CALIFORNIA

Assessment of Student Performance and Progress

California Science Test

Training Items Scoring Guide

– High School –

2017–18 Administration

Measuring the Power of Learning.™

California Assessment of Student Performance and Progress

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Guide Content

This California Science Test (CAST) training items scoring guide offers details about the items, student response types, correct responses, and related scoring considerations for the included samples of training items. These items have been selected to show some of the new approaches to measuring the California Next Generation Science Standards (CA NGSS) that can be found in the assessment. The training test items are not fully representative of all possible item types included in the CAST, but additional samples will be provided over time. The samples cover a selection of items from high school.

The following information is presented along with each item:

- Grade Level: The intended grade level of the item
- Performance Expectations (PE) Code: References the assessable evidence statements of what students should know and be able to do
- Science and Engineering Practices (SEP): Descriptions of behaviors that scientists and engineers engage in as they investigate the natural world and design solutions, respectively
- Disciplinary Core Ideas (DCI): Most essential ideas in the major science disciplines that all students should understand during 13 years of school
- Crosscutting Concepts (CCC): Interdisciplinary skills that unify the study of science and engineering through common application across fields
- Depth of Knowledge (DOK): A measure of complexity that considers the students' cognitive process in response to an item (There are four DOK levels, with 4 being the highest.)
- Item-Level Claim Statement (ILCS): A brief statement that illustrates how an item aligns to the PE through at least two of the dimensions (An ILCS is included with each item to help item reviewers (1) identify the intent of the alignment, (2) determine if the alignment is appropriate and valid, and (3) identify the content reflected in item-level specifications.)
- Item and stimulus: A representation of the item and any associated stimulus
- Answer Key: The expected student response or example response including score point value
- Rubric and sample student response for each score point for short answer items: Score point representations for student responses

Each item is aligned to a specific PE but may align through an emphasis or focus on the different dimensions of the PE (the SEP, DCI, or CCC). Within each dimension and the overall alignment to the PE, the items may have differing degrees of alignment as well. The training test samples represent some possible degrees of alignment to the three dimensions of the PEs.

While each item is aligned to a specific PE through its dimensions, certain items, based on their contexts, also incorporate aspects of environmental literacy outlined in the

Environmental Principles and Concepts (EP&Cs) adopted by the State Board of Education in 2004. This set of sample items is not fully representative of the full range of ways items can incorporate environmental literacy.

The items included also represent a range of cognitive approaches to the assessment of the CA NGSS. However, this sample set is not fully representative of the full range of item difficulty.

The sample items will include a numbered instructional text preceding the first item.

Each item that follows has metadata as shown below. The item number in the table preceding each sample item corresponds to the sequence number of the item as it appears in the training test.

Example of Metadata:

Item	Grade	PE	SEP	DCI	CCC	DOK
2	High School	HS-ESS2-5	3. Planning and carrying out Investigations	ESS2.C The Roles of Water in Earth's Surface Processes	6. Structure and Function	2

ILCS: This item requires students to plan and carry out an investigation on the rate of water flow in a river and its impacts on the surrounding environment.

High School Sample Items

Item	Grade	PE	SEP	DCI	CCC	DOK
2	High School	HS-ESS2-5	3. Planning and carrying out Investigations	ESS2.C The Roles of Water in Earth's Surface Processes	6. Structure and Function	2

ILCS: This item requires students to plan and carry out an investigation on the rate of water flow in a river and its impacts on the surrounding environment.

Environmental Principle III: Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.

2

Engineers were studying water flow rates and the erosion of a nearby creek. Concern was raised because the flow rate of the creek changed enough to cause an increase in erosion around the creek. This resulted in habitat loss for several endangered species. Several agencies worked together to implement a plan to protect both the infrastructure and environment within the creek area.

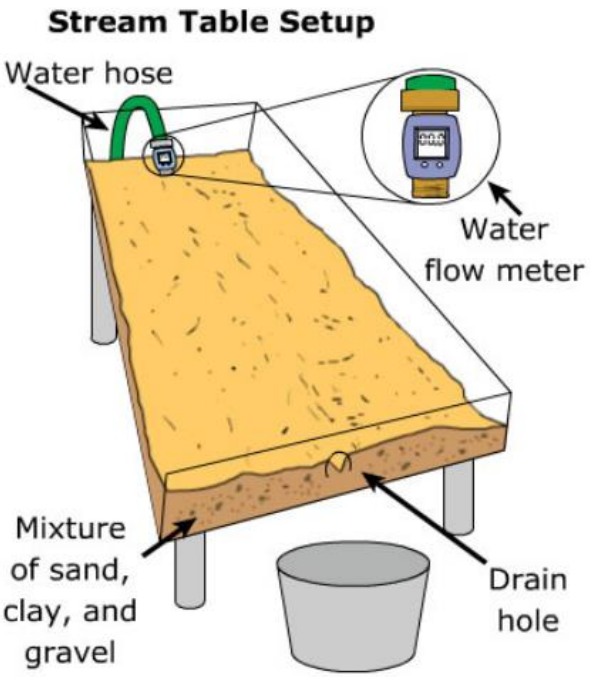
In order to understand the results of stream flow rates, students in an ecology class were assigned to investigate the effects of water velocity on stream shape and sediment transport.

(Item 2 continued on next page)

Click the menu to select the water velocity, and then click Run and watch the animation.

Water Velocity: Low

Run



Rivers can have different path shapes depending on water flow. The path shapes are often labeled as youthful, mature, and old age. Based on your selected water velocity, which label **best** describes the river path shape demonstrated by the stream table?

Ⓐ youthful

Ⓑ mature

Ⓒ old age

Based on your selected water velocity, the stream table should show a [ ] valley and [ ] sediments transported downstream.

1 point

Exemplars:

- The student selects a Water Velocity of Low, the river path shape of C, old age, and completes the sentence for Low water velocity flow by selecting broad U-shape and clay. OR
- The student selects a Water Velocity of Medium, the river path shape of B, mature, and completes the sentence for Medium water velocity flow by selecting narrow U-shape and sand and clay. OR
- The student selects a Water Velocity of High, the river path shape of A, youthful, and completes the sentence for High velocity water flow by selecting V-shape, gravel, sand and clay.

Rubric:

The student selects one of the three combinations provided in the key.

0 points

Rubric:

The student chooses any different combination than provided in the key.

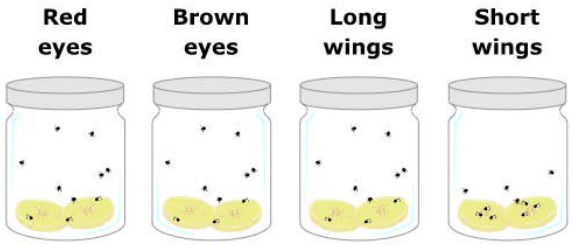
NOTE: In the stacked Spanish presentation, some stacked Spanish translation items for inline choice item types will show the entire question in Spanish, including the response options in the drop-down menus, which appear with the Spanish translation of the questions. However, other items will show the Spanish translation of the drop-down response options in italics where the drop-down list would appear in the translation; in this case, to select a response, the students will select from the English options where the English drop-down list appears.

Item	Grade	PE	SEP	DCI	CCC	DOK
3	High School	HS-LS4-3	4. Analyzing and interpreting data	LS4.B Natural Selection	1. Patterns	2

ILCS: This item requires students to analyze and interpret heritable traits between two fruit flies and explain why certain traits are not present within the population of offspring.

In this performance task, you will answer six questions.

You will be using fruit flies, *Drosophila melanogaster*, to study genetics. Fruit flies are studied because they have a short life cycle and have only 4 pairs of chromosomes. The flies will be crossed to observe the inheritance patterns of eye color and wing shape. The fruit flies are kept in jars with pieces of banana to serve as a nutrient source. The fruit flies were ordered from a supply company, and each jar contains its own phenotype. You will use the jars containing different fruit flies to answer questions. Click the play button to watch the animation.



3

Based on the results in the data table, explain why there are no flies with short wings. Type your answer in the box below.

1 point

Exemplar:

- "There are no short-winged flies because long wings are dominant." OR
- "There are no short-winged flies because short wings are recessive."

Rubric:

The student demonstrates a full understanding of the Performance Expectation, including aspects of applying concepts of statistics and probability in the expression of genetic information. The differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not.

0 points

Exemplar:

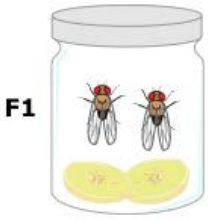
"There are no short-winged flies because short-wings is a lethal mutation and the offspring did not survive."

Rubric:

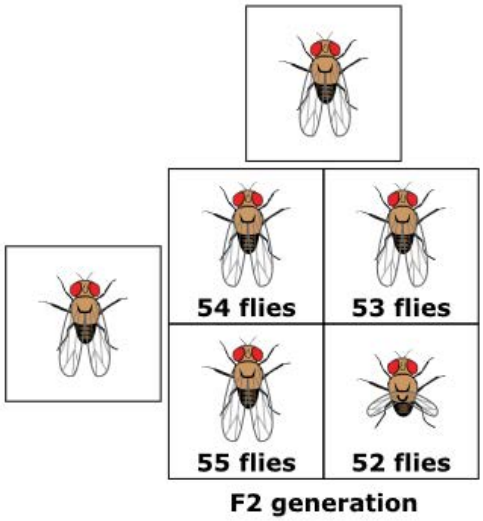
The student demonstrates little or no understanding of the Performance Expectation.

The following stimulus accompanies high school items numbered 4 and 5 in the training test.

To further the study, two flies from the offspring of the F1 generation are crossed and produce an F2 generation.

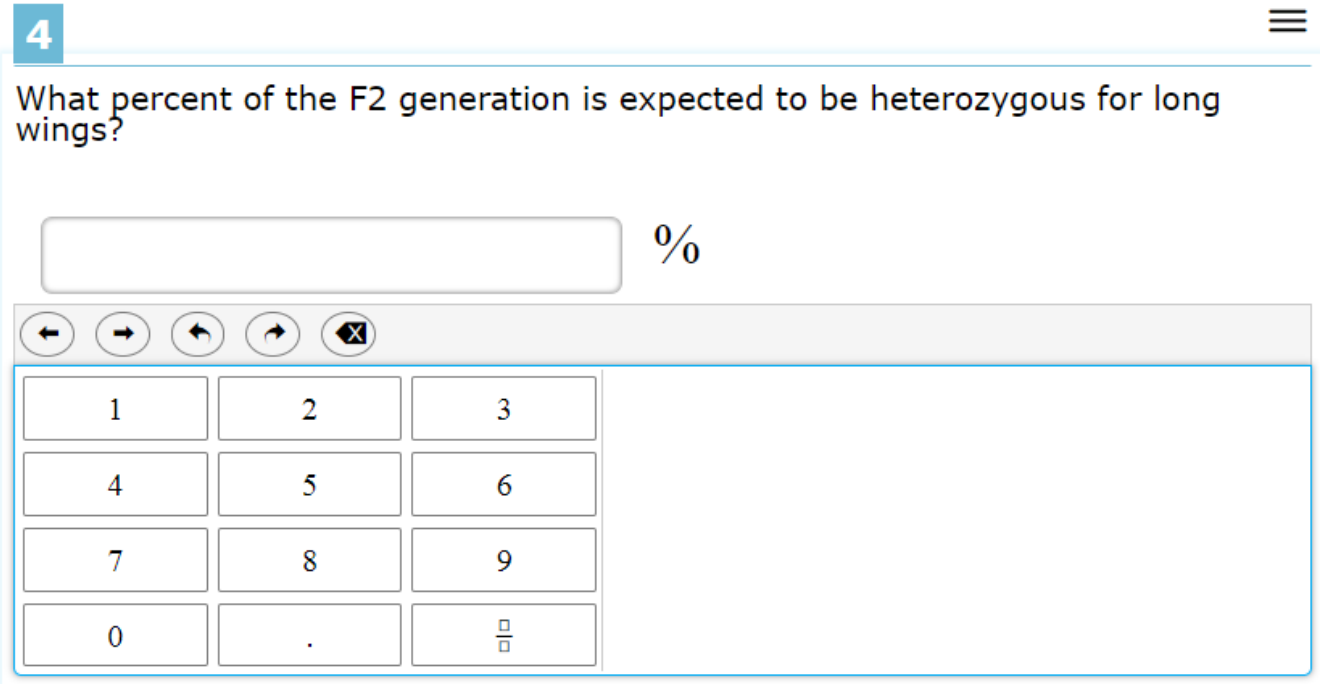


The number and phenotype of the offspring are shown below.



Item	Grade	PE	SEP	DCI	CCC	DOK
4	High School	HS-LS3-3	4. Analyzing and interpreting data	LS3.B Variation of Traits	3. Scale, proportion, and quantity	2

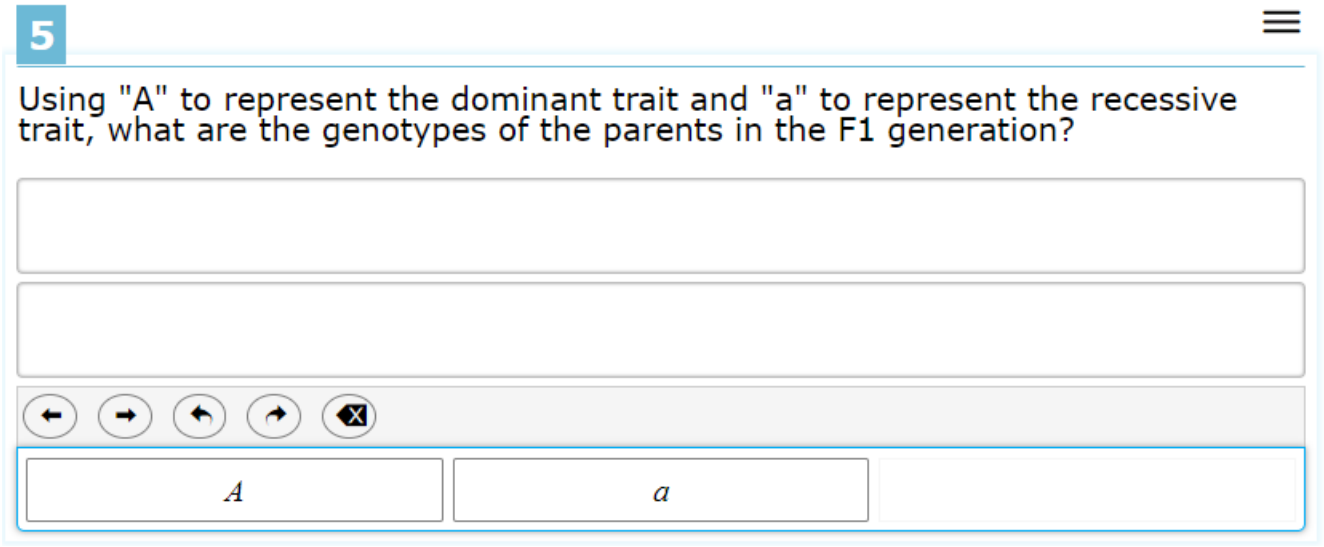
ILCS: This item requires students to analyze the data collected and interpret the percent of offspring that have a particular trait.



Key: 50 (1 point)

Item	Grade	PE	SEP	DCI	CCC	DOK
5	High School	HS-LS3-3	4. Analyzing and interpreting data	LS3.B Variation of Traits	3. Scale, proportion, and quantity	2

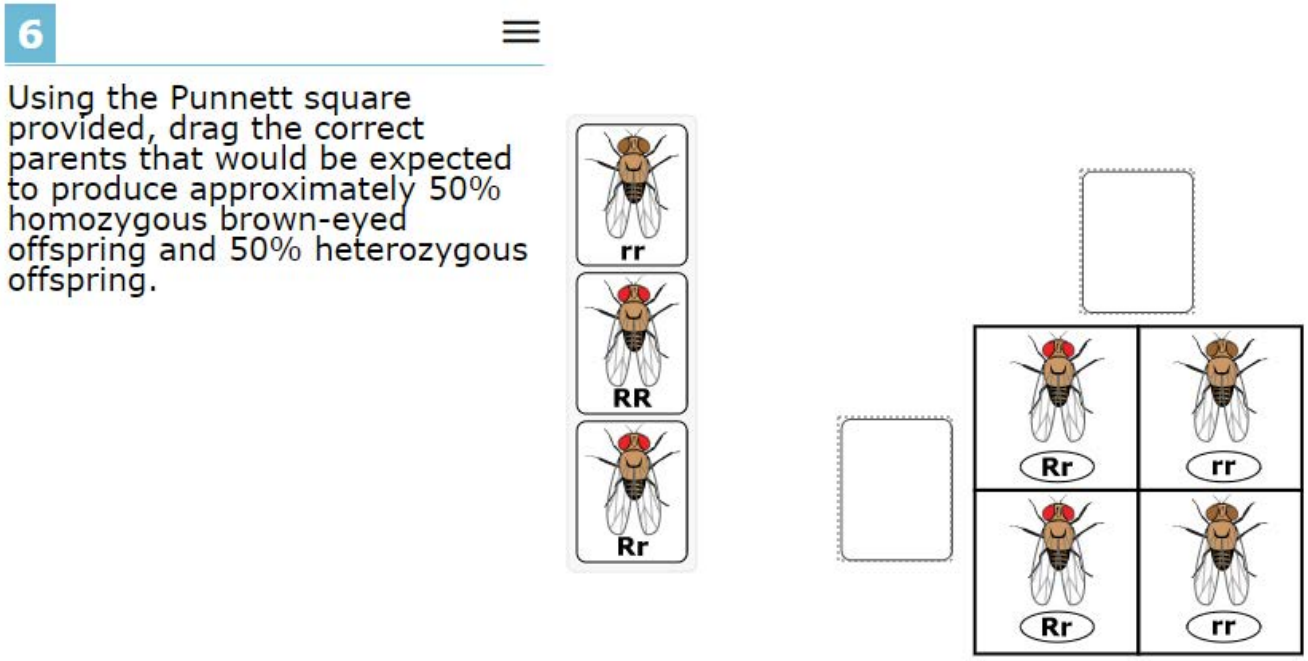
ILCS: This item requires students to interpret the results of the Punnett square in terms of recognizing the parental genotypes.



Key: Aa, Aa (1 point)

Item	Grade	PE	SEP	DCI	CCC	DOK
6	High School	HS-LS3-2	7. Engaging in argument from evidence	LS3.B Variation of Traits	2. Cause and effect: mechanism and explanation	2

ILCS: This item requires students to study the evidence provided in the Punnett square to determine the correct parental genotypes that would be expected to produce the offspring shown.

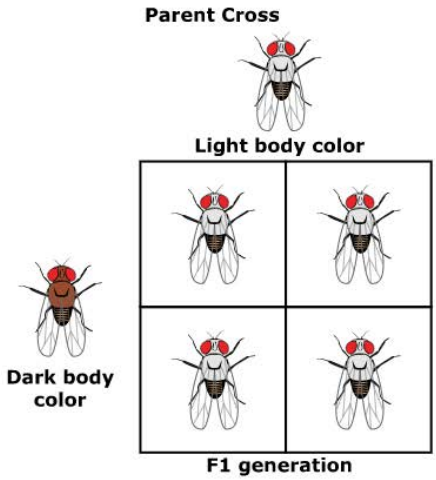


Key: Rr, rr (1 point)

Item	Grade	PE	SEP	DCI	CCC	DOK
7	High School	HS-LS4-2	6. Constructing explanations (for science) and designing solutions (for engineering)	LS4.B Natural Selection	2. Cause and effect: mechanism and explanation	3

ILCS: This item requires students to understand how particular traits are maintained in a population and to construct an explanation based on the results of the Punnett square.

To allow the students to observe an additional trait, the teacher gives them a fly with a darker body color than the other flies, which have a lighter body color. The students crossed the dark-body-colored fly with the light-body-colored fly. The cross is represented in the Punnett square below.



7

The students then crossed two flies from the F1 generation and recorded the following results:

162 light-body-colored fruit flies
52 dark-body-colored fruit flies

Explain how the dark body color of the fruit flies remained in the gene pool.

2 points

Exemplar:

“Light-bodied flies carry a recessive allele for dark body color, and the offspring homozygous for the recessive trait appear.”

Rubric:

The student demonstrates a full understanding of the Performance Expectation, including

- aspects of constructing explanations based on evidence obtained from a variety of sources; AND
- that natural selection occurs only if there is variation in the genetic information between organisms in a population.

1 point

Exemplar:

“The dark body is recessive.” OR “Homozygous offspring can appear later.”

Rubric:

The student demonstrates a partial understanding of the Performance Expectation.

0 points

Exemplar:

“The dark body color is dominant and will appear in the offspring.”

Rubric:

The student demonstrates little or no understanding of the Performance Expectation.

Item	Grade	PE	SEP	DCI	CCC	DOK
8	High School	HS-LS4-3	4. Analyzing and interpreting data	LS4.B Natural Selection	1. Patterns	2

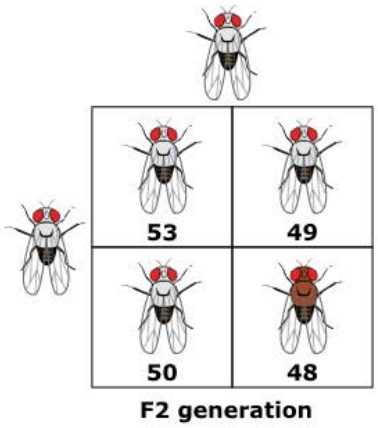
ILCS: This item requires students to interpret the data presented in the Punnett square to determine the correct percentages of genotypes.

8

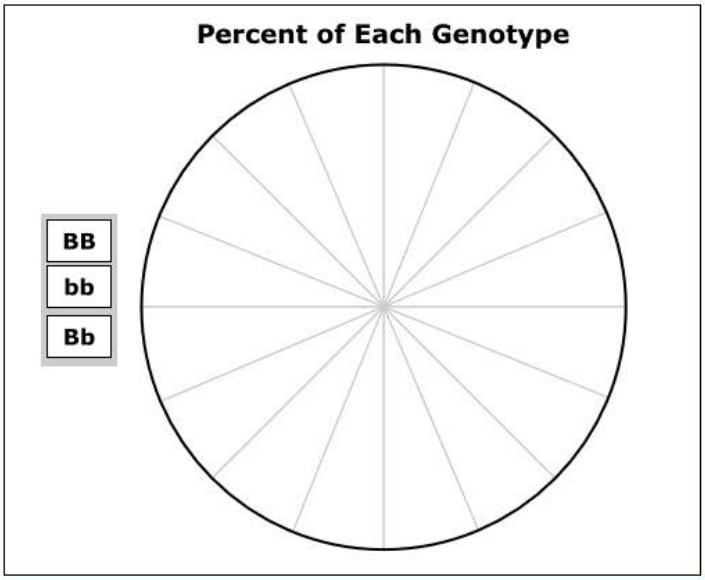
The Punnett square shows the possible results of a cross between two flies from the F1 generation.

Click on the lines in the circle to create a pie graph representing the percent of offspring of each genotype in the Punnett square.

Drag the genotype into the appropriate section of the pie chart based on the results in the Punnett square.



F2 generation

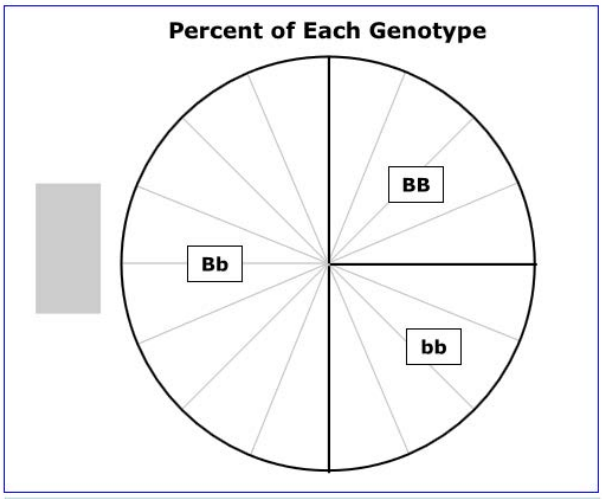


Functionality: The student chooses line segments inside the circle to create a pie chart and then places genotype labels on the sections of the pie chart.

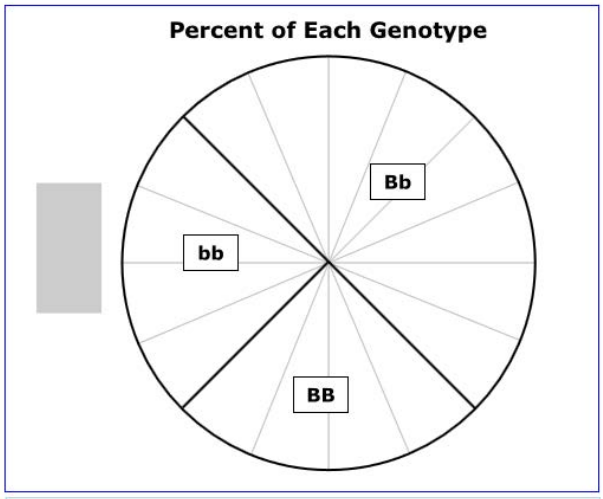
Key: The student correctly labels the pie chart:

- One-half (50%) represents Bb.
- One-fourth (25%) represents BB.
- One-fourth (25%) represents bb.

Exemplars: (1 point)



OR



OR any pie chart representing the correct percentages and labeling