

SECURE MATERIAL - Reader Name: _____
Tennessee Comprehensive Assessment Program

TCAP/CRA

2014



7

Phase III

Digging a Ditch Task

Anchor Set

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**Grade 7 — 2013–14, Phase III
Constructed Response Assessment**

Digging Ditches Task

A company is using a piece of equipment to dig a ditch. The piece of equipment digs a length of 3 feet every $\frac{1}{3}$ hour.

- a. Find the unit rate for the digging equipment in feet per hour. Show your work.



A large rectangular box for writing the answer to question a. In the top-left corner, there is a small icon of a hand holding a pencil.

- b. Write an equation that describes the relationship between time and the length of the ditch.



A large rectangular box for writing the answer to question b. In the top-left corner, there is a small icon of a hand holding a pencil.



**Grade 7 — 2013–14, Phase III
Constructed Response Assessment**

Digging Ditches Task

- c. Explain the meaning of each variable and constant in your equation.



A large rectangular box for writing the response to question c.

To speed up the project, the construction crew adds a second piece of equipment. The table below represents the length of the ditch with respect to the time since the second piece of equipment was added.

Time since second piece of equipment was added (hours)	Length of ditch (feet)
0.5	27
2	54
3	72

- d. Delon says that the relationship in the table is proportional because the rate of two pieces of equipment digging is double the rate of a single piece of equipment digging. Show Delon that the relationship in the table is not proportional.



A large rectangular box for writing the response to question d.



Scoring Guide

The CCSS for Mathematical Content (3 points)

7-RP.A.1 Determines the unit rate for the piece of equipment in feet per hour in ways such as the following: _____

- calculating the complex fraction $\frac{\frac{3}{1}}{\frac{1}{3}}$, equivalent to 9 feet per hour; or
- indicating that $\frac{1}{3}$ hour is 20 minutes and scaling up the ratio 3:20 = 9:60 or 9 feet per hour.

(May have minor calculation errors.)

(1 Point)

7-RP.A.2c Writes an equation of the form $y = kh$ where k is the value determined as the unit rate in part a. _____

(1 Point)

7-RP.A.2a Shows that the relationship in the table is not proportional in ways such as the following: _____

- extending the table to determine the length of the ditch at 0 hours and finding that it is not 0 feet;
- showing that the ratio $x:y$ (or $y:x$) is not constant;
- plotting the points on the coordinate plane and noting that the line does not cross through the origin; or
- writing the equation $y = 18x + 18$ (or an equivalent equation) to represent the data in the table and indicating that the equation is not of the form $y = kx$.

(1 Point)

The CCSS for Mathematical Practice (2 points)

MP2 In the equation $y = 9t$, identifies y as the length of the ditch (in feet), t as the time (in hours since the equipment began digging), and 9 as the rate at which the piece of equipment is digging or as the unit rate or rate per hour of the piece of equipment. May write an incorrect equation, but correctly identifies the variables and constants in the equation within the context of the problem. May use variables other than y and t . _____

(1 Point)

(MP2: Reason abstractly and quantitatively.)

MP6 Algebraic expressions and all calculations are correct; mathematical language and notation is precise. _____

(1 Point)

(MP6: Attend to precision.)

TOTAL POINTS 5

The CCSS for Mathematical Content Addressed In This Task

Analyze proportional relationships and use them to solve real-world and mathematical problems.

7.RP.A.1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. <i>For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction $1/2 / 1/4$ miles per hour, equivalently 2 miles per hour.</i>
7.RP.A.2a	Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
7.RP.A.2c	Represent proportional relationships by equations. <i>For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$.</i>

The CCSS for Mathematical Practice*

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.


* Gray type indicates Mathematical Practices not addressed in this assessment.

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment


Digging a Ditch Task

A company is using a piece of equipment to dig a ditch. The piece of equipment digs a length of 3 feet every $\frac{1}{3}$ hour.

- a. Find the unit rate for the digging equipment in feet per hour. Show your work.


$$\frac{3 \text{ feet}}{20 \text{ min.}} \cdot \frac{60 \text{ min.}}{1 \text{ hour}} = \frac{180 \text{ feet}}{20 \text{ hours}} = \frac{9 \text{ feet}}{1 \text{ hour}}$$

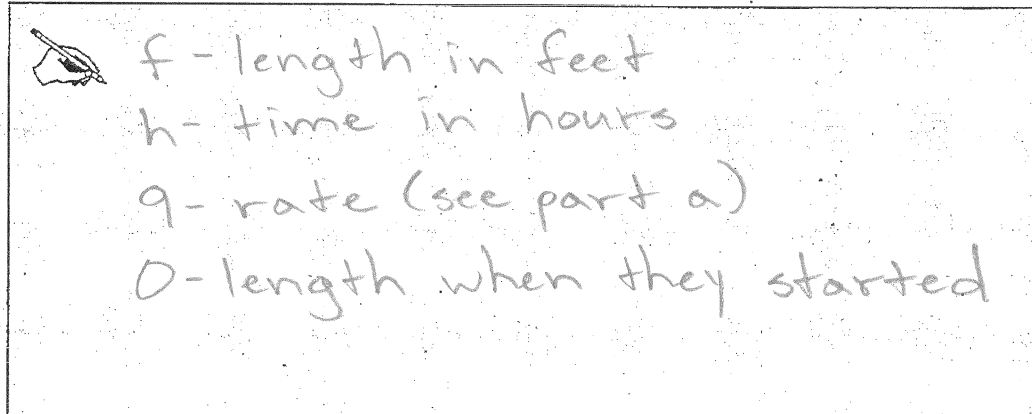
- b. Write an equation that describes the relationship between time and the length of the ditch.


$$f = 9h + 0$$

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

- c. Explain the meaning of each variable and constant in your equation.



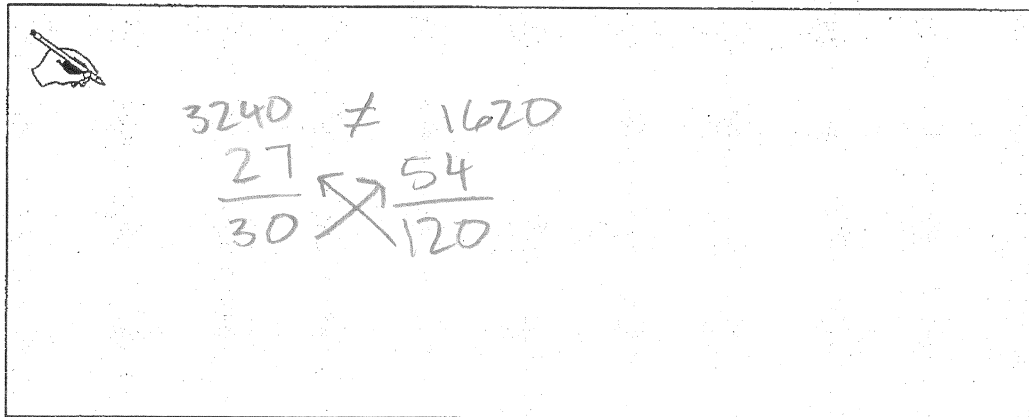
Handwritten response for part c:

- f - length in feet
- h - time in hours
- q - rate (see part a)
- O - length when they started

To speed up the project, the construction crew adds a second piece of equipment. The table below represents the length of the ditch with respect to the time since the second piece of equipment was added.

Time since second piece of equipment was added (hours)	Length of ditch (feet)
0.5	27
2	54
3	72

- d. Delon says that the relationship in the table is proportional because the rate of two pieces of equipment digging is double the rate of a single piece of equipment digging. Show Delon that the relationship in the table is not proportional.



Handwritten response for part d:

$3240 \neq 1620$
 $\frac{27}{30} \neq \frac{54}{120}$

Anchor 1

Litho 00827200163

Total Content Points: 3 (7.RP.A.1, 7.RP.A.2c, 7.RP.A.2a)

Total Practice Points: 2 (MP2, MP6)

In Part A, the student determines the unit rate $\left(\frac{9 \text{ feet}}{1 \text{ hour}}\right)$ by multiplying

$\frac{3 \text{ feet}}{20 \text{ minutes}} \times \frac{60 \text{ minutes}}{1 \text{ hour}}$ and simplifying (7.RP.A.1). In Part B, the student writes an equation of the form $y = kh + b$, where k is the value determined as the unit rate in Part A and b is zero ($f = 9h + 0$) (7.RP.A.2c). In Part D, the student shows that the relationship in the table is not proportional by using cross multiplication to show that the ratio $x:y$ is not constant (7.RP.A.2a). In Part C, the student correctly identifies all of the variables and constants in the equation given in Part B, including the correct units for length and time. The correct unit for rate is given in Part A, while 0 would be the correct starting point, no matter what units of length the student uses (MP2). Algebraic expressions and all calculations are correct; mathematical language and notation are precise (MP6).

Total Awarded Points: 5 out of 5

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

A company is using a piece of equipment to dig a ditch. The piece of equipment digs a length of 3 feet every $\frac{1}{3}$ hour.

- a. Find the unit rate for the digging equipment in feet per hour. Show your work.

~~$\frac{1}{3} \times 3 = 1 \text{ hour}$~~
 ~~$3 \times 3 = 6 \text{ feet}$~~
 ~~6 ft per hour~~

$\frac{3 \text{ feet}}{\frac{1}{3} \text{ hour}} \times \frac{x \text{ feet}}{1 \text{ hour}}$
 $\frac{1}{3}x = 3$
 $x = 9 \text{ feet per hour}$

- b. Write an equation that describes the relationship between time and the length of the ditch.

~~$f = 9h$~~

if $f =$ total (feet) length of the ditch and $h =$ hours.
 9 feet per hour.

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

- c. Explain the meaning of each variable and constant in your equation.

$f = gh$ → number of hours digging.

total length in feet of ditch

feet per hour

To speed up the project, the construction crew adds a second piece of equipment. The table below represents the length of the ditch with respect to the time since the second piece of equipment was added.

Time since second piece of equipment was added (hours)	Length of ditch (feet)
0.5	27
2	54
3	72

- d. Delon says that the relationship in the table is proportional because the rate of two pieces of equipment digging is double the rate of a single piece of equipment digging. Show Delon that the relationship in the table is not proportional.

$\frac{0.5}{27} \times \frac{2}{57} = \frac{54}{28.5}$

$\frac{2}{54} \times \frac{3}{75} = \frac{162}{150}$

↑ not equal

The table is not equal so it is not proportional.

Anchor 2

Litho 00417200163

Total Content Points: 3 (7.RP.A.1, 7.RP.A.2c, 7.RP.A.2a)

Total Practice Points: 1 (MP2)

In Part A, the student determines the unit rate (“9 feet per hour”) by setting up an equation and solving for x (7.RP.A.1). In Part B, the student writes an equation of the form $y = kh$, where k is the value determined as the unit rate in Part A ($f = 9h$) (7.RP.A.2c). In Part D, the student shows that the relationship in the table is not proportional by using cross multiplication to show that the ratio $x:y$ is not constant. Minor transcription errors do not affect the student’s understanding of how to demonstrate proportionality (7.RP.A.2a). In Part C, the student correctly identifies all of the variables and constants in the equation given in Part B, including the correct units for length, rate, and time (MP2). The student makes some transcription errors in Part D (57 instead of 54, 75 instead of 72) and uses imprecise mathematical language in Part D (“The table is not equal”), demonstrating a lack of precision (no credit for MP6).

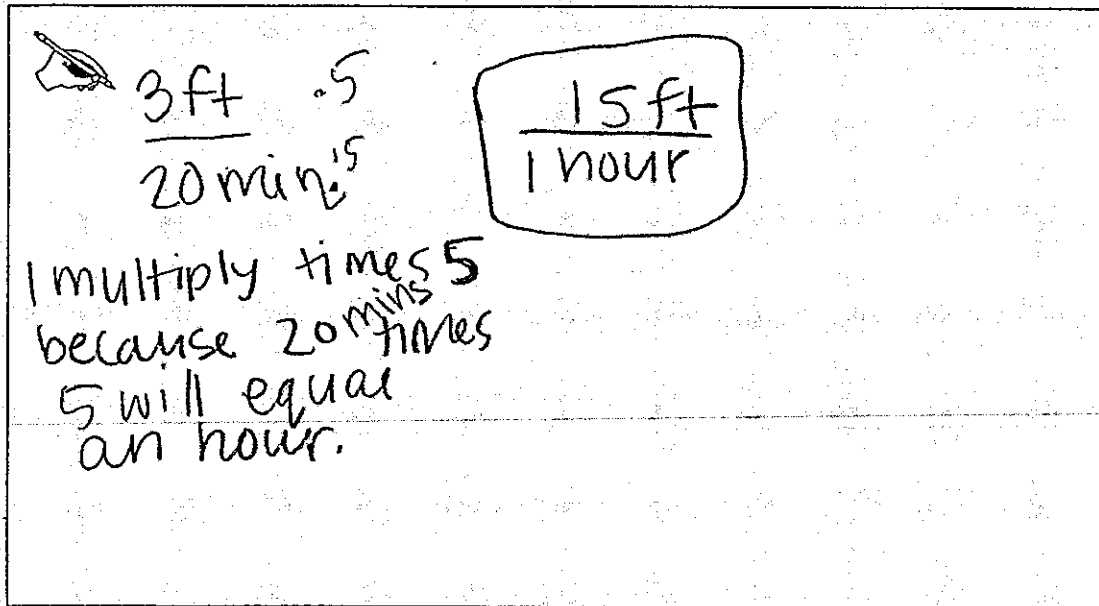
Total Awarded Points: 4 out of 5

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

A company is using a piece of equipment to dig a ditch. The piece of equipment digs a length of 3 feet every $\frac{1}{3}$ hour.

- a. Find the unit rate for the digging equipment in feet per hour. Show your work.

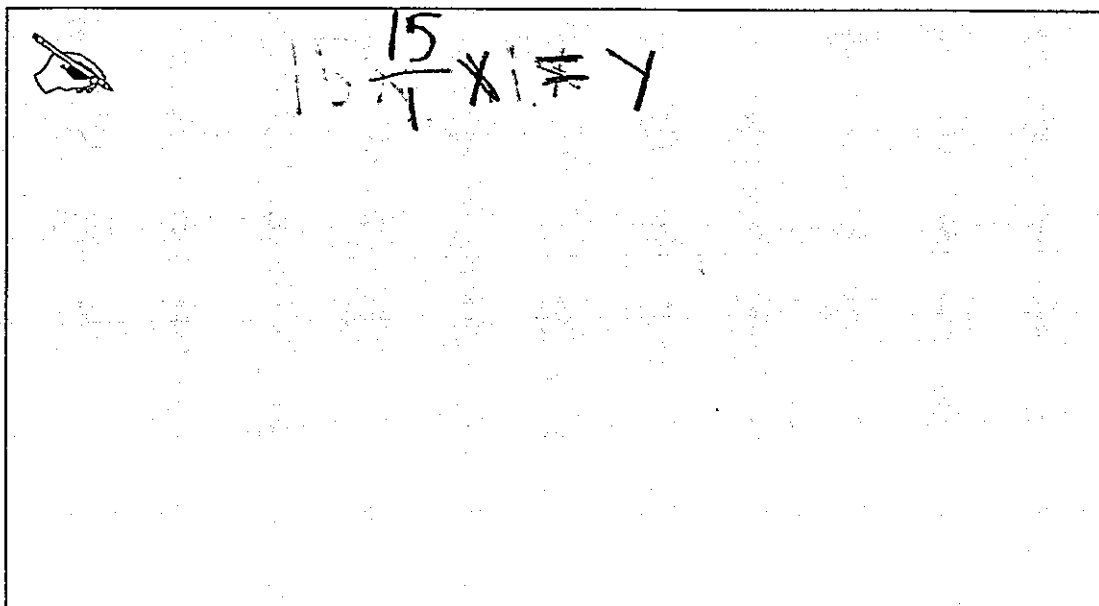


$\frac{3 \text{ ft}}{20 \text{ min}}$

$\frac{15 \text{ ft}}{1 \text{ hour}}$

I multiply times 5
 because 20 mins
 times 5 will equal
 an hour.

- b. Write an equation that describes the relationship between time and the length of the ditch.




$15 \cdot \frac{1}{4} \cdot x = y$

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

- c. Explain the meaning of each variable and constant in your equation.




$x =$ how many hours you dig
and $y =$ how many feet
 $\frac{15 \text{ feet}}{1 \text{ hour}}$ is the rate you dig

To speed up the project, the construction crew adds a second piece of equipment. The table below represents the length of the ditch with respect to the time since the second piece of equipment was added.

Time since second piece of equipment was added (hours)	Length of ditch (feet)
0.5	27
2	54
3	72

- d. Delon says that the relationship in the table is proportional because the rate of two pieces of equipment digging is double the rate of a single piece of equipment digging. Show Delon that the relationship in the table is not proportional.



$\frac{27}{.5} = \frac{54 \text{ feet}}{1 \text{ hour}}$ $\frac{54 \text{ feet}}{2 \text{ hours}} = \frac{27 \text{ feet}}{1 \text{ hour}}$

$\frac{72 \text{ feet}}{3 \text{ hour}} = \frac{24 \text{ feet}}{1 \text{ hour}}$

they all have different unit rates so they are not proportional.

Anchor 3

Litho 00867200163

Total Content Points: 2 (7.RP.A.2c, 7.RP.A.2a)

Total Practice Points: 2 (MP2, MP6)

In Part A, the student miscalculates the number of minutes in an hour, and consequently does not find the correct unit rate (no credit for 7.RP.A.1). In Part B, the student writes an equation of the form $y = kh$, where k is the value determined as the unit rate in Part A

$\left(\frac{15}{1}x = y\right)$ (7.RP.A.2c). In Part D, the student shows that the relationship in the table is

not proportional by showing that the ratio $y:x$ is not constant (7.RP.A.2a). In Part C, the student correctly identifies all of the variables and constants in the equation given in Part B, including the correct units for length, rate, and time (MP2). Algebraic expressions and all calculations are correct; mathematical language and notation are precise (MP6).

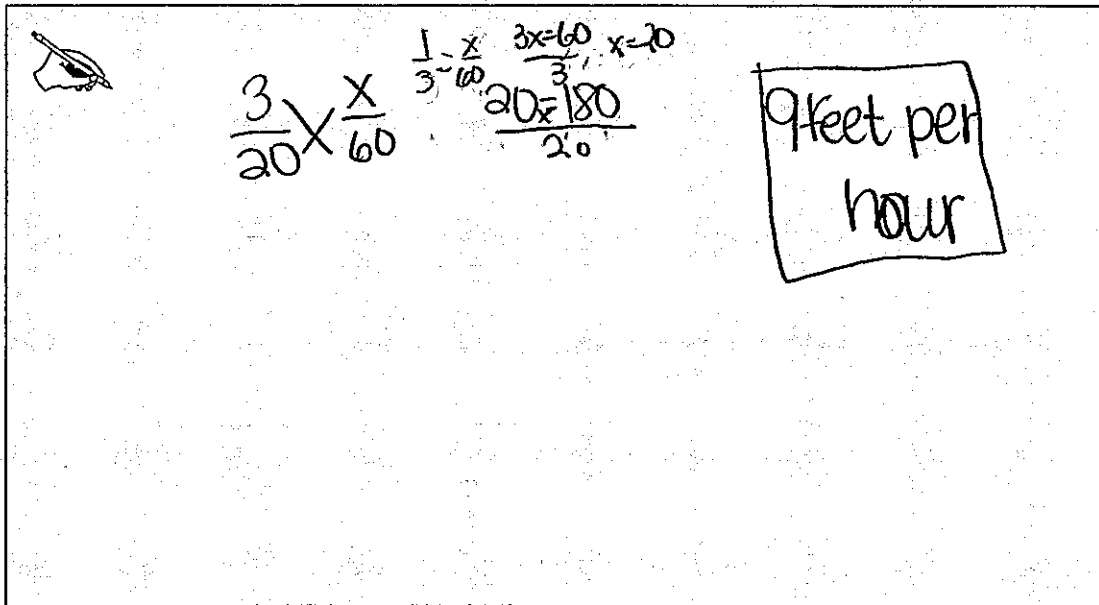
Total Awarded Points: 4 out of 5

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

A company is using a piece of equipment to dig a ditch. The piece of equipment digs a length of 3 feet every $\frac{1}{3}$ hour.

- a. Find the unit rate for the digging equipment in feet per hour. Show your work.



Handwritten work for part a:

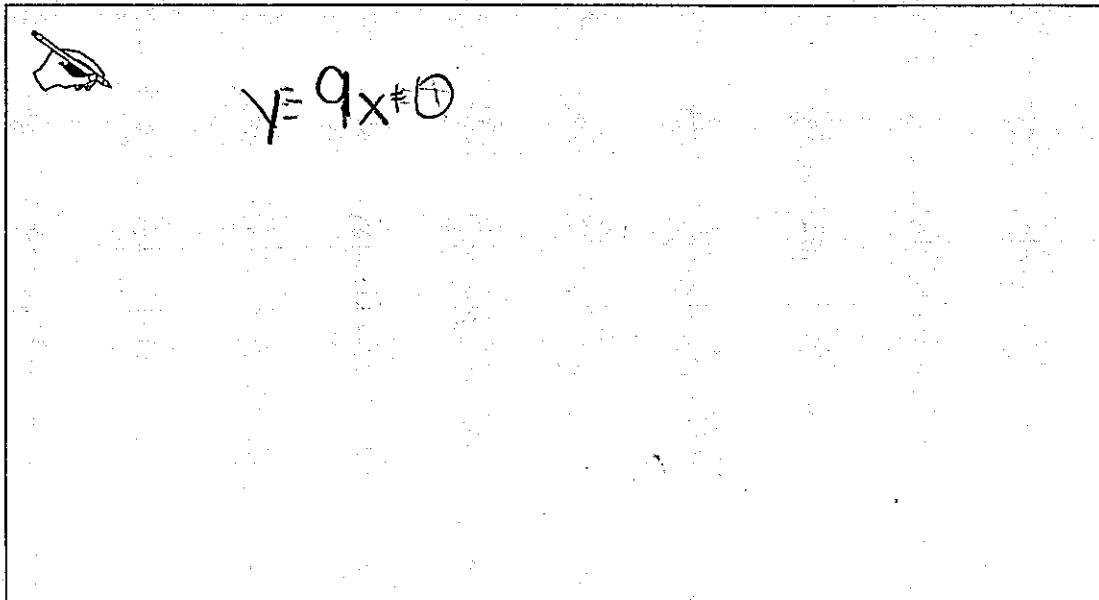
$\frac{3}{20} \times \frac{x}{60}$

$\frac{1}{3} \times x = 3x = 60, x = 20$

$\frac{20 \times 3}{20} = 60$

9 feet per hour

- b. Write an equation that describes the relationship between time and the length of the ditch.



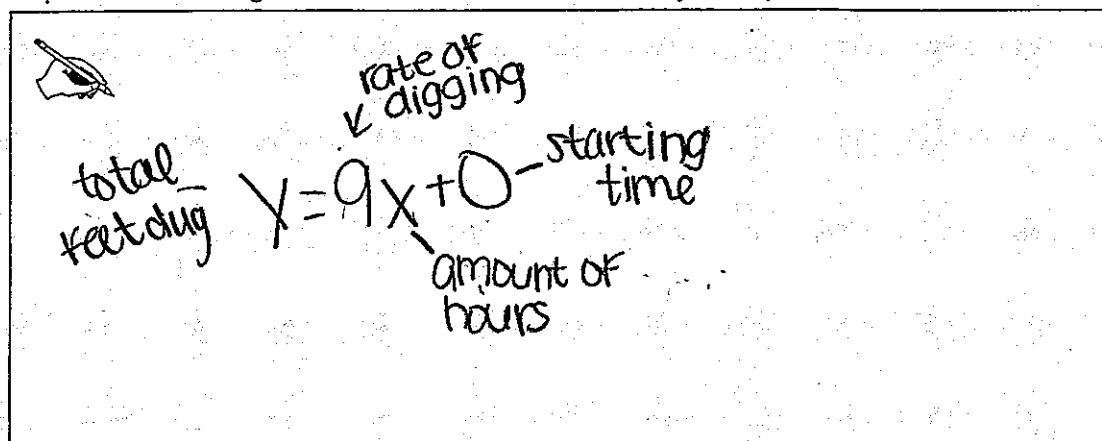
Handwritten work for part b:

$y = 9x + 1$

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

- c. Explain the meaning of each variable and constant in your equation.

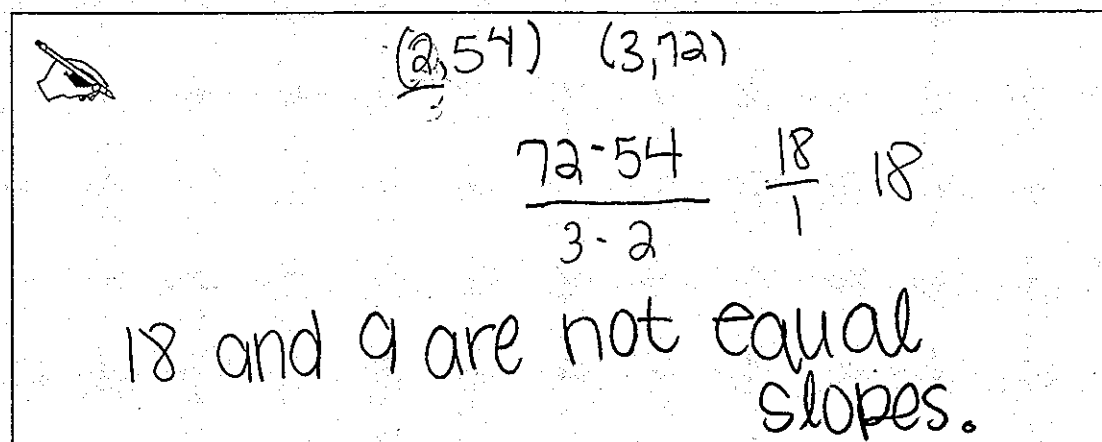


total feet dug $y = 9x + 0$ starting time
rate of digging
amount of hours

To speed up the project, the construction crew adds a second piece of equipment. The table below represents the length of the ditch with respect to the time since the second piece of equipment was added.

Time since second piece of equipment was added (hours)	Length of ditch (feet)
0.5	27
2	54
3	72

- d. Delon says that the relationship in the table is proportional because the rate of two pieces of equipment digging is double the rate of a single piece of equipment digging. Show Delon that the relationship in the table is not proportional.



$(2, 54)$ $(3, 72)$
 $\frac{72-54}{3-2} = \frac{18}{1} = 18$
18 and 9 are not equal slopes.

Anchor 4

Litho 00687200163

Total Content Points: 2 (7.RP.A.1, 7.RP.A.2c)

Total Practice Points: 1 (MP6)

In Part A, the student determines the unit rate (“9 feet per hour”) by setting up a series of equations and solving first for the number of minutes in $\frac{1}{3}$ of an hour and then for the number of feet per hour (7.RP.A.1). In Part B, the student writes an equation of the form $y = kh + b$, where k is the value determined as the unit rate in Part A and b is zero ($y = 9x + 0$) (7.RP.A.2c). In Part D, the student does not show that the relationship in the table is not proportional. Instead, the student calculates the slope of the data from 2 hours to 3 hours in the table, and indicates that the slope is not equal to the rate already calculated in Part A, which has only one piece of equipment digging (no credit for 7.RP.A.2a). In Part C, the student correctly identifies most of the variables and constants in the equation given in Part B, including the correct units for length and time. The correct unit for rate is given in Part A. However, by specifying that 0 refers to the “starting time,” the student makes the equation invalid because the resulting process of adding feet to hours or minutes would not be correct for finding the total number of feet dug (no credit for MP2). Algebraic expressions and all calculations are correct; mathematical language and notation are precise (MP6).


Total Awarded Points: 3 out of 5

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Constructed Response Assessment


Digging a Ditch Task

A company is using a piece of equipment to dig a ditch. The piece of equipment digs a length of 3 feet every $\frac{1}{3}$ hour.

- a. Find the unit rate for the digging equipment in feet per hour. Show your work.


$$\frac{3}{.33} \quad 9.09 \text{ f/h}$$


- b. Write an equation that describes the relationship between time and the length of the ditch.


$$y = 3x$$

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

- c. Explain the meaning of each variable and constant in your equation.




y = how many feet he dug
 3 = how many feet in every
 $\frac{1}{3}$ hour
 x = how many $\frac{1}{3}$ hours there
 were

To speed up the project, the construction crew adds a second piece of equipment. The table below represents the length of the ditch with respect to the time since the second piece of equipment was added.

Time since second piece of equipment was added (hours)	Length of ditch (feet)
0.5	27
2	54
3	72

13.5
108
222

- d. Delon says that the relationship in the table is proportional because the rate of two pieces of equipment digging is double the rate of a single piece of equipment digging. Show Delon that the relationship in the table is not proportional.



Their not the same.

Anchor 5

Litho 00387200163

Total Content Points: 2 (7.RP.A.1, 7.RP.A.2c)

Total Practice Points: 1 (MP2)

In Part A, the student determines the approximate unit rate (9.09 feet per hour) by dividing 3 by .33 (7.RP.A.1). In Part B, the student writes an equation of the form $y = kh$, where k is a correct rate based on the definition of the variables in Part C ($y = 3x$) (7.RP.A.2c). In Part D, the student does not show that the relationship in the table is not proportional. Multiplying each time, x , by its corresponding length, y , is not a correct method to determine proportionality (no credit for 7.RP.A.2a). In Part C, the student correctly identifies all of the variables and constants in the equation given in Part B, including the correct units for length, rate, and time (MP2). The student uses imprecise mathematical language in Part D (“Their not the same”), demonstrating a lack of precision (no credit for MP6).


Total Awarded Points: 3 out of 5

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

A company is using a piece of equipment to dig a ditch. The piece of equipment digs a length of 3 feet every $\frac{1}{3}$ hour.

- a. Find the unit rate for the digging equipment in feet per hour. Show your work.



$$\frac{3}{\frac{1}{3}}$$


$\frac{1}{3}$ needs to be $\frac{1}{1}$ to determine the rate.

$$\frac{1}{3} + \frac{1}{3} = \frac{2}{3} \quad \frac{2}{3} + \frac{1}{3} = \frac{3}{3} = 1$$

$$3 + 3 = 6 \quad 6 + 3 = 9 = 9$$

9 feet per hour

- b. Write an equation that describes the relationship between time and the length of the ditch.



$$y = 9x$$

y → total depth of ditch
 x → the total the time dug (h)
 → rate or (slope)

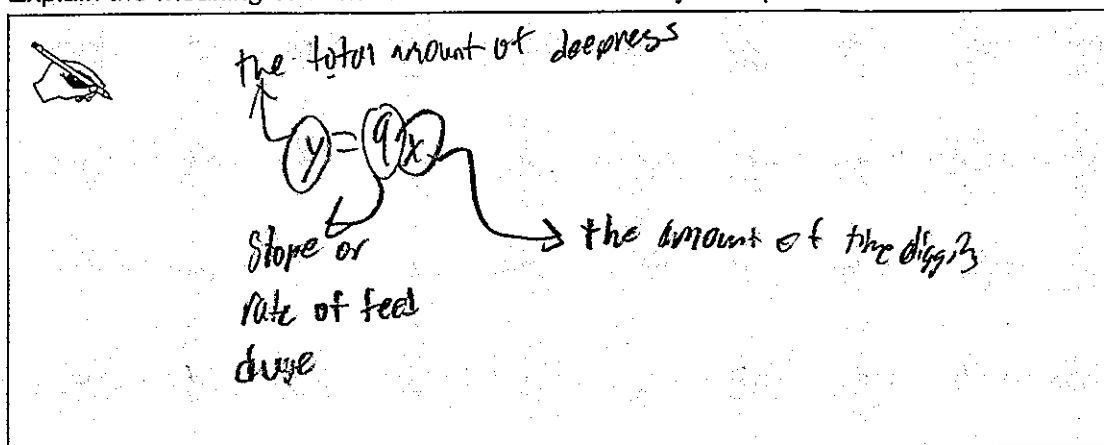
x would be the length

every hour the hole becomes 9 feet deeper.

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Digging a Ditch Task

- c. Explain the meaning of each variable and constant in your equation.



the total amount of deepness

$$y = 9x$$

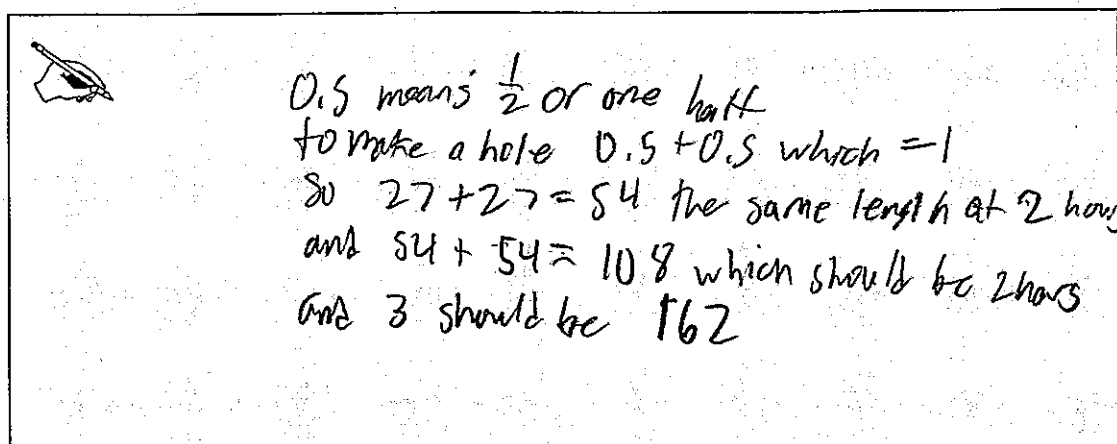
slope or rate of feet dig

the amount of the digging

To speed up the project, the construction crew adds a second piece of equipment. The table below represents the length of the ditch with respect to the time since the second piece of equipment was added.

Time since second piece of equipment was added (hours)	Length of ditch (feet)
0.5	27
2	54
3	72

- d. Delon says that the relationship in the table is proportional because the rate of two pieces of equipment digging is double the rate of a single piece of equipment digging. Show Delon that the relationship in the table is not proportional.



0.5 means $\frac{1}{2}$ or one half
to make a hole $0.5 + 0.5$ which = 1
so $27 + 27 = 54$ the same length at 2 hours
and $54 + 54 = 108$ which should be 2 hours
and 3 should be 162

Anchor 6

Litho 00597200163

Total Content Points: 3 (7.RP.A.1, 7.RP.A.2c, 7.RP.A.2a)

Total Practice Points: 0

In Part A, the student determines the unit rate (“9 feet per hour”) by setting up the complex fraction $\frac{3}{\left(\frac{1}{3}\right)}$ and by scaling up the ratio (7.RP.A.1). In Part B, the student writes

an equation of the form $y = kh$, where k is the value determined as the unit rate in Part A ($y = 9x$) (7.RP.A.2c). In Part D, the student shows that the relationship in the table is not proportional by scaling the first relationship in the table to show that it is not equivalent to the other two (7.RP.A.2a). In Part C, the student identifies all of the variables and constants in the equation given in Part B, but fails to provide units for length or time. In addition, the student makes an error in conceptualizing the problem situation, stating that y refers to the vertical depth rather than the horizontal length (no credit for MP2). The student uses imprecise mathematical language in Part D (“So $27 + 27 = 54$ the same length at 2 hours and $54 + 54 = 108$ which should be 2 hours and 3 should be 162”), demonstrating a lack of precision (no credit for MP6).


Total Awarded Points: 3 out of 5

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

A company is using a piece of equipment to dig a ditch. The piece of equipment digs a length of 3 feet every $\frac{1}{3}$ hour.

- a. Find the unit rate for the digging equipment in feet per hour. Show your work.




~~$d = r \cdot t$~~

$$3 = r \cdot \frac{1}{3} = \textcircled{9}$$

The rate is 9

- b. Write an equation that describes the relationship between time and the length of the ditch.



$$\textcircled{3 = 9 \cdot \frac{1}{3}}$$

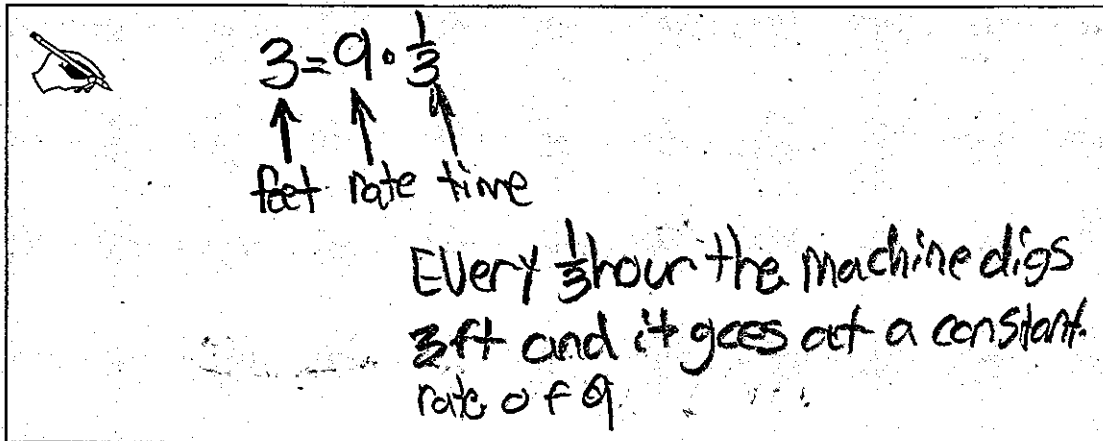
↑ ↑ ↑
feet rate time

every $\frac{1}{3}$ hour the machine digs 3 feet the rate is 9

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Digging a Ditch Task

- c. Explain the meaning of each variable and constant in your equation.



$3 = 9 \cdot \frac{1}{3}$

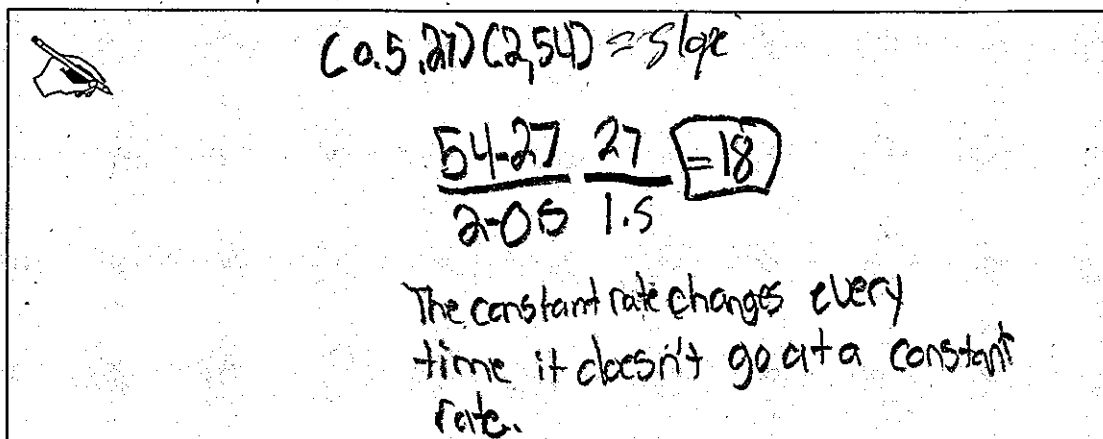
↑ ↑ ↑
feet rate time

Every $\frac{1}{3}$ hour the machine digs 3ft and it goes out a constant rate of 9.

To speed up the project, the construction crew adds a second piece of equipment. The table below represents the length of the ditch with respect to the time since the second piece of equipment was added.

Time since second piece of equipment was added (hours)	Length of ditch (feet)
0.5	27
2	54
3	72

- d. Delon says that the relationship in the table is proportional because the rate of two pieces of equipment digging is double the rate of a single piece of equipment digging. Show Delon that the relationship in the table is not proportional.



$(0.5, 27) (2, 54) = \text{slope}$

$\frac{54-27}{2-0.5} = \frac{27}{1.5} = 18$

The constant rate changes every time it doesn't go at a constant rate.

Anchor 7

Litho 00187200163

Total Content Points: 1 (7.RP.A.1)

Total Practice Points: 1 (MP2)

In Part A, the student determines the unit rate (9) by setting up an equation and solving for r (7.RP.A.1). While the student's equation in Part B is correct for the specific situation described in the problem, it does not describe the general relationship between time and the length of the ditch (no credit for 7.RP.A.2c). In Part D, the student does not show that the relationship in the table is not proportional, since calculating the slope is not sufficient to determine proportionality (no credit for 7.RP.A.2a). In Part C, the student correctly identifies all of the constants in the equation given in Part B, including the correct units for length and time (MP2). The student uses imprecise mathematical notation in Parts A and D, using a running equation in Part A and omitting an equal sign in Part D, which demonstrate a lack of precision (no credit for MP6).


Total Awarded Points: 2 out of 5

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Constructed Response Assessment


Digging a Ditch Task

A company is using a piece of equipment to dig a ditch. The piece of equipment digs a length of 3 feet every $\frac{1}{3}$ hour.

- a. Find the unit rate for the digging equipment in feet per hour. Show your work.


$$3 \cdot 3 = 9 \text{ ft per hour}$$

- b. Write an equation that describes the relationship between time and the length of the ditch.


$$y = 9x$$

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Constructed Response Assessment

Digging a Ditch Task

- c. Explain the meaning of each variable and constant in your equation.

Handwritten student response for part c. The student has written the equation $y = 9x$. An arrow points from 'y' to 'length of the pit'. Another arrow points from '9' to 'amount of ft per hour (rate)'. A third arrow points from 'x' to 'number of hours'.

To speed up the project, the construction crew adds a second piece of equipment. The table below represents the length of the ditch with respect to the time since the second piece of equipment was added.

Time since second piece of equipment was added (hours)	Length of ditch (feet)
0.5	27
2	54
3	72

- d. Delon says that the relationship in the table is proportional because the rate of two pieces of equipment digging is double the rate of a single piece of equipment digging. Show Delon that the relationship in the table is not proportional.

Handwritten student response for part d. The student has written $0.5 \cdot 9 = 4.5$ and "It is not proportional because the 1st digger has a rate of $9x$, while the 2nd digger has a rate of $4.5x$." Below this, there are two vertical calculations: $27 - 4.5 = 22.5$ and $0.5 \overline{)45}$.

Anchor 8

Litho 00737200163

Total Content Points: 1 (7.RP.A.2c)

Total Practice Points: 0

In Part A, the student determines the correct unit rate (9 ft per hour), but the work shown (3×3) is not sufficient for credit because it is unclear where the numbers the student uses came from (no credit for 7.RP.A.1). In Part B, the student writes an equation of the form $y = kh$, where k is the value determined as the unit rate in Part A ($y = 9x$) (7.RP.A.2c). In Part D, the student does not show that the relationship in the table is not proportional. Instead, the student calculates what the rate should be for the first data point in the table, assuming that both diggers begin at the same time, and indicates that the table is not proportional with the already calculated rate from Part A (no credit for 7.RP.A.2a). In Part C, the student identifies all of the variables and constants in the equation given in Part B, including the correct unit for time, but fails to provide a unit for length for y (no credit for MP2). The student uses incorrect mathematical language in Part D (“a rate of $9x$,” “a rate of $45x$ ”), demonstrating a lack of precision (no credit for MP6).


Total Awarded Points: 1 out of 5

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

A company is using a piece of equipment to dig a ditch. The piece of equipment digs a length of 3 feet every $\frac{1}{3}$ hour.


- a. Find the unit rate for the digging equipment in feet per hour. Show your work.



9 ft per hour

$$60 \cdot \frac{1}{3} = 20$$

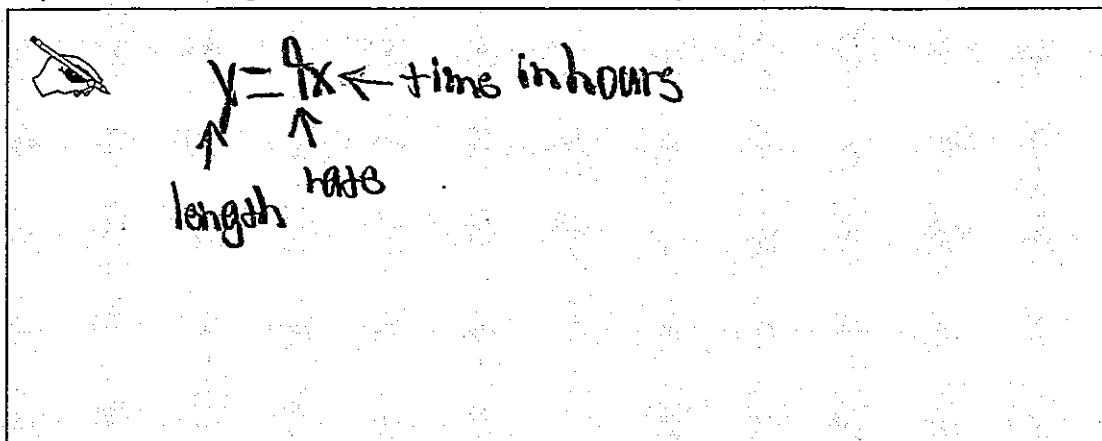
- b. Write an equation that describes the relationship between time and the length of the ditch.


$$y = 9x$$

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

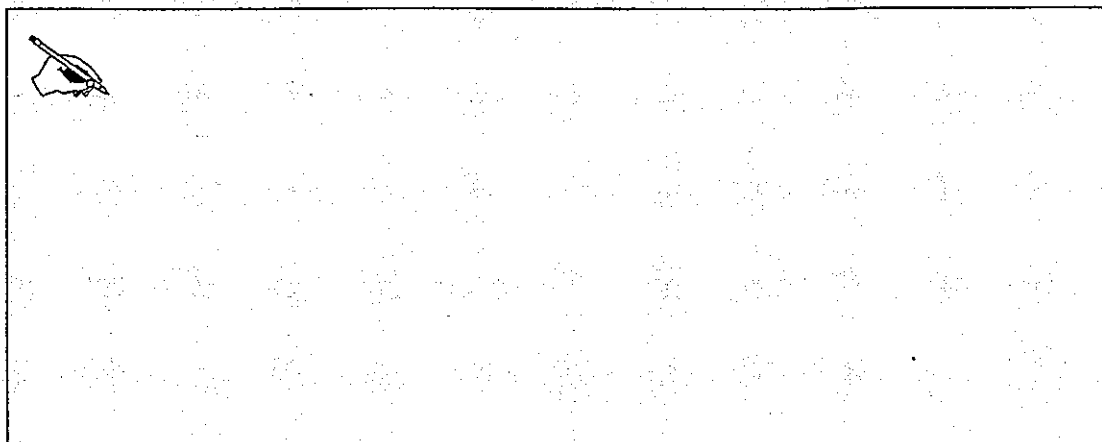
- c. Explain the meaning of each variable and constant in your equation.



To speed up the project, the construction crew adds a second piece of equipment. The table below represents the length of the ditch with respect to the time since the second piece of equipment was added.

Time since second piece of equipment was added (hours)	Length of ditch (feet)
0.5	27
2	54
3	72

- d. Delon says that the relationship in the table is proportional because the rate of two pieces of equipment digging is double the rate of a single piece of equipment digging. Show Delon that the relationship in the table is not proportional.



Anchor 9

Litho 00617200163

Total Content Points: 1 (7.RP.A.2c)

Total Practice Points: 0

In Part A, the student determines the correct unit rate (9 ft per hour), but the work shown $\left(60 \times \frac{1}{3} = 20\right)$ is not sufficient for credit because it does not demonstrate how the student arrived at this conclusion (no credit for 7.RP.A.1). In Part B, the student writes an equation of the form $y = kh$, where k is the value determined as the unit rate in Part A ($y = 9x$) (7.RP.A.2c). In Part D, the student does not show that the relationship in the table is not proportional (no credit for 7.RP.A.2a). In Part C, the student identifies all of the variables and constants in the equation given in Part B, including the correct unit for time, but fails to provide a unit for length (no credit for MP2). While the student makes no errors in calculation, language, or notation, there is insufficient work shown to demonstrate precision (no credit for MP6).


Total Awarded Points: 1 out of 5

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task


A company is using a piece of equipment to dig a ditch. The piece of equipment digs a length of 3 feet every $\frac{1}{3}$ hour.

- a. Find the unit rate for the digging equipment in feet per hour. Show your work.



It will dig $9\frac{1}{2}$ feet
every hour.

- b. Write an equation that describes the relationship between time and the length of the ditch.

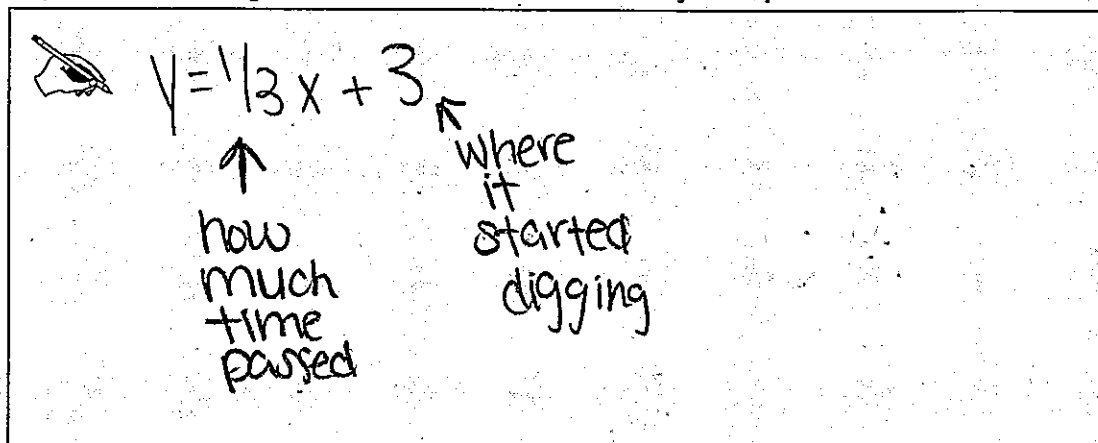


$y = \frac{1}{3}x + 3$

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

- c. Explain the meaning of each variable and constant in your equation.



$y = \frac{1}{3}x + 3$

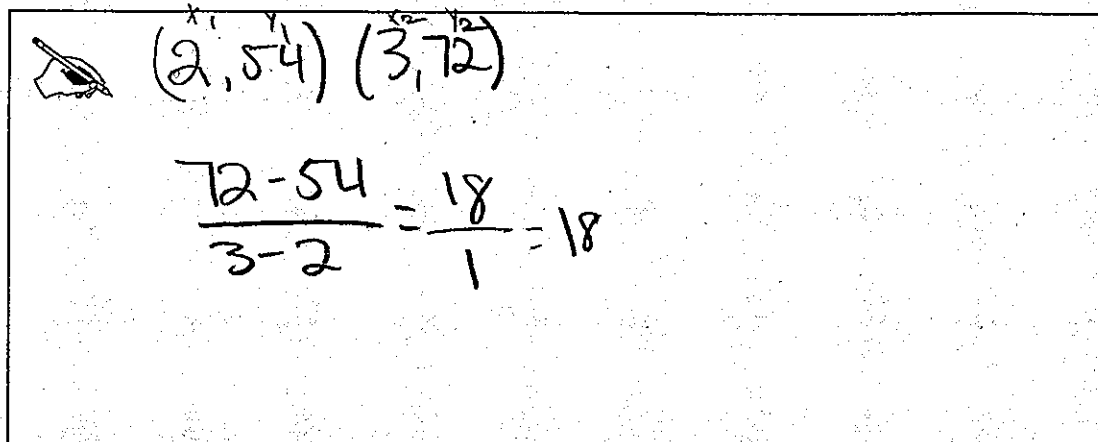
↑
how much time passed

↑
where it started digging

To speed up the project, the construction crew adds a second piece of equipment. The table below represents the length of the ditch with respect to the time since the second piece of equipment was added.

Time since second piece of equipment was added (hours)	Length of ditch (feet)
0.5	27
2	54
3	72

- d. Delon says that the relationship in the table is proportional because the rate of two pieces of equipment digging is double the rate of a single piece of equipment digging. Show Delon that the relationship in the table is not proportional.



$(x_1, y_1) = (2, 54)$ $(x_2, y_2) = (3, 72)$

$$\frac{72 - 54}{3 - 2} = \frac{18}{1} = 18$$

Anchor 10

Litho 00097200163

Total Content Points: 0

Total Practice Points: 1 (MP6)

In Part A, the student does not determine the correct unit rate and shows no work (no credit for 7.RP.A.1). In Part B, the student writes an equation of the form $y = kh + b$; but k is not the value determined as the unit rate in Part A, and b is not zero

$\left(y = \frac{1}{3}x + 3 \right)$ (no credit for 7.RP.A.2c). In Part D, the student does not show that the

relationship in the table is not proportional. Calculating the slope is not sufficient to determine proportionality (no credit for 7.RP.A.2a). In Part C, the student incorrectly identifies 3 as “where it started digging” and fails to define y or x (no credit for MP2). Algebraic expressions and all calculations are correct; mathematical language and notation are precise. In addition, there is sufficient work to demonstrate precision (MP6).


Total Awarded Points: 1 out of 5

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task


A company is using a piece of equipment to dig a ditch. The piece of equipment digs a length of 3 feet every $\frac{1}{3}$ hour.

- a. Find the unit rate for the digging equipment in feet per hour. Show your work.



3 feet every $\frac{1}{3}$ hour
60 minutes in 1 hour
 $\frac{1}{3} \times 60 = 20$ min. per 3 feet
20 \cdot 3 = 60 feet per hour

- b. Write an equation that describes the relationship between time and the length of the ditch.

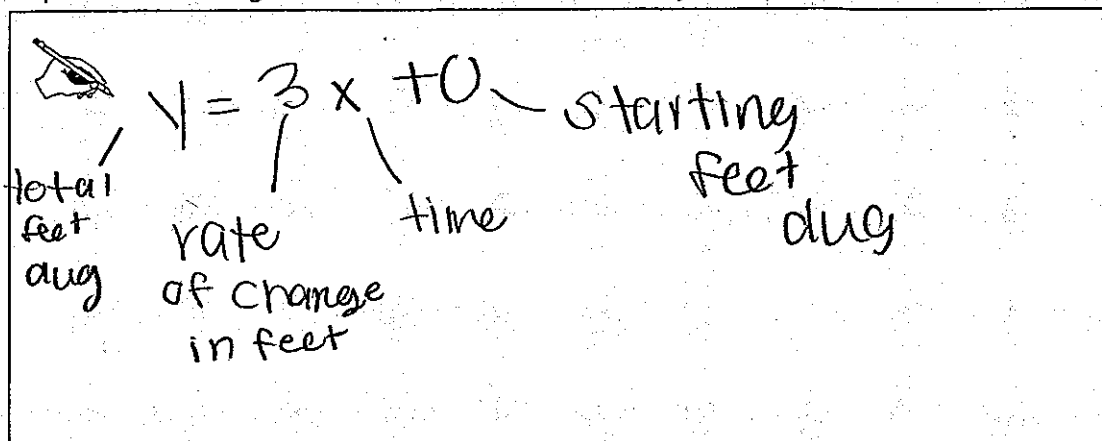


$y = 3x + 0$

Grade 7 — 2013–14, Phase III, Stage 2 Pilot
Constructed Response Assessment

Digging a Ditch Task

- c. Explain the meaning of each variable and constant in your equation.



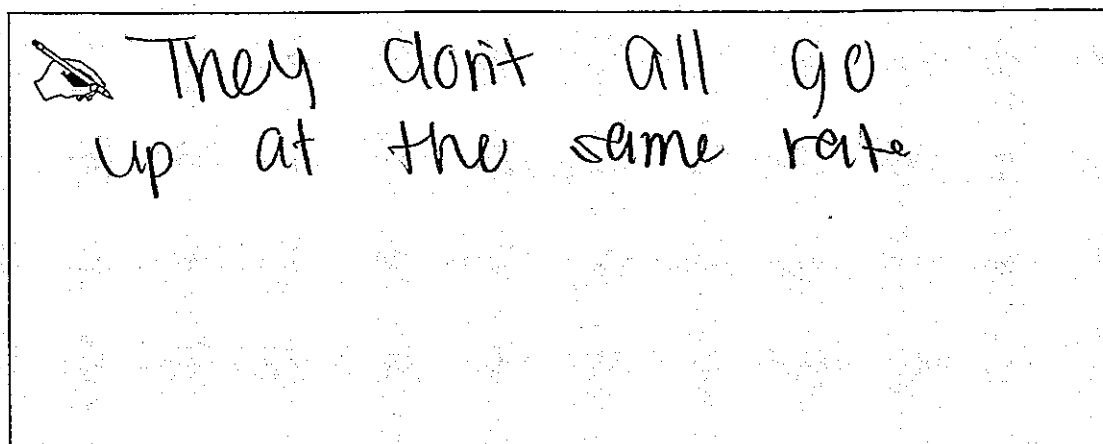
Handwritten equation: $y = 3x + 0$

- y : total feet dug
- 3 : rate of change in feet
- x : time
- 0 : starting feet dug

To speed up the project, the construction crew adds a second piece of equipment. The table below represents the length of the ditch with respect to the time since the second piece of equipment was added.

Time since second piece of equipment was added (hours)	Length of ditch (feet)
0.5	27
2	54
3	72

- d. Delon says that the relationship in the table is proportional because the rate of two pieces of equipment digging is double the rate of a single piece of equipment digging. Show Delon that the relationship in the table is not proportional.



Handwritten response: They don't all go up at the same rate

Total Content Points: 0

Total Practice Points: 0

In Part A, the student does not determine the correct unit rate, and the work shown is insufficient (no credit for 7.RP.A.1). In Part B, the student writes an equation of the form $y = kh + b$, where b is zero, but k is neither the value determined as the unit rate in Part A nor correctly defined in Part C ($y = 3x + 0$) (no credit for 7.RP.A.2c). In Part D, the student does not show that the relationship in the table is not proportional. “They don’t all go up at the same rate” is not specific enough for credit (no credit for 7.RP.A.2a). In Part C, the student identifies all of the variables and constants in the equation given in Part B, including the correct unit for length, but fails to provide a unit for time (no credit for MP2). The student uses imprecise mathematical language in Part D (They don’t all go up at the same rate), demonstrating a lack of precision (no credit for MP6).

Total Awarded Points: 0 out of 5