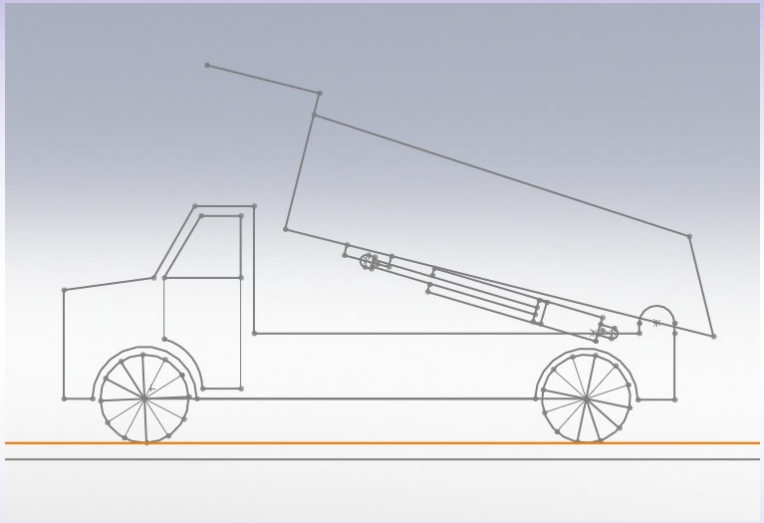
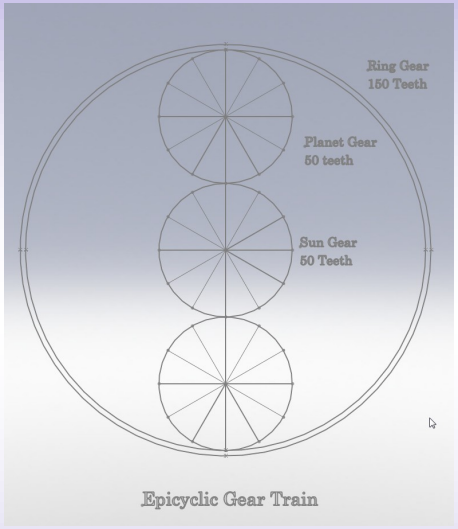
E.T.T.A.
Conference 2010





Mechanism's & Loci

Using SolidWorks Blocks

Blocks

- You can create blocks from single or multiple sketch entities.
- With blocks, you can quickly develop conceptual models of mechanisms or linkages. These models can include several parts that can pivot, slide, or rotate.

The benefit of modelling mechanisms with layout sketches is the speed and flexibility with which designers can experiment with design variations.

Blocks allow the designer to:

- Create layout sketches using a minimum number of dimensions and relations.
- Freeze a subset of entities in a sketch to manipulate as a single entity.
- Manage complex sketches.
- Edit all instances of blocks simultaneously.

One Block per Entity

- When you assign a different block to each sketch entity, motion between the sketch entities can occur.
- When you create a single block that includes multiple sketch entities, motion between the sketch entities is frozen.

Nested Blocks

You can create nested blocks by creating and saving a block that includes multiple blocks.

Use nested blocks to:

- Insert a single block as opposed to multiple blocks.
- Edit multiple blocks simultaneously.
- Shorten the list of blocks displayed in the Feature-Manager design tree.
- Manage scale factor.

Explode Blocks

Nested blocks prevent motion between sets of blocks below the top level.

When you explode a nested block:

- Blocks that were part of the nested block become individual blocks again.
- Relations created between sketch entities remain intact.

Save Blocks: You can save blocks for use in other sketches.

Simple Gear Train.

Instructions:

- Students sketch 2 circles of a specific size to represent the gears.
- Create 2 individual blocks from the circles and the lines
- Fix one block in place
- Add relations between the 2 blocks (Tangent & Traction) to simulate movement

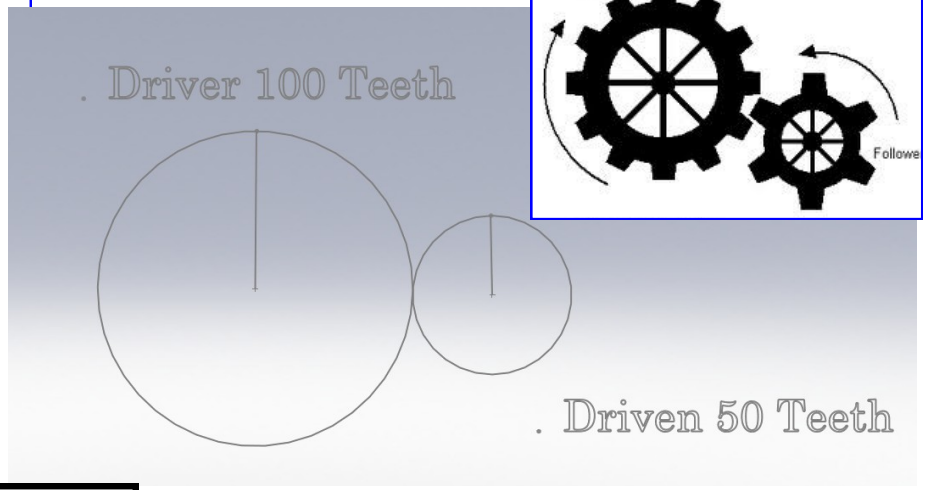
Note: The line is included for easier visualisation when the gear is rotated.

Learning Outcomes:

Driven (Follower) gear rotates 2 times for every one rotation of the Driver.
Velocity Ratio = 2:1.
The Driven (Follower) gear rotates in the opposite direction to the Driver gear.

Further Work

- Alter the ratio between Driver & Driven (follower) and calculate the new velocity ratio.
- Is it possible to alter the arrangement of gears or add gears to get the driven (follower) gear to rotate in the same direction as the driver gear?



Simple Gear Train with Idler Gear.

Instructions:

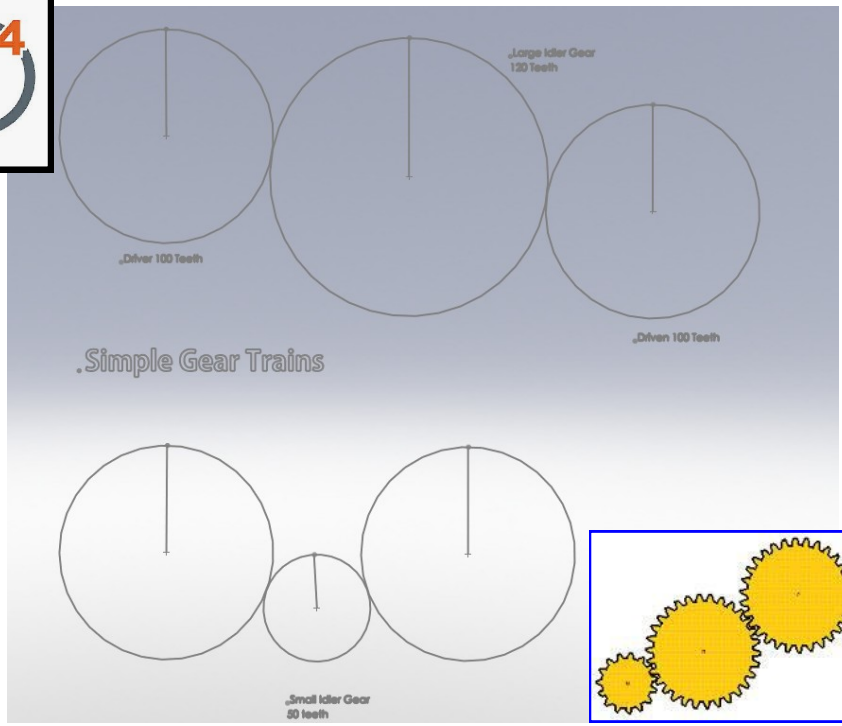
Similar to above, but draw 2 individual gear trains, one with a small idler and one with a large Idler gear.

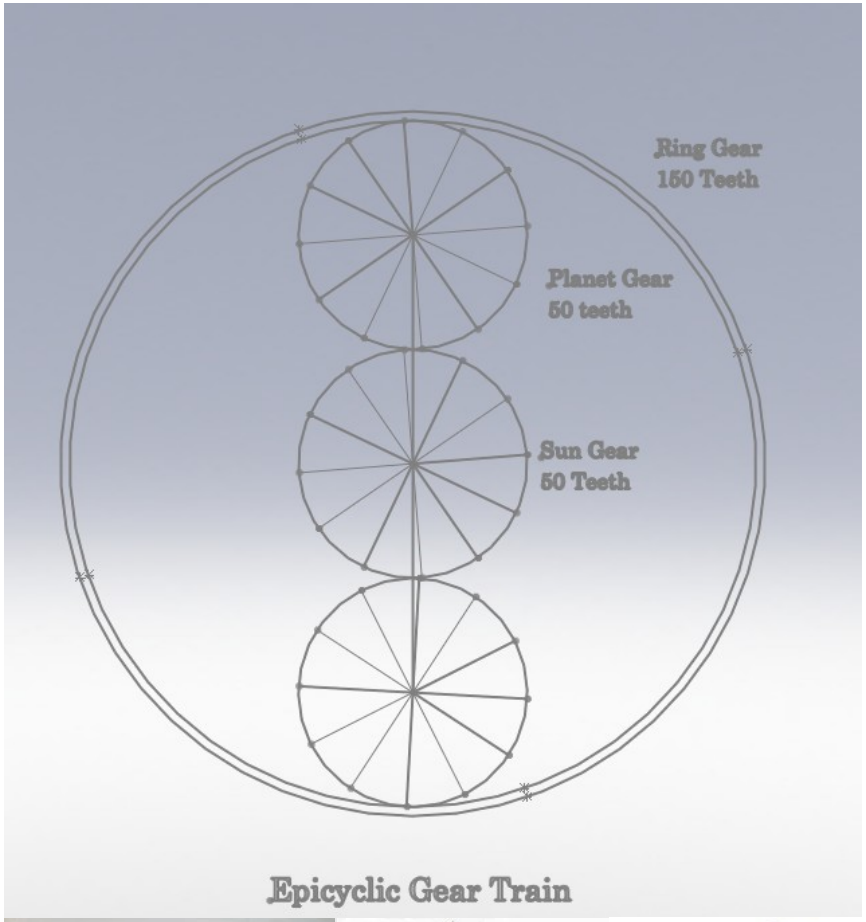
Learning Outcomes:

The Idler gear links the Driver and the Driven (follower) Gears.
The Driven (follower) gear is the same size as the driver in both trains and will rotate at the same speed as the Driver gear despite the size of the Idler gear.
The Velocity Ratio = 1:1 in both these cases as the Driver & Driven (follower) are the same size.
Therefore the size of the idler gear has no effect on the Velocity Ratio.
The Driven (follower) gear rotates in the same direction as the Driver gear.

Further Work

- Alter the ratio between Driver & Driven (follower) to prove further that the idler has no effect on the Velocity Ratio.
- Experiment to determine what would be the effect of adding a 4th gear.





Epicyclical gearing used to position car rear view mirror

Decorative Clock

single-stage planetary gearhead

Epicyclic Gearing.

Epicyclic gearing or **planetary gearing** is a system that consists of one or more outer gears, or Planet gears, revolving about a central, or Sun gear, these typically would be joined to a Ring (annulus) gear.

One of the gears is normally held stationary and one of the two remaining components would provide the input power to the system, while the last component would be used as an output to receive power from the system. To increase output speed for example the Planet gears could be the driver gears, while the Sun would be the driven gear (follower) and the Ring gear would remain stationary.

Instructions for sketching the Epicyclic System

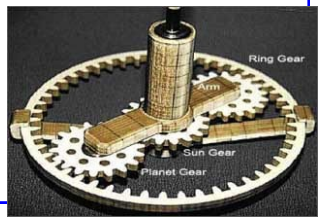
Note: The Sun Gear and Planet Gears do not have to be the same size, but the Ring Gear diameter must be equal to the combined diameter of the other three.

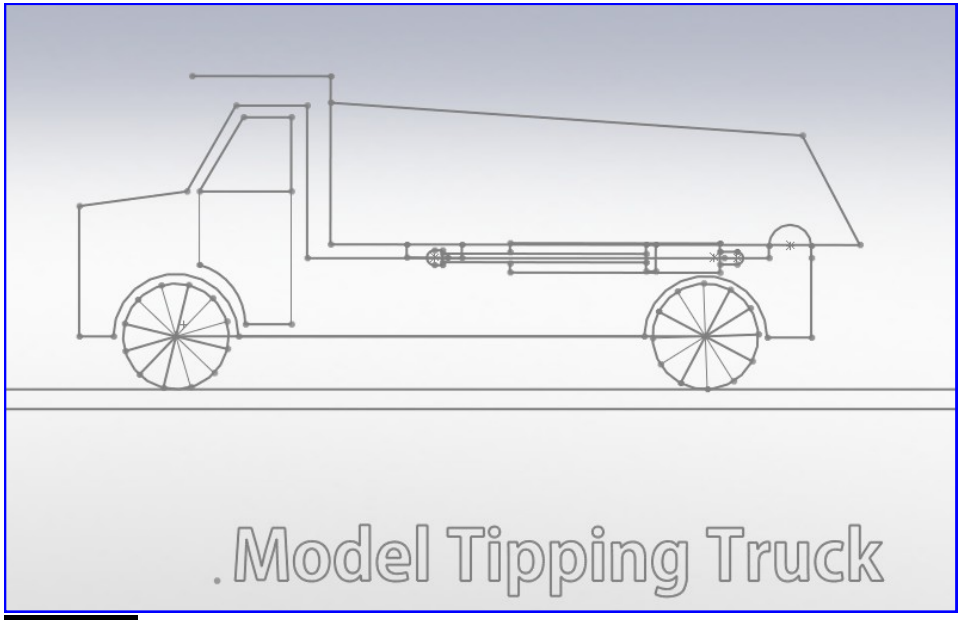
Keep testing the simulation as you progress through the sketch.

- There are five parts in this sketch. The 4 gears plus a connecting rod which is coincident with the centre of the Planet gears.
- Create the five individual blocks.
- Fix the Sun gear block in place by making the centre of the block & the origin point coincident.
- Join the connecting rod to the centre of the 2 Planet Gears (coincident).
- Set up tangent and traction relations between the Planet gears and the Sun gear.
- Make the centre of the Ring gear coincident with the centre of the Sun gear (origin point).
- Add a tangent and traction relation between the Ring gear and one of the Planet Gears.
- Test

Further Work

- Locate 2 other uses for an epicyclical gearing system.



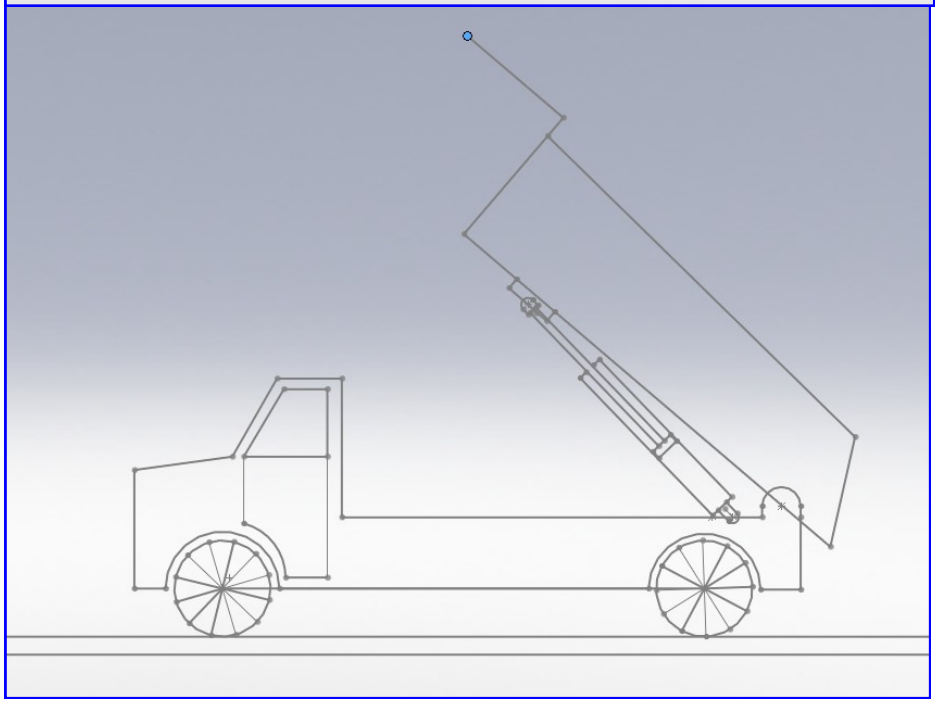


Model Truck.

SolidWorks blocks can be used in the early stage of the Design Process to check and test draft working ideas and the functionality of different designs.

In the sketch of the Model Truck shown the location and size of the piston and cylinder will be important for the tipping mechanism to function as intended. By creating a simple sketch and converting the sketch entities to blocks the student can test the feasibility of his/her idea and make any adjustments to the use, size and location of a component before deciding on their final design .

Individual blocks such as the piston & cylinder can be saved and re-used in alternative designs and give the student the flexibility to test different design ideas before deciding on their final design.



Blocks & Loci.

Using SolidWorks blocks to sketch a mechanism used to open and close the PVC Windows shown opposite and to demonstrate how it operates .

Plot the locus of point P when the window opens and closes. The main dimensions of the mechanism are listed. Point A is fixed and point C slides along the horizontal line.
AB - 115, PB - 100, BC - 70.

All these SolidWorks files are available on the T4 website at www.t4.ie (Engineering Technology)

Further examples of Dynamic Mechanism's are included on the DVD supplied to teachers attending the autumn 2010 DCG Professional Development sessions.

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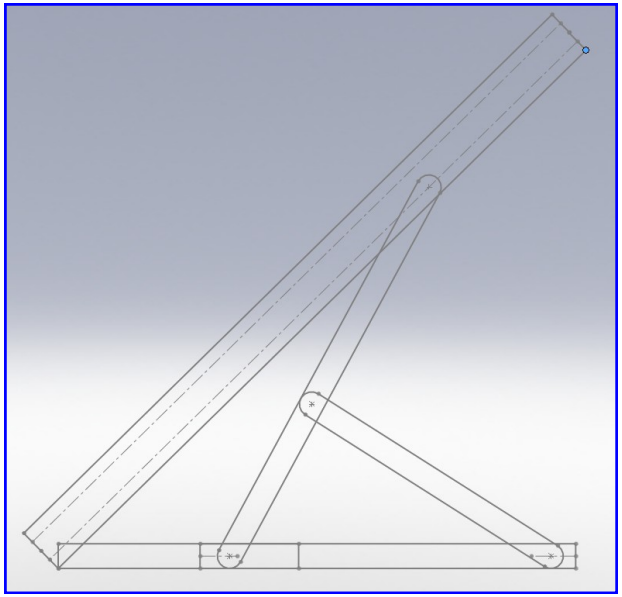
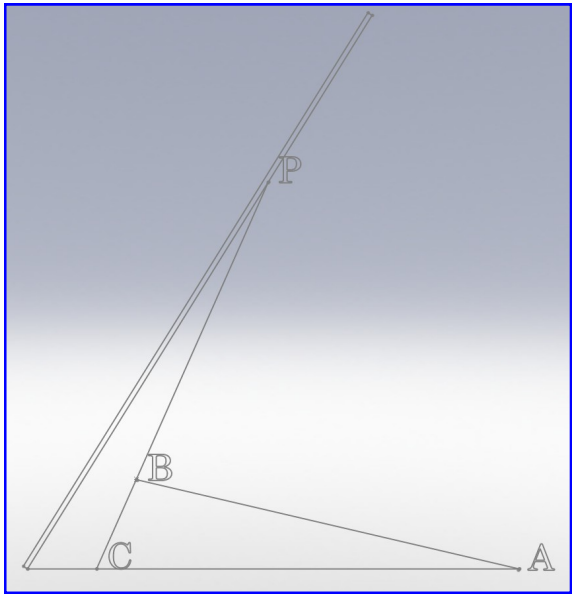
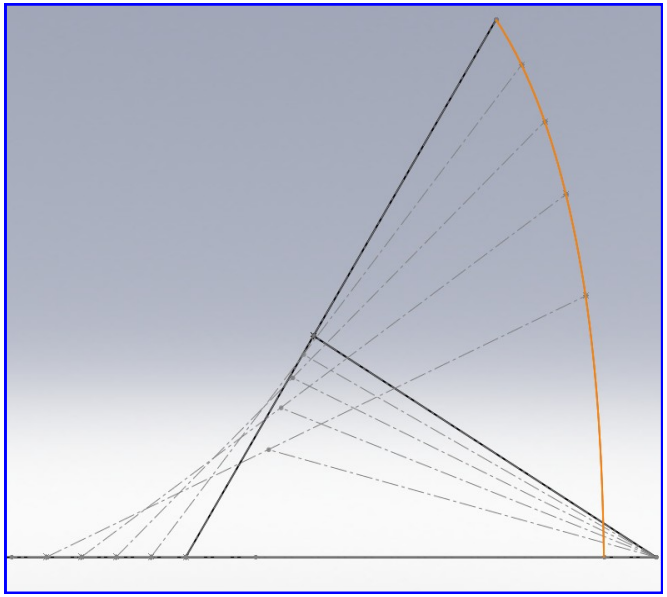


Block Sketch simulating function of window mechanism



Line diagram simulating function of window mechanism



Locus of point P