar) or that it is less than the amount of daylight on September 1 (13 h 15 min) and more than the amount of daylight on November 1 (10 h 15 min).

##### Essential:

Student response estimates the number of hours and minutes of daylight to be in the range from 11 h 15 min – 12 h 15 min, and provides a general explanation indicating understanding that there is a pattern in the data.

##### Partial:

Student response estimates the number of hours and minutes of daylight to be in the range from 11 h 15 min – 12 h 15 min, but provides no explanation for support.

OR

Student response estimates the number of hours and minutes of daylight to be in the range from 10 h 16 min – 11 h 14 min or from 12 h 16 min – 13 h 14 min, and provides an explanation based on the pattern of the amount of daylight in the data table.

##### Unsatisfactory/Incorrect:

Student response is inadequate or incorrect.

Percentage of fourth-grade students in each response category: 2009

Complete	Essential	Partial	Unsatisfactory/Incorrect	Omitted
5	16	16	61	2

NOTE: Detail may not sum to totals because of rounding.

**Question 6**

Two farmers grow tomato plants in two places, X and Y, shown on the maps below. You are now ready to decide which of the two places is better for growing tomato plants. The two tables below show sunrise times, sunset times, and the amount of daylight during the growing season in each place.

Tomato plants that need a lot of sunlight are grown in both places. They are planted in the same type of soil. The tomato plants are grown in greenhouses that are kept at the same temperature in both places.



**Growing Season for Place X**

Date	Time of Sunrise	Time of Sunset	Amount of Daylight
April 1	6:45 AM	7:30 PM	12 h 45 min
May 1	5:50 AM	8:00 PM	14 h 10 min
June 1	5:15 AM	8:30 PM	15 h 15 min



**Growing Season for Place Y**

Date	Time of Sunrise	Time of Sunset	Amount of Daylight
April 1	6:50 AM	7:20 PM	12 h 30 min
May 1	6:15 AM	7:45 PM	13 h 30 min
June 1	6:00 AM	8:00 PM	14 h 0 min

Based on the data in the tables, in which place would you expect the tomato plants to grow the most in the growing season?

- A. Place X
- B. Place Y
- C. The tomato plants would grow the same amount in both places.

**Your answer:**

Explain how you know. Use the data to support your explanation.

**Your answer:**

**Sample Complete Student Response:**

Selection: A

Explanation: Place x because it has the earliest sun rise and the latest sunset, it has the most sunlight.

**Scoring Guide**

**Complete:**

Student response selects (A) Place X, and provides an explanation based on the data that refers to the greater amount of daylight at Place X compared to Place Y.

OR

Student response selects (A) Place X, and provides an explanation based on the data that refers to the earlier sunrise (or later sunset) at Place X compared to Place Y.

**Essential:**

Student response selects (A), and provides an explanation based on the data that refers to the amount of daylight (or time of sunrise or sunset) at Place X (or Place Y) or a general comparison of daylight at Place X and Place Y.

**Partial:**

Student response makes an incorrect or no selection, and provides an explanation based on the data that indicates understanding that a greater amount of daylight makes plants grow more.

**Unsatisfactory/Incorrect:**

Student response is inadequate or incorrect.

Percentage of fourth-grade students in each response category: 2009

Complete	Essential	Partial	Unsatisfactory/Incorrect	Omitted
26	3	7	64	#
# Rounds to zero. NOTE: Detail may not sum to totals because of rounding.				

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2009 Science Assessment.