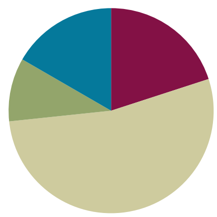
Lesson 13

Objective: Find areas by decomposing into rectangles or completing composite figures to form rectangles.

Related Topics: [More Lesson Plans for the Common Core Math]()

Suggested Lesson Structure

Fluency Practice	(12 minutes)
Application Problem	(6 minutes)
Concept Development	(32 minutes)
Student Debrief	(10 minutes)
Total Time	**(60 minutes)**



Fluency Practice (12 minutes)

- Group Counting **3.OA.1** (4 minutes)
- Find the Common Products **3.OA.7** (8 minutes)

Group Counting (4 minutes)

Note: Group counting reviews interpreting multiplication as repeated addition.

Direct students to count forward and backward, occasionally changing the direction of the count.

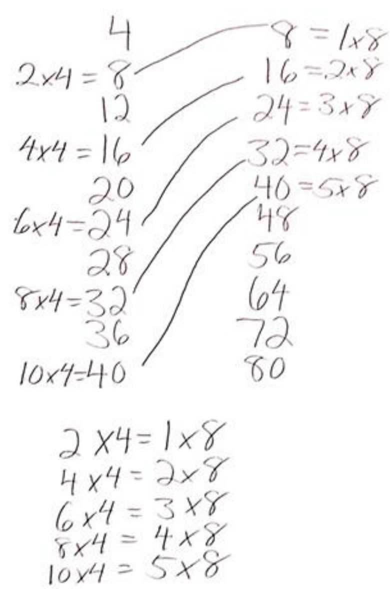
- Threes to 30
- Sixes to 60
- Eights to 80
- Nines to 90

Find the Common Products (8 minutes)

Materials: (S) Blank paper

Note: This fluency reviews multiplication patterns.

After listing the multiples of 4 and 8, guide students through the following steps.



T: Draw a line to match the numbers that appear in both columns.

S: (Match 8, 16, 24, 32, and 40.)

T: (Write 2 × 4 = 8, etc., next to each matched number on the left half of the paper.) Write the rest of the number sentences like I did.

S: (Write number sentences.)

T: (Write 8 = 1 × 8, etc., next to each matched number on the right half of the paper.) Write the rest of the number sentences like I did.

S: (Write number sentences.)

T: (Write 2 × 4 = __ × 8.) Say the true number sentence.

S: 2 × 4 = 1 × 8.

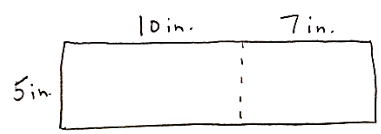
T: (Write 2 × 4 = 1 × 8.) Write the remaining equal facts as number sentences.

S: (Write 4 × 4 = 2 × 8, 6 × 4 = 3 × 8, 8 × 4 = 4 × 8, and 10 × 4 = 5 × 8.)

T: Discuss the patterns in your number sentences.

Application Problem (6 minutes)

Anil finds the area of a 5 inch by 17 inch rectangle by breaking it into 2 smaller rectangles. Show one way that he could have solved the problem. What is the area of the rectangle?



The area of the rectangle is 85 sq. in.

$5 \times 17 = (5 \times 10) + (5 \times 7)$

$5 \times 17 = 50 + 35 = 85$

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Students who solve the Application Problem quickly may enjoy comparing their solution strategy with others. They may discuss or journal about their reasoning.

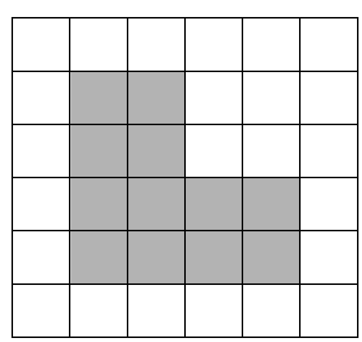
Note: This problem reinforces the strategy of breaking a larger shape apart into 2 smaller shapes to find the total area.

Concept Development (32 minutes)

Materials: (S) Personal white boards, grid template

Problem 1: Add using the break apart strategy to find area of a composite shape.

Distribute one grid template to each student. Draw or project the shape shown at right.



T: Draw and shade the shape on your grid template.

S: (Draw and shade.)

T: How do you find the area of a rectangle?

S: Multiply the side lengths!

T: Talk to your partner: Can we find the area of the shaded figure by multiplying side lengths? How do you know?

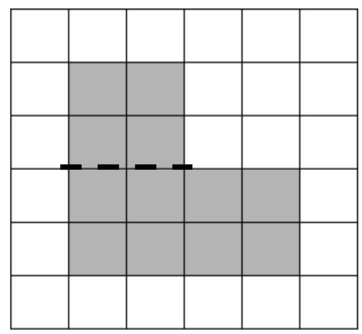
S: No, because it isn't a rectangle. → We can count the unit squares inside, though.

T: In the Application Problem, we used the break apart and distribute strategy to find the area of a larger rectangle by breaking it into smaller rectangles. Turn and talk to your partner: How might we use a strategy like that to find the area of the shaded figure?

S: We can break it into a square and a rectangle. → We can break it into three squares.

T: Draw a dotted line to show how to break the shaded figure apart into a square and rectangle.

S: (Draw.)



T: (Model as shown at right.) What equation tells you the area of the square on top?

S: 2 × 2 = 4!

T: What equation tells you the area of the rectangle on bottom?

S: 2 × 4 = 8!

T: How do we use those measurements to find the area of the shaded figure?

MP.7

S: Add them together!

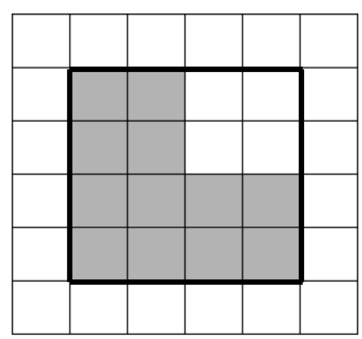
T: What is the sum of 8 and 4?

S: 12.

T: What is the area of the shaded figure?

S: 12 square units!

Draw or project the shape shown at right.

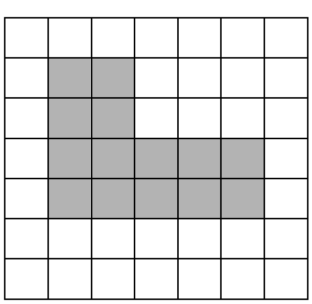


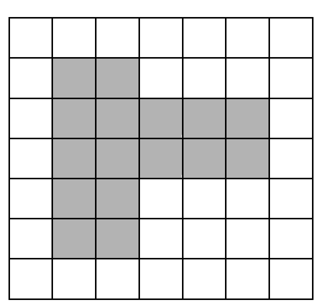
T: We can also find the area of the shaded figure by thinking about a 4 × 4 square with missing units. Turn and talk to your partner: How can we find the shaded area using our square?

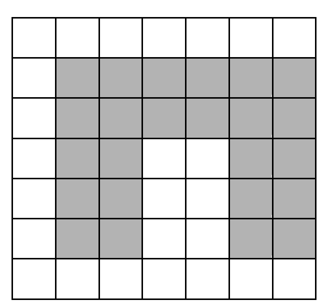
S: The area of the square is 16 square units. → Since the entire square isn't shaded, we need to subtract the 4 units that are unshaded. → 16 – 4 = 12 square units.

T: There are different strategies of finding the area of a figure. It just depends on how you choose to look at it.

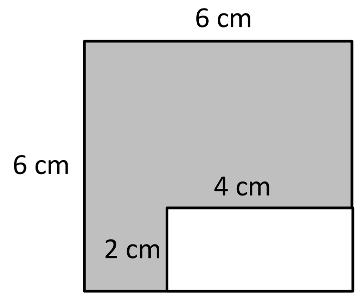
Continue with the following suggested examples:







Problem 2: Subtract to find area of a composite shape.



Draw or project the shape shown at right.

T: This figure shows a small rectangle cut out of a larger, shaded rectangle. How can we find the area of the shaded figure?

S: We can break apart the shaded part. → Or we can subtract the unshaded area from the shaded square.

T: (Shade in the white shape.) We now have a large, shaded square. Write a number sentence to find the area of the large square.

S: (Write 6 × 6 = 36.)

T: What is the area of the square?

S: 36 square centimeters.

T: (Erase the shading inside the white rectangle.) Beneath the number sentence you just wrote, write a number sentence to find the area for the shape we "cut out."

S: (Write 2 × 4 = 8.)

T: What is the area of the white shape?

S: 8 square centimeters.

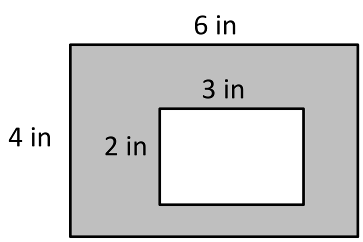
T: The area of the square is 36 square centimeters. We cut out, or took away, 8 square centimeters of shading. Turn and talk to you partner. How can we find the area of the shaded region?

S: Subtract 8 square centimeters from 36 square centimeters!

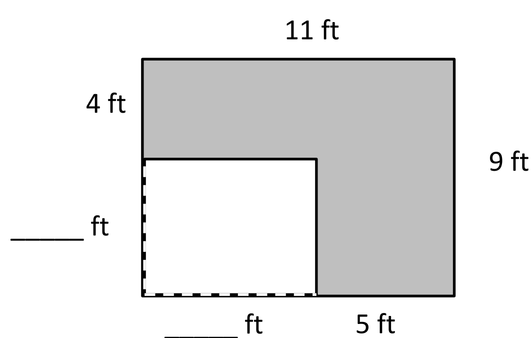
T: Write a number sentence to find the area of the shaded region.

S: (Write 36 – 8 = 28.)

Continue with the following example:



Problem 3: Subtract to find area of a composite shape with missing side lengths.



Draw or project the shape shown at right.

T: This figure also shows a small rectangle cut out of a larger, shaded rectangle, but what is missing?

S: The side lengths of the smaller rectangle.

T: Do we have enough information to find the side lengths of the smaller rectangle?

S: No, I don't think so. → We know the side lengths of the larger rectangle. → Maybe we can subtract to the find the missing side lengths.

T: Opposite sides of a rectangle are equal. Since we know the length of the rectangle is 9 feet, what is the opposite side length?

S: 9 feet.

T: You can then find the missing lengths by subtracting the total, 9 feet, from the known length, 4 feet.

S: The missing length is 5 feet!

T: Use the same strategy to find the missing width.

S: (Write 11 – 5 = 6.)

T: What is the missing width?

S: 6 feet!

T: Can we now find the area of the shaded figure?

S: Yes!

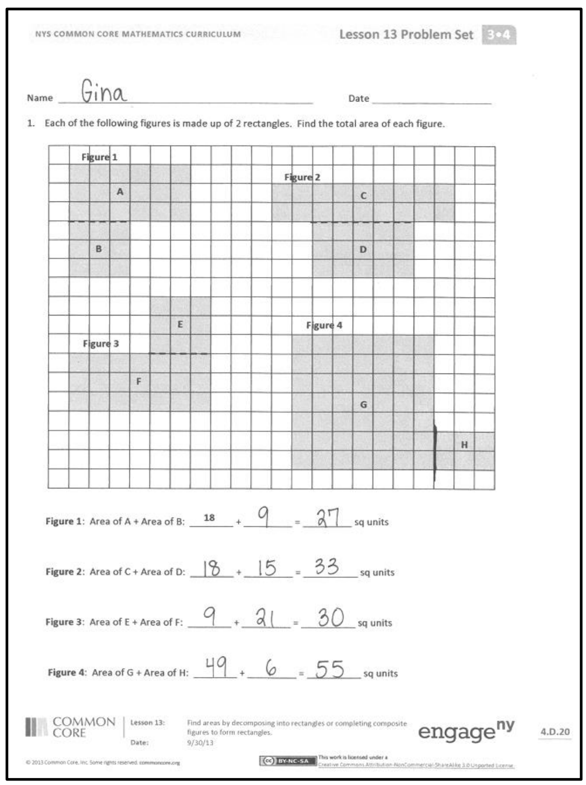
T: With your partner, find the area of the shaded figure.

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Extend Problem 3 for students working above grade level. Challenge students to think about a real life scenario in which this model might be used and to write a word problem to match. Always offer challenges and extensions to learners as alternatives. Here, a student might be given the option of solving one other problem in addition to this extension. Another option would be to direct students to solve the problem you intend to discuss in the Student Debrief.

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students solve these problems using the RDW approach used for Application Problems.


NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 13 Problem Set 3•4

Name Gina Date

1. Each of the following figures is made up of 2 rectangles. Find the total area of each figure.

Figure 1: Area of A + Area of B: 18 + 9 = 27 sq units

Figure 2: Area of C + Area of D: 18 + 15 = 33 sq units

Figure 3: Area of E + Area of F: 9 + 21 = 30 sq units

Figure 4: Area of G + Area of H: 49 + 6 = 55 sq units

COMMON CORE | Lesson 13: Find areas by decomposing into rectangles or completing composite figures to form rectangles. Date: 9/30/13 engage^ny 4.D.20

Student Debrief (10 minutes)

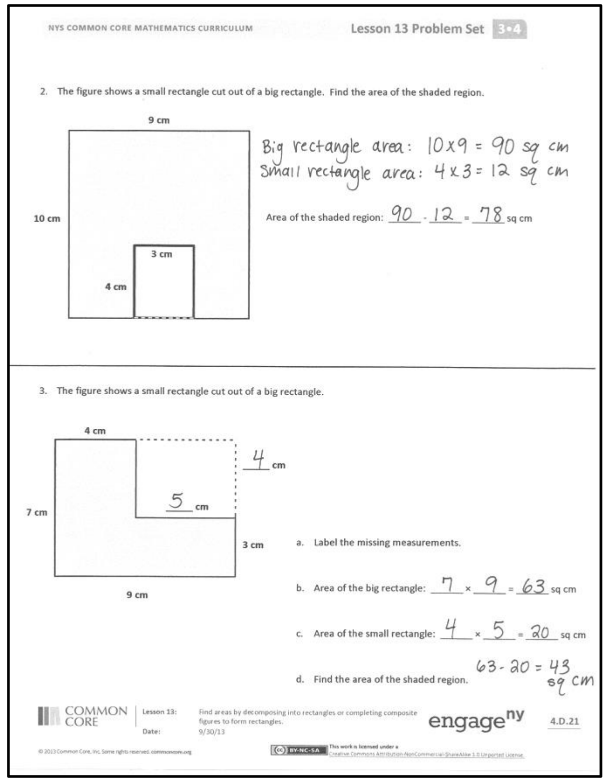
Lesson Objective: Find areas by decomposing into rectangles or completing composite figures to form rectangles.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- How did you break apart the rectangles in Figure 4?. Did anyone break apart the rectangles in a different way? (A rectangle of 10 by 2).
- In Problem 2, a 4-cm by 3-cm rectangle was cut out of a bigger rectangle. What other measurements could have been cut out to keep the same area for the shaded region?
- How did you find the unknown measurements in Problem 3?
- How were today's strategies examples of using what we know to solve new types of problems?


NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 13 Problem Set 3•4

2. The figure shows a small rectangle cut out of a big rectangle. Find the area of the shaded region.

Big rectangle area: 10 x 9 = 90 sq cm
Small rectangle area: 4 x 3 = 12 sq cm

Area of the shaded region: 90 - 12 = 78 sq cm

3. The figure shows a small rectangle cut out of a big rectangle.

a. Label the missing measurements.

b. Area of the big rectangle: 7 x 9 = 63 sq cm

c. Area of the small rectangle: 4 x 5 = 20 sq cm

d. Find the area of the shaded region. 63 - 20 = 43 sq cm

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

Name ______________________________ Date ______________

1. Each of the following figures is made up of 2 rectangles. Find the total area of each figure.

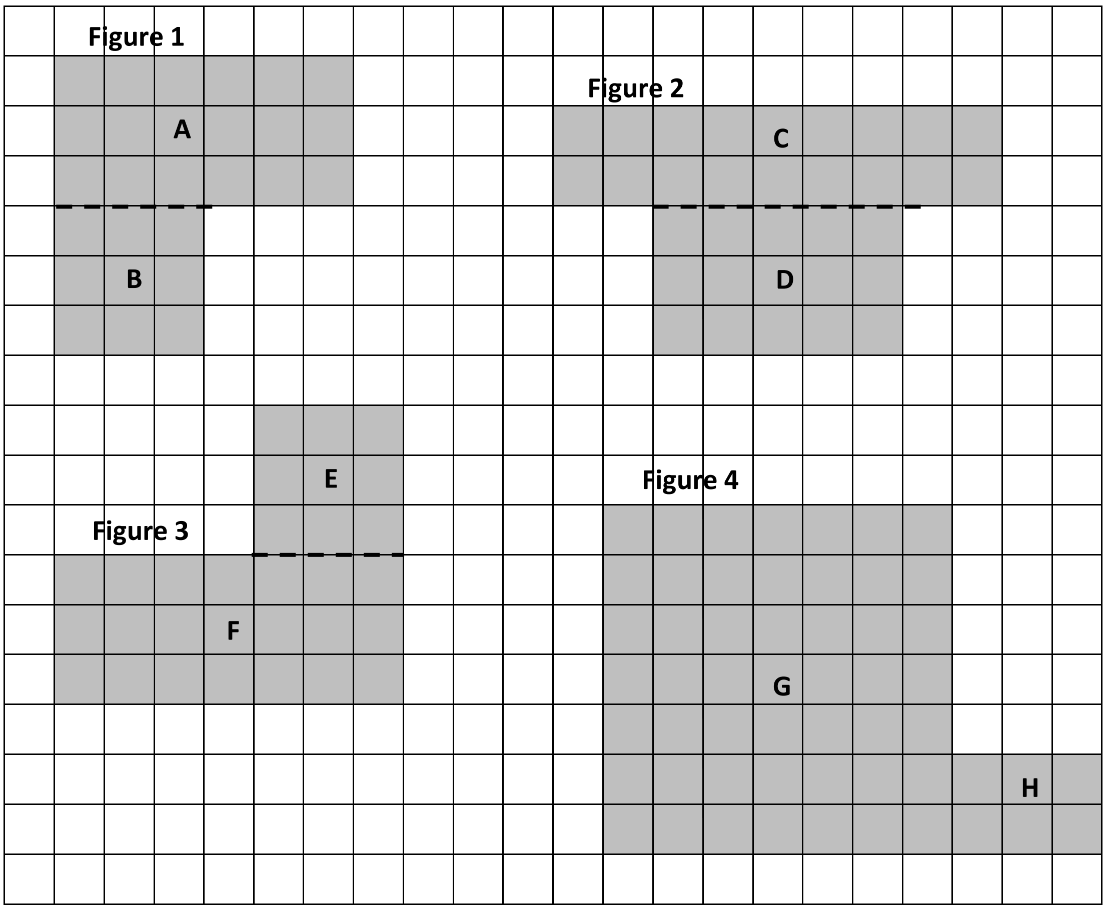


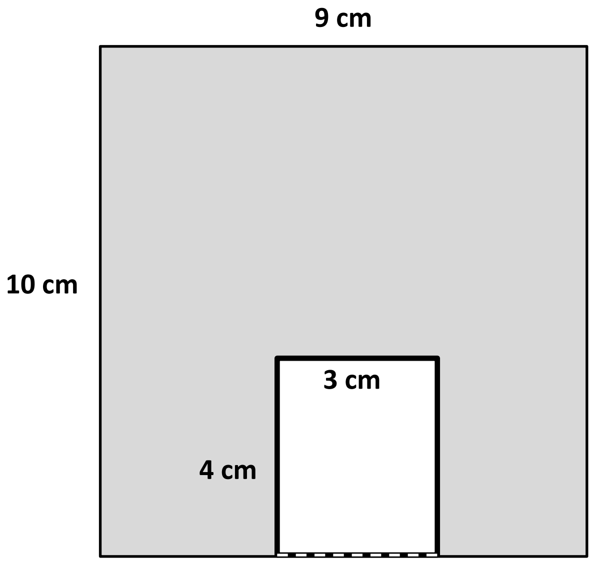
Figure 1: Area of A + Area of B: ___18___ + _________ = _________ sq units

Figure 2: Area of C + Area of D: ________ + _________ = __________ sq units

Figure 3: Area of E + Area of F: ________ + _________ = __________ sq units

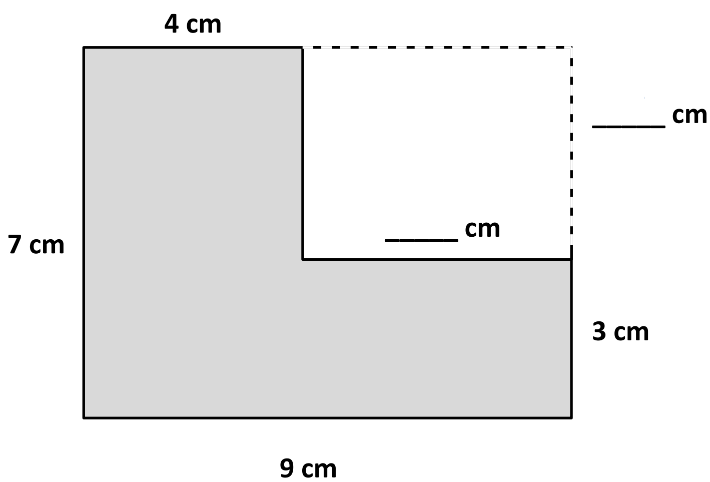
Figure 4: Area of G + Area of H: ________ + _________ = __________ sq units

2. The figure shows a small rectangle cut out of a big rectangle. Find the area of the shaded region.



Area of the shaded region: ______ – ______ = ______ sq cm

3. The figure shows a small rectangle cut out of a big rectangle.



a. Label the missing measurements.

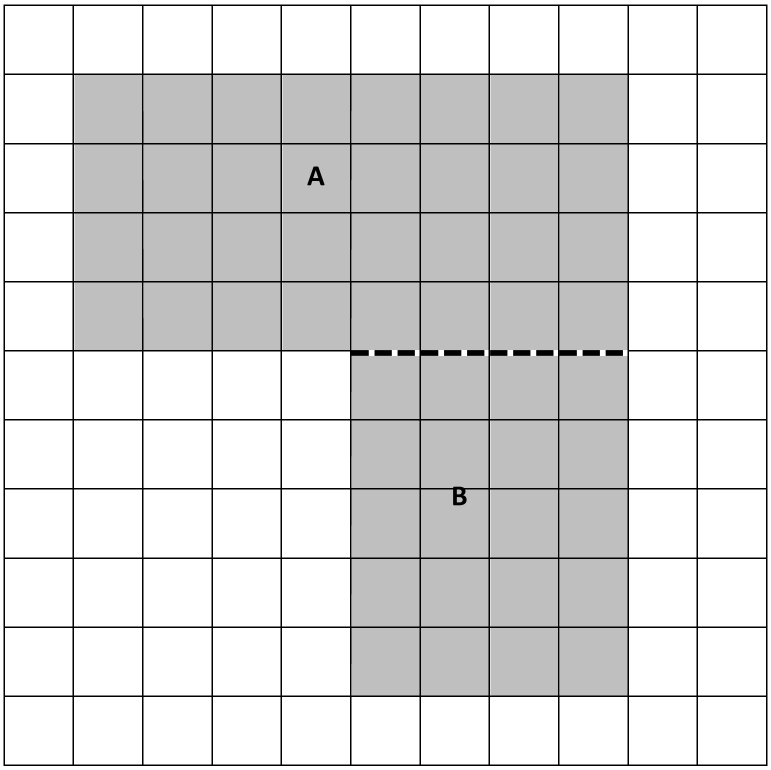
b. Area of the big rectangle: ______ × ______ = ______ sq cm

c. Area of the small rectangle: ______ × ______ = ______ sq cm

d. Find the area of the shaded region.

Name ____ Date ____________________

The following figure is made up of 2 rectangles. Find the total area of the figure.



Area of A + Area of B: ________ + _________ = _________ sq units

Name ____ Date ____________________

1. Each of the following figures is made up of 2 rectangles. Find the total area of each figure.

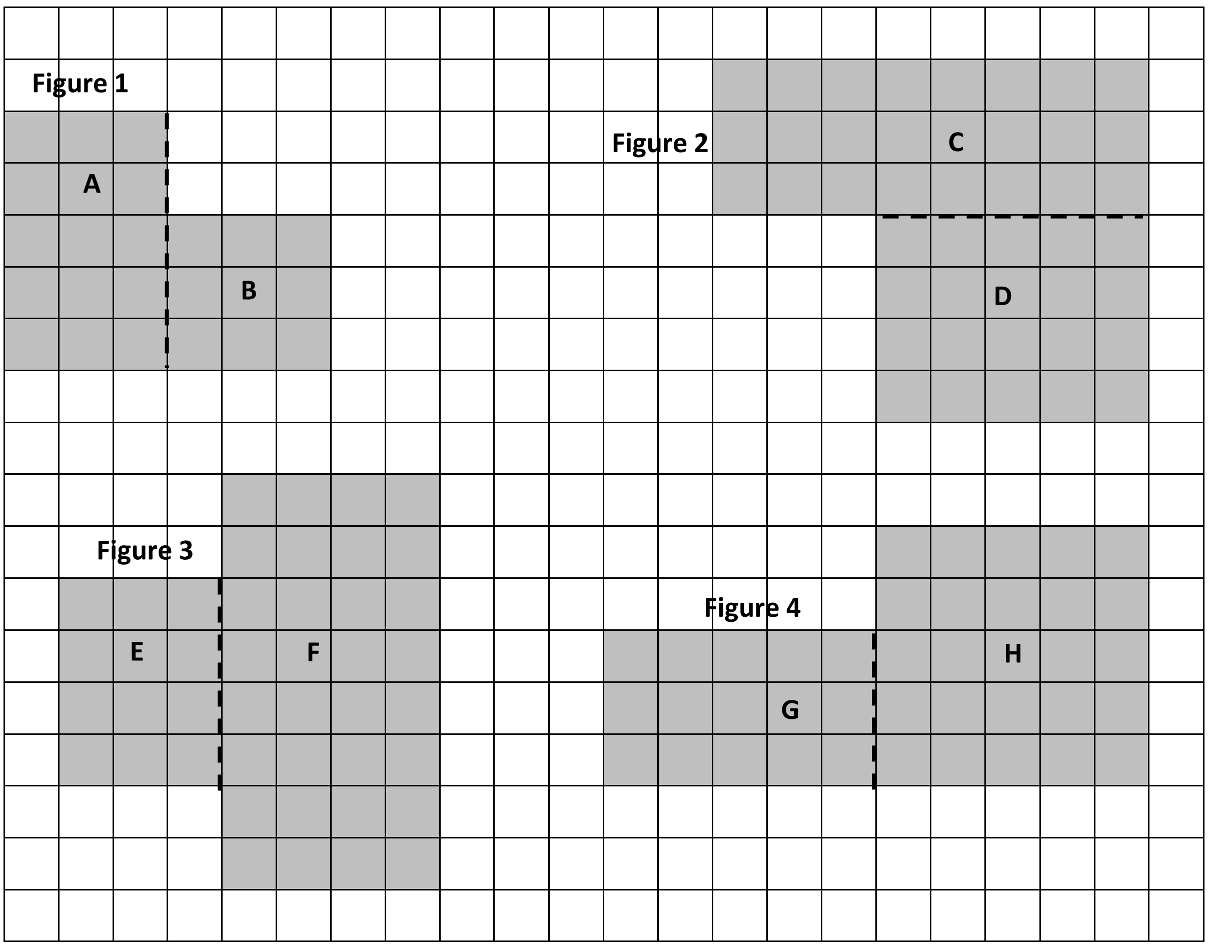


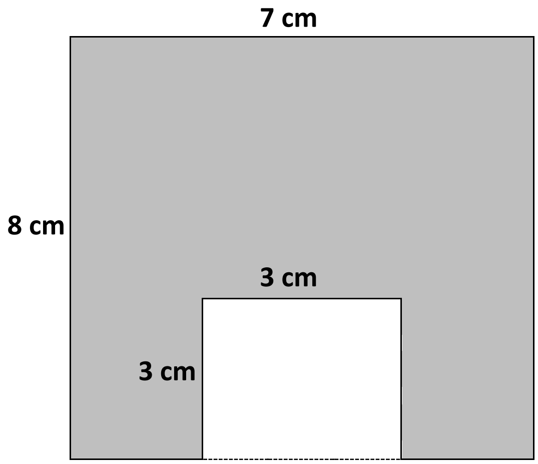
Figure 1: Area of A + Area of B: ________ + _________ = _________ sq units

Figure 2: Area of C + Area of D: ________ + _________ = __________ sq units

Figure 3: Area of E + Area of F: ________ + _________ = __________ sq units

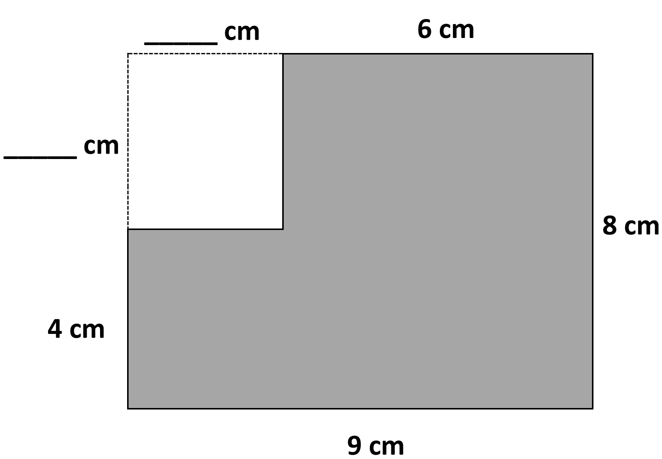
Figure 4: Area of G + Area of H: ________ + _________ = __________ sq units

2. The figure shows a small rectangle cut out of a big rectangle. Find the area of the shaded region.



Area of the shaded region: ______ - ______ = ______ sq cm

3. The figure shows a small rectangle cut out of a big rectangle.



a. Label the missing measurements.

b. Area of the big rectangle: ______ × ______ = ______ sq cm

c. Area of the small rectangle: ______ × ______ = ______ sq cm

d. Find the area of the shaded region.