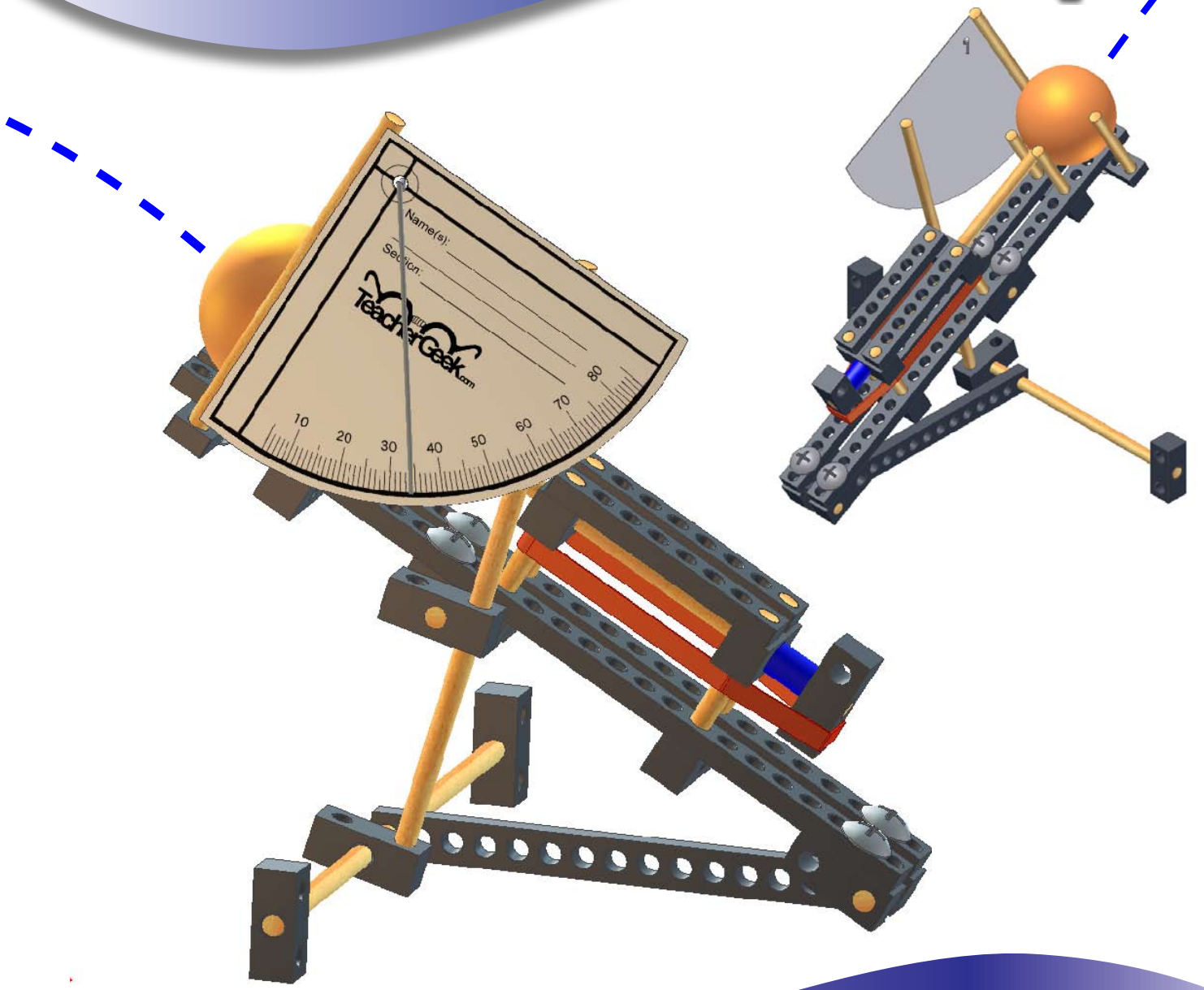
Example Ping-Pong Ball Launcher



Unleash Your Creativity!

TeacherGeek.com

Ping-Pong Ball Launcher

Parts List (parts for each launcher

Part Description	QTY	Picture
Long Link Strip	10	
Dowel	5	
Perpendicular Adaptor	15	
Paper Cup	2	
Rubber Bands	~4	
#12 Screws	6	
Slide Stop Material	2 Inches	

Additional Equipment Needed	
Part Description	**QTY**
TeacherGeek Easy Engineering Tool Pack	1

Additional Supplies Needed	
Part Description	**QTY**
Ping Pong Ball	1
String	1 roll
Rulers	1/student
Masking Tape	1 roll
Paper Clips	1/student
Card Stock Sheets (heavy weight paper)	1/student
SAFETY GLASSES	1/student

Think Safety!

Wear safety glasses when working on or using your launcher.

"Kit" Can Be a Bad Word:

Don't think of this as a kit. Think of it as a bag full of endless solutions. Although the end of this guide contains step-by-step instructions for creating a launcher, we encourage you (your students) to try and develop new and different designs.

Because, in design and engineering, there is never one right answer…

TeacherGeek Easy Engineering Series products are designed to encourage innovation and alternative designs. We encourage you to use the Easy Engineering Components to create your own brilliant solutions.

Because, your first idea is rarely your best…

TeacherGeek Easy Engineering Series products are designed to be redesigned; they allow you to quickly change and evolve your designs.

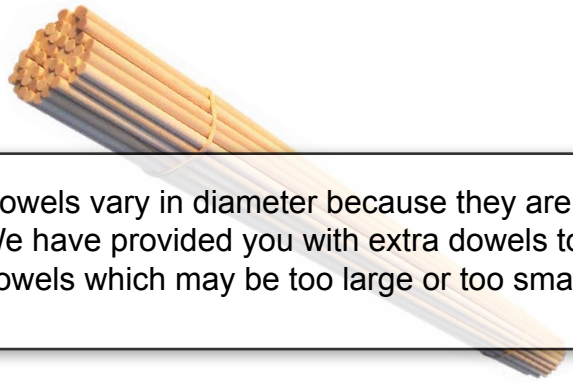
Because, possibilities are endless…

TeacherGeek Easy Engineering Components can be easily combined with other materials and products (Raid the recycling bin, wood, metal, broken toys, etc.)

Other Documents That Will Help You With This Activity:

Download

Document:	Path:	Access Code:
Easy Engineering Guide	teachergeek.org/easy_engineering_guide.pdf	No Code Required
Launcher Protractor	teachergeek.org/protractor.pdf	No Code Required
Easy Engineering Ruler	teachergeek.org/ruler.pdf	No Code Required

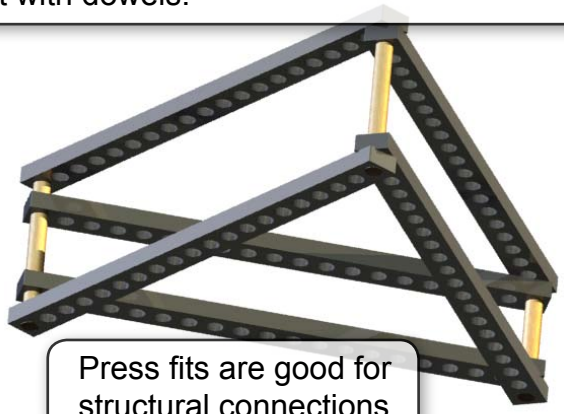


Dowels vary in diameter because they are made of wood. We have provided you with extra dowels to make up for dowels which may be too large or too small to use.

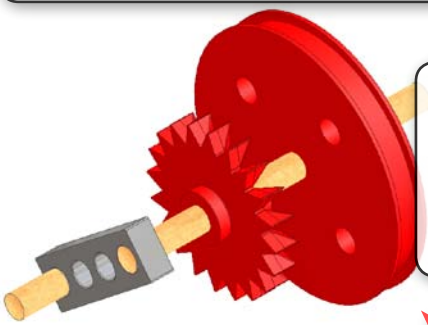
Dowels and Holes

Easy Engineering™ Components come with holes that are the perfect size for a press fit with dowels.

A press fit is one where the dowel is fixed and not able to rotate or slide once it's in the component hole. A press fit is good for creating rigid structures.



Press fits are good for structural connections.



Press fits are good for gears, pulleys and levers that turn together on the same dowel (axle).

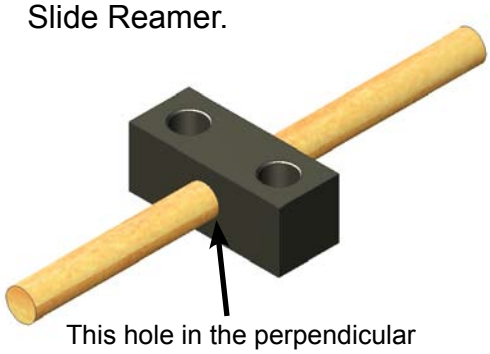
Learn how to use a reamer on page 5

Reaming Holes

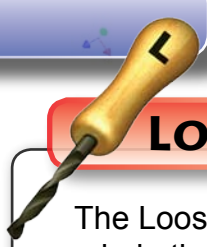
Slide Fit

A Slide Reamer makes it easier to push or pull a dowel through a hole.

*Having trouble getting a dowel into a hole? Ream it with the Slide Reamer.



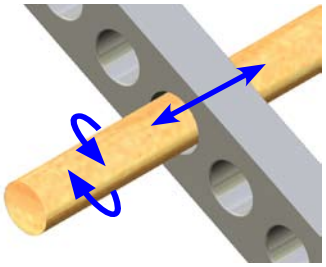
This hole in the perpendicular adaptor was reamed with the Slide Reamer to make it easier for it to slide to the middle of the dowel.



Loose Fit

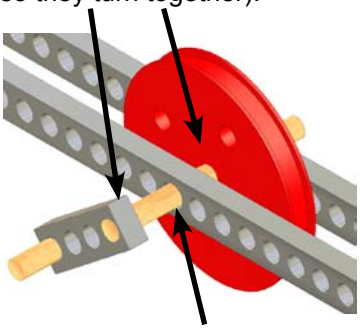
The Loose Reamer creates a hole that dowels can freely rotate in and slide through.

A loose fit is typically used to support axles, wheels and pulleys. It is also used for pivot points.

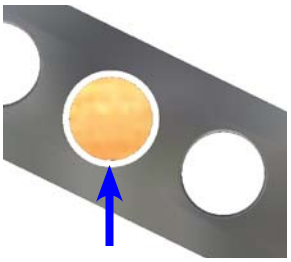


The dowel moves freely in the loose fitting hole.

The crank and pulley are press fit onto the same dowel (so they turn together).

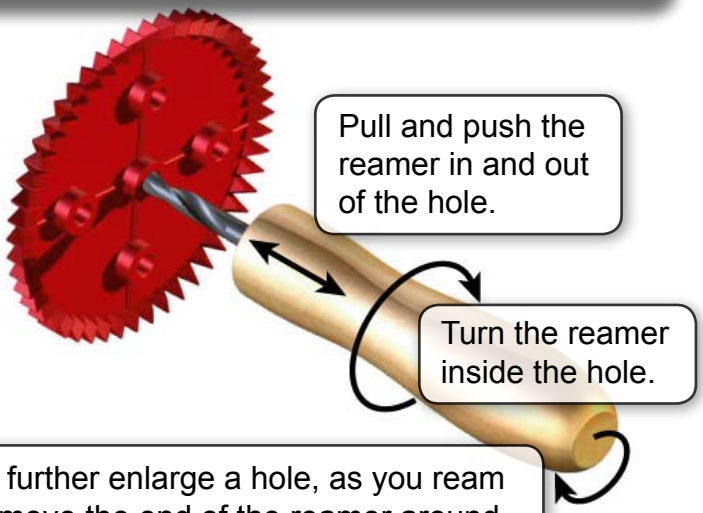


The link strip holes that the dowel needs to rotate in were reamed with the Loose Reamer.



The Loose Reamer creates a hole that is larger than the dowel.

How to Ream Holes



Pull and push the reamer in and out of the hole.

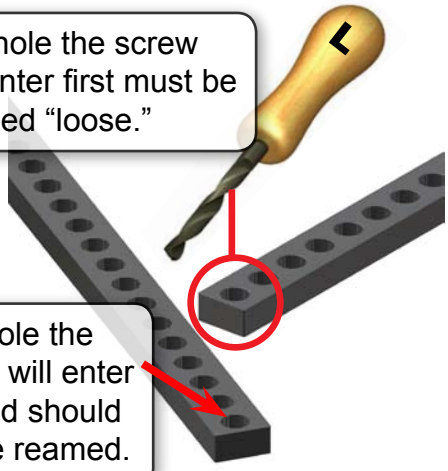
Turn the reamer inside the hole.

To further enlarge a hole, as you ream it, move the end of the reamer around so it is not in line with the hole.

Screws

Screws can be used to attach two components together.

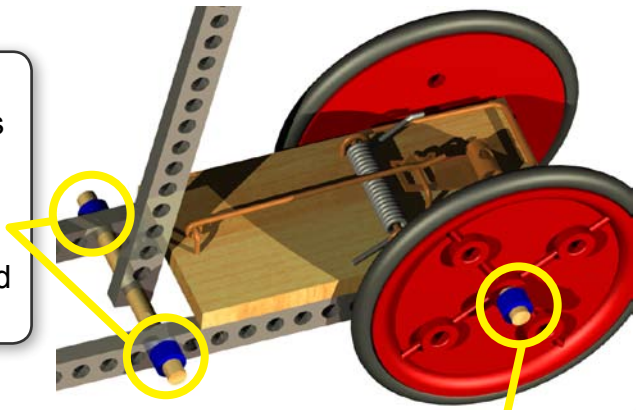
The hole the screw will enter first must be reamed “loose.”



The hole the screw will enter second should not be reamed.

Slide-Stop Material

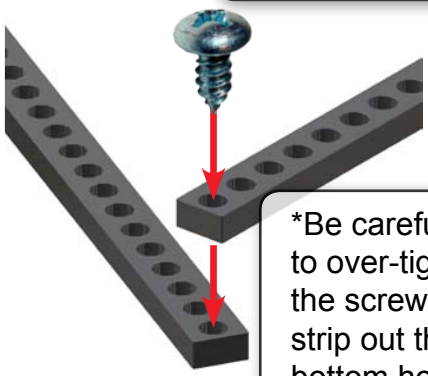
Slide-Stop Material comes in long lengths. It must be cut into 6mm (~1/4”) sections before it can be used.



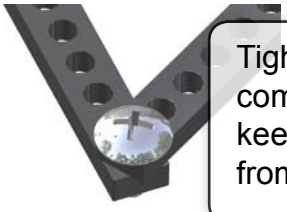
Slide-Stop Material keeps dowels from sliding back and forth in “loose” reamed holes.

Slide-Stop Material keeps components with “loose” reamed holes from sliding back and forth on dowels.

Turn the screw into both components.



*Be careful not to over-tighten the screw and strip out the bottom hole.



Tighten the screw completely to keep components from rotating.

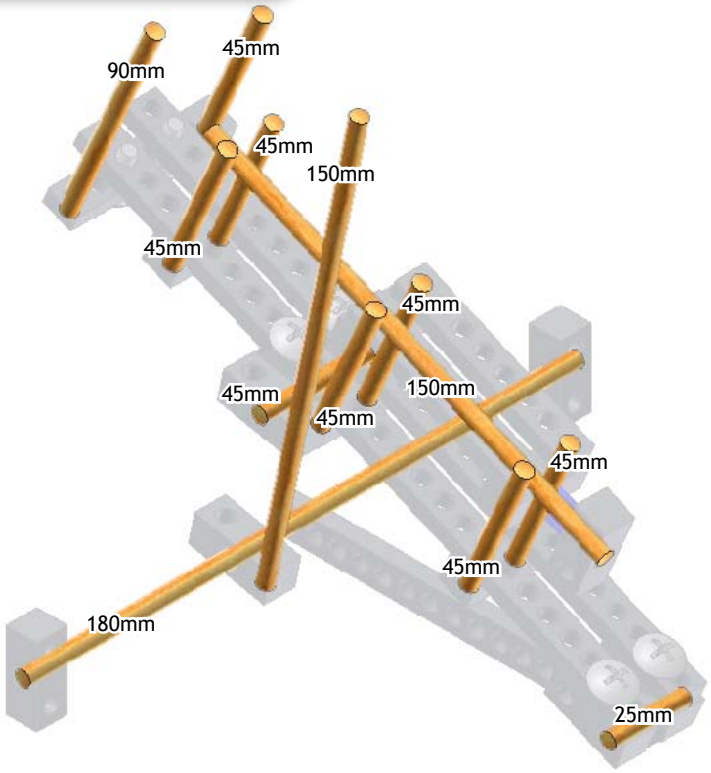
OR

Leave the screw a ¼ turn from tight to allow components to rotate/pivot.

Step 1: Cutting Dowels

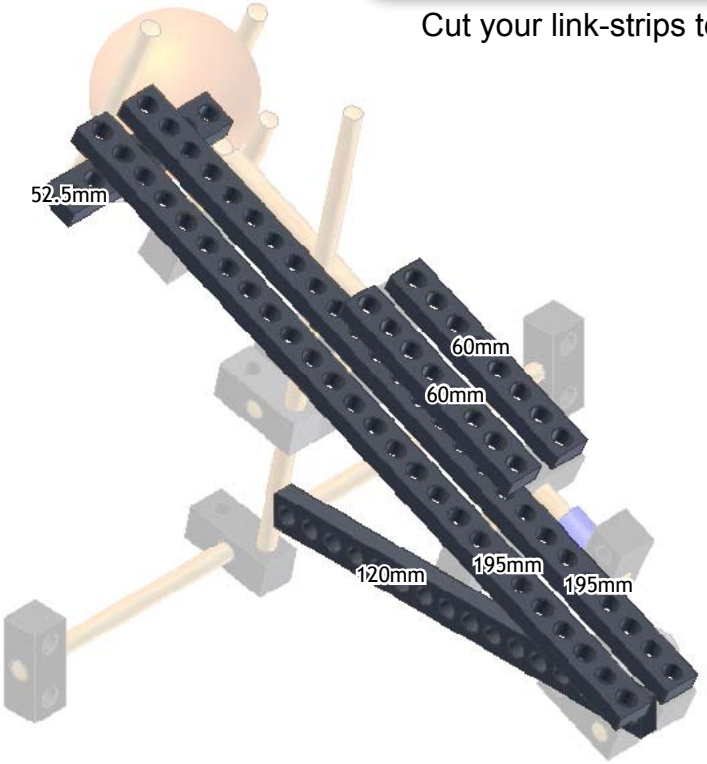
Cut your dowels to length.

Dowel Length:	Dowel Quantity:
25mm	1
45mm	8
90mm	1
150mm	2
180mm	1



Step 2: Cutting Link-Strips

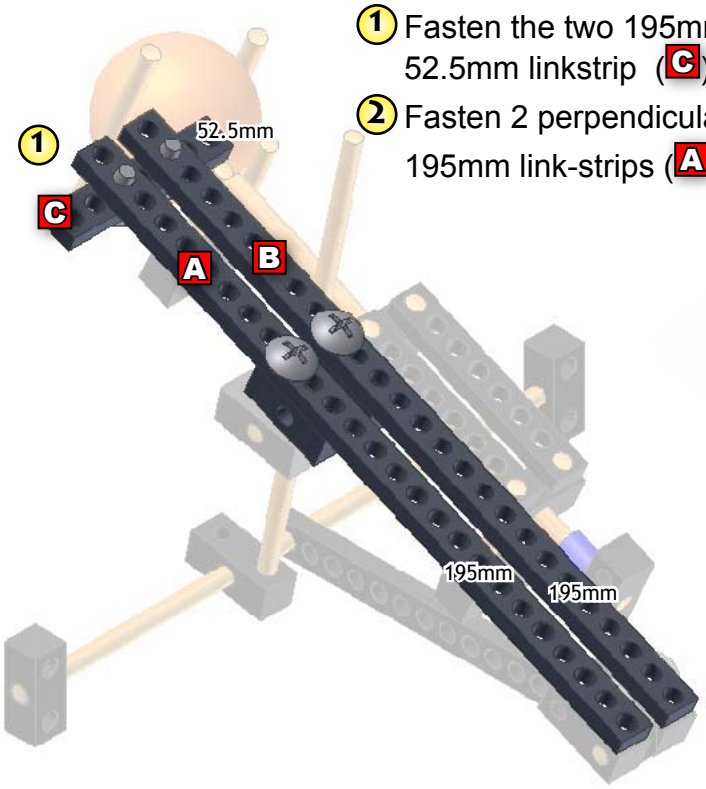
Cut your link-strips to length.

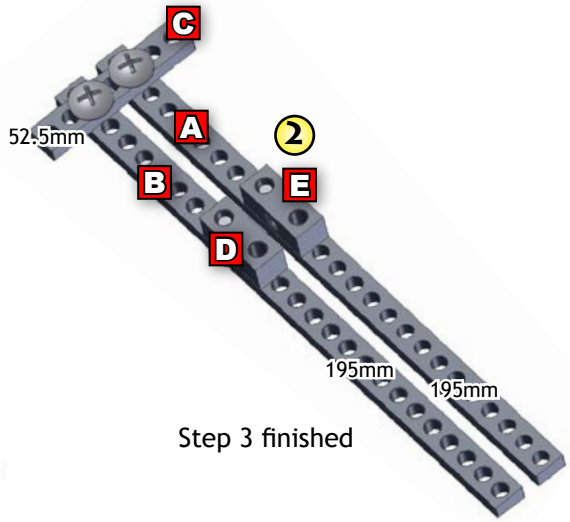


Length:	Quantity:
52.5mm	1
60mm	2
120mm	1
195mm	2

Step 3: Assembling The Body

1. Fasten the two 195mm linkstrips (A and B), to the 52.5mm linkstrip (C) with 2 screws.
2. Fasten 2 perpendicular adaptors (D and E) to the 195mm link-strips (A and B) using 2 screws.

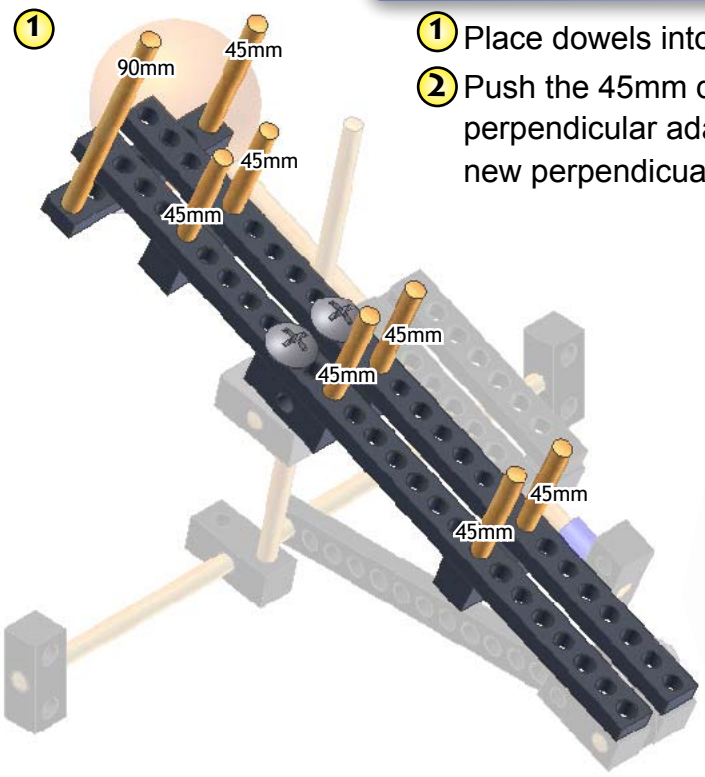


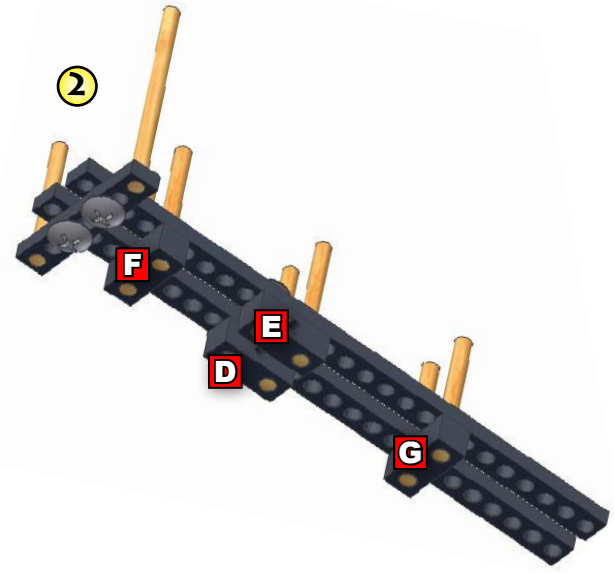


Step 3 finished

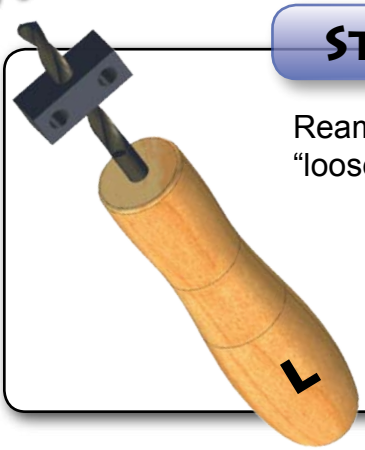
Step 4: Assembling The Body

1. Place dowels into linkstrips (as shown).
2. Push the 45mm dowels down below the linkstrips into perpendicular adaptors from step 3 (D and E) and new perpendicual adaptors (F and G).

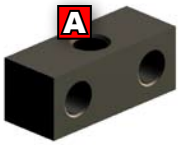




Step 5: Reaming "Loose" Holes



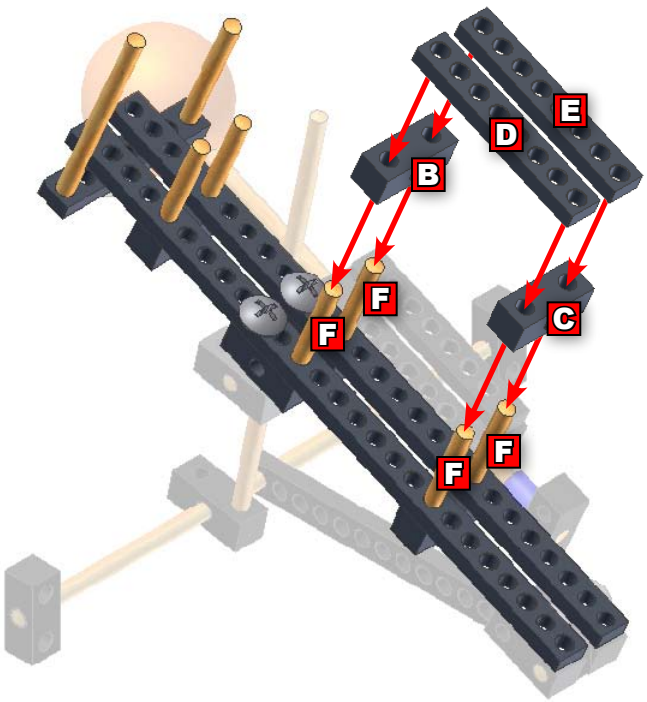
Ream hole A in 2 perpendicular adaptors. Use the "loose" reamer.

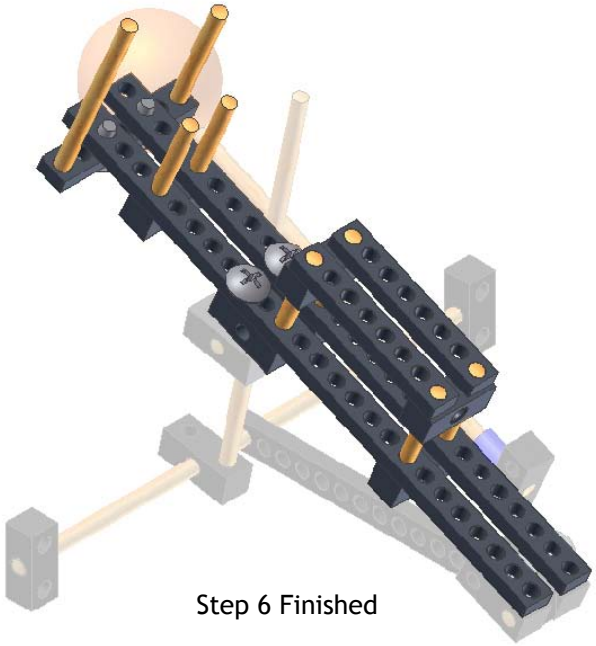


x2

Step 6: Assembling The Body

Place the reamed perpendicular adaptors from step 5 (B and C) and two 60mm linkstrips (D and E) onto dowels (F).

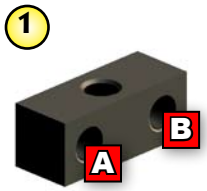


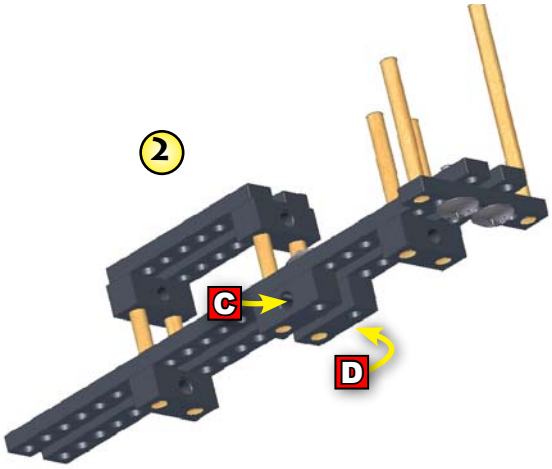


Step 6 Finished

Step 7: Reaming "Slide" Holes

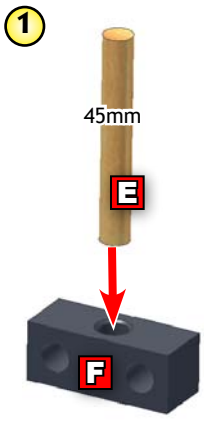
1. Ream holes A and B in a perpendicular adaptor. Use the "slide" reamer.
2. Ream holes C and D on the the the launcher body. Use the "slide" reamer.

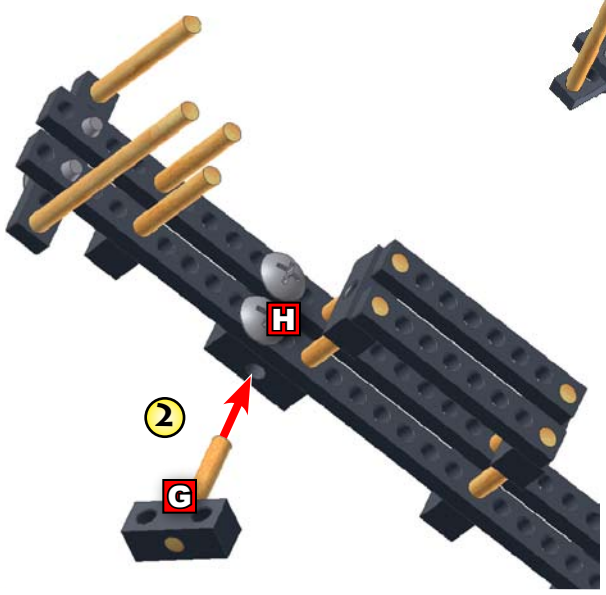




Step 8: Creating a Pivot Point

1. Place 45mm dowel (E) into a perpendicular adaptor (F).
2. Place the assembled 45mm dowel and perpendicular adaptor (G) into the launcher body (H).

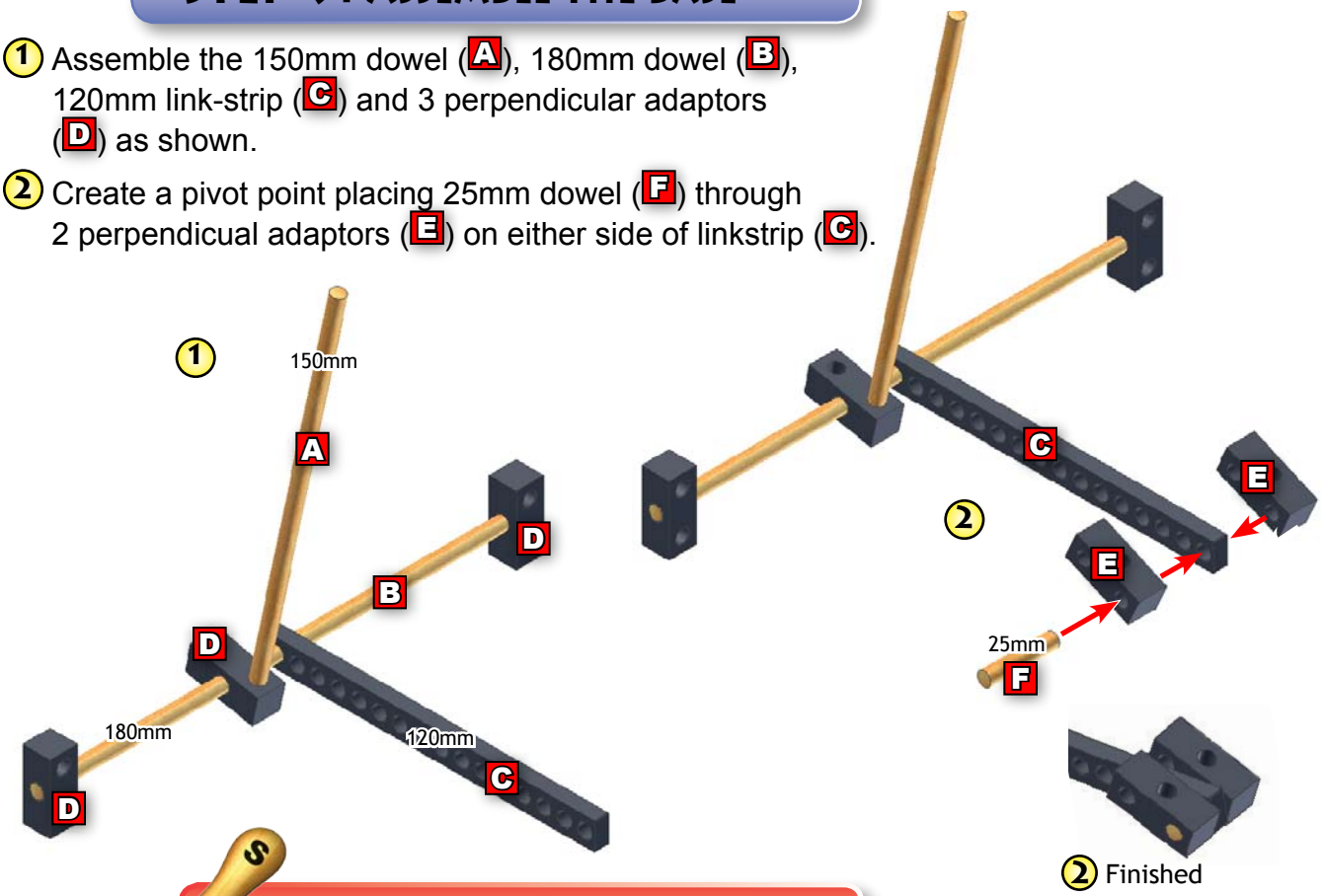




Step 8 Finished

Step 9: Assemble The Base

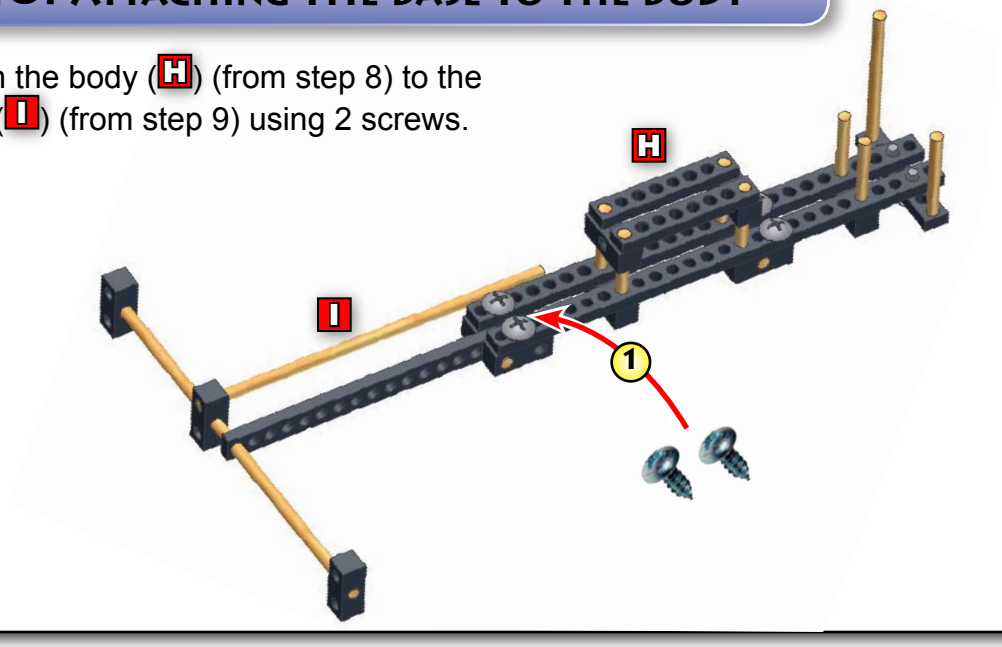
1. Assemble the 150mm dowel (A), 180mm dowel (B), 120mm link-strip (C) and 3 perpendicular adaptors (D) as shown.
2. Create a pivot point placing 25mm dowel (F) through 2 perpendicual adaptors (E) on either side of linkstrip (C).



Use the "slide" reamer to get components to slide onto the dowels

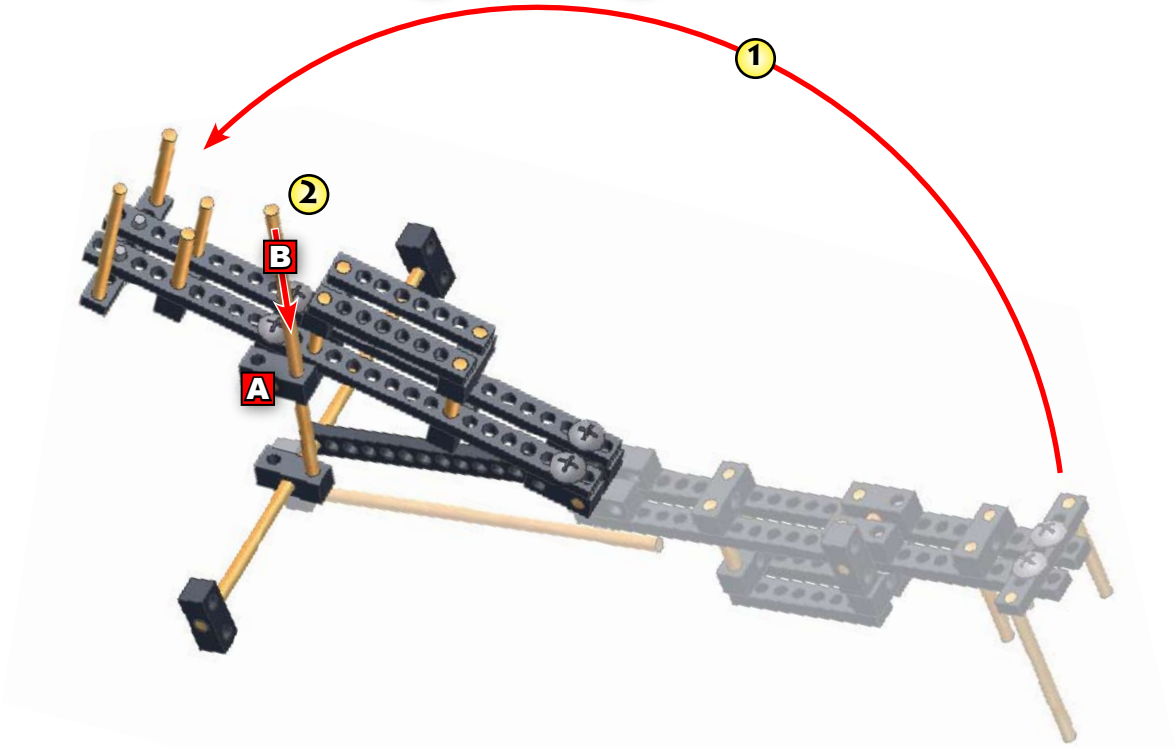
Step 10: Attaching The Base To The Body

1. Attach the body (H) (from step 8) to the base (I) (from step 9) using 2 screws.



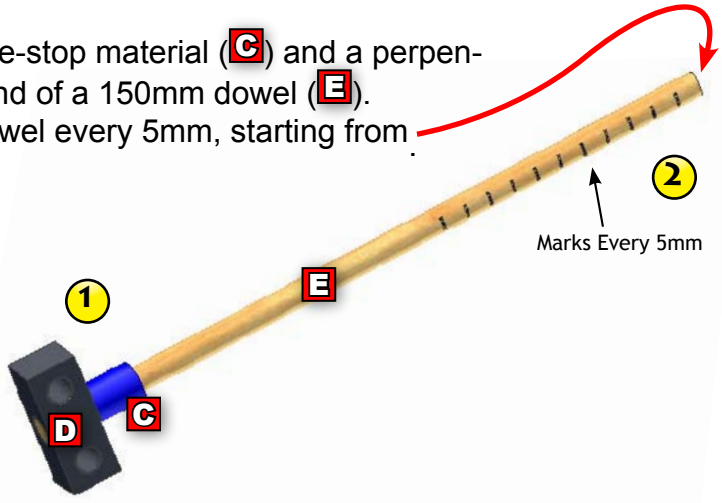
Step 11: Fold it Up

1. Fold over the assembly from step 10 onto itself.
2. Slide the perpendicular adaptor A onto dowel B.



Step 12: Assemble and Mark The Ram

1. Place a 10mm section of slide-stop material (C) and a perpendicular adaptor (D) on the end of a 150mm dowel (E).
2. Draw a black mark on the dowel every 5mm, starting from .



Step 13: Inserting The Ram

1. Insert the ram (A) (from step 12) into the "loose" reamed holes in the launcher body (B).

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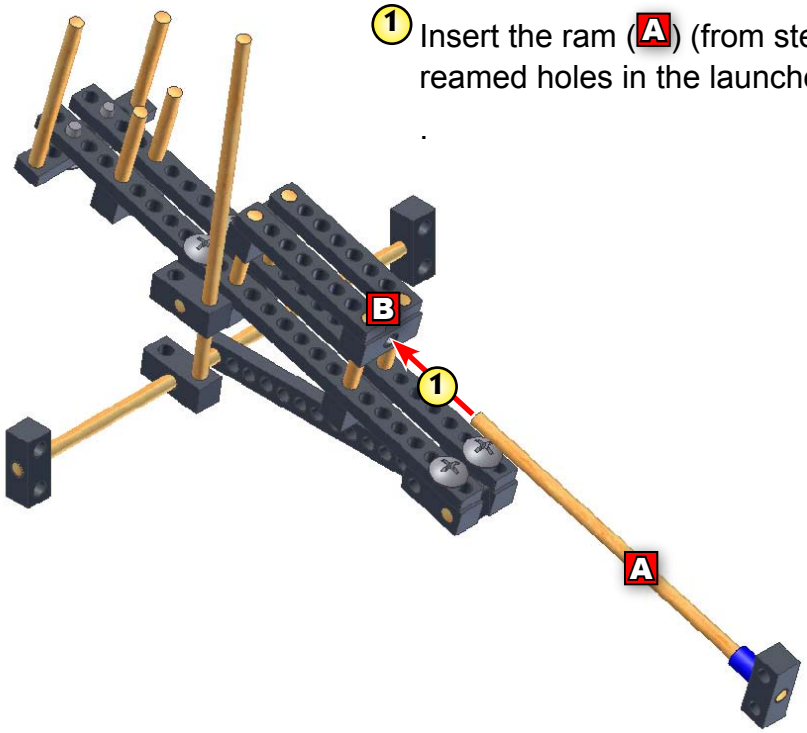
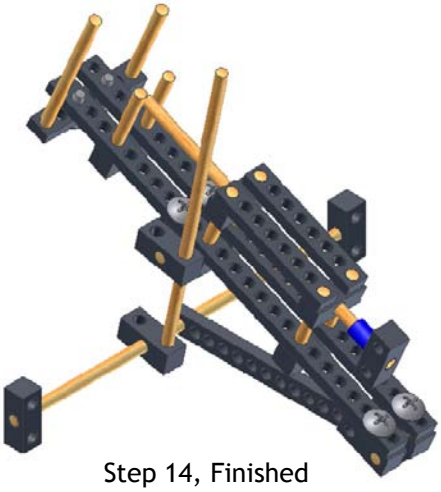
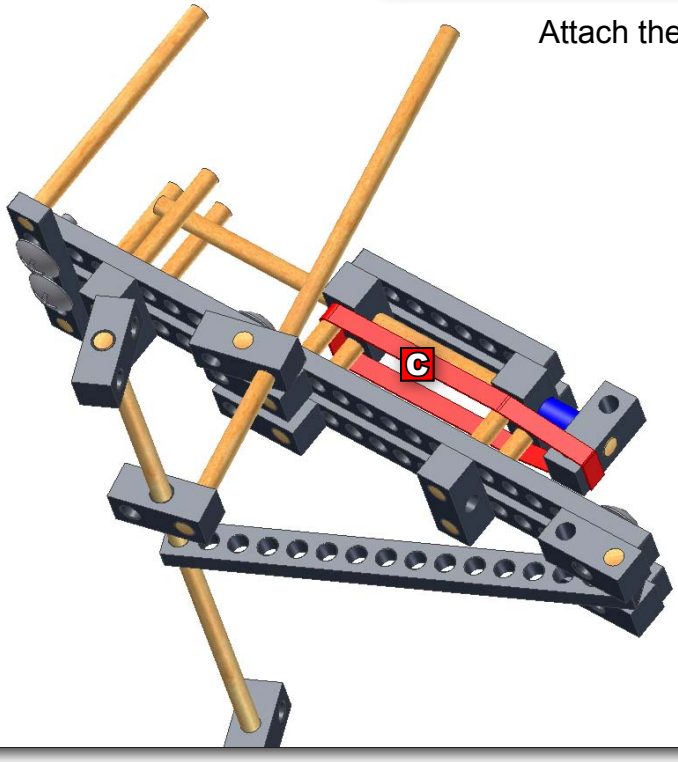




Step 14, Finished

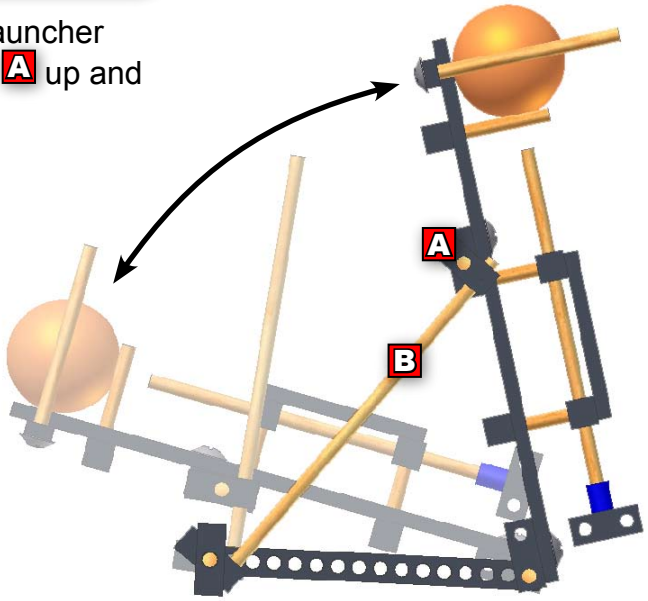
Step 14: The Rubber Band

Attach the rubber band (C).



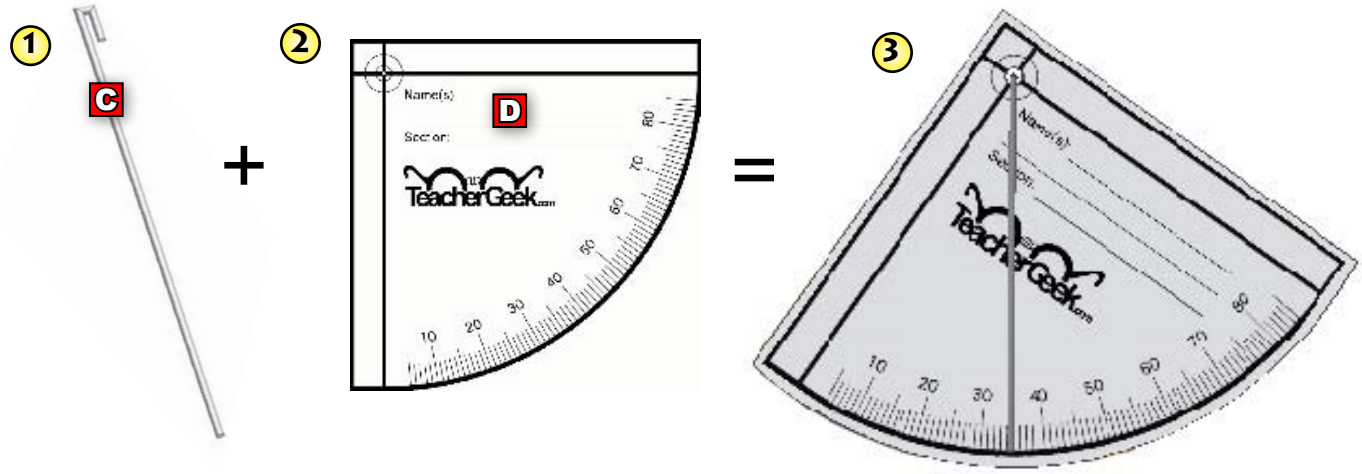
Step 15: Adjust The Angle

You can change the angle of your launcher by sliding the perpendicual adaptor A up and down the dowel B.



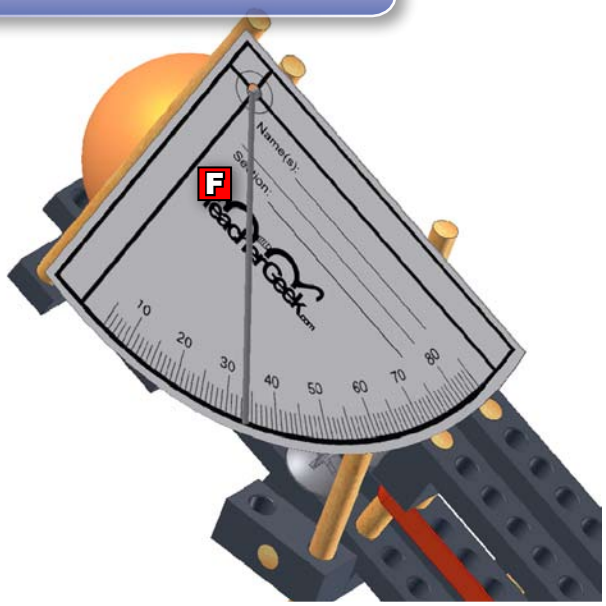
Step 16: Creating an Angle Finder

1. Cut a 4" wire. Bend it so the end hooks around at the end (C).
2. Cut a protractor (D) from the Launcher Protractor Sheet. Punch a hole in the middle of the circles in the upper left hand corner of the protractor. You can download additional protractor sheets at: http://www.teachergeek.org/protractor.pdf *best printed on cardstock
3. Place the hook end of the wire into the hole in the corner of the protractor.



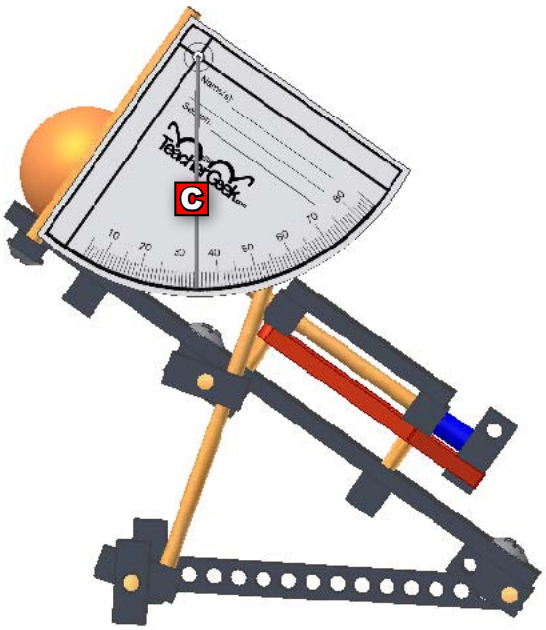
Step 17: Attaching The Angle Finder

Tape or glue the angle finder (F) (from step 16) onto the 90mm dowel on the launcher. The straight lines on the side of the angle finder must be parallel with the dowel



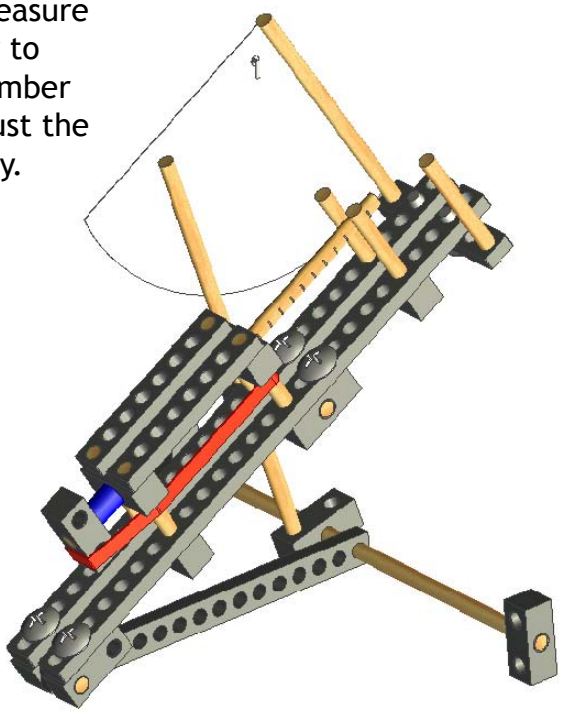
Step 18: Using The Angle Finder

Make sure that the wire hanging in front of the angle finder (C) is perfectly straight. Set the launcher on a table top. The angle of the launcher is the number the wire falls to on the protractor.

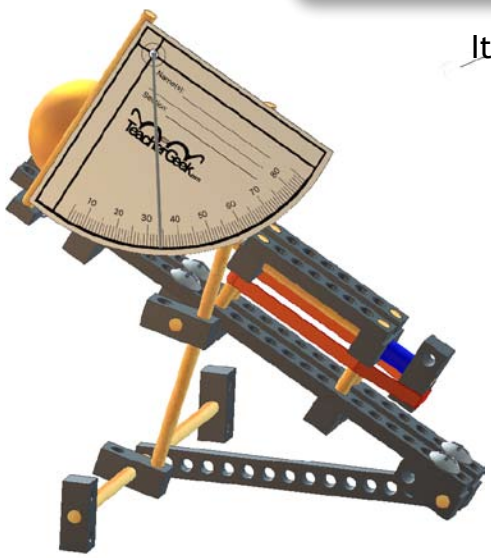


Tip: Numbering The Ram Markings

The markings on the ram allow you to measure the distance the ram is pulled back prior to firing. It is a good idea to sequentally number the ram marks. You can use them to adjust the power of the ram, and to fire consistantly.



Your Launcher is Complete!!!



It's time to start shooting ping-pong balls!