Candy Vending Machine

ASSEMBLY VIDEO!

Scan this QR code to view a step-by-step assembly video and tips on how to build and use the Candy Vending Machine.

THAMES & KOSMOS

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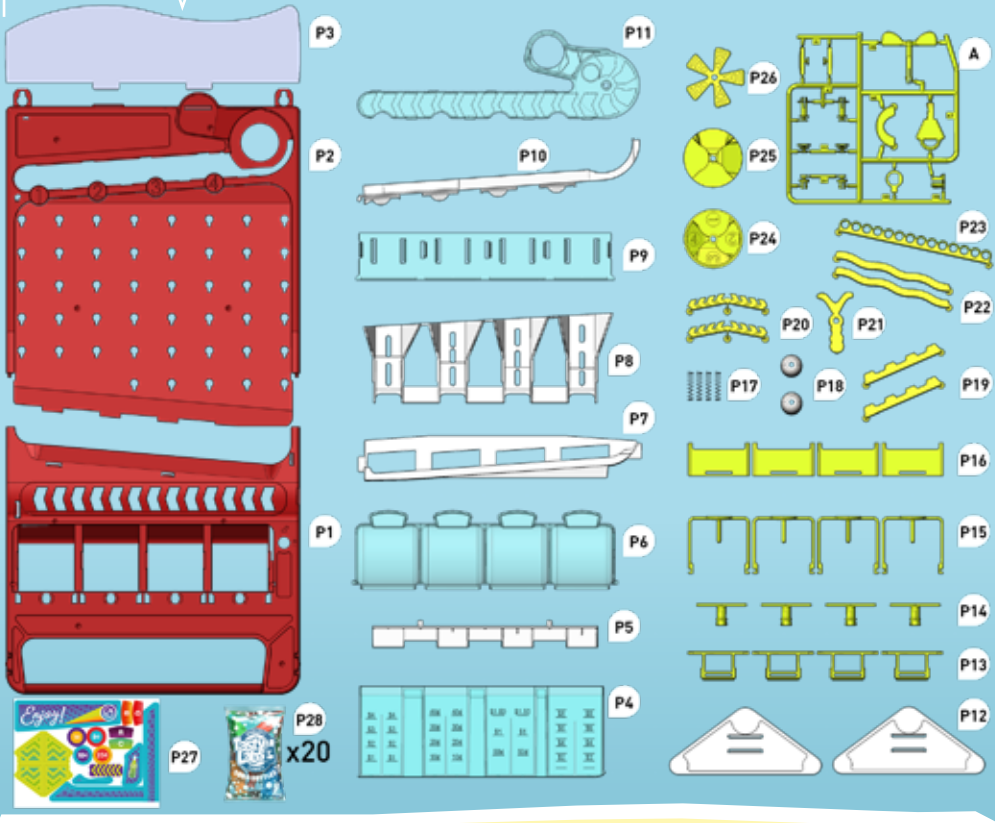
Thames & Kosmos, 89 Ship St., Providence, RI, 02903, USA | 1-800-587-2872 | www.thamesandkosmos.com

KIT CONTENTS

Good to know!
Do you have any questions or are you missing any parts? Our tech support team will be happy to help you!
support@thamesandkosmos.com
or 1-800-587-2872

What's inside your experiment kit:



Checklist:

YOU WILL ALSO NEED:
Coins (quarters, dimes, nickels, pennies), optional: screws or nails to hang on the wall

✓	No.	Description	Qty.
○	P1	Base bottom	1
○	P2	Base top	1
○	P3	Cardboard header	1
○	P4	Coin holder	1
○	P5	Slider base	1
○	P6	Prize window	1
○	P7	Coin sorter	1
○	P8	Coin funnel, front	1
○	P9	Coin funnel, back	1
○	P10	Coin ramp	1
○	P11	Coin ramp cover	1

✓	No.	Description	Qty.
○	P12	Foot	2
○	P13	Prize door coin slot	4
○	P14	Prize door button stopper	4
○	P15	Prize door button	4
○	P16	Prize door	4
○	P17	Spring	4
○	P18	Bell	2
○	P19	Pegboard ramp, medium	2
○	P20	Pegboard randomizer	2
○	P21	Pegboard pendulum arm	1
○	P22	Pegboard bumpy ramp	2

✓	No.	Description	Qty.
○	P23	Pegboard ramp, long	1
○	P24	Coin wheel, front	1
○	P25	Coin wheel, back	1
○	P26	Pegboard spinner	1
○	P27	Sticker sheet	1
○	P28	Soda-bottle candy packs	20
○	A1	Pegboard half circle	2
○	A2	Bell peg	2
○	A3	Peg	2
○	A4	Spinner peg	2
○	A5	Coin wheel crank	1
○	A6	Pegboard coin catch	1
○	A7	Key	1
○	A8	Lock, front	1
○	A9	Lock, back	1

TABLE OF CONTENTS

TIP

ADDITIONAL INFORMATION CAN BE FOUND ON PAGE 16 AND THE INSIDE BACK COVER.

WARNING !

Not suitable for children under 3 years. Choking hazard — small parts may be swallowed or inhaled. Keep the packaging and instructions as they contain important information.

Refer to the packaging for the nutritional information and the ingredients list for the candies.

Dear parents and adults,

Children as young as eight years of age can enjoy experimenting with the built Candy Vending Machine, but most children under ten will need some help building it. Regardless of their age, please support your child with advice and a helping hand, especially during tricky assembly steps. Before beginning, read the instructions together and discuss the safety instructions.

To prevent damage to the work surface on which your child is building, provide them with a mat or other surface protection.

When cutting the plastic parts out of the frames with the diagonal cutter or scissors, special care must be taken, not just because of the sharp edges on the tools, but also because the plastic parts can yield sharp edges or burrs. These can be removed with the help of the diagonal cutter or a nail file. Supervise your child when they are using the sharp tools until you trust that they can handle the tools independently.

We hope you and your child have a lot of fun building and playing with the Candy Vending Machine!

IMPORTANT TIPS

- **You must carefully cut the plastic parts out of their frames with diagonal cutting pliers (diagonal cutters) or scissors.**
- **Remove the parts from the frames only when they are needed.**
- **Remove excess material (burrs) from the parts before assembling them. Normal scissors do not cut as precisely as diagonal cutters, so if you only have those, you may need to file some of the rough edges down with a nail file or sandpaper.**
- **Assemble everything in the order shown. Don't jump ahead!**

Candy Vending Machine

You have probably seen **vending machines** that sell all sorts of things, from soda and snacks to electronics. Most vending machines exist in public places, and dispense goods without needing a store clerk to sell them. The money that enters the vending machine remains there until a vending machine technician comes to collect the money.

With this kit, you can build a **mechanical** vending machine that dispenses candy or other small prizes. Your machine requires no electricity or electronics — just simple machines and the power of your hand. You are both the customer and the technician! Your coins are automatically sorted and saved in the bank at the back of the machine. The best part? Change up the pegboard to create endless combinations of stunts and tricks. And you can learn cool engineering and physics concepts along the way.

COIN SLOT: PLACE THE COIN HERE TO START.

COIN WHEEL: THE COIN WILL MOVE INTO ONE OF FOUR SLOTS IN THE COIN WHEEL, WHICH DETERMINES WHERE THE COIN WILL ENTER THE PEGBOARD AREA.

RANDOMIZER: WILL YOUR COIN GO LEFT OR RIGHT?

BELL: MAKES A COOL SOUND WHEN A COIN HITS IT. THE BELLS CAN BE USED AS TARGETS.

PEGBOARD AREA: CREATE ENDLESS COMBINATIONS OF TRICKS, STUNTS, AND TRAPS.

COIN SORTER: SORTS THE COINS ACCORDING TO SIZE.

SPINNER: SPINS WHEN A COIN HITS IT.

COIN TRAP: WATCH OUT, YOUR COIN COULD GET STUCK!

PRIZE DOOR: WILL ONLY OPEN WHEN THERE IS A COIN IN THE SLOT. GO AHEAD, TRY IT!

LOCK: OPENS AND CLOSES THE PRIZE WINDOW FOR LOADING PRIZES.

PRIZE DOOR BUTTON: PUSH TO RELEASE THE CANDY!

FEET: PUT THESE ON IF YOU WANT YOUR MACHINE TO REST ON A SURFACE, OR REMOVE THEM IF YOU WANT TO HANG THE MACHINE ON A WALL.

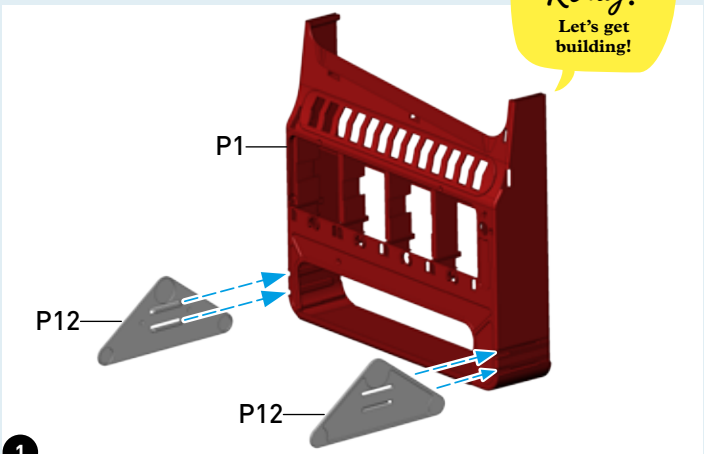
CANDY: YUM! SODA-BOTTLE CANDIES! YOU CAN ALSO LOAD IN YOUR FAVORITE SMALL CANDIES OR PRIZES.

CANDY VENDING MACHINE ASSEMBLY

ASSEMBLY VIDEO!

Scan this QR code to view a step-by-step assembly video and tips on how to use the Candy Vending Machine.

Ready? Let's get building!



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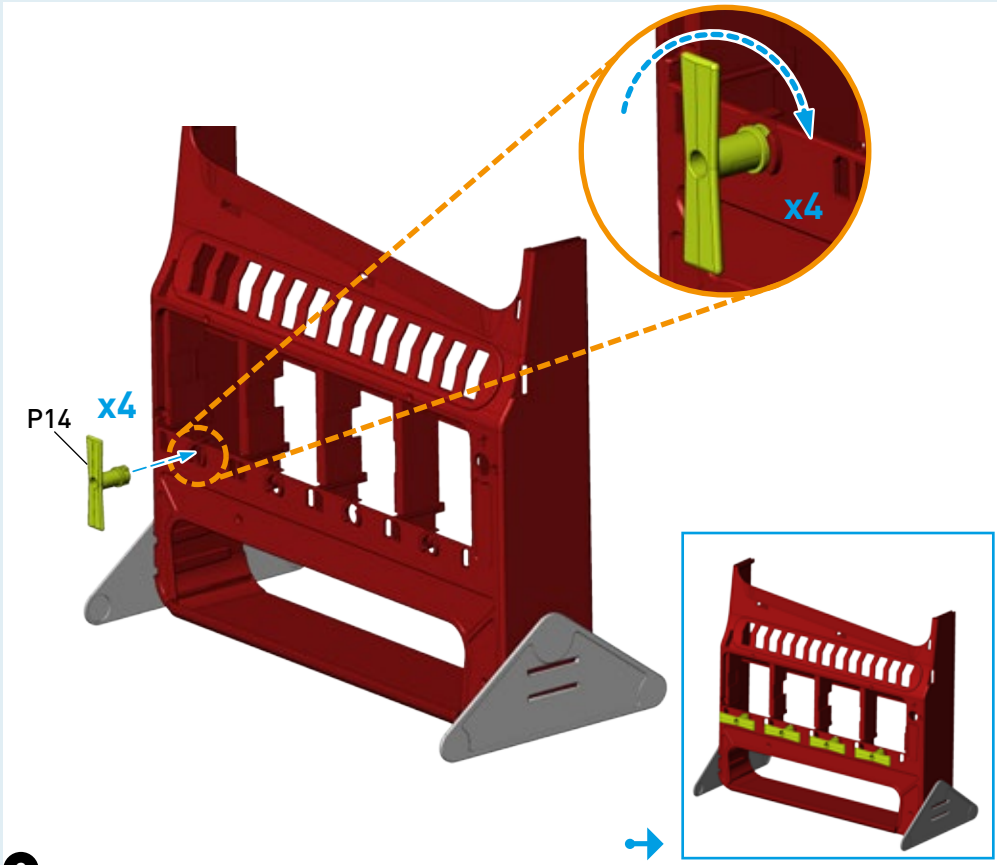

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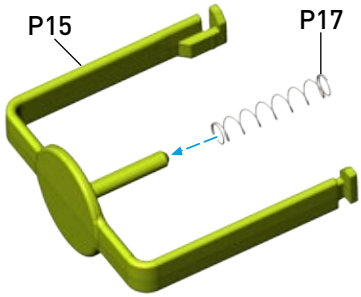

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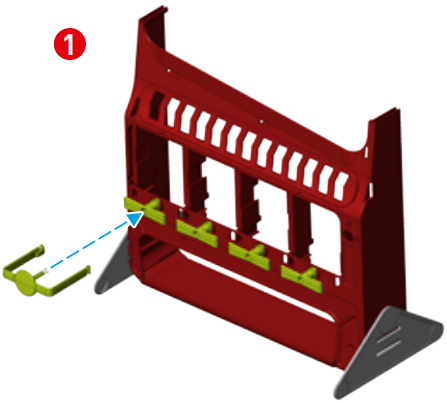
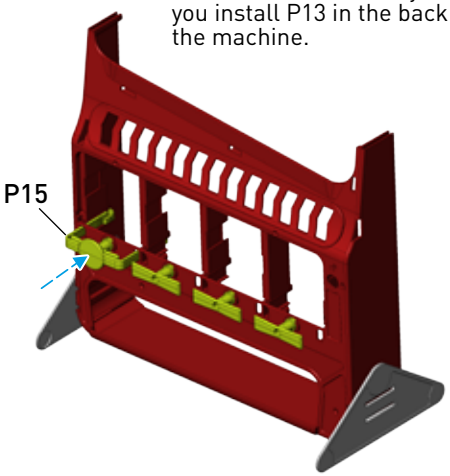
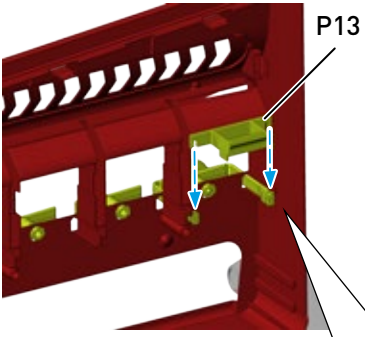


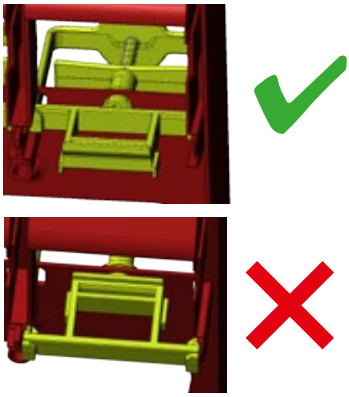
2 Push and hold the prize door button (P15) all the way in while you install P13 in the back of the machine.



3 Turn around.



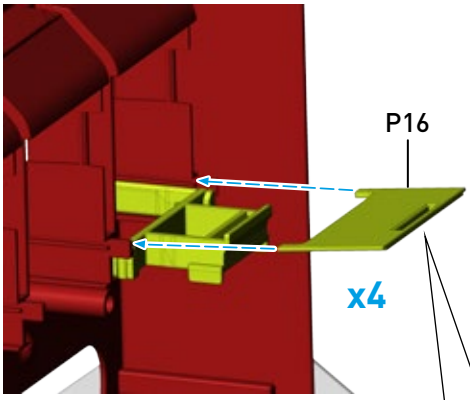
Pay attention to the orientation of P13:

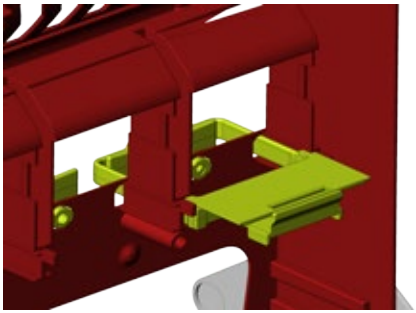


4 **Repeat 3 more times.**

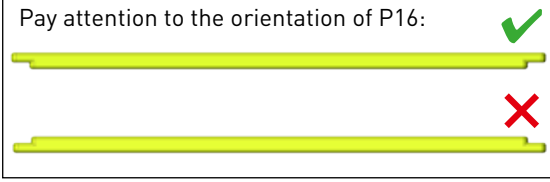
4

Push and hold the prize door button (P15) all the way in while you install P16 in the back of the machine.





Pay attention to the orientation of P16:



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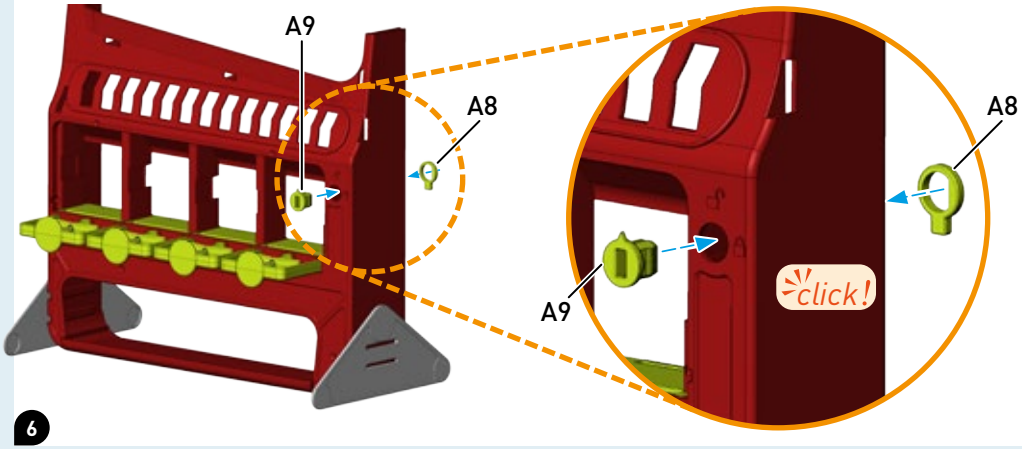
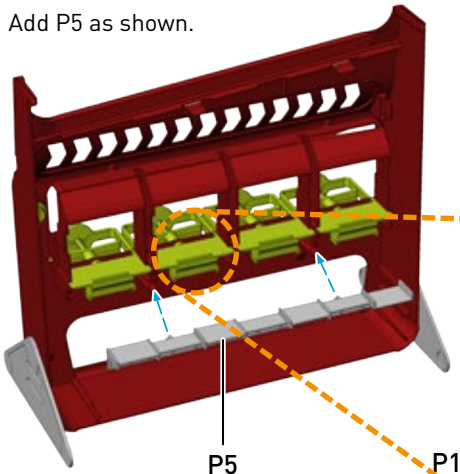
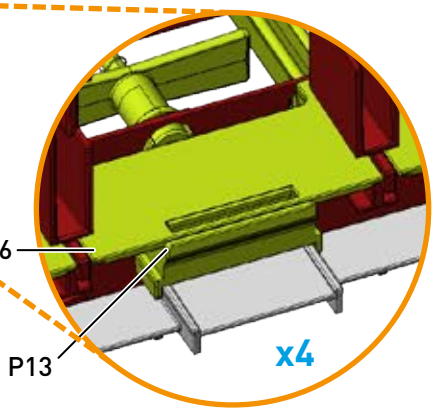


6

Add P5 as shown.



After adding P5, make sure the lip of P13 sits outside P16 on all four prize doors. You may need to make adjustments if P13 has slid below P16.



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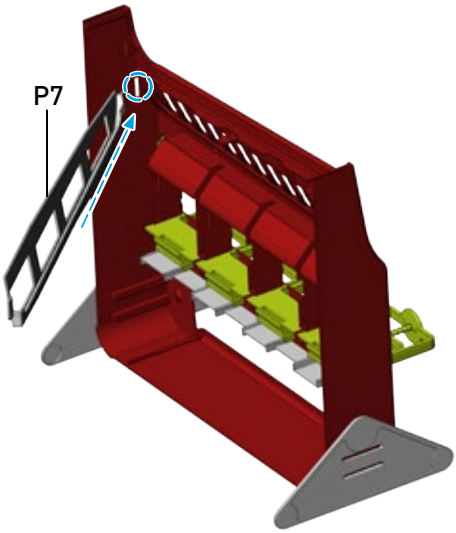
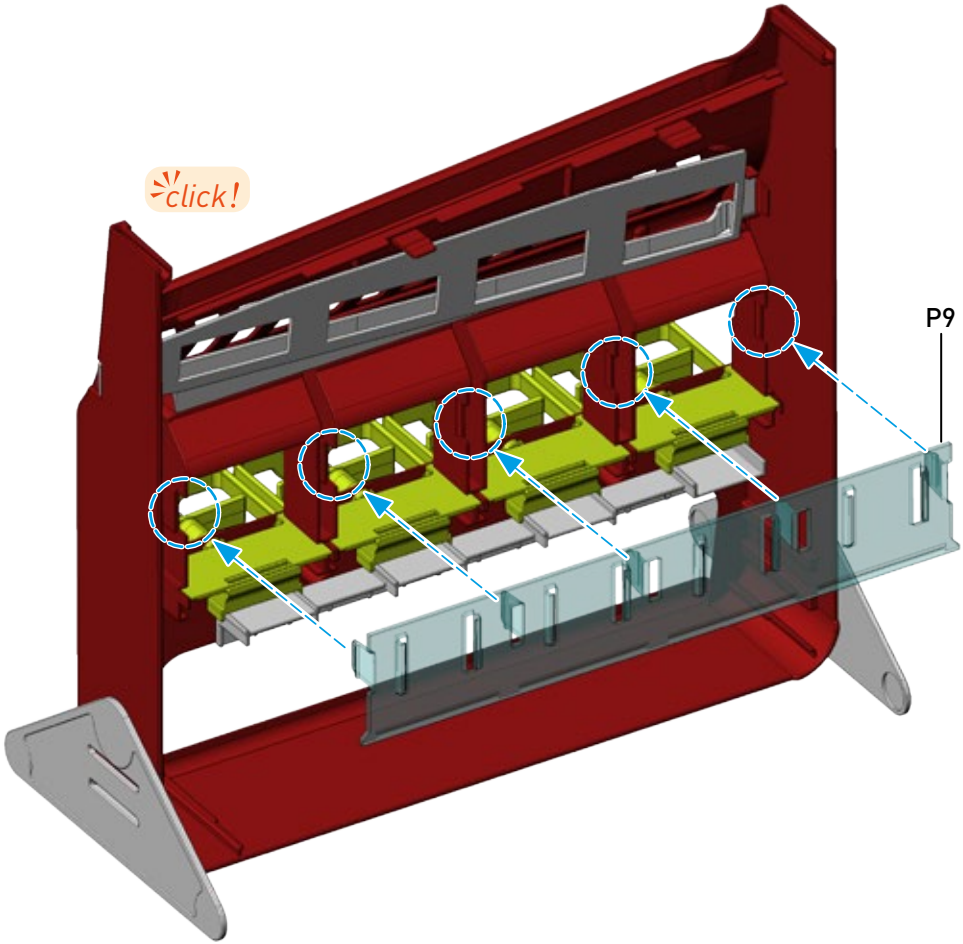


8

Make sure that P9 is securely clipped into place in P1 (there are five clips). Also make sure that the edges of P9 are flush with P1.



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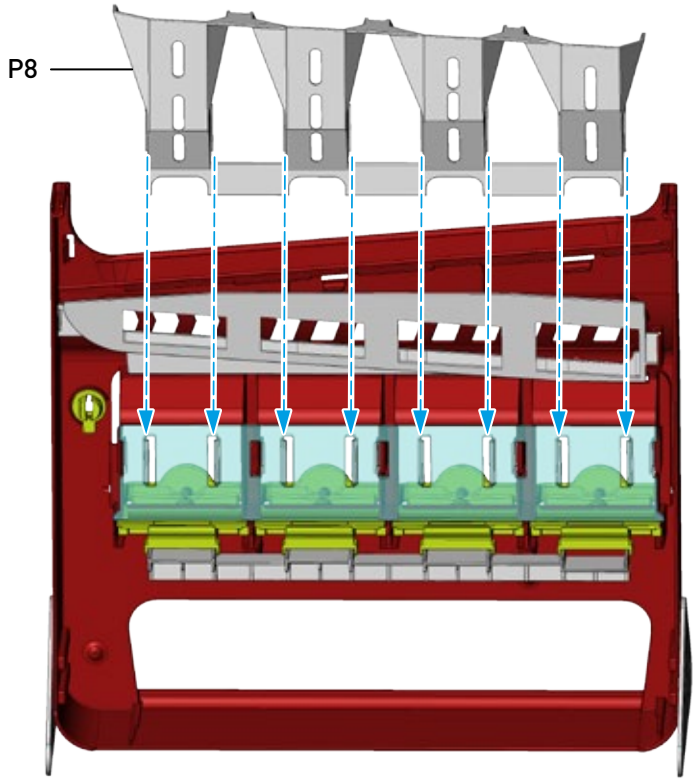
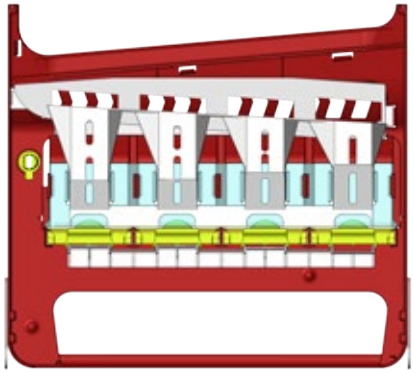
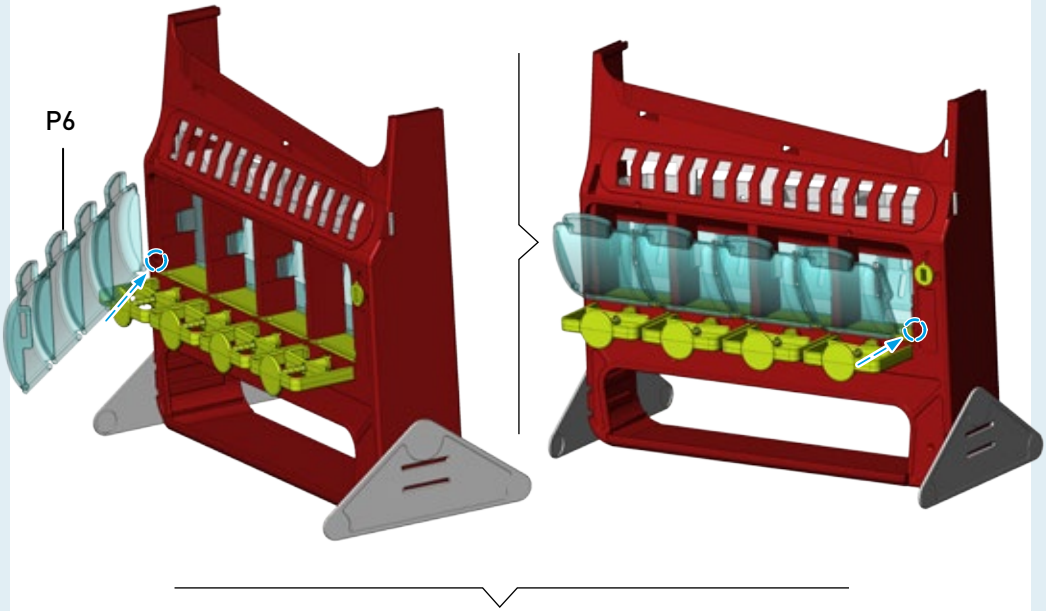
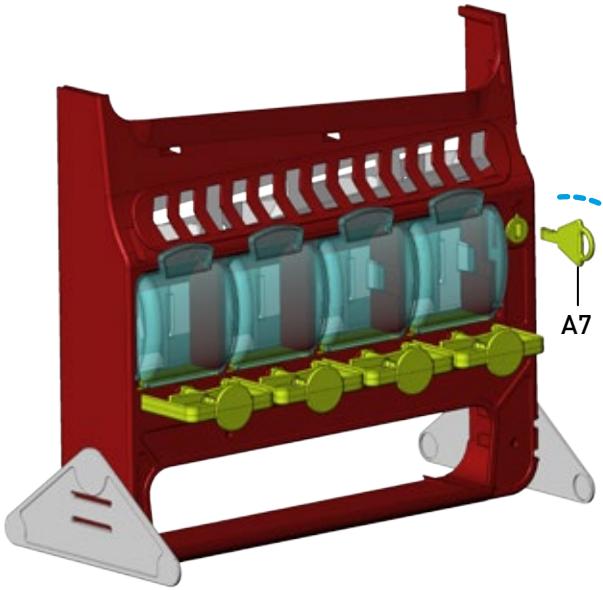

P8







Turn the key 90° clockwise to lock.

If you lose the key, you can use a flathead screwdriver.

Important: Pushing the prize door button will not open the prize door until there is a coin in the slot behind the door. Please finish assembly and then test this in the experiments starting on page 13.

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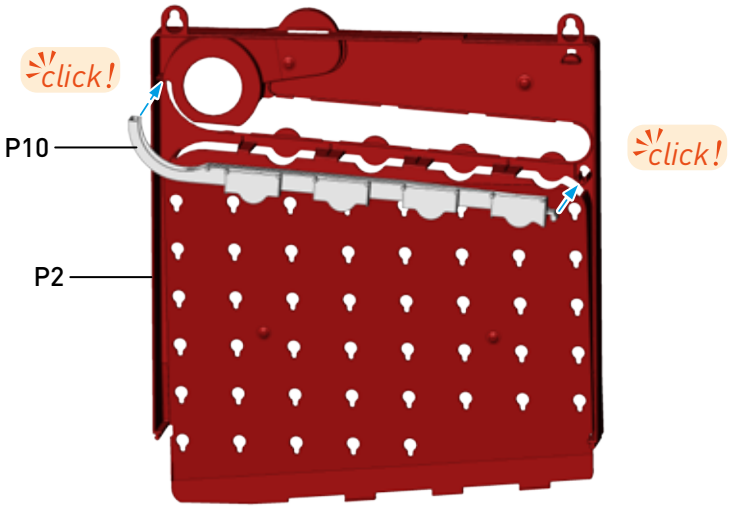

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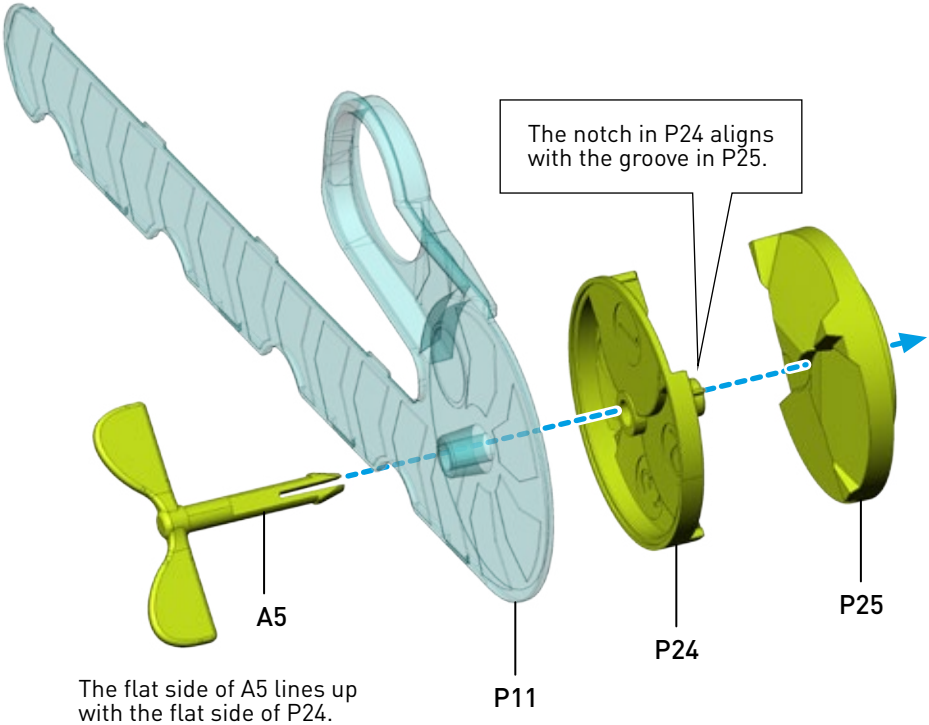
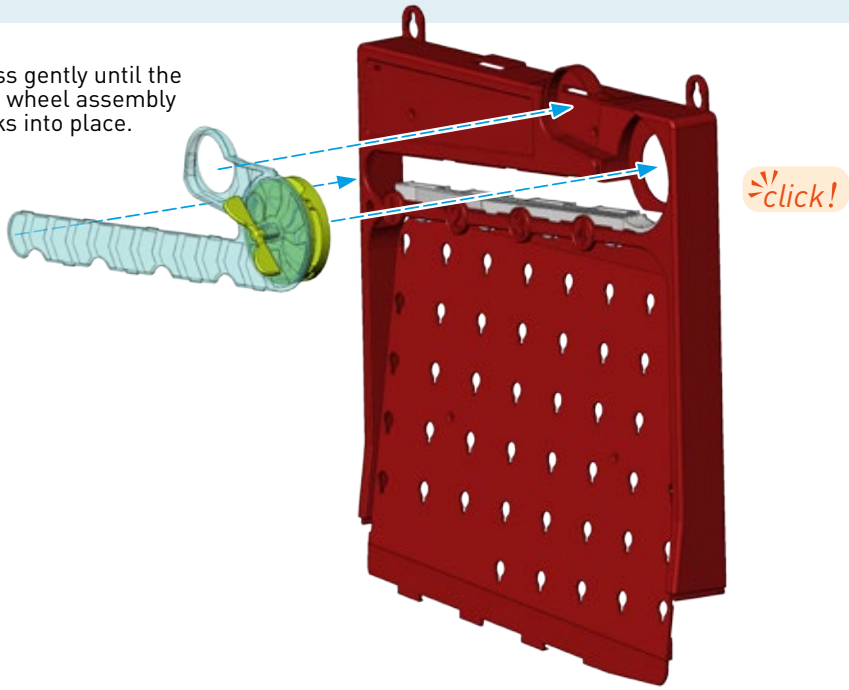


The flat side of A5 lines up with the flat side of P24.

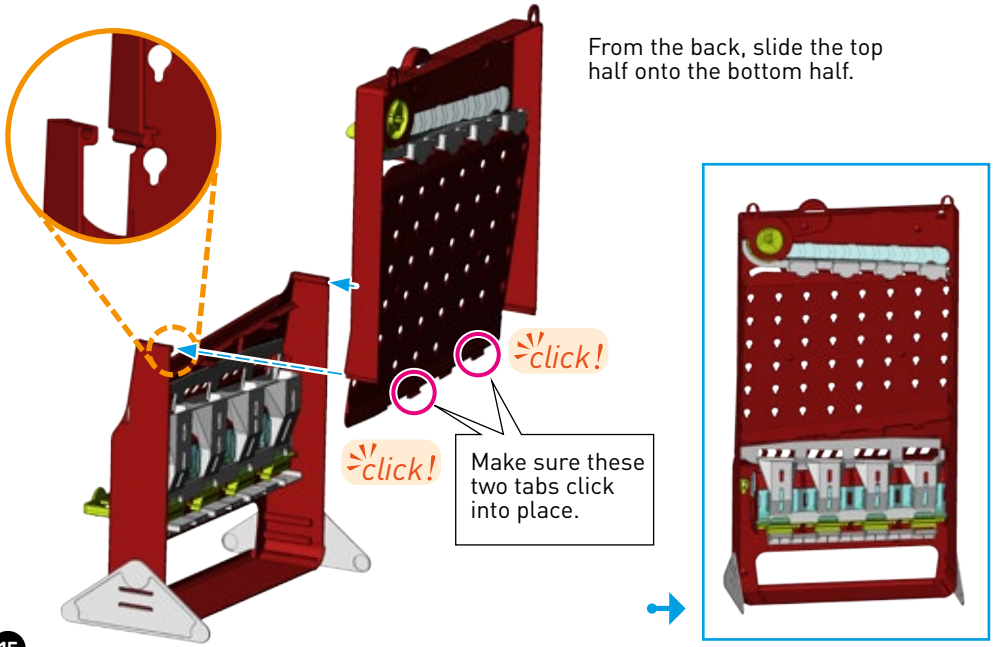
13

Press gently until the coin wheel assembly clicks into place.



14

From the back, slide the top half onto the bottom half.



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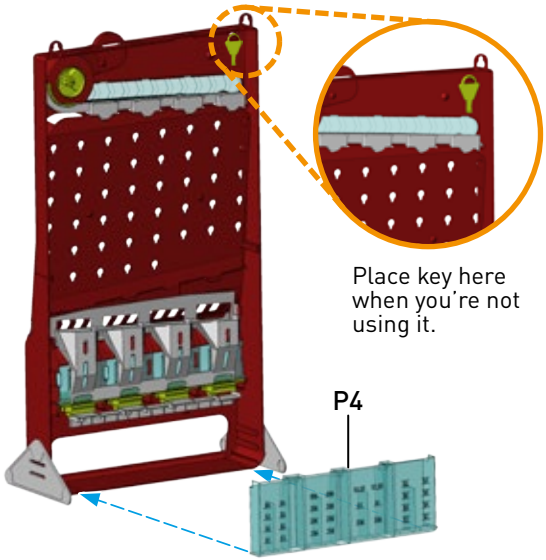
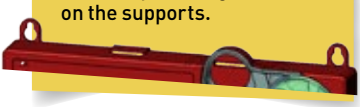


16

OPTIONAL STEP

When you are finished with the experiments on pages 13 – 15, you can hang the Candy Vending Machine on the wall.

First remove the feet. Then hold the machine level against the wall while you make pencil marks in the centers of the two loops at the top of the machine. Install screws or hooks on those marks. Finally, hang the Candy Vending Machine on the supports.



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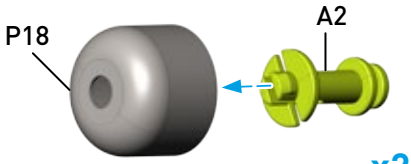

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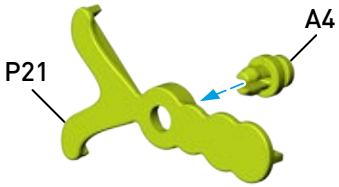

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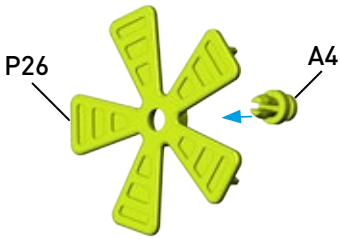

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EXPERIMENT 1

1. Place a quarter in the coin slot at the top of the machine and turn the crank clockwise. Which prize door does the quarter fall behind? Place the 25 ¢ sticker on that prize door button.
2. Repeat for a dime (10 ¢), a nickel (5 ¢), and a penny (1 ¢).
3. Add the rest of the stickers to the machine. Refer to the box.

So why is a dime *smaller* than a nickel and penny, even though it's worth more money?

When the new United States government established coins in the 1790s, the basic unit was the silver dollar, which was actually made of silver. The half-dollar, the quarter, and the dime were also made of silver. The dime had to be very small because it contained only one tenth of the amount of silver in a silver dollar. The penny and the nickel were introduced later. The U.S. Treasury decided to make these new coins out of cheaper metals: copper for the penny, and nickel for the nickel, so they could be larger and wouldn't get lost in people's pockets.

WHAT'S HAPPENING?

How does the coin sorter work? Look closely at the back of the machine, at part P7. What do you notice about the holes?

The holes get progressively bigger. Take a nickel (5 ¢) for example. As the nickel rolls down P7, it is too big to fall through the first and second holes. but when it gets to the third hole, it falls right through.

EXPERIMENT 2

1. Turn the coin wheel crank until the number 1 is lined up with the coin slot at the top of the machine.
2. Place a coin in the coin slot, then rotate the coin wheel crank clockwise. Where does the coin come out?
3. Repeat steps 1 and 2 with different coins. What do you notice?
4. Repeat steps 1 and 2, first lining up a different number on the coin crank.

WHAT'S HAPPENING?

At the top of the machine, you can use the numbers on the coin wheel to determine which slot the coin will drop out of. How does it work? Look closely at the back of the machine. Part P10 has four tracks for the coin to travel in. The track is determined by where the coin is placed in the coin wheel. To understand this mechanism, slowly rotate the coin wheel crank as you watch the back of the machine.

EXPERIMENT 3

1. Use the key to unlock the prize window, then fill each prize area with a soda-bottle candy pack or other prize. Then close and lock the prize window.
2. Before placing a coin in the machine, press one of the prize door buttons. Does the prize come out?
3. Now put a coin in the machine. When the coin reaches the bottom, press the prize door button where the coin landed. What happened?

What's going on here?

WHAT'S HAPPENING?

No coin, no candy! To understand the prize door mechanism, watch the back of the machine as you repeat steps 2 and 3 in slow motion. You might need to repeat several times to figure it out.

EXPERIMENT 4

1. Set up the pegboard as shown to the right.
2. Feed a coin into the #3 slot. Does it hit the bell? Now try feeding a coin into the #2 and #1 slots. What do you notice?

EXPERIMENT 5

1. Now experiment with feeding coins with different masses (quarter, dime, nickel, penny) into the same slot. What do you notice?

WHAT'S HAPPENING?

Experiments 4 and 5 demonstrate the properties of *projectile motion*. Coins that start at the top of the ramp build up speed as they roll down the ramp. By the time they get to the bottom of the ramp, coins that drop out of slot #1 are going faster than coins that drop out of slot #3. This horizontal speed remains constant, so the coins that drop out of slots #1 and #2 have enough speed to carry them to the left to hit the bell.

In the 16th century in Italy, Galileo Galilei performed an experiment: he dropped two spheres of different masses from the top of the Leaning Tower of Pisa. Both spheres hit the ground at the same time, which demonstrated that all objects fall to Earth with the same acceleration. That is the explanation for what you see in experiment 5.

EXPERT SETUP #1

EXPERT SETUP #2

CHALLENGE #1:

Use the pegboard pieces to create the ***slowest*** track possible. Use a stopwatch and compete with your friends to see who can maximize the time it takes for a coin to reach the prize door coin slot.

CHALLENGE #2:

Design a track where the coin hits ***both bells*** on the way down. Can you make a track where this works for all coins, no matter which slot they drop from?

CHALLENGE #3:

Create an ***impossible track!*** Frustrate your friends and family by setting up a track that does not allow coins to reach the prize slots, no matter where they start from.

Math with *Money*

Working with money is a great way to learn about many different math operations. Coins represent ***fractions*** of dollars. For example, a quarter, which is worth 25 cents, gets its name from being one quarter (1/4) of a dollar. That means four quarters add up to one dollar. Because a dollar is equal to 100 cents, the fractions represented by coins translate nicely to ***percentages***. A nickel, which is worth five cents, is 5% of a dollar. You can practice your addition and subtraction skills by making change, like a cashier does at a store. As you stack up change in the coin holder at the back of the Candy Vending Machine, use your skills to figure out how much money you have.

MANY WAYS TO MAKE A DOLLAR

There are many ways to make a dollar, and learning them will teach you about fractions, percentages, addition, subtraction, multiplication, and division.

"QUARTER"

25 CENTS
$0.25
1/4 DOLLAR

4 quarters add up to $1

$0.25 x 4 = $1.00

"DIME"

10 CENTS
$0.10
1/10 DOLLAR

10 dimes add up to $1

$0.10 x 10 = $1.00

"NICKEL"

5 CENTS
$0.05
1/20 DOLLAR

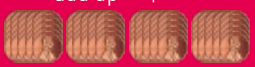
20 nickels add up to $1

$0.05 x 20 = $1.00

"PENNY"

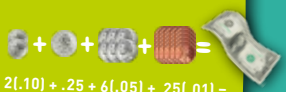
1 CENT
$0.01
1/100 DOLLAR

100 pennies add up to $1



$0.01 x 100 = $1.00

OTHER COMBINATIONS?



2(.10) + .25 + 6(.05) + 25(.01) =

$1.00

How many other ways to make a dollar can you think of?

CHECK IT OUT

WHAT CAN YOU BUY IN THE WORLD'S *Coolest* Vending Machines?

CRABS!

A vending machine in Shanghai, China keeps crabs cooled to a chilly 5° Celsius, the temperature at which they hibernate, so the crabs stay alive until they are sold.

PIZZA!

Got three minutes and a few extra bucks? In Europe, you can buy hot, fresh pizza out of a vending machine. For the best vending machine pizza, head to Italy, where the machine kneads fresh dough right before your eyes.

Art Vending North Adams, a vending machine outside of Mass MoCA.

ART!

Local artists in Massachusetts can sell their creations in this awesome art vending machine, conveniently located right outside an art museum. Prices range from $2 to $50. Artists apply to sell their work in the machine. One rule: the art must be small!

Sell your art!

Instead of candy, you can put your own small artworks into the Candy Vending Machine and sell them to your friends and family.

Invented by David Yakos, Streamline Design LLC
Text and editing: Hannah Mintz and Ted McGuire
Technical product development: Streamline Design LLC, Longshore, Hong Kong
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