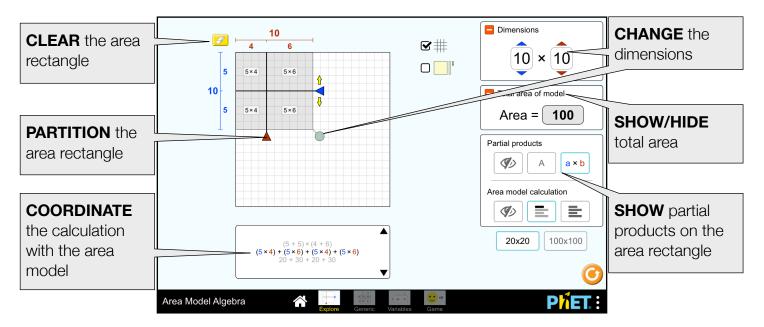## Explore Screen
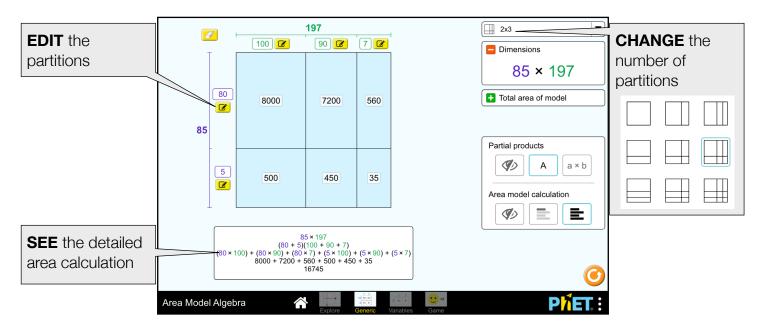
Re-discover how an area model can be used to justify the product of two numbers, that the product/area can be partitioned into smaller products/areas, and that the total area is the sum of the partial areas.
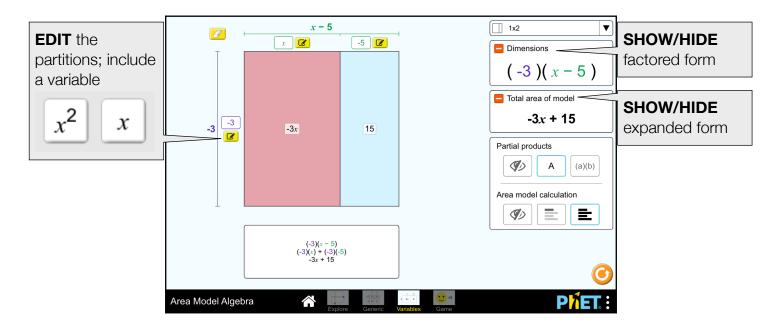
CLEAR the area rectangle

PARTITION the area rectangle

COORDINATE the calculation with the area model

CHANGE the dimensions

SHOW/HIDE total area

SHOW partial products on the area rectangle

Dimensions
10×10

Total area of model
Area = 100

Partial products

Area model calculation

20x20   100x100

$(5 + 5) \times (4 + 6)$
$(5 \times 4) + (5 \times 6) + (5 \times 4) + (5 \times 6)$
$20 + 30 + 20 + 30$

Area Model Algebra   Explore   Generic   Variables   Game

Generic Screen

Apply the area model to justify the product of two integers using a generic model.

EDIT the partitions

SEE the detailed area calculation

CHANGE the number of partitions

2x3

Dimensions
85×197

Total area of model

Partial products

Area model calculation

85×197
$(80 + 5)(100 + 90 + 7)$
$(80 \times 100) + (80 \times 90) + (80 \times 7) + (5 \times 100) + (5 \times 90) + (5 \times 7)$
$8000 + 7200 + 560 + 500 + 450 + 35$
16745

Area Model Algebra   Explore   Generic   Variables   Game

Variables Screen

Use the generic area model to multiply algebraic expressions and justify the distributive property.

EDIT the partitions; include a variable

$$x^2 \qquad x$$

$x - 5$

| x | -5 |

1x2

Dimensions
$$(\; -3 \;)(\; x - 5 \;)$$

SHOW/HIDE factored form

Total area of model
$$-3x + 15$$

SHOW/HIDE expanded form

-3

$-3x$ | 15

Partial products

A   (a)(b)

Area model calculation

$(-3)(x - 5)$
$(-3)(x) + (-3)(-5)$
$-3x + 15$

Area Model Algebra

Explore   Generic   **Variables**   Game

PhET

Game Screen

Test your understanding of the area model by finding missing partial products, dimensions, or total area.
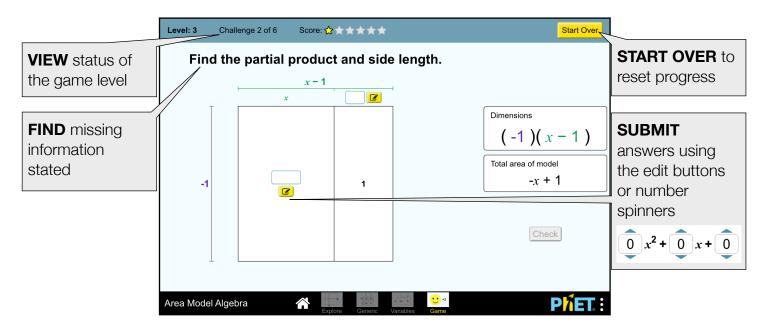**Level 1:** Find 1 partial product or total area
Level 2: Find 2 partial products or 1 partial product and total area
Level 3: Find 2 partial dimensions or 1 partial dimension and 1 partial product
Level 4: Find 2 partial dimensions or 1 partial dimension and 1 partial product
Level 5: Factor a 1x2 or 1x3 expression
Level 6: Factor a 2x2 expression

Level: 3   Challenge 2 of 6   Score: ★★★★★   Start Over

VIEW status of the game level

START OVER to reset progress

Find the partial product and side length.

$x - 1$

x |

FIND missing information stated

Dimensions
$$(\; -1 \;)(\; x - 1 \;)$$

Total area of model
$$-x + 1$$

SUBMIT answers using the edit buttons or number spinners

-1

| 1

Check

$$0 \; x^2 + \; 0 \; x + \; 0$$

Area Model Algebra

Explore   Generic   Variables   **Game**

PhET

Design Notes

- On the Explore screen, the area rectangle drag handle is useful for initial exploration, and the number spinners are useful for more precise configurations.
- On the Explore screen, multiplying numbers less than 10 in the 100x100 grid will result in very small areas displayed on the area grid.
- Multiplication of 5×7 will not lead to as rich of a discussion as 15×7 or 15×17. Encourage students to justify why partitioning dimensions larger than 10 is useful, and describe a useful partition strategy.

Suggestions for Use

- Use the area model for justifying multiplication of algebraic expressions.
- Use an area model to determine a strategy for factoring an algebraic expression.

Sample Challenge Prompts

- How is partitioning numbers similar to partitioning expressions?
- Look at each line of the calculation. Where is that represented in the area model?
- Given a total area, find the dimensions. Can you find other dimensions that produce the same total area?

See all published activities for Area Model Algebra here.
For more tips on using PhET sims with your students, see Tips for Using PhET.