Analyzing Relationships Between Patterns

Analyzing Relationships Between Patterns: Models and Computation

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QUICK REVIEW

Step 0 is the start. Each step applies both rules once. Pair values from the same step. In (A, B), A goes across and B goes up. Compare the starts and the increases to see whether one value stays ahead by a fixed amount or is a fixed multiple of the other.

Worked example

A starts at 4 and adds 5. B starts at 10 and adds 3. Give the pairs at steps 0, 1, and 2. What happens to the gap?

1. Pair the starting values to get $(4, 10)$.
2. Add 5 to A and 3 to B each time: $(9, 13)$, then $(14, 16)$.
3. B leads by $10 - 4 = 6$, $13 - 9 = 4$, then $16 - 14 = 2$. A gains $5 - 3 = 2$ more than B each step.
Answer: $(4, 10), (9, 13), (14, 16)$. The gap shrinks by 2 each step shown.

Practice Problems

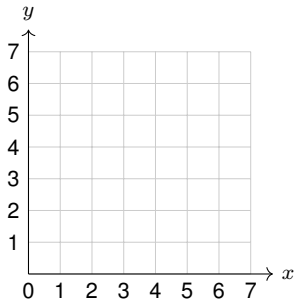
Show your thinking.

1. A and B both start at 0. A adds 3 and B adds 6 each step. Write the first five pairs (A, B), including the start. How is B related to A?

2. A starts at 2 and B at 5. Both add 2 each step. Complete the table and describe how B compares with A in every row.

Step	Pattern A	Pattern B
0	2	5
1	4	7
2		
3		
4		

3. A and B start at 0. A adds 1 and B adds 2 per step. Plot (A, B) at steps 0 through 3. Explain how B is related to A.



4. A starts at 3 and B starts at 1. Both add 4 per step. Compare their fourth terms and explain whether the same pattern will stay ahead.

5. A begins $0, 2, 4$ and B begins $0, 6, 12$. Each pattern keeps adding a fixed amount. Find both add rules and the next two pairs (A, B).

6. A starts at 1 and B starts at 4. Both add 3 per step. A student writes $(1, 7)$ as the starting pair. Give the first three correct pairs and explain the error.

Answer Key

1. $(0,0), (3,6), (6,12), (9,18), (12,24)$; B is twice A.
2. Steps $2, 3, 4$: $(6,9), (8,11), (10,13)$. B is 3 more than A.
3. $(0,0), (1,2), (2,4), (3,6)$; $B = 2A$.
4. A: 15; B: 13. A stays 2 ahead.
5. A adds 2; B adds 6. Next pairs: $(6,18), (8,24)$.
6. $(1,4), (4,7), (7,10)$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. From step 0 through step 4, A is $0, 3, 6, 9, 12$ and B is $0, 6, 12, 18, 24$.

2. Pair values from the same step: $(0,0), (3,6), (6,12), (9,18), (12,24)$.

3. Both start at 0 and B adds $6 = 2 \times 3$ each time A adds 3. So B is always twice A.

Problem 2

1. Continue A from 4 by twos: $6, 8, 10$.

2. Continue B from 7 by twos: $9, 11, 13$. Match the values at steps 2, 3, and 4.

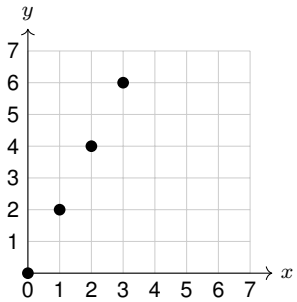
3. B starts $5 - 2 = 3$ ahead. Adding 2 to both lists keeps that difference.

Problem 3

1. At steps 0 through 3, the A-values are $0, 1, 2, 3$ and the B-values are $0, 2, 4, 6$.

2. Plot $(0,0), (1,2), (2,4), (3,6)$, using A across and B up. The starting pair is at the origin.

3. B starts at 0 and adds 2 each time A increases by 1, so B is twice A at every step.



Problem 4

1. The start is the first term, so the fourth term comes after 3 additions.

2. A is $3 + 3 \times 4 = 15$ and B is $1 + 3 \times 4 = 13$.

3. A starts $3 - 1 = 2$ ahead, and adding the same amount to both keeps that lead.

Problem 5

1. Each A increase is $2 - 0 = 4 - 2 = 2$; each B increase is $6 - 0 = 12 - 6 = 6$.

2. Apply both rules to $(4, 12)$: $4 + 2 = 6$ and $12 + 6 = 18$, giving $(6, 18)$.

3. Apply both again: $6 + 2 = 8$ and $18 + 6 = 24$, giving $(8, 24)$.

Problem 6

1. The 1 is A at step 0. The 7 is B at step 1 because $4 + 3 = 7$. They are from different steps.

2. Pair both step-0 values to get $(1, 4)$.

3. Add 3 to both coordinates for each next step: $(4, 7)$, then $(7, 10)$.

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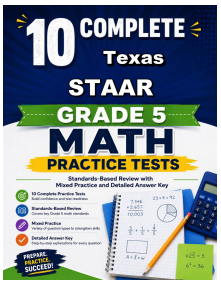

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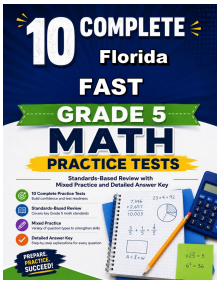

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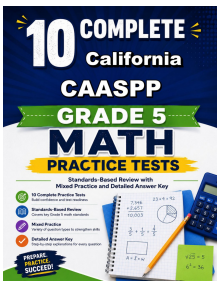

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