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Cam Workshop

D&T Workshop Skill Level ● ● ● ○ ○

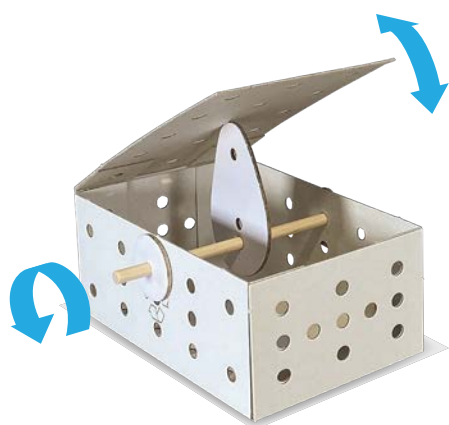


Build three basic models that explore simple cams.

Learn how cams convert a rotating force into an up and down force.

See how to make with TechCard on our website.

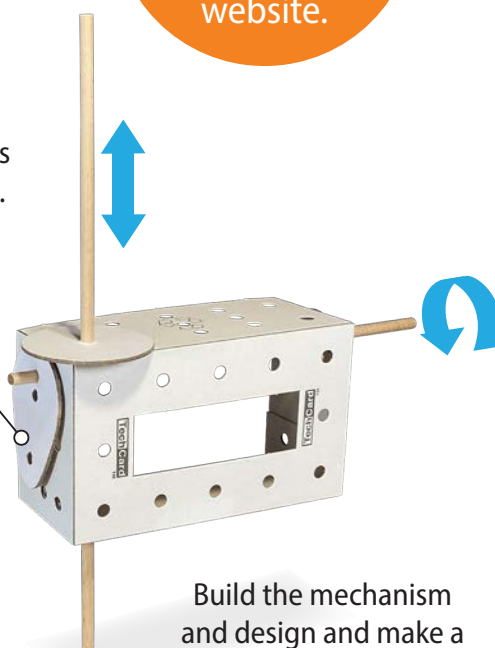
Three different starter models...



Rotating cam creates up and down action.



egg cam



Build the mechanism and design and make a model for it to operate!

Great for moving toys projects!

Parts to make 1 model

Structural Parts

TechCard Project Base 1
TechCard Beam * 1

*Only needed for the opening box model.

Mechanical Parts

25mm Disc 2
50mm Wheel 1
60mm Egg Cam 1
300mm Dowel Axle 2

Additional Materials

300mm Thin String
(Only needed for opening box model)

You will have parts left over towards other models.

Parts to make 10 models

Structural Parts

TechCard Project Base 10
TechCard Beam * 10

*Only needed for the opening box model.

Mechanical Parts

25mm Disc 20
50mm wheel 10
60mm Egg Cam 10
300mm Dowel Axle 20

Additional Materials

3M Thin String
(Only needed for opening box model)

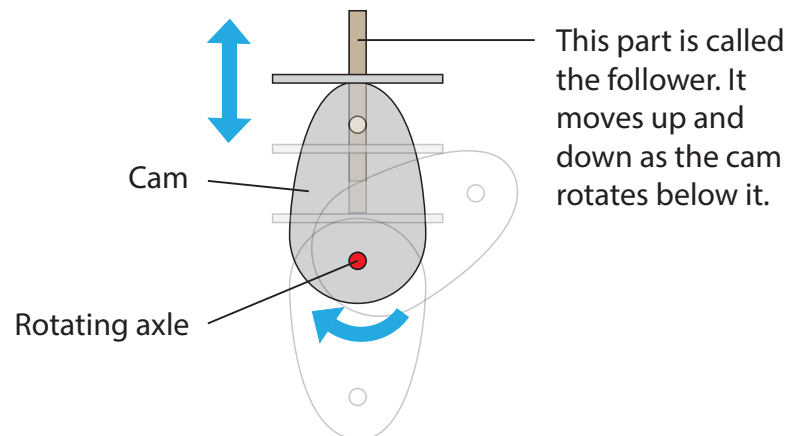
Based on pupils sharing off-cuts between them.

Simple Mechanisms

A cam is a form of simple machine. Simple machines are devices that make work easier to do. The key simple machines are lever, inclined plane, screw, wheel & axle, pulley and wedge. Simple machines don't make work easier by creating force, they make work easier by changing the force applied to them. For example, with a fulcrum in the centre of a lever, a 50kg downward force will raise a 50kg load. The closer you move the fulcrum to the load the easier it will be to lift. If the distance between the effort force and the fulcrum is twice the distance between the fulcrum and the load, then a 25kg force will raise the 50kg load. If you study the movement of the lever in this position you will see that the effort has travelled twice the distance downwards than the load is raised. The lever has increased the power of the force but the applied force has had to travel further to do it. The lever has exchanged distance for power.

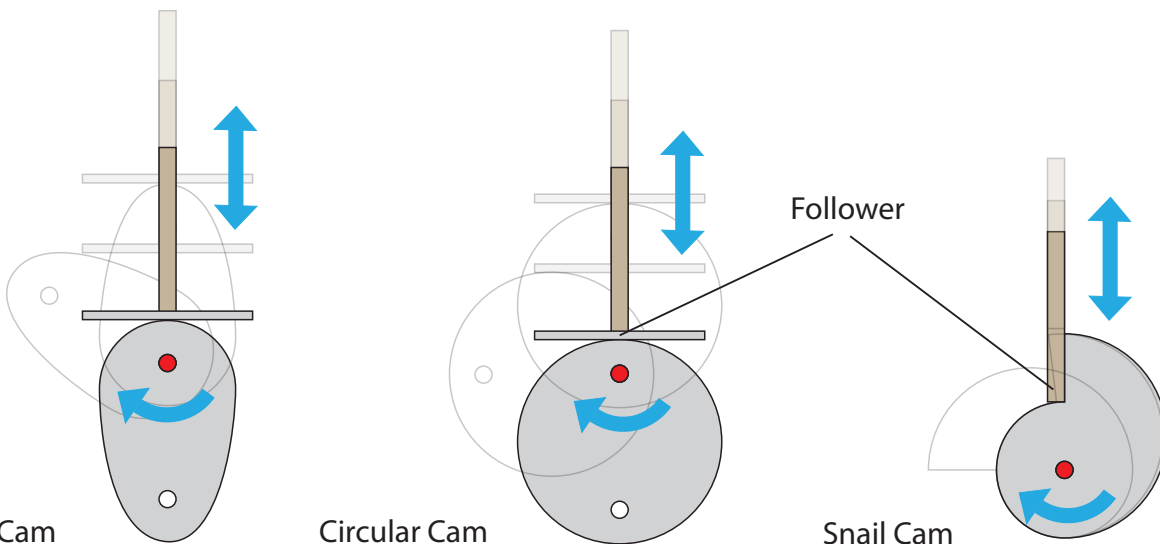
What is a Cam?

Cams do not change the power of the force applied to them but they do change the direction and type of resulting force. A cam can transform the rotating force of an axle into a 'reciprocating' or back and forth force. A cam can also do the reverse and convert a reciprocating force into a rotating force.

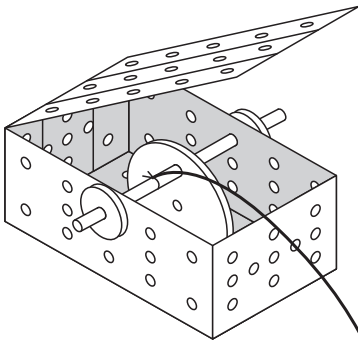


Types of Cam

There are three main types of cam; the egg cam, circular cam and snail or drop cam. The most common is the 'egg' cam which is shaped so that it creates a high point and a low point as it rotates. The circular cam works in the same way but the up and down action is created by fixing the axle off centre in relation to the circle. A snail or drop cam is shaped so that the follower rises gradually but then drops instantly. This type of cam can only operate in one direction.

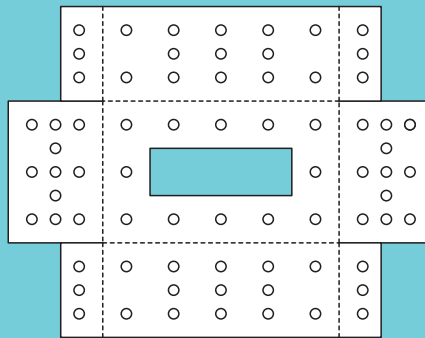


Make the Cam Opening Box

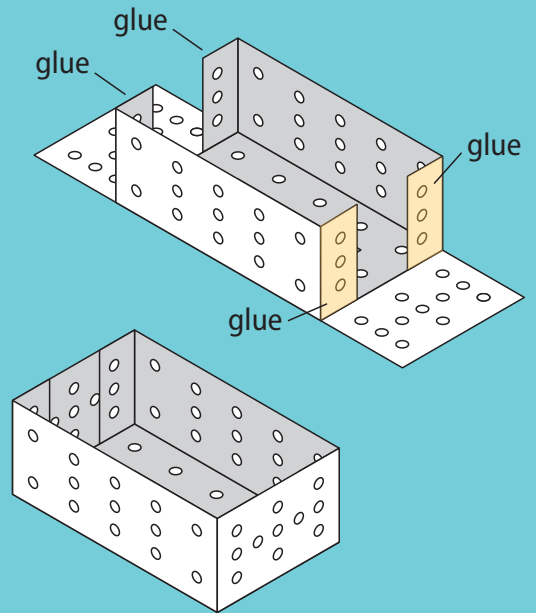


Before you begin see
'Make with TechCard'
on our website.

1 Make the body.

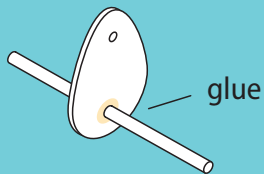


Fold and glue the
TechCard Project Base.

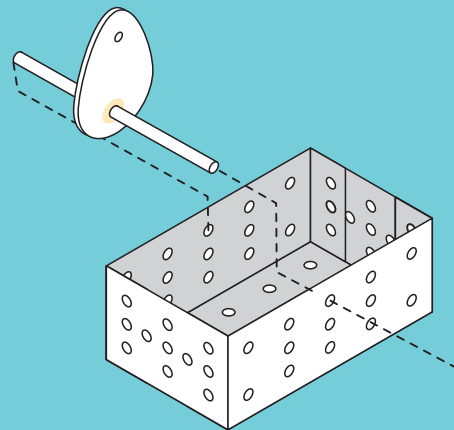


2 Fit the cam.

Cut a 100mm axle.

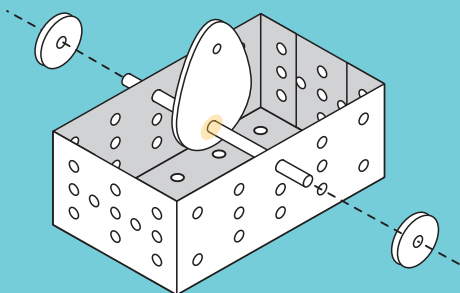


Slide the axle half way through a 60mm
cam where shown. Glue in place.

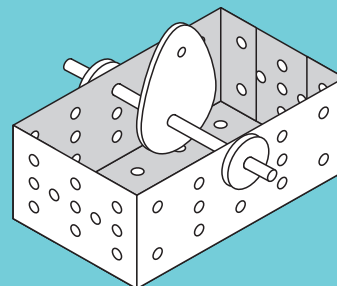


Fit the axle through
the base as shown.

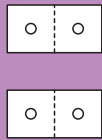
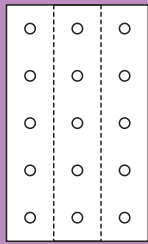
3 Secure the cam.



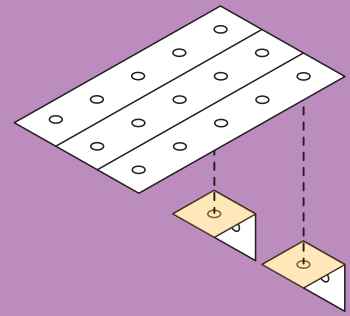
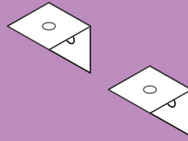
Fit two 25mm discs
to the axle as shown.



4 Make the jaw.



— You can cut these from a TechCard Beam if you don't have any girders.

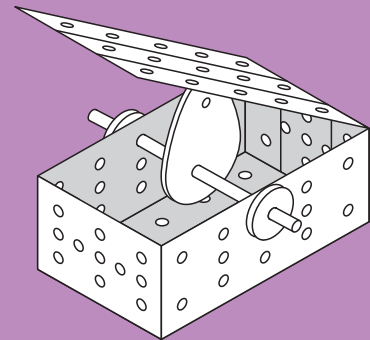
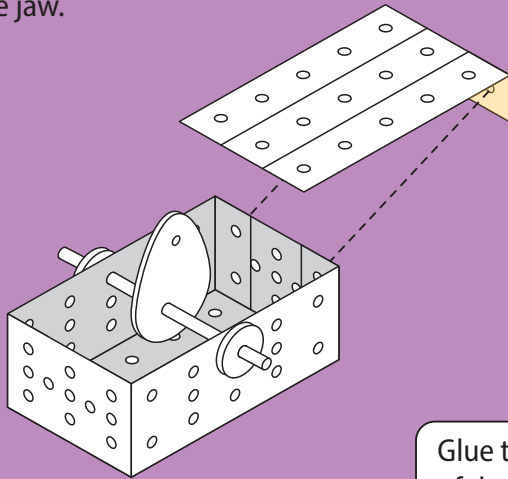


Cut a 125mm beam and two 25mm girders.

Fold the two girders to form hinges.

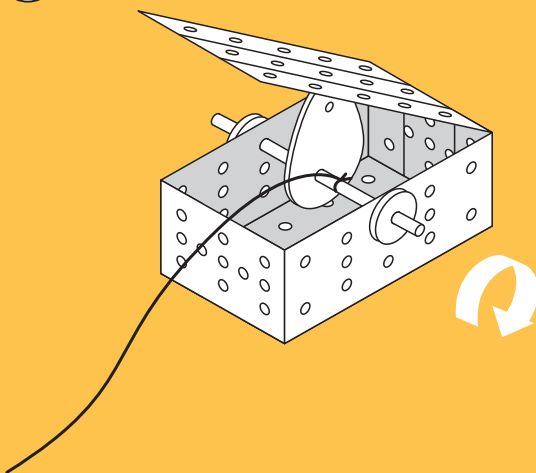
Glue the hinges to the beam where shown.

5 Fit the jaw.



Glue the hinges to the back of the base where shown.

6 Operate the cam.



Tie a 300mm length of string to the axle where shown.

Operate your Cam Opening Box

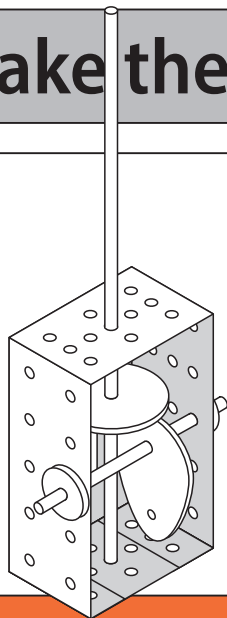
Turn the axle in the direction shown and the box lid will open and close.

You will need to make some feet for the box to raise it if you want to operate it while it sits on the table so the cam does not hit the tabletop.

You can have some extra fun by tying a piece of string to the axle inside as shown. As you turn the axle the lid snaps up and down and the string winds in.

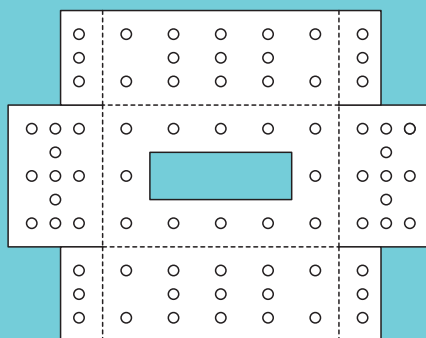
What can you make your cam mechanism into?

Make the Internal Cam and Axle

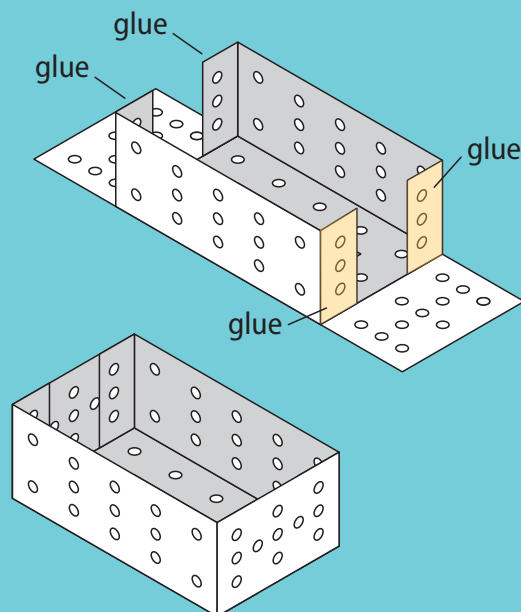


Before you begin see
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1 Make the body.

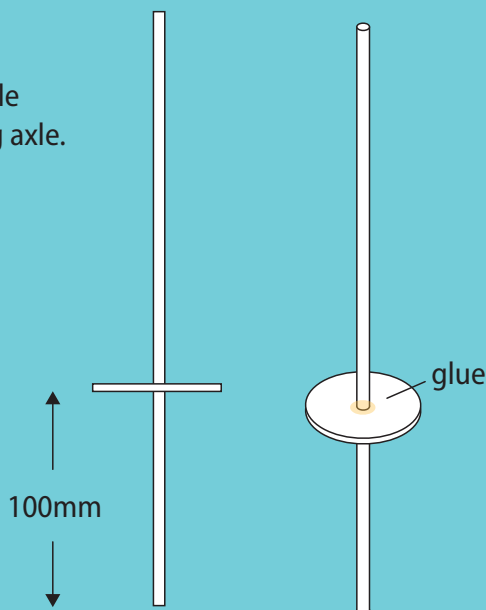


Fold and glue the
TechCard Project Base.



2

Assemble
the long axle.

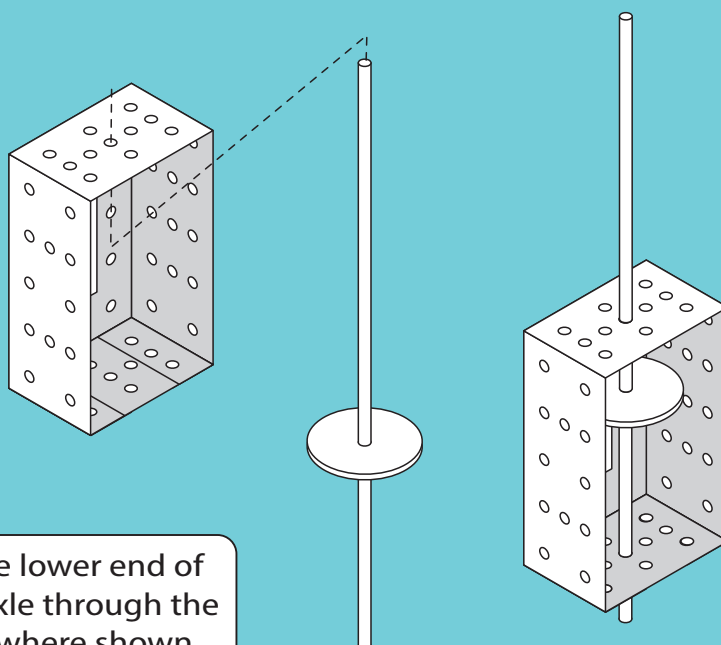


Fit a 50mm wheel onto a
300mm axle so that it is
100mm from the end.

Check the wheel is straight
and glue in place.

3 Fit the long axle.

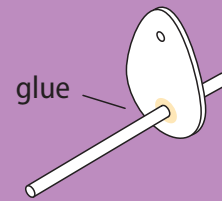
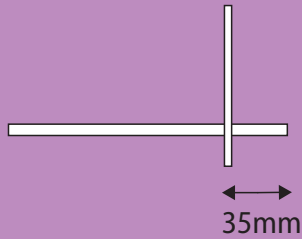
Fit the top of the axle through the
middle hole in the top of the base.



Fit the lower end of
the axle through the
base where shown.

4 Assemble the cam axle.

Cut a 100mm axle.

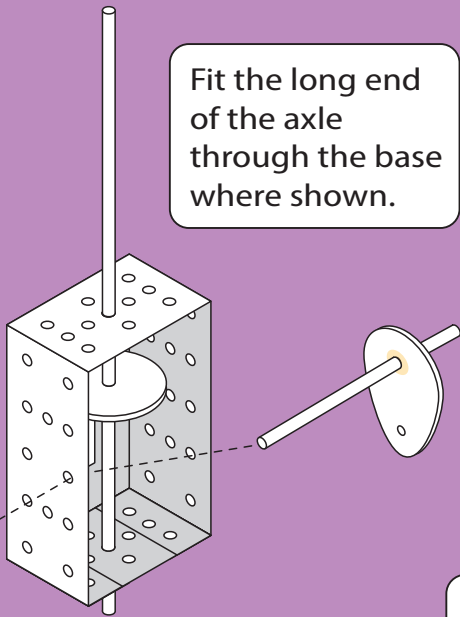


Fit a cam onto the axle so that it is 35mm from one end.

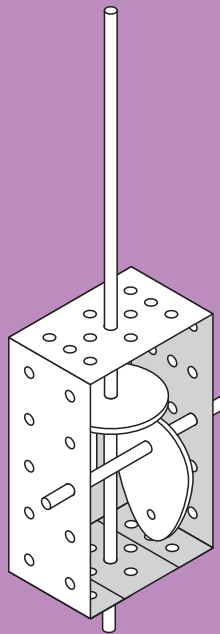
Check the wheel is straight and glue.

5 Fit the cam axle.

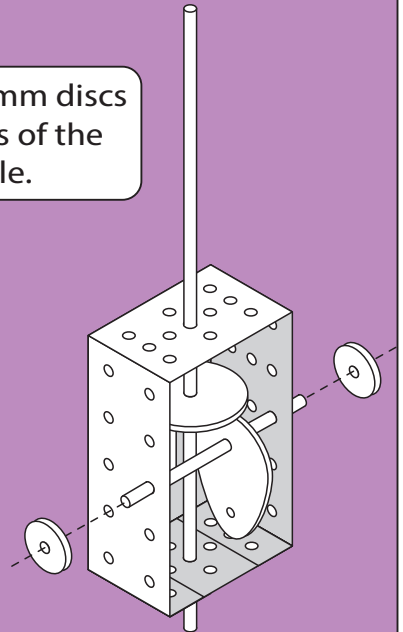
Fit the long end of the axle through the base where shown.



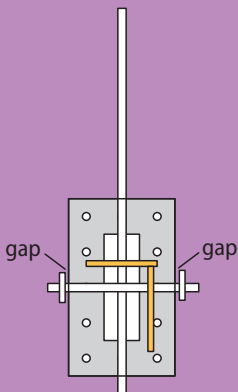
Fit two 25mm discs to the ends of the 100mm axle.



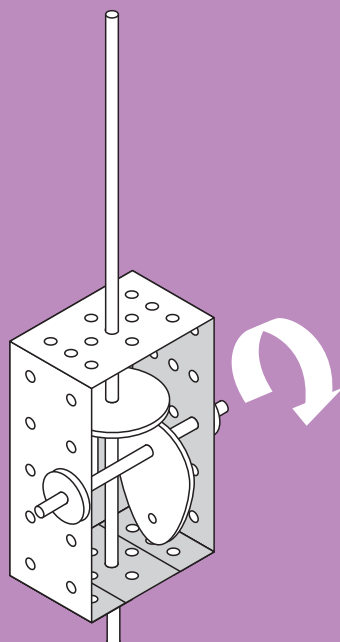
Raise the 60mm wheel and fit the short axle through the other side of the base.



6 Finish the assembly.



Check the assembly is as shown.



Operate your Internal Cam Model

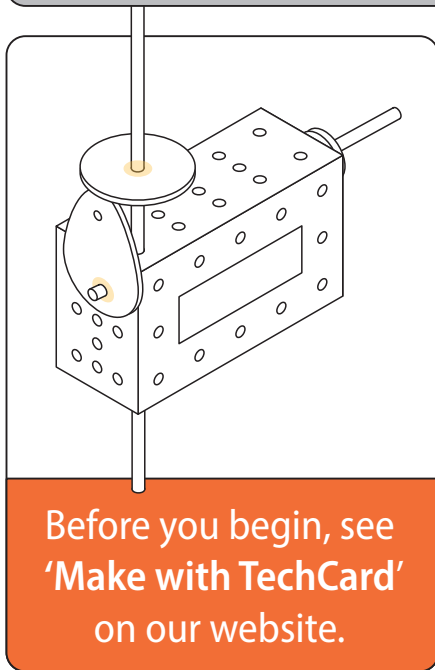
Turn the axle in the direction shown and the vertical axle will rise up and down.

The vertical axle sticks out the bottom so you will need to make legs for the box unless you want to hold the model while you operate it.

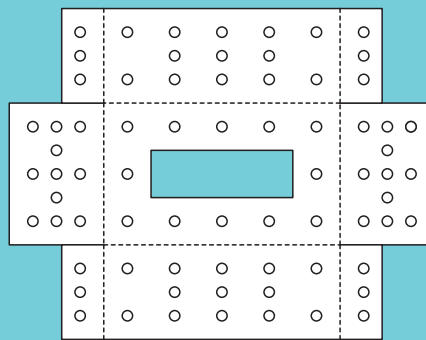
The vertical axle will also rotate. If you want to prevent this, then glue a scrap of card to the vertical axle so it sticks out of the window of the box.

What can you design and make for your cam mechanism? Think of something that goes up and down like a hopping frog or a bobbing boat...

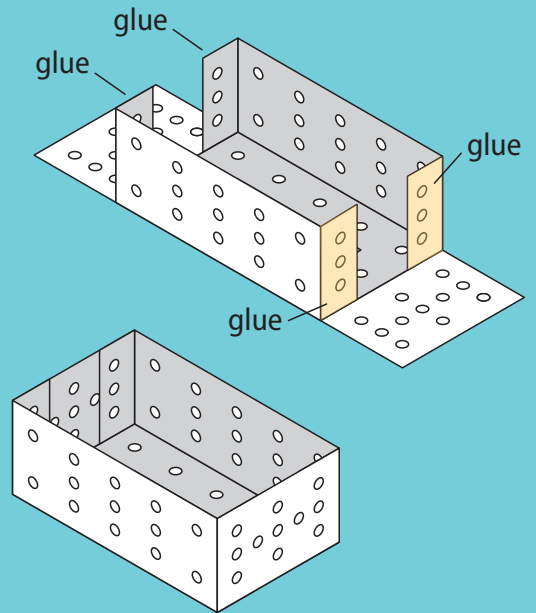
Make the External Cam and Axle



1 Make the body.



Fold and glue the TechCard Project Base.



2 Fit the wheel and axle.

Cut a 200mm dowel axle.

glue

Fit the cam to one end of the axle. Check the cam is straight and glue.

Pass the axle through the base where shown.

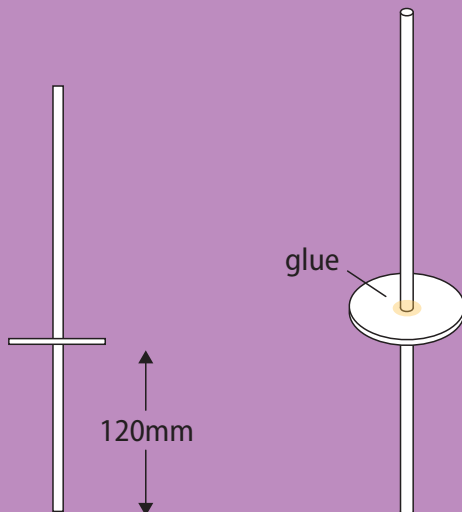
Fit a 25mm disc onto the axle.

3 Check the assembly.

Check the axle and cam rotate smoothly.

gap

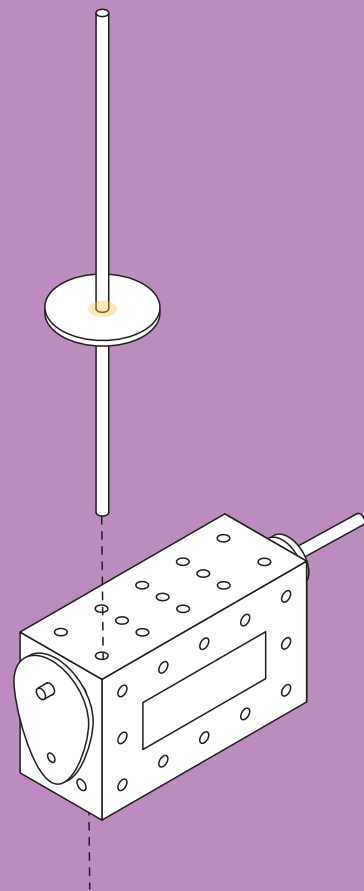
4 Fit the vertical axle.



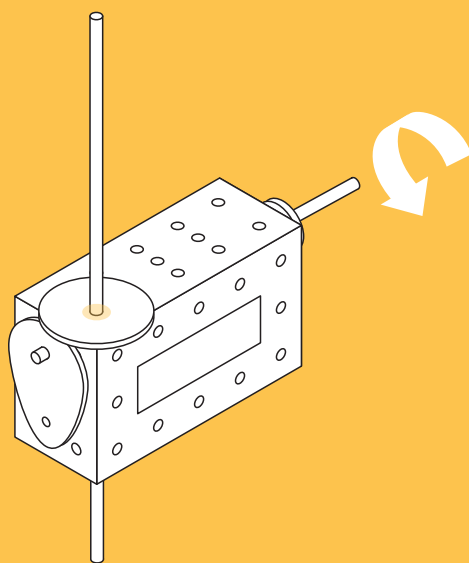
Check the wheel is straight and glue.

Fit a 50mm wheel 120mm from the end of a 300mm axle.

Fit the axle through the base where shown.



5 Check the mechanism.



Turn the axle in the direction shown.

Operate your External Cam Model

Turn the axle in the direction shown and the vertical axle will rise up and down.

The vertical axle sticks out the bottom so you will need to make legs for the box unless you want to hold the model while you operate it.

What can you design and make for your cam mechanism? Think of something that goes up and down like a hopping frog or a bobbing boat...

Make it your own!

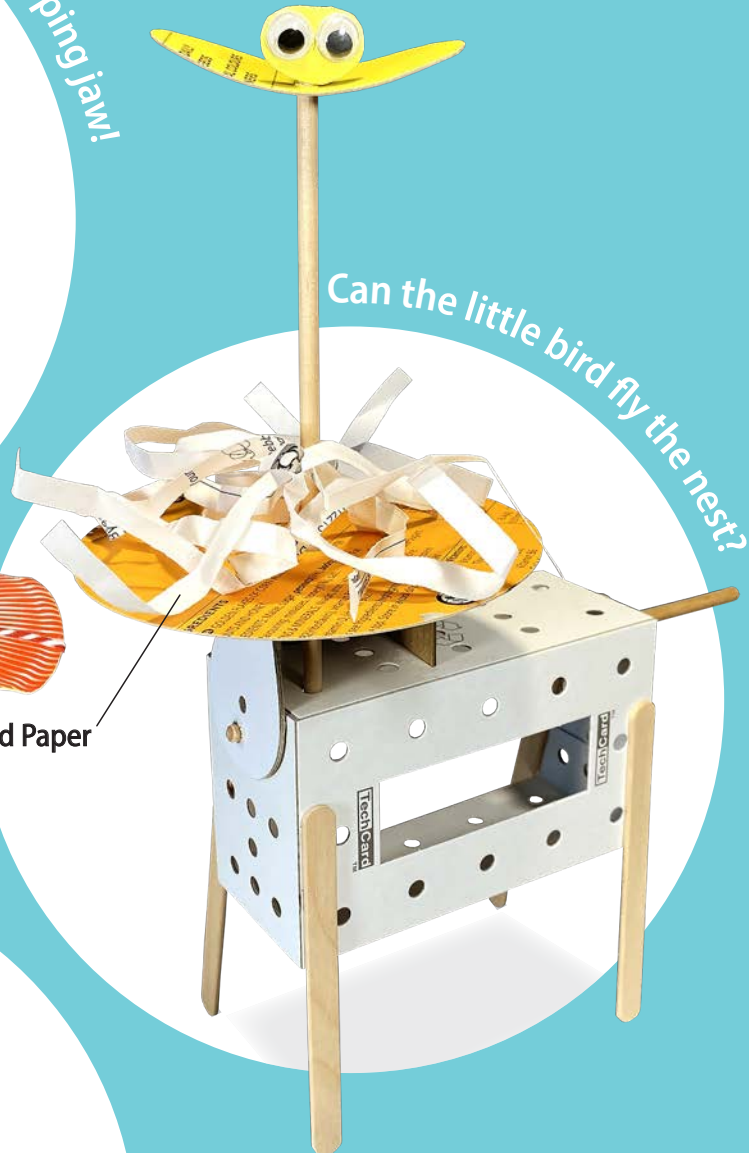
Create a monster with a snapping jaw!



Lolly sticks

Your cam system can power lots of things. Use more TechCard and add other materials to design and make your own working model!

Can the little bird fly the nest?



Shredded Paper

Build a bobbing boat!

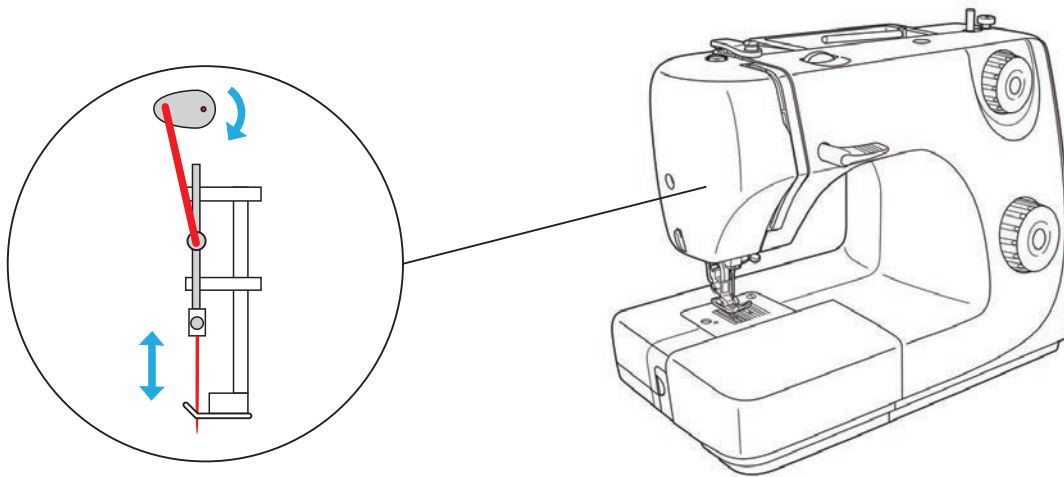


Upcycled Card

Send us photos of your models so we can post them on Instagram!

How Cams are used

Many everyday mechanisms and machines incorporate cams. A door handle mechanism is a form of cam where the rotating handle causes the latch to slide inwards. A sewing machine uses a cam mechanism to convert the rotating force of the motor into the up and down action of the needle.



Car engines use cams working in reverse where an up and down reciprocating force is converted into a rotating force. Inside the engine, fuel is ignited and expands forcing pistons to move up and down. Each piston in the engine is connected to a cam on a shaft called a cam shaft. As the pistons move up and down they cause the cam shaft to rotate. The rotating force is transferred through the gearbox and drive shaft to the wheels of the car.

