Tennessee Comprehensive Assessment Program

TCAP/CRA 2013

3

Anchor Set

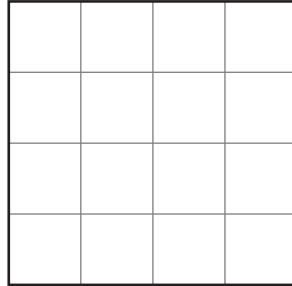## Grade 3 – Area of Squares Task

SECURE MATERIAL - Reader Name: _____

Tennessee Comprehensive Assessment Program

Part 2: Constructed Response Task Section
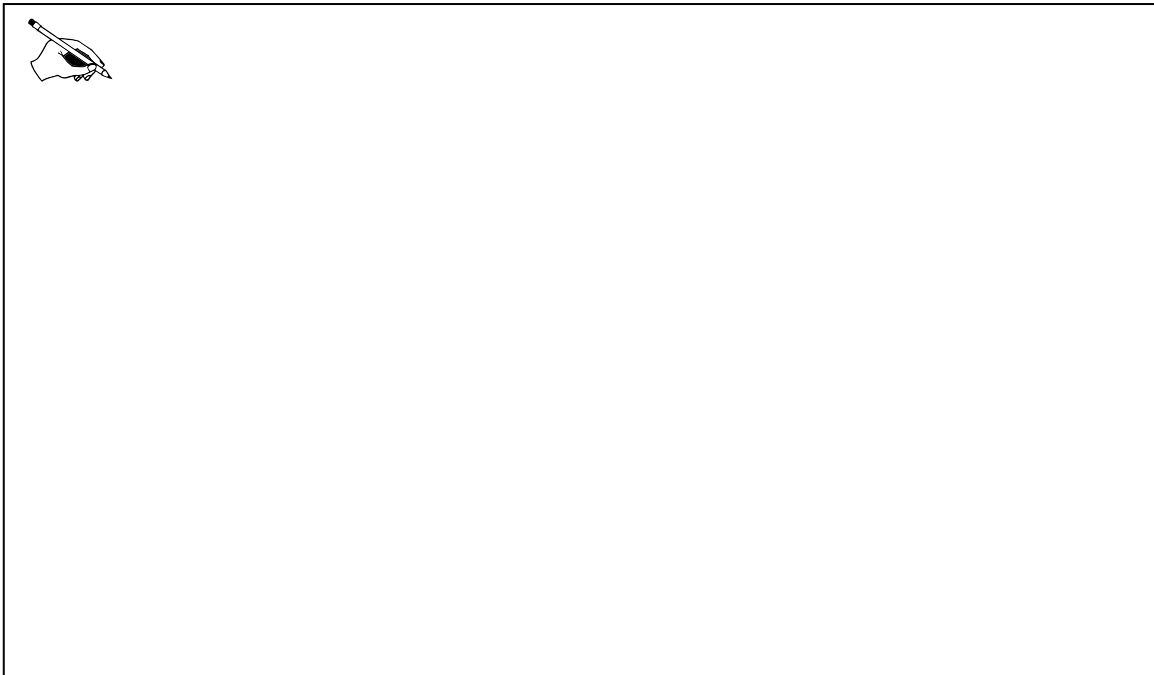
Areas of Squares Task

Square M

Josh claims that he can determine the area of Square M using two different ways:

- by a multiplication equation: $4 \times 4 = 16$ square units

- by a repeated addition equation: $4 + 4 + 4 + 4 = 16$ square units

a.   Explain or show on the diagram how the multiplication and repeated addition equations describe the rows and columns in Square M.
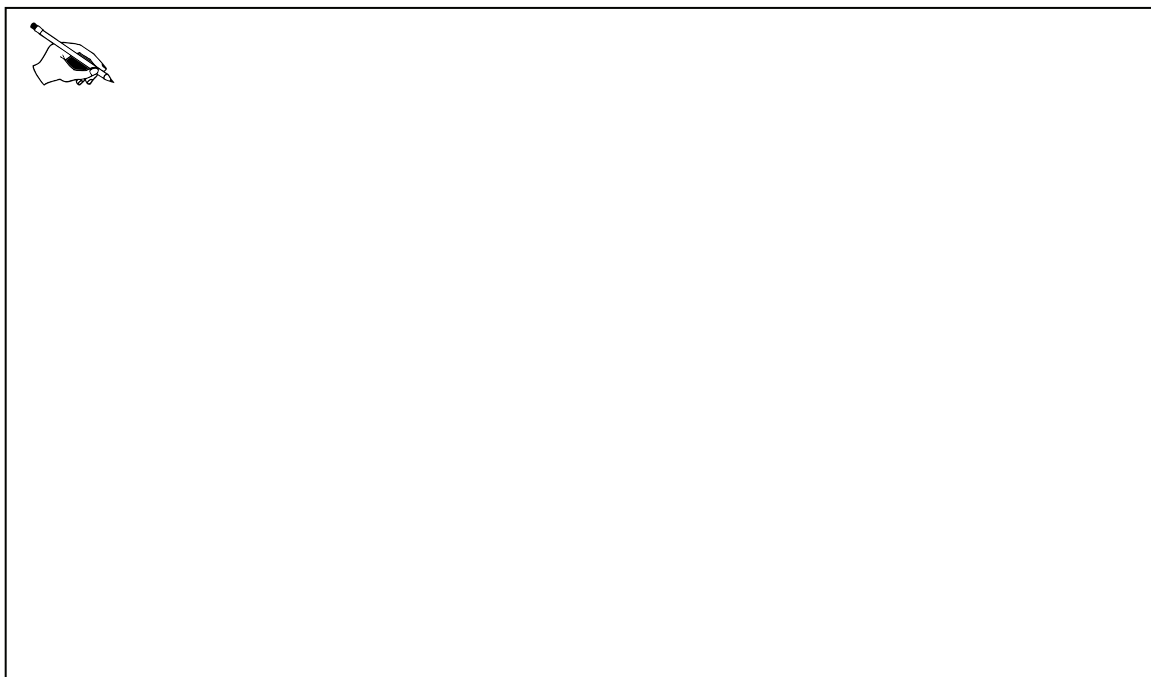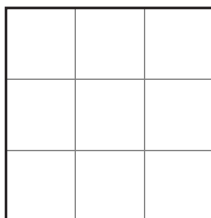
Part 2: Constructed Response Task Section

b.   Josh claims that the area of a square can always be determined using either multiplication or repeated addition. Josh is correct.

Write both a multiplication equation and a repeated addition equation to determine the area of Square P.

Square P

Scoring Guide

The CCSS for Mathematical Content (2 points)

3.MD.C.7x Shows or explains the relationship between the rows and columns and the multiplication   ———
and repeated addition equations. States that the four rows or columns each have four
square units.

(1 Point)

3.MD.C.7z Determines the area of the figure by writing a multiplication equation and a repeated   ———
addition equation.

(1 Point)

The CCSS for Mathematical Practice (1 points)

MP6 Indicates accurate calculations and labels and gives precise explanations. **(1 Point)**   ———

(MP6: Attend to precision.)

TOTAL POINTS: 3

The CCSS for Mathematical Content Addressed In This Task

| Geometric measurement: understand concepts of area and relate area to multiplication and to addition. |
|---|
| 3.MD.C.7   Relate area to the operations of multiplication and addition |

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.

2. Areas of Squares Task
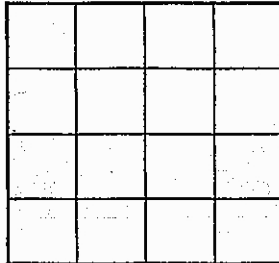
Square M

Josh claims that he can determine the area of Square M using two different ways:

- by a multiplication equation: $4 \times 4 = 16$ square units

- by a repeated addition equation: $4 + 4 + 4 + 4 = 16$ square units

a.   Explain or show on the diagram how the multiplication and repeated addition equations describe the rows and columns in Square M.

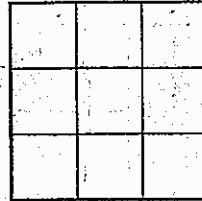> The multiplication equation and repeated addition equation have rows and columns called a array. I drawed a array 4 down and 4across.
>
> $\begin{array}{r} \times4 \\ \hline \end{array}$
>
> 4 OOOO OOOO OOOO OOOO = 16 square units

b.   Josh claims that the area of a square can always be determined using either multiplication or repeated addition. Josh is correct.

Write both a multiplication equation and a repeated addition equation to determine the area of Square P.

Square P

3×3 = 9 square units

3+3+3 = 9 square units

Anchor 1   Litho 0016

Total Content Points: 2   (3.MD.C.7x, 3.MD.C.7z)

Total Practice Points: 1   (MP6)

In Part A, the student explains the relationship between the rows and columns ("4 down and 4 across") and the multiplication and repeated addition equations by relating to the area ("16 square units") and the numbers of rows and columns (3.MD.C.7x). In Part B, the student determines the area of the figure by writing a multiplication equation $(3 \times 3 = 9)$ and a repeated addition equation $(3 + 3 + 3 = 9)$ (3.MD.C.7z). The student indicates accurate calculations and labels the answer in Part B ("9 square units") and gives a precise explanation in Part A (MP6).

Total Awarded Points: 3 out of 3

2. Areas of Squares Task
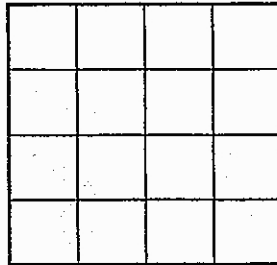
Square M

Josh claims that he can determine the area of Square M using two different ways:

- by a multiplication equation: 4 × 4 = 16 square units

- by a repeated addition equation: 4 + 4 + 4 + 4 = 16 square units

a.   Explain or show on the diagram how the multiplication and repeated addition equations describe the rows and columns in Square M.

There is 4 columns and 4 rows and you can multiply 4x4 or do repeated addition. If you do 4x4 it will equal 16. If you do 4+4+4+4 it will equal 16.

b. Josh claims that the area of a square can always be determined using either multiplication or repeated addition. Josh is correct.

Write both a multiplication equation and a repeated addition equation to determine the area of Square P.

Square P

$3 \times 3 = 9$
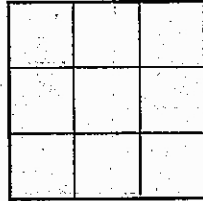
$3 + 3 + 3 = 9$

The area of Square P is 9.

Litho#: 0057

Anchor 2   Litho 0057

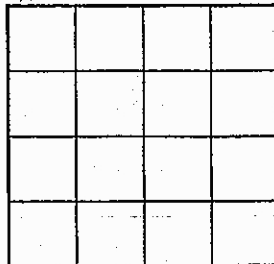Total Content Points: 2   (3.MD.C.7x, 3.MD.C.7z)

Total Practice Points: 1   (MP6)

In Part A, the student explains the relationship between the rows and columns ("4 columns and 4 rows") and the multiplication ("4×4 it will equal 16") and repeated addition ("$4 + 4 + 4 + 4$ it will equal 16") equations (3.MD.C.7x). In Part B, the student determines the area of the figure by writing a multiplication equation ($3 \times 3 = 9$) and a repeated addition equation ($3 + 3 + 3 = 9$) (3.MD.C.7z). The student indicates accurate calculations and labels the answer in Part B ("The area of Square P is 9") and gives a precise explanation in Part A (MP6).

Total Awarded Points: 3 out of 3

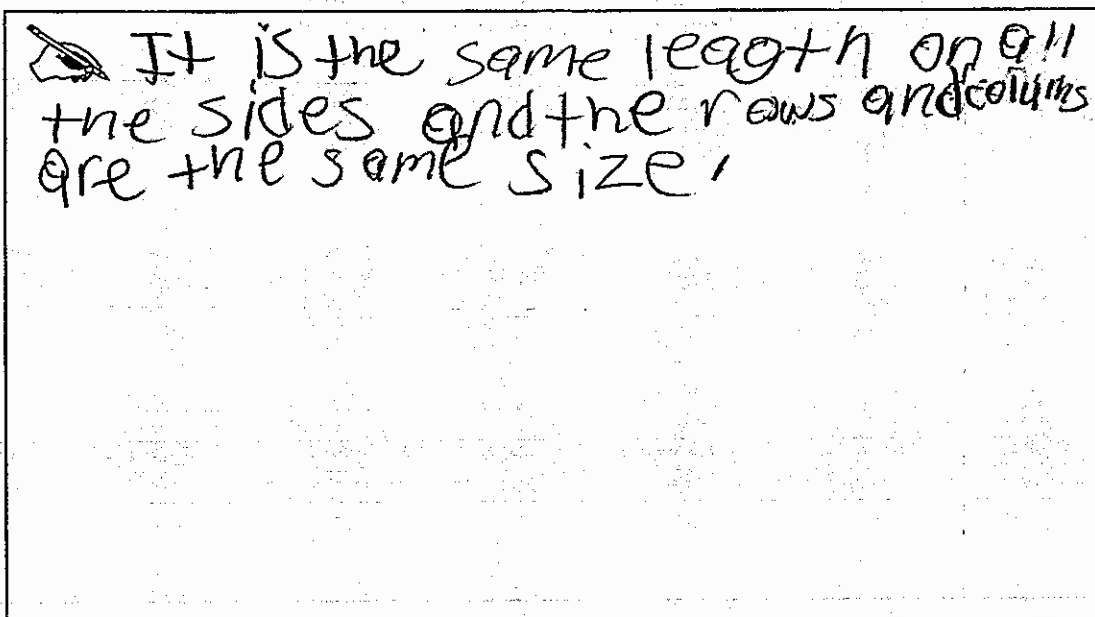## 2. Areas of Squares Task

Square M

Josh claims that he can determine the area of Square M using two different ways:

- by a multiplication equation: $4 \times 4 = 16$ square units

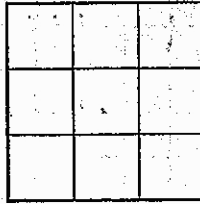- by a repeated addition equation: $4 + 4 + 4 + 4 = 16$ square units

a. Explain or show on the diagram how the multiplication and repeated addition equations describe the rows and columns in Square M.

It is the same length on all the sides and the rows and columns are the same size.

b. Josh claims that the area of a square can always be determined using either multiplication or repeated addition. Josh is correct.

Write both a multiplication equation and a repeated addition equation to determine the area of Square P.

Square P

$$3 \times 3 = 9 \text{ square units}$$
$$3 + 3 + 3 = 9 \text{ square units}$$

Anchor 3   Litho 0050

Total Content Points: 1 (3.MD.C.7z)

Total Practice Points: 1 (MP6)

In Part A, the student attempts to explain the relationship between the rows and columns and the multiplication and repeated addition equations, but the explanation ("the rows and colums are the same size") does not relate the rows and columns to the area (no credit for 3.MD.C.7x). The student determines the area of the figure in Part B by writing a multiplication equation ($3 \times 3 = 9$) and a repeated addition equation ($3 + 3 + 3 = 9$) (3.MD.C.7z). The student indicates accurate calculations and labels units in Part B ("9 square units") and gives an acceptably precise explanation in Part A (MP6).

Total Awarded Points: 2 out of 3

2. Areas of Squares Task
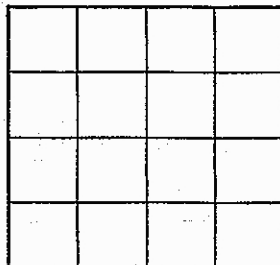
Square M

Josh claims that he can determine the area of Square M using two different ways:

- by a multiplication equation: $4 \times 4 = 16$ square units

- by a repeated addition equation: $4 + 4 + 4 + 4 = 16$ square units

a.   Explain or show on the diagram how the multiplication and repeated addition equations describe the rows and columns in Square M.
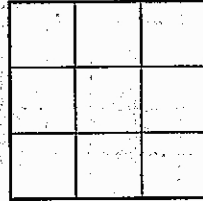

$$4 \times 4 = 16$$
$$4 + 4 + 4 + 4 = 16$$

There is four rows of 4 that equals 16

b.   Josh claims that the area of a square can always be determined using either multiplication or repeated addition. Josh is correct.

Write both a multiplication equation and a repeated addition equation to determine the area of Square P.

Square P

$$3 \times 3 = 9$$

$$3 + 3 + 3 = 9$$

Anchor 4   Litho 0037

Total Content Points: 2   (3.MD.C.7x, 3.MD.C.7z)

Total Practice Points: 0

In Part A, the student explains the relationship between the rows and columns and the multiplication ($4 \times 4 = 16$) and repeated addition ($4 + 4 + 4 + 4 = 16$) equations ("There is four rows of 4 that equas 16") (3.MD.C.7x). The student determines the area of the figure in Part B by writing a multiplication equation ($3 \times 3 = 9$) and a repeated addition equation ($3 + 3 + 3 = 9$) (3.MD.C.7z). The student indicates accurate calculations and gives an acceptably precise explanation in Part A, but there are no labels in Part B (no credit for MP6).

Total Awarded Points: 2 out of 3

2. Areas of Squares Task
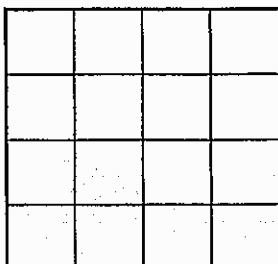
Square M

Josh claims that he can determine the area of Square M using two different ways:

- by a multiplication equation: 4 × 4 = 16 square units

- by a repeated addition equation: 4 + 4 + 4 + 4 = 16 square units

a. Explain or show on the diagram how the multiplication and repeated addition equations describe the rows and columns in Square M.

> Because their are four rows and in each row there are four squares. If you turn it sideways it will Just be the same.

b. Josh claims that the area of a square can always be determined using either multiplication or repeated addition. Josh is correct.

Write both a multiplication equation and a repeated addition equation to determine the area of Square P.

Square P
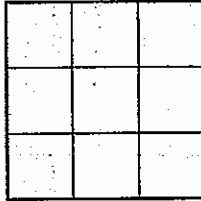
$3 \times 3 = 9$ and $3 + 3 + 3 = 9$

Anchor 5 Litho 0017
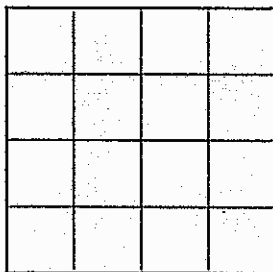
Total Content Points: 2 (3.MD.C.7x, 3.MD.C.7z)

Total Practice Points: 0

In Part A, the student explains the relationship between the rows and columns ("their are four rows") and the multiplication and repeated addition equations by relating to the area ("in each row there are four squares") (3.MD.C.7x). The student determines the area of the figure in Part B by writing a multiplication equation ($3 \times 3 = 9$) and a repeated addition equation ($3 + 3 + 3 = 9$) (3.MD.C.7z). The student indicates accurate calculations and gives a precise enough explanation in Part A, but there are no labels in Part B (no credit for MP6).

Total Awarded Points: 2 out of 3
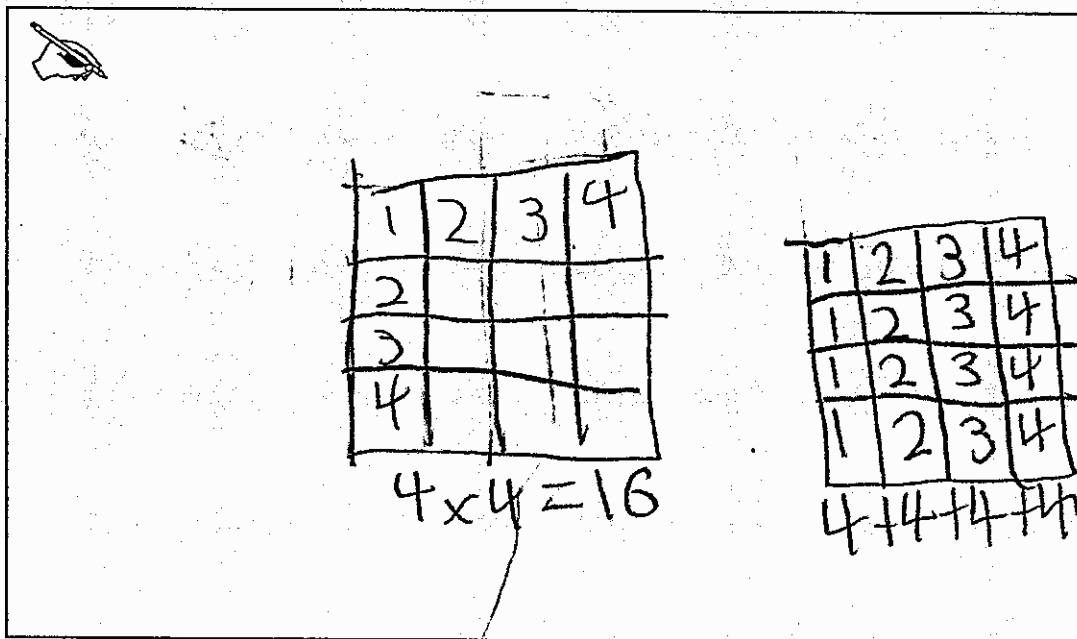
2. Areas of Squares Task

Square M

Josh claims that he can determine the area of Square M using two different ways:

- by a multiplication equation: 4 × 4 = 16 square units

- by a repeated addition equation: 4 + 4 + 4 + 4 = 16 square units

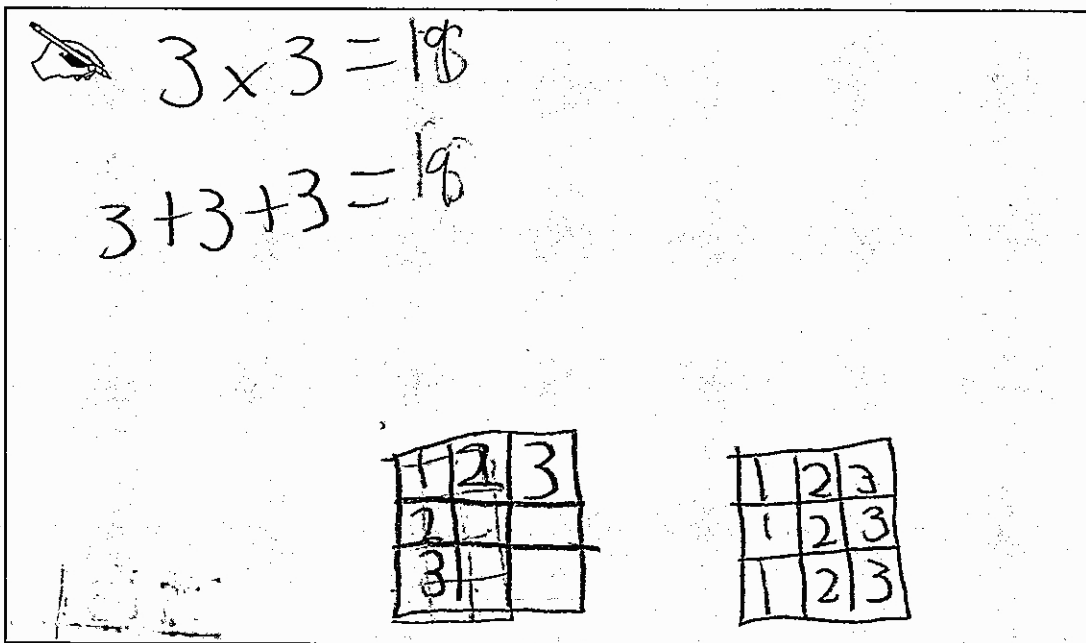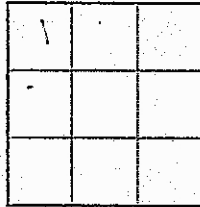a.   Explain or show on the diagram how the multiplication and repeated addition equations describe the rows and columns in Square M.

$$4 \times 4 = 16$$

$$4 + 4 + 4 + 4 = 16$$

Litho#: 01083200015

b. Josh claims that the area of a square can always be determined using either multiplication or repeated addition. Josh is correct.

Write both a multiplication equation and a repeated addition equation to determine the area of Square P.

Square P

$$3 \times 3 = 18$$

$$3 + 3 + 3 = 18$$

Litho#: 01083200015

Anchor 6   Litho 01083200015

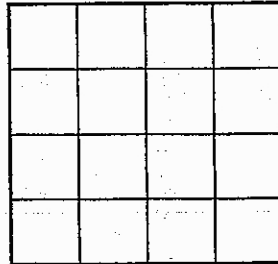Total Content Points: 2   (3.MD.C.7x, 3.MD.C.7z)

Total Practice Points: 0

In Part A, the student uses two grids to illustrate the relationship between the rows and columns and the multiplication ($4 \times 4 = 16$) and repeated addition ($4 + 4 + 4 + 4 = 16$) equations (3.MD.C.7x). The student determines the area of the figure in Part B by writing a multiplication equation (taken as $3 \times 3 = 9$ despite an incompletely erased incorrect answer) and a repeated addition equation (taken as $3 + 3 + 3 = 9$ despite an incompletely erased incorrect answer) (3.MD.C.7z). The student indicates accurate calculations but there are no labels in Part B (no credit for MP6).

Total Awarded Points: 2 out of 3
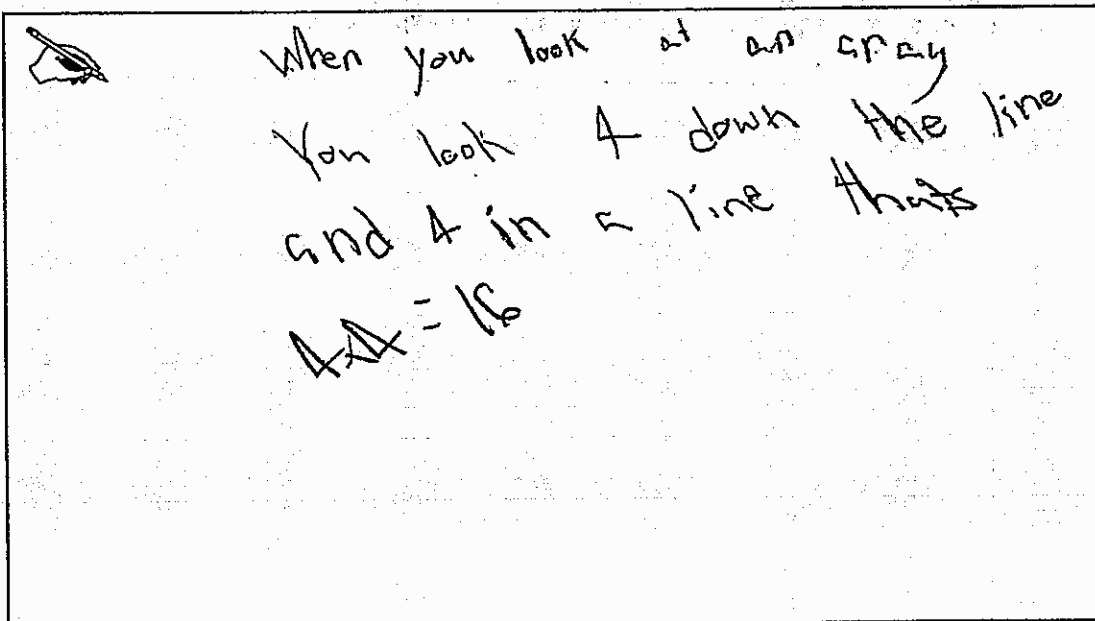
2. Areas of Squares Task

Square M

Josh claims that he can determine the area of Square M using two different ways:

- by a multiplication equation: $4 \times 4 = 16$ square units

- by a repeated addition equation: $4 + 4 + 4 + 4 = 16$ square units
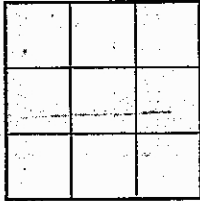
a. Explain or show on the diagram how the multiplication and repeated addition equations describe the rows and columns in Square M.

When you look at an array
You look 4 down the line
and 4 in a line that's

$4 \times 4 = 16$

Litho#: 0006

b. Josh claims that the area of a square can always be determined using either multiplication or repeated addition. Josh is correct.

Write both a multiplication equation and a repeated addition equation to determine the area of Square P.

Square P

$$3+3+3=9$$

$$\begin{array}{r} 3 \\ \times\ 3 \\ \hline 9 \end{array}$$

Anchor 7   Litho 0006

Total Content Points: 1   (3.MD.C.7z)

Total Practice Points: 0

In Part A, the student explains the relationship between the rows and columns ("4 down the line and 4 in a line") and the multiplication equation ($4 \times 4 = 16$), but not the repeated addition equation (no credit for 3.MD.C.7x). The student determines the area of the figure in Part B by writing a multiplication expression ($3 \times 3 = 9$) and a repeated addition equation ($3 + 3 + 3 = 9$) (3.MD.C.7z). The student indicates accurate calculations and gives an acceptable explanation in Part A, but there are no labels in Part B (no credit for MP6).

Total Awarded Points: 1 out of 3

2. Areas of Squares Task
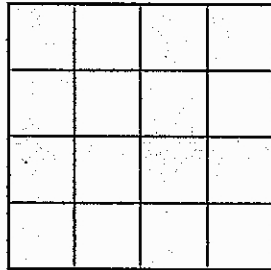
Square M

Josh claims that he can determine the area of Square M using two different ways:

- by a multiplication equation: $4 \times 4 = 16$ square units

- by a repeated addition equation: $4 + 4 + 4 + 4 = 16$ square units
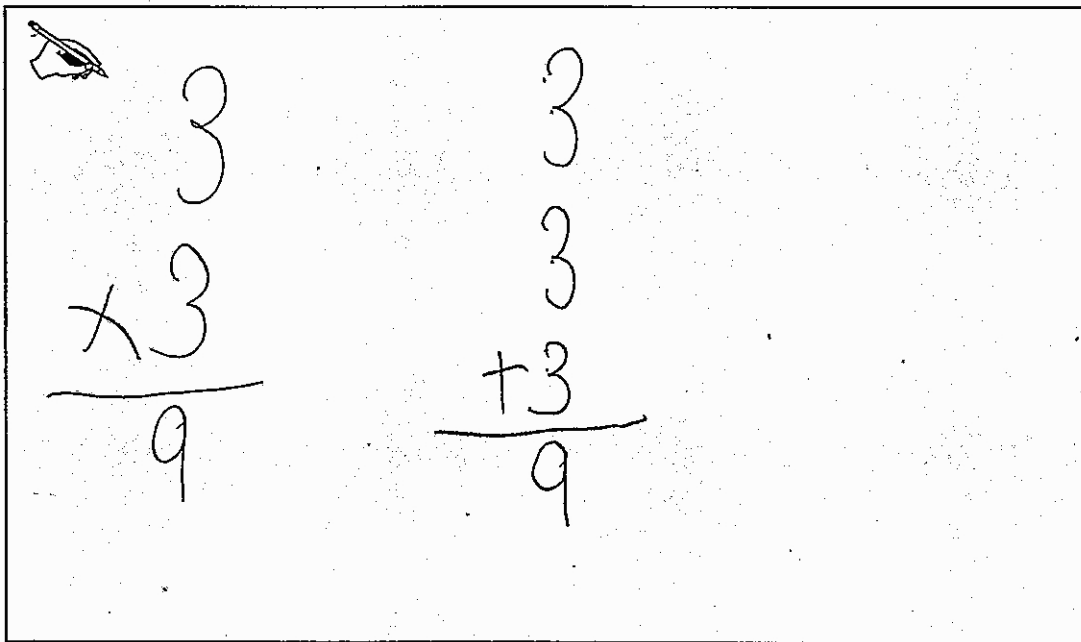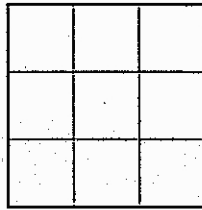
a. Explain or show on the diagram how the multiplication and repeated addition equations describe the rows and columns in Square M.

Because it is an a, array. I has a row with four blockes and a other row with four blocks.

Litho#: 01143200015

b. Josh claims that the area of a square can always be determined using either multiplication or repeated addition. Josh is correct.

Write both a multiplication equation and a repeated addition equation to determine the area of Square P.

Square P

$$\begin{array}{|c|c|c|}\hline & & \\\hline & & \\\hline & & \\\hline\end{array}$$

$$\begin{array}{r} 3 \\ \times 3 \\ \hline 9 \end{array} \qquad \begin{array}{r} 3 \\ 3 \\ + 3 \\ \hline 9 \end{array}$$

Anchor 8   Litho 01143200015

Total Content Points: 1   (3.MD.C.7z)

Total Practice Points: 0

Because the indicated area ("a row with four blockes and a other row with four blocks")
is not the complete square, and is not related to the given multiplication and addition
equations, the student does not show or explain the relationship between the rows and
columns and the multiplication and repeated addition equations in Part A (no credit
for 3.MD.C.7x). The student determines the area of the figure in Part B by writing a
multiplication expression ($3 \times 3 = 9$) and a repeated addition expression ($3 + 3 + 3 = 9$)
(3.MD.C.7z). The student indicates accurate calculations and gives precise explanations,
but there are no labels in Part B (no credit for MP6).

Total Awarded Points: 1 out of 3
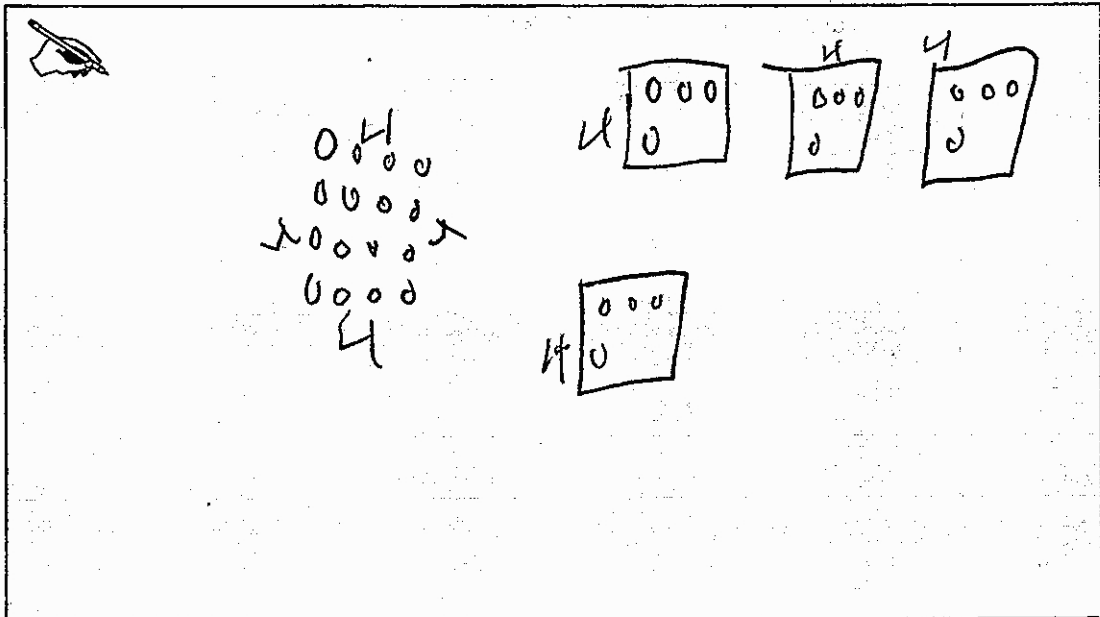
2. Areas of Squares Task
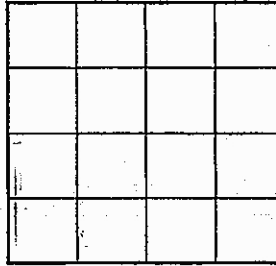
Square M

Josh claims that he can determine the area of Square M using two different ways:

- by a multiplication equation: 4 × 4 = 16 square units

- by a repeated addition equation: 4 + 4 + 4 + 4 = 16 square units

a. Explain or show on the diagram how the multiplication and repeated addition equations describe the rows and columns in Square M.

b. Josh claims that the area of a square can always be determined using either multiplication or repeated addition. Josh is correct.

Write both a multiplication equation and a repeated addition equation to determine the area of Square P.

Square P

$$3 \times 3 = 9$$
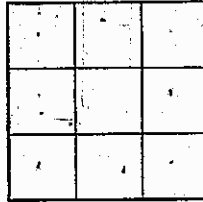
$$3 + 3 + 3 = 9$$

Anchor 9   Litho 0022

Total Content Points: 1   (3.MD.C.7x)

Total Practice Points: 0

In Part A, although the student provides diagrams attempting to show the relationship between rows and columns and the multiplication and repeated addition equations in the question, the diagrams are insufficient to explain this relationship without better labeling or an accompanying explanation (no credit for 3.MD.C.7x). The student determines the area of the figure in Part B by writing a multiplication equation ($3 \times 3 = 9$) and a repeated addition equation ($3 + 3 + 3 = 9$) (3.MD.C.7z). The student indicates accurate calculations, but there are no labels in Part B (no credit for MP6).

Total Awarded Points: 1 out of 3

2. Areas of Squares Task

Square M

Josh claims that he can determine the area of Square M using two different ways:

- by a multiplication equation: $4 \times 4 = 16$ square units

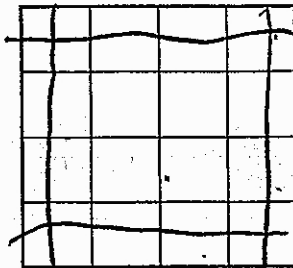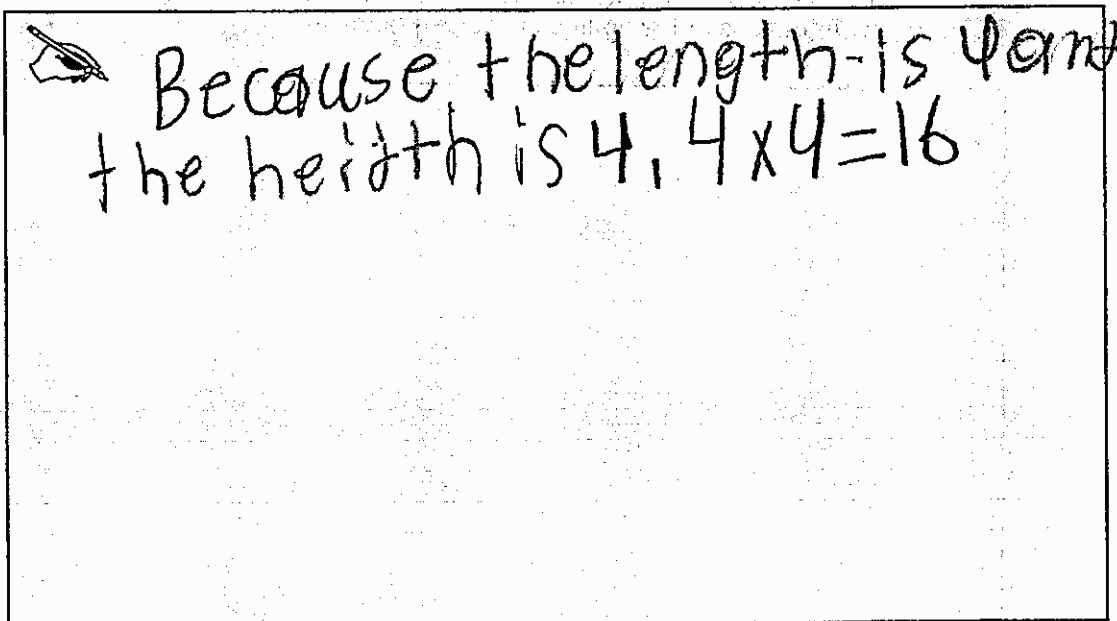- by a repeated addition equation: $4 + 4 + 4 + 4 = 16$ square units

a. Explain or show on the diagram how the multiplication and repeated addition equations describe the rows and columns in Square M.

Because the length is 4 and the heigth is 4, 4x4=16

b. Josh claims that the area of a square can always be determined using either multiplication or repeated addition. Josh is correct.

Write both a multiplication equation and a repeated addition equation to determine the area of Square P.

Square P

$$3 + 3 + 3 + 3 = 12$$

$$6\!\!\!\!\diagdown \times 4 = 12$$

Anchor 10   Litho 0030

Total Content Points: 0

Total Practice Points: 0

In Part A, the student explains the relationship between the rows and columns ("length is 4 and the heidth is 4") and the multiplication equation ($4 \times 4 = 16$), but not the repeated addition equation (no credit for 3.MD.C.7x). The student does not determine the area of the figure in Part B because the multiplication equation ($3 \times 4 = 12$) and repeated addition equation ($3 + 3 + 3 + 3 = 12$) provided do not match the figure (no credit for 3.MD.C.7z). The student indicates accurate calculations (although the calculations do not match the context of the task, they are correctly calculated) and gives precise explanations, but there are no labels in Part B (no credit for MP6).

Total Awarded Points: 0 out of 3

2. Areas of Squares Task

Square M

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Josh claims that he can determine the area of Square M using two different ways:

- by a multiplication equation: 4 × 4 = 16 square units

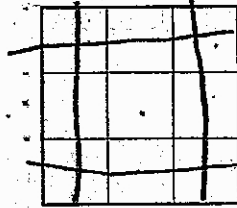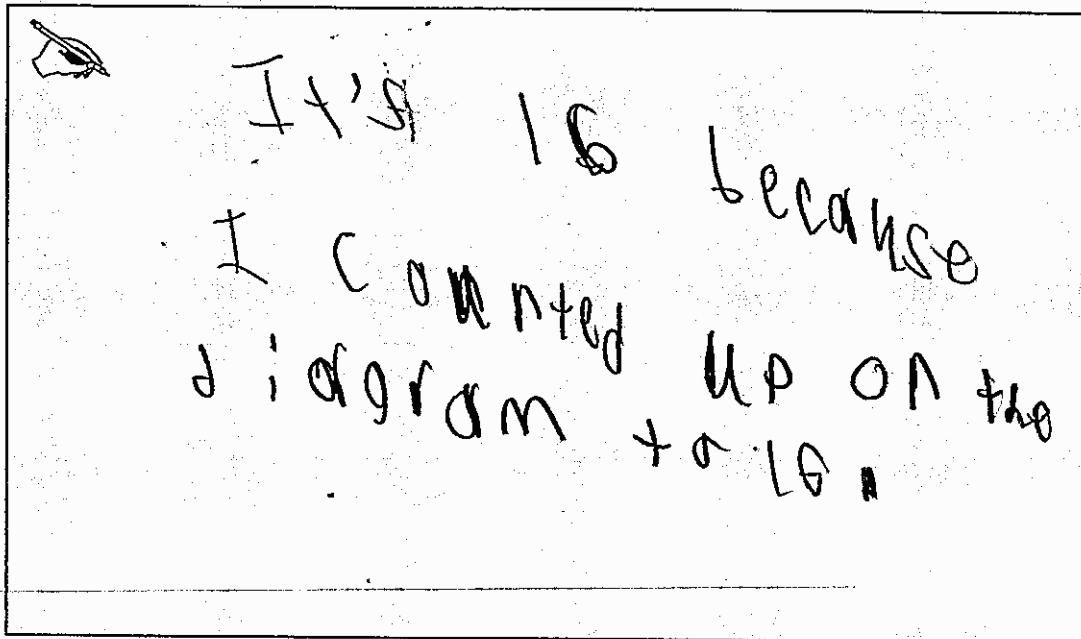- by a repeated addition equation: 4 + 4 + 4 + 4 = 16 square units

a. Explain or show on the diagram how the multiplication and repeated addition equations describe the rows and columns in Square M.

It's 16 because I counted up on the diagram to 16.

b.   Josh claims that the area of a square can always be determined using either multiplication or repeated addition. Josh is correct.

Write both a multiplication equation and a repeated addition equation to determine the area of Square P.

Square P

$$9 \times 1 = 9$$

$$4 + 4 + 1 = 9$$
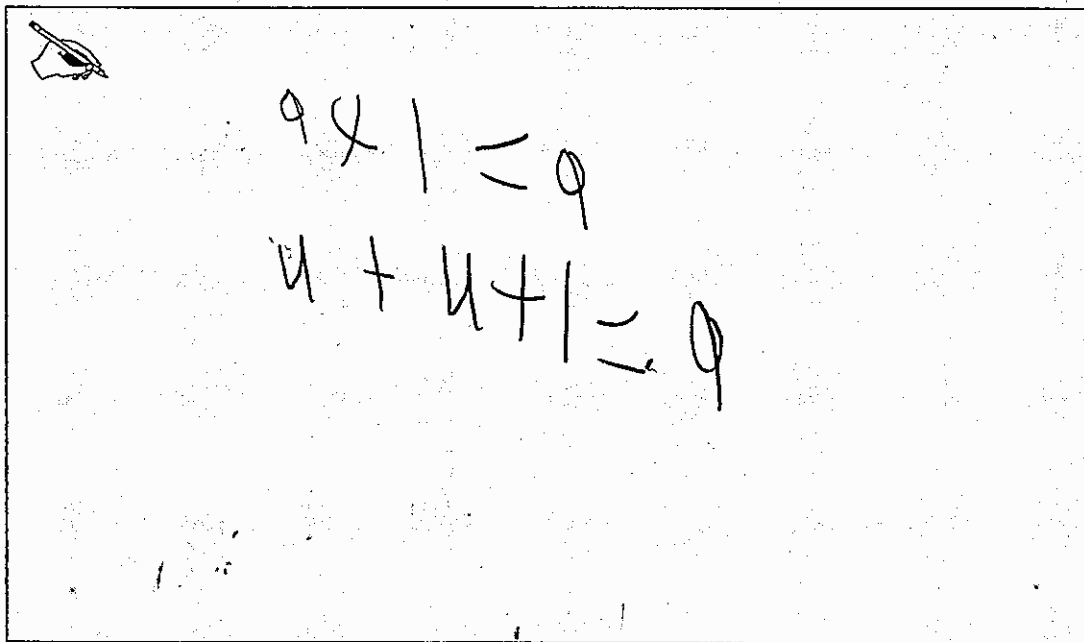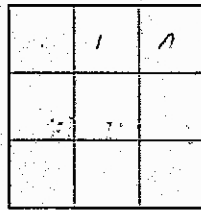
Litho#: 00893200015

Anchor 11   Litho 00893200015

Total Content Points: 0

Total Practice Points: 0

In Part A, the student does not show or explain the relationship between the rows and columns and the multiplication and repeated addition equations ("I counted up on the diagram") (no credit for 3.MD.C.7x). The student does not determine the area of the figure in Part B because the multiplication equation ($9 \times 1 = 9$) and repeated addition equation ($4 + 4 + 1 = 9$) provided do not match the figure (no credit for 3.MD.C.7z). The student indicates accurate calculations and gives precise explanations, but there are no labels in Part B (no credit for MP6).

Total Awarded Points: 0 out of 3