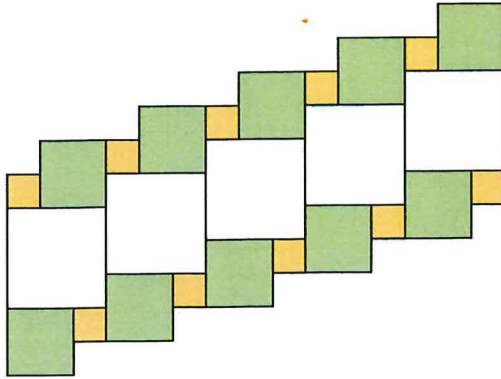


Lesson 1 Practice Problems

Problem 1

Which square—large, medium, or small—covers more of the plane? Explain your reasoning.



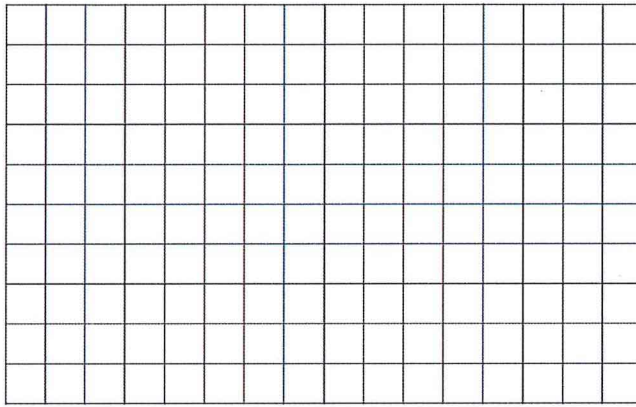
Possible Solutions

POSSIBLE SOLUTIONS

The large square covers more of the plane. Reasoning varies. Sample reasoning: A large square can fit exactly 9 small squares. A medium square can fit exactly 4 small squares. There are 5 large squares, which cover the same amount of the plane as 45 small squares. There are 10 medium squares, which cover the same amount of the plane as 40 small squares. There are only 10 small squares.

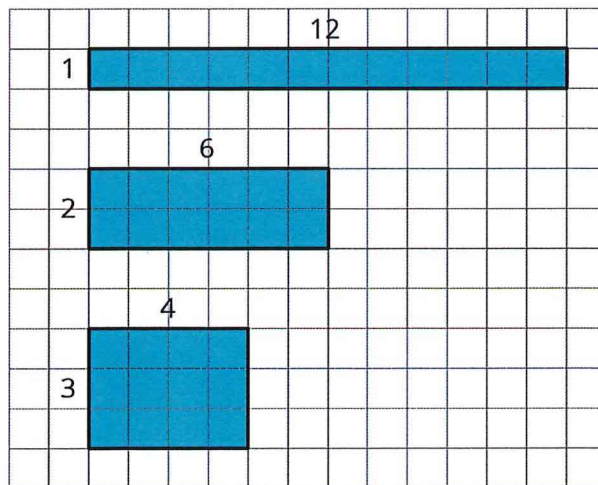
Problem 2

Draw three different quadrilaterals, each with an area of 12 square units.



Possible Solutions

Answers vary. Sample response:

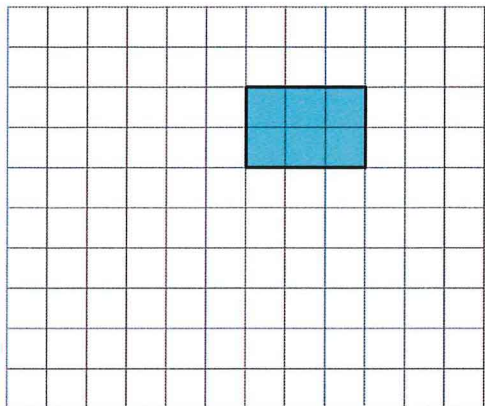


Problem 2

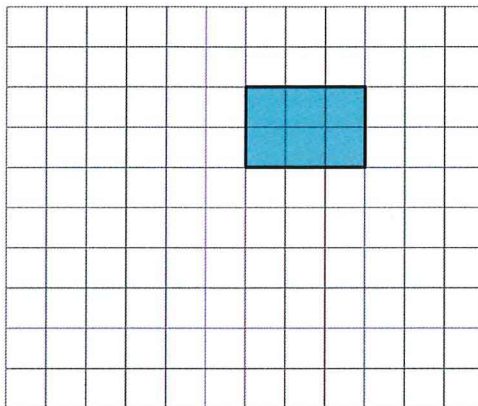
PROBLEMS

Use copies of the rectangle to show how a rectangle could:

a. tile the plane.

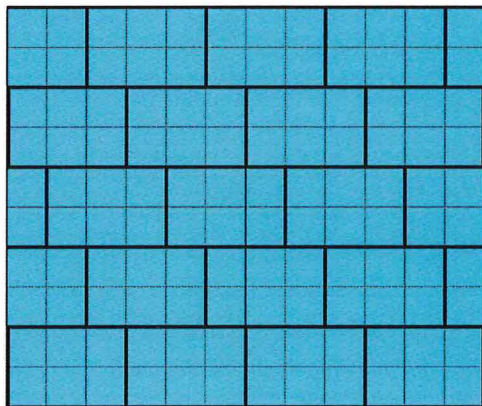


b. *not* tile the plane.

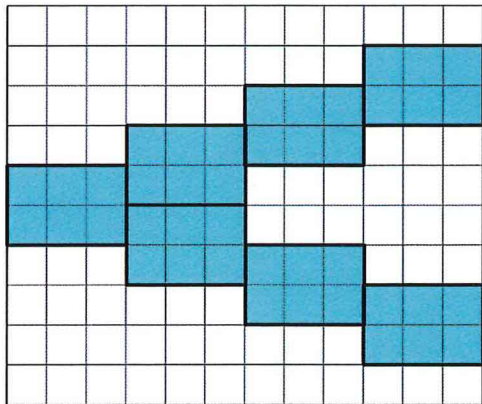


Possible Solutions

a. Answers vary. Sample response:

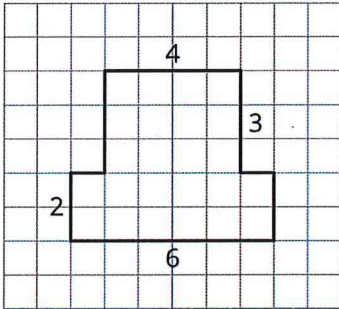


b. Answers vary. Sample response:



Problem 4

The area of this shape is 24 square units. Which of these statements is true about the area?
Select **all** that apply.



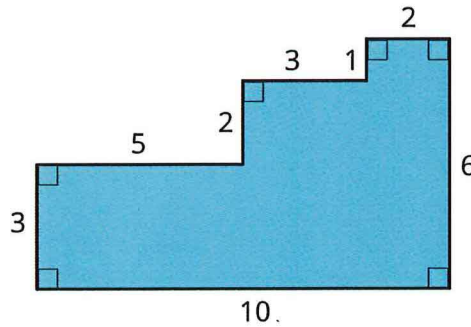
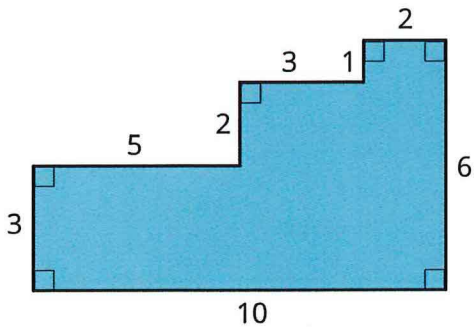
- A. The area can be found by counting the number of squares that touch the edge of the shape.
- B. It takes 24 grid squares to cover the shape without gaps and overlaps.
- C. The area can be found by multiplying the side lengths that are 6 units and 4 units.
- D. The area can be found by counting the grid squares inside the shape.
- E. The area can be found by adding 4×3 and 6×2 .

Possible Solutions

B, D, E

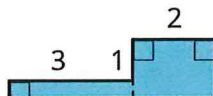
Problem 5

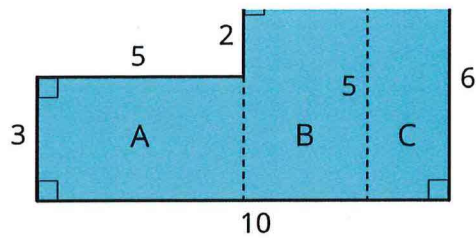
Here are two copies of the same figure. Show two different ways for finding the area of the shaded region. All angles are right angles.



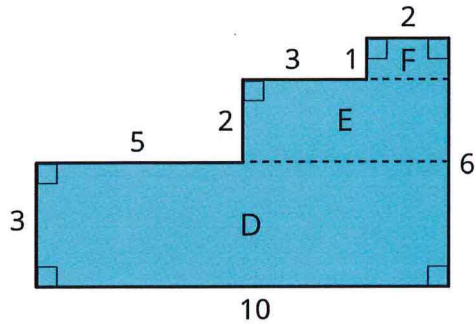
Possible Solutions

Answers vary. Sample strategies:

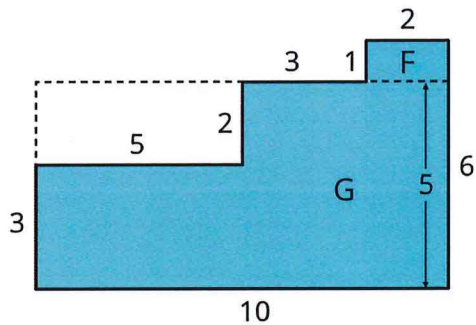




Area of A is 15 square units. Area of B is 15 square units. Area of C is 12 square units. The area of the entire region is $15 + 15 + 12$ or 42 square units.



Area of D is 30 square units. Area of E is 10 square units. Area of F is 2 square units. The area of the entire region is $30 + 10 + 2$ or 42 square units.



Area of F is 2 square units. Area of G is the area of the 10-by-5 rectangle subtracted by the area of a 5-by-2 rectangle in the upper left. $(10 \times 5) - (5 \times 2) = 50 - 10 = 40$, so the area of G is 40 square units. The total area is $40 + 2$ or 42 square units.

Problem 6

Which shape has a larger area: a rectangle that is 7 inches by $\frac{3}{4}$ inch, or a square with a side length of $2\frac{1}{2}$ inches? Show your reasoning.

Possible Solutions

The square is larger. Its area is $2\frac{1}{2} \times 2\frac{1}{2} = \frac{5}{2} \times \frac{5}{2}$, which is $\frac{25}{4}$ or $6\frac{1}{4}$ square inches. The

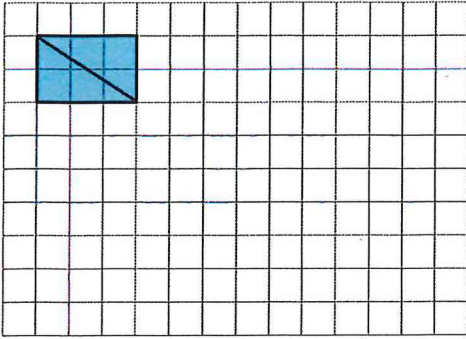
rectangle has an area of $5\frac{1}{4}$ square inches because $7 \times \frac{3}{4} = \frac{21}{4}$.

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Lesson 2 Practice Problems

Problem 1

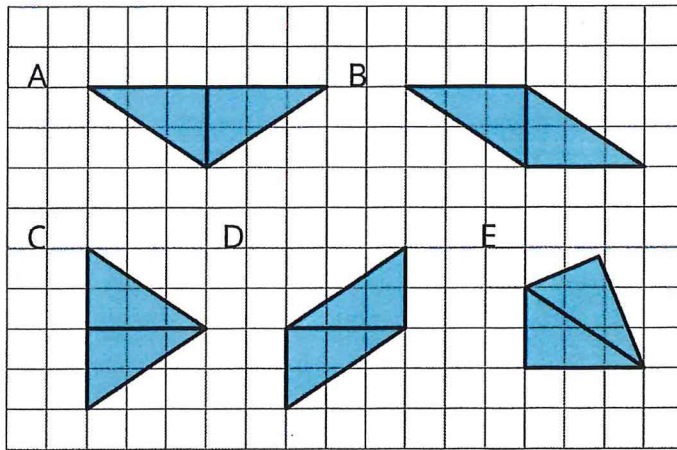
The diagonal of a rectangle is shown.



- Decompose the rectangle along the diagonal, and recompose the two pieces to make a *different* shape.
- How does the area of this new shape compare to the area of the original rectangle? Explain how you know.

Possible Solutions

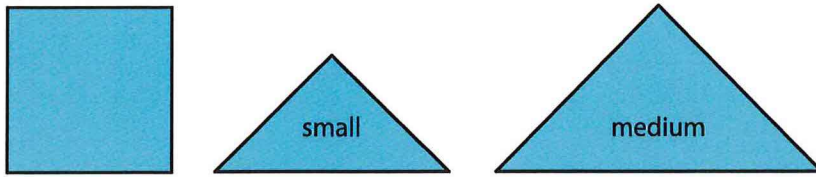
a. Answers vary. Five different ways are shown.



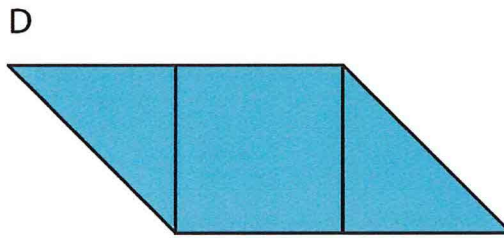
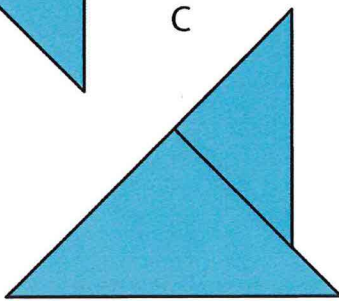
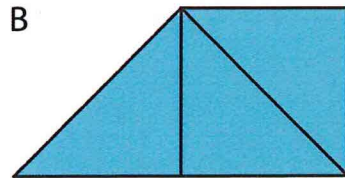
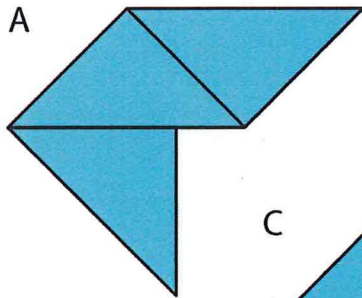
- The areas are the same as all of the shapes are composed of two copies of the same triangle.

Problem 2

The area of the square is 1 square unit. Two small triangles can be put together to make a square or to make a medium triangle.



Which figure also has an area of $1\frac{1}{2}$ square units? Select **all** that apply.



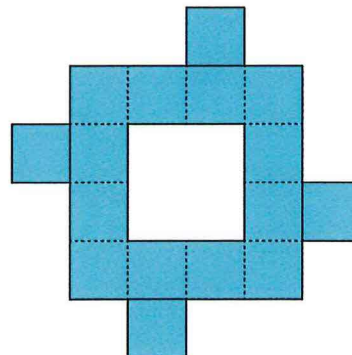
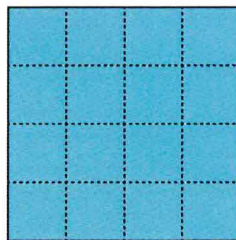
Possible Solutions

A, B, C

Problem 3

Priya decomposed a square into 16 smaller, equal-size squares and then cut out 4 of the small squares and attached them around the outside of original square to make a new figure.

How does the area of her new figure compare with that of the original square?



A. The area of the new figure is greater.

B. The two figures have the same area.

B. The two figures have the same area.

C. The area of the original square is greater.

D. We don't know because neither the side length nor the area of the original square is known.

Possible Solutions

B

Problem 4

From Grade 6, Unit 1, Lesson 1

The area of a rectangular playground is 78 square meters. If the length of the playground is 13 meters, what is its width?

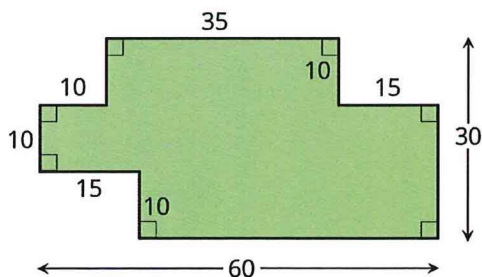
Possible Solutions

6 feet.

Problem 5

From Grade 6, Unit 1, Lesson 1

A student said, "We can't find the area of the shaded region because the shape has many different measurements, instead of just a length and a width that we could multiply."



Explain why the student's statement about area is incorrect.

Possible Solutions

Answers vary. Sample explanation: Area measures how many unit squares cover a region without gaps or overlaps. We multiply a length and a width when finding the area of a

rectangle because that product tells us the number of unit squares in it. We can still find the area of a shape as shown, but first we will need to break it apart into rectangles whose areas we can find and then find the total area. We can also enclose the 30-by-60 region with a rectangle, find its area, and subtract the areas of the unshaded portions.

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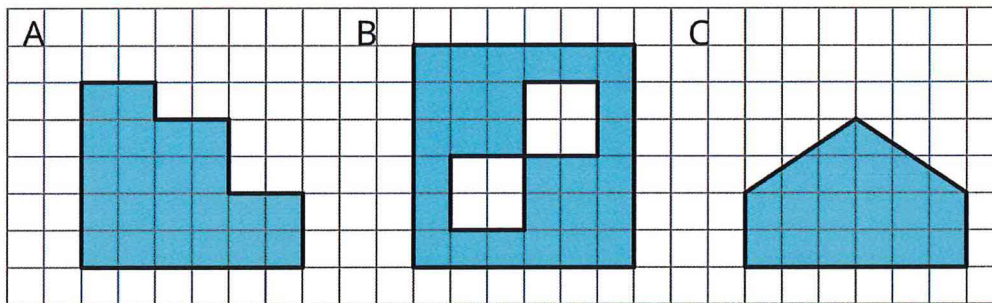
Possible Responses

72 square inches. Reasoning varies. Sample reasoning: If we draw a line down the middle of the shaded area, we would have a 4 inch-by-12 inch rectangle on the left and two right triangles. The 4-by-12 rectangle has an area of 48 square inches. The two triangles on the right can be composed into a 4 inch-by-6 inch rectangle, so their combined area is 24 square inches. $48 + 24 = 72$.

Lesson 3 Practice Problems

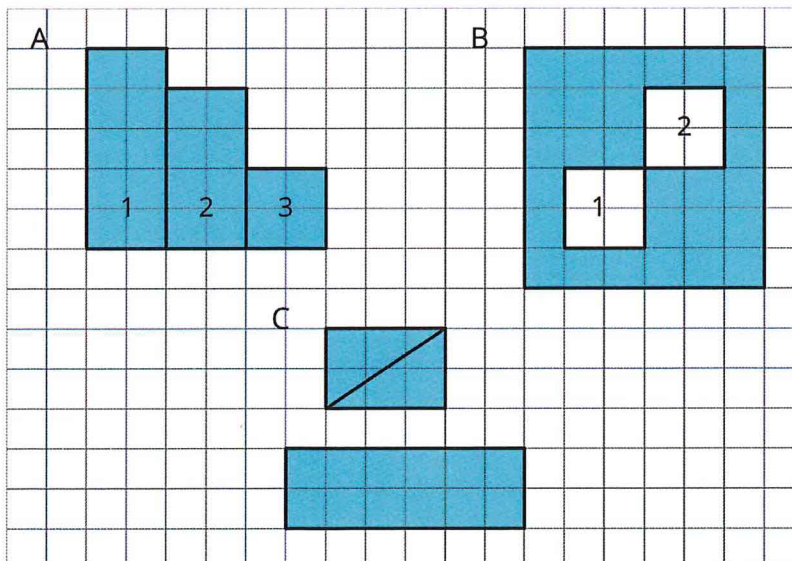
Problem 1

Find the area of each shaded region. Show your reasoning.



Possible Solutions

Answers vary. Sample response:



Shape A: 22 square units. The shaded region can be partitioned into rectangles. One way to do this is shown above. Rectangle 1 is 2 units by 5 units, so its area is 10 square units. Rectangle 2

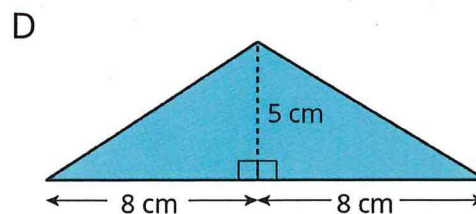
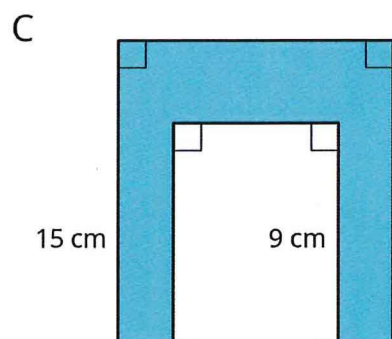
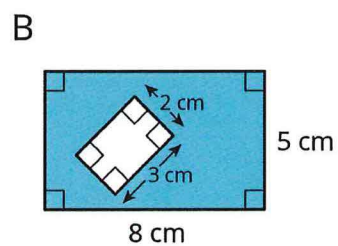
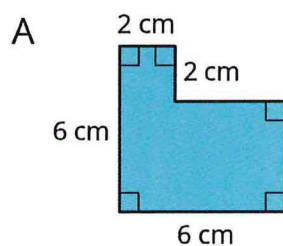
is 2 units by 4 units, so its area is 8 square units. The area of Rectangle 3 is 4 square units. The total shaded area is 22 square units, since $10 + 8 + 4 = 22$.

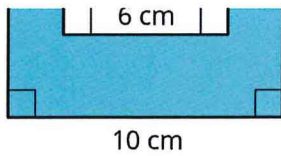
Shape B: 28 square units. The outer square is 6 units by 6 units, so its area is 36 square units. There are two smaller squares inside. Square 1 and Square 2 have been removed. Each small square has an area of 4 square units. To get the shaded area, compute $36 - 4 - 4$, which equals 28.

Shape C: 18 square units. The region can be recomposed to form a 2-by-6 rectangle and a 2-by-3 rectangle. $(2 \cdot 6) + (2 \cdot 3) = 18$.

Problem 2

Find the area of each shaded region. Show or explain your reasoning.





Possible Solutions

Reasoning varies. Sample responses:

A: 28 sq cm. A horizontal cut partitions this into a 2 cm-by-2 cm square (4 sq cm) and a 4 cm-by-6 cm rectangle (24 sq cm).

B: 34 sq cm. The outer rectangle has an area of 40 sq cm while the inner rectangle has an area of 6 sq cm. $40 - 6 = 34$.

C: 96 sq cm. The outer rectangle has an area of 150 sq cm while the inner rectangle has an area of 54 sq cm. $150 - 54 = 96$.

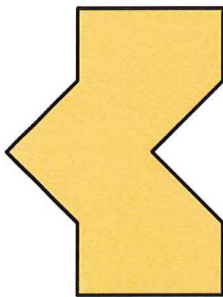
D: 40 sq cm. The two right triangles can be put together to make a 5 cm-by-8 cm rectangle.

Problem 3

Two plots of land have very different shapes. Noah said that both plots of land have the same area.



plot A



plot B

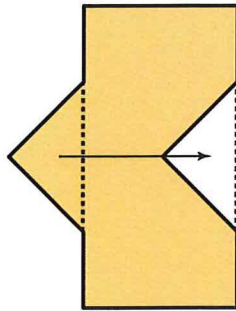
Do you agree with Noah? Explain your reasoning.

Possible Solutions

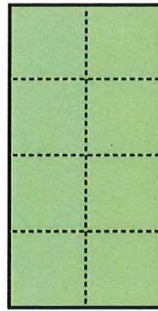
Agree. Answers vary. Sample reasoning: The triangular shape that juts out from the left side of plot B can be cut off and moved to the right side of plot B. The resulting shape is a rectangle that matches exactly with the shape of plot A. We can use tracing paper to verify. Sample diagrams:



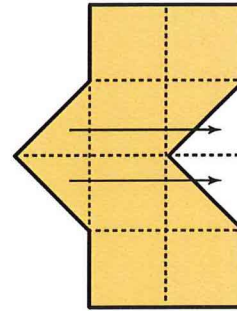
plot A



plot B



plot A



plot B

Problem 4

From Grade 6, Unit 1, Lesson 2

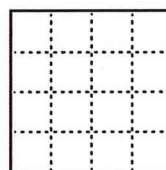
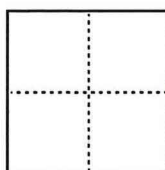
A homeowner is deciding on the size of tiles to use to fully tile a rectangular wall in her bathroom that is 80 inches by 40 inches. The tiles are squares and come in three side lengths: 8 inches, 4 inches, and 2 inches. State if you agree with each statement about the tiles. Explain your reasoning.

- Regardless of the size she chooses, she will need the same number of tiles.
- Regardless of the size she chooses, the area of the wall that is being tiled is the same.
- She will need two 2-inch tiles to cover the same area as one 4-inch tile.
- She will need four 4-inch tiles to cover the same area as one 8-inch tile.
- If she chooses the 8-inch tiles, she will need a quarter as many tiles as she would with 2-inch tiles.

Possible Solutions

Explanations vary. Sample explanations and diagram:

- Disagree. She will need fewer of the larger tiles and more of the smaller tiles.
- Agree. The region being covered does not change regardless of what tiles she chooses.
- Disagree. She will need four 2-inch tiles to cover the same area as one 4-inch tile.



8 in

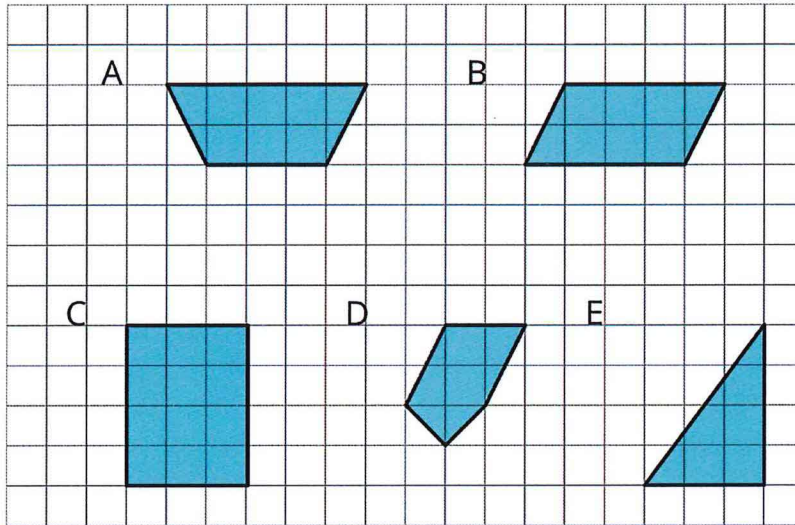


- d. Agree. Two rows of two 4-inch tiles cover the same area as one 8-inch tile.
- e. Disagree. Because one 8-inch tile covers the same area as four 4-inch tiles, she will need $\frac{1}{16}$ as many 8-inch tiles as she would with 2-inch tiles.

Lesson 4 Practice Problems

Problem 1

Select **all** of the parallelograms. For each figure that is *not* selected, explain how you know it is not a parallelogram.

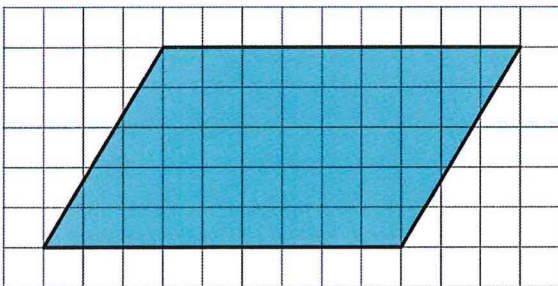


Possible Solutions

B and C are parallelograms (C is also a rectangle). A is a trapezoid (two opposite sides are not parallel and two are not the same length), D is a pentagon, and E is a (right) triangle.

Problem 2

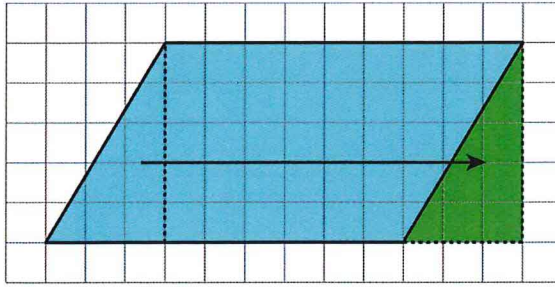
a. Decompose and rearrange this parallelogram to make a rectangle.



b. What is the area of the parallelogram?
Explain your reasoning.

Possible Solutions

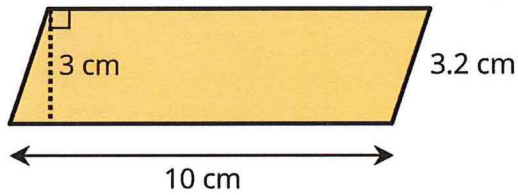
a. Answers vary. Sample response: The diagram shows that we get a rectangle that is 5 units by 3 units by decomposing and rearranging.



b. The area of the parallelogram is the same as the area of the rectangle, which is 45 square units.

Problem 3

Find the area of the parallelogram.

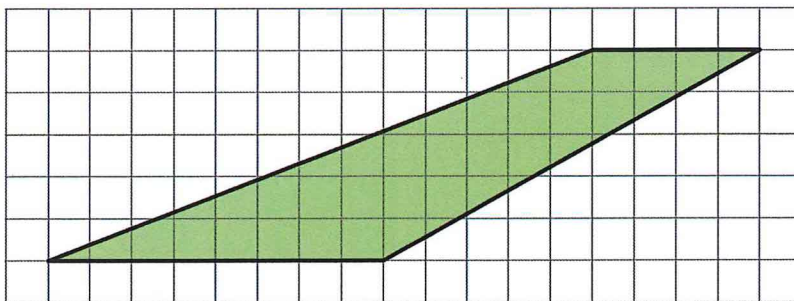


Possible Solutions

30 sq cm

Problem 4

Explain why this quadrilateral is *not* a parallelogram.



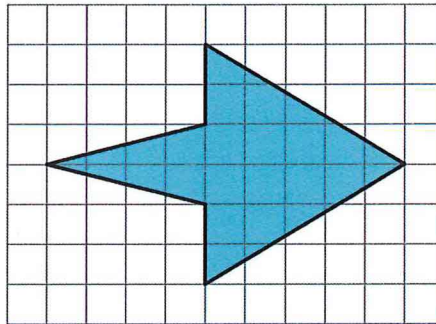
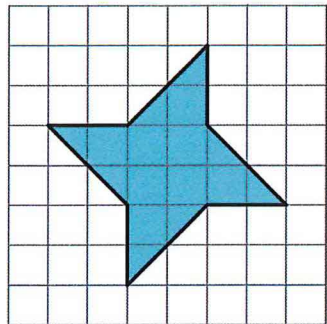
Possible Solutions

Explanations vary. Sample explanation: Opposite sides are not parallel and not the same length. Opposite angles are not equal.

Problem 5

From Grade 6, Unit 1, Lesson 3

Find the area of each shape. Show your reasoning.



Possible Solutions

12 square units, 19 square units. Reasoning varies.

Problem 6

From Grade 6, Unit 1, Lesson 1

Find the areas of the rectangles with the following side lengths.

a. 5 in and $\frac{1}{3}$ in

c. $\frac{5}{2}$ in and $\frac{4}{3}$ in

b. 5 in and $\frac{4}{3}$ in

d. $\frac{7}{6}$ in and $\frac{6}{7}$ in

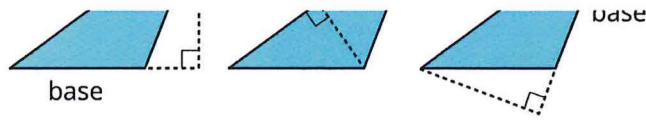
Possible Solutions

a. $\frac{5}{3}$ square inches

b. $\frac{20}{3}$ square inches

c. $\frac{10}{3}$ square inches

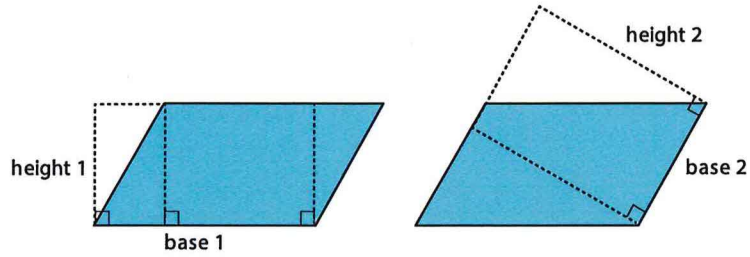
d. 1 square inch



height (of a parallelogram or triangle)

The height is the shortest distance from the base of the shape to the opposite side (for a parallelogram) or opposite vertex (for a triangle).

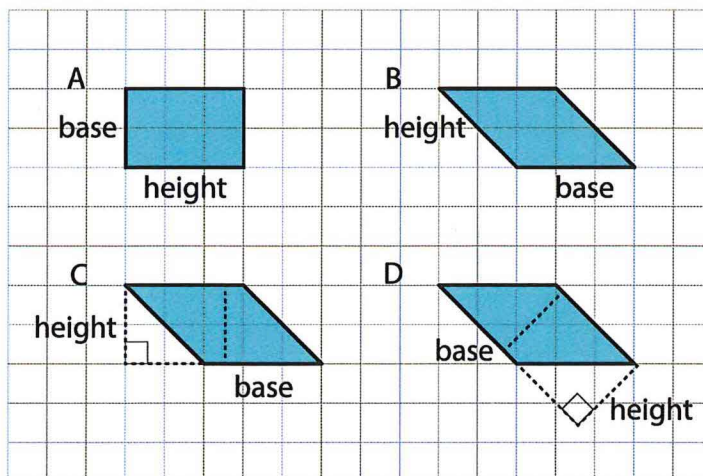
We can show the height in more than one place, but it will always be perpendicular to the chosen base.



Lesson 5 Practice Problems

Problem 1

Select **all** parallelograms that have a correct height labeled for the given base.



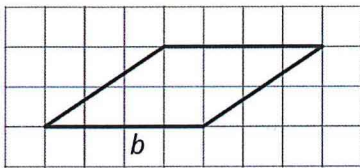
Possible Solutions

A. C. D

(B is incorrect because the base and height are not perpendicular.)

Problem 2

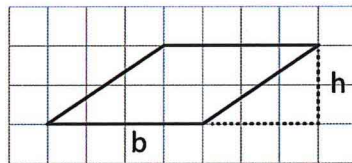
The side labeled b has been chosen as the base for this parallelogram.



Draw a segment showing the height corresponding to that base.

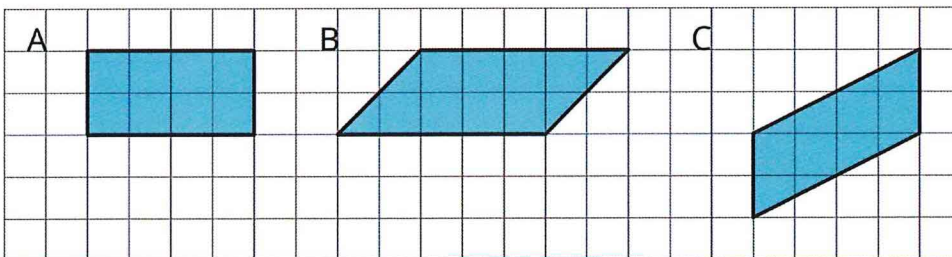
Possible Solutions

Answers vary. (The height can be any segment perpendicular to the base that joins the line containing the base to the line containing the side opposite the base). Sample response:



Problem 3

Find the area of each parallelogram.



Possible Solutions

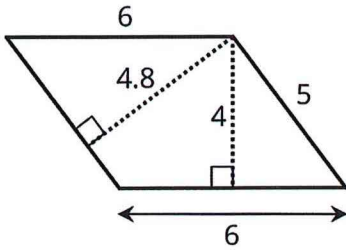
A: 8 square units. (This is a 2-by-4 rectangle.)

B: 10 square units. (The horizontal side is 5 units long and can be the base. The height for this base is 2 units.)

C: 8 square units. (The vertical side can be used as the base. The base is 2 units, and the height for this base is 4 units.)

Problem 4

If the side that is 6 units long is the base of this parallelogram, what is its corresponding height?



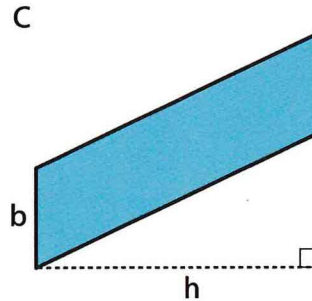
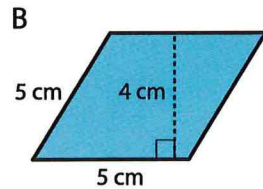
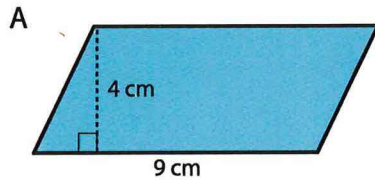
- A. 6 units
- B. 4.8 units
- C. 4 units
- D. 5 units

Possible Solutions

C

Problem 5

Find the area of each parallelogram.



Possible Solutions

A: 36 sq cm. (The base is 9 cm, and the height for that base is 4 cm.)

B: 20 sq cm. (The base is 5 cm, and the height for this base is 4 cm.)

C: bh . (The base is b , and the corresponding height is h .)

Problem 6

From Grade 6, Unit 1, Lesson 4

Do you agree with each of these statements? Explain your reasoning.

- A parallelogram has six sides.
- Opposite sides of a parallelogram are parallel.
- A parallelogram can have one pair or two pairs of parallel sides.
- All sides of a parallelogram have the same length.
- All angles of a parallelogram have the same measure.

Possible Solutions

- Disagree. A parallelogram is a quadrilateral.
- Agree. By definition, opposite sides of a parallelogram are parallel.
- Disagree. By definition, a parallelogram has two pairs of parallel sides.
- Disagree. Sometimes all sides of a parallelogram have the same length, but not always. Opposite sides of a parallelogram always have the same length.
- Disagree. Sometimes all angles of a parallelogram have the same measure (when the parallelogram is a rectangle), but not always. Opposite angles of a parallelogram have the same measure.

Problem 7

From Grade 6, Unit 1, Lesson 2

A square with an area of 1 square meter is decomposed into 9 identical small squares. Each small square is decomposed into two identical triangles.

- What is the area, in square meters, of 6 triangles? If you get stuck, draw a diagram.
- How many triangles are needed to compose a region that is $1\frac{1}{2}$ square meters?

Possible Solutions

- $\frac{6}{18}$ or $\frac{1}{3}$ square meter.
- 27 triangles. It takes 18 triangles to make an area of 1 square meter and 9 triangles to make an area of $\frac{1}{2}$ square meter. $18 + 9 = 27$.

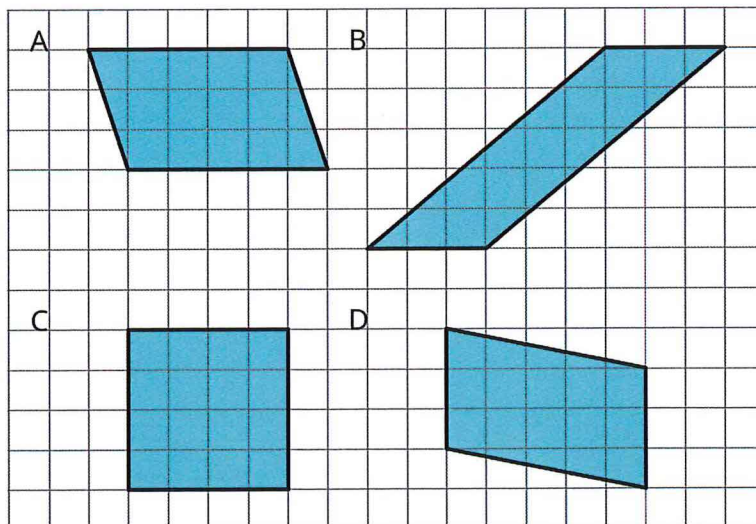
Possible Responses

- 54 sq cm. A base is 9 cm and its corresponding height is 6 cm. $9 \cdot 6 = 54$.
- The 7.5 cm length was not used. Explanations vary. Sample explanations:
 - If the side that is 7.5 cm was used to find area, we would need the length of a perpendicular segment between that side and the opposite side as its corresponding height. We don't have that information.
 - The parallelogram can be decomposed and rearranged into a rectangle by cutting it along the horizontal line and moving the right triangle to the bottom side. Doing this means the side that is 7.5 cm is no longer relevant. The rectangle is 6 cm by 9 cm; we can use those side lengths to find area.

Lesson 6 Practice Problems

Problem 1

Which three of these parallelograms have the same area as each other?



Possible Solutions

A, B, D. (They all have an area of 15 square units.)

Problem 2

Which of the following pairs of base and height produces the greatest area? All measurements are in centimeters.

- A. $b = 4, h = 3.5$
- B. $b = 0.8, h = 20$
- C. $b = 6, h = 2.25$
- D. $b = 10, h = 1.4$

Possible Solutions

B

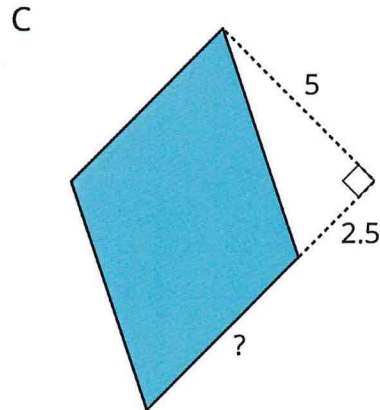
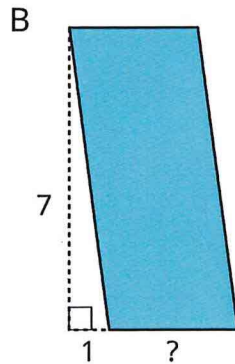
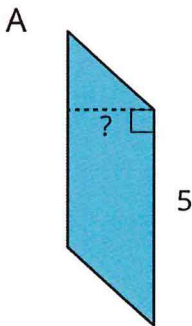
Problem 3

Here are the areas of three parallelograms. Use them to find the missing length (labeled with a "?") on each parallelogram.

A: 10 square units

B: 21 square units

C: 25 square units



Possible Solutions

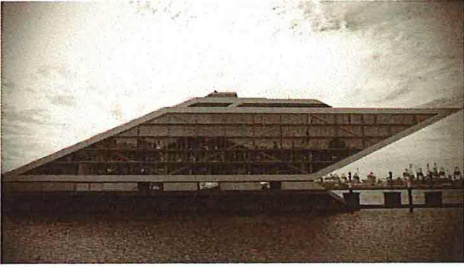
A: 2 units

B: 3 units

C: 5 units

Problem 4

The Dockland Building in Hamburg, Germany is shaped like a parallelogram.



If the length of the building is 86 meters and its height is 55 meters, what is the area of this face of the building?

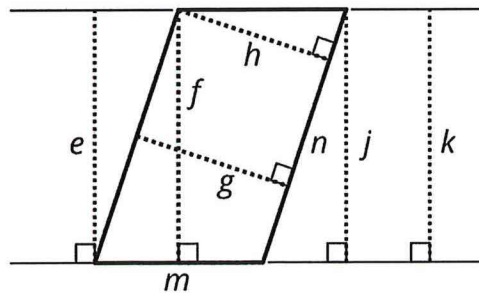
Possible Solutions

4,730 square meters ($86 \cdot 55 = 4,730$).

Problem 5

From Grade 6, Unit 1, Lesson 5

Select all segments that could represent a corresponding height if the side m is the base.



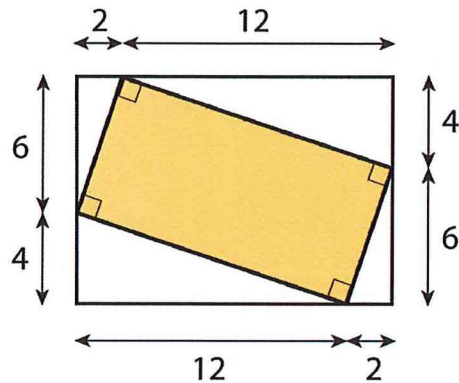
Possible Solutions

e, f, j, k

Problem 6

From Grade 6, Unit 1, Lesson 3

Find the area of the shaded region. All measurements are in centimeters. Show your reasoning.



Possible Solutions

80 square centimeters. Sample reasoning: The area of the large rectangle is 140 square centimeters, because $14 \cdot 10 = 140$. The areas of the small, unshaded right triangles are each 6 square centimeters, because $6 \cdot 2 \div 2 = 6$. The areas of the larger, unshaded right triangles are each 24 square centimeters, because $4 \cdot 12 \div 2 = 24$. Subtracting the areas of the four unshaded right triangles from the area of the large rectangle yields 80:

$$140 - 6 - 6 - 24 - 24 = 80.$$