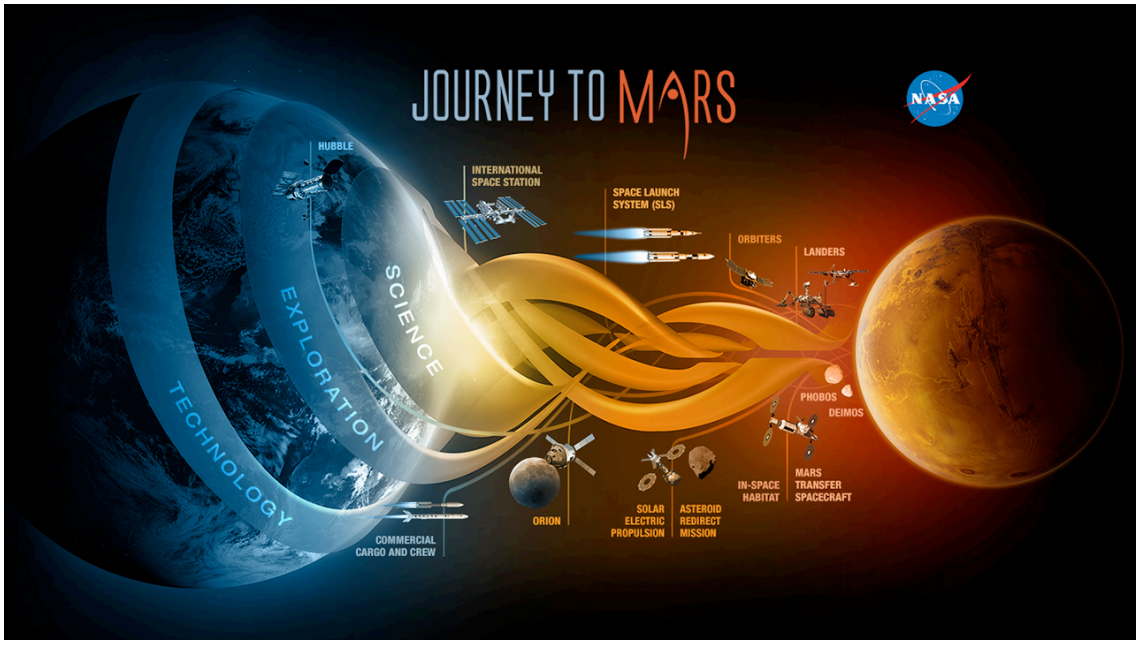
Journey to Mars. What´s the best way?



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1. Tools used to study the motion.

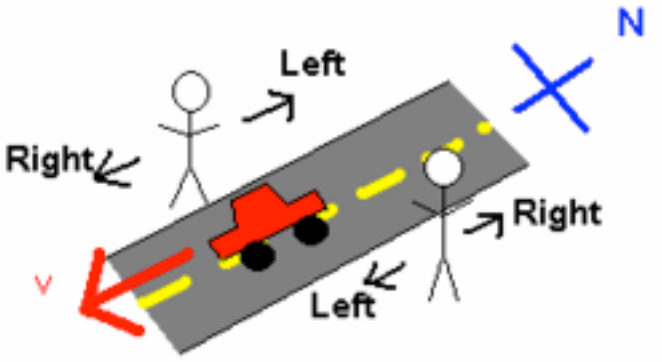
As you have watched in news, there is a new, exciting challenge for scientist all over the world. NASA is on a journey to Mars, with a goal of sending humans to the Red Planet in the 2030s. That journey is already well under way.
But, what do you think about use of rockets to travel from the Earth to Mars? Is the best way? Could be possible any another means of transport? This is the issue we are going to talk about.

First, we must know some things about the motion of the objects:

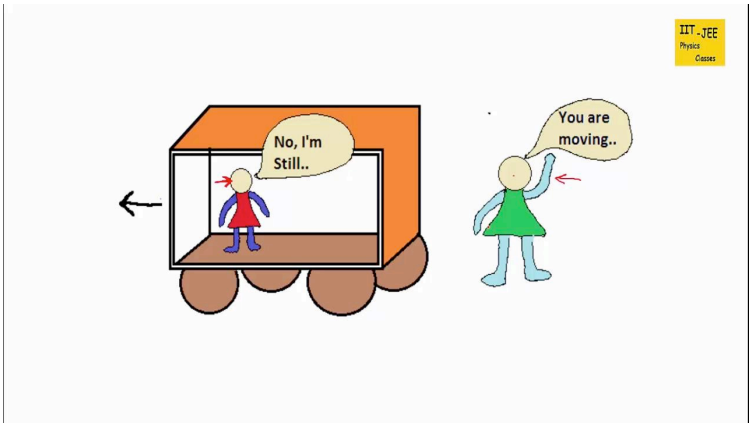
1. Frame of reference. Reference point.

Think about the objects in your class. Where is each one? It´s near? It´s far? It depends if you refer it to you or, for example, to the door class (Form example, your pencil is near you, but far from the door class.)

Always you want to say where is an object, you need a frame of reference. How many frames of references can I use? All that I want, because I can describe where are the windows, the door, etc. using as a frame of reference myself or the teacher, or another thing in the class.



The reference frame tells you what I am comparing my motion against. When I tell you that I am currently sitting (not moving) at my computer while typing this sentence, I am comparing my lack of movement to the room I am sitting in.
I actually could be on a bus, with wireless internet access, that is moving through town at some (obviously) changing velocity. In my frame of reference, I am sitting still, but if you saw me from the street, you would claim that I am moving.



2. ¿What´s the position?

   Once you have a reference point, you can define where is an object. Its position, and it´s always referred to the reference point you are using. In your class, your pencil is in front of you, but for your schoolmate, this is not in front of him. For him/her, the pencil would be on the right or on the left, it depends if he/she is on your left or on your right.

   As you can see, the place where the object is the same for both, on your table, but if you want to explain the position, you should use a reference point.

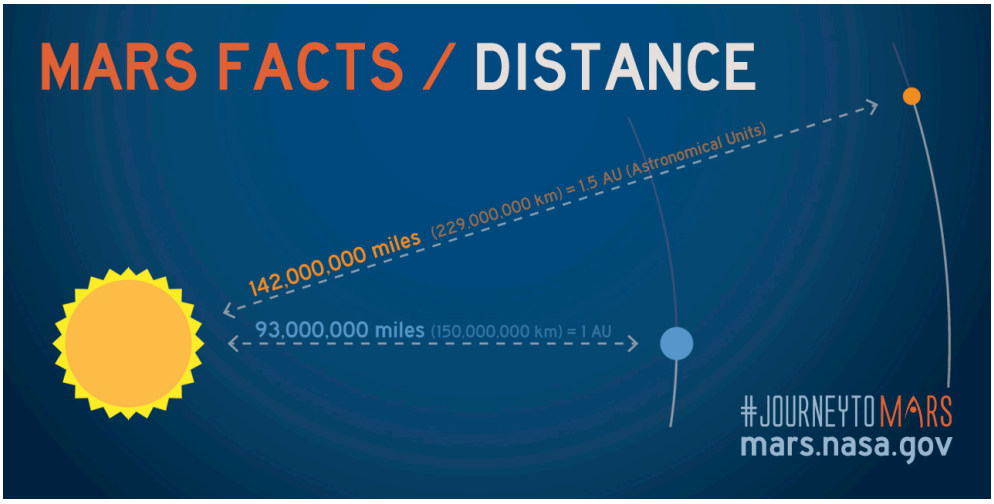
3. ¿What´s the distance?

   Distance is a quantity that refers to "how much ground an object has covered" going from a position to another one.

   We use different units (and different measuring equipment) to measure distances. It depends of the distance you are studying. For example:

   a. If you want to express the length of a screw, you will use millimetres (mm).
   b. When you want to express the width of a finger, is better to use centimetres (cm).
   c. If you want to express the length between two cities, you will use the kilometre (km).

   But, which one do we choose to measure the distance between the earth and the sun? Look at the picture:



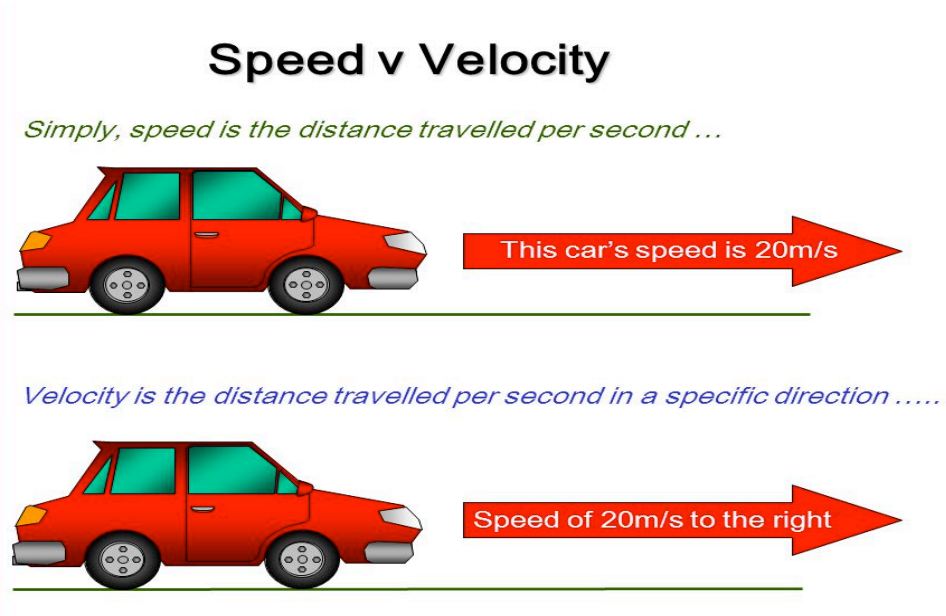
4. ¿What´s the time?

Time in physics is one of the seven fundamental physical quantities in both the International System of Units and International System of Quantities. Time is used to define other quantities—such as velocity. Time is used to sequence events, to compare the duration or the intervals between them. It´s also referred as the fourth dimension, along with the three spatial dimensions.

5. ¿What´s the velocity/speed?

The velocity of an object is the rate of change of its position with respect to a point of reference, and it´s function of time. Velocity is equivalent to a specification of its speed and direction of motion. As you studied this year, velocity is a physical vector quantity; both magnitude and direction are needed to define it.

The scalar absolute value (magnitude) of velocity is called "speed", whose quantity is measured in the SI system as metres per second (m/s).



We can join all in an equation to calculate distances, times and speeds. All of the calculations will be worked out using the distance, speed and time equation. An easy way to remember the distance, speed and time equations is to put the letters into a triangle.

Distance = Speed x Time

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

The triangles will help you remember these 3 rules:

Distance = Speed x Time
Time = Distance/Speed
Speed= Distance/Time

Here you have some examples to work through. Have paper and a pen handy, draw the distance, speed and time triangle on your paper, then try the examples:

a. Calculating **distance**, given speed and time.

   Ian walked from his parents' farm into town at a steady speed of 5km/h. The journey took 3 hours. How far did Iain walk?

b. Calculating **speed**, given distance and time.

   Alan travels 100km in 5hrs. Find his average speed in km/h.

c. Calculating **time**, given speed and distance.

   Joanna drives for 400km at an average speed of 80km/h. How long was her journey?

2. Means of transport.

Long ago people did not have any means of transport. They used to move only on foot and carry goods either on their back or using animals.

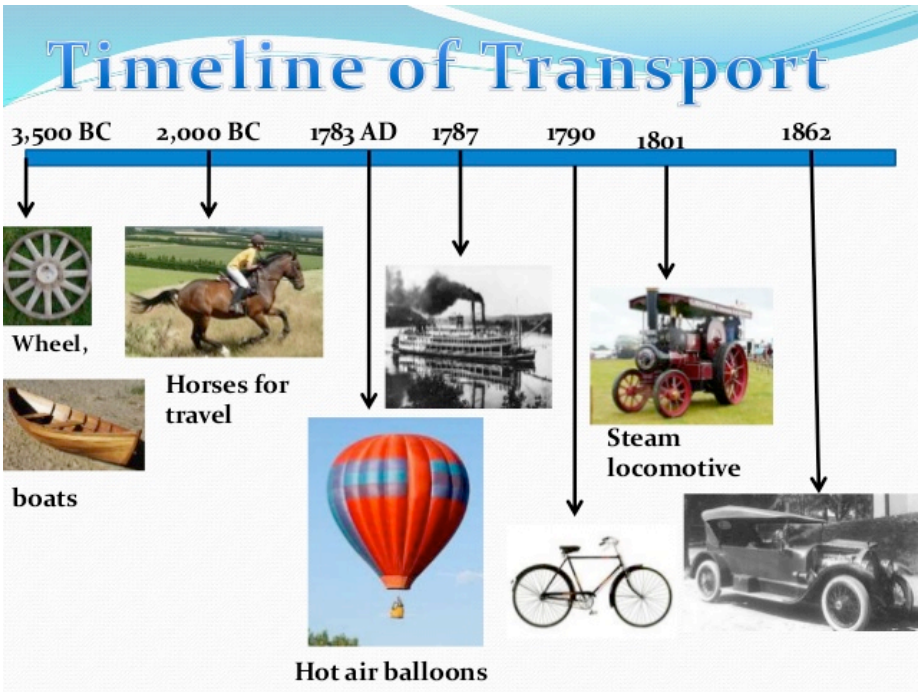
For transport along water routes, boats were used from ancient times. To begin with, boats were simple logs of wood in which a hollow cavity could be made. Later, people learnt to put together different pieces of wood and give shapes to the boats. These shapes imitated the shapes of the animals living in water. Recall our discussions of this streamlined shape of fish in Chapters 8 and 9.

Invention of the wheel made a great change in modes of transport. The design of the wheel was improved over thousands of years. Animals were used to pull vehicles that moved on wheels.

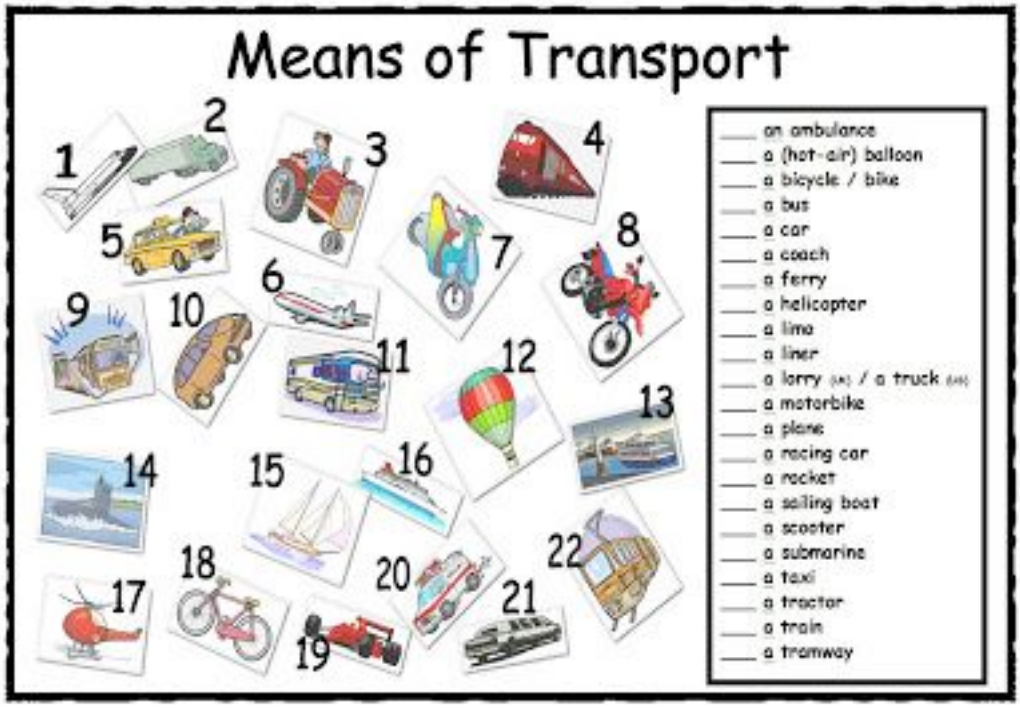
Until the beginning of the 19th century, people still depended on animal power to transport them from place to place. The invention of steam engine introduced a new source of power. Railroads were made for steam engine driven carriages and wagons.

Later came automobiles. Motorised boats and ships were used as means of transport on water. The early years of 1900 saw the development of aeroplanes. These were later improved to carry passengers and goods. Electric trains, monorail, supersonic aeroplanes and spacecraft are some of the 20th century contributions.

Are there any of the early modes of transport that are not in use today?



Look at the picture and try to solve it:



3. How far have you travelled?

How will you know whether you can walk all the way to your school or whether you will need to take a bus to reach your school? When you need to purchase something, is it possible for you to walk to the market? How will you know the answers to these questions?

It´s often important to know how far a place is, so that we can have an idea how we are going to reach that place – walk, take a bus or a train, a ship, an aeroplane or even a rocket!

Sometimes, there are objects whose length or width we need to know.

4. Our task….

Now, it´s time for our task. What means of transport do you think is better to travel from the Earth to Mars? Why?

We should find out about the three faster means of transport and check their maximum speed. (the fastest car, train, ship, helicopter, rocket…)

With this information and the distance between the Earth and Mars and, using equations form previous paragraphs, we must to calculate the time to go from the Earth to Mars with each means of transport.

Once you have all data, compare between different means of transport and answer the next questions.

How long does it take to get from the Earth to Mars by car?

How long does it take to get from the Earth to Mars by train?

How long does it take to get from the Earth to Mars by fly?

How long does it take to get from the Earth to Mars by rocket?

If you begin a travel to Mars now. How old will be you when you arrive there?

Think about a so huge trip inside a Rocket. What do you think about this?