Lesson Self-Check

CAN YOU EXPLAIN IT?

FIGURE 17: How likely is it that there is a genetic copy of you somewhere?

Now that you have learned about meiosis and genetic variation, think again about the possibility of finding a genetic copy of yourself. According to some estimates, the number of possible gene combinations made by meiosis is trillions of times more than the number of people who have ever lived on Earth. Independent assortment alone makes millions of possible combinations of chromosomes. Each chromosome contains anywhere from hundreds to thousands of genes. When those genes are shuffled during meiosis, an astounding number of combinations is possible. Multiply this by the probability that the gametes that formed you would merge, and it's no wonder there is so much variation in the human race.

Explain In general, how likely is it that there is someone in the world who is genetically identical to you? Refer to the notes in your Evidence Notebook to construct an explanation for this question using a claim, evidence, and reasoning. Your explanation should include a discussion of sexual reproduction, meiosis, crossing over, and independent assortment.

1. State your claim.
2. Cite evidence to support your claim. Include models and examples as necessary.
3. Explain how the evidence you cited supports your claim. For example, consider the number of possible chromosome combinations made by independent assortment. How would this evidence support the statement you are making?

CHECKPOINTS

Check Your Understanding

1. Fruit fly gametes each have four chromosomes representing 2^4, or 16, possible chromosome combinations. How many chromosome combinations could results from fertilization between a fruit fly egg and a sperm cell?

2. A student uses string to model four pairs of homologous chromosomes in a parent cell. Each chromosome pair is a different color. Which model would best show the genetic makeup of a daughter cell produced by meiosis?

a. two strings, each a combination of different colors

b. two strings, each the same color

c. four strings, each a combination of different colors

d. four strings, each the same color

3. Which of the following statements describe differences between mitosis and meiosis? Select all correct answers.

a. Mitosis produces diploid cells, and meiosis produces haploid cells.

b. Mitosis is involved in asexual reproduction, and meiosis is involved in sexual reproduction.

c. Only body cells result from mitosis, but both body cells and gametes result from meiosis.

d. Mitosis produces genetically unique cells, and meiosis produces genetically identical cells.

e. Two daughter cells are produced by mitosis, and four daughter cells are produced by meiosis.

4. Describe two pieces of evidence to support the claim that sexual reproduction increases genetic variation.

5. Identify the process shown in Figure 18. Then explain how the figure provides evidence to support the claim that meiosis increases genetic variation.

6. Make a table categorizing each of the items in the list as a description of diploid or haploid cells.

- contain single chromosomes, each from one parent
- are described as 2*n*
- make fertilization possible
- result from meiosis
- contain chromosomes in pairs, one from each parent
- are described as *n*
- result from mitosis

7. Why is it important that human gametes have half a set of DNA instead of a full set of DNA? Use scientific reasoning to support your claim.

MAKE YOUR OWN STUDY GUIDE

In your Evidence Notebook, design a study guide that supports the main ideas from this lesson:

Inheritable genetic variations result from new genetic combinations made through meiosis and sexual reproduction.

Independent assortment and crossing over are processes that contribute to genetic variation within a species.

Remember to include the following information in your study guide:

- Use examples that model main ideas.
- Record explanations for the phenomena you investigated.
- Use evidence to support your explanations. Your support can include drawings, data, graphs, laboratory conclusions, and other evidence recorded throughout the lesson.

Consider how the models and explanations in this lesson can be used to support a claim for how meiosis and sexual reproduction increase genetic variation.

FIGURE 18: This process occurs during meiosis.