

# Patterns Guided Notes

If we contract a set of elements or numbers in which all these elements or numbers are related to each other in a specific rule, then this rule or manner is called **the pattern**.

To construct a pattern, we have to know about some rules. To know about the rule for any pattern, we have to understand the nature of the sequence and the difference between the two successive terms.

**Sample Problem 1: Fill in the missing numbers.**

- a. The rule for the pattern shown is +7.

4, \_\_\_\_\_, 18, 25, \_\_\_\_\_, .....

$4 + 7 = 11$   
 $11 + 7 = 18$   
 $18 + 7 = 25$   
 $25 + 7 = 32$   
 4, **11**, 18, 25, **32**, .....

- b. The rule for the pattern shown is \* 10.

10; \_\_\_\_\_; 1, 000; \_\_\_\_\_; 100, 000; 1, 000, 000 .....

$10 * 10 = 100$   
 $100 * 10 = 1,000$   
 $1,000 * 10 = 10,000$   
 $10,000 * 10 = 100,000$   
 $100,000 * 10 = 1,000,000$

10; **100**; 1, 000; **10,000**; 100, 000; 1, 000, 000 .....

**Sample Problem 2: Find the rule for the following table of values.**

- a.

<i>n</i>	1	2	3	4	5	6	7
	15	18	21	24	27	30	37

<i>n</i>	1	2	3	4	5	6	7
$3n$	3	6	9	12	15	18	21
$3n + 12$	15	18	21	24	27	30	37

$+3$     $+3$     $+3$     $+3$     $+3$     $+3$

The difference between successive values is always 3. The rule is of the form  $3n + 12$

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b.

<b><i>n</i></b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
	6	2	-2	-6	-10	-14	-18

<b><i>n</i></b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b><math>-4n</math></b>	<b>-4</b>	<b>-8</b>	<b>-12</b>	<b>-16</b>	<b>-20</b>	<b>-24</b>	<b>-28</b>
<b><math>-4n + 10</math></b>	<b>6</b>	<b>2</b>	<b>-2</b>	<b>-6</b>	<b>-10</b>	<b>-14</b>	<b>-18</b>

The difference between successive values is always -4. The rule is of the form  $-4n + 10$

## Number Patterns

### Algebraic Patterns

Algebraic patterns are number patterns with sequences based on addition or subtraction.

In other words, we can use addition or subtraction to predict the next few numbers in the pattern, as long as two or more numbers are already given to us.

The value added each time is called the **common difference**.

**Sample Problem 3:** Find the common difference and the next number.

a. 1, 5, 9, 13, ... ..

The pattern starts with 1 and continued by adding 4 to the last number each time.

The common difference is 4

$$1 + 4 = 5$$

$$5 + 4 = 9$$

$$9 + 4 = 13$$

$$13 + 4 = 17$$

The next number is 17

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b. 30, 25, 20, 15, ... ..

The pattern starts with **30** and continued by adding  $-5$  to the last number each time.

The common difference is  **$-5$**

$$30 + (-5) = 25$$

$$25 + (-5) = 20$$

$$20 + (-5) = 15$$

$$15 + (-5) = 10$$

The next number is **10**

### Geometric Patterns

Geometric patterns are sequences of numbers with patterns that are based on multiplication and division. In other words, as long as we know two or more numbers in the pattern, we can use either multiplication or division to find missing numbers. What we multiply by each time is called the **common ratio**.

**Sample Problem 4: Find the common ratio and the next number.**

a. 1; 6; 36; ; 216; 1, 296; ... ..

The pattern starts with **1** and continued by multiplying by **6** to the last number each time.

The common ratio is **6**

$$1 * 6 = 6$$

$$6 * 6 = 36$$

$$36 * 6 = 216$$

$$216 * 6 = 1,296$$

$$1,296 * 6 = 7,776 \quad \text{The next number is } 7,776$$

b. 24, 12, 6, 3, 1.5 ... ..

The pattern starts with **24** and continued by multiplying by **0.5** to the last number each time.

The common ratio is **0.5**

$$24 * 0.5 = 12$$

$$12 * 0.5 = 6$$

$$6 * 0.5 = 3$$

$$3 * 0.5 = 1.5$$

$$1.5 * 0.5 = 0.75 \quad \text{The next number is } 0.75$$