

# Delivering the Mail, Assessment Variation

Sample task from [achievethecore.org](http://achievethecore.org)

By Illustrative Mathematics and Student Achievement Partners

GRADE LEVEL Eighth

IN THE STANDARDS 8.F.B.4

## WHAT WE LIKE ABOUT THIS TASK

Mathematically:

- Requires students to have facility with all the major components of a linear function: initial value, rate of change, and how they relate to the description of a relationship (8.F.B.4)
- Builds on work with variables and equations from seventh grade (see 7.EE.B.4)
- Engages students in specifying units of measure, requiring attention to precision (MP.6)

In the classroom:

- Offers opportunity for students to share their developing thinking and understanding of interpreting functions and parts of functions
- Offers students and teachers an opportunity to see an assessment-type task with the possibility of 3 different technology-enhanced response types
- Allows opportunities for extending the task to deepen student understanding (see Additional Thoughts below)

## MAKING THE SHIFTS<sup>1</sup>



Focus

Belongs to the major work<sup>2</sup> of eighth grade



Coherence

Builds on grade 7 work with expressions and equations; prepares students for more advanced modeling in high school



Rigor<sup>3</sup>

Conceptual Understanding: primary in this task

Procedural Skill and Fluency: not targeted in this task

Application: primary in this task

<sup>1</sup>For more information read [Shifts for Mathematics](#).

<sup>2</sup>For more information, see [Focus in Grade Eight](#).

<sup>3</sup>Tasks will often target only one aspect of rigor.

## ADDITIONAL THOUGHTS

As noted in the Commentary above, this task is the first in a set of two tasks. It's interesting to view the two tasks side-by-side, as this task addresses a relationship that is linear while [US Airports](#) addresses statistical data that can be approximated to a linear relationship through the use of a model.

There are many ways this task could be extended to deepen students' understanding of functions. Teachers may want to ask students to relate this function to the equation  $y = mx + b$  and discuss how the slope and  $y$ -intercept are interpreted in the context of this task (8.F.A.3). Students could also graph the function and describe various points that lie on the graph, again in the context of the task (8.F.B). Teachers could also give students an additional function (represented in a different way) and have the students compare the properties of that function to the function represented in this task (8.F.A.2).

For more insight on the expectations for functions in grade 8, read pages 5 and 6 of the progression document, *Grade 8, High School, Functions*, available at [www.achievethecore.org/progressions](http://www.achievethecore.org/progressions).

For more insight on the distinctions between equations and functions, read pages 2 and 3 of the progression document, *High School, Algebra*, available at [www.achievethecore.org/progressions](http://www.achievethecore.org/progressions).

For further analysis on this task from an assessment perspective, read the [Cognitive Complexity](#) section on the Illustrative Mathematics site.

## Illustrative Mathematics

### 8.F Delivering the Mail, Assessment Variation

#### Alignment 1: 8.F.B.4

Tags: summative assessment, SAP

Joshua's mail truck travels 14 miles every day he works, and is not used at all on days he does not work. At the end of his 100th day of work the mail truck shows a mileage of 76,762.

- a. Fill in the blanks to express the mileage  $y$  as a linear function of the number of days  $x$  that Joshua has worked:

$$y = [\text{blank 1}]x + [\text{blank 2}].$$

- b. What are the units of the number [the number the student typed into in blank 1] that appears in your equation?

- c. What are the units of the number [the number the student typed into in blank 2] that appears in your equation?

- d. Which of the following is a correct interpretation of the number [the number the student typed into in blank 1] that appears in your equation? (Select all that apply.)

- i. The mileage at the end of Joshua's first day of work.
- ii. The number of miles Joshua drives the truck each day he works.
- iii. The mileage at the beginning of Joshua's first day of work.
- iv. The number of days Joshua works for each mile he drives.
- v. The number of miles Joshua drives at work over 100 days.

- e. In this context, which of the following is a correct interpretation of the number [the number the student typed into in blank 2] that appears in your equation? (Select all that apply.)

- i. The mileage at the end of Joshua's first day of work.
- ii. The number of miles Joshua drives the truck each day he works.
- iii. The mileage at the beginning of Joshua's first day of work.
- iv. The number of days Joshua works for each mile he drives.
- v. The number of miles Joshua drives at work over 100 days.

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## Commentary

This task is part of a joint project between [Student Achievement Partners](#) and Illustrative Mathematics to develop prototype machine-scorable assessment items that test a range of mathematical knowledge and skills described in the CCSSM and begin to signal the focus and coherence of the standards.

## Purpose

This is one of two assessment tasks illustrating the similarities and differences between the 8th grade standards in Functions and in Statistics and Probability. The first, [8.F Mail Truck](#), involves a situation that can be modeled exactly with a linear function. The second, [8.SP US Airports](#), uses a linear function to model a relationship between two quantities that show statistical variation and do not have an exact linear relationship.

In [8.SP US Airports](#), each additional person in the state does not directly correspond to a portion of an airport, but the relationship can be modeled using a linear association, and the model can be used to make predictions about the number of airports in states with a given population. In [8.F Mail Truck](#), each additional day of driving does correspond to exactly the same increase in the number of miles put onto the truck each day.

## Cognitive Complexity

### Mathematical Content

This task involves constructing a linear function and interpreting its parameters in a context. Thus, this task has a medium level of complexity.

### Mathematical Practice

The task asks students to reason abstractly and quantitatively (MP 2) and directly assesses component skills related to mathematical modeling (MP 4), namely, interpreting mathematical objects in contexts.

### Linguistic Demand

This context in this task requires students to interpret the mathematics in this context, so has a high level of linguistic complexity.

### Stimulus Material

The stimulus material is not complex.

### Response Mode

The interface is not complex.

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Solution: 1

a.  $y = 14x + 75,362$

b. miles/day

c. miles

d. (ii)

e. (iii)

This is a 2-point item: 1 point for parts (a)-(c) and 1 point for parts (d) and (e).



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