

Reasoning and Problem Solving

Step 5: Square Numbers

National Curriculum Objectives:

Mathematics Year 5: (5C5d) [Recognise and use square numbers and cube numbers, and the notation for squared \(2\) and cubed \(3\)](#)

Mathematics Year 5:(5C8a) [Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes](#)

Differentiation:

Questions 1, 4 and 7 (Problem Solving)

Developing Finding the sum of two square numbers up to 12^2 using pictorial representations for each question. Each question includes the full calculation as well as the notation for squared.

Expected Finding the sum of two square numbers up to 12^2 .

Greater Depth Finding the sum of two square numbers up to 12^2 within set parameters.

Questions 2, 5 and 8 (Problem Solving)

Developing Identify a number using inverse operations and knowledge of square numbers up to 12^2 with pictorial representations for each question.

Expected Identify a number using inverse operations and knowledge of square numbers up to 12^2 . Up to two steps in each question.

Greater Depth Identify a number using inverse operations and knowledge of square numbers up to 12^2 . Up to 3 steps in each question.

Questions 3, 6 and 9 (Reasoning)

Developing Explain common misconceptions when calculating squared numbers up to 12^2 using pictorial representations for each question.

Expected Explain common misconceptions when calculating squared numbers to 12^2 .

Greater Depth Explain common misconceptions when calculating with squared numbers to 12^2 . Up to two steps in each question.

More [Year 5 Multiplication and Division](#) resources.

Did you like this resource? Don't forget to [review](#) it on our website.

Square Numbers

1a. 13 is the sum of two square numbers.

$$13 = 3^2 + 2^2$$

$$13 = (3 \times 3) + (2 \times 2)$$

$$13 = \begin{array}{|c|c|c|} \hline \square & \square & \square \\ \hline \square & \square & \square \\ \hline \square & \square & \square \\ \hline \end{array} + \begin{array}{|c|c|} \hline \square & \square \\ \hline \square & \square \\ \hline \end{array}$$

Using the example above, complete the following:

41 is the sum of 4^2 and which other square number?

$$41 = (4 \times 4) + (? \times ?)$$

$$41 = \begin{array}{|c|c|c|c|} \hline \square & \square & \square & \square \\ \hline \square & \square & \square & \square \\ \hline \square & \square & \square & \square \\ \hline \square & \square & \square & \square \\ \hline \end{array} + ?$$



PS

Square Numbers

1b. 18 is the sum of two square numbers.

$$18 = 3^2 + 3^2$$

$$18 = (3 \times 3) + (3 \times 3)$$

$$18 = \begin{array}{|c|c|c|} \hline \square & \square & \square \\ \hline \square & \square & \square \\ \hline \square & \square & \square \\ \hline \end{array} + \begin{array}{|c|c|c|} \hline \square & \square & \square \\ \hline \square & \square & \square \\ \hline \square & \square & \square \\ \hline \end{array}$$

Using the example above, complete the following:

45 is the sum of 3^2 and which other square number?

$$45 = (3 \times 3) + (? \times ?)$$

$$45 = \begin{array}{|c|c|c|} \hline \square & \square & \square \\ \hline \square & \square & \square \\ \hline \square & \square & \square \\ \hline \end{array} + ?$$

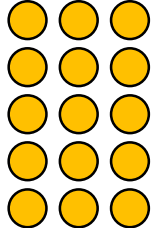


PS

2a. Solve the following problem.

I think of a number. I square it and add 6. My answer is 15. What was my number?

Use the array below to help you.

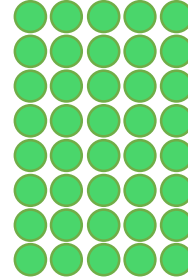


PS

2b Solve the following problem.

I think of a number. I square it and add 15. My answer is 40. What was my number?

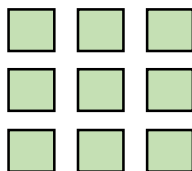
Use the array below to help you.



PS

3a. Drew says,

This array represents 9^2 .



Is Drew correct? Convince me.



R

3b. Frankie says,

I can use this array to calculate 5^2 .



Is Frankie correct? Convince me.



R

Square Numbers

4a. 20 is the sum of two square numbers.

$$20 = 4^2 + 2^2$$

Using the example above, complete the following:

61 is the sum of two squared numbers.
What could they be?

113 is the sum of two squared numbers.
What could they be?



PS

Square Numbers

4b. 29 is the sum of two square numbers.

$$29 = 5^2 + 2^2$$

Using the example above, complete the following:

89 is the sum of two squared numbers.
What could they be?

193 is the sum of two squared numbers.
What could they be?



PS

5a. Solve the following problems.

I think of a number. I square it and subtract 8. My answer is 41.
What was my number?

I think of another number. I square it and add 12. The answer is 48. What was my number?



PS

5b Solve the following problems.

I think of a number. I square it and add 11. My answer is 92.
What was my number?

I think of another number. I square it and subtract 14. My answer is 107.
What was my number?



PS

6a. Henry says,

To find the square of a number, you multiply it by 2.



Is Henry correct? Convince me.



R

6b. Laura says,

To square a number, you add the number twice. For example, 2^2 means $2 + 2$ which is 4.



Is Laura correct? Convince me.



R

Square Numbers

7a. 155 is the sum of 2 squared numbers.

$$155 = 12^2 + 3^2$$

2 squared numbers are added together to make an odd number between 50 and 100. What could they be?

3 squared numbers are added together to make an even number between 150 and 200. What could they be?



PS

Square Numbers

7b. 149 is the sum of 2 squared numbers.

$$149 = 10^2 + 7^2$$

2 squared numbers are added together to make an even number between 50 and 100. What could they be?

3 squared numbers are added together to make an odd number between 150 and 200. What could they be?



PS

8a. Solve the following problems.

I think of a number. I square it, subtract 8 and multiply by 3. My answer is 24. What was my number?

I think of another number. I square it, add 12 and then subtract 16. The answer is 140. What was my number?



PS

8b. Solve the following problems.

I think of a number. I square it, add 15 and times by 5. My answer is 255. What was my number?

I think of another number. I square it, subtract 15 and then add 25. My answer is 131. What was my number?



PS

9a. Tariq says,

The product of two square numbers always equals a square number.



Is Tariq correct? Convince me.



R

9b. Lin says,

When I add an odd square number to another odd square number, the answer is always even.



Is Lin correct? Convince me.



R

Reasoning and Problem Solving Square Numbers

Developing

1a. 5^2

2a. 3

3a. Drew is incorrect. The array represents 3^2 because $3 \times 3 = 9$.

Expected

4a. $5^2 + 6^2$, $7^2 + 8^2$

5a. 7, 6

6a. Henry is incorrect. To find the square of a number, you multiply a number by itself. Only 2^2 is 2×2 .

Greater Depth

7a. Various answers, for example:

$7^2 + 4^2 = 65$, $7^2 + 6^2 = 85$, $9^2 + 4^2 = 97$, $8^2 + 5^2 = 89$, $8^2 + 3^2 = 73$ and

$10^2 + 8^2 + 4^2 = 180$, $12^2 + 4^2 + 2^2 = 164$, $11^2 + 9^2 + 6^2 = 166$, $10^2 + 7^2 + 3^2 = 158$,
 $11^2 + 5^2 + 4^2 = 162$

8a. 4, 12

9a. Tariq is correct. Multiplying two square numbers always equals a square number. For example, $4 \times 9 = 36$, $4 \times 16 = 64$, $4 \times 25 = 100$ and $4 \times 36 = 144$.

Reasoning and Problem Solving Square Numbers

Developing

1b. 6^2

2b. 5

3b. Frankie is incorrect. The array represents $2 \times 5 = 10$.

Expected

4b. $8^2 + 5^2$, $12^2 + 7^2$

5b. 9, 11

6b. Laura is incorrect. To square a number, you multiply the number by itself. For example, 6^2 means 6×6 which is 36.

Greater Depth

7b. Various answers, for example:

$6^2 + 4^2 = 52$, $7^2 + 3^2 = 58$, $8^2 + 2^2 = 68$, $9^2 + 3^2 = 90$, $7^2 + 5^2 = 74$ and
 $11^2 + 5^2 + 3^2 = 155$, $12^2 + 4^2 + 3^2 = 169$, $9^2 + 7^2 + 5^2 = 155$, $10^2 + 5^2 + 8^2 = 189$,
 $10^2 + 8^2 + 3^2 = 173$

8b. 6, 11

9b. Lin is correct. Adding two odd numbers together always equals an even number. For example, $25 + 9 = 34$, $9 + 49 = 58$, $81 + 9 = 90$ and $81 + 25 = 106$.