Math Live – *Area and Perimeter of Irregular Shapes*: Assessment Task

Grade: 4 **Strand**: Shape and Space (Measurement) **Outcome:** 3

SPECIFIC LEARNER OUTCOME – Shape and Space (Measurement)	
SS3	Demonstrate an understanding of area of regular and irregular 2-D shapes by: • recognizing that area is measured in square units • selecting and justifying referents for the units cm2 or m2 • estimating area, using referents for cm2 or m2 • determining and recording area (cm2 or m2) • constructing different rectangles for a given area (cm2 or m2) in order to demonstrate that many different rectangles may have the same area.

PROCESSES **Communication (C), Connections (CN), Mental Mathematics and Estimation (ME), Problem Solving (PS), Reasoning (R), Technology (T), Visualization (V)**
C, CN, ME, PS, R, V

Part One: Perimeter

EVIDENCE the student has achieved the outcomes

Each student will:

- Estimate the perimeter of irregular shapes (both with curved lines and with straight line segments) and adjust estimates based on partial measurements.
- Measure the perimeter of irregular shapes by a) dividing the figure into parts, and b) using a flexible tool such as string and then measuring the length of the string.
- Describe two methods of finding the perimeter of an irregular shape.

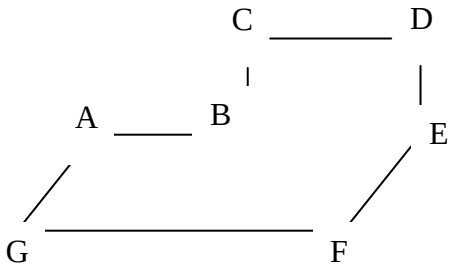
TEACHER NOTE

- In this assessment task, students will be asked to demonstrate their understanding of linear measurement by estimating and measuring the perimeter of irregular shapes. They will use string to measure the perimeter of a curved playground enclosure. Students will then divide a polygon shape into parts to measure the perimeter of a playground structure. Finally, students describe each type of measuring strategy for finding the perimeter of an irregular shape.
- Students should have access to string/yarn and rulers.
- When estimating, students are expected to change their initial estimates if it does not make sense when they are given more information.

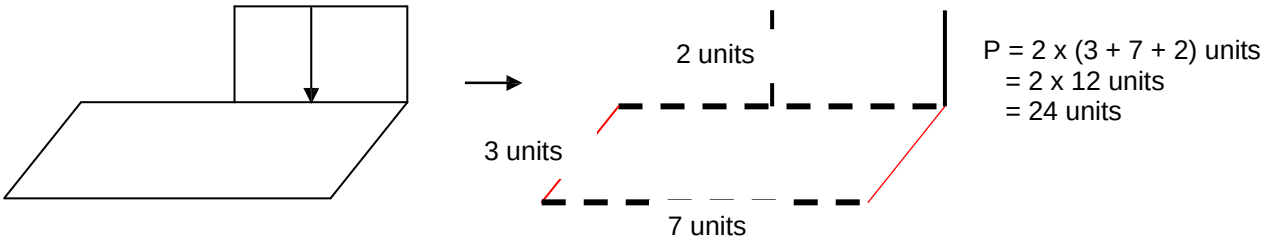
  For example, a student may first estimate the perimeter of the entire playground to be 45 m. This student then measures what looks like ¼ of the distance around the playground and finds that it is 8 m. The student may want to change his estimate to about 30 m given this new information.

Dividing a figure into parts to measure the perimeter may be simplified by looking for relationships between the different parts.

For example, in the figure below, the student does not need to measure the length of $\overline{AB}$ and $\overline{CD}$ as together, they are the same length as $\overline{FG}$.



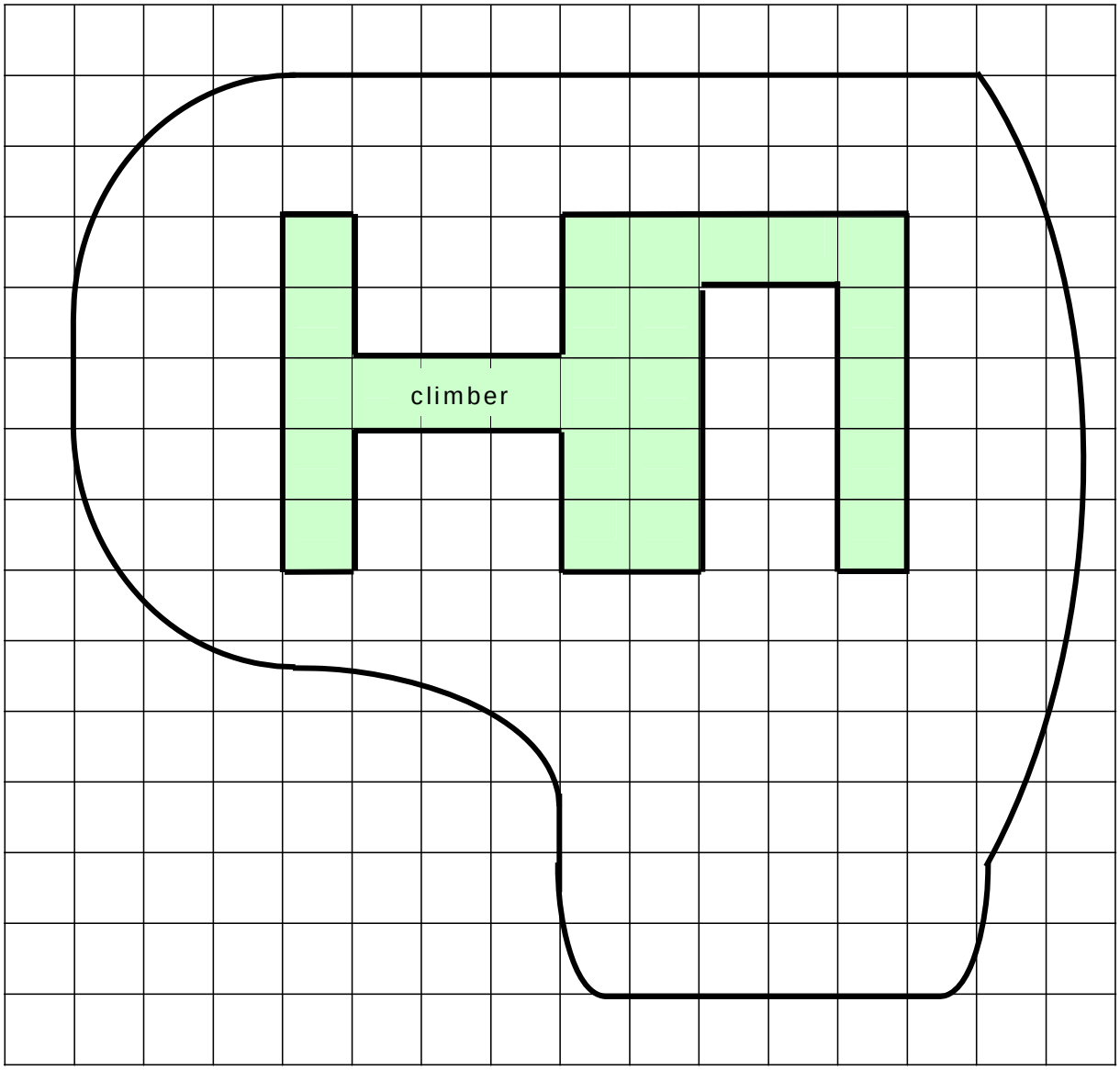
Another strategy students might use is to visualize how the lines on a figure can be moved so that fewer measurements are required to find the total perimeter.



- Early finishers can finish the playground design by adding different equipment and colouring their picture.

Math Live – *Perimeter of Irregular Shapes*: Assessment Task

Your class has been asked to design a new play area for your school. You begin by putting a climber in the middle of an area filled with sand. To show your plan to the rest of the school, you draw the grid map below.



—— is equal to 1 metre

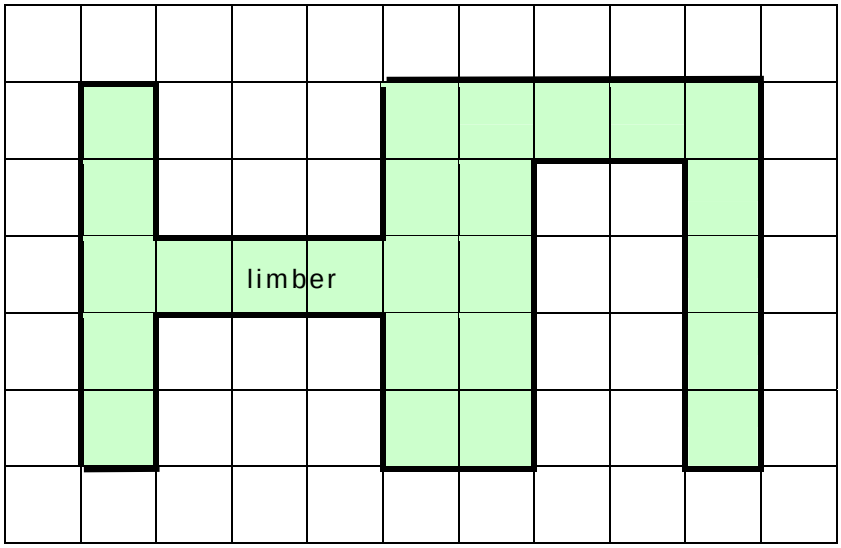
1. Estimate the perimeter of the play area to find out how many bricks you will need to keep the sand inside.

   My first estimate: _____

2. Measure a part of the distance around the play area. Would you change your first estimate now? Why or why not?

3. Find the total perimeter of the play area. Explain how you measured the perimeter using words and pictures.

4. Find the total perimeter of the space taken up by the climber. Explain how you found the perimeter using words and pictures.



—— is equal to 1 metre

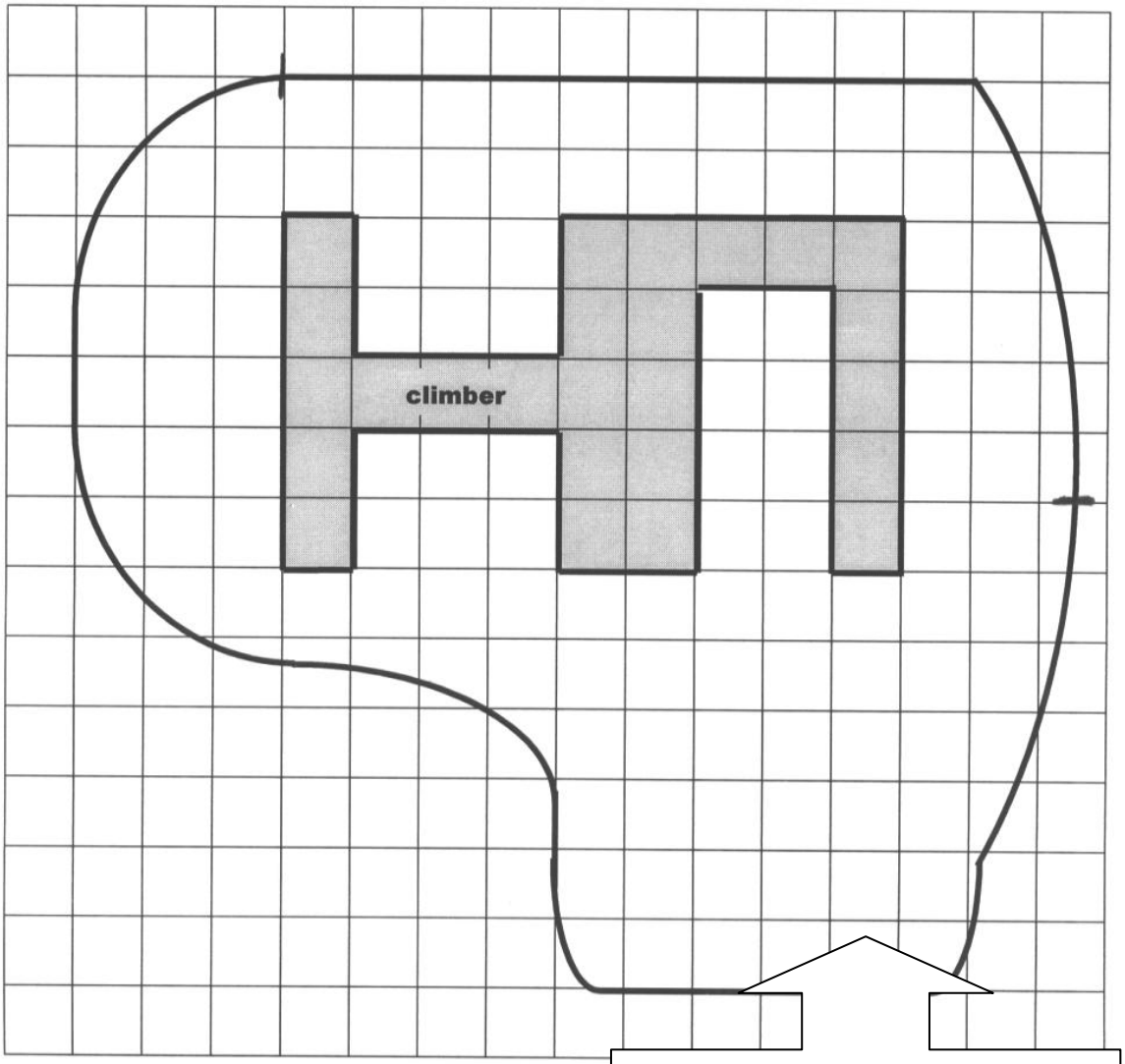
Math Live – *Perimeter of Irregular Shapes*: Scoring Guide

Level / Criteria	Estimates the perimeter of irregular shapes Questions #1 and #2	Measures and describes the method used to find the perimeter of the play area (approx. 48 m) Question #3	Measures and describes the method used to find the perimeter of the climber (44 m) Question #4
Wow!	Reasonably estimates the perimeter of the play area and justifies decision whether or not to change this estimate by referring to partial measurements or to calculations based on a similar regular shape (a 12 m x 13 m rectangle)	Measures the perimeter using an efficient strategy and clearly describes this strategy	Measures the perimeter by visually creating a more regular shape with fewer sides or by combining like sides to find the total perimeter of the shape
Yes		Measures the perimeter using a workable strategy and describes this strategy	Measures the perimeter by measuring each side and then adding these measurements to find the total perimeter of the shape
Yes, but…	Estimates the perimeter of the play area but unconvincingly justifies whether or not to change this estimate	Measures the perimeter by counting units one by one and describes this strategy	Measures the perimeter of the shape by counting units one by one
No, but…	Provide an unreasonable estimate and/or decides to change the estimate only after finding the actual perimeter	Inaccurately measures the perimeter and/or does not provide a description of the strategy used	Inaccurately measures the perimeter of the shape and/or provides little or no evidence of the measurement strategy used
Insufficient / Blank	No score awarded due to insufficient evidence of student learning based on the requirements of the assessment task	No score awarded due to insufficient evidence of student learning based on the requirements of the assessment task	No score awarded due to insufficient evidence of student learning based on the requirements of the assessment task

Math Live – *Perimeter of Irregular Shapes*: Assessment Task

Wow!

Your class has been asked to design a new play area for your school. You begin by putting a climber in the middle of an area filled with sand. To show your plan to the rest of the school, you draw the grid map below.



—— is equal to 1 metre

Student used the bottom edge of the grid to first make a length of string 32 cm long. (A student may also use a longer piece of string, which will go all the way around the perimeter and cut off any extra length.)

Wow!

1. Estimate the perimeter of the play area to find out how many bricks you will need to keep the sand inside.

   My first estimate: 75m

2. Measure a part of the distance around the play area. Would you change your first estimate now? Why or why not?

   I will because I think it is too high, after measuring a couple of straight lines

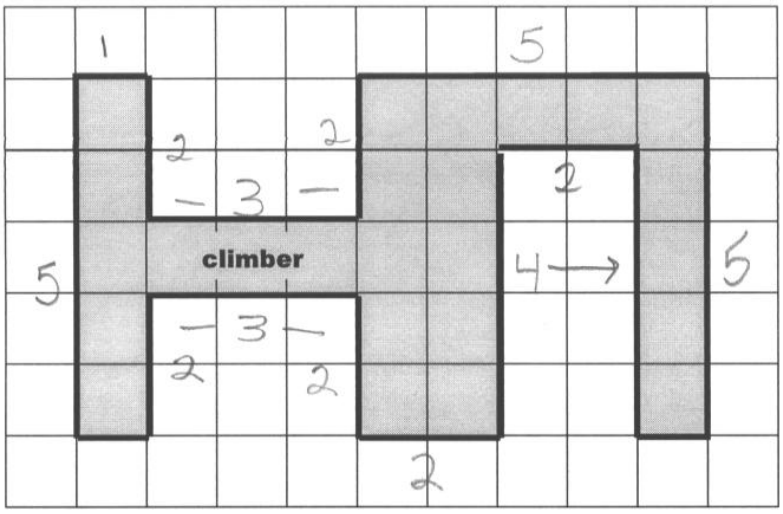
3. Find the total perimeter of the play area. Explain how you measured the perimeter using words and pictures.

First I marked off my starting point on my paper. Then I went with will the string around the shape as far as it would go. I marked off the place on my paper where it ended. Then I measured the rest and when I got to where I started I marked it off on my string. Then I measured the string and to where I marked off on my string and came up with 48.4.

String: 32cm
Tick : 16.4
on
String

Wow!

4. Find the total perimeter of the space taken up by the climber. Explain how you found the perimeter using words and pictures.



—— is equal to 1 metre

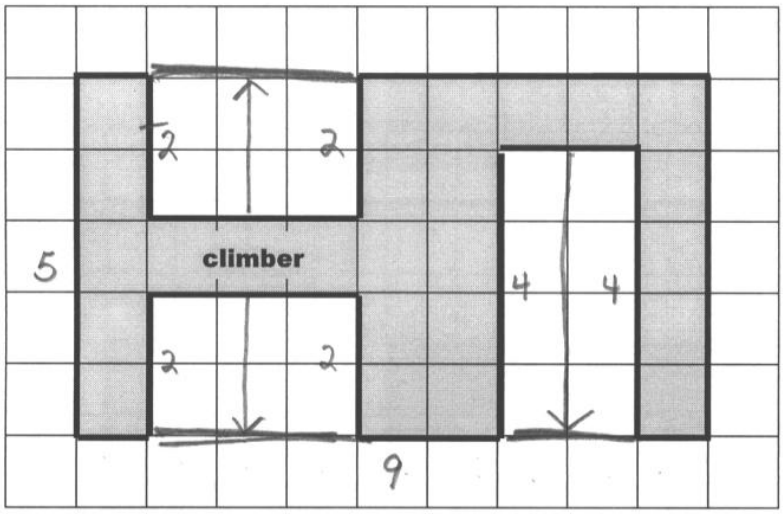
Example #1

I counted the squares on the outside and recorded the numbers.

$3 \times 1\,cm = 3$
$6 \times 2\,cm = 12$
$2 \times 3\,cm = 6$
$2 \times 4\,cm = 8$
$3 \times 5\,cm = 15$
$44\,cm$

Wow!

4. Find the total perimeter of the space taken up by the climber. Explain how you found the perimeter using words and pictures.



—— is equal to 1 metre

Example #2

I moved some sides to make it easier to count.

$2 \times 5 = 10$
$2 \times 9 = 18$
} the rectangles equals 28m

$4 \times 2 = 8$
$2 \times 4 = 8$
} the extra lines are 16m

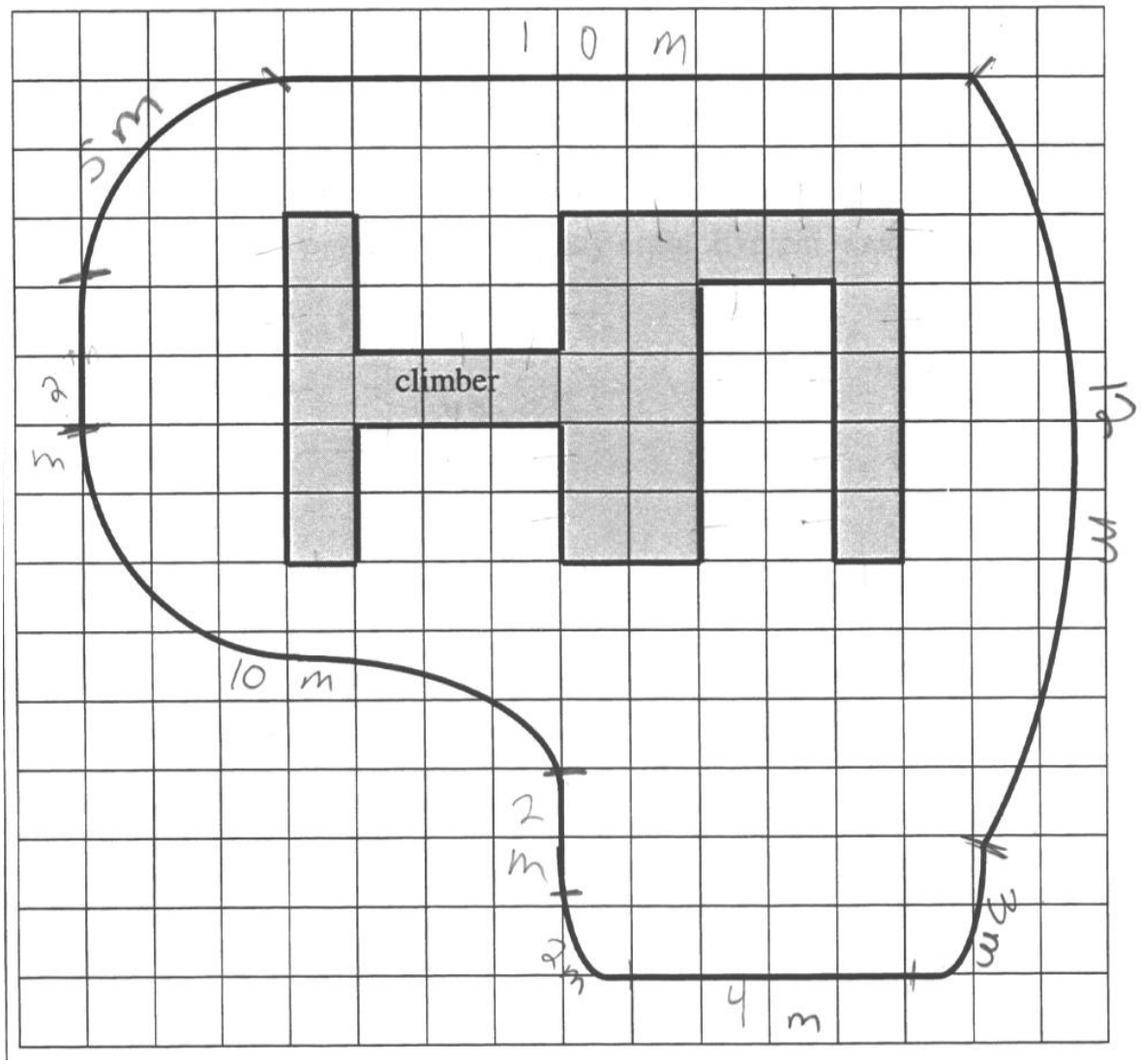
$$\begin{array}{r} 28\text{m} \\ +\ 16\text{m} \\ \hline 44\text{m} \end{array}$$

The perimeter is 44 m

Math Live – *Perimeter of Irregular Shapes*: Assessment Task

Yes

Your class has been asked to design a new play area for your school. You begin by putting a climber in the middle of an area filled with sand. To show your plan to the rest of the school, you draw the grid map below.



—— is equal to 1 metre

Yes

1. Estimate the perimeter of the play area to find out how many bricks you will need to keep the sand inside.

   My first estimate: 50 m

2. Measure a part of the distance around the play area. Would you change your first estimate now? Why or why not?

   Cause if it was not curvey if would be a rectangle 12m × 13 m and putting these sides together would be 50 m (12 + 12 + 13 + 13 = 50 m)

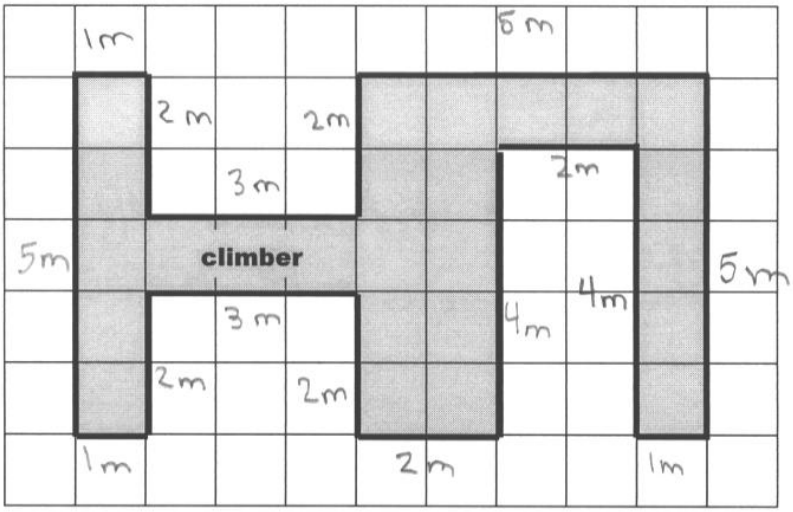
3. Find the total perimeter of the play area. Explain how you measured the perimeter using words and pictures.

I measured the straight parts first by counting and than I measured the curvey parts by putting my string on the line and then measuring how much meters it took up on the string.

10
4
2
2
2 5
10
2
3
12
50 m

Yes

4. Find the total perimeter of the space taken up by the climber. Explain how you found the perimeter using words and pictures.



—— is equal to 1 metre

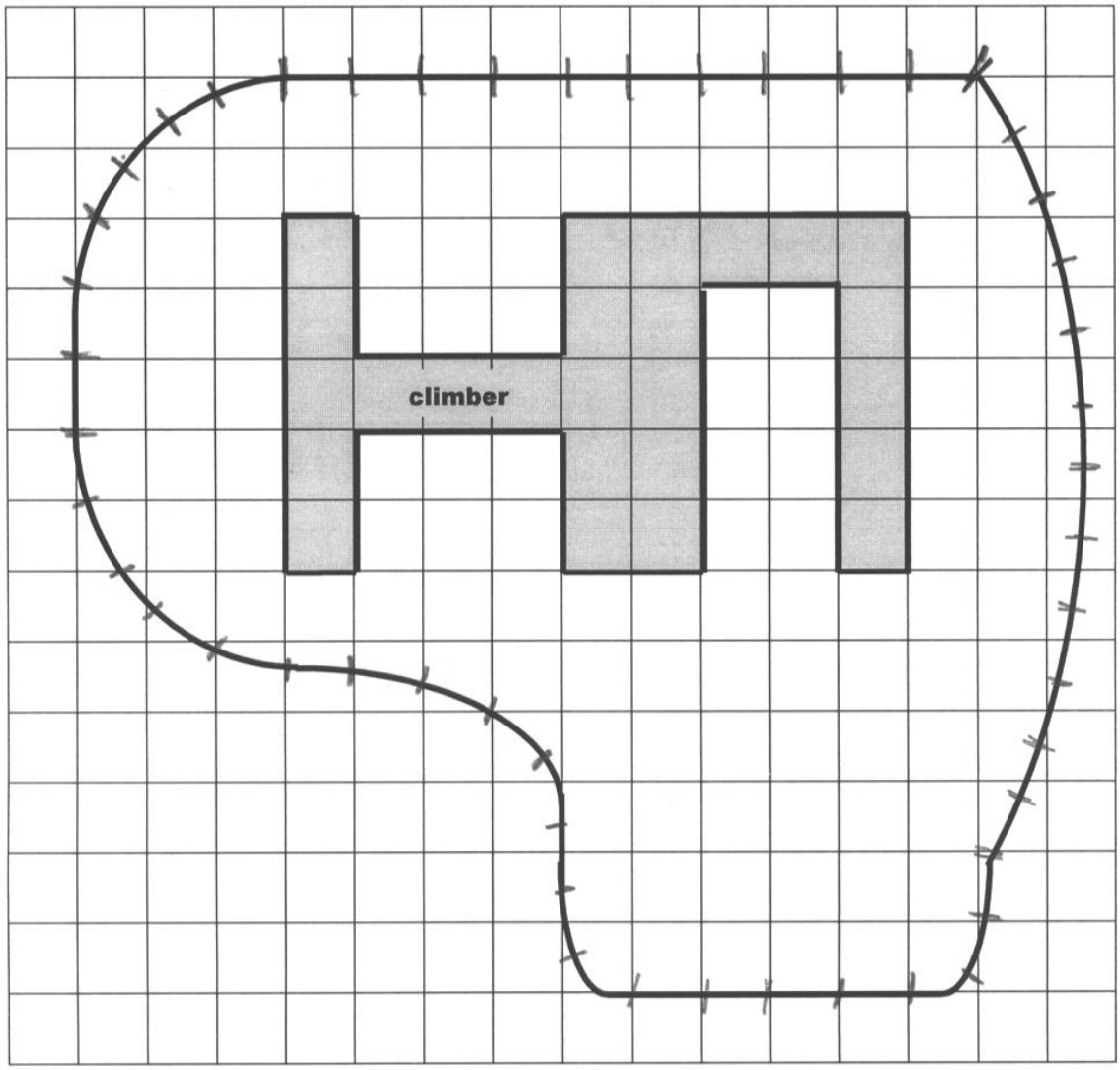
I counted each side then added all the sides together.

1m
2m
3m
2m
5m
5m
1m
4m
2m
4m
2m
2m
3m
2m
1m
+ 5m
44m

Math Live – *Perimeter of Irregular Shapes*: Assessment Task

Yes, but

Your class has been asked to design a new play area for your school. You begin by putting a climber in the middle of an area filled with sand. To show your plan to the rest of the school, you draw the grid map below.



—— is equal to 1 metre

Yes, but

1. Estimate the perimeter of the play area to find out how many bricks you will need to keep the sand inside.

   My first estimate: 39m

2. Measure a part of the distance around the play area. Would you change your first estimate now? Why or why not?

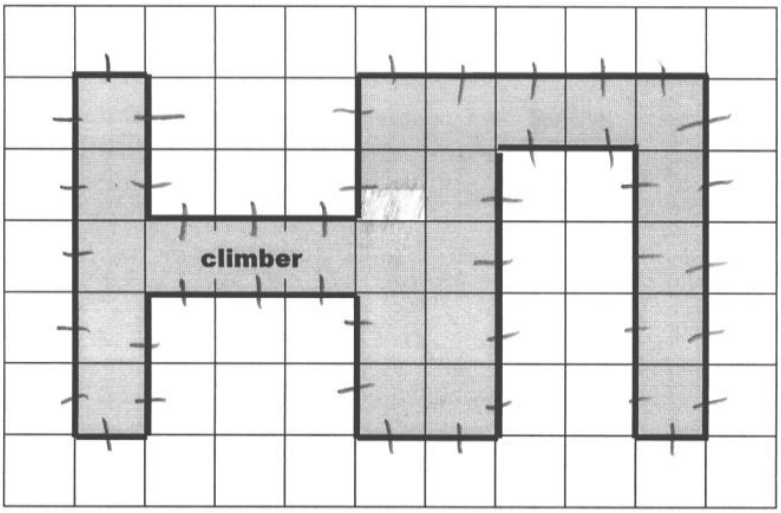
I would not change my answer because I think it is close

3. Find the total perimeter of the play area. Explain how you measured the perimeter using words and pictures.

I counted the metres one by one and estimated the curves 49 m.

Yes, but

4. Find the total perimeter of the space taken up by the climber. Explain how you found the perimeter using words and pictures.



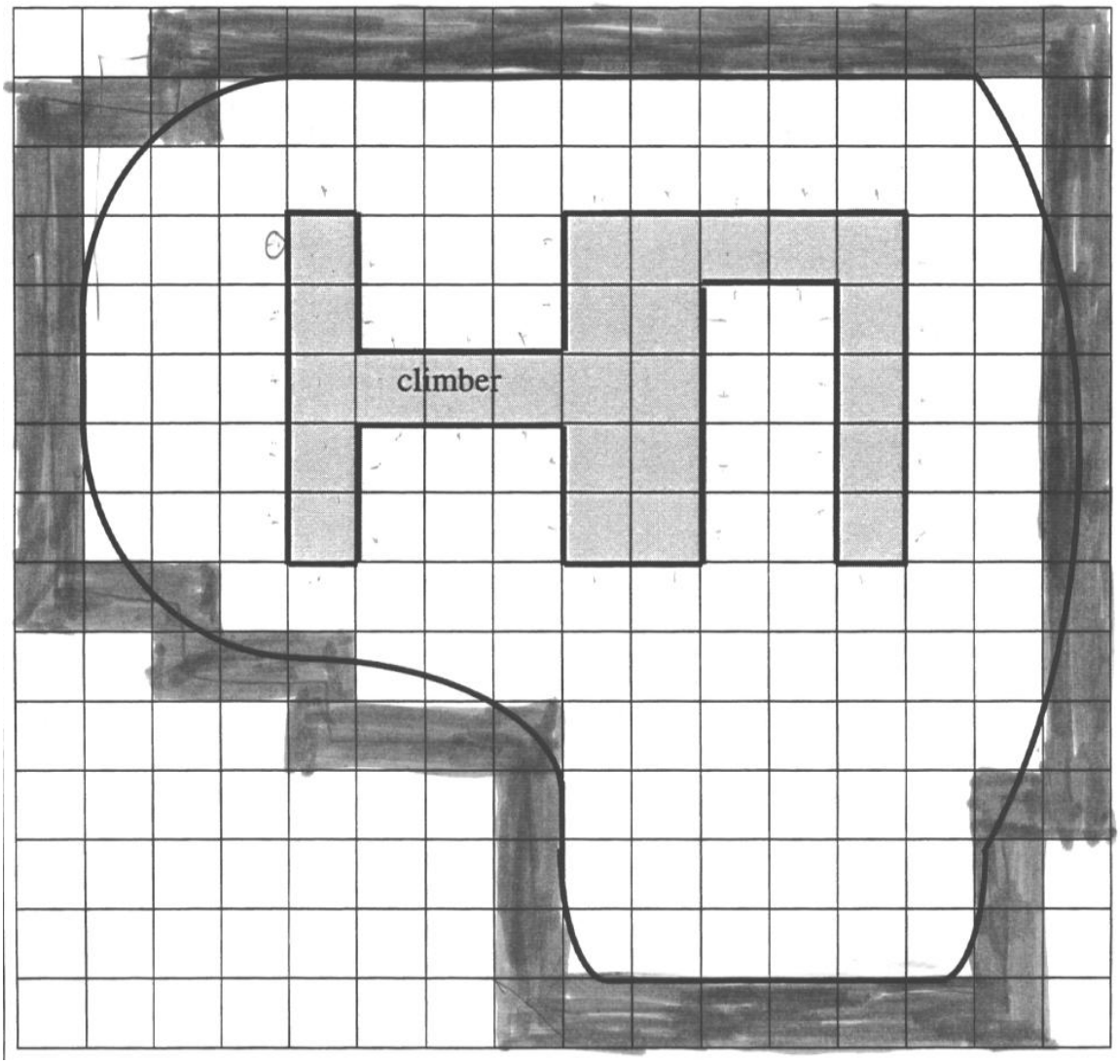
—— is equal to 1 metre

44

I got this answer by counting the outside lines of the figure.

Math Live – *Perimeter of Irregular Shapes*: Assessment Task

Your class has been asked to design a new play area for your school. You begin by putting a climber in the middle of an area filled with sand. To show your plan to the rest of the school, you draw the grid map below.



—— is equal to 1 metre

No, but

1. Estimate the perimeter of the play area to find out how many bricks you will need to keep the sand inside.

   My first estimate: 100 m

2. Measure a part of the distance around the play area. Would you change your first estimate now? Why or why not?

   Yes because I was way off

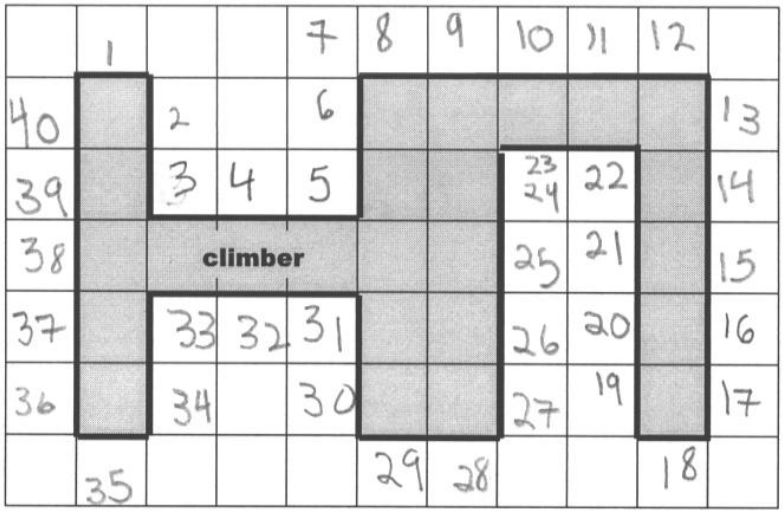
3. Find the total perimeter of the play area. Explain how you measured the perimeter using words and pictures.

58

I measured the perimeter of the play area by coloring around the perimeter  in marker and counted the lenth that I colored. There were 58 meters

No, but

4. Find the total perimeter of the space taken up by the climber. Explain how you found the perimeter using words and pictures.



—— is equal to 1 metre

40

I counted all the black lines around the climber

Part Two: Area

EVIDENCE the student has achieved the outcomes

Each student will:

- Estimate the area of irregular shapes (with both curved and straight sides) and adjust estimates based on partial measurements.
- Measure the area of irregular shapes either by dividing the shape into more manageable parts or by creating a rectangular area and adding or subtracting the area inside or outside of the shape from the area of the rectangle.
- Evaluate the accuracy and effectiveness of two methods of finding the area of an irregular shape.

TEACHER NOTE

- In this assessment task, students will be asked to demonstrate their understanding of area by estimating and measuring the area of irregular shapes. Given a figure in the shape of Alberta on a grid, they will divide the shape into parts and add these parts to find the area. Students will then enclose the map in a rectangle and recalculate the area of Alberta by subtracting the area outside of the shape from the total area of the rectangle or by creating the largest rectangle possible inside of the shape and adding the squares outside of this rectangle to find the total area. Some students may also count all the squares in the shape, combining part squares. Finally, students explain which of their two methods they preferred and evaluate the accuracy and effectiveness of both.

- When estimating, students are expected to change their initial estimates when they are given more information.

  For example, a student may first estimate the area of the Alberta to be 50 square units. This student then measures what looks like ¼ of the area and finds that it is 15 square units. The student may want to change his estimate given this new information.

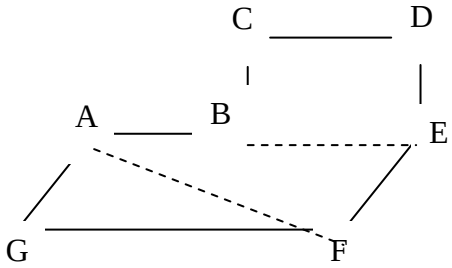
Students can simply count square units inside of the shape. This is done by:

a) Counting the square units completely inside the shape,
b) Counting partial square units and dividing by 2 to estimate the number of complete units.

Students may also make rectangles as large as possible inside the shape to make their calculations simpler. This method will require them to measure the area left outside of the rectangle.

Students may also simplify the task of counting the square units in a figure by dividing it up into regular shapes.

For example, in the figure below, the student may find the area of the rectangle BCDE and one of the areas of the triangles. The student then doubles the area of the rectangle and adds this to the area of the rectangle.



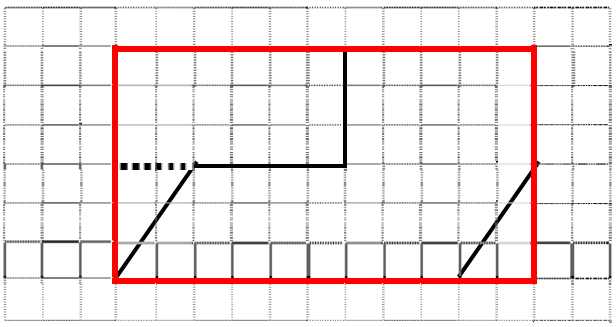
Another strategy for finding the area of irregular shapes is by compensation. The student encloses the shape in a rectangle and then subtracts the area outside of the shape from the total area of the rectangle.

For example, in the figure below, the student may find the area of the rectangle BCDE and one of the areas of the triangles. The student then doubles the area of the rectangle and adds this to the area of the rectangle.

When measuring the area outside of the shape, students may again use partitioning strategies:

The area of the shape below is:

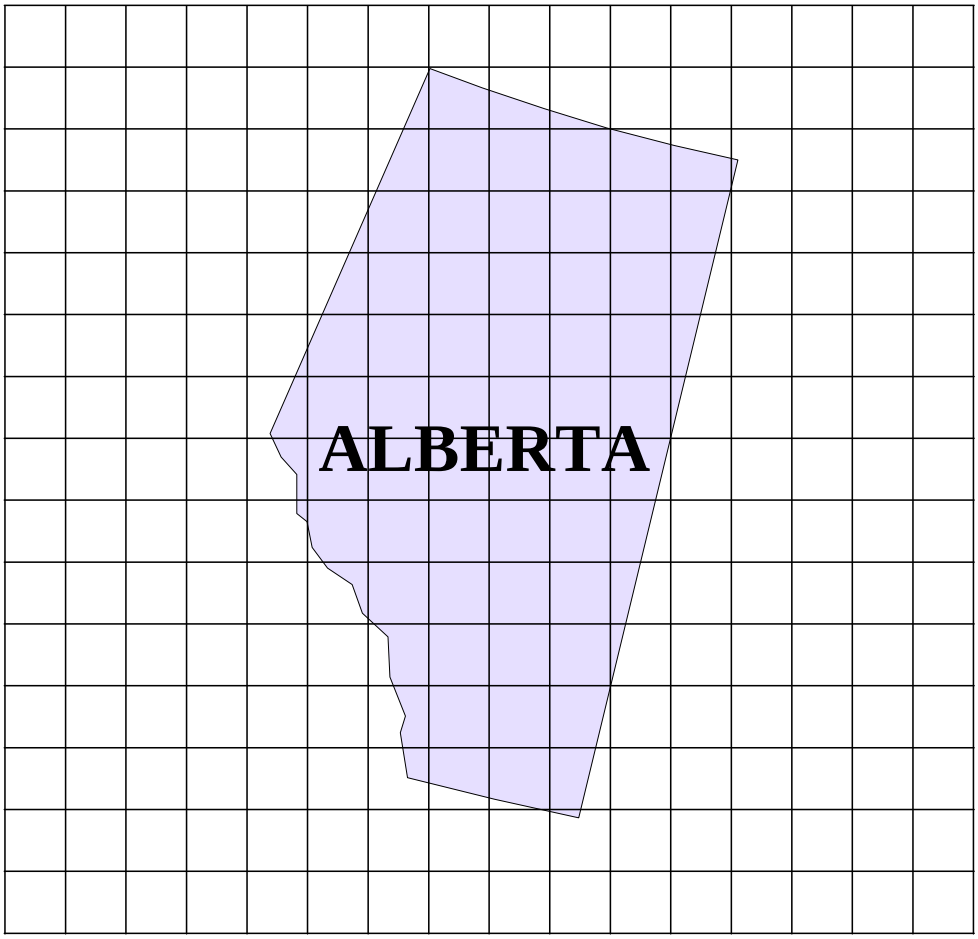
Area of the rectangle – [Area of small rectangle – Area of the two triangles]
(6 x 11) units – [(3 x 6) units - (2 x 3) units] = 66 units – (18 + 6) units
= 66 units – 24 units
= 42 units



Early finishers can colour the map of Alberta, indicating the different geographic regions of the province.

Math Live – *Area of Irregular Shapes*: Assessment Task

Your class has been studying Canada in Social Studies. They are calculating the area of the province of Alberta.



☐ is equal to 1 square unit

1. Estimate the area of Alberta in square units.

   My first estimate: _____

2. Measure a part of the area of the province. Would you change your first estimate now? Why or why not?

3. Find the total area of the province in two different ways. Explain how you measured the area both ways using words and pictures.

My first strategy:
My second strategy:

Which strategy did you find the easiest? The most accurate? Explain why.

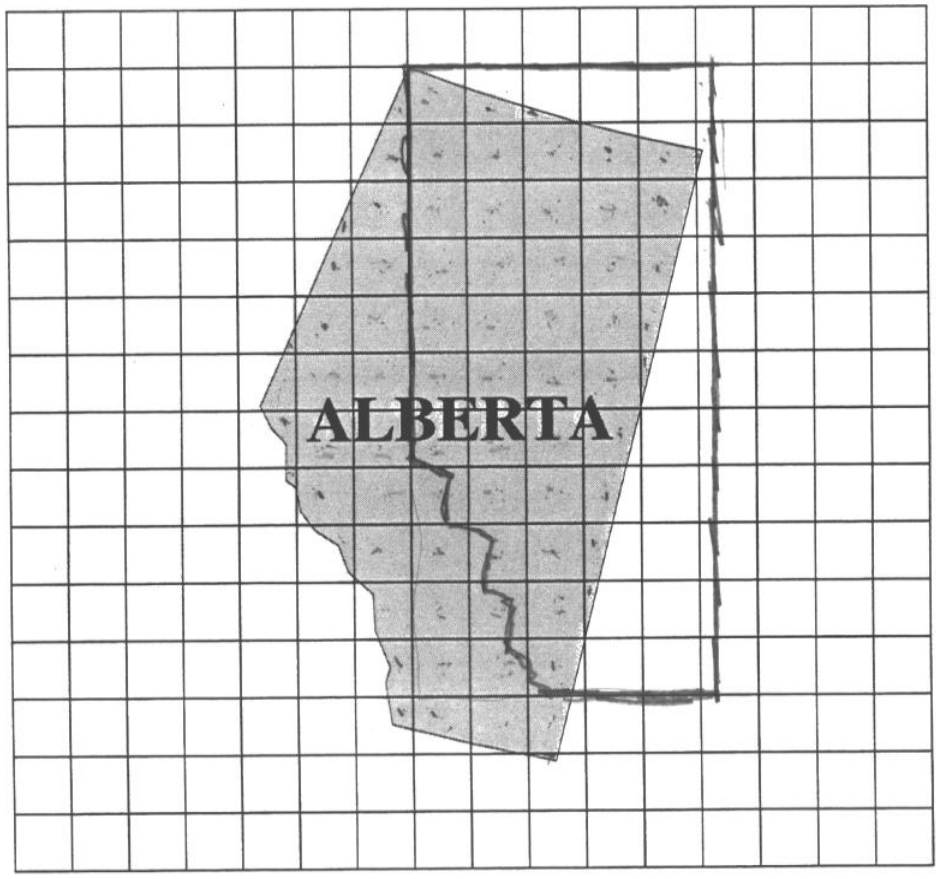
Math Live – *Area of Irregular Shapes*: Scoring Guide

Level / Criteria	Justifies estimates of the area of an irregular shape Question #2	Applies strategies for finding the area of an irregular shape Question #3	Evaluates the accuracy and effectiveness of strategies for finding the area of an irregular shape Question #4
Wow!	Makes reasonable estimate of the area of the map and provides a complete and logical explanation for either changing or keeping the initial estimate	Uses strategies that demonstrate a thorough understanding of how to accurately find the area of irregular shapes	Provides clear and compelling reasons for the strategy of their choice based on mathematical logic
Yes	Makes estimate of the area of the map of Alberta and provides a logical explanation for either changing or keeping the initial estimate	Uses strategies that demonstrate a clear understanding of how to accurately find the area of irregular shapes	Provides plausible reasons for the strategy of their choice based on mathematical logic
Yes, but…	Makes estimate of the area of the map of Alberta but provides an incomplete explanation for either changing or keeping the initial estimate	Uses strategies that demonstrate a general understanding of how to find the area of irregular shapes	Provides reasons for the strategy of their choice but with minimal support
No, but…	Makes estimate of the area of the map of Alberta but provides an unconvincing explanation for either changing or keeping the initial estimate	Uses strategies that demonstrate a beginning understanding of how to find the area of irregular shapes and may not find area	States strategy of choice but provides little or no justification for this choice
Insufficient / Blank	No score awarded due to insufficient evidence of student learning based on the requirements of the assessment task	No score awarded due to insufficient evidence of student learning based on the requirements of the assessment task	No score awarded due to insufficient evidence of student learning based on the requirements of the assessment task

Math Live – *Area of Irregular Shapes*: Assessment Task

Wow!

Your class has been studying Canada in Social Studies. They are calculating the area of the province of Alberta.



☐ is equal to 1 square unit

1. Estimate the area of Alberta in square units.

   My first estimate: 55 cm^2

2. Measure a part of the area of the province. Would you change your first estimate now? Why or why not?

Yes because I measured about half of the area and I would change my estamit to about 58cm^2 because when I mesured half of the area it was about 29. So if half is 29 it is most likely that the other half will be about the same then 29 multiplied by two equals 58

Wow!

3. Find the total area of the province in two different ways.
Explain how you measured the area both ways using words and pictures.

My first strategy: My first strategy was to was to count the one cm units. I first counted all the whole units (diagram #1) and wrote the number down. I then found 2 partial units that would fit togather to make a whole unit and counted those two as 1 unit I did this until all the partial units were peiced togather to make whole units. When ever I had counted a unit I put a dot on it so I would know that that one had been counted (diagram #3)

(diagram #2)

diagram #1

diagram #2

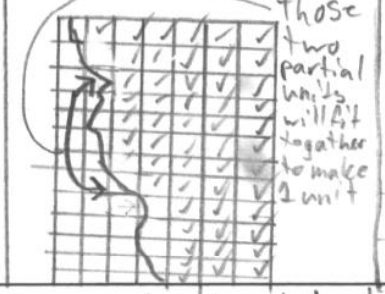
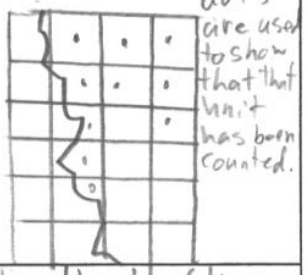


diagram #3



My second strategy: My second stratigy is to take the top (diagram #1) and count how long it is and then take the right side (diagram #2) and count how long it is and then multiply the two after that I made the shape into a rectangle counted the parts that are not part of the area but inside the rectangle and minused that from my multiplied number (diagram #3)

diagram #1

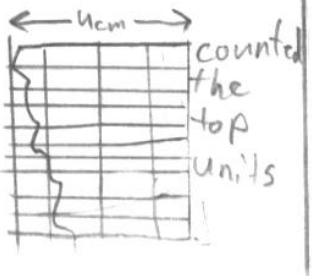


diagram #2

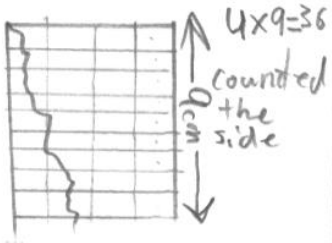
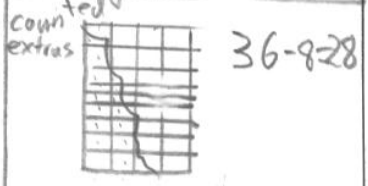


diagram #3



my real answer is 58

Wow!

Which strategy did you find the easiest? The most accurate? Explain why.

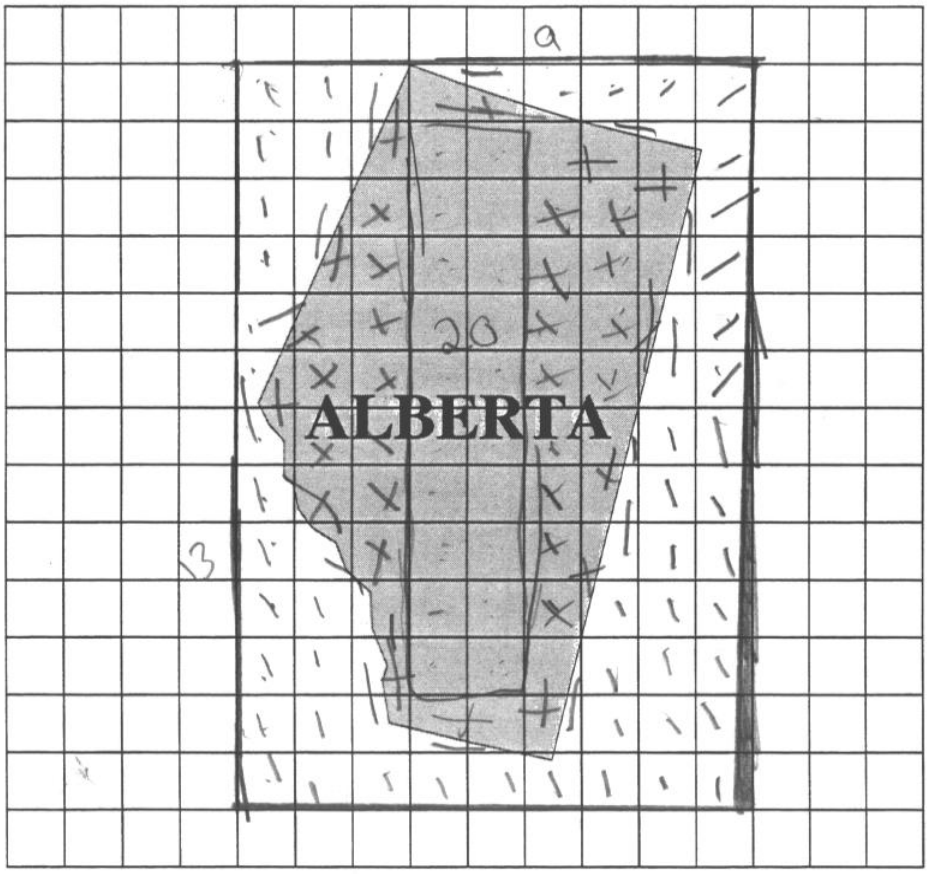
I found the second stratigy the easy est because you dont lose track of counting and it is quicker

I found the first way to be more accurate because I can make sure all the peices fit so I can get the exact ansner

Yes

Math Live – *Area of Irregular Shapes*: Assessment Task

Your class has been studying Canada in Social Studies. They are calculating the area of the province of Alberta.



☐ is equal to 1 square unit

1. Estimate the area of Alberta in square units.

   My first estimate: 25 square units

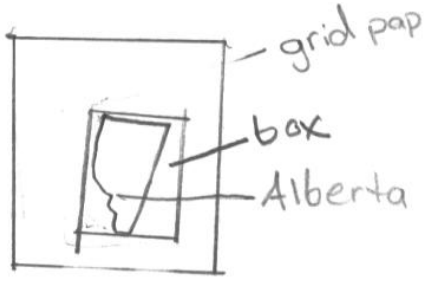
2. Measure a part of the area of the province. Would you change your first estimate now? Why or why not?

   Yes I would. I would change my estemet because the piece that I mesured had 20 square units in it and that piece was about ½ of Alberta.

Yes

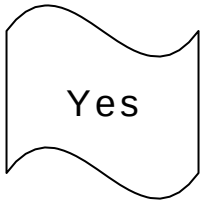
3. Find the total area of the province in two different ways.
Explain how you measured the area both ways using words and pictures.

My first strategy: My first strategy was to put a big box around the picture of Alberta. Then I multiplyed the length and width. I got 117 square units. Then I counted the number of boxes that were not part of Alberta. There were 60 square units that were not part of Alberta. So I then subtracted 60 from 117 and I got 57. My answer is 57 square units.



My second strategy: My second strategy was to make the biggest reotangle that I could in Alberta. Then I counted the number of boxes left over, wich was 33 square units. Then I added them up and got 53 square units. My answer is 53 square units.

Which strategy did you find the easiest? The most accurate? Explain why.

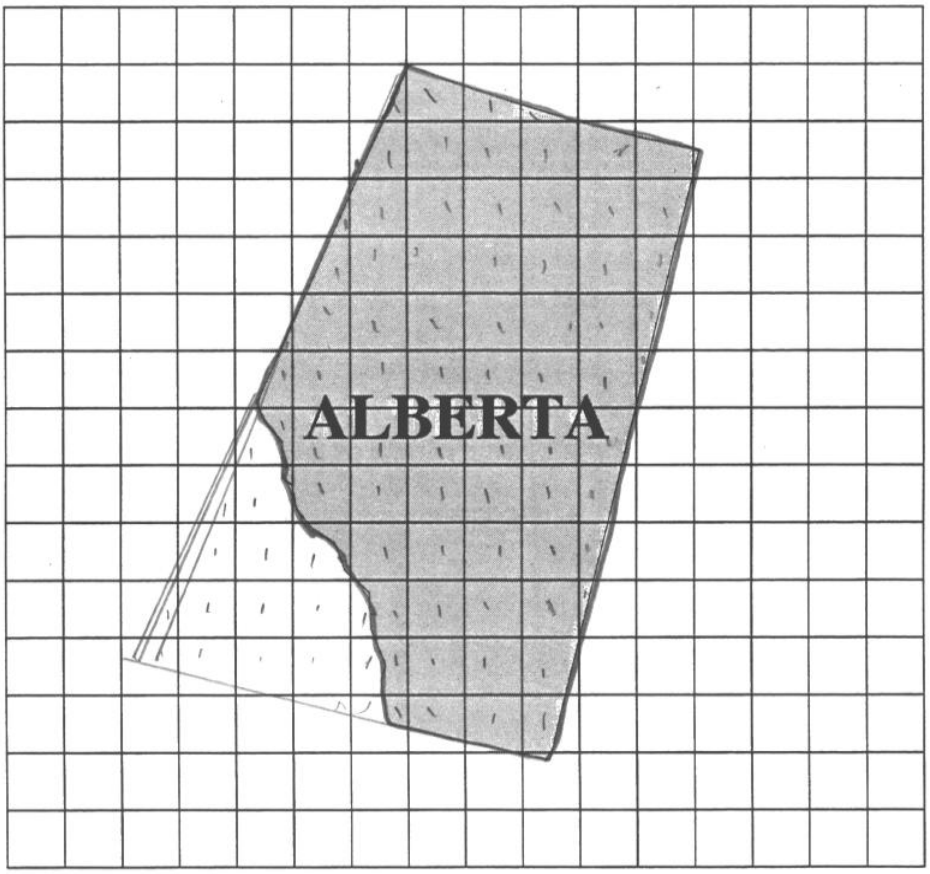


I found that both stategies were easy because you just multiplyed then subtracted or added. They are both as accurate. if you count the parts of squares accurent in both ways.

Yes, but

Math Live – *Area of Irregular Shapes*: Assessment Task

Your class has been studying Canada in Social Studies. They are calculating the area of the province of Alberta.



☐ is equal to 1 square unit

1. Estimate the area of Alberta in square units.

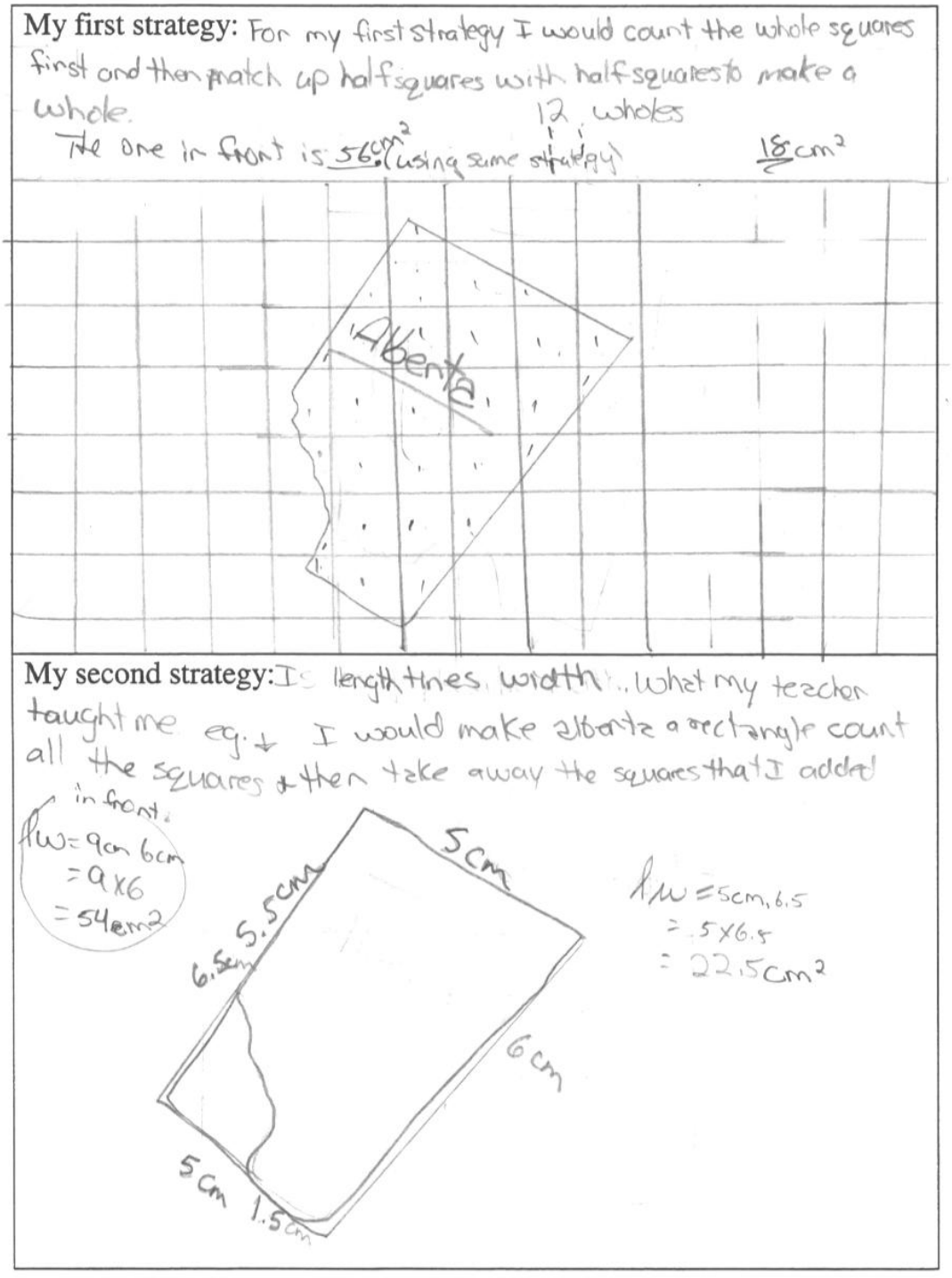
   My first estimate: 21 cm^2

2. Measure a part of the area of the province. Would you change your first estimate now? Why or why not?

   yes, I would change my estimate because I found out that on one side there is 11 blocks. Not just the whole ones, and there is lots more.

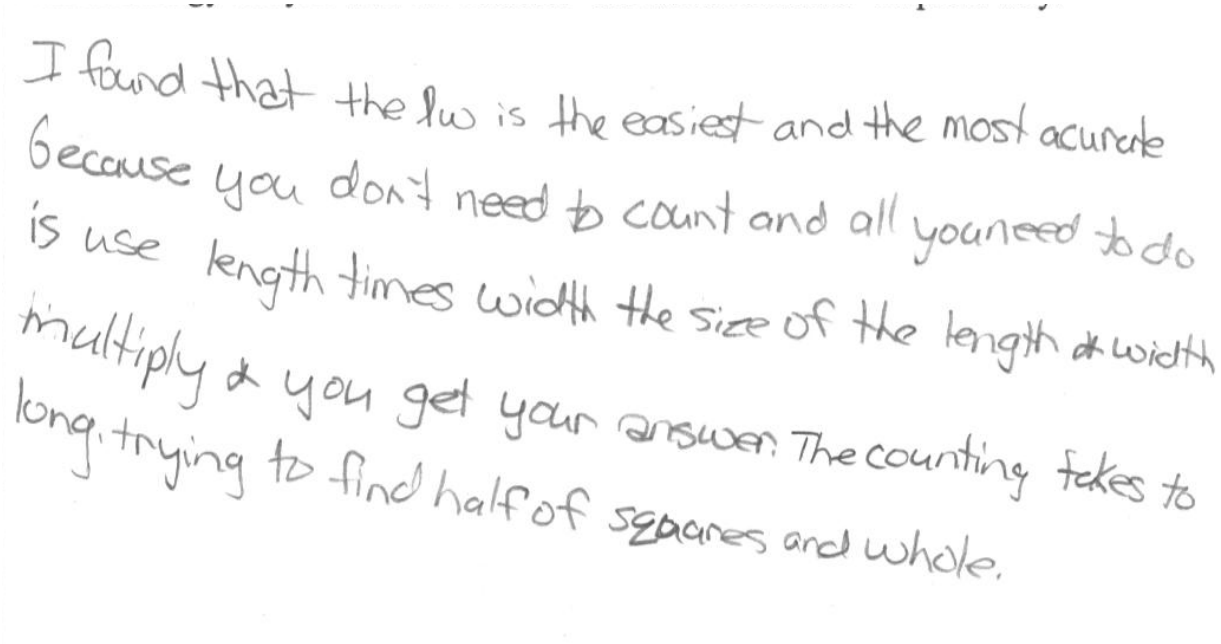
Yes, but

3. Find the total area of the province in two different ways.
Explain how you measured the area both ways using words and pictures.



Yes, but

Which strategy did you find the easiest? The most accurate? Explain why.


I found that the lw is the easiest and the most acurate because you don't need to count and all you need to do is use length times width the size of the length * width multiply & you get your answer. The counting takes to long, trying to find half of squares and whole.

No, but

Math Live – *Area of Irregular Shapes*: Assessment Task

Your class has been studying Canada in Social Studies. They are calculating the area of the province of Alberta.

☐ is equal to 1 square unit

1. Estimate the area of Alberta in square units.

   My first estimate: 70 cm²

2. Measure a part of the area of the province. Would you change your first estimate now? Why or why not?

   No. I wouldn't because my estimate is close to the right answer

No, but

3. Find the total area of the province in two different ways.
Explain how you measured the area both ways using words and pictures.

My first strategy:
I counted the area inside Alberta and it comes out to 57 cm^2

My second strategy: I counted the pecimetre(lxw) which is 12 x 9 = 108

No, but

Which strategy did you find the easiest? The most accurate? Explain why.

I found that the l x w strategy was easyer to do then counting and it was quicker. But the most accurate is counting.