

CONTROLLER DOWN. BUILDER
MODE ON.

Mission: Square Builders!

Square plazas made of tiles: how many tiles does each one need? With square numbers, you can tell at once.



Name _____

Date _____



How to practice: one mission a day (15 to 20 minutes) and 5 minutes in the trainer. Goal: **all square numbers from 1^2 to 20^2** , forward and backward.

SQUARE NUMBERS · THE IDEA

1 Square Tiles

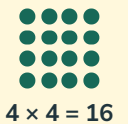
At the construction site, plazas are made of tiles: always as many rows as tiles in each row. The result is a square.



What is a square number?

Multiply a number **by itself**: $4 \times 4 = 16$. The short way to write it is $4^2 = 16$ (say “4 squared”).

Careful: 4^2 means 4×4 , not 4×2 !



$$4 \times 4 = 16$$

A How many tiles does each plaza have?

$2 \times 2 =$  $3 \times 3 =$  $4 \times 4 =$  $5 \times 5 =$ 

B The first ten square numbers

n	1	2	3	4	5	6	7	8	9	10
n^2										

☐ Mission 1 done

★ Tile pro

SQUARE NUMBERS FROM 11² TO 20²

2 Big Squares

Starting at 11, the problems get more challenging. With two tricks you can build every big square number yourself.



Trick 1: split

$$13^2 = 13 \times 13 = 13 \times 10 + 13 \times 3 = 130 + 39 = 169$$

A Split

$$\text{a) } 12^2 = 12 \times 12 = \boxed{}_{12 \times 10} + \boxed{}_{12 \times 2} = \boxed{}$$

$$\text{b) } 14^2 = 14 \times 14 = \boxed{}_{14 \times 10} + \boxed{}_{14 \times 4} = \boxed{}$$

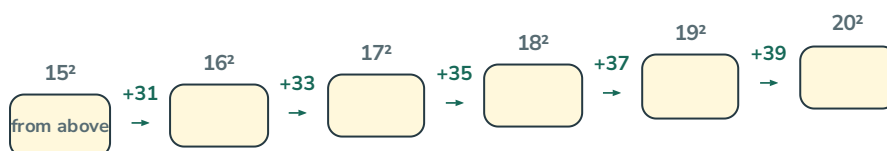
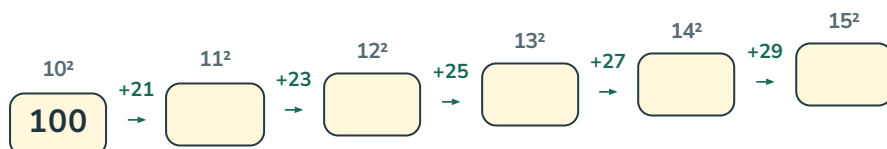
$$\text{c) } 16^2 = 16 \times 16 = \boxed{}_{16 \times 10} + \boxed{}_{16 \times 6} = \boxed{}$$

$$\text{d) } 18^2 = 18 \times 18 = \boxed{}_{18 \times 10} + \boxed{}_{18 \times 8} = \boxed{}$$

Trick 2: the square staircase

To get from one square number to the next, add **the number + the next number**: $15^2 = 225$, so $16^2 = 225 + 15 + 16 = 256$. The jumps always grow by 2.

B Climb the square staircase



C Mixed up

$$17^2 = \boxed{}$$

$$13^2 = \boxed{}$$

$$19^2 = \boxed{}$$

$$11^2 = \boxed{}$$

$$15^2 = \boxed{}$$

$$20^2 = \boxed{}$$

$$14^2 = \boxed{}$$

$$16^2 = \boxed{}$$

THINKING BACKWARDS · SPOTTING SQUARE NUMBERS

3

Square Detective

The detective knows square numbers backwards too. Which number is hiding behind them?



A Which number times itself makes ...?

$\square \times \square = 196$

$\square \times \square = 81$

$\square \times \square = 289$

$\square \times \square = 225$

$\square \times \square = 361$

$\square \times \square = 144$

B Is it a square number?

64 yes / no

90 yes / no

121 yes / no

150 yes / no

169 yes / no

200 yes / no

256 yes / no

324 yes / no

C Between which two consecutive square numbers does it lie?

Example: $49 < 50 < 64$, because $7^2 = 49$ and $8^2 = 64$.

$\square < 110 < \square$

$\square < 200 < \square$

$\square < 300 < \square$

$\square < 390 < \square$

D Greater or less?

Write $<$ or $>$.

$13^2 \bigcirc 170$

$12 \times 14 \bigcirc 13^2$

$15^2 \bigcirc 220$

$11^2 \bigcirc 100 + 20$

$16^2 \bigcirc 250$

$9^2 \bigcirc 8 \times 10$

E Pixel says: " $7^2 = 14$." What is wrong? Explain.

☐ Mission 3 done

☆ Case closed

PATTERNS · WORD PROBLEMS

4 Pattern Garden

The garden is full of surprising patterns. Spot them, and you can calculate faster.



A Odd numbers build squares

Each new square gets a corner made of the next odd number (red).



The first 10 odd numbers ($1 + 3 + \dots + 19$) add up to $\boxed{}$.

B Neighbors of the middle number

$$12 \times 14 = \boxed{} \text{ and } 13^2 = \boxed{}$$

$$14 \times 16 = \boxed{} \text{ and } 15^2 = \boxed{}$$

$$18 \times 20 = \boxed{} \text{ and } 19^2 = \boxed{}$$

Compare the two answers in each row. What do you notice?

Use the pattern: $17^2 = 289$, so $16 \times 18 = \boxed{}$

C Word problems

1 A square plaza is laid with **15** rows of **15** tiles each. How many tiles are needed?

N $\boxed{} \bigcirc \boxed{} = \boxed{}$ A _____

2 Pro: Wobbi has **200** tiles. He lays the largest square plaza he can. How many tiles go in each row, and how many are left over?

N $\boxed{} \bigcirc \boxed{} = \boxed{}$ A _____

$\boxed{} \bigcirc \boxed{} = \boxed{}$

EVERYTHING MIXED · LIKE A TEST

5

Test Check

Show what you can do: lightning round, true or false and number riddles.



A Lightning round: 12 problems, goal 3 minutes

$16^2 = \square$

$\square \times \square = 169$

$9^2 = \square$

$19^2 = \square$

$\square \times \square = 64$

$12^2 = \square$

$\square \times \square = 324$

$15^2 = \square$

$7^2 = \square$

$\square \times \square = 256$

$18^2 = \square$

$\square \times \square = 400$

B True or false?

1. $13^2 = 169$

true / false

2. $7^2 = 14$

true / false

3. Every square number is even.

true / false

4. $20^2 = 400$

true / false

5. 150 is a square number.

true / false

6. There is no square number between 100 and 121.

true / false

C Number riddles

1. I am an **odd** square number between 150 and 200.

2. I am the square number closest to 300.

3. My side is twice as long as the side of the 64-tile square. How many tiles do I have?

D Traffic light: how sure are you?

Square numbers up to 10^2

☐ ☒ got it ☐ almost ☐ practice more

Square numbers 11^2 to 20^2

☐ ☒ got it ☐ almost ☐ practice more

Backwards and spotting

☐ ☒ got it ☐ almost ☐ practice more

Patterns and word problems

☐ ☒ got it ☐ almost ☐ practice more

☐ Mission 5 done

☆ Square champion