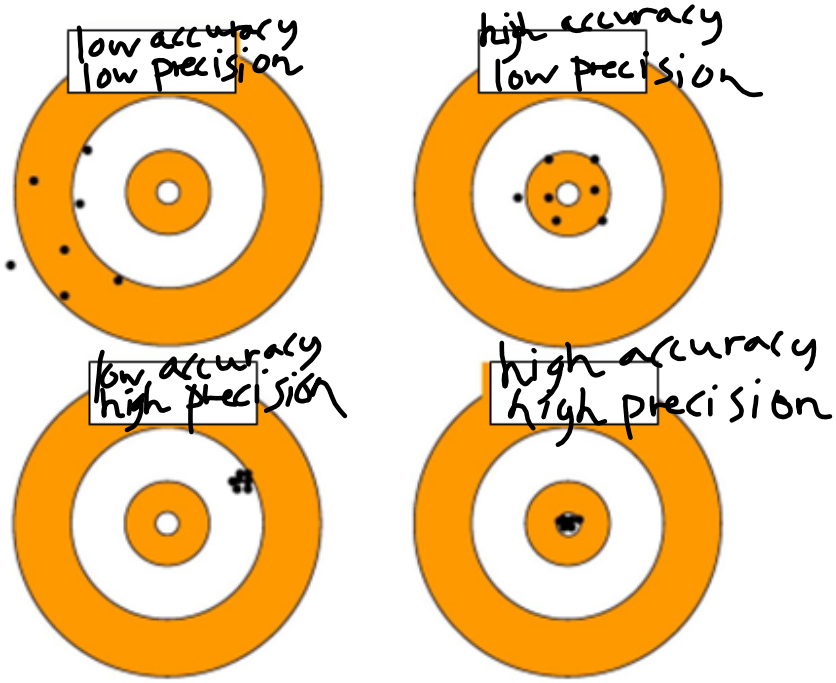
Accuracy vs. Precision
Accuracy: refers to the closeness of a measured value to a standard or known value.

Precision: refers to the closeness of two or more measurements to each other.



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How long is the block?

Ans: 9.8

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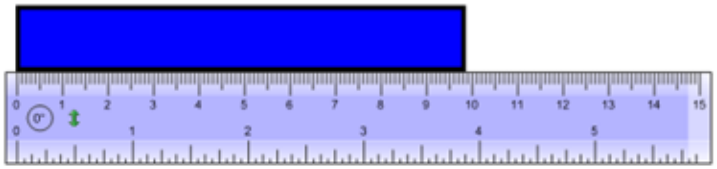

Ans: 9.8

Which measurement is the most precise?

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Significant Figures

1. Any digit that is not zero is significant
   example: 2.456 4 Sig Figs

2. Zeros between non-zero digits are significant. Count the "TRAPPED" zeros!
   example: 302 3 Sig Figs

3. Leading zeros are NOT significant.
   example: 0.006 1 Sig Fig

4. Trailing zeros only count IF there is a decimal in the number.
   example: 8.0 2 Sig Figs
   80 1 Sig Fig

5. Counted or Defined Values = Exact Values
   - Exact values are objects that have an **infinite** (unlimited) number
   - of significant digits Exs: 4 dogs, 10 CDs, 3 birds, 452 coins, etc.

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PRACTICE!

How many significant figures are in the following?

1. 4562 →
2. 9.81 →
3. 0.106 →
4. 0.0004 →
5. 3.0700 →
6. 7200 →

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Rounding!

We need to figure out how many sig figs we need then drop the extra digits.
This is done by rounding!

If the number is 5 or higher we round up!

ex) rewrite with 2 sig figs,

3.367 --> 3.4

If the number is less than 5 we leave it!

ex) rewrite with 2 sig figs,

3.3**4**7 --> 3.3

Practice!

Rewrite the following with the number of sig figs indicated in the brackets!

1) 0.2067 (2) --->

2) **34.2 (5)** --->

3) **256000 (2)** --->

4) 0.0523 (1) --->

5) 4502.4 (1) --->

6) 1.5607 (4) --->

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Scientific Notation

Scientific notation is a way to write numbers that are very large or very small. It can also be useful when dealing with significant figures.

Scientific notation is written in two parts:

- The first is just the digits (with the decimal point placed after the first digit).
- The second part is ×10 to a power that would put the decimal point back where it should be.

right

0.0045

4.5×10^{-3}

Hint: The power we choose is the number of decimal places we move the number. If we move left the power is positive. If we move right the power is negative!

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Practice!

Re-write the following in scientific notation

1) 4167 → 4.167×10^{3}

2) 0.478 → 4.78×10^{-1}

3) 200 → 2.00×10^{2}

4) 0.00382 → 3.82×10^{-3}

5) 50178000 → 5.0178×10^{7}

6) 0.0000000072 → 7.2×10^{-9}

move to right is negative.

move to left is positive

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Addition and Subtraction!

When adding or subtracting the answer should have the same number of DECIMAL places are the LEAST number found in the original problem

Example: 2.10 m + 3.1 m = 5.2 m

1.304 m - 0.2 m = 1.1 m

Practice!

1. 4.02 + 7.135 = 11.155 = 11.16 4 s.g. digits
2. 12.23 - 1.124 = 11.106 = 11.11 4 s.g digits
3. 4.569 + 0.1 = 4.669 = 4.7 2 s.g digits
4. 108.92 - 1.1 = 107.82 = 107.8 4 s.g digits.

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Multiplication and Division

The answer should have the same number of significant figures as the measurement with the LEAST number of significant figures in the original problem.

Example: 3.245 x 5.02 = 16.2899 = 16.3

16.5 / 2.3342 = 7.068803016....=7.07

Practice!

1. 0.02 x 5.23 = 0.1046 → 0.1

2. 23.5 / 7.0 = 3.357142857 → = 3.4

3. 32.0 / 0.0032 = 10000 → 1.0×10^4

4. 100 x 45 = 4500 → = 5000

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