# Arithmetic Patterns

Explore ideas and representations

**Name** _____ **Date** _____ **Score** _____ / 8

**QUICK REVIEW**

Check at least two changes before naming a pattern. In $2, 7, 12, 17$, each term increases by $5$: $7 - 2 = 5$ and $12 - 7 = 5$. In the $4$ times table, $4, 8, 12, 16$ also increase by $4$ and every total is even.

**Worked example**

Continue $2, 5, 8, \square, \square$. State the rule.

**1.** The difference is $5 - 2 = 3$ and $8 - 5 = 3$.
**2.** Continue: $8 + 3 = 11$, then $11 + 3 = 14$.
**Answer:** $11, 14$; add $3$.

## Practice Problems

Show your thinking.

**1.** Continue $3, 7, 11, \square, \square$. State the rule.

**2.** Complete the last two outputs. Explain how the outputs change.

| Input | Output |
|---|---|
| 1 | 3 |
| 2 | 6 |
| 3 | 9 |
| 4 | ☐ |
| 5 | ☐ |

**3.** A rule is add $5$. Find and repair the wrong number: $2, 7, 13, 17$.

**4.** A pattern adds the same number each time: $1, \square, 13, 19$. Find the rule and missing number.

**5.** Look at the first four multiples of $4$. Are they all even, all odd, or alternating? Explain.

**6.** A plant is $8$ cm tall. It grows $2$ cm each week. List its heights after $1, 2, 3$ weeks.

**7.** Continue $5, 12, 19, \square, \square$. State the rule.

**8.** Complete the last two outputs. Explain how the outputs change.

| Input | Output |
|---|---|
| 1 | 5 |
| 2 | 10 |
| 3 | 15 |
| 4 | ☐ |
| 5 | ☐ |

# Answer Key

1. $15, 19$; add $4$.
2. Outputs $12, 15$; add $3$ each row.
3. Replace $13$ with $12$.
4. Add $6$; missing $7$.
5. All are even.
6. $10, 12, 14$ cm.
7. $26, 33$; add $7$.
8. Outputs $20, 25$; add $5$ each row.

## Step-by-Step Solutions

Follow each calculation, then check your own work.

### Problem 1

**1.** The difference is $7 - 3 = 4$ and $11 - 7 = 4$.

**2.** Continue: $11 + 4 = 15$, then $15 + 4 = 19$.

### Problem 2

**1.** The first outputs are $1 \times 3 = 3$, $2 \times 3 = 6$, $3 \times 3 = 9$.

**2.** The next are $4 \times 3 = 12$ and $5 \times 3 = 15$; each new group adds $3$.

### Problem 3

**1.** From the second term, $7 + 5 = 12$, not $13$.

**2.** The repaired term works next too: $12 + 5 = 17$.

### Problem 4

**1.** The last two terms give the step: $19 - 13 = 6$.

**2.** Add it to the first term: $1 + 6 = 7$; $7 + 6 = 13$ checks it.

### Problem 5

**1.** The totals are $4, 8, 12, 16$. The factor $4$ is even.

**2.** Each total is a whole number of pairs because $4 = 2 \times 2$. Adding another $4$ keeps the total even.

### Problem 6

**1.** After week $1$: $8 + 2 = 10$ cm.

**2.** Next heights: $10 + 2 = 12$ cm, then $12 + 2 = 14$ cm.

### Problem 7

**1.** The difference is $12 - 5 = 7$ and $19 - 12 = 7$.

**2.** Continue: $19 + 7 = 26$, then $26 + 7 = 33$.

### Problem 8

**1.** The first outputs are $1 \times 5 = 5$, $2 \times 5 = 10$, $3 \times 5 = 15$.

**2.** The next are $4 \times 5 = 20$ and $5 \times 5 = 25$; each new group adds $5$.

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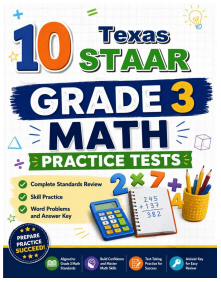


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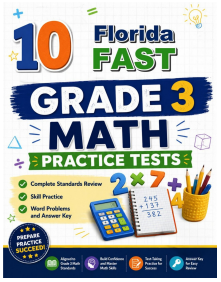


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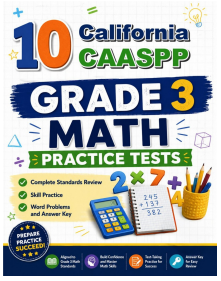


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