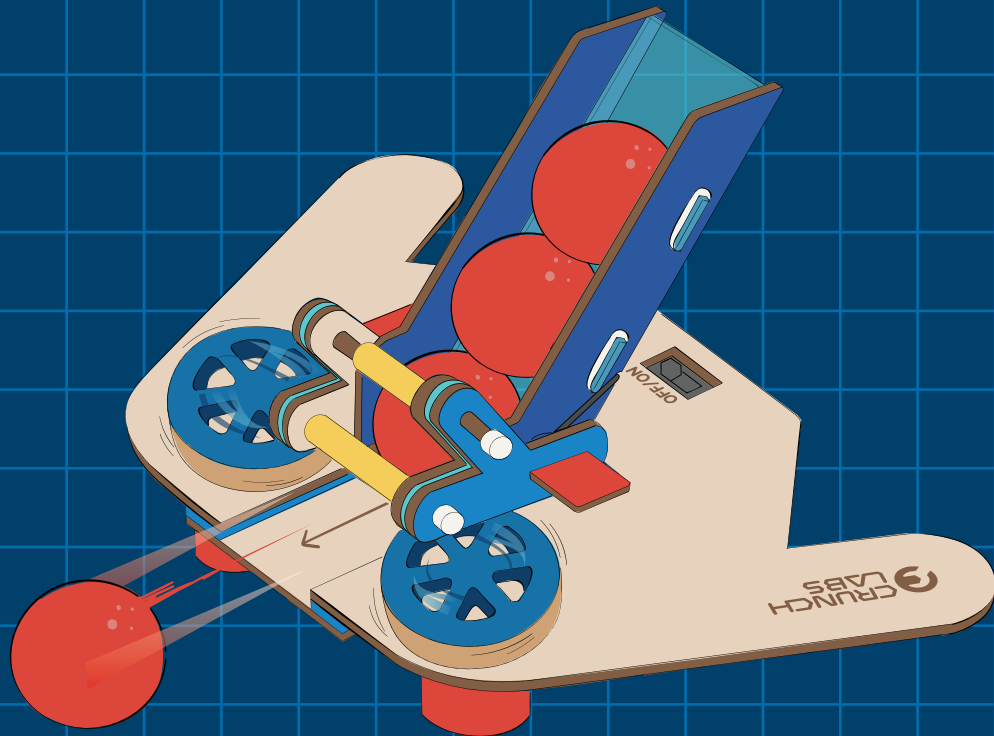




BUILD  
BOX



# BALL LAUNCHER



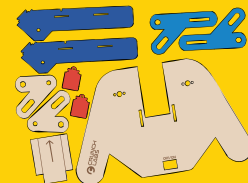
# NEW VIDEO UNLOCKED

BUILD ALONG & LEARN WITH MARK ROBER



# CRUNCHLABS.COM/BALL

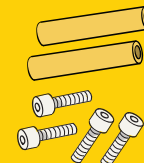
## PARTS



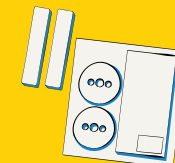
wood pieces



o-rings



bolts and standoffs



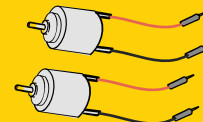
foam stickers



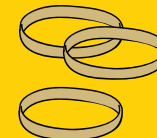
plastic sheets



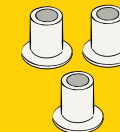
elastic cords



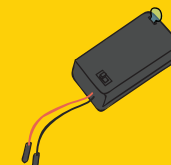
motors



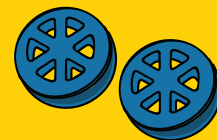
rubberbands



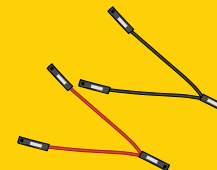
shoulder washers



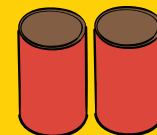
battery pack



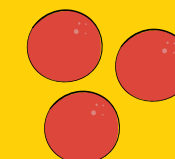
flywheels



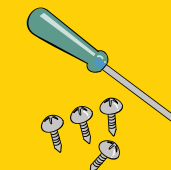
y-splitters



paper tubes



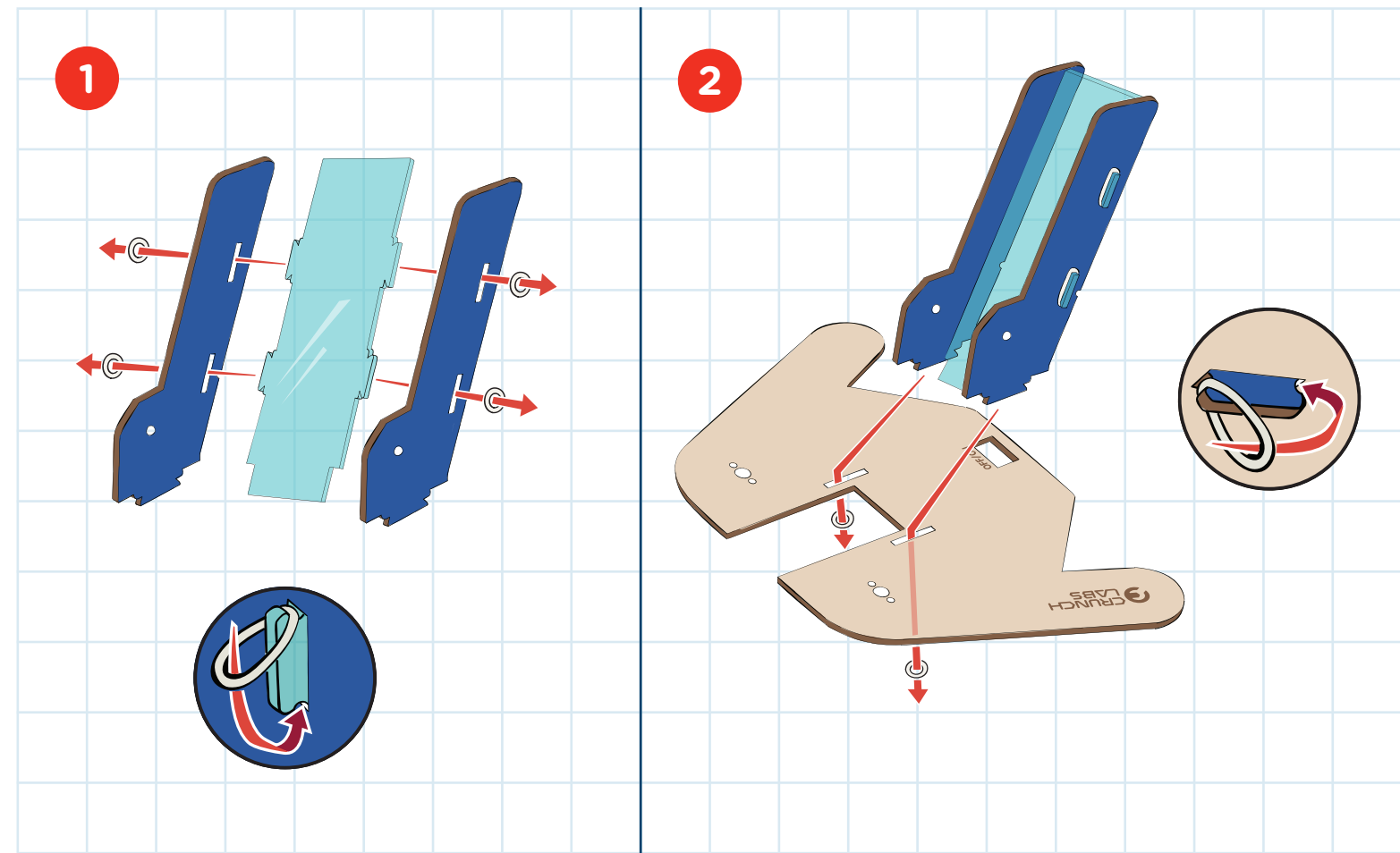
foam balls



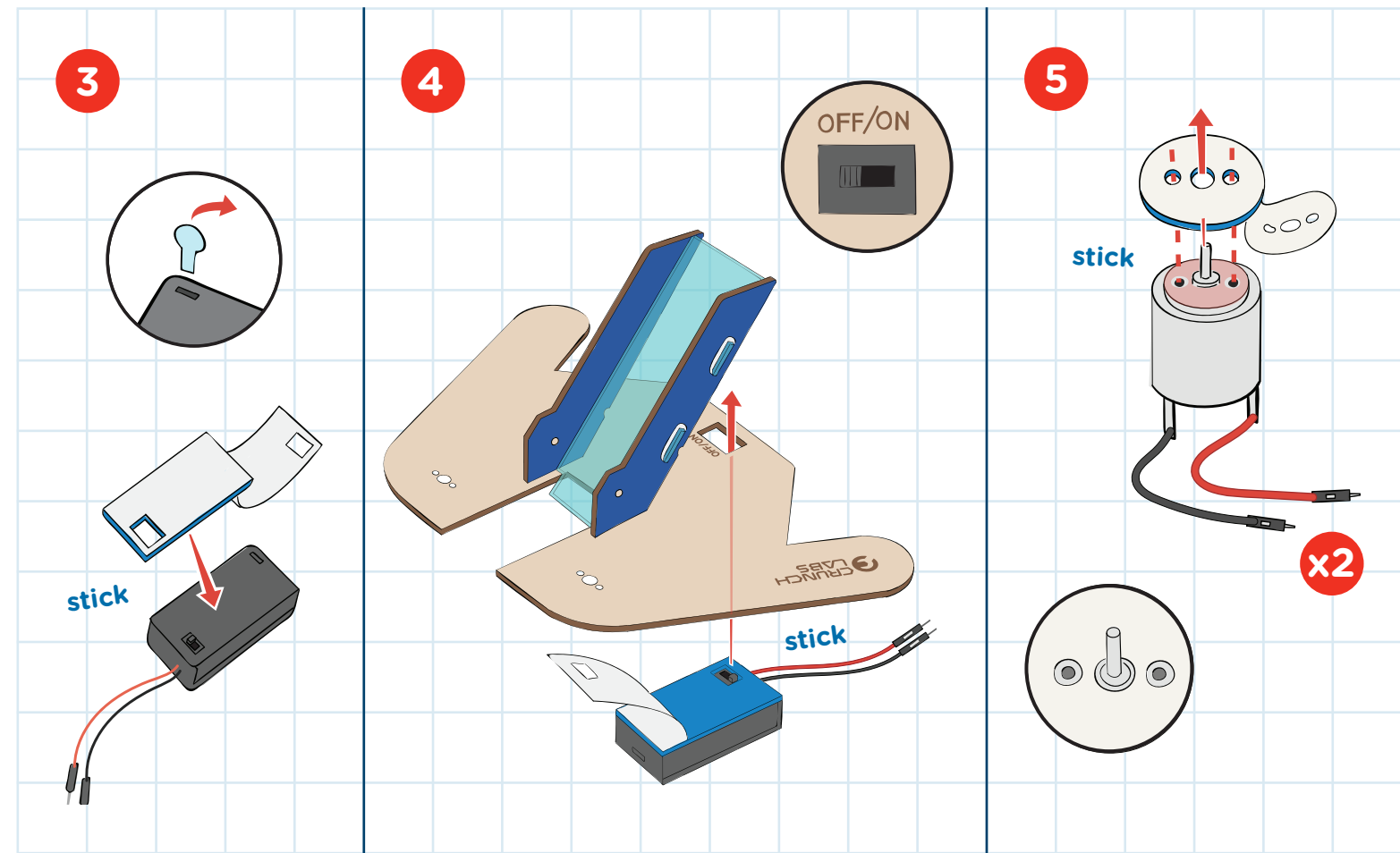
screw kit

For missing and replacement parts, visit "My Account" at [crunchlabs.com](https://crunchlabs.com) and we'll ship them to you for free.

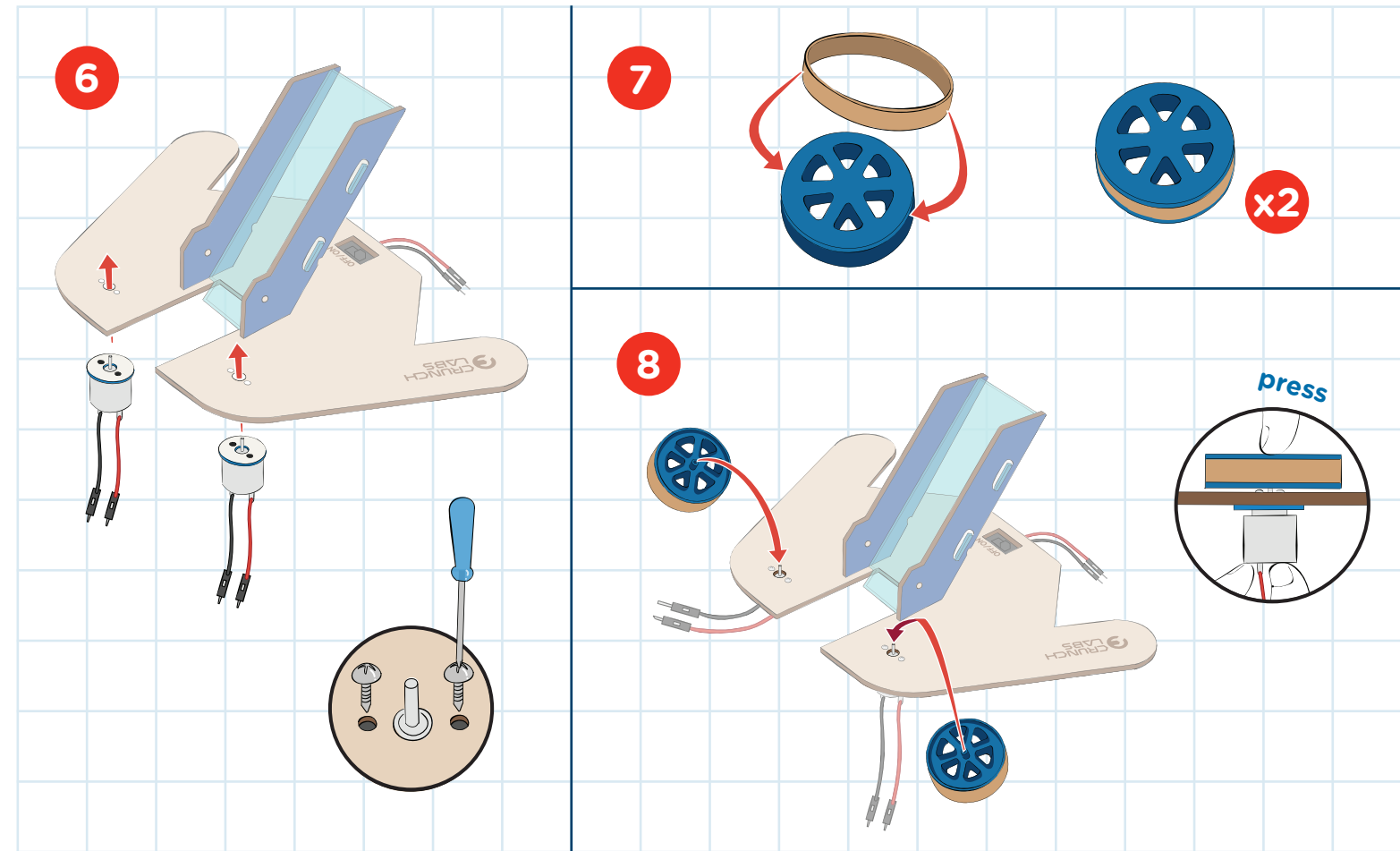
# BUILD



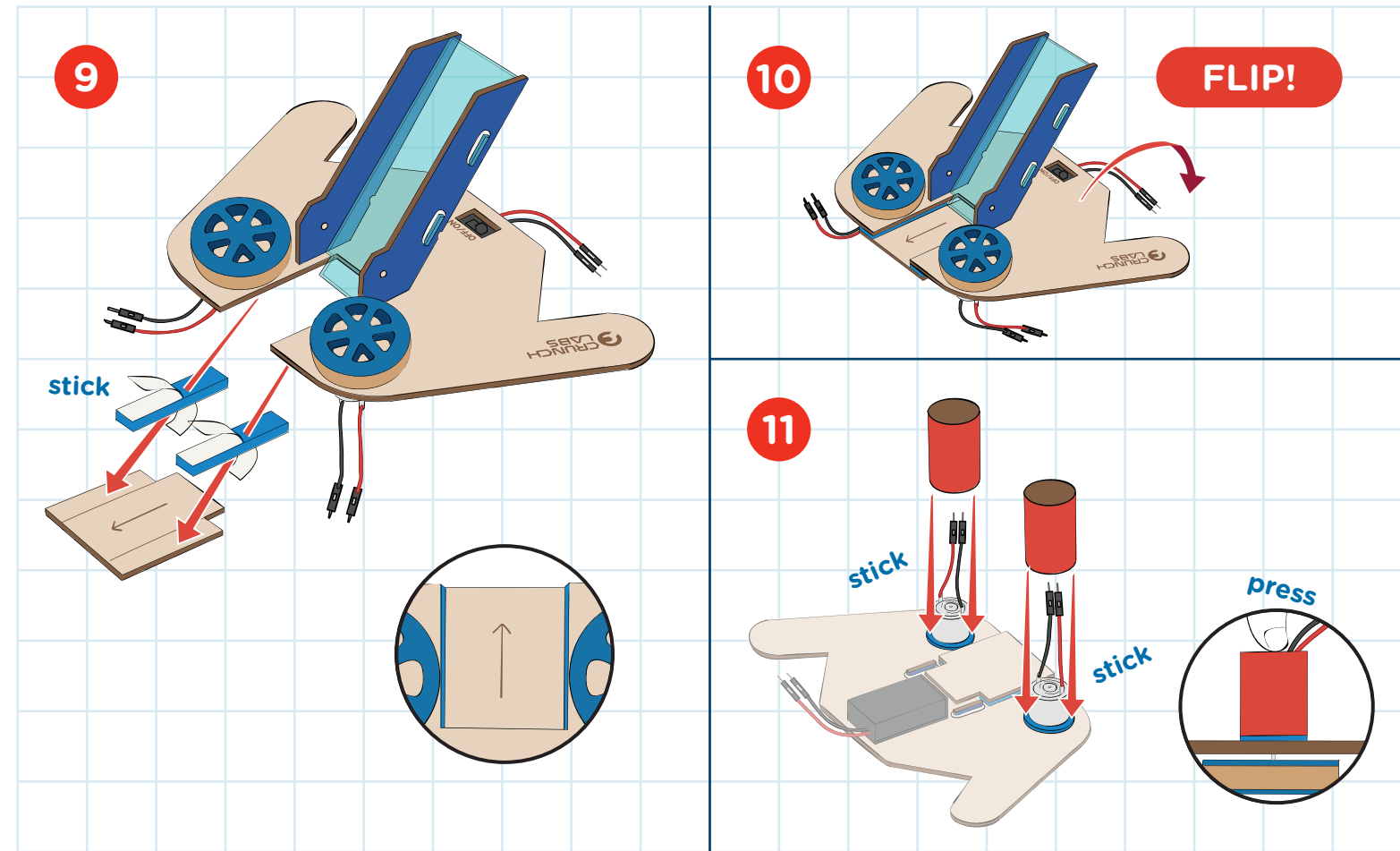
# BUILD



# BUILD



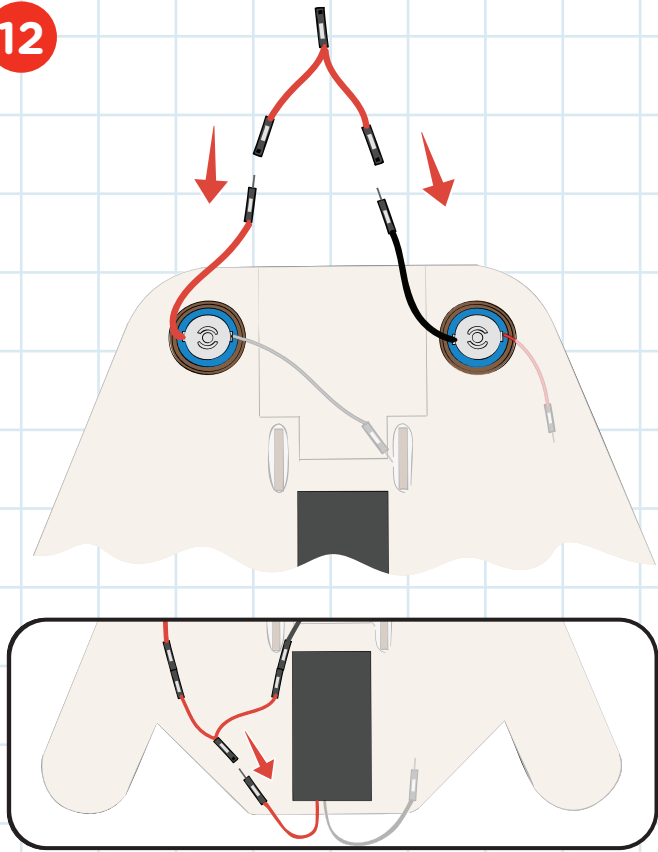
# BUILD



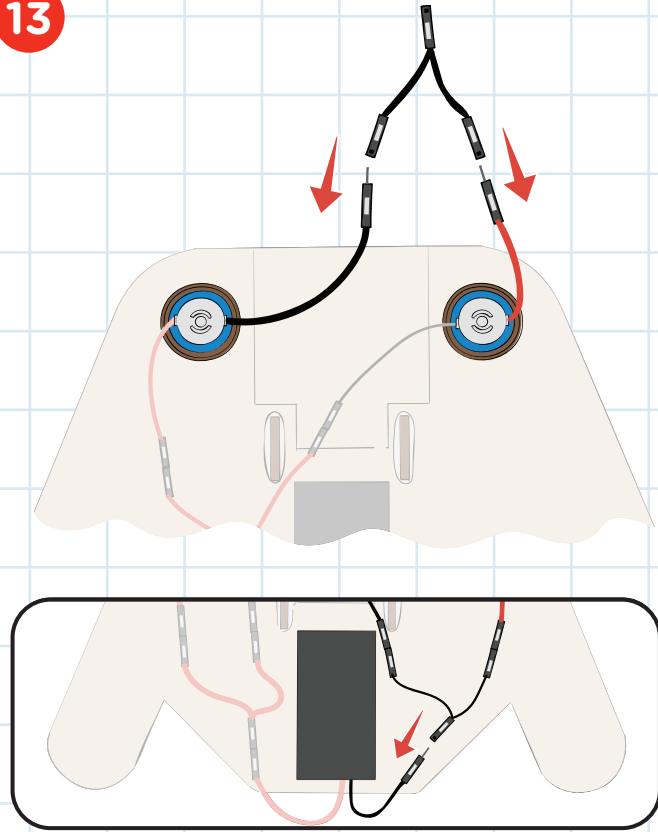


# BUILD

12

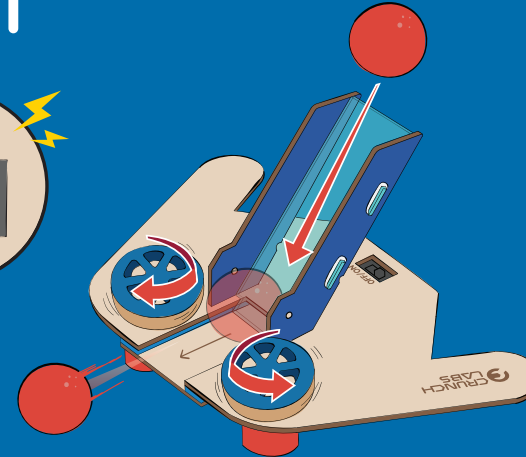
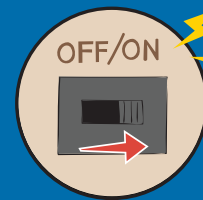


13



# BUILD

## TEST

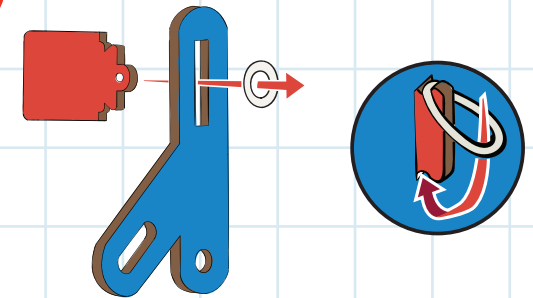


### PRO TIP!

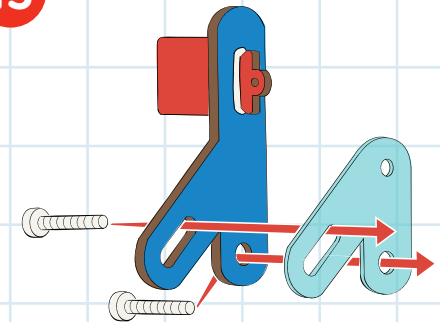
You can **reverse** the direction that a DC motor spins by swapping the wire connections. If your flywheels aren't spinning the right way, try checking your **wire connections**.

Having trouble? Watch the video at [crunchlabs.com/ball](https://crunchlabs.com/ball)

14

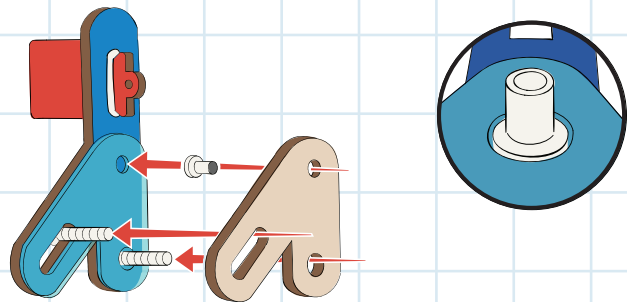


15

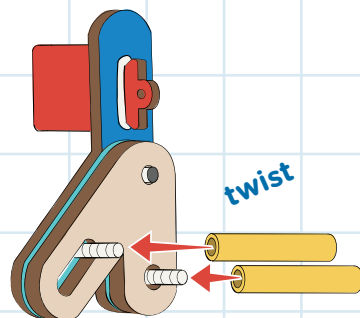


# BUILD

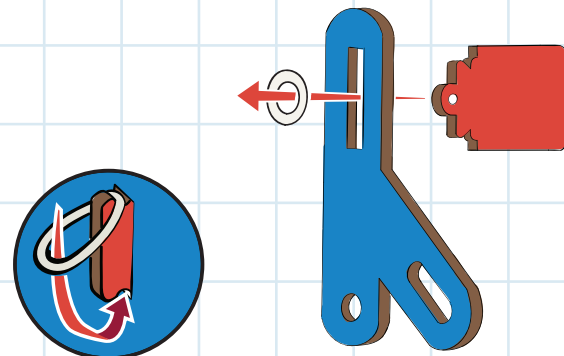
16



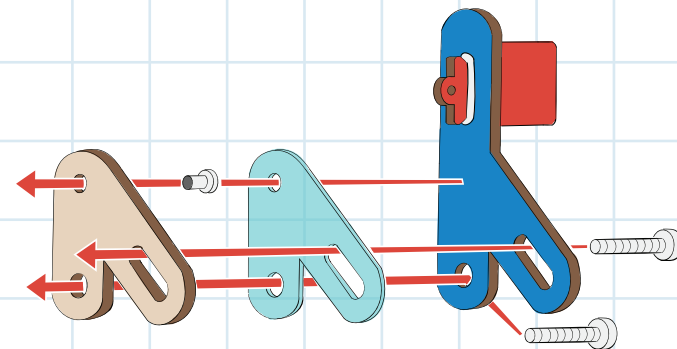
17



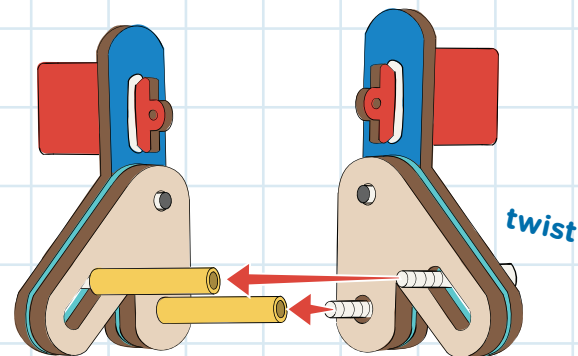
18



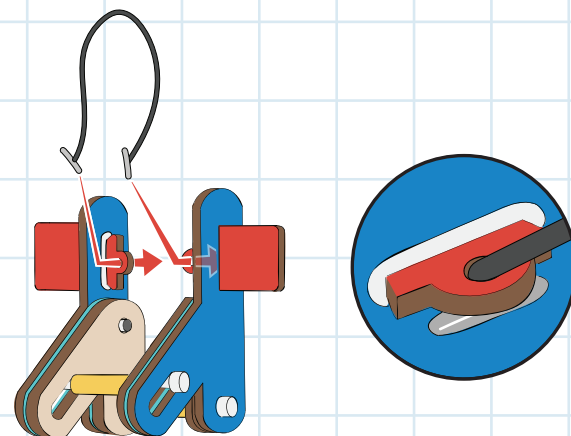
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20



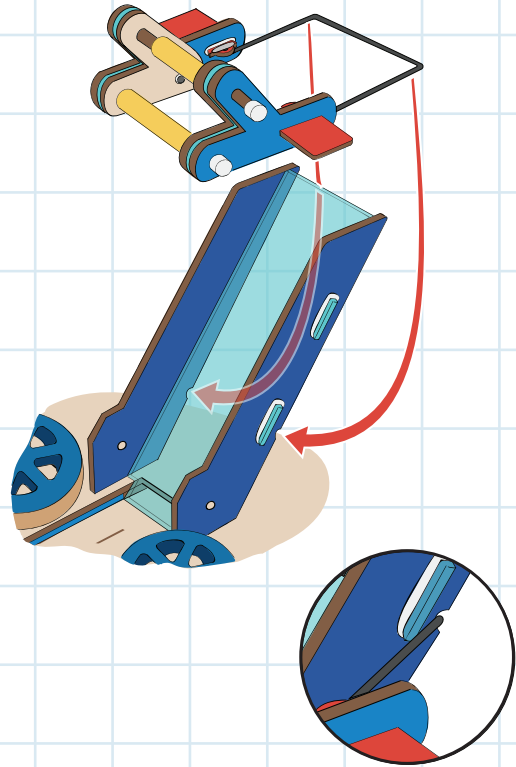
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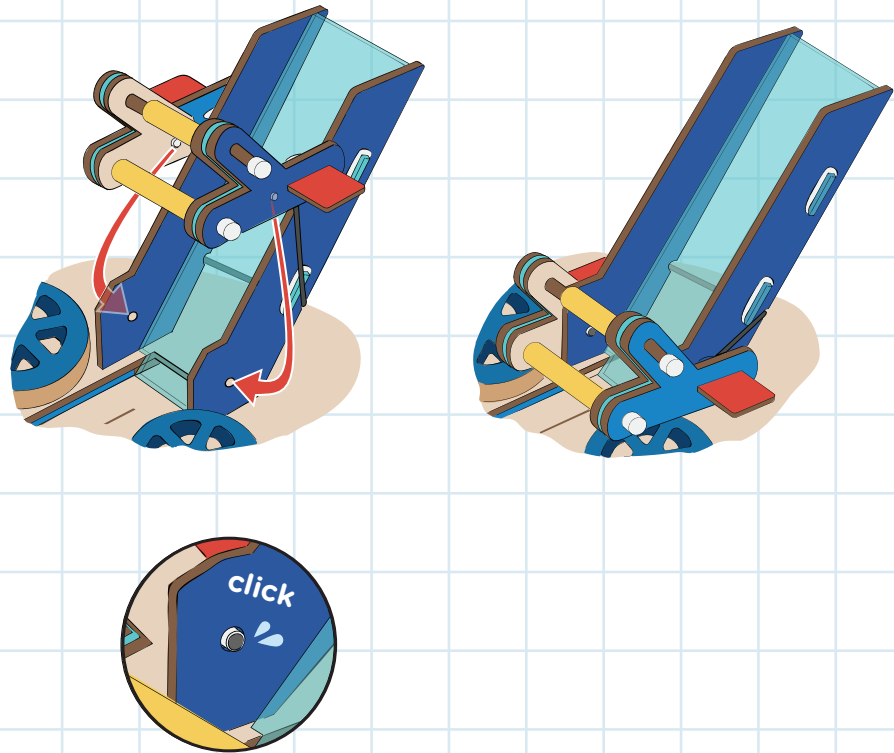
# BUILD

# BUILD

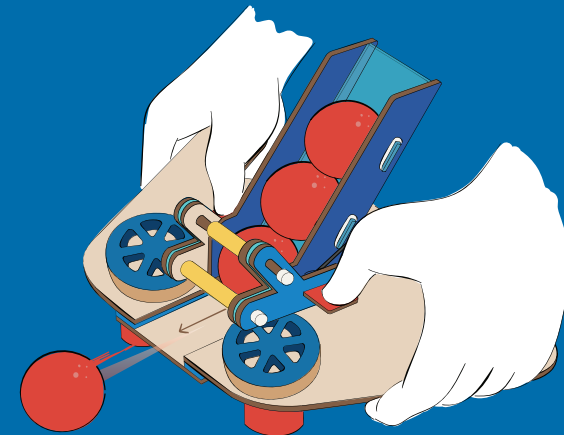
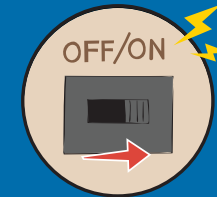
22



23

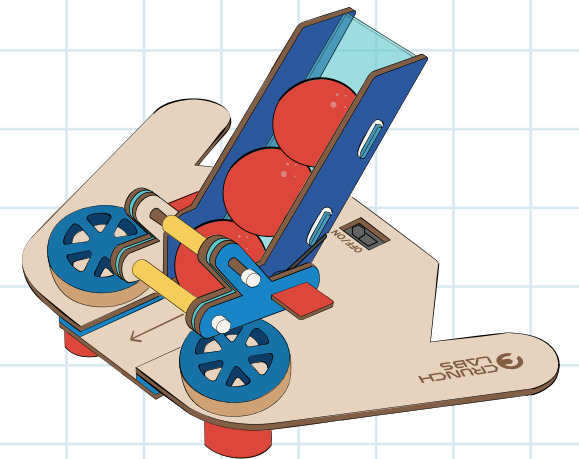


# TEST

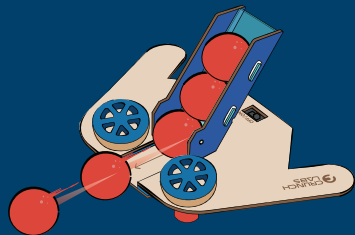


Having trouble? Watch the video at [crunchlabs.com/ball](https://crunchlabs.com/ball)

BUILT!

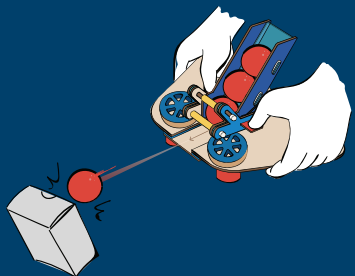


## PLAY



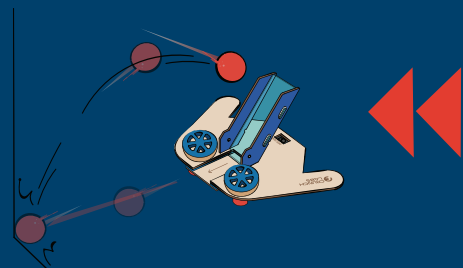
### SEMI-AUTO VS FULL AUTO

If you slide the yellow standoff upwards in its slot, you can turn your semi-auto ball launcher in to a full auto ball launcher!



### TARGET PRACTICE

Get creative and look for common objects that can be used as targets. Baskets and bins work great!



### BOUNCE AND CATCH

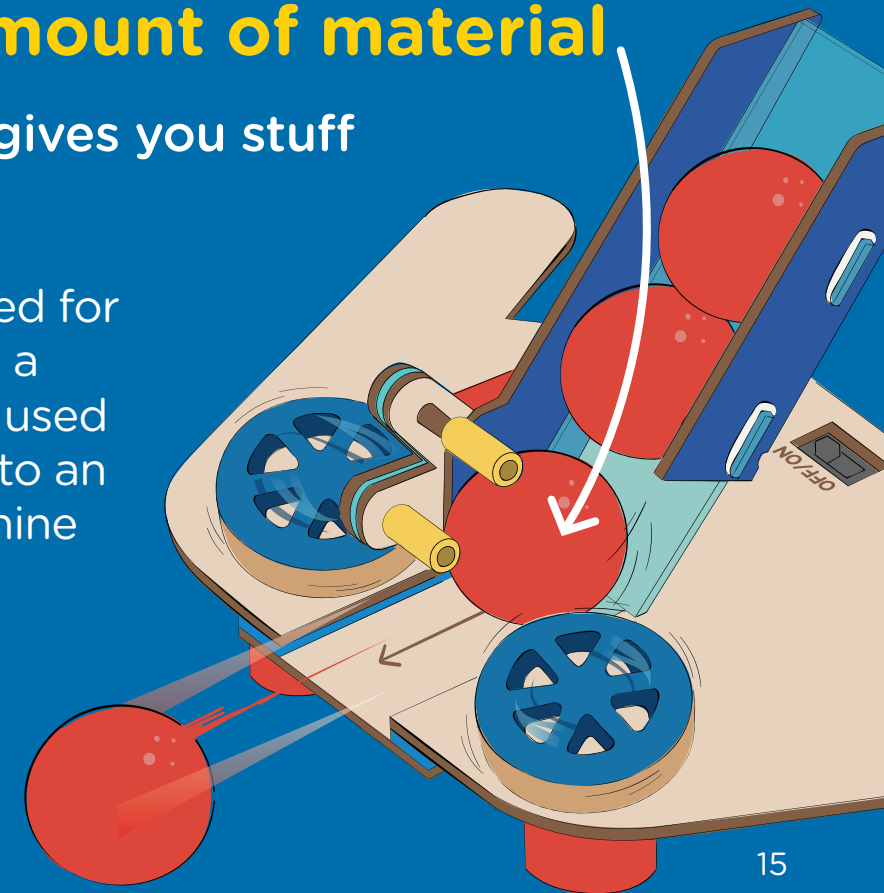
Place one ball in your launcher and aim at a nearby wall. See if you can bounce the ball off the wall and catch it back in your launcher.

## THINK

A dispenser is a mechanism that reliably releases a specific amount of material

Basically, it's a machine that gives you stuff one piece at a time.

Dispenser mechanisms can be used for solids, liquids, and even gasses. In a science lab, a dispenser might be used to add a certain amount of liquid to an experiment, while a vending machine might limit the amount of candy you get for each coin. Your ball launcher uses a dispenser to **limit the number** of balls that launch, each time you press the trigger.



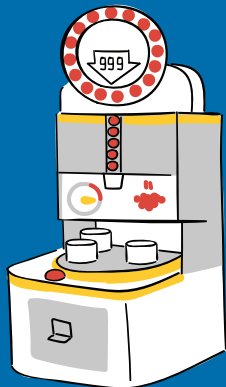
THINK

Find dispenser in other objects!



## VENDING MACHINE

Vending machines use lots of clever dispenser mechanisms depending on what they sell. Snack machines use motor driven corkscrews because they have to hold a wide variety of shapes. Gumball machines get away with using mechanical hoppers because they only have to dispense spheres.

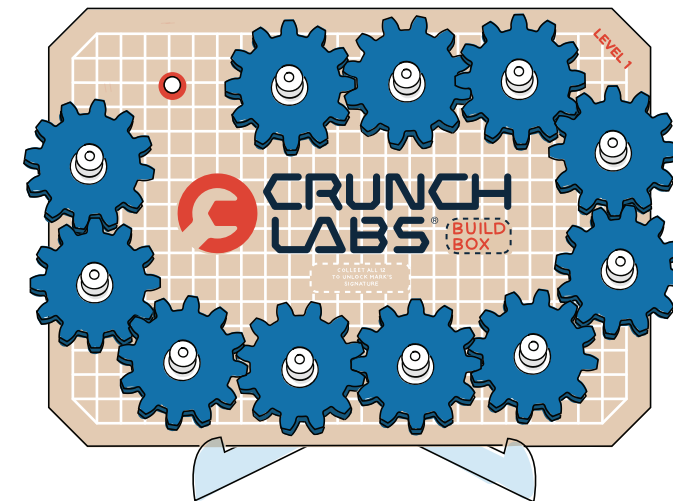


## ARCADE MACHINE

Mark once did a video about arcade machines and how they work. Lots of arcade machines use dispenser mechanisms for balls, tickets, and prizes. The dispenser in your ball launcher was directly inspired by a mechanism that appeared in Mark's video!

THINK

CONGRATULATIONS! You earned a gear badge for dispenser

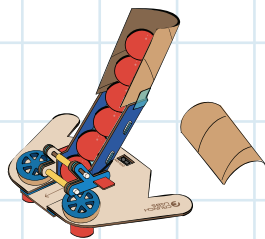


Don't forget to add your gear badge to your gear train!



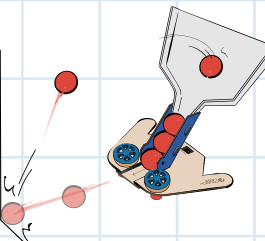
# CRUNCH

It's crunch time! Use your engineering superpowers to keep building.



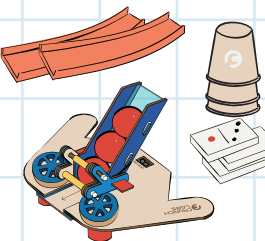
## EXTENDED MAGAZINE

Mod your ball launcher by adding an extended magazine! Cut a paper towel tube in half and use some rubber bands to attach it to your ball launcher.



## FUNNEL CATCH

Build a funnel and attach it to your launcher. See if you can bounce the ball off the wall and land back in the funnel. That way you can form a never ending loop.



## RUBE GOLDBERG MACHINE

Use your ball launcher as part of a rube goldberg machine!

# SHOW OFF YOUR BUILD



Share your funniest moments & coolest mods!  
**#crunchlabs @crunchlabs**    



**WARNING:** Improper assembly can short circuit batteries. Do not aim at face and eyes.

#### BATTERY SAFETY

Remove exhausted batteries. Do not mix old & new batteries. Do not mix alkaline, standard (carbon-zinc), or rechargeable batteries. Do not recharge non-rechargeable batteries. If using rechargeable batteries, remove them from the toy before charging. Rechargeable batteries should be charged under adult supervision. Do not short-circuit supply terminals. Do not connect this toy to a power supply greater than two AA batteries. **How to remove batteries:** 1. Remove screw and lid from battery pack. 2. Remove batteries. **How to insert batteries:** 1. Remove screw and lid from battery pack. 2. Insert two new batteries into the battery pack with correct polarity (+ and -). 3. Replace lid and secure the screw on the battery pack.

#### SWEEPSTAKES

**Each CrunchLabs build box contains the chance to WIN a trip to visit CrunchLabs with Mark Rober! Sadly, you are not a prize winner this time. Check inside your next build box for another chance to win.**

*Trip includes roundtrip transportation and two (2) night's hotel accommodations for a family of four (4). Approximate value: \$4,500. NO PURCHASE NECESSARY. Open to legal U.S. residents, 18 years of age or older. Void where prohibited. For complete Official Rules, including promotion end date and information on how to obtain a free game ticket, visit [www.crunchlabs.com/win](http://www.crunchlabs.com/win).*

This toy is intended for use by children over the age of eight years. These instructions contain important information, do not throw away.