Unit 2: Physics

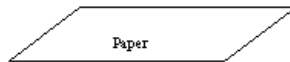## Physics is the study of matter and its motion.

What is motion?

The change of position of an option with respect to time. We will use terms like distance, displacement, speed, velocity, acceleration, and time to help us describe the motion of an object!

Moving from point A to point B

1.

Book   Paper
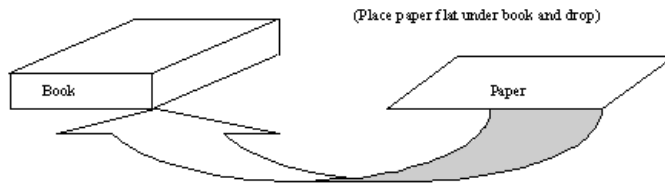
What do you think will happen?

What happened? Why?

2.

(Place paper flat under book and drop)

Book   Paper

What do you think will happen?

What happened? Why?

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3.

Book   Paper

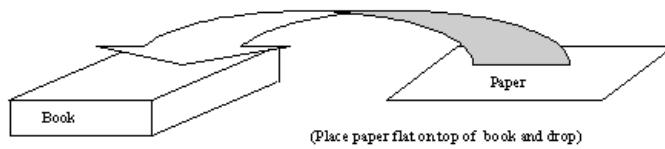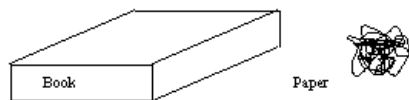(Place paper flat on top of book and drop)

What do you think will happen?

What happened? Why?

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4.

Book   Paper

What do you think will happen?

What happened? Why?

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Discussion questions

1. What has more mass, the book or the paper?
2. Does the mass effect the rate at which something falls?
   Use the information you collected from the demonstrations to back up your answer.
3. What is air resistance?
4. Does air resistance affect the rate at which things fall?
   Use the information you collected from the demonstrations to back up your answer.

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Chapter 9

Distance and Speed

Distance is the amount of space between two objects or points.

- The common unit of distance is the metre (m)

  Ex:

  From Renous to Newcastle is approximately 35 Km

  Length of the smartboard is 126 c m

  Distance across an atom is approximately 3×10^{-10} m

  Closest visible star system to the sun is 4.1×10^{16} m away

- We use a variety of instruments to measures distances
  - Odometer , metre stick, microscope, telescope
  - Each tool has a certain degree of precision

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- **Precision-** the precision of a measurement tool is the smallest unit that can be measured with confidence using the tool. It depends on the fines of scale.
  - **Ex:** metre stick 1.43 m

The person that uses the tool for measuring has a certain degree of accuracy

Accuracy – the accuracy of a measurement indicates how close the recorded measurement is to the true value. It depends in the user's skill.

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Time – is the duration between two events

- Is measured in seconds, minutes or hours

What is the relationship between Distance and Time you may ask?

- The answer is speed

Speed = **_distance_**

  Time

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Measuring and Calculation

There are many mathematical calculations performed when measuring physical

properties and scientists around the world use a set of rules to indicate the degree

of accuracy and precision of these measurements.

Certainty of a measurement is determined by how many certain digits (plus one)

are obtained by the measuring instrument.

What are **significant digits**?
-    The number of digits in a measurement we know **for certain** *plus one additional uncertain digit*.

General Rule:
Record all those digits that are certain plus one uncertain digit, and no more.

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For example, using a ruler to measure the length of your pencil. If you placed the ruler (eraser end) exactly even with the 0 mark on the ruler and the other end is shown to be approximately in the middle
between 10.5 cm and 10.6 cm.

    What would you report the length of the pencil to be???

Ans: since it falls approximately in the middle between 10.5 cm and 10.6 cm,
we can report the length of the pencil to be:
        10.55 cm   which is shown to have **four** significant digits!

    [**three** digits we know for certain (10.5) plus **one** uncertain digit (5) which we estimated]

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Rules for counting Significant Digits
1. All non-zero digits are significant
   a.   1234 ----→ 4 sig digs
   b.   735 -----→ 3 Sig digs

2. Zeros placed between other digits are always significant
   a.   1.203   --→ 4 sig digs
   b.   10002   --→ 5 sig digs
   c.   3404   --→ 4 sig digs

3. Zeroes behind other digits after a decimal point are significant.
   (Zeros placed after digits are only significant if they are behind a decimal point.)

   a.   **0.30   -----→ 2 sig digs**

   b.   **0.4500 ---→   4 sig digs**

   c.   **0.0560 --→   3 sig digs**

   d.   **4000   ---→ 1 sig dig**

   e.   **290 --→ 2 sig digs**

   f.   **4200 --→ 2 sig digs**

   g.   **3700.0 --→ 5 sig digs**

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Exercise

Determine how many significant digits are in each of the following numbers.

If you are having trouble look at the rules for sig digs.

a) 425.6 m   b) 1.05 km   c) 9.6093 kg   d) 5.0 g

e) 6 lbs   f) 0.5 hr   g) 0.24 m   h) 0.006

i) 0.0245   j) 0.42   k) 0.00560   l) 173.2×10^{-3} M

m) 3.45 m   n) 6.7523 km   o) 9.7 ounces   p) 4.0 cm

q) 440 miles   r) Speed of light: 3.0×10^{8} m/s   s) 0.454 g

t) 0.7 s   u) 0.00465 km   v) 0.08905 L

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