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Calculating with negative numbers

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Overview

This presentation will include:

- Addition involving negative numbers;
- Subtraction involving negative numbers;
- Multiplication involving negative numbers; and
- Division involving negative numbers.

Addition involving negative numbers

- Adding two negative numbers gives us a larger negative number. We have moved to the left along the number line.
- When adding numbers with different signs look at the two numbers you are adding together. Which number is furthest away from the zero on the number line? The sign of this number is the sign of the answer.

Addition involving negative numbers: Examples

Evaluate the following:

1.
$$\begin{aligned} & -7 + (-16) \\ = \; & -(7 + 16) \\ = \; & -23\,. \end{aligned}$$

2.
$$\begin{aligned} & 4 + (-9) \\ = \; & -5\,. \end{aligned}$$

Addition involving negative numbers: Exercise

Evaluate the following:

1. $-25 + (-12)$
2. $-456 + (-32)$
3. $-3 + -(1\,245)$
4. $-5 + 3$
5. $-56 + 78$
6. $456 + (-67)$
7. $89 + (-567)$
8. $-1\,789 + 1\,674$

Addition involving negative numbers: Answers

1. $-25 + (-12) = -(25 + 12) = -37\,.$
2. $-456 + (-32) = -(456 + 32) = -488\,.$
3. $-3 + (-1\,245) = -(3 + 1\,245) = -1\,248\,.$
4. $-5 + 3 = -2\,.$
5. $-56 + 78 = 22\,.$
6. $456 + -67 = 389\,.$
7. $89 + -567 = -478\,.$
8. $-1\,789 + 1\,674 = -115\,.$

Subtraction involving negative numbers

- When subtracting a positive number, write the subtraction as an addition of a negative number, and follow the procedures for adding numbers involving negatives.
- Two negatives together make a positive.
- *Two wrongs do not make a right. But here in maths we think they might!*

Subtraction involving negative numbers: Examples

Evaluate the following.

1.
$$\begin{aligned} & -45 - 89 \\ = \; & -45 + (-89) \\ = \; & -(45 + 89) \\ = \; & -134\,. \end{aligned}$$

2.
$$\begin{aligned} & -498 - (-587) \\ = \; & -498 + 587 \\ = \; & +(587 - 498) \\ = \; & 89\,. \end{aligned}$$

Subtraction involving negative numbers: Exercise

Evaluate the following.

1. $456 - 765$
2. $-376 - (-46)$
3. $73 - (-34)$
4. $567 - 345$
5. $-45 - 238$
6. $1\,234 - (-890)$
7. $-56 - 4\,693$
8. $567 - (-780)$

Subtraction involving negative numbers: Answers

1. $456 - 765 = 456 + (-765) = -(765 - 456) = -309\,.$
2. $-376 - (-46) = -376 + 46 = -(376 - 46) = -330\,.$
3. $73 - (-34) = 73 + 34 = 107\,.$
4. $567 - 345 = 222\,.$
5. $-45 - 238 = -45 + (-238) = -(45 + 238) = -283\,.$
6. $1\,234 - (-890) = 1\,234 + 890 = 2\,124\,.$
7. $-56 - 4\,693 = -56 + (-4\,693) = -(56 + 4\,693) = -4\,749\,.$
8. $567 - (-780) = 567 + 780 = 1\,347\,.$

Multiplication involving negative numbers

- When multiplying numbers of opposite sign (one positive and one negative), the answer must be negative.
- When multiplying numbers of the same sign (both positive or both negative), the answer must be positive.

Multiplication involving negative numbers: Examples

Evaluate the following:

1. $$\begin{aligned} & -3 \times 5 \\ = \; & -(3 \times 5) \\ = \; & -15\,. \end{aligned}$$

2. $$\begin{aligned} & -6 \times -8 \\ = \; & +(6 \times 8) \\ = \; & 48\,. \end{aligned}$$

Multiplication involving negative numbers: Exercise

Evaluate the following without a calculator. Where appropriate check your answers on a calculator.

1. 4×-7
2. -12×6
3. -6×0
4. -34×29
5. 37×-87
6. -104×6
7. 789×-45
8. -67×-45

Multiplication of negative numbers: Answers

1. $4 \times -7 = -(4 \times 7) = -28\,.$
2. $-12 \times 6 = -(12 \times 6) = -72\,.$
3. $-6 \times 0 = 0\,.$
4. $34 \times 29 = -(34 \times 29) = -986\,.$
5. $37 \times -87 = -(37 \times 87) = -3\,219\,.$
6. $-104 \times 6 = -(104 \times 6) = -624\,.$
7. $789 \times -45 = -(789 \times 45) = 35\,505\,.$
8. $-67 \times -45 = +(67 \times 45) = 3\,015\,.$

Division involving negative numbers

The same rules that we apply for multiplication involving negative numbers also apply for division:

- *When dividing numbers of opposite sign (one positive and one negative) the answer must be negative.*
- *When dividing numbers of the same sign (both positive or both negative) the answer must be positive.*

In general, when dividing numbers involving negatives, decide on the sign of the answer using the above rules, then ignore the signs and perform the division.

Finally, give your answer the sign you determined in the first step.

Division involving negative numbers: Example

Evaluate $-45 \div 5$.

Look at the question and determine that the answer must be negative because the numbers possess different signs.

Now ignore the signs and divide:

$$45 \div 5 = 9\,.$$

Finally, attach the sign you determined in the first step, so

$$-45 \div 5 = -9\,.$$

Division involving negative numbers: Exercises

Evaluate the following. Estimate your answer, where necessary, before you begin.

1. $-42 \div 6$
2. $64 \div -8$
3. $-861 \div -3$
4. $-12 \div 6$
5. $-6 \div 2$
6. $-32 \div 16$
7. $5\,642 \div -91$
8. $-5\,688 \div 6$
9. $765 \div -45$
10. $-135 \div -45$

Division involving negative numbers: Answers

1. $-42 \div 6 = -(42 \div 6) = -7\,.$
2. $64 \div -8 = -(64 \div 8) = -8\,.$
3. $-861 \div -3 = +(861 \div 3) = 287\,.$
4. $-12 \div 6 = -(12 \div 6) = -2\,.$
5. $-6 \div 2 = -(6 \div 2) = -3\,.$
6. $-32 \div 16 = -(32 \div 16) = -2\,.$
7. $5\,642 \div -91 = -(5\,642 \div 91) = -62\,.$
8. $-5\,688 \div 6 = -(5\,688 \div 6) = -948\,.$
9. $765 \div -45 = -(765 \div 45) = -17\,.$
10. $-135 \div -45 = +(135 \div 45) = 3\,.$

Further help

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