Tennessee Comprehensive Assessment Program

TCAP/CRA 2013

3

Anchor Set

Grade 3 – Using Simpler Problems Task

SECURE MATERIAL - Reader Name: _____

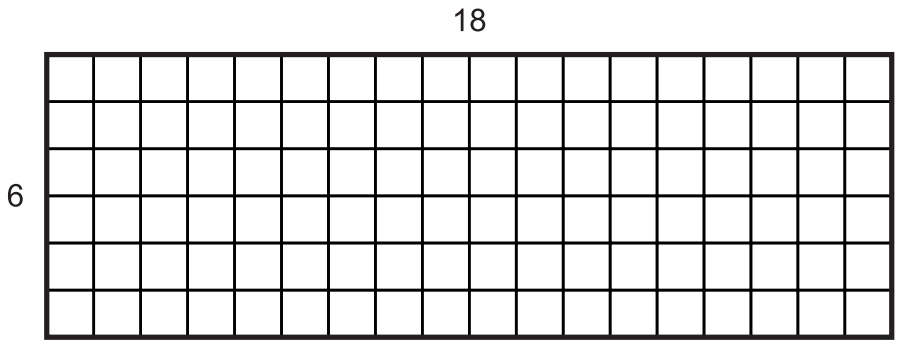
Tennessee Comprehensive Assessment Program

Part 2: Constructed Response Task Section

Using Simpler Problems

Suppose you do *not* know how to solve 18×6 to find the area of Figure 1 below.

Figure 1



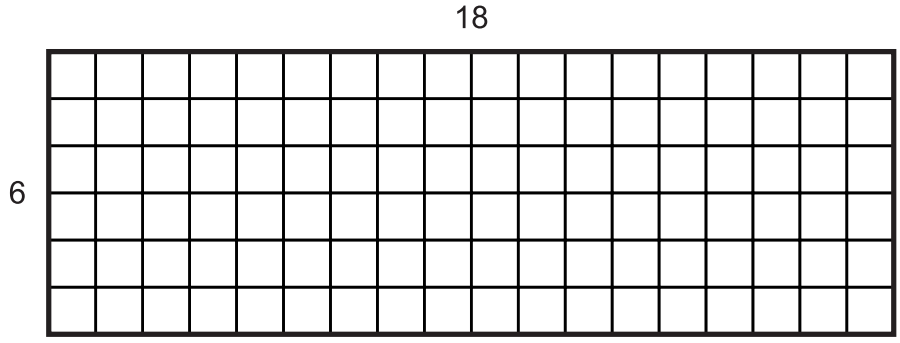
a. Draw a line on Figure 1 above to partition the whole figure into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

b. Explain how the multiplication equations for the rectangles that you created relate to the side lengths of Figure 1.

Part 2: Constructed Response Task Section

c. Now, draw a line to show a *different* way of partitioning Figure 1 below into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

Figure 1



d. Find the total area of Figure 1 using the areas of the rectangles that you created. Explain with words and equations how you used the areas of the rectangles you created to determine the total area of Figure 1.

REVIEW YOUR WORK IF YOU HAVE TIME.

Scoring Guide

The CCSS for Mathematical Content (2 points)

3.MD.C.7c Writes multiplication equations that represents the partitioned areas and indicates that one factor has been decomposed into smaller quantities. _____

(1 Point)

3.MD.C.7d Indicates the use of the areas of the rectangles to find the total area of the 18 x 6 figure.

(1 Point)

The CCSS for Mathematical Practice (2 points)

MP1 Makes decisions about how to approach the task. The student may show this in any of the following ways: partitioning of the figure, labeling dimensions, indicating the number of square tiles per row or column. Works to complete all parts of the task. _____

(1 point)

(MP1: Make sense of problems and persevere in solving them.)

MP6 Indicates precise calculations and precise explanations.

(1 Point)

(MP6: Attend to precision.)

TOTAL POINTS: 4

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.7c	Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.
3.MD.C.7d	Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.

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.

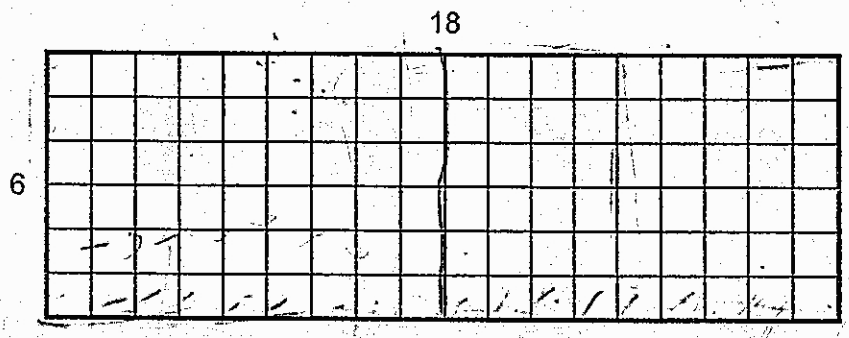
* Gray type indicates Mathematical Practices not addressed in this assessment.

A-1a

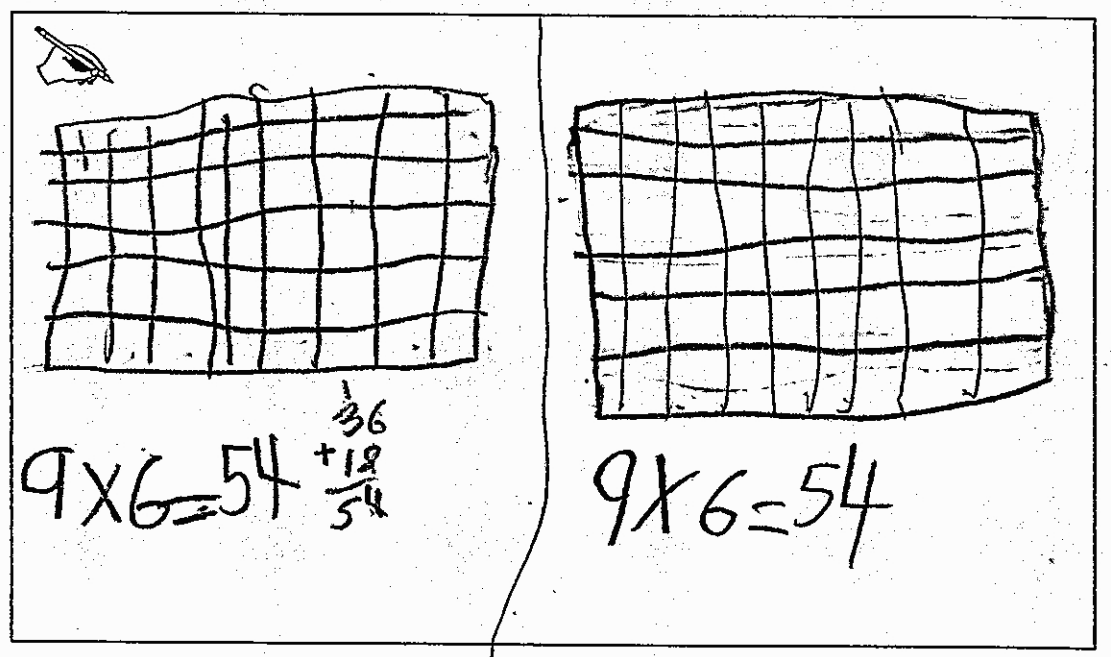
3. Using Simpler Problems

Suppose you do *not* know how to solve 18 × 6 to find the area of Figure 1 below.

Figure 1



a. Draw a line on Figure 1 above to partition the whole figure into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.



A-1b

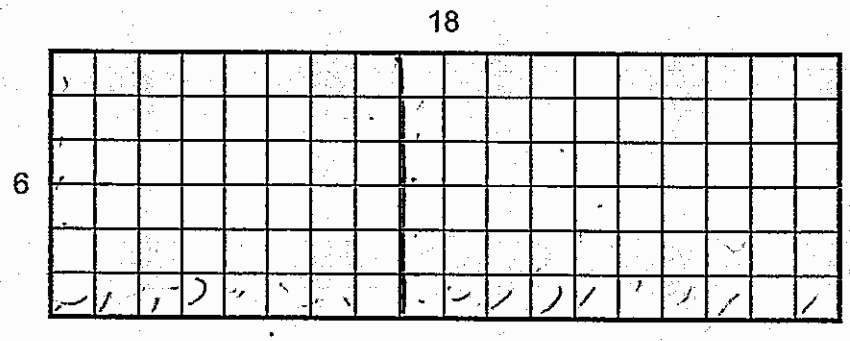
b. Explain how the multiplication equations for the rectangles that you created relate to the side lengths of Figure 1.

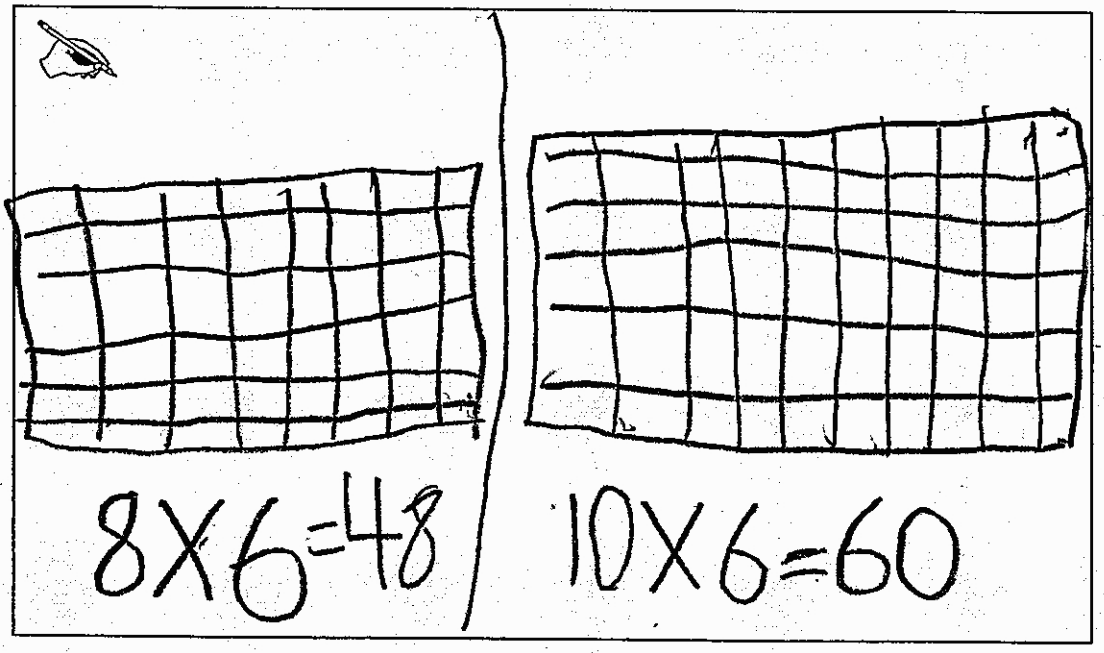
9+9=18

A-1c

c. Now, draw a line to show a *different* way of partitioning Figure 1 below into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

Figure 1





8 16 + 32 / 16 / 48

A-1d

d. Find the total area of Figure 1 using the areas of the rectangles that you created. Explain with words and equations how you used the areas of the rectangles you created to determine the total area of Figure 1.

48 +
60
108

The way to find the answer is take both of the equations answers and add the together.

Anchor 1 Litho 01043200015

Total Content Points: 2 (3.MD.C.7c, 3.MD.C.7d)

Total Practice Points: 2 (MP1, MP6)

In Part A, the student provides multiplication equations ($9 \times 6 = 54$ twice) that represent the partitioned areas and, in Part B, indicates that one factor has been decomposed into smaller quantities ($9 + 9 = 18$) (3.MD.C.7c). In Part C, the student partitions the figure in a different way and calculates the areas of the partitions ($8 \times 6 = 48$, $10 \times 6 = 60$). Then, in Part D, the student uses these areas to find the total area of the 18×6 figure ($48 + 60 = 108$) (3.MD.C.7d). The student makes decisions on how to approach the task by partitioning the figure into rectangles and writing equations, and completes all parts of the task (MP1). The student provides precise calculations and precise explanations (MP6).

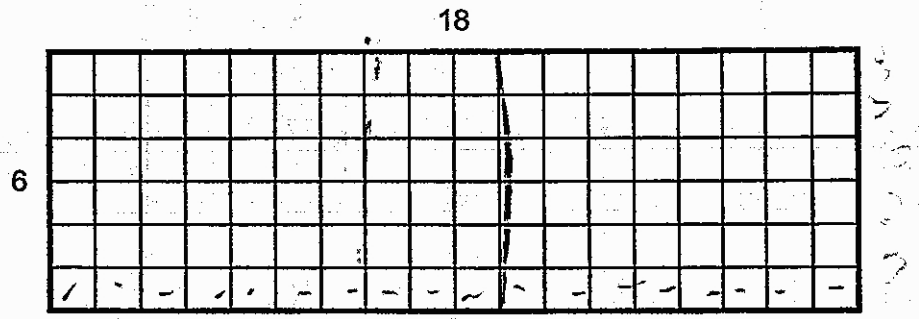
Total Awarded Points: 4 out of 4

A-2a

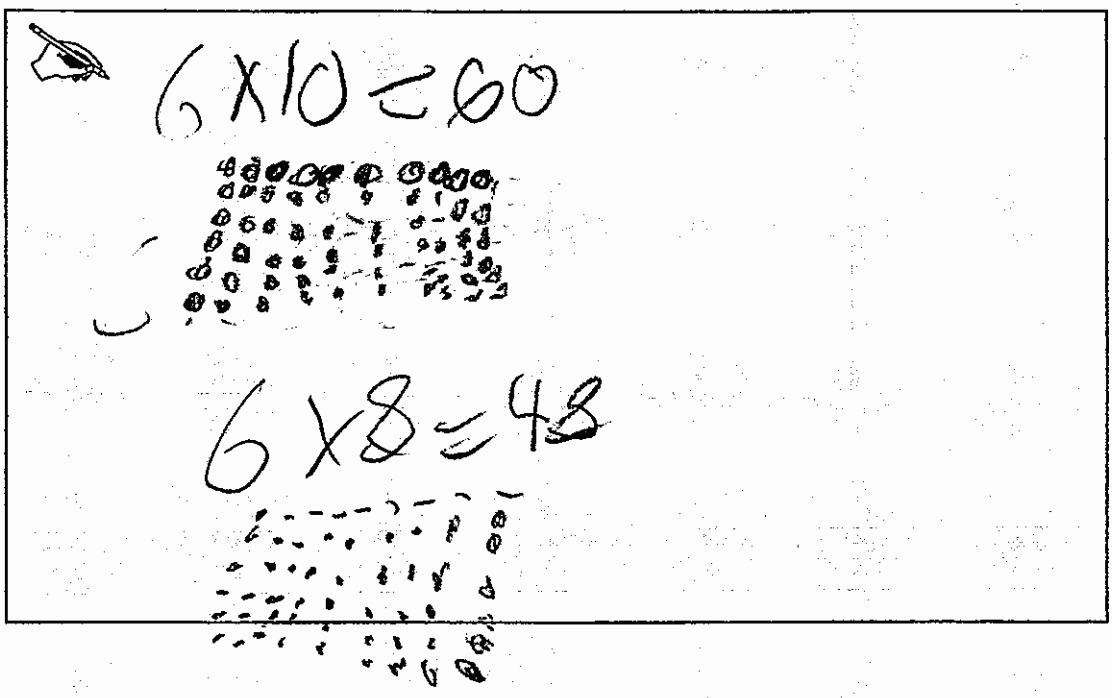
3. Using Simpler Problems

Suppose you do *not* know how to solve 18 × 6 to find the area of Figure 1 below.

Figure 1



a. Draw a line on Figure 1 above to partition the whole figure into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.



A-2b

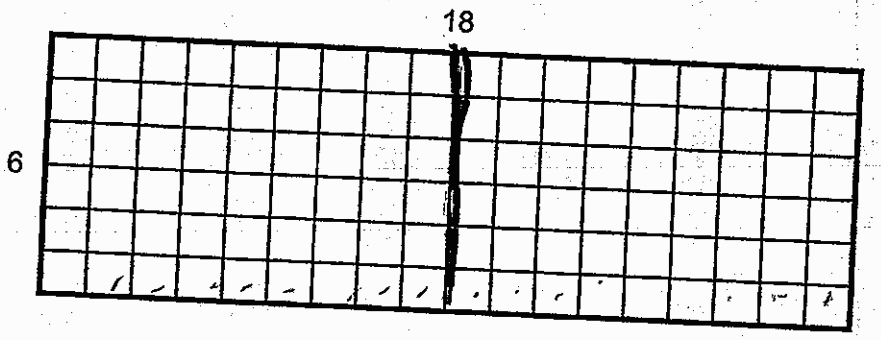
b. Explain how the multiplication equations for the rectangles that you created relate to the side lengths of Figure 1.

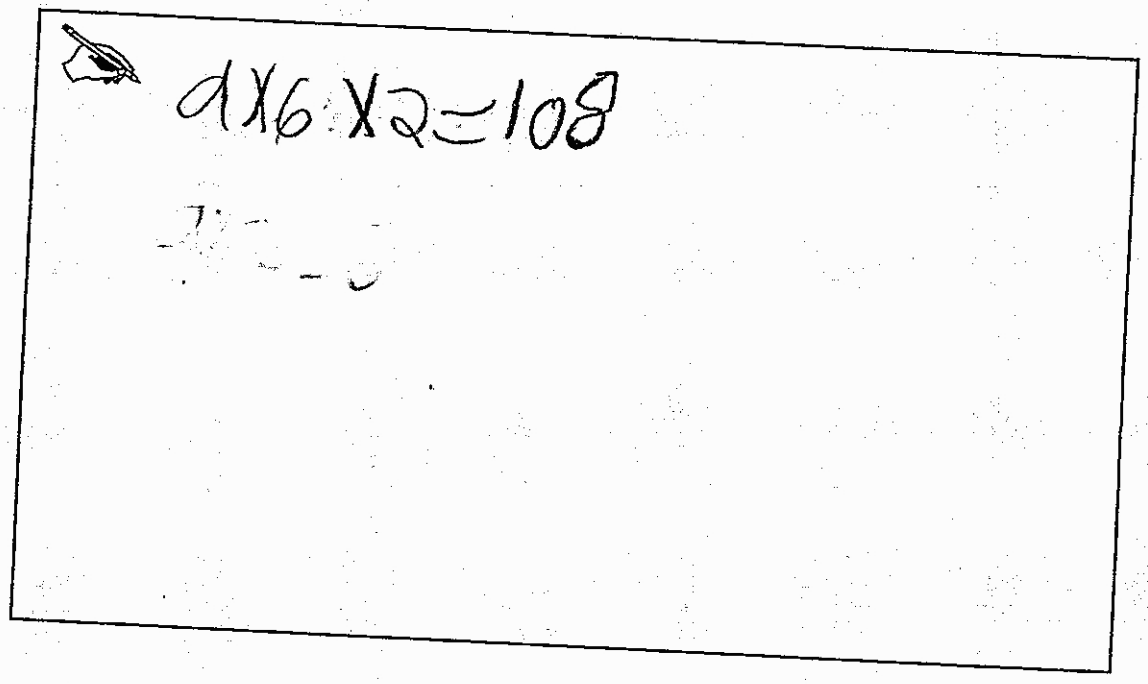
1 multiplication equation had 10 and @ther had 8 and in total that is 18. The same Numbe as the side length

A-2c

c. Now, draw a line to show a *different* way of partitioning Figure 1 below into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

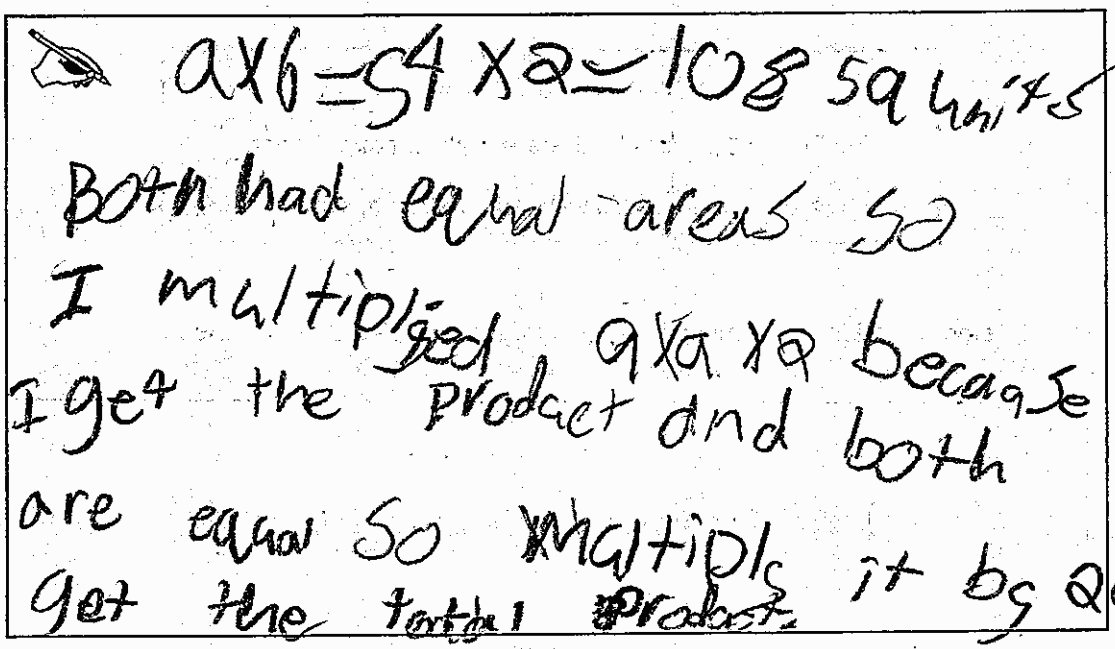
Figure 1





A-2d

d. Find the total area of Figure 1 using the areas of the rectangles that you created. Explain with words and equations how you used the areas of the rectangles you created to determine the total area of Figure 1.



Anchor 2 Litho 0013

Total Content Points: 2 (3.MD.C.7c, 3.MD.C.7d)

Total Practice Points: 1 (MP1)

In Part A, the student provides multiplication equations ($6 \times 10 = 60$ and $6 \times 8 = 48$) that represent the partitioned areas and, in Part B, indicates that one factor has been decomposed into smaller quantities ("1 multiplication equation had 10 and other had 8 and in total that is 18. The same numbe as the side length") (3.MD.C.7c). In Part C, the student partitions the figure into two equal 9×6 rectangles. In Part D, the student calculates the area of one of the partitions ($9 \times 6 = 54$) and multiplies this by 2, since the partitions had equal dimensions, to find the total area of the 18×6 figure ($54 \times 2 = 108$) (3.MD.C.7d). The student makes decisions on how to approach the task by partitioning each of the figures differently and writing equations, and completes all parts of the task (MP1). The student provides precise calculations and the explanation in Part B is precise, but in Part D the explanation is imprecise because the student refers to "$9 \times 9 \times 2$" when explaining how the total area of the figure was determined (no credit for MP6).

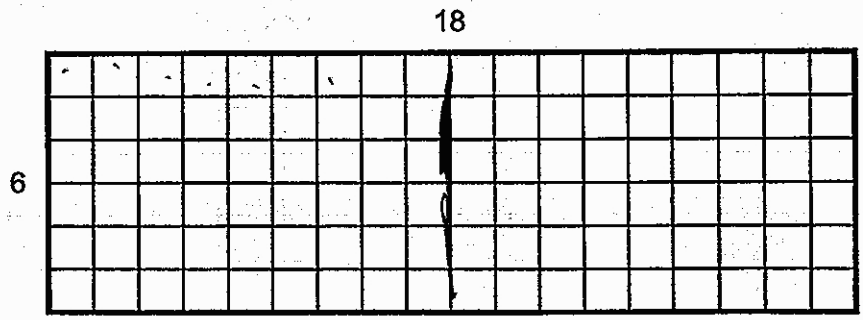
Total Awarded Points: 3 out of 4

A-3a

3. Using Simpler Problems

Suppose you do *not* know how to solve 18 × 6 to find the area of Figure 1 below.

Figure 1

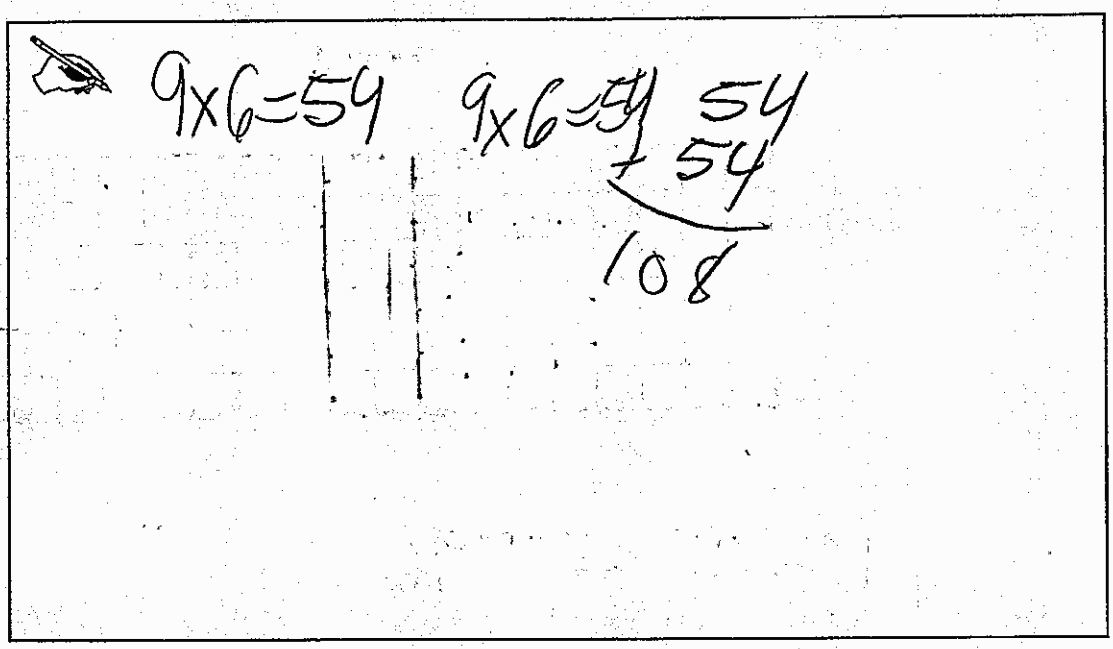


a. Draw a line on Figure 1 above to partition the whole figure into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

$9 \times 6 + 9 \times 6 = 108$

A-3b

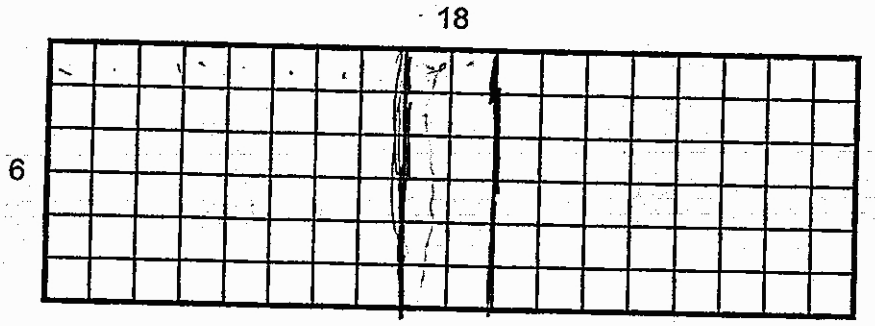
b. Explain how the multiplication equations for the rectangles that you created relate to the side lengths of Figure 1.



A-3c

c. Now, draw a line to show a *different* way of partitioning Figure 1 below into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

Figure 1



$8 \times 6 + 8 \times 6 = 96$ $2 \times 6 = 12$

$96 + 12 = 108$

A-3d

d. Find the total area of Figure 1 using the areas of the rectangles that you created. Explain with words and equations how you used the areas of the rectangles you created to determine the total area of Figure 1.

8x6+8x6=96 2x6=12

96
+12
108

Anchor 3 Litho 0042

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

Total Practice Points: 2 (MP1, MP6)

In Part A, the student provides multiplication equations ($9 \times 6 + 9 \times 6 = 108$) that represent the partitioned areas. However, in Part B, without an addition equation adding the 9s to show the total side length of 18 or an explanation in words, the student does not indicate that one factor has been decomposed into smaller quantities (no credit for 3.MD.C.7c). In Part C, the student partitions the figure in a different way and calculates the areas of the partitions ($8 \times 6 + 8 \times 6 = 96$, $2 \times 6 = 12$). Then, in Part D as well as Part C, the student uses these areas to find the total area of the 18×6 figure ($96 + 12 = 108$) (3.MD.C.7d). By partitioning each of the figures differently and writing equations, the student makes decisions on how to approach the task. All parts of the task are completed (MP1). The student provides precise calculations and in Part D, by using equations, explains how the total area can be determined (MP6).

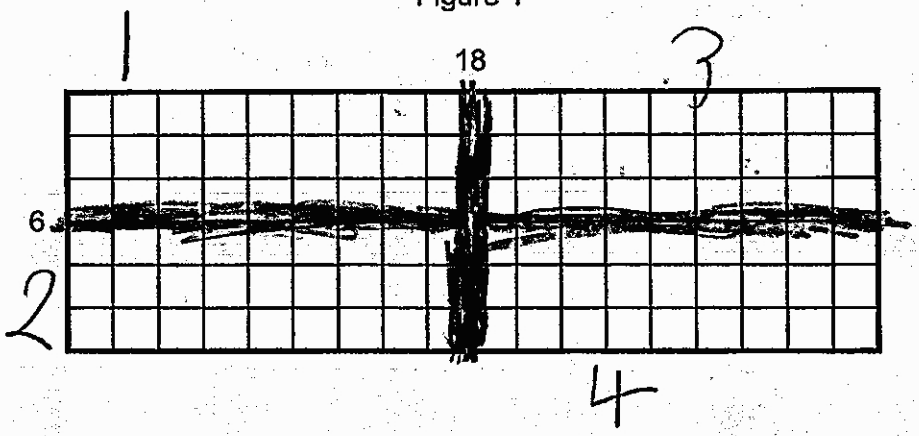
Total Awarded Points: 3 out of 4

A-4a

3. Using Simpler Problems

Suppose you do *not* know how to solve 18 × 6 to find the area of Figure 1 below.

Figure 1



a. Draw a line on Figure 1 above to partition the whole figure into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

6 x 18 = 108

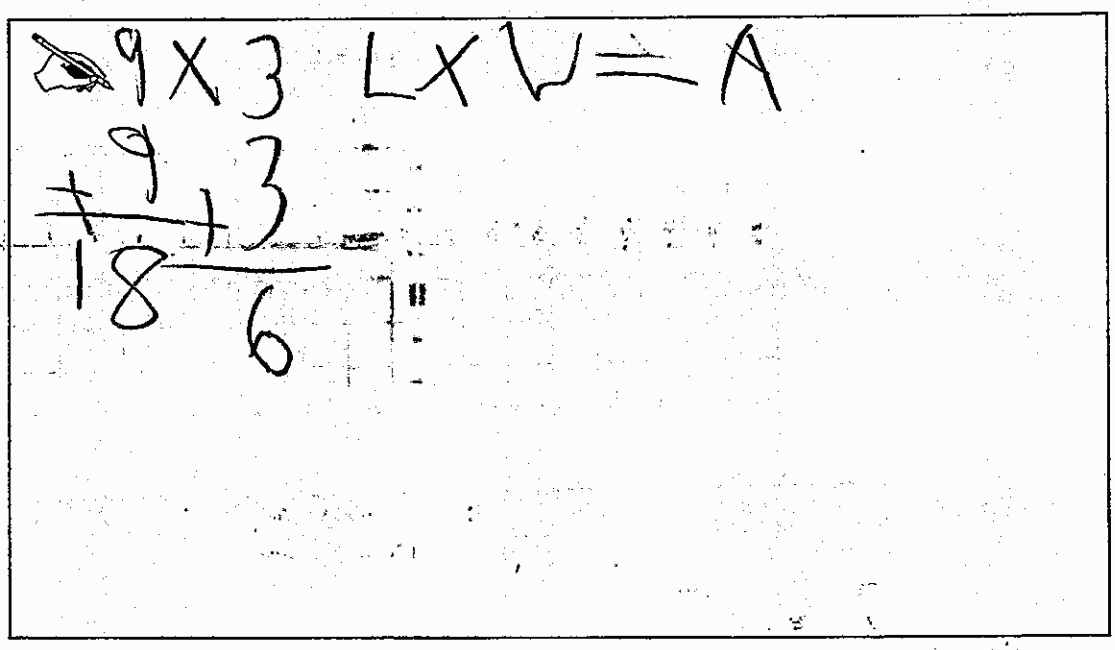
1. 3 x 9 = 27 R14
2. 3 x 9 = 27 > 14
3. 3 x 9 = 27 > 14
4. 3 x 9 = 27 > 14

18

108

A-4b

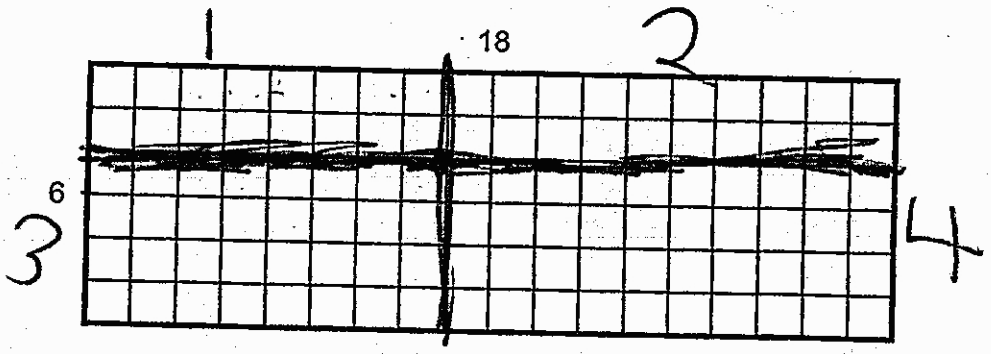
b. Explain how the multiplication equations for the rectangles that you created relate to the side lengths of Figure 1.

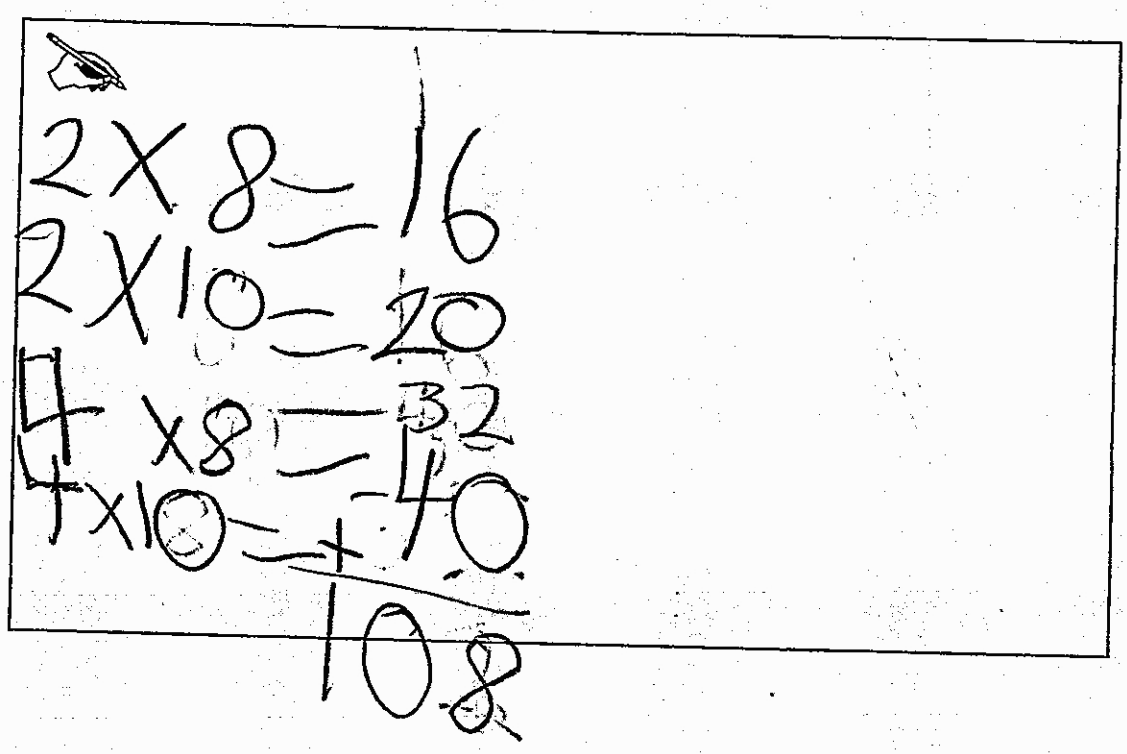


A-4c

c. Now, draw a line to show a *different* way of partitioning Figure 1 below into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

Figure 1





A-4d

d. Find the total area of Figure 1 using the areas of the rectangles that you created. Explain with words and equations how you used the areas of the rectangles you created to determine the total area of Figure 1.

2 x 8 = 16
2 x 10 = 20
4 x 8 = 32
4 x 10 = 40

Anchor 4 Litho 0040

Total Content Points: 2 (3.MD.C.7c, 3.MD.C.7d)

Total Practice Points: 1 (MP1)

In Part A, the student provides multiplication equations ($3 \times 9 = 27$ four times) that represent the partitioned areas, and in Part B the student indicates that one factor has been decomposed into smaller quantities ($9 + 9 = 18$) (3.MD.C.7c). In Part C, the student partitions the figure in a different way and calculates the areas of the partitions ($2 \times 8 = 16$, $2 \times 10 = 20$, $4 \times 8 = 32$, $4 \times 10 = 40$). The student also uses these areas to find the total area of the 18×6 figure (108) in Part C, which is acceptable as long as Part D doesn't contradict it (3.MD.C.7d). The student completes all parts of the task, and by partitioning each of the figures differently and writing equations, makes decisions on how to approach the task (MP1). The student provides precise calculations, but the equations and notation in Part B is unclear. Also, in Part D, where the student is directed to determine and explain the total area, the student only writes the equations and does not explain the significance of the sums (no credit for MP6).

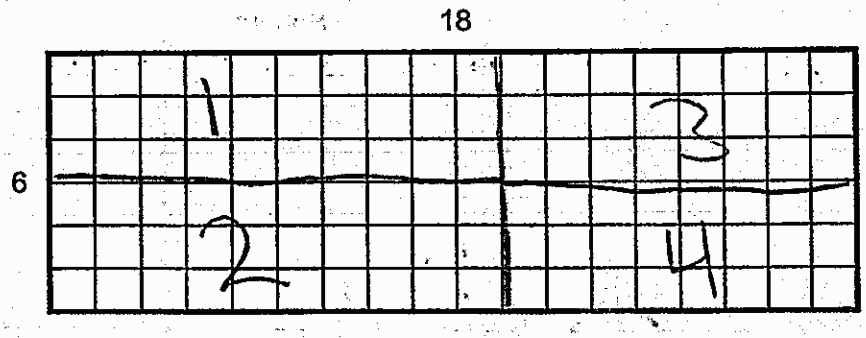
Total Awarded Points: 3 out of 4

A-5a

3. Using Simpler Problems

Suppose you do *not* know how to solve 18 × 6 to find the area of Figure 1 below.

Figure 1

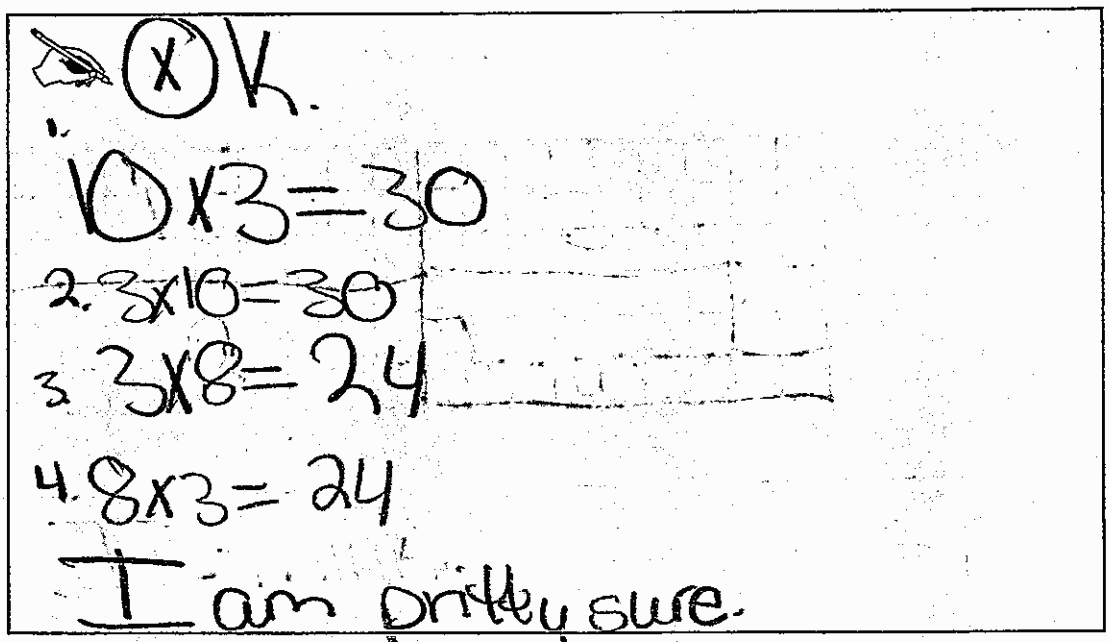


a. Draw a line on Figure 1 above to partition the whole figure into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

I could olny do 4, beacuse that is all I could do.

A-5b

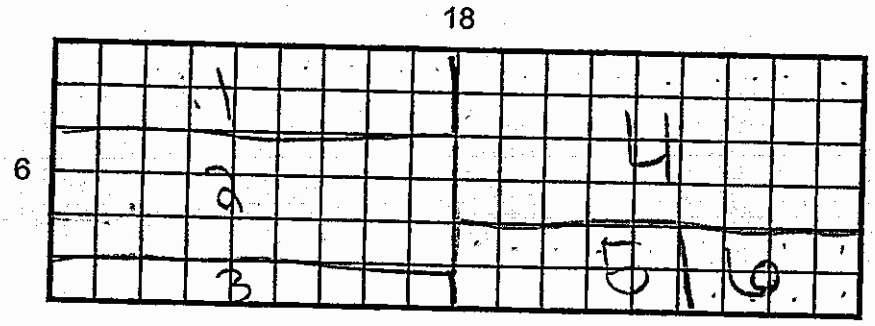
b. Explain how the multiplication equations for the rectangles that you created relate to the side lengths of Figure 1.



A-5c

c. Now, draw a line to show a *different* way of partitioning Figure 1 below into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

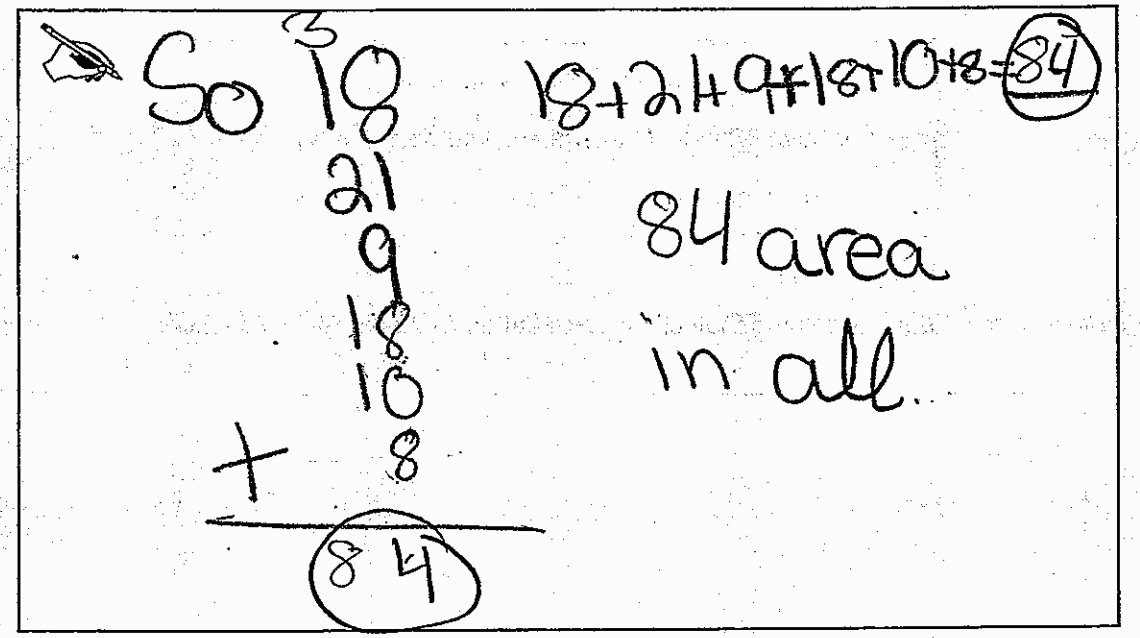
Figure 1



9x2=18
9x3=21
9x1=9
4x9=18
5x2=10
4x2=8

A-5d

d. Find the total area of Figure 1 using the areas of the rectangles that you created. Explain with words and equations how you used the areas of the rectangles you created to determine the total area of Figure 1.



Anchor 5 Litho 0027

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

Total Practice Points: 1 (MP1)

In Part A, the student partitions the figure into four rectangles and, in Part B, provides multiplication equations that represent the partitioned areas ($10 \times 3 = 30$, $3 \times 10 = 30$, $3 \times 8 = 24$, and $8 \times 3 = 24$). However, by not showing an addition equation adding the 8 and 10 to show the total side length of 18 or explaining in words, the student does not indicate that one factor has been decomposed into smaller quantities (no credit for 3.MD.C.7c). In Part C, the student uses the correct process to partition the figure and determine areas for each of the partitions ($9 \times 2 = 18$, $9 \times 3 = 21$, $9 \times 1 = 9$, $4 \times 9 = 18$, $5 \times 2 = 10$, $4 \times 2 = 8$) in order to find the total area of the 18×6 figure in Part D ($18 + 21 + 9 + 18 + 10 + 8 = 84$) (3.MD.C.7d). There are two inaccurate calculations ($9 \times 3 = 21$, $4 \times 9 = 18$) resulting in an incorrect total area (84) (no credit for MP6). The student makes decisions on how to approach the task by partitioning each of the figures differently and writing equations, and completes all parts of the task (MP1).

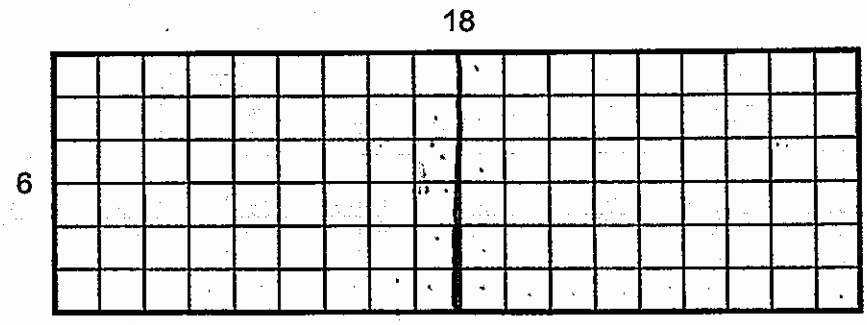
Total Awarded Points: 2 out of 4

A-6a

3. Using Simpler Problems

Suppose you do *not* know how to solve 18 × 6 to find the area of Figure 1 below.

Figure 1

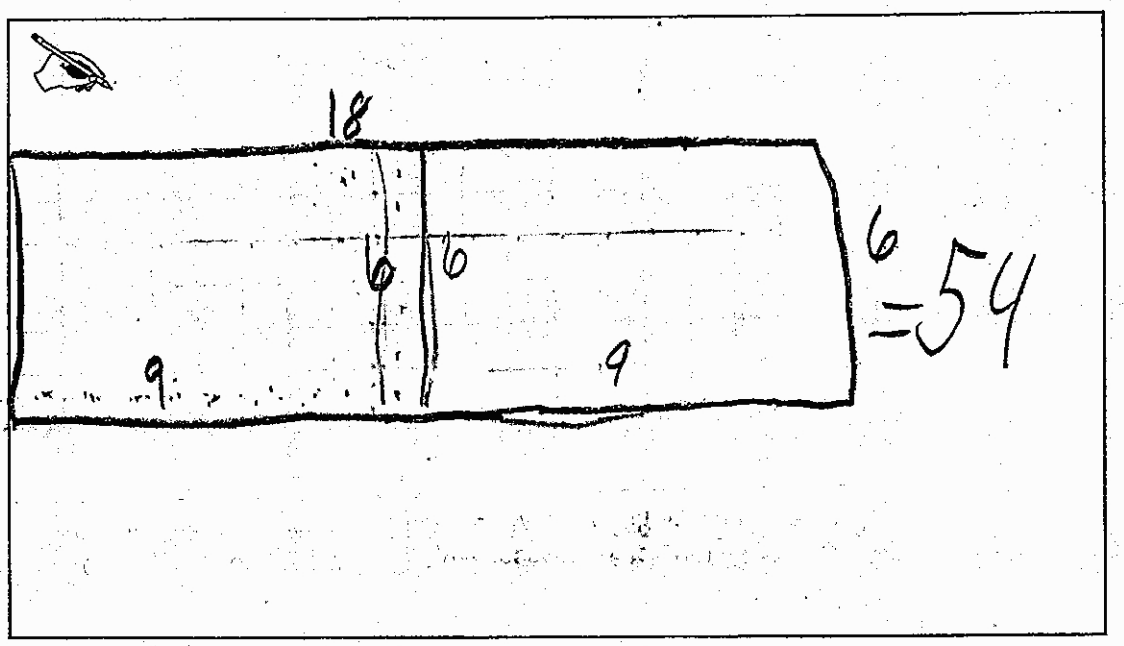


a. Draw a line on Figure 1 above to partition the whole figure into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

6 x 9 = 54 6 x 9 = 54
54 + 54 = 108

A-6b

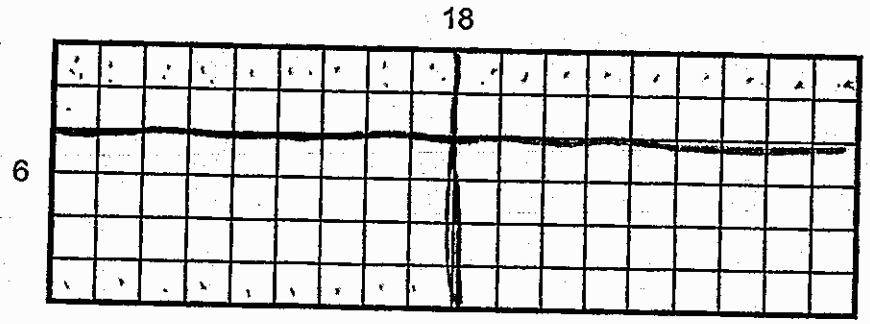
b. Explain how the multiplication equations for the rectangles that you created relate to the side lengths of Figure 1.



A-6c

c. Now, draw a line to show a *different* way of partitioning Figure 1 below into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

Figure 1



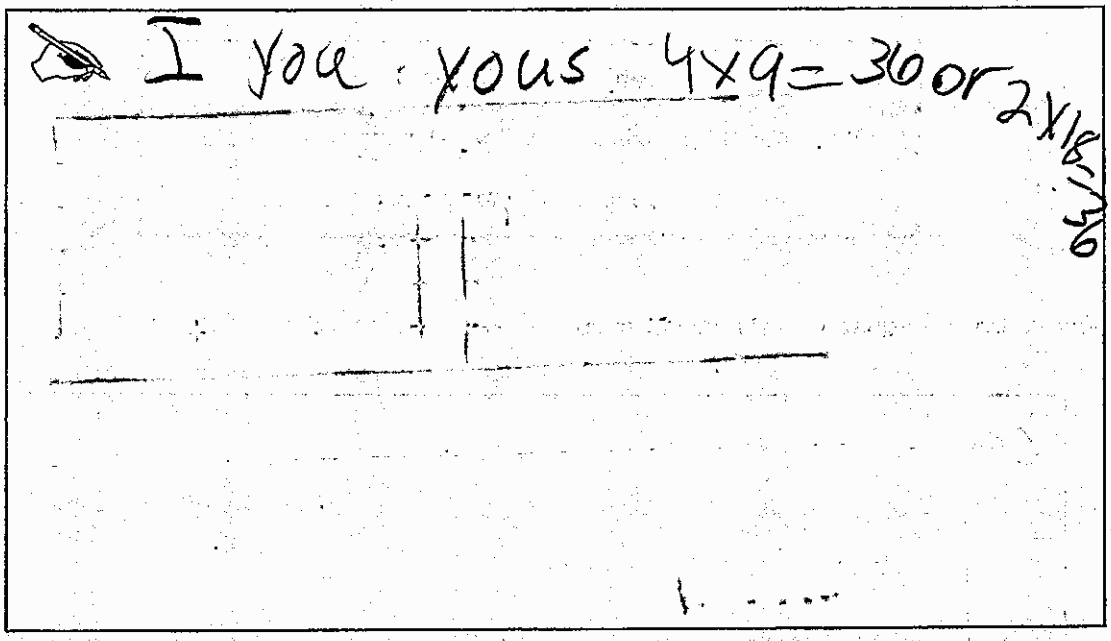
2 X 8

2 X 18 = 36

4 X 9 = 36

A-6d

d. Find the total area of Figure 1 using the areas of the rectangles that you created. Explain with words and equations how you used the areas of the rectangles you created to determine the total area of Figure 1.



Anchor 6 Litho 0002

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

Total Practice Points: 1 (MP1)

In Part A, the student provides multiplication equations that represent the partitioned areas ($6 \times 9 = 54$ twice). In Part B, by drawing a diagram with 18 on the top length and two 9s on the bottom length, the student indicates that one factor has been decomposed into smaller quantities (3.MD.C.7c). The student attempts in Part C to partition the figure, but does not write an equation for each partitioned rectangle. In Part D, the student does not find the total area of the 18×6 figure (no credit for 3.MD.C.7d). The student attempts to complete all parts of the task, and makes decisions on how to approach the task by partitioning each of the figures differently and writing equations (MP1). The student provides precise calculations, but in Part B it is unclear what the notation (= 54) refers to, and in Part C the student does not indicate side length as being 10 or less in one equation ($2 \times 18 = 36$) (no credit for MP6).

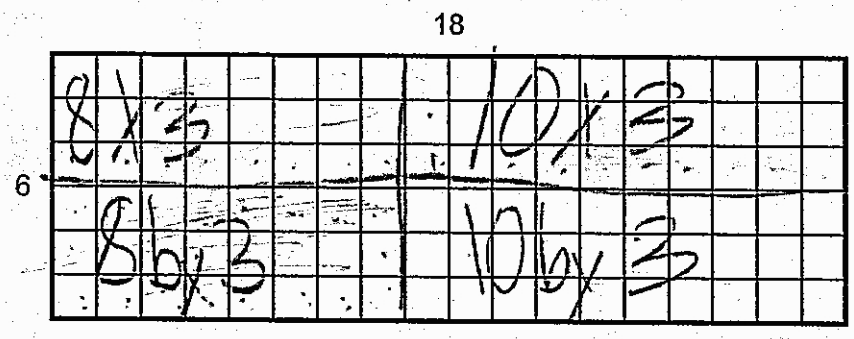
Total Awarded Points: 2 out of 4

A-7a

3. Using Simpler Problems

Suppose you do *not* know how to solve 18 × 6 to find the area of Figure 1 below.

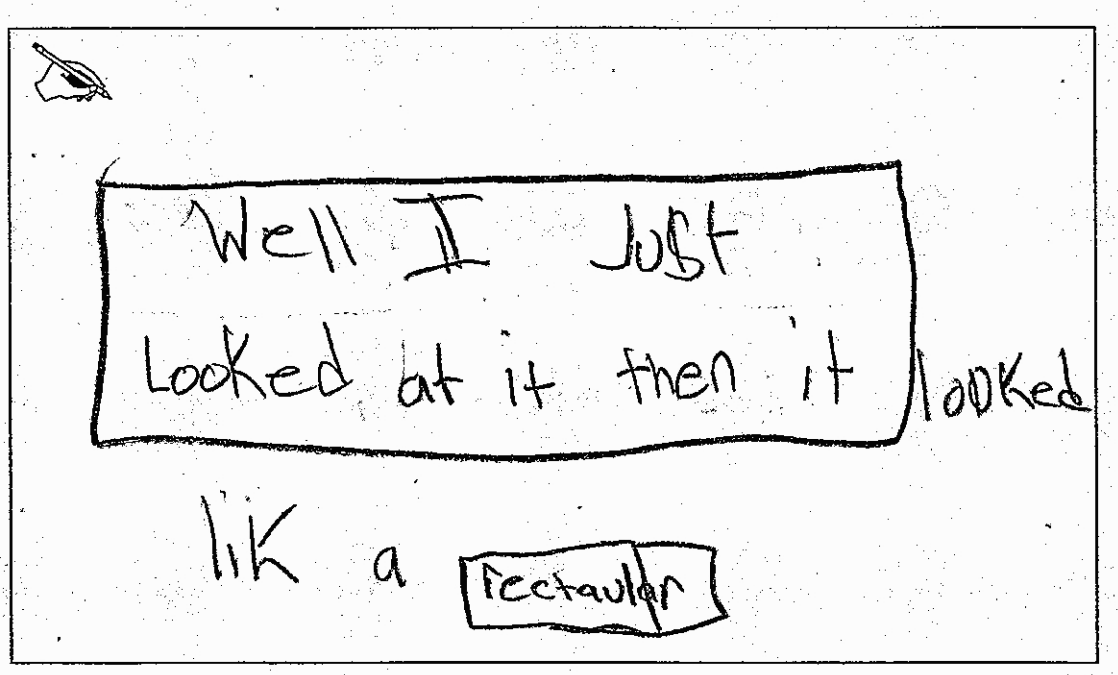
Figure 1



a. Draw a line on Figure 1 above to partition the whole figure into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

A-7b

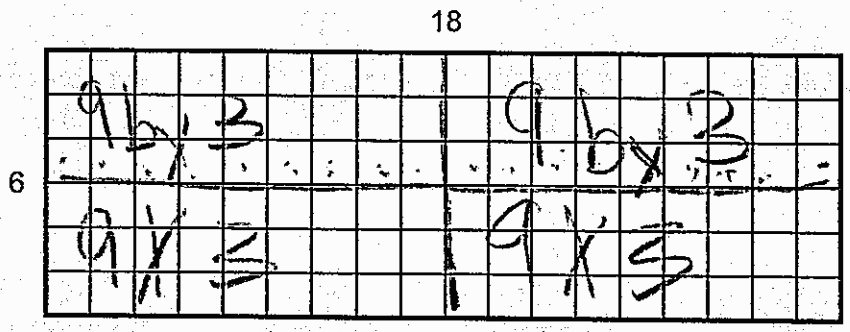
b. Explain how the multiplication equations for the rectangles that you created relate to the side lengths of Figure 1.



A-7c

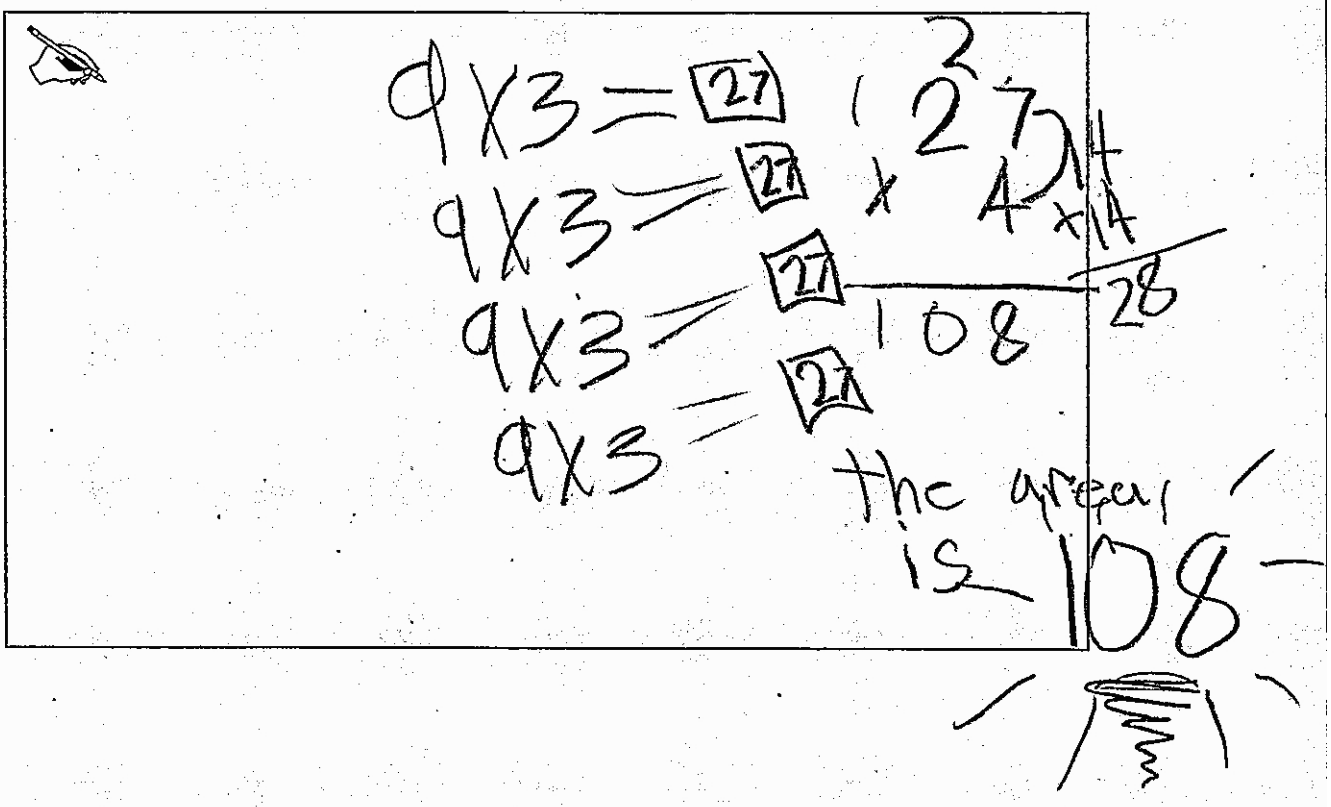
c. Now, draw a line to show a *different* way of partitioning Figure 1 below into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

Figure 1



A-7d

d. Find the total area of Figure 1 using the areas of the rectangles that you created. Explain with words and equations how you used the areas of the rectangles you created to determine the total area of Figure 1.



Anchor 7 Litho 01223200015

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

Total Practice Points: 1 (MP1)

In Part A, the student provides only multiplication expressions to represent the partitioned areas (8×3, 10×3) instead of equations, and in Part B the student does not indicate that one factor has been decomposed into smaller quantities (no credit for 3.MD.C.7c). In Part C, the student partitions the figure and provides expressions for the partitions. The student, in Part D, determines the areas of the rectangles ($9 \times 3 = 27$ four times) to use to find the total area of the 18×6 figure ($27 \times 4 = 108$) (3.MD.C.7d). The student attempts to complete all parts of the task, and makes decisions on how to approach the task by partitioning each of the figures differently and writing expressions and equations (MP1). Without calculations in Part A and with the oversimplified explanation in Part B, the student does not provide enough evidence of precision (no credit for MP6).

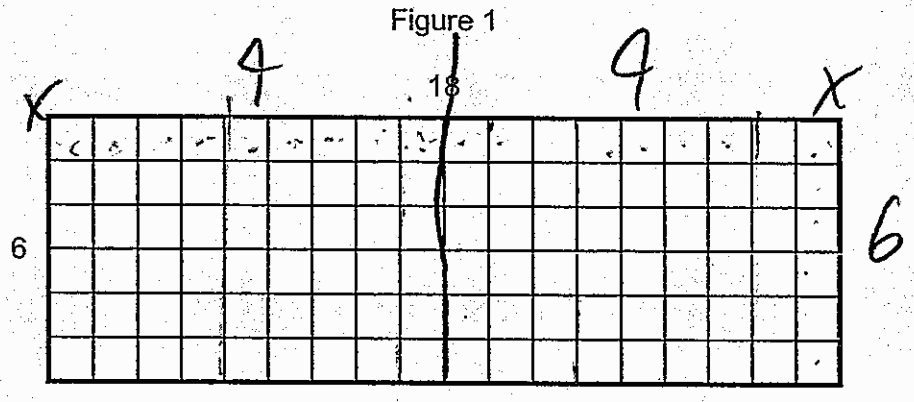
Total Awarded Points: 2 out of 4

A-8a

3. Using Simpler Problems

Suppose you do *not* know how to solve 18 × 6 to find the area of Figure 1 below.

Figure 1



a. Draw a line on Figure 1 above to partition the whole figure into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

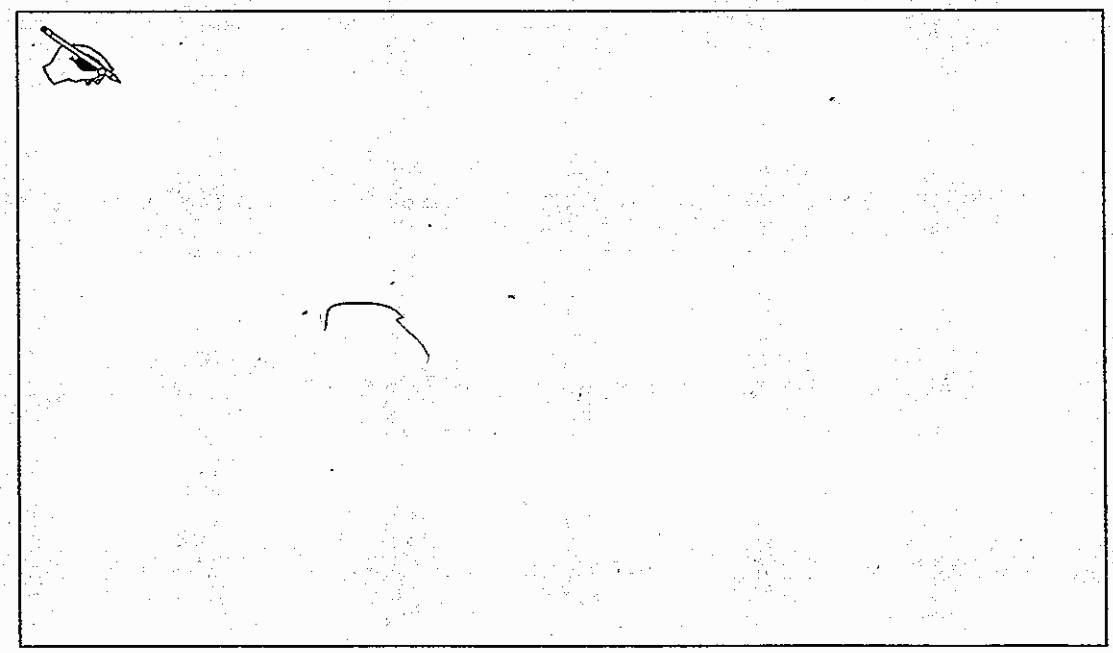
They both have the same
leagh and wigthhh(I forgot how to
Which is 9 9 spell)

54
54
+54
108

x6 +6
54+54=108

A-8b

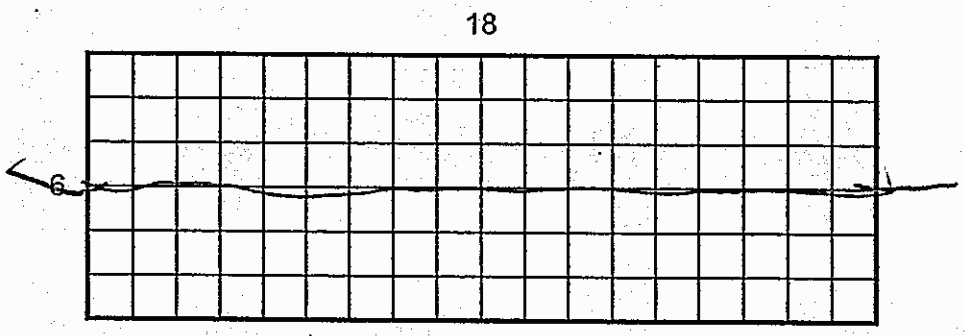
b. Explain how the multiplication equations for the rectangles that you created relate to the side lengths of Figure 1.



A-8c

c. Now, draw a line to show a *different* way of partitioning Figure 1 below into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

Figure 1



They both still have the same length and weight. (I don't know how to spell.)

The answer is

$$\begin{array}{r} {}^{2}18 \\ \times\ 3 \\ \hline 54 \end{array} \qquad \begin{array}{r} 18 \\ \times\ 3 \\ \hline 54 \end{array} \qquad \begin{array}{r} 54 \\ +54 \\ \hline 108 \end{array}$$

A-8d

d. Find the total area of Figure 1 using the areas of the rectangles that you created. Explain with words and equations how you used the areas of the rectangles you created to determine the total area of Figure 1.

I just did 18x3=54 twice and I added them. So my answer to Figure 1 is

18 18
+3 +3
54 + 54 = 108

Anchor 8 Litho 01243200015

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

Total Practice Points: 0

In Part A, the student provides multiplication equations that represent the partitioned areas ($9 \times 6 = 54$ twice), but does not indicate that one factor has been decomposed into smaller quantities (no credit for 3.MD.C.7c). In Part C, the student recognizes areas as additive by partitioning the figure into two 18×3 rectangles and finds the areas of each of these ($18 \times 3 = 54$). Then, in Part D, the student adds to find the total area of the 18×6 figure ($54 + 54 = 108$) (3.MD.C.7d). The student makes decisions on how to approach the task by partitioning each of the figures differently and writing equations, but leaves Part B unanswered (no credit for MP1). In Part C, the student does not partition the figure into rectangles with side lengths of 10 or less, and in Part A the student shows a multiplication equation using a plus sign ($9 + 6 = 54$) (no credit for MP6).

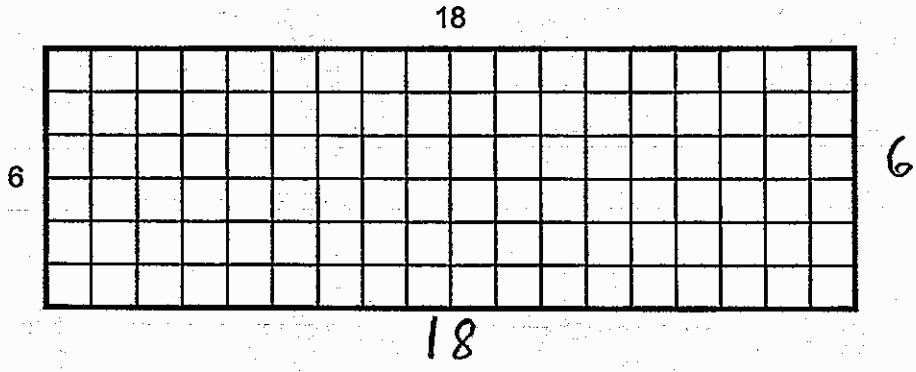
Total Awarded Points: 1 out of 4

A-9a

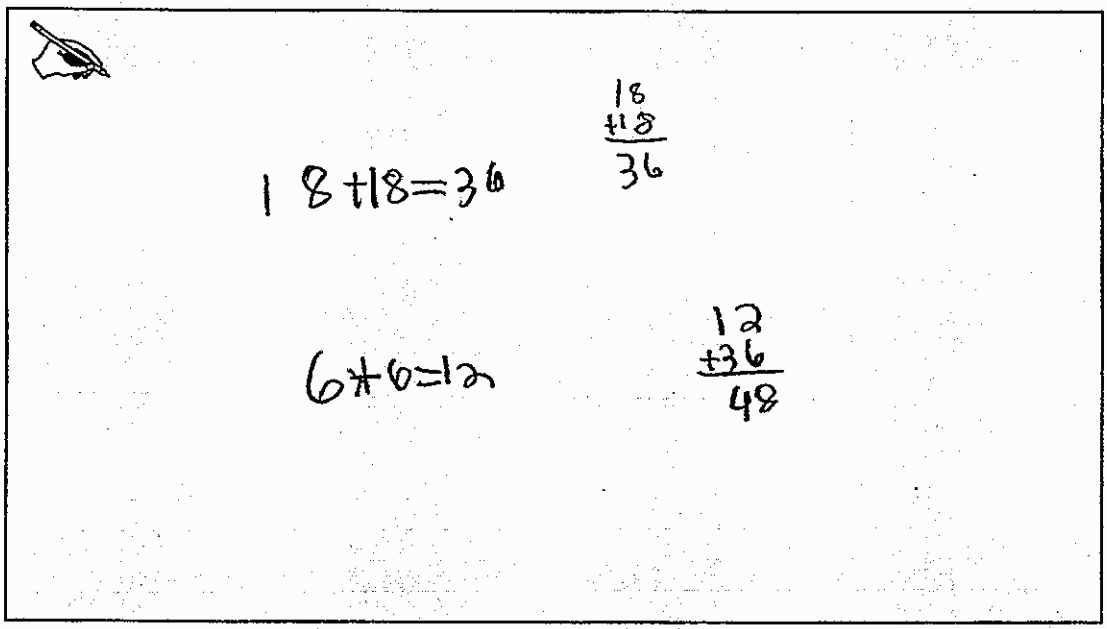
3. Using Simpler Problems

Suppose you do *not* know how to solve 18 × 6 to find the area of Figure 1 below.

Figure 1



a. Draw a line on Figure 1 above to partition the whole figure into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.



Litho#: 0043

A-9b

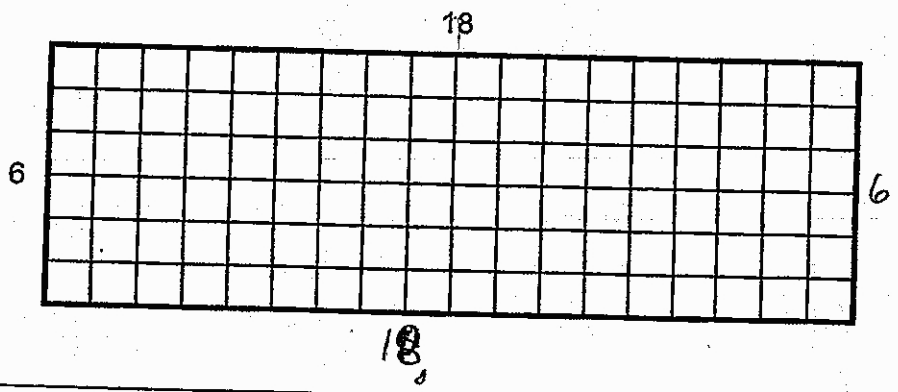
b. Explain how the multiplication equations for the rectangles that you created relate to the side lengths of Figure 1.

I did 18+18=36, because 18 is on one side and 6 is on the other, I did do 6+6=12, Because 6 on the little sides and added 12+36=48.

A-9c

c. Now, draw a line to show a *different* way of partitioning Figure 1 below into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

Figure 1



18+18=36

6+6=12

36
+12
48

36+12=48

A-9d

d. Find the total area of Figure 1 using the areas of the rectangles that you created. Explain with words and equations how you used the areas of the rectangles you created to determine the total area of Figure 1.

I did 6+6=12 because it had 6 on the sides. It and did 18+18=36 because it had them on the top lines. So 36+12=48.

Anchor 9 Litho 0043

Total Content Points: 0

Total Practice Points: 0

In part A, the student does not partition the figure into two or more rectangles but finds perimeter instead and, in part B, does not indicate that one factor has been decomposed into smaller quantities (no credit for 3.MD.C.7c). The perimeter work from Parts A and B is repeated in Parts C and D, and the student does not use partitioned rectangles to find the total area of the 18 × 6 figure (no credit for 3.MD.C.7d). The student makes decisions on how to approach the task, but by making no attempt to partition either figure into smaller rectangles and by calculating perimeter instead of area, the student did not make sense of the task (no credit for MP1). With repeated work in Parts C and D, and with no multiplication equations as required by the task, there is insufficient evidence of precision (no credit for MP6).

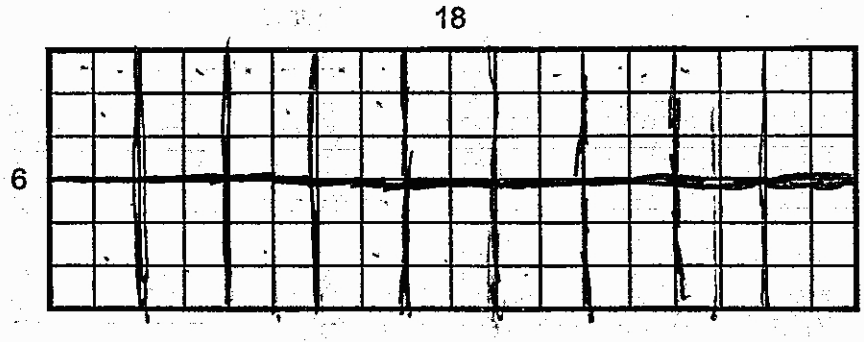
Total Awarded Points: 0 out of 4

A-10a

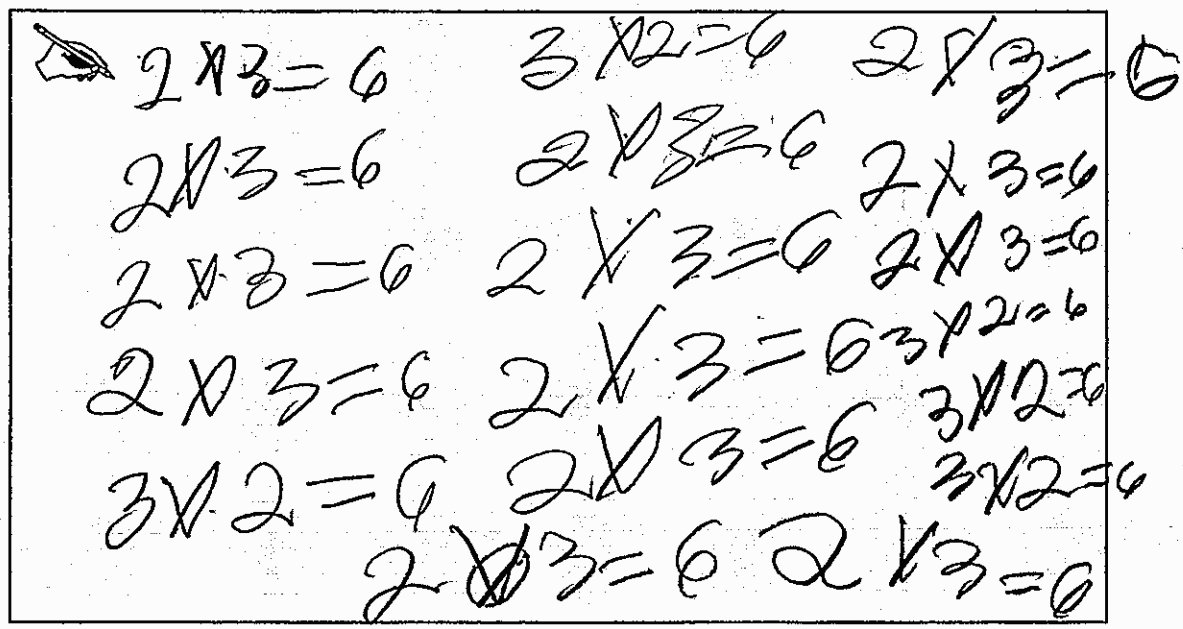
3. Using Simpler Problems

Suppose you do *not* know how to solve 18 × 6 to find the area of Figure 1 below.

Figure 1

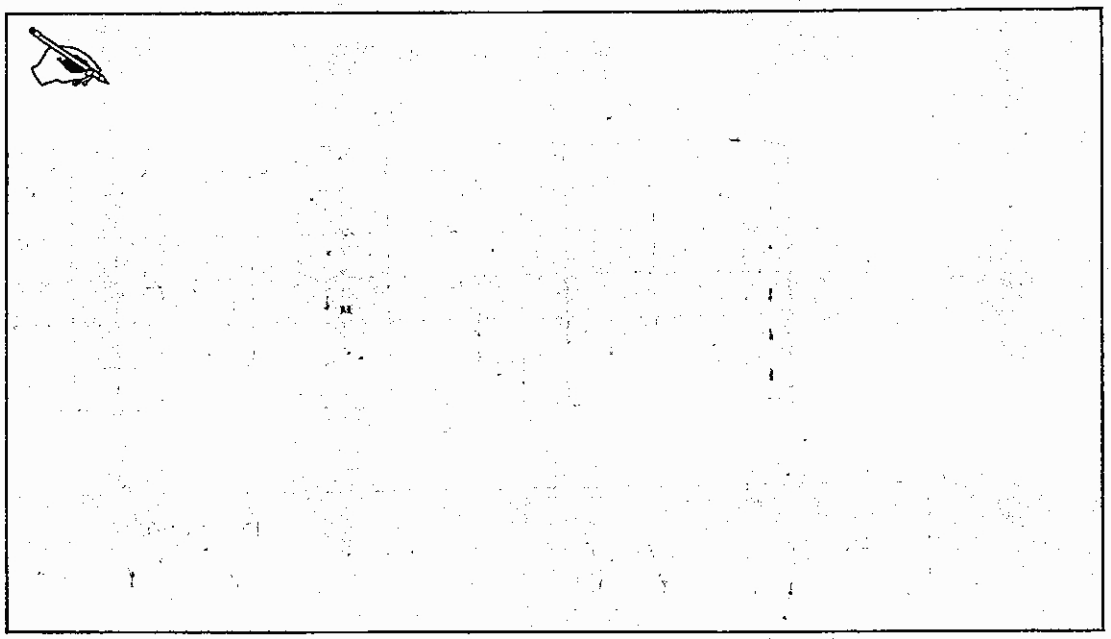


a. Draw a line on Figure 1 above to partition the whole figure into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.



A-10b

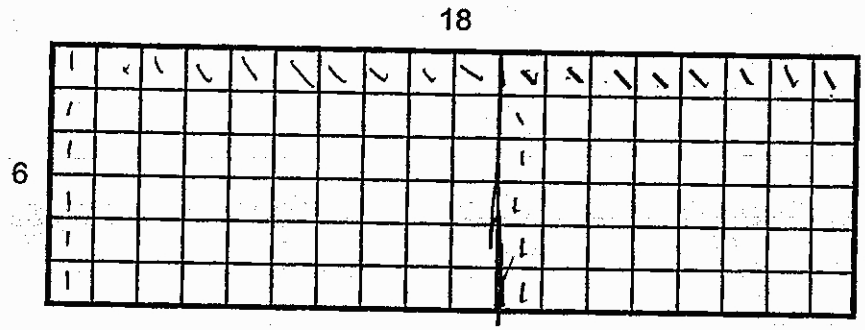
b. Explain how the multiplication equations for the rectangles that you created relate to the side lengths of Figure 1.



A-10c

c. Now, draw a line to show a *different* way of partitioning Figure 1 below into two or more rectangles that have side lengths of 10 or less. Write a multiplication equation for the area of each rectangle you created.

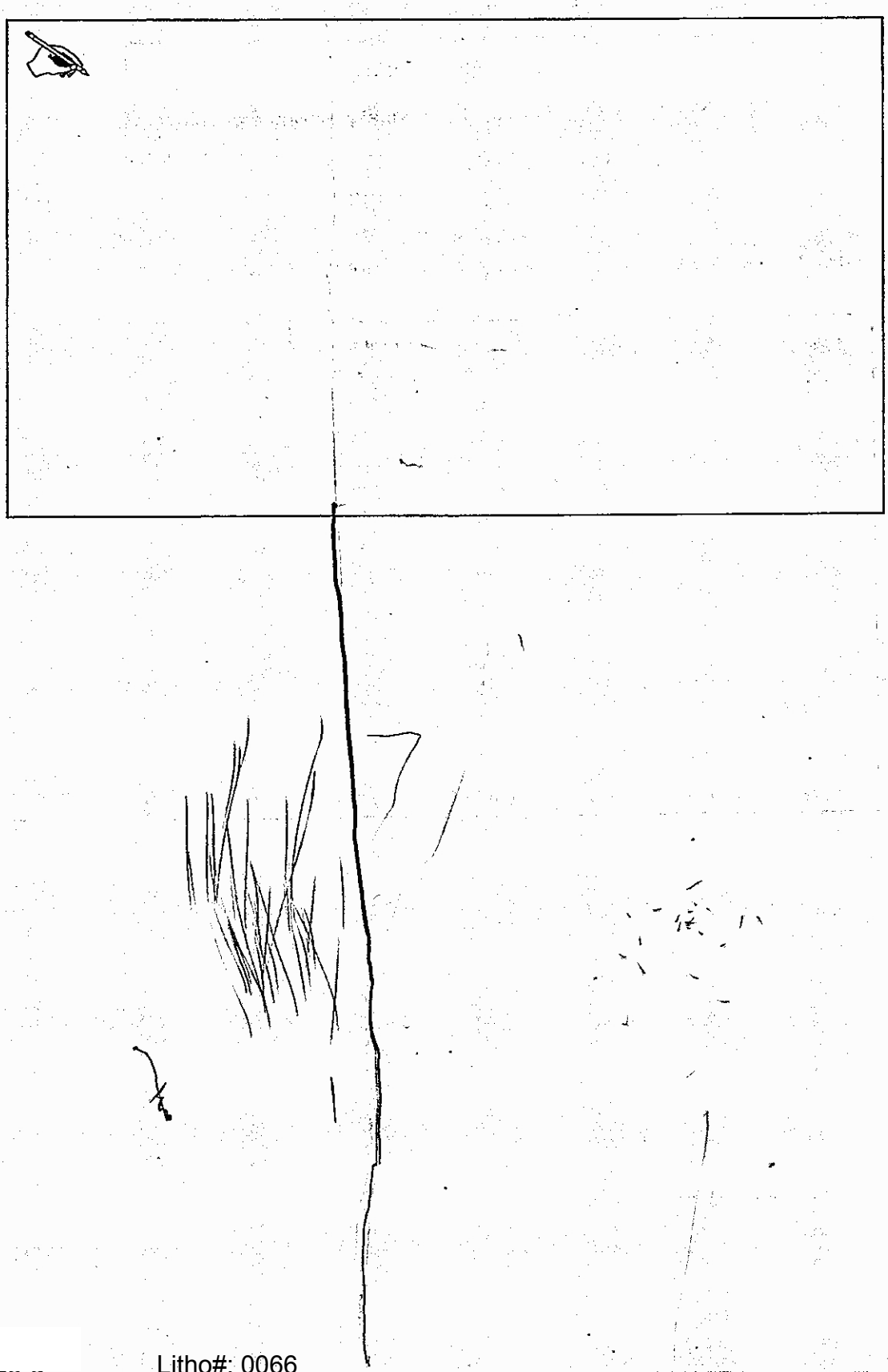
Figure 1



10 x 6 = 60 6 x 8 = 48

A-10d

d. Find the total area of Figure 1 using the areas of the rectangles that you created. Explain with words and equations how you used the areas of the rectangles you created to determine the total area of Figure 1.



Anchor 10 Litho 0066

Total Content Points: 0

Total Practice Points: 0

In Part A, the student provides multiplication equations that represent the partitioned areas ($2 \times 3 = 6$ eighteen times), but in Part B does not indicate that one factor has been decomposed into smaller quantities (no credit for 3.MD.C.7c). In Part C, the student partitions the rectangle and finds the areas of these partitions ($10 \times 6 = 60$, $6 \times 8 = 48$). However, in Part D the student does not indicate the use of these areas to find the total area of the 18×6 figure (no credit for 3.MD.C.7d). While making decisions on how to approach the task by partitioning each of the figures differently and writing equations, the student leaves Part B and Part D unanswered (no credit for MP1). The student provides some accurate calculations, but without total areas calculated or explanations in Parts B and D, there is insufficient evidence of precision (no credit for MP6).

Total Awarded Points: 0 out of 4