WEEK 3: Forces (*Grymoedd*):

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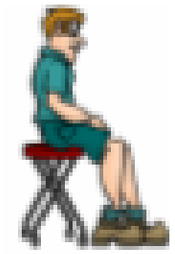
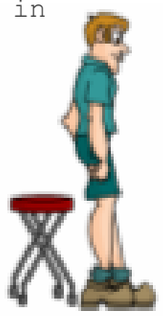


Static forces: do not move – stationary do not change (e.g. bricks in a bridge).

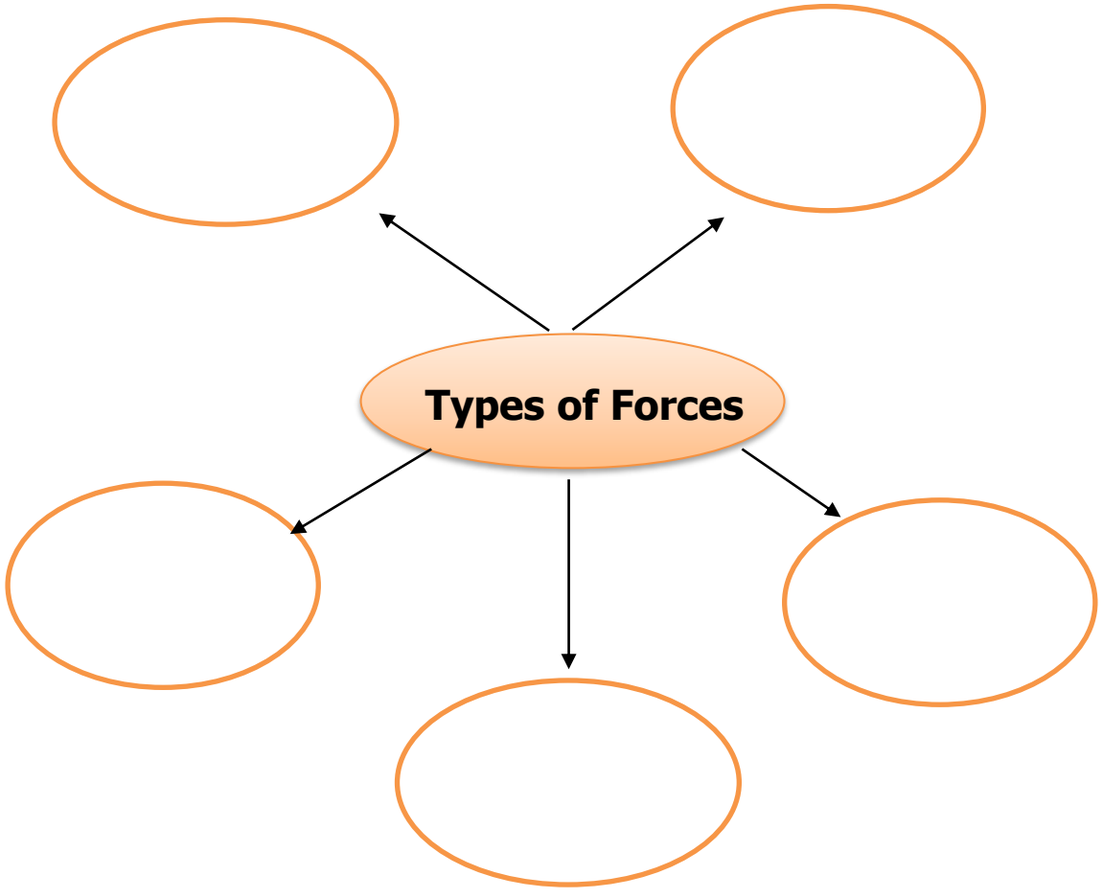
Dynamic forces: will move on a structure can change in size.

By sitting up and down this man is creating movement in the chair structure, placing the chair under dynamic loading.



TASK 1: Forces

What are the 5 main types of forces that act upon a structure



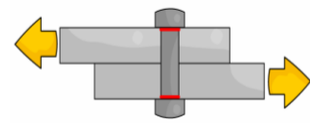
TASK 2: Forces classifications

Read through each of the 5 forces descriptions and fill in the blanks using the words from the word bank at the bottom.

Compression is a ……. or pushing force. When an object is compressed, the external force applied pushes downwards, squashing it. To compensate against this, the internal forces inside the object are pushing out against the external force. The object is safe as long as the internal force is equal to or greater than the external force. However, when the external force is ..... than the internal forces, the object will fail.

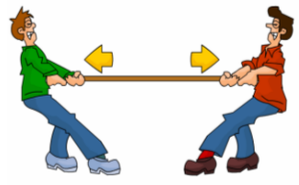
Torsion is a turning or …….. force. This spanner is turning a bolt.

A ***shear force*** is a sliding or ……. force, pulling in opposite directions. The bolt holding the plates together will eventually be sheared in ……...



The force is at an angle to the shelf, making the shelf ..... This causes compression in the top half of the shelf and tension in the bottom half.

Tension is a pulling or …… force.



Word Bank

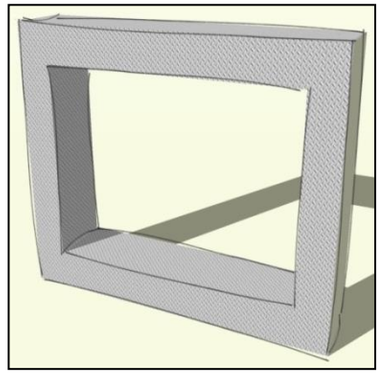
half *twisting* *bend* *half* *stretching* *squashing* *cutting* *greater*

Lesson Objectives / (Nodau Dysgu)

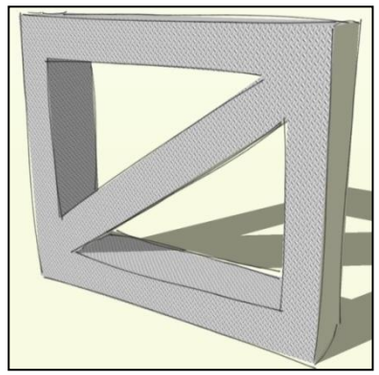
- Pupils should be able to research and identify the different classification of forces
- Pupils should be able to correctly place different types of forces under the correct classification
- Pupils should be able to classify forces and how they act upon structures and be able to take into account these forces when designing their car.

WEEK 3: Forces and Designing Structures (Grymoedd a dylunio adeiledd):

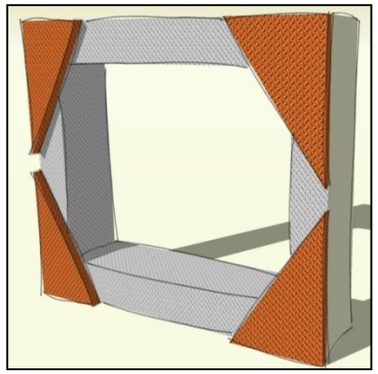
If you look at some pictures of familiar frame structures like cranes, electricity pylons or roof supports you may notice that triangulation is used to make them rigid.

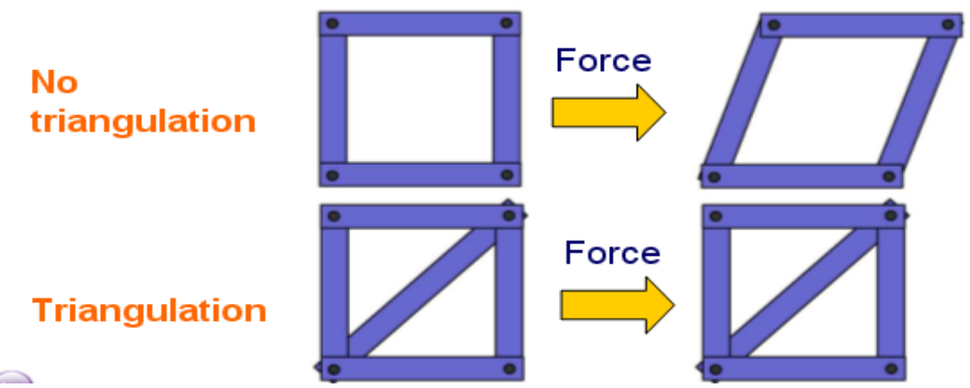


By adding an extra bar or member (usually a strut) corners A and B are prevented from moving apart. The structure then cannot be forced out of shape, and is said to be rigid. Notice that the additional member has formed two triangles in the structure.



An alternative to triangulation is to use a gusset plate. A gusset is simply a piece of material used to brace and join the members in a structure. A triangular gusset plate has been used here but they can be made in a variety of shapes.





TASK 3: Tower Design

In pairs or small groups design and manufacture a free standing structure to hold a weight. The winning team will have the highest tower which holds the weight you have been given. You will have limited tape, a piece of A4 paper, a piece of A3 paper, a piece of A4 card and 4 art straws. Draw and label your design below and evaluate how successful it was, why it succeeded or failed, what would you do different next time.

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