**Patterns in Signed Numbers**

Symbols for positive and negative numbers:

 Positive numbers may be indicated with a raised “plus” sign, for example, +3.

 Negative numbers may be indicated with a raised “minus” sign, for example, -4.

 We often write a positive number without the raised “plus” sign, for example, 3 = +3.

Positive and negative integers may be shown on a number line.

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| **Addition of Integers** | Key words: add, combine, plusSymbol for addition: a + b means “a plus b” |

You may already be familiar with the rules for combining two signed numbers. You can also discover these rules by observing patterns.

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| (1) Complete this pattern | (2) Complete this pattern |
|  |  |
| 3 + 5 = \_\_\_\_\_\_\_\_ | -2 + 5 = \_\_\_\_\_\_\_\_ |
| 3 + 4 = \_\_\_\_\_\_\_\_ | -2 + 4 = \_\_\_\_\_\_\_\_ |
| 3 + 3 = \_\_\_\_\_\_\_\_ | -2 + 3 = \_\_\_\_\_\_\_\_ |
| 3 + 2 = \_\_\_\_\_\_\_\_ | -2 + 2 = \_\_\_\_\_\_\_\_ |
| 3 + 1 = \_\_\_\_\_\_\_\_ | -2 + 1 = \_\_\_\_\_\_\_\_ |
| 3 + 0 = \_\_\_\_\_\_\_\_ | -2 + 0 = \_\_\_\_\_\_\_\_ |
| 3 + -1 = \_\_\_\_\_\_\_\_ | -2 + -1 = \_\_\_\_\_\_\_\_ |
| 3 + -2 = \_\_\_\_\_\_\_\_ | -2 + -2 = \_\_\_\_\_\_\_\_ |
| 3 + -3 = \_\_\_\_\_\_\_\_ | -2 + -3 = \_\_\_\_\_\_\_\_ |
| 3 + -4 = \_\_\_\_\_\_\_\_ | -2 + -4 = \_\_\_\_\_\_\_\_ |
| 3 + -5 = \_\_\_\_\_\_\_\_ | -2 + -5 = \_\_\_\_\_\_\_\_ |

Now state the rules for adding (combining) two signed numbers:

If both numbers are positive, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If both numbers are negative, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If one number is positive and the other is negative, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Subtraction of Integers** | Key words: Subtract, find the difference, minusSymbol for subtraction: a – b means “a minus b” |

Discover the rules for subtraction by observing patterns.

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| (1) Complete this subtraction pattern | (2) Complete this addition pattern |
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| 9 – 4 = \_\_\_\_\_\_\_\_ | 9 + -4= \_\_\_\_\_\_\_\_ |
| 9 – 3 = \_\_\_\_\_\_\_\_ | 9 + -3= \_\_\_\_\_\_\_\_ |
| 9 – 2 = \_\_\_\_\_\_\_\_ | 9 + -2 = \_\_\_\_\_\_\_\_ |
| 9 – 1 = \_\_\_\_\_\_\_\_ | 9 + -1 = \_\_\_\_\_\_\_\_ |
| 9 – 0 = \_\_\_\_\_\_\_\_ | 9 + 0 = \_\_\_\_\_\_\_\_ |
| 9 – -1 = \_\_\_\_\_\_\_\_ | 9 + 1 = \_\_\_\_\_\_\_\_ |
| 9 – -2 = \_\_\_\_\_\_\_\_ | 9 + 2 = \_\_\_\_\_\_\_\_ |
| 9 – -3 = \_\_\_\_\_\_\_\_ | 9 + 3 = \_\_\_\_\_\_\_\_ |
| 9 – -4 = \_\_\_\_\_\_\_\_ | 9 + 4 = \_\_\_\_\_\_\_\_ |

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| (3) Complete this subtraction pattern | (4) Complete this addition pattern |
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| -2 – 4 = \_\_\_\_\_\_\_\_ (think “4 less than -2) | -2 + -4= \_\_\_\_\_\_\_\_ |
| -2 – 3 = \_\_\_\_\_\_\_\_ | -2 + -3= \_\_\_\_\_\_\_\_ |
| -2 – 2 = \_\_\_\_\_\_\_\_ | -2 + -2 = \_\_\_\_\_\_\_\_ |
| -2 – 1 = \_\_\_\_\_\_\_\_ | -2 + -1 = \_\_\_\_\_\_\_\_ |
| -2 – 0 = \_\_\_\_\_\_\_\_ | -2 + 0 = \_\_\_\_\_\_\_\_ |
| -2 – -1 = \_\_\_\_\_\_\_\_ | -2 + 1 = \_\_\_\_\_\_\_\_ |
| -2 – -2 = \_\_\_\_\_\_\_\_ | -2 + 2 = \_\_\_\_\_\_\_\_ |
| -2 – -3 = \_\_\_\_\_\_\_\_ | -2 + 3 = \_\_\_\_\_\_\_\_ |
| -2 – -4 = \_\_\_\_\_\_\_\_ | -2 + 4 = \_\_\_\_\_\_\_\_ |

Compare answers in pattern 1 and in pattern 2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Compare answers in pattern 3 and in pattern 4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How are subtraction and addition related? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Describe a rule for subtracting signed numbers: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Multiplication of Integers** | Key words: multiply, find the product, timesMultiplication symbols: x, \*, · |

Discover the rules by observing patterns.

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| 5 \* 4 = \_\_\_\_\_\_\_\_ | -5 \* 4= \_\_\_\_\_\_\_\_ |
| 5 \* 3 = \_\_\_\_\_\_\_\_ | -5 \* 3 = \_\_\_\_\_\_\_\_ |
| 5 \* 2 = \_\_\_\_\_\_\_\_ | -5 \* 2 = \_\_\_\_\_\_\_\_ |
| 5 \* 1 = \_\_\_\_\_\_\_\_ | -5 \* 1 = \_\_\_\_\_\_\_\_ |
| 5 \* 0 = \_\_\_\_\_\_\_\_ | -5 \* 0 = \_\_\_\_\_\_\_\_ |
| 5 \* -1 = \_\_\_\_\_\_\_\_ | -5 \* -1 = \_\_\_\_\_\_\_\_ |
| 5 \* -2 = \_\_\_\_\_\_\_\_ | -5 \* -2 = \_\_\_\_\_\_\_\_ |
| 5 \* -3 = \_\_\_\_\_\_\_\_ | -5 \* -3 = \_\_\_\_\_\_\_\_ |
| **Division of Integers** | Key words: divide by, find the quotientDivision symbols: ÷, / |

Discover the rules by observing patterns.

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| --- | --- |
| 20 ÷ 5 = \_\_\_\_\_\_\_\_ | 20 ÷ -5 = \_\_\_\_\_\_\_\_ |
| 15 ÷ 5= \_\_\_\_\_\_\_\_ | 15 ÷ -5 = \_\_\_\_\_\_\_\_ |
| 10 ÷ 5 = \_\_\_\_\_\_\_\_ | 10 ÷ -5 = \_\_\_\_\_\_\_\_ |
| 5 ÷ 5 = \_\_\_\_\_\_\_\_ | 5 ÷ -5 = \_\_\_\_\_\_\_\_ |
| 0 ÷ 5 = \_\_\_\_\_\_\_\_ | 0 ÷ -5 = \_\_\_\_\_\_\_\_ |
| -5 ÷ 5 = \_\_\_\_\_\_\_\_ | -5 ÷ -5 = \_\_\_\_\_\_\_\_ |
| -10 ÷ 5 = \_\_\_\_\_\_\_\_ | -10 ÷ -5 = \_\_\_\_\_\_\_\_ |
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Now state the rules for multiplying and dividing two signed numbers:

If both numbers are positive, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If both numbers are negative, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If one number is positive and the other is negative, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Summarize what you found in the table below.**

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|  | **Both Positive** | **Both Negative** | **One Positive,** **One Negative** |
| **Addition** |  |  |  |
| **Subtraction** |  |  |  |
| **Multiplication** |  |  |  |
| **Division** |  |  |  |