

Sequences Retrieve and Connects

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Retrieve and Connect

Matchsticks



1. Draw the next shape.
2. How many matchsticks in the 4th?

Dots



3. Draw the next pattern.
4. How many dots in the 4th?

5. Complete The Sequence

13, 23, 33, __, __, __

Retrieve and Connect

Matchsticks



?

1. Draw the next shape.
2. How many matchsticks in the 4th?

Dots



?

3. Draw the next pattern.
4. How many dots in the 4th?

5. Complete The Sequence

13, 23, 33, 43, 53, 63 (add 10)

Answers



1.

2. 13 sticks

Answers



3.

4. 16 dots

Worked Solution: Retrieve and Connect 1, Question 1

Question: Draw the next matchstick shape.

Worked Solution: The pattern has 1 square, then 2 squares, then 3 squares in a row. The next shape has 4 squares in a row.



Worked Solution: Retrieve and Connect 1, Question 2

Question: How many matchsticks are in the 4th matchstick shape?

Worked Solution: The counts are 4, 7, 10, Each extra square adds 3 matchsticks. Therefore shape 4 has

$$10 + 3 = 13 \qquad 3(4) + 1 = 13.$$

So the 4th shape has 13 matchsticks.

Worked Solution: Retrieve and Connect 1, Question 3

Question: Draw the next dot pattern.

Worked Solution: The dot grids are 1×1 , then 2×2 , then 3×3 .
The next pattern is 4×4 .



Worked Solution: Retrieve and Connect 1, Question 4

Question: How many dots are in the 4th dot pattern?

Worked Solution: The numbers of dots are 1, 4, 9, ..., which are square numbers. Shape 4 has

$$4^2 = 16$$

dots.

Worked Solution: Retrieve and Connect 1, Question 5

Question: Complete the sequence 13, 23, 33, –, –, –.

Worked Solution: The rule is add 10.

$$33 + 10 = 43, \quad 43 + 10 = 53, \quad 53 + 10 = 63.$$

Completed sequence: 13, 23, 33, 43, 53, 63.

Retrieve and Connect

Matchsticks



?

1. Draw shape 4.

2. How many matchsticks in shape 4?

Dots



?

3. Draw pattern 4.

4. How many dots in pattern 4?

5. Complete The Sequence

1, 3, 5, 7, __, __, __

Retrieve and Connect

Matchsticks



?

1. Draw shape 4.

2. How many matchsticks in shape 4?

Dots



?

3. Draw pattern 4.

4. How many dots in pattern 4?

5. Complete The Sequence

1, 3, 5, 7, 9, 11, 13 (add 2)

Answers

1.



2. 9 sticks

Answers

3.



4. 10 dots

Worked Solution: Retrieve and Connect 2, Question 1

Question: Draw shape 4 in the matchstick triangle pattern.

Worked Solution: Each new shape adds one triangle to the row.
Shape 4 therefore has 4 triangles.



Worked Solution: Retrieve and Connect 2, Question 2

Question: How many matchsticks are in shape 4?

Worked Solution: The stick counts are 3, 5, 7, ... because each new triangle adds 2 sticks. So shape 4 has

$$7 + 2 = 9.$$

Equivalently, the rule is $2n + 1$, giving $2(4) + 1 = 9$.

Worked Solution: Retrieve and Connect 2, Question 3

Question: Draw pattern 4 for the triangular dot pattern.

Worked Solution: The triangular dot patterns have row lengths 1; 1, 2; 1, 2, 3. Pattern 4 has row lengths 1, 2, 3, 4.



Worked Solution: Retrieve and Connect 2, Question 4

Question: How many dots are in pattern 4?

Worked Solution: The dot counts are 1, 3, 6, ... Pattern 4 has

$$1 + 2 + 3 + 4 = 10$$

dots. Also, $\frac{4 \times 5}{2} = 10$.

Worked Solution: Retrieve and Connect 2, Question 5

Question: Complete the sequence 1, 3, 5, 7, –, –, –.

Worked Solution: Add 2 each time:

$$7 + 2 = 9, \quad 9 + 2 = 11, \quad 11 + 2 = 13.$$

Completed sequence: 1, 3, 5, 7, 9, 11, 13.

Retrieve and Connect

Dots



1. Draw pattern 4.
2. How many dots in pattern 4?

Matchsticks



3. How many sticks in the 10th shape?
4. Find a rule.

5. Complete The Sequence

3, 6, 9, 12, __, __, __

6. 20th term?

Retrieve and Connect

Dots



1. Draw pattern 4.
2. How many dots in pattern 4?

Matchsticks



3. How many sticks in the 10th shape?
4. Find a rule.

5. Complete The Sequence

3, 6, 9, 12, 15, 18, 21 (add 3) 6. 20th term? 60

Answers



- 1.
2. 20 dots (pattern is $n \times (n + 1)$ dots)

Answers

3. 31
4. Rule: $3n + 1$

Worked Solution: Retrieve and Connect 3, Question 1

Question: Draw pattern 4 for the rectangular dot pattern.

Worked Solution: The rectangles are 1×2 , 2×3 , 3×4 , so pattern 4 is 4×5 .



Worked Solution: Retrieve and Connect 3, Question 2

Question: How many dots are in pattern 4?

Worked Solution: Pattern 4 is a 4×5 rectangle, so it has

$$4 \times 5 = 20$$

dots. In general, pattern n has $n(n + 1)$ dots.

Worked Solution: Retrieve and Connect 3, Question 3

Question: How many sticks are in the 10th square-matchstick shape?

Worked Solution: The square-matchstick counts are 4, 7, 10, ...
The rule is $3n + 1$: shape n has n top sticks, n bottom sticks and $n + 1$ vertical sticks.

$$3(10) + 1 = 31.$$

The 10th shape has 31 sticks.

Worked Solution: Retrieve and Connect 3, Question 4

Question: Find a rule for the square-matchstick pattern.

Worked Solution: If n is the shape number, the number of sticks is

$$3n + 1.$$

Check: $n = 1$ gives 4, $n = 2$ gives 7, $n = 3$ gives 10.

Worked Solution: Retrieve and Connect 3, Question 5

Question: Complete the sequence 3, 6, 9, 12, –, –, –.

Worked Solution: Add 3 each time:

$$12 + 3 = 15, \quad 15 + 3 = 18, \quad 18 + 3 = 21.$$

Completed sequence: 3, 6, 9, 12, 15, 18, 21.

Worked Solution: Retrieve and Connect 3, Question 6

Question: What is the 20th term of the sequence 3, 6, 9, 12, ...?

Worked Solution: The sequence is the multiples of 3, so the n th term is $3n$. Therefore the 20th term is

$$3 \times 20 = 60.$$

Retrieve and Connect

Matchsticks



?

1. Find a rule for the number of matchsticks.
2. Use it to find the 20th term.

Dots



?

3. Find a rule for the number of dots.
4. Use it to find the 10th term.

5. Complete The Sequence

5, 9, 13, 17, __, __, __

6. n th term rule? 100th term?

Retrieve and Connect

Matchsticks



?

1. Find a rule for the number of matchsticks.
2. Use it to find the 20th term.

Dots



?

3. Find a rule for the number of dots.
4. Use it to find the 10th term.

5. Complete The Sequence

5, 9, 13, 17, 21, 25, 29 (add 4)

6. n th term rule? 100th term?

$$4n + 1,$$

$$401$$

Answers

1. Rule: $2n + 1$
2. 20th term: 41

Answers

3. Rule: $\frac{n(n+1)}{2}$
4. 10th term: 55

Worked Solution: Retrieve and Connect 4, Question 1

Question: Find a rule for the number of matchsticks in the triangle-stick pattern.

Worked Solution: The counts are 3, 5, 7, Each term increases by 2, so the rule is

$$2n + 1.$$

Check: $n = 1$ gives 3, $n = 2$ gives 5, $n = 3$ gives 7.

Worked Solution: Retrieve and Connect 4, Question 2

Question: Use the rule to find the 20th term.

Worked Solution: Using $2n + 1$ with $n = 20$,

$$2(20) + 1 = 41.$$

The 20th term is 41.

Worked Solution: Retrieve and Connect 4, Question 3

Question: Find a rule for the number of dots in the triangular dot pattern.

Worked Solution: The dot counts are triangular numbers 1, 3, 6, Pattern n has

$$1 + 2 + \cdots + n = \frac{n(n+1)}{2}$$

dots.

Worked Solution: Retrieve and Connect 4, Question 4

Question: Use the rule to find the 10th term.

Worked Solution: Using $\frac{n(n+1)}{2}$ with $n = 10$,

$$\frac{10(10 + 1)}{2} = \frac{110}{2} = 55.$$

The 10th term is 55.

Worked Solution: Retrieve and Connect 4, Question 5

Question: Complete the sequence 5, 9, 13, 17, –, –, –.

Worked Solution: Add 4 each time:

$$17 + 4 = 21, \quad 21 + 4 = 25, \quad 25 + 4 = 29.$$

Completed sequence: 5, 9, 13, 17, 21, 25, 29.

Worked Solution: Retrieve and Connect 4, Question 6

Question: For the sequence 5, 9, 13, 17, ..., what is the n th term rule and the 100th term?

Worked Solution: The first term is 5 and the common difference is 4, so

$$T_n = 5 + 4(n - 1) = 4n + 1.$$

The 100th term is

$$4(100) + 1 = 401.$$

Retrieve and Connect

Dots



1. Draw shape 4.
2. How many dots in shape 5?
3. Try to find a rule.

Special Sequence

1, 1, 2, 3, 5, 8, __, __, __

4. Next three terms?
5. What is the rule?

6. Complete The Sequence

1, 4, 9, 16, __, __, __

7. 20th term?

Retrieve and Connect

Dots



1. Draw shape 4.
2. How many dots in shape 5?
3. Try to find a rule.

Special Sequence

1, 1, 2, 3, 5, 8, 13, 21, 34

4. Next three terms?
5. What is the rule?

6. Complete The Sequence

1, 4, 9, 16, 25, 36, 49 (square numbers n^2) 7. 20th term? 400

Answers



2. Shape 5 has 17 dots
3. Rule: $4n - 3$

Answers

4. 13, 21, 34
5. Fibonacci: add the two previous terms

Worked Solution: Retrieve and Connect 5, Question 1

Question: Draw shape 4 for the cross-dot pattern.

Worked Solution: Each new shape adds one dot to each of the four arms. Shape 4 has a centre dot and 3 dots on each arm.



Worked Solution: Retrieve and Connect 5, Question 2

Question: How many dots are in shape 5?

Worked Solution: Shape 5 has 1 centre dot plus 4 dots on each of 4 arms:

$$1 + 4 \times 4 = 17.$$

Equivalently, using the rule $4n - 3$, $4(5) - 3 = 17$.

Worked Solution: Retrieve and Connect 5, Question 3

Question: Try to find a rule for the cross-dot pattern.

Worked Solution: Shape n has a centre dot and four arms of length $n - 1$. Therefore

$$1 + 4(n - 1) = 4n - 3.$$

So the rule is $4n - 3$.

Worked Solution: Retrieve and Connect 5, Question 4

Question: Next three terms in 1, 1, 2, 3, 5, 8, –, –, –.

Worked Solution: Add the two previous terms:

$$5 + 8 = 13, \quad 8 + 13 = 21, \quad 13 + 21 = 34.$$

Next three terms: 13, 21, 34.

Worked Solution: Retrieve and Connect 5, Question 5

Question: What is the rule for the special sequence?

Worked Solution: Start with 1 and 1. After that, each term is the sum of the two previous terms. This is the Fibonacci sequence.

Worked Solution: Retrieve and Connect 5, Question 6

Question: Complete the sequence 1, 4, 9, 16, –, –, –.

Worked Solution: These are square numbers:

$$5^2 = 25, \quad 6^2 = 36, \quad 7^2 = 49.$$

Completed sequence: 1, 4, 9, 16, 25, 36, 49.

Worked Solution: Retrieve and Connect 5, Question 7

Question: What is the 20th term of $1, 4, 9, 16, \dots$?

Worked Solution: The n th term is n^2 . Therefore the 20th term is

$$20^2 = 400.$$