

marbleocity®

CHAOS MOUNTAIN

ASSEMBLY INSTRUCTIONS



LET'S GET THIS
ROLLING!





Hello!

Thank you for being a Tinkineer! We've taken great care in creating the experience that you are about to embark upon. We want your build, whether performed alone or with a family member, to be something special and memorable. Hands-on fun awaits!

The kit you are about to construct is made of real wood, right here in the United States of America! Sometimes knots or other anomalies hidden in the material can cause a part to be cut incorrectly. Not to worry! If you encounter an issue that we didn't catch, visit our website and use the "Contact Us" button at the bottom of any page to let us know what you found. We'll make it right.

One of the things about a kit is that, while we've tried, we can't fully predict exactly how you will approach the build, what things you will find easy and what things you will find difficult. At the end of the day, it's important to us that you and/or your family have a wonderful experience. If you don't, it means that despite our best attempt, there may still be an instruction to tweak or an aspect of the design to improve upon.

We'd like to take this opportunity to open a two-way dialog. If you had a great experience, we want you to tell us and, of course, your friends. If you didn't, we would like the first opportunity to make things right for you. Please reach out to us using the website link and we'll get right back to you. Allow us to help - to offer a friendly construction tip or to ship a replacement part.

When you're finished, it would give us great pride to see how your completed model turned out. Share your photos, videos, and comments on our Tinkineer Facebook page and on Instagram. Tag us @tinkineer and/or contact us directly from the website.

Happy making!

Team Tinkineer

on the web @
TINKINEER.COM

We are constantly working to improve your maker experience. You may observe that the shape of a part differs slightly from how it is depicted in the assembly instructions.

Please keep the wooden parts in your kit away from excessive heat and humidity.

WELCOME!



Hi! My name is Adam and I'm the creator of the Marbleocity® product line.

When I was a kid I loved machines, contraptions and, of course, marble ramps. I also loved building models but I found the plastic materials unsatisfying and model cement hard to work with. Today, amazing laser-cutting technology exists to craft highly detailed shapes out of wood. The real wood parts in your kit have a great tactile feel and can be assembled easily with household white glue.

The kit that you are about to build was carefully designed to be a great maker experience that you'll enjoy in and of itself. But beyond that there's a little physics and a lot of engineering experience waiting for you. The graphic novel that begins on the next page will teach you how tiny, sometimes invisible, changes can impact final results. Chaos isn't just the state of your bedroom before you clean it, it's actually a physics and mathematical principle worthy of study and understanding.

Another goal of this Marbleocity maker project is to show how you – yes, you! – can build a seemingly complex machine out of simple parts. Simple parts become sub-assemblies and sub-assemblies come together to construct an amazing, working machine that you built yourself. So grab your glue and let's get started!

Adam B. Hocherman
Chief Tinkineer

GETTING HELP FROM OUR COMMUNITY

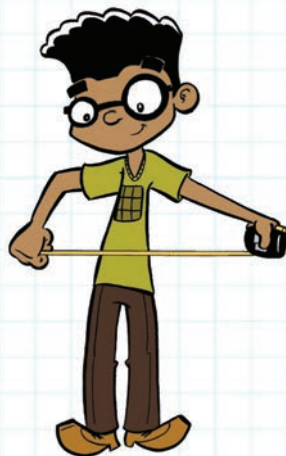
Have a question about a step you're working on? Need a video tutorial? We're building a community of Tinkineers – just like you! Please visit us online at Tinkineer.com/community.

LEARNING MORE

Today you'll be building your very own model that showcases a chaotic environment. Watch your marbles descend different paths each time they emerge from the ball pump. Did you notice that there's a ball pump that moves the marbles up to the top of Chaos Mountain? If you'd like to learn more about Chaos or the Ball Pump (and other clever engineering mechanisms) start at Wikipedia.org. You can also find a variety of cool videos highlighting real-world applications on YouTube.

A NOTE ABOUT SAFETY

The kit that you are about to assemble is designed for children and adults ages 9+. It contains marbles and other small parts that can be a choking hazard for children under 3 years old. If you have younger siblings or other small children living in your household, please keep these small parts safely out of their reach.



NEWT IN ... "QUIXOTIC CHAOTIC"

AHH, WHAT AN
AWESOME DAY!

SUNNY ...75 ...
WHAT MORE COULD
YOU ASK FOR?

HEY, HAVE YOU
EVER HEARD OF THE
BUTTERFLY EFFECT?

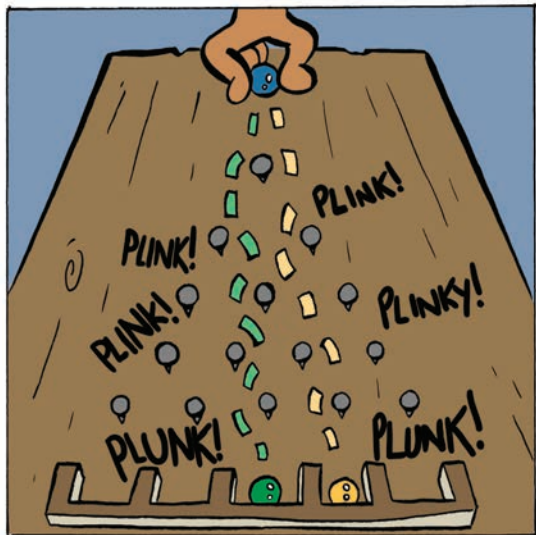
RINGS A BELL.

IT'S A METAPHOR OFTEN
USED TO DESCRIBE A
SCIENTIFIC IDEA KNOWN AS
CHAOS THEORY.

RIGHT! THE IDEA IS THAT
SMALL DIFFERENCES EARLY
ON ("INITIAL CONDITIONS")
CAN HAVE DRAMATIC AND FAR
REACHING EFFECTS LATER.

EXACTLY!
FOR EXAMPLE,
THE FLUTTER OF A
BUTTERFLY'S
WINGS ...



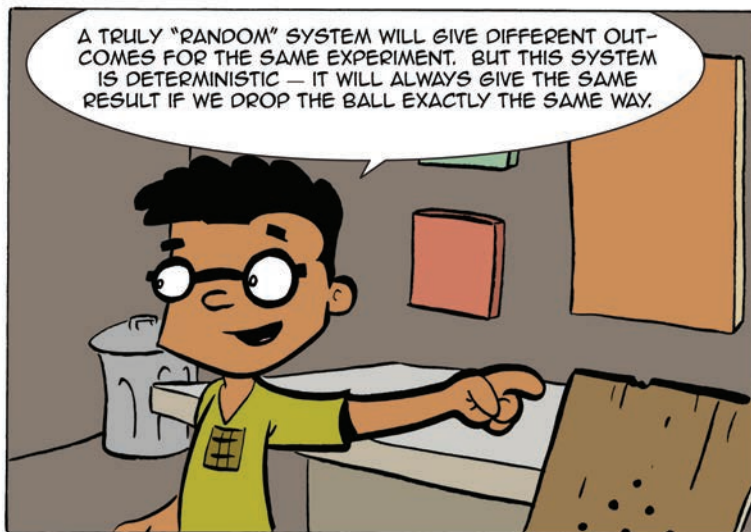


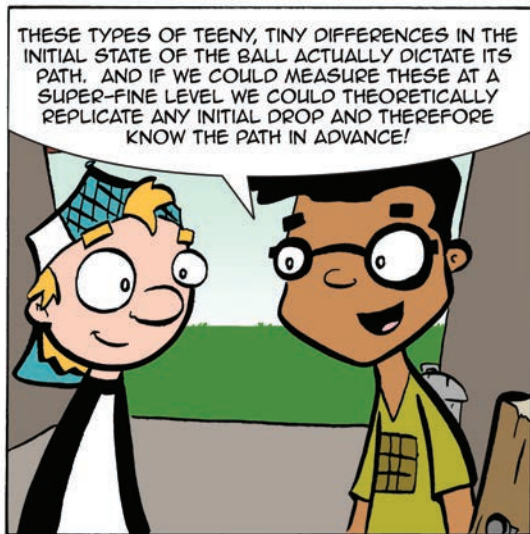
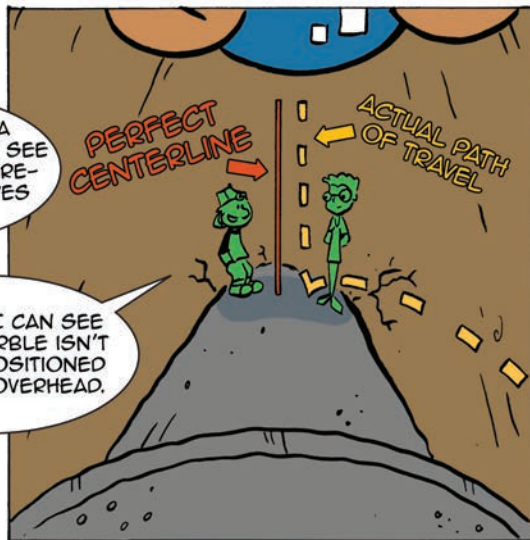
LOOKS PRETTY
RANDOM TO ME ...

IT DOES, DOESN'T
IT? BUT IT'S NOT! THIS
SYSTEM IS ACTUALLY
CHAOTIC!



A TRULY "RANDOM" SYSTEM WILL GIVE DIFFERENT OUT-
COMES FOR THE SAME EXPERIMENT. BUT THIS SYSTEM
IS DETERMINISTIC — IT WILL ALWAYS GIVE THE SAME
RESULT IF WE DROP THE BALL EXACTLY THE SAME WAY.







LET'S DO THIS!

READY TINKINEER?

For this project you'll need:



Elmer's® Glue-All® Multi-Purpose white glue. A good, household white glue is the best glue for the job – it's easy to work with, makes a strong bond in ~20-30 minutes, and dries perfectly clear so your finished marble machine will look great! Elmer's® Washable School Glue will bond but Glue-All® is recommended for the best experience.



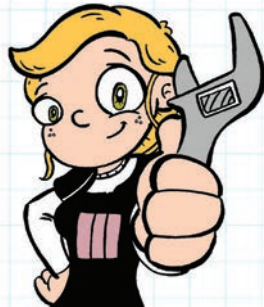
Wax paper. Scavenge a sheet of wax paper from your kitchen – it's the perfect work surface. Household white glue will not stick to it and you'll avoid mom's wrath by protecting the kitchen table.



Round toothpicks. These are perfect for applying glue. Make a puddle on your wax paper work surface and use the tip and/or edge of a toothpick to apply glue to your wood parts.



A wax stick is used to lubricate wood bearing surfaces that rub against one another.



TIPS ON TECHNIQUE >



Test Fit First!

Most steps can be test assembled without any glue at all! Check your part fit and marble operation first and then apply glue second.



Applying Glue to Flat Surfaces

Use glue sparingly – you don't need a lot! Wipe away excess glue using your finger or the edge of a clean toothpick.

BREAK SOMETHING? NEED A REPLACEMENT PART?

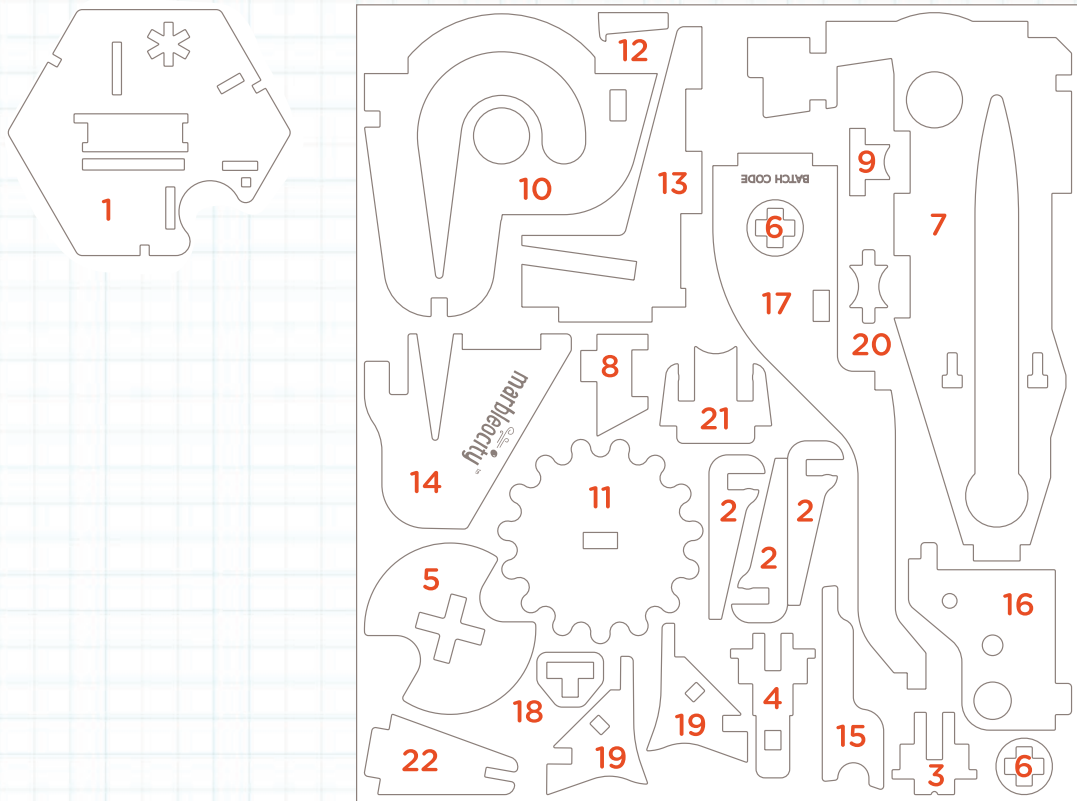
Marbleocity is a natural wood product! Sometimes a hidden knot can slip past our quality control gurus. If you need a replacement part contact us at Tinkineer.com. Please have your batch code handy, which is located on the bottom of upright part #17. The batch code is the six digit number etched onto that part. See example at right.

603231

[example only]

HERE ARE THE PARTS!

All of the wooden parts required to create your model are pictured below. If you have trouble identifying a part during the build, you can find it below.



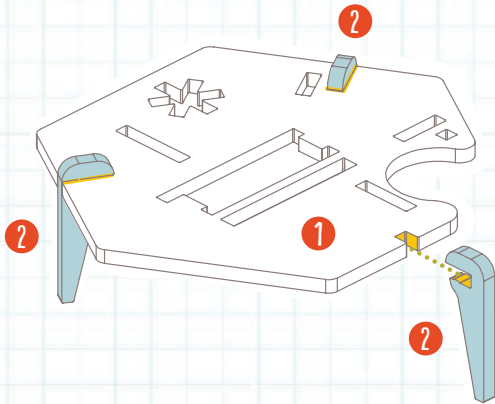
NOTE: Parts are not drawn to scale.

STEP 1

PLATFORM

Working on a sheet of wax paper, apply glue using a toothpick.

Start with the platform [1]. Apply glue with your toothpick and attach three identical legs [2].



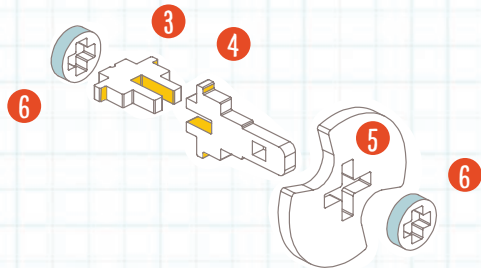
For the first few steps, we'll show you exactly where to add glue, highlighted in yellow.



TIP



Wipe away any glue that gets on your bearing surfaces (denoted in blue) using a toothpick or your finger.



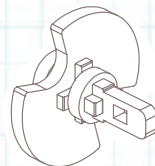
STEP 2

IMPELLER ASSEMBLY

Create your marble impeller assembly. Glue shaft halves [3, 4] together and then add the marble impeller [5].

Complete the assembly by gluing a bearing [6 x2] to either side. Clamp the assembly with your fingers for a moment, so that it dries square and tight.

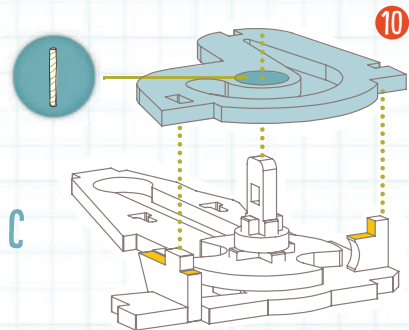
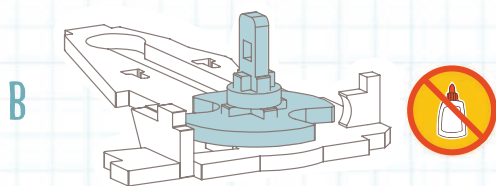
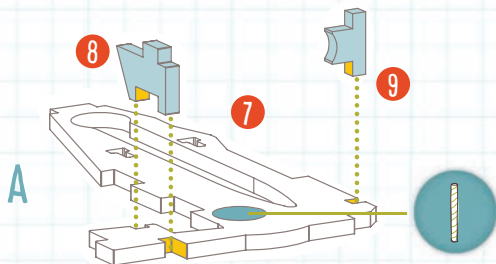
{COMPLETE!}



STEP 3

MARBLE PUMP ASSEMBLY

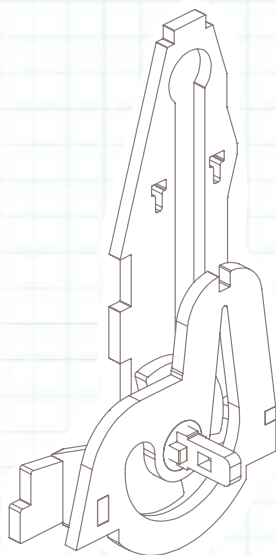
The full pump assembly houses the impeller sub-assembly that you just created.



A: First, use your wax stick to lubricate the bearing hole (shown in dark blue). Now place large upright [7] on your work surface and add cross-braces [8 and 9].

B: Next, place (no glue!) your impeller assembly as shown.

C: Wax the bearing hole in small upright [10]. Apply glue to the cross-braces and then complete your assembly by adding the small bracket.



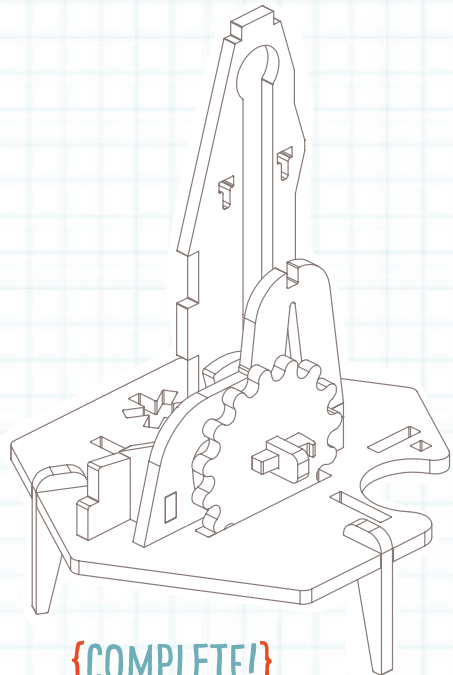
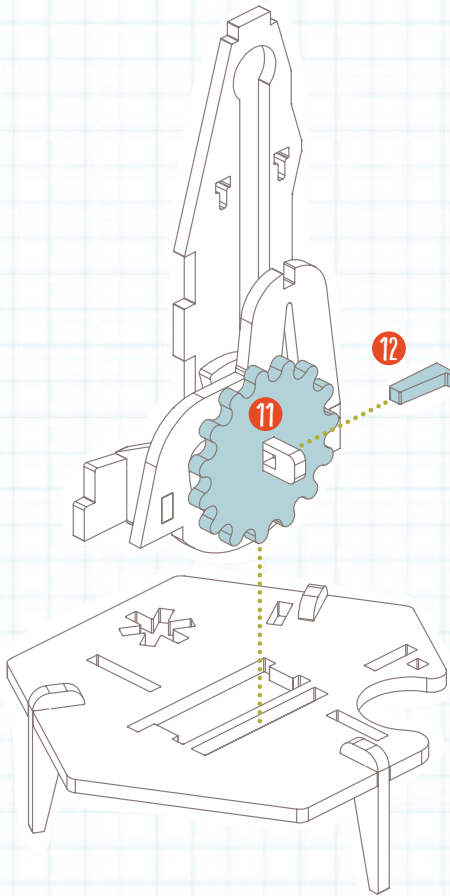
TIP
Clamp this assembly together with your fingers, for a moment, while the glue sets up.

STEP 4

INSTALL MARBLE PUMP ASSEMBLY

Attach your large gear [11] by slipping it onto the shaft and then securing it with peg [12]. Glue is optional here.

Next, test position your marble pump assembly onto the platform. Notice how the gear fits neatly into the rectangular slot. Test that the gear rotates smoothly! Once you're comfortable with the positioning, glue the assembly into place.



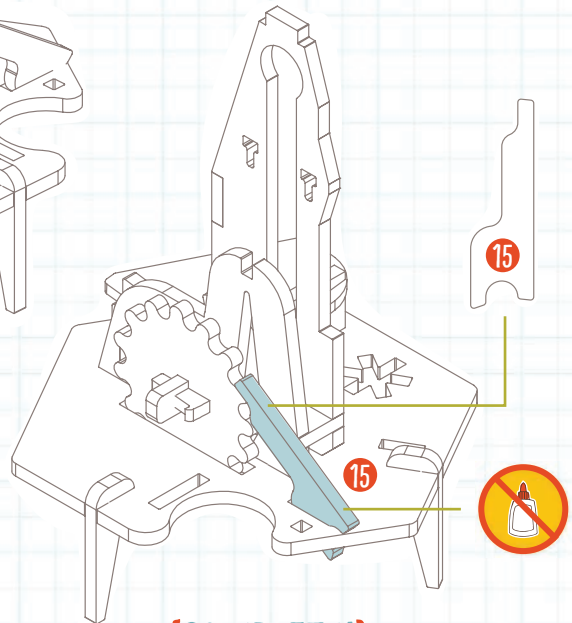
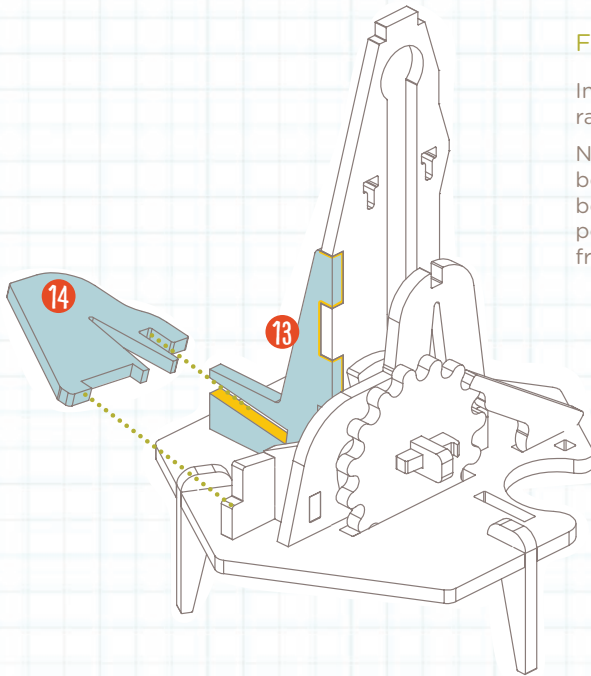
{COMPLETE!}

STEP 5

FEEDER RAMP AND RATCHET

Install your ramp bracket [13] and then slide ramp [14] into place, as shown.

Now, rotate your model 90 degrees for a better view, as shown in second drawing below. Place (no glue!) your ratchet [15] into position. The ratchet keeps the ball pump from slipping back as it fills with marbles.



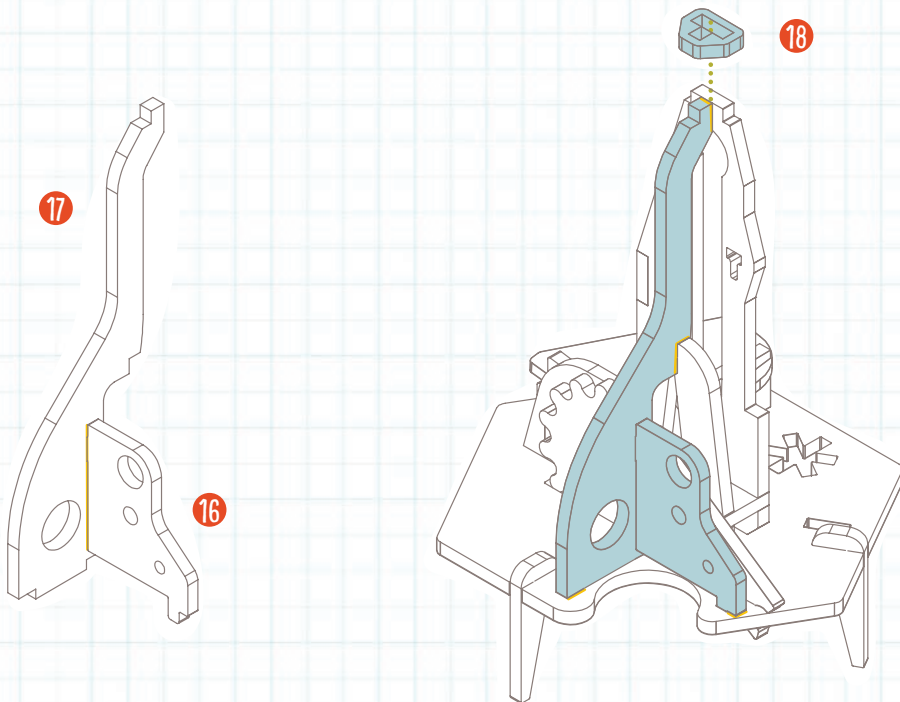
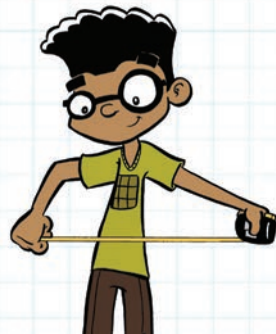
{COMPLETE!}

STEP 6

REAR INFRASTRUCTURE

Create the motor bracket sub-assembly. Glue motor bracket [16] to rear upright [17].

Next, glue the sub-assembly to the platform, securing the top in place with your T-shaped fastener [18].

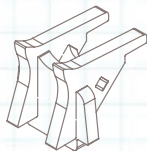
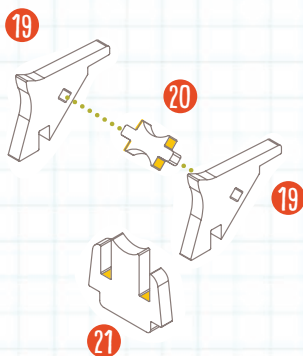


STEP 7

DIVERTER

Assemble your diverter from the four parts shown at left. Start by gluing the two sides [19 x2] to cross-brace [20]. Then take that assembly and drop it into the slots on diverter base [21].

You can position your completed diverter on your model (see page 17), while the glue dries. But be careful! The diverter does not get glued to the platform. You'll rotate this diverter later, when you link up additional Triple Play models!

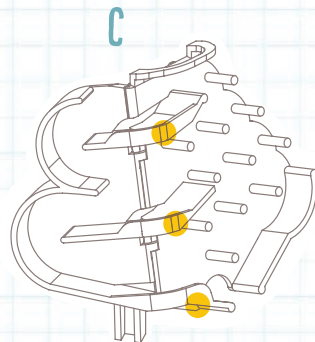
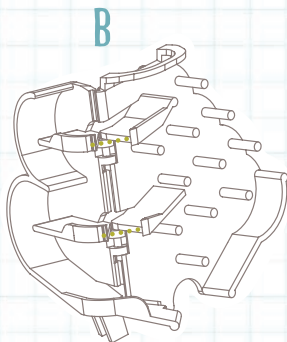
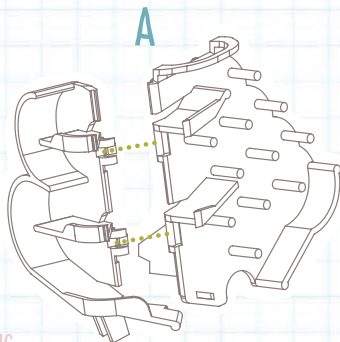


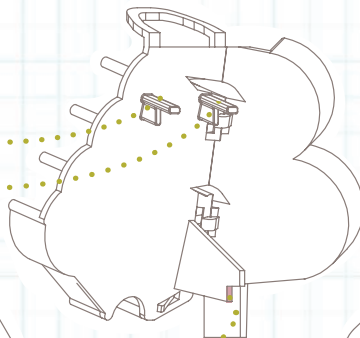
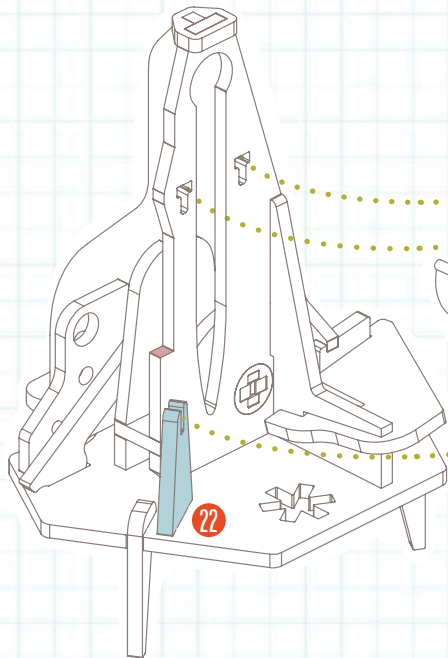
{COMPLETE!}

STEP 8

DESCENT TRACK

Snap together the two halves of your descent track. Begin by snapping the hinge together (highlighted in A). Next, rotate the two parts together (see B) until they snap into place at the points shown in drawing C.





TIP



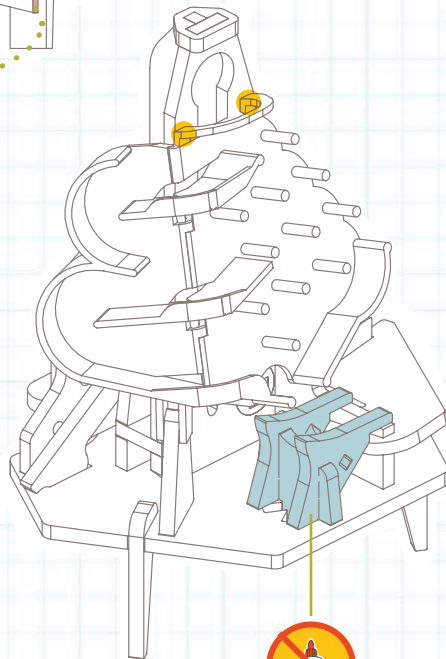
It's critical that the top of the descent track dries flush to the wood. Apply a little pressure here while the glue sets up.

STEP 9

INSTALL DESCENT TRACK

Install descent mount [22] with a small dab of glue. Next align the tabs on the rear of the descent track with the corresponding mounting points on your model. Use enough glue to secure.

Place your diverter as shown at right but don't glue it! The diverter can be rotated later, when you interconnect models.

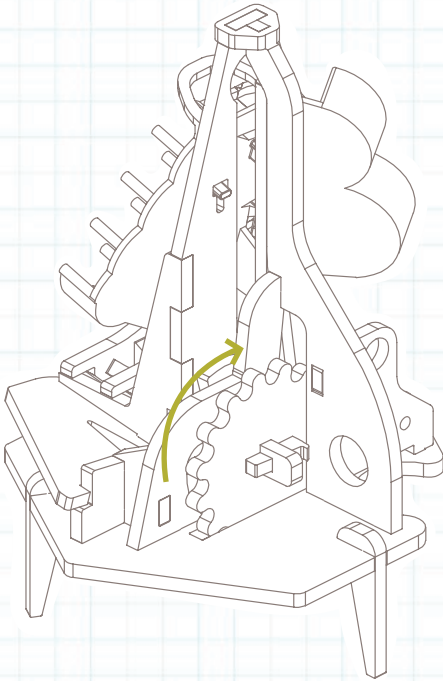


STEP 10

LET'S ROLL!

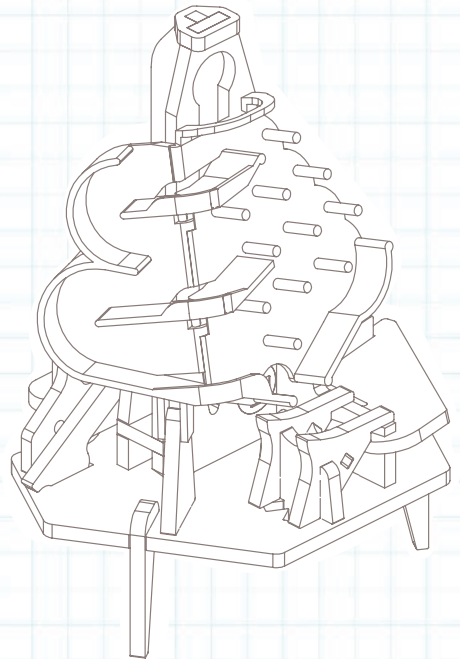
Chaos Mountain requires all ten marbles to operate. That's because the marble pump operates by displacing the top marble in the pump with new marbles added from the bottom.

Prime your marble pump by loading marbles into the ramp while turning the large gear counter-clockwise (as viewed from behind) with your thumb ...



Once nine marbles are loaded you'll see that the tenth marble added causes the chaos to commence!

The marbles descend in a "random" pattern (hence the name "Chaos Mountain"). If your marbles are all trending to one side or the other, try to find a more level table or shim one leg with a thin piece of cardboard until you observe a more "random" (and more fun!) action.



STEP 11

(OPTIONAL) ADD A MOTOR!

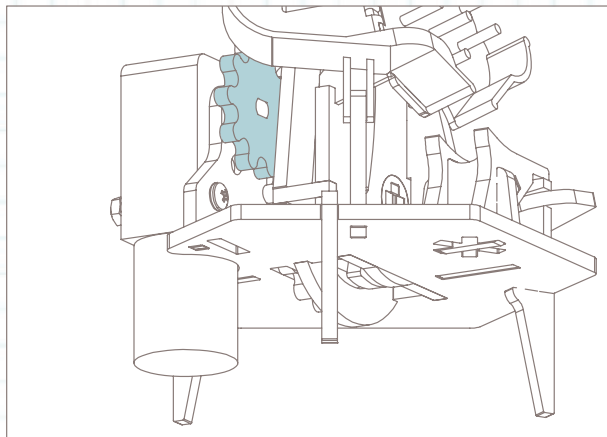
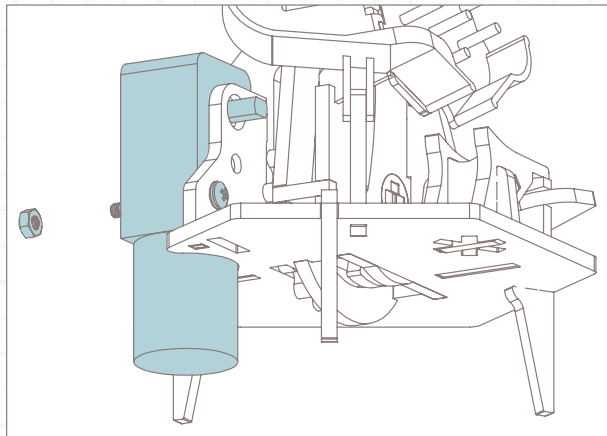
Individual Triple Play models can be operated by hand but for even more fun, add a motor kit (sold separately).

For this model, first remove the ratchet (you won't need it anymore). Position the motor as shown in the top drawing and secure it with a machine screw and nut.

With the motor securely in place, carefully position the pinion gear as shown - it press-fits onto the shaft.

The wires and battery box are not shown in this diagram. Follow the instructions included with the motor kit to make connections and get things running.

And, by the way, you will need a motor kit if you want to connect Chaos Mountain to other Triple Play models. You can even connect it to a second Chaos Mountain kit, if you or a friend has one!

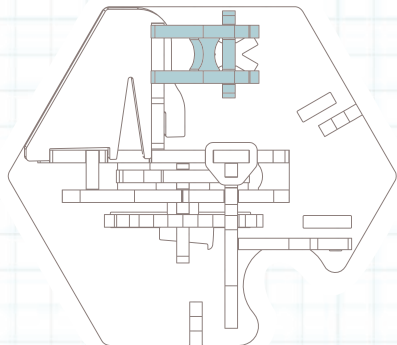


CONNECT!

CONNECTING MODELS!

The secret to connecting multiple models together is to rotate the diverter. The illustration at left shows a top view of the model you just completed (some parts have been removed for clarity).

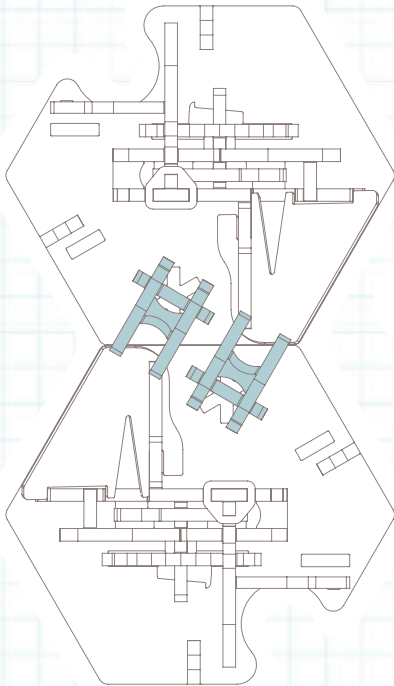
On the next page we'll show you how you can connect two or three models ...



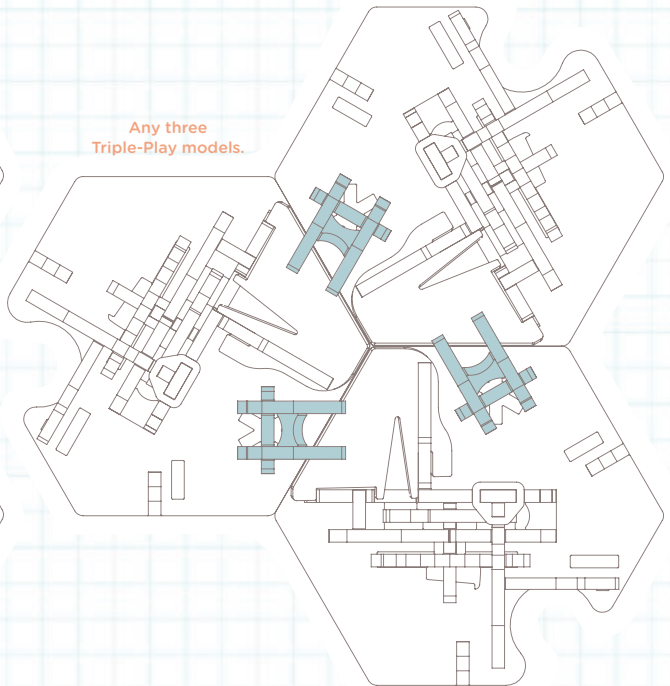
CONNECTING MODELS (CON'T)!

Two or even three Marbleocity Triple Play models can be motorized (motor kits sold separately) and connected for an even more dynamic marble machine experience! Notice that the diverter can be positioned in one of three different ways. Follow the diagrams below to arrange your models adjacent to one another and position the diverter on each model accordingly.

Any two
Triple-Play models.



Any three
Triple-Play models.



WHERE TO GO FROM HERE?

CONGRATULATIONS!

You've just built a complex, three-dimensional marble machine out of flat wooden parts and learned some physics in the process. Nice work!

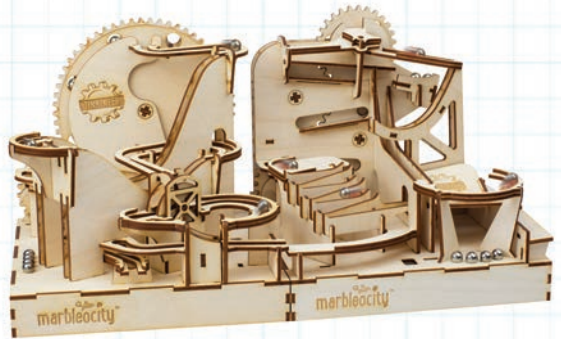


TELL US ABOUT IT! SHOW US!

We hope you enjoyed building/making with us. We'd love to see your Marbleocity Chaos Mountain. Did you decorate your model? Where did you put it?



Share your photos and comments on our Tinkineer Facebook page and Instagram feed. Tag us @tinkineer. Or contact us directly at www.tinkineer.com/community.



MAKE MORE!

Good news, there are more Marbleocity kits available! Check out additional Triple Play models like Archimedes Screw or try a kit from our "Mini" series, such as the Mini Coaster pictured here. For the intermediate maker, there are larger models which offer a more challenging build and more complex rolling action!

POWER UP AND CONNECT!

Add the optional Motor Kit to power your Marbleocity model and keep those marbles rolling. Then you're ready to connect for the most epic experience! Connect any three Triple Play kits together (mix and match)! In addition - our large Marbleocity kits are designed to interact together such that marbles pass between those models. So cool!

VISIT TINKINEER.COM/PRODUCTS TO LEARN MORE. WE'LL SEE YOU THERE!

EVERYONE
IS A TINKINEER



LEARNING
IS THE BEST!



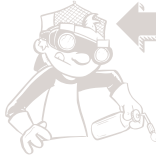
BUILD FUN

GLUE IT,
MAKE IT.



EVERYONE
IS A TINKINEER

MAKERS HAVE
MORE FUN



PSST

HE'S A TOTAL
SMARTY PANTS



ADVENTURE
AWAITS!
{ LET'S EXPLORE }

MAKERS HAVE
MORE FUN



EVERYONE
IS A TINKINEER



LEARNING
IS THE BEST!



BUILD FUN

CUT IT,
TRIM IT,
GLUE IT,
MAKE IT.



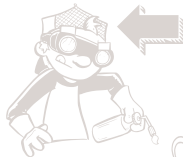
PSST

HE'S A TOTAL
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ADVENTURE
AWAITS!
{ LET'S EXPLORE }

MAKERS HAVE
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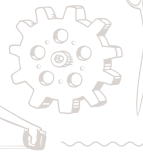


LEARNING
IS THE BEST!



BUILD FUN

CUT IT,
TRIM IT,
GLUE IT,
MAKE IT.



EVERYONE
IS A TINKINEER

MAKERS HAVE
MORE FUN



PSST

HE'S A TOTAL
SMARTY PANTS



ADVENTURE
AWAITS!
{ LET'S EXPLORE }

MAKERS HAVE
MORE FUN



⚠ WARNING:
CHOKING HAZARD.

Kit contains marbles and small parts.
Not for children under 3 years old.

MACM100BB

PlayMonster



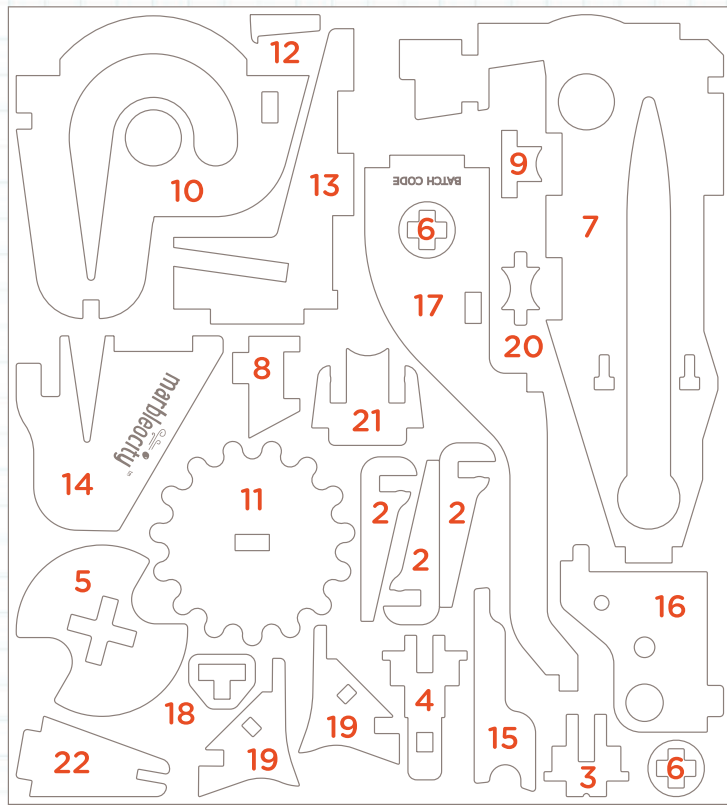
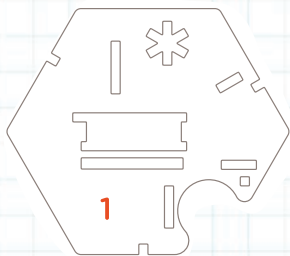
We wanna hear about all the fun you had!

Contact us at: Customer Service, 1400 E. Inman Pkwy.,
Beloit, WI 53511 • playmonster@playmonster.com • 1-800-524-4263.
For more fun, visit playmonster.com

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Parts and colors may vary from those shown.

HERE ARE THE PARTS!

All of the wooden parts required to create your model are pictured below. If you have trouble identifying a part during the build, you can find it below.



NOTE: Parts are not drawn to scale.