Significant Figures and Rounding

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Outline

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When to Round

- Estimation

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- Significant Digits in Measurements

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- Significant Digits in Measurements
- When it makes sense for units (for instance, in money).

Rounding Method

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1. Choose a digit to round to.
2. Look to the digit to the right of this one.
3. If the digit is ≥ 5, add 1 to the digit you are rounding to.
4. The digits to the right of this position become zero.

Examples

Round the following to the 10's place:

1. 12.5

Examples

Round the following to the 10's place:

1. 12.5 10

Examples

Round the following to the 10's place:

1. 12.5 10
2. 17.9

Examples

Round the following to the 10's place:

1. 12.5 10
2. 17.9 20

Examples

Round the following to the 10's place:

1. 12.5 10
2. 17.9 20
3. 14.999

Examples

Round the following to the 10's place:

1. 12.5 10
2. 17.9 20
3. 14.999 10

Examples

Round the following to the 100's place:

1. 125

Examples

Round the following to the 100's place:

1. 125 100

Examples

Round the following to the 100's place:

1. 125 100
2. 170

Examples

Round the following to the 100's place:

1. 125 100
2. 170 200

Examples

Round the following to the 100's place:

1. 125 100
2. 170 200
3. 14

Examples

Round the following to the 100's place:

1. 125 100
2. 170 200
3. 14 0

Examples

Round the following to 1/10th's place

1. 12.54555

Examples

Round the following to 1/10th's place

1. 12.54555 12.5

Examples

Round the following to 1/10th's place

1. 12.54555 12.5
2. 12.78

Examples

Round the following to 1/10th's place

1. 12.54555 12.5
2. 12.78 12.8

Examples

Round the following to 1/10th's place

1. 12.54555 12.5
2. 12.78 12.8
3. 1.31111

Examples

Round the following to 1/10th's place

1. 12.54555 12.5
2. 12.78 12.8
3. 1.31111 1.3

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Accuracy and Precision

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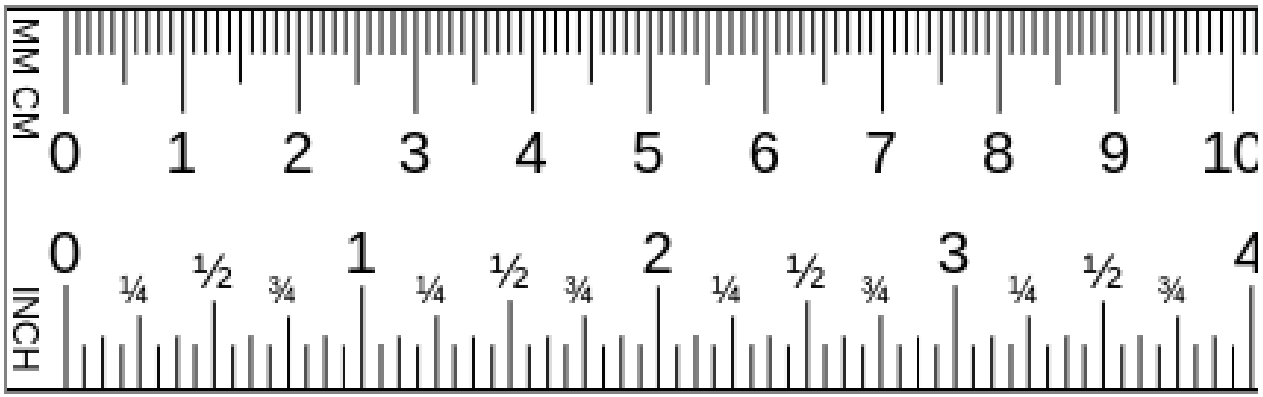
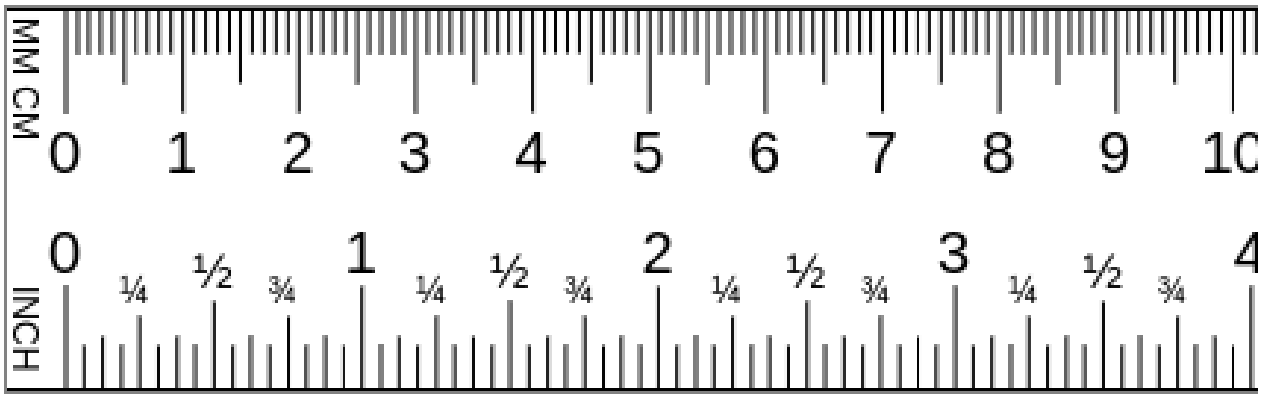
- A number by itself is an abstract (or exact) number.
- A number which quantifies objects or units is a concrete number.
- A measurement is a number observed using some instrument (ruler, scale, etc.).
- Measurements will always contain errors.
- **Accuracy** - The distance between an observed value and the actual value.
- **Precision** - The distance between repeated observations.

Significant Digits



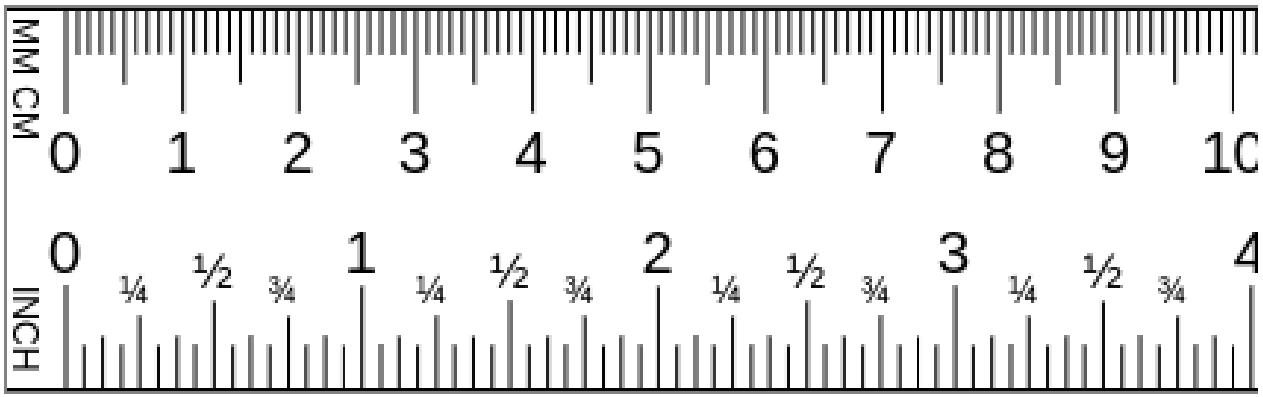
Significant Digits

- Significant digits roughly correspond to the precision of the instrument used to take measurements.



Significant Digits

- Significant digits roughly correspond to the precision of the instrument used to take measurements.
- When performing calculations, your answer cannot be more precise than your measurements!



Significant Digit Rules

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2. Any zero digits between significant digits are significant.

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1. All non-zero digits are significant.
2. Any zero digits between significant digits are significant.
3. A trailing zero is significant only if it appears to the right of the decimal point.

Examples

How many significant digits are in each of the following?

1. 1

Examples

How many significant digits are in each of the following?

1. 1 1 significant digit

Examples

How many significant digits are in each of the following?

1. 1 1 significant digit
2. 10

Examples

How many significant digits are in each of the following?

1. 1 1 significant digit
2. 10 1 significant digit

Examples

How many significant digits are in each of the following?

1. 1 1 significant digit
2. 10 1 significant digit
3. 1.0

Examples

How many significant digits are in each of the following?

1. 1 1 significant digit
2. 10 1 significant digit
3. 1.0 2 significant digits

Examples

How many significant digits are in each of the following?

1. 1 1 significant digit
2. 10 1 significant digit
3. 1.0 2 significant digits
4. 10.0

Examples

How many significant digits are in each of the following?

1. 1 1 significant digit
2. 10 1 significant digit
3. 1.0 2 significant digits
4. 10.0 3 significant digits

Examples

How many significant digits are in each of the following?

1. 1 1 significant digit
2. 10 1 significant digit
3. 1.0 2 significant digits
4. 10.0 3 significant digits
5. 0.000312

Examples

How many significant digits are in each of the following?

1. 1 1 significant digit
2. 10 1 significant digit
3. 1.0 2 significant digits
4. 10.0 3 significant digits
5. 0.000312 3 significant digits

Examples

How many significant digits are in each of the following?

1. 1 1 significant digit
2. 10 1 significant digit
3. 1.0 2 significant digits
4. 10.0 3 significant digits
5. 0.000312 3 significant digits
6. 0.00300

Examples

How many significant digits are in each of the following?

1. 1 1 significant digit
2. 10 1 significant digit
3. 1.0 2 significant digits
4. 10.0 3 significant digits
5. 0.000312 3 significant digits
6. 0.00300 3 significant digits

Addition with Significant Digits

1. Count the number of significant digits to the right of the decimal place in each of the numbers you are adding. This is the number of significant digits that your answer can have to the right of the decimal place.

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1. Count the number of significant digits to the right of the decimal place in each of the numbers you are adding. This is the number of significant digits that your answer can have to the right of the decimal place.
2. Add as normal.

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1. Count the number of significant digits to the right of the decimal place in each of the numbers you are adding. This is the number of significant digits that your answer can have to the right of the decimal place.
2. Add as normal.
3. Round the sum to the correct number of significant digits.

Multiplication with Significant Digits

1. Count the number of significant digits in each number you are multiplying. This is the number of significant digits that can be in your answer.

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2. Multiply as normal.

Multiplication with Significant Digits

1. Count the number of significant digits in each number you are multiplying. This is the number of significant digits that can be in your answer.
2. Multiply as normal.
3. Round the product to the correct number of significant digits.

Examples

1. $10\text{in} + 11\text{in} = ?$

Examples

1. $10\text{in} + 11\text{in} = ?$ 21in

Examples

1. $10\text{in} + 11\text{in} = ?$ 21in
2. $1\text{mm} + 2.0\text{mm} = ?$

Examples

1. $10\text{in} + 11\text{in} = ?$ 21in
2. $1\text{mm} + 2.0\text{mm} = ?$ 3mm

Examples

1. $10\text{in} + 11\text{in} = ?$ 21in
2. $1\text{mm} + 2.0\text{mm} = ?$ 3mm
3. $1.125\text{kg} + 0.1\text{kg} = ?$

Examples

1. $10\text{in} + 11\text{in} =?$ 21in
2. $1\text{mm} + 2.0\text{mm} =?$ 3mm
3. $1.125\text{kg} + 0.1\text{kg} =?$ 1.2kg

Examples

1. $10\text{in} + 11\text{in} = ?$ 21in
2. $1\text{mm} + 2.0\text{mm} = ?$ 3mm
3. $1.125\text{kg} + 0.1\text{kg} = ?$ 1.2kg
4. $1.5\text{in} \times 2.125\text{in} = ?$

Examples

1. $10\text{in} + 11\text{in} = ?$ 21in
2. $1\text{mm} + 2.0\text{mm} = ?$ 3mm
3. $1.125\text{kg} + 0.1\text{kg} = ?$ 1.2kg
4. $1.5\text{in} \times 2.125\text{in} = ?$ 3.2in^2

Examples

1. $10\text{in} + 11\text{in} = ?$ 21in
2. $1\text{mm} + 2.0\text{mm} = ?$ 3mm
3. $1.125\text{kg} + 0.1\text{kg} = ?$ 1.2kg
4. $1.5\text{in} \times 2.125\text{in} = ?$ 3.2in^2
5. $10.0\text{mm} \times 2\text{mm} = ?$

Examples

1. $10\text{in} + 11\text{in} = ?$ 21in
2. $1\text{mm} + 2.0\text{mm} = ?$ 3mm
3. $1.125\text{kg} + 0.1\text{kg} = ?$ 1.2kg
4. $1.5\text{in} \times 2.125\text{in} = ?$ 3.2in^2
5. $10.0\text{mm} \times 2\text{mm} = ?$ 20mm^2
6. Compute the Perimeter of your student ID.

Examples

1. $10\text{in} + 11\text{in} = ?$ 21in
2. $1\text{mm} + 2.0\text{mm} = ?$ 3mm
3. $1.125\text{kg} + 0.1\text{kg} = ?$ 1.2kg
4. $1.5\text{in} \times 2.125\text{in} = ?$ 3.2in^2
5. $10.0\text{mm} \times 2\text{mm} = ?$ 20mm^2
6. Compute the Perimeter of your student ID.
7. Compute the area of your student ID.

Significant Digits and Scientific Notation

When using scientific notation, only write significant digits.

When to Use Significant Digits

Significant digit considerations only apply to values observed via measurement. They do not apply to counting, abstract numbers, or theoretical values.