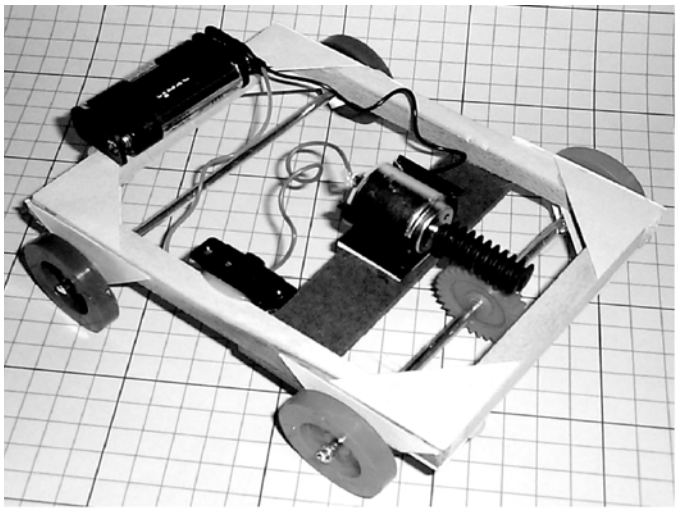
21872 Motorized Worm Gear Vehicle



CONTENTS OF KIT:

Motor Mount Strip (1)
Motor Mount (1)
Sticks (4)
Axles (2)
Worm Gear (1)
30 Tooth Gear (1)
Slide Switch (1)
T Bushings (1)
Medium Torque Motor (1)
Spacers (4)
Triangles, Green (10)
Triangles, White (6)
Wheels, Plastic (4)
Wire (1)
Battery Holder 2AA (1)

Notes:

The car uses stored energy in the batteries to run the electric motor. The motor turns much too fast and without enough turning force (torque) to be directly connected to the axle. A small worm drive on the motor connected to the larger gear on the drive axle reduces the speed and increases the turning force (torque). The wheel diameter is 50 mm.

Typical repairs to the vehicle can be made with white glue and hot-melt glue, should there be any mishaps.

NOT SUITABLE FOR CHILDREN AGED 3 AND UNDER.

Investigations:

1) How many times does the drive axle turn in a minute? (Tip: Attach a piece of tape to a drive wheel so it can flap against your finger and you can feel the revolutions. Have a buddy watch a clock.) It will be convenient to position the vehicle upside down.

2) How fast is the constant speed vehicle going on a flat surface?

3) Make a skid from an index card, attached with a string, to tow behind. Add weights in even increments to the skid until the car can pull no more. What is the force called that is slowing down the car? How can you make it pull more?

4) How steep an incline will the car climb? How can you get it to go up a steeper incline?

5) How can you keep the wheels from slipping, that is, how can you improve traction?

6) How would you design a switching arrangement so that the motor would stop when the car hits an obstacle?

TOOLS NEEDED TO MAKE THIS KIT:

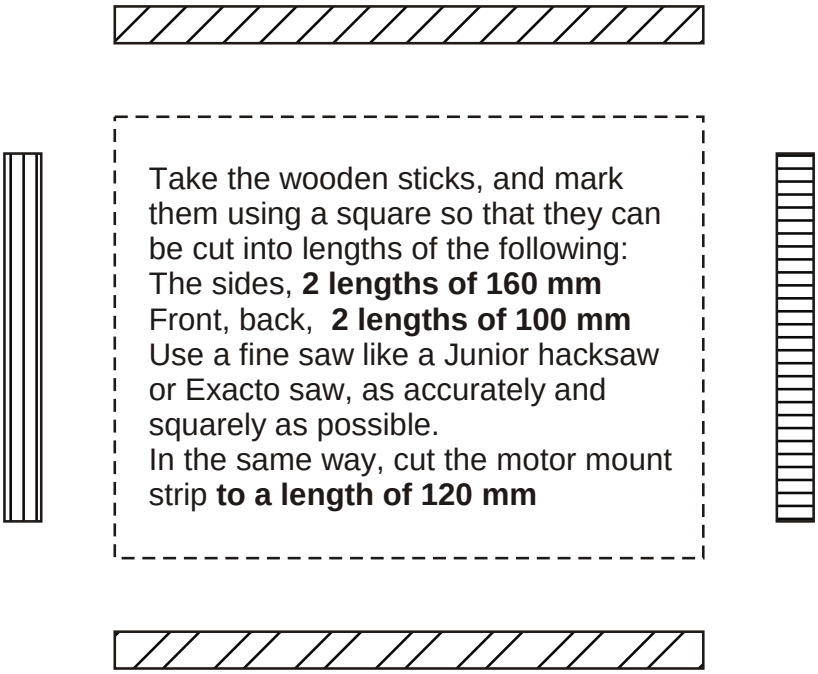
Junior Hacksaw
Glue Gun
Pencil and Ruler
Craft Knife (WITH SUPERVISION)
Small Hammer
Small Vise
Wire Stripper
Batteries, AA, (2)

Instructions:

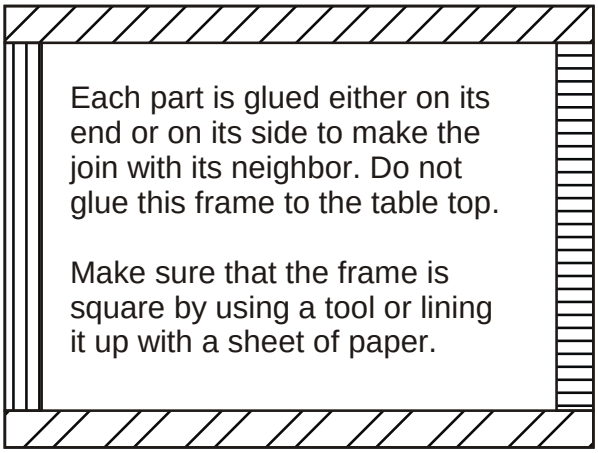
1. Identify and count all the items from the list of contents.

2. Prepare a workspace and lay out the proper tools and required accessories.

3. Proceed with the construction using the illustrations as a guide.



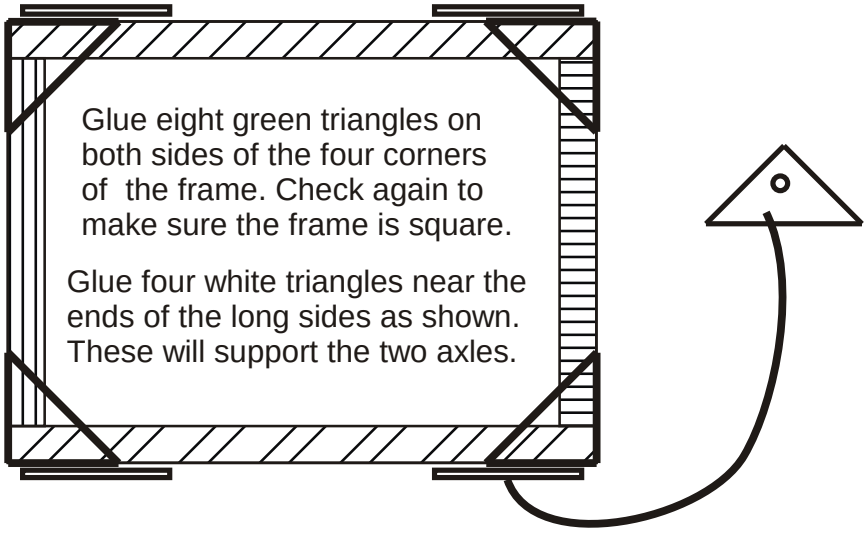
Take the wooden sticks, and mark them using a square so that they can be cut into lengths of the following:
The sides, **2 lengths of 160 mm**
Front, back, **2 lengths of 100 mm**
Use a fine saw like a Junior hacksaw or Exacto saw, as accurately and squarely as possible.
In the same way, cut the motor mount strip **to a length of 120 mm**



Each part is glued either on its end or on its side to make the join with its neighbor. Do not glue this frame to the table top.

Make sure that the frame is square by using a tool or lining it up with a sheet of paper.

4. The early part of the assembly requires a "white glue" but the mounting of the battery holder is expected to be done with a hot melt glue gun.



Glue eight green triangles on both sides of the four corners of the frame. Check again to make sure the frame is square.

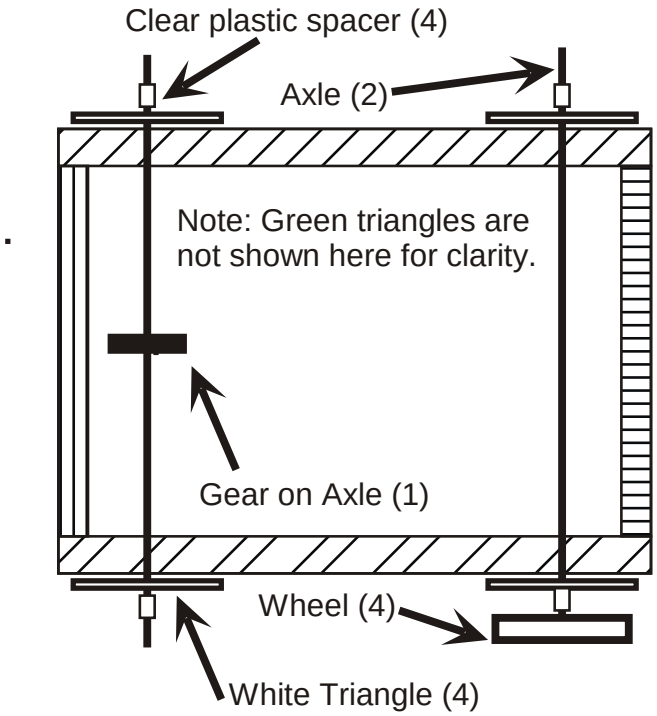
Glue four white triangles near the ends of the long sides as shown. These will support the two axles.

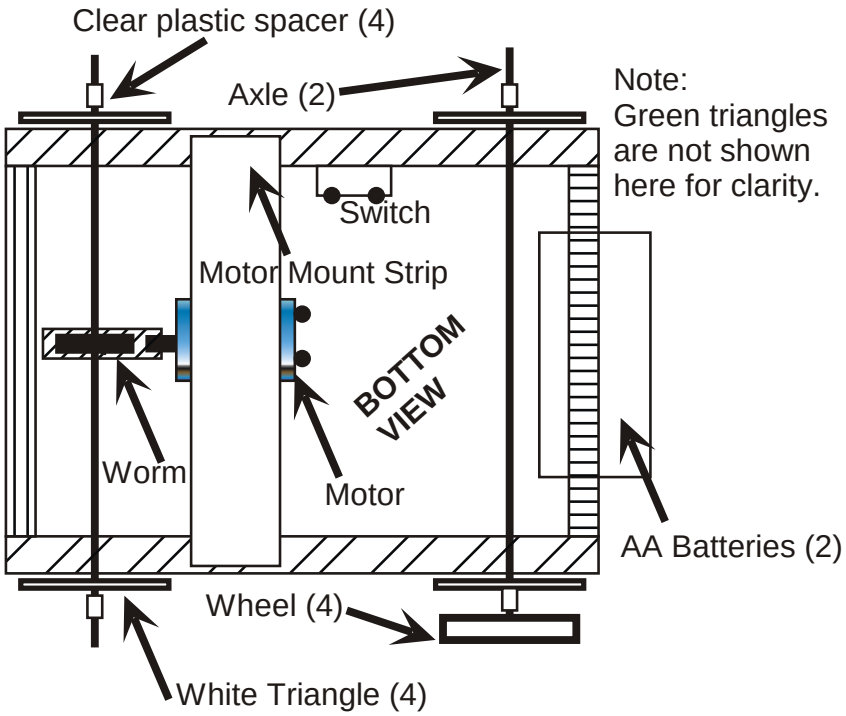
Instructions:

5. Once the white triangles have been glued in place as indicated, the spacers and wheels can be assembled as shown, for the un-driven axle. USE CAUTION TO PREVENT INJURY.

6. For the driven axle, the 30 tooth gear has been driven to the mid point. This is a very snug fit and no glue will be needed to hold the gear in place.

7. The axle can be fitted through the remaining white triangles. Then the remaining spacers and wheels can be carefully installed. USE CAUTION TO PREVENT INJURY.





8. Slide the T- Bushing inside the worm gear and push this on the motor shaft. Push the motor on to the motor mount (clip).

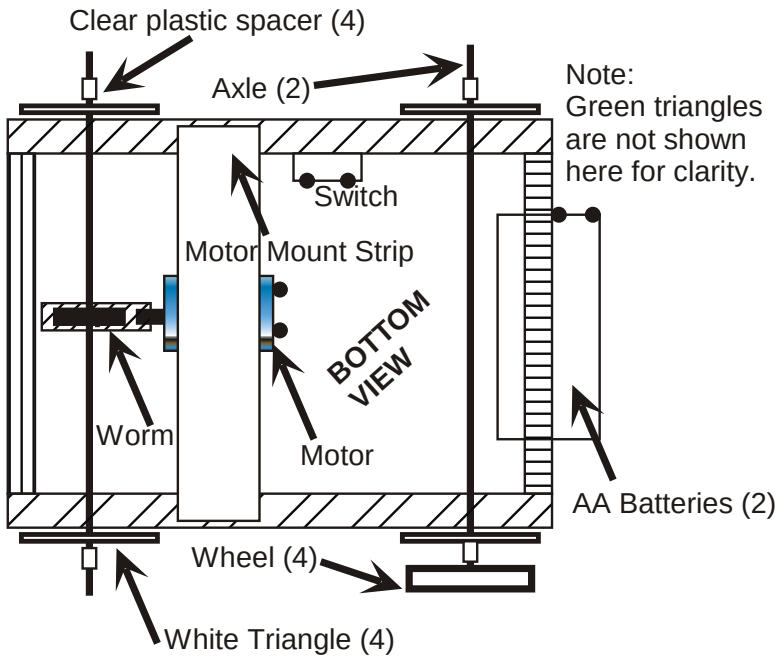
9. Make a trial fit of the motor and motor mount strip on the vehicle frame.

10. Glue the motor mount strip in its proper place on the underside of the frame, using white glue.

11. Attach the motor in such a position that it will easily engage the 30 tooth gear. It may happen that the gears will disengage when the frame is lifted because of the holes in the white triangles.

12. Using hot - melt glue, attach the switch and the battery holder to a frame member.

Instructions:



Final Assembly:

1. Using the illustration above, draw a heavy smooth curving line from one of the battery posts to one of the motor posts (these are the black dots in both cases).

2. Continue on the illustration above, drawing a heavy smooth curving line from the other battery terminal to one of the switch terminals.

3. Now, draw a heavy smooth curving line from the other switch terminal to the other motor terminal.

4. Using the sketch just completed, connect the wire represented by each drawn line. Notice that the connections are already made for the battery terminals, and the color choice will not matter. Only the remaining wire from the switch to the Motor will have to be added. In each case the insulation must be removed to expose the bare wire before connection. The wires may be simply wrapped and pinched, or they may be soldered, if desired.

5. Place batteries in the battery holder

6. Position the vehicle on the floor and turn the switch on.

7. Make sure that the worm drive gear is fully engaging the 30 tooth gear, making adjustments to the white triangles if necessary. Extra triangles have been included.

Warranty and Parts: We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Intended for children 13 years of age and up. This item is not a toy. It may contain small parts that can be choking hazards. Adult supervision is required.