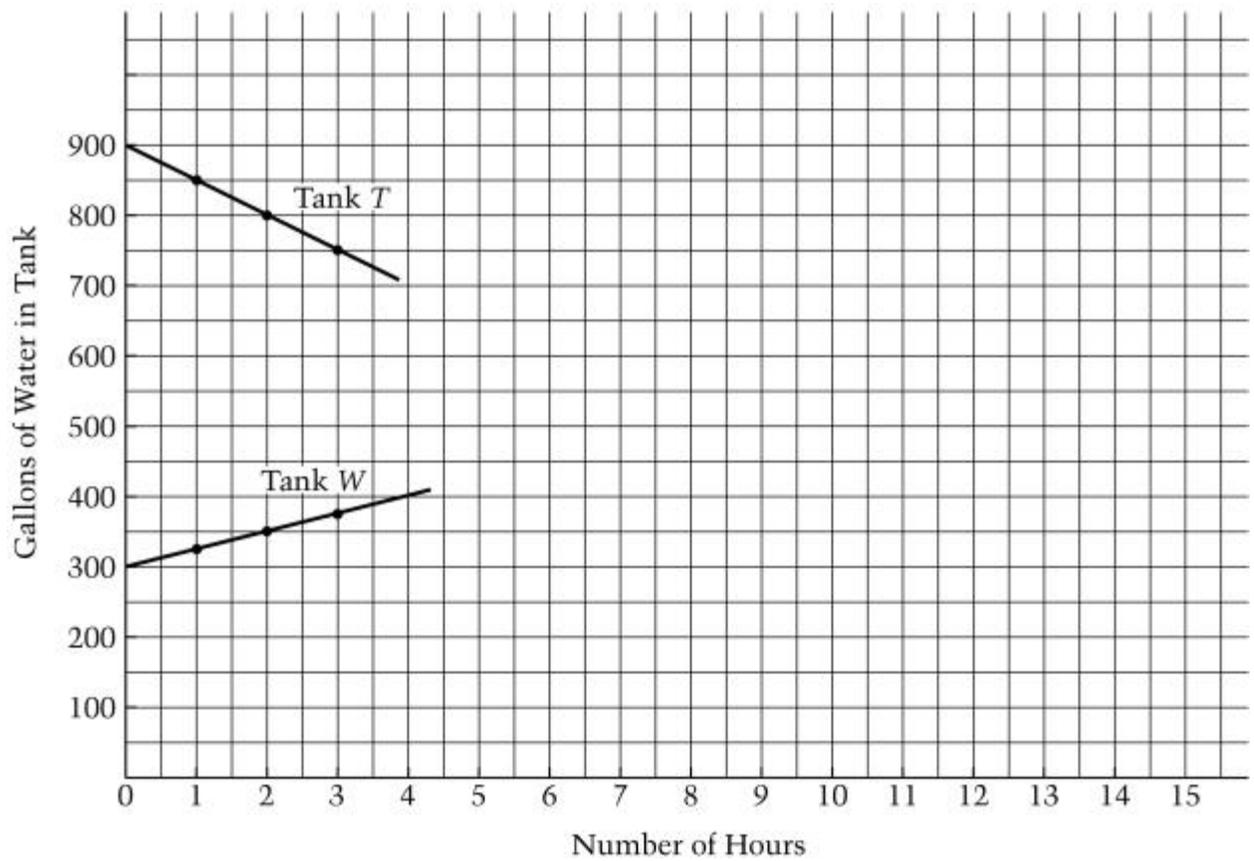


Two large storage tanks, T and W, contain water. T starts losing water at the same time additional water starts flowing into W. The graph below shows the amount of water in each tank over a period of hours.



Assume that the rates of water loss and water gain continue as shown. At what number of hours will the amount of water in T be equal to the amount of water in W ?

Show or explain how you found your answer.

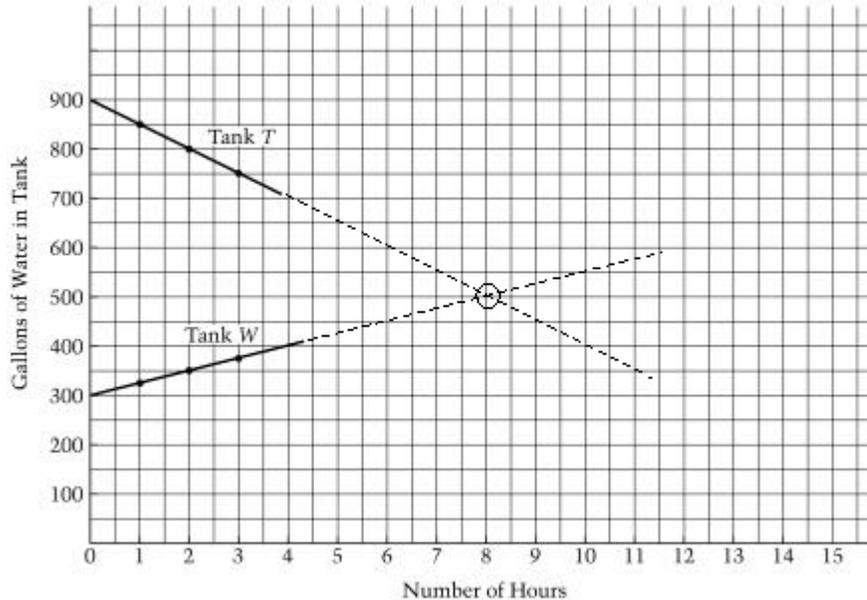
Scoring Guide

Solution:

8 hours.

Graphical Solution:

Extend both lines to the right until they intersect. Then read the horizontal coordinate of the point of intersection.



Note: If lines are extended correctly until they intersect, this will serve as sufficient justification. No words are required in this situation.

Algebraic Solution:

Equation of lines:

$$T \quad y = -50x + 900$$

$$W \quad y = 25x + 300$$

Point of intersection (8hrs, 500 gal)

Score & Description

Correct

Correct response

Partial

Number of hours is incorrect, but falls between $6 \frac{1}{2}$ and $8 \frac{1}{2}$ and a correct procedure is demonstrated.

OR

Number of hours is correct, but accompanying justification is insufficient or missing

Incorrect

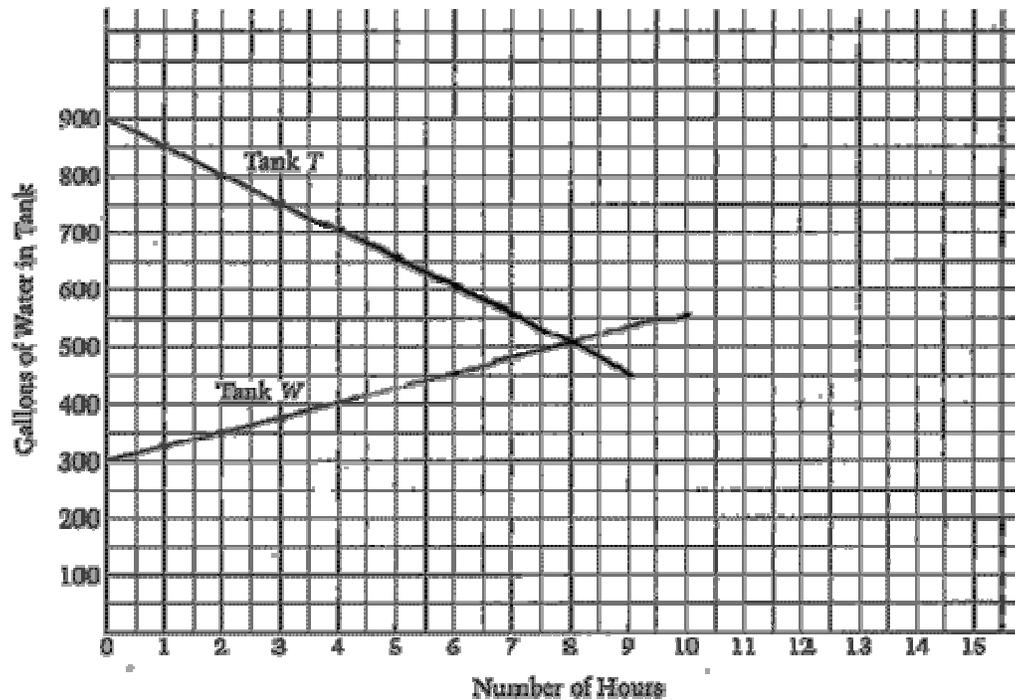
Incorrect response

This question could be solved using either a numerical, graphical, or algebraic approach. Whatever solution path was selected required the student to recognize that the water in tank T is decreasing at a rate of 50 gallons per hour and the water in tank W is increasing at a rate of 25 gallons per hour. These rates could be used to determine when there are equal amounts of water in the two tanks by using any

one of several methods, for example, by numerically comparing values for the amount of water in the tanks at different times, by extending the given graphs until they intersect, or by setting up and solving an equation.

Correct - Student Response

- 1 Two large storage tanks, T and W, contain water. T starts losing water at the same time additional water starts flowing into W. The graph below shows the amount of water in each tank over a period of hours.



Assume that the rates of water loss and water gain continue as shown. At what number of hours will the amount of water in T be equal to the amount of water in W?

In 8 hours

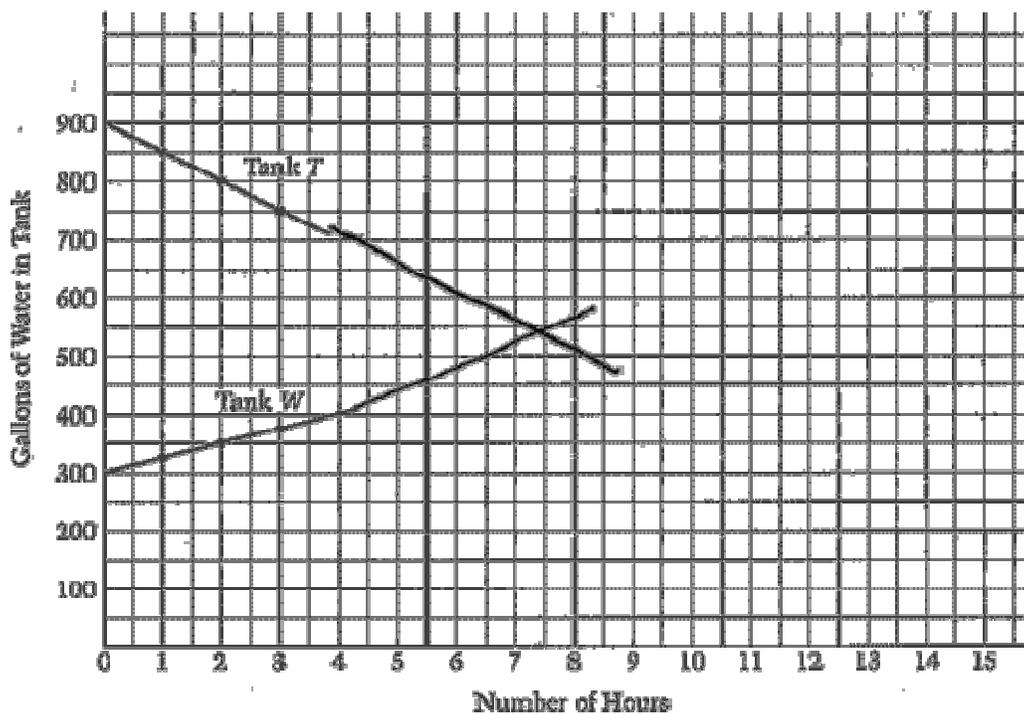
Show or explain how you found your answer.

First I found the rise over run for tank W.
Then I found the rise over run for tank T.
& Then I completed these lines and found
the intersection.

Partial - Student Response

- 1 Two large storage tanks, T and W, contain water. T starts losing water at the same time additional

water starts flowing into W. The graph below shows the amount of water in each tank over a period of hours.



Assume that the rates of water loss and water gain continue as shown. At what number of hours will the amount of water in T be equal to the amount of water in W?

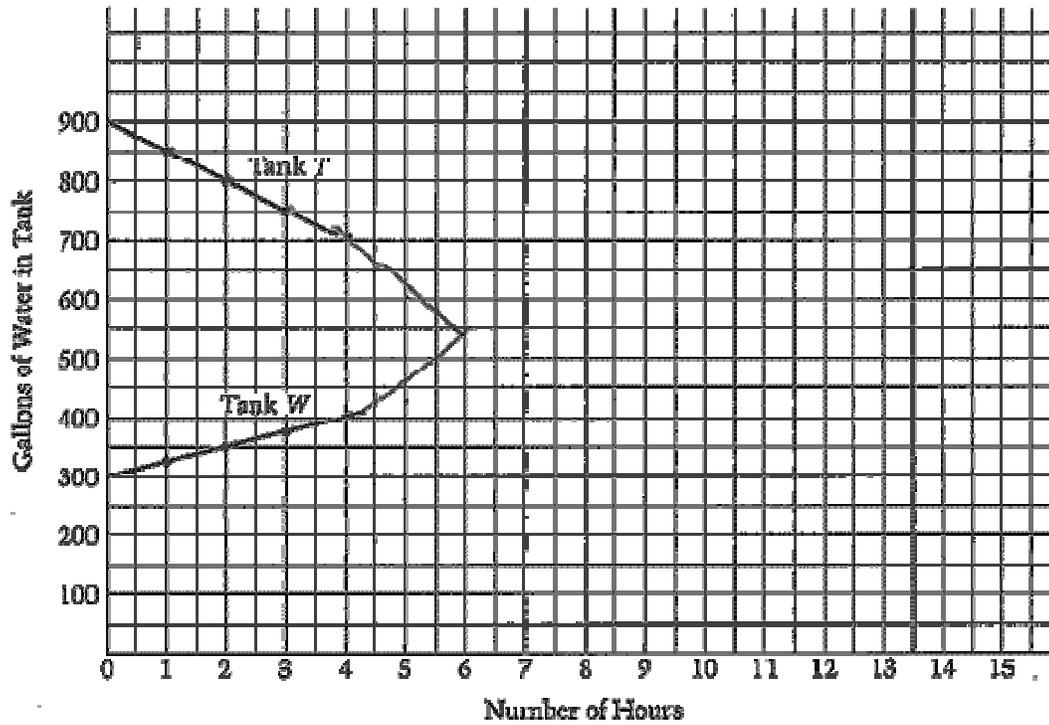
7

Show or explain how you found your answer.

Draw straight lines

Incorrect - Student Response

- 1 Two large storage tanks, T and W, contain water. T starts losing water at the same time additional water starts flowing into W. The graph below shows the amount of water in each tank over a period of hours.

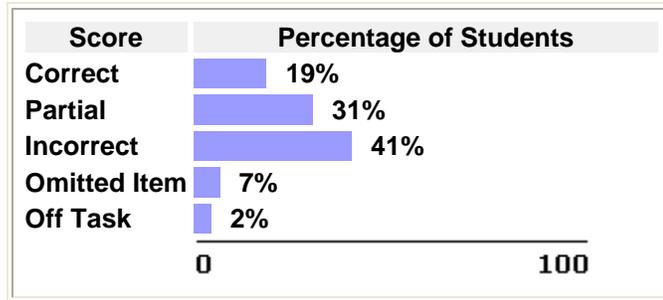


Assume that the rates of water loss and water gain continue as shown. At what number of hours will the amount of water in T be equal to the amount of water in W?

6

Show or explain how you found your answer.

2003 National Performance Results



Note:

- These results are for public and nonpublic school students.
- Percentages may not add to 100 due to rounding.

Mathematical Content Area: *Algebra and functions*
Mathematical Ability: *Conceptual understanding*

Mathematical Content Area

Algebra and functions

This question measures algebra and functions. This content area extends from work with simple patterns, to basic algebra concepts, to sophisticated analysis. Students are expected to use algebraic notation and thinking in meaningful contexts to solve mathematical and real-world problems, addressing an increasing understanding of the use of functions. Other topics assessed include using open sentences and equations as representational tools and using the notion of equivalent representations to transform and solve number sentences and equations of increasing complexity.

Mathematical Ability

Conceptual understanding

This question measures students' conceptual understanding. Students demonstrate conceptual understanding in mathematics when they provide evidence that they can recognize, label, and generate examples of concepts; use and interrelate models, diagrams, manipulatives, and varied representations of concepts; identify and apply principles; know and apply facts and definitions; compare, contrast, and integrate related concepts and principles; recognize, interpret, and apply the signs, symbols, and terms used to represent concepts. Conceptual understanding reflects a student's ability to reason in settings involving the careful application of concept definitions, relations, or representations of either.

	Description	Grade	Type	Difficulty
1	Solve problem involving two linear relationships	8th	Short Constructed Response	Hard