Analyzing Relationships Between Patterns

Analyzing Relationships Between Patterns: Apply, Compare, and Design

Name _____ **Date** _____ **Score** _____ / 6

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. At the start of a book drive, class A has 20 books and class B has 8. Each day A collects 3 more and B collects 7 more. After which day is B first ahead, and by how many books?

2. A machine makes 4 buttons and 7 beads per minute, starting with none. An order needs at least 18 buttons and 28 beads. After how many whole minutes are both targets first met? Give both totals and tell which supply sets the wait.

3. Towers start at 6 cm and 10 cm. Each grows by 3 cm per round. Plan X adds 2 cm to each starting height. In Plan Y, only the taller tower gains an extra 2 cm per round. Which plan keeps a 4 cm gap every round? What gap does the other plan give after two rounds?

4. Library counters A and B start at 3 and 9 and gain 4 and 6 each day. A report now records the pair every two days instead of daily, starting at day 0. How much do A, B, and the gap increase between entries? Compare the gap increase with the daily report.

5. Team A starts with 4 flags and B with 10. In each of the first two rounds A gets 2 flags and B gets 5. In round 3, B gets none and A still gets 2. Does B keep pulling farther ahead? Compare the gaps after rounds 2 and 3.

6. Pile A starts with 4 cards and gains 3 each round. Pile B starts with 7 cards and gains 5. A display shows the sum of the two piles. Give its first three totals, including the start, and explain the add rule for the display.

Answer Key

1. After day 4, B leads by 4 books.

2. After 5 minutes: 20 buttons and 35 beads. Buttons set the wait.

3. Plan X keeps the 4 cm gap. Plan Y gives an 8 cm gap after two rounds.

4. A gains 8, B gains 12, and the gap grows by 4 per entry, twice the daily gap increase.

5. No. B leads by 12 flags after round 2 and 10 flags after round 3.

6. $11, 19, 27$ cards; add 8 each round.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. B starts $20 - 8 = 12$ books behind and gains $7 - 3 = 4$ books on A each day.

2. It takes $12 \div 4 = 3$ days to erase the gap. The classes tie after day 3.

3. One day later B is first ahead, by $7 - 3 = 4$ books.

Problem 2

1. The bead target is met at $28 \div 7 = 4$ minutes.

2. At that same time there are only $4 \times 4 = 16$ buttons, so the order is not ready.

3. After 5 minutes the pair is $(20, 35)$, since $5 \times 4 = 20$ and $5 \times 7 = 35$. Now both targets are met.

Problem 3

1. Plan X starts at 8 cm and 12 cm, still 4 cm apart. Both still gain 3 cm each round.

2. Plan Y keeps the 4 cm starting gap, but the tall tower grows $3 + 2 = 5$ cm per round while the other grows 3 cm.

3. Plan Y widens the gap by $5 - 3 = 2$ cm per round. After two rounds it is $4 + 2 \times 2 = 8$ cm.

Problem 4

1. Each new entry is two days later, so A gains $2 \times 4 = 8$ and B gains $2 \times 6 = 12$.

2. B is already ahead, so the gap grows by $12 - 8 = 4$ between new entries.

3. Between daily entries the gap grew by $6 - 4 = 2$. The two-day increase is twice as much.

Problem 5

1. After round 2, A has $4 + 2 \times 2 = 8$ and B has $10 + 2 \times 5 = 20$. The gap is $20 - 8 = 12$.

2. After round 3, the pair is $(10, 20)$, so the gap is $20 - 10 = 10$.

3. B stopped gaining and A gained 2, so the lead shrank by 2 in that round.

Problem 6

1. At the start, the total is $4 + 7 = 11$ cards.

2. Each round adds 3 cards to A and 5 to B, so the total grows by $3 + 5 = 8$.

3. The next totals are $11 + 8 = 19$ and $19 + 8 = 27$.

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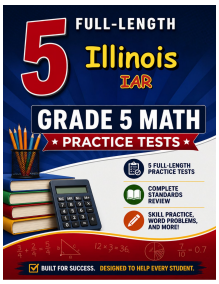

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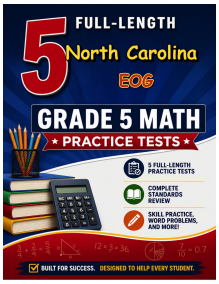

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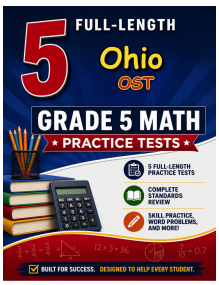

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