BUILD YOUR OWN®

MARBLE RUN

WARNING!

- Use only under adult supervision and/or guidance - Only to be used by persons capable of understanding the safety aspects concerning misuse of the product.
- Recommended age 8+ NOT suitable for children under 3 years
- Small parts could be a choking hazard
- Retain these instructions for future reference
- DO NOT leave the marble run unattended, especially with younger children who may not be familiar with the risks mentioned above.
- Always count and pack up the marbles after use

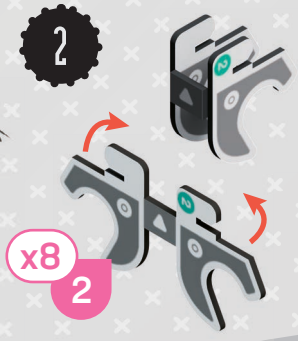
INSTRUCTION BOOKLET 1

Yo! Use the removal tool to push out the smaller bits of card!

1

Fold along all crease lines to prepare for next steps

2



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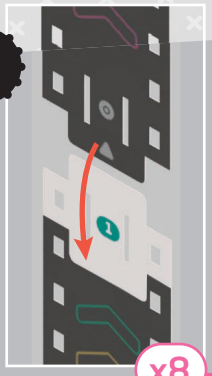

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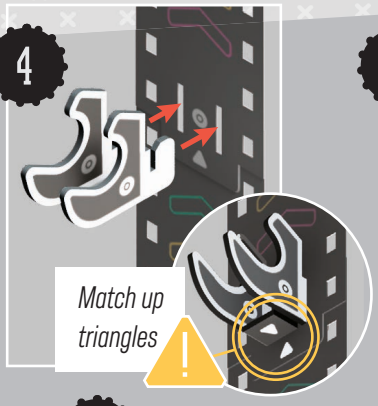
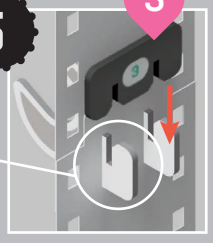


Match up triangles

5

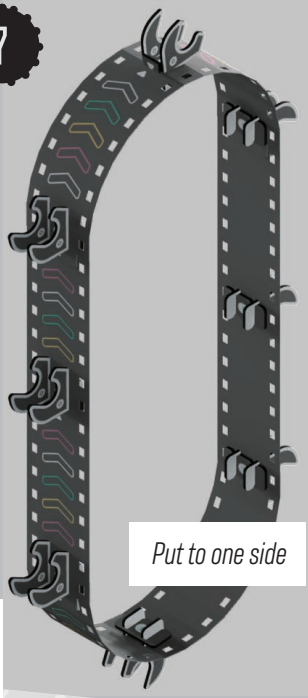


IMPORTANT
Ensure you push piece 2 <u>all the way</u> through

6

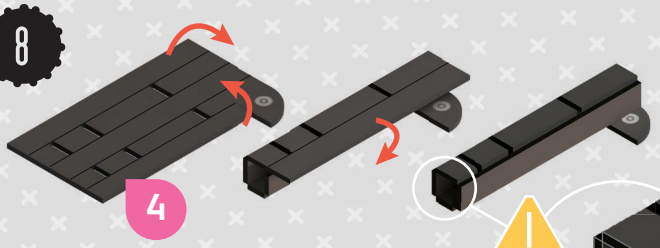
Repeat steps 4-6 with all 8 hooks

7



Put to one side

8

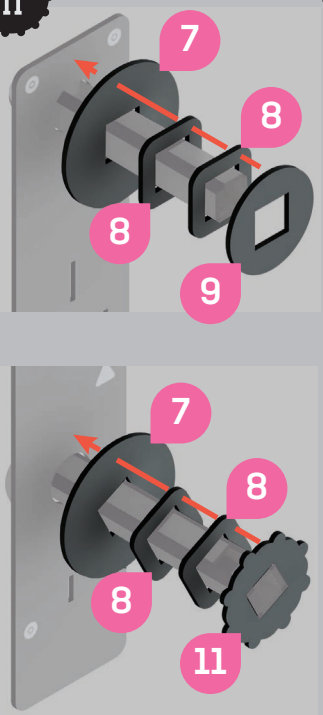


9

Shortest side folds inside

10

11



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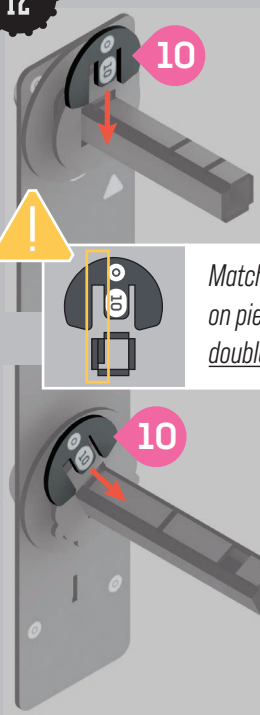
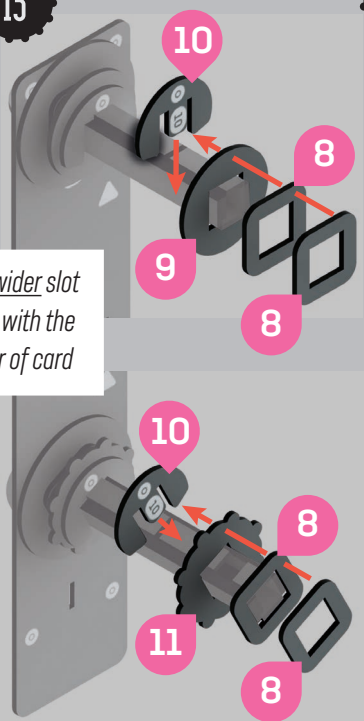


Match the <u>wider</u> slot on piece **10** with the <u>double</u> layer of card

13



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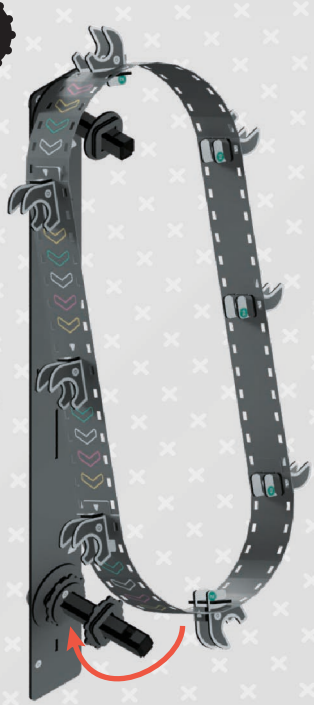
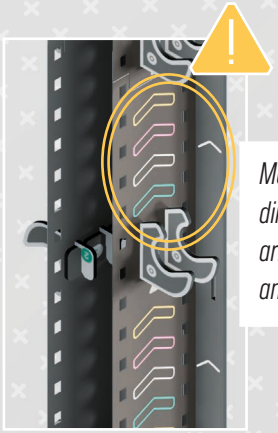
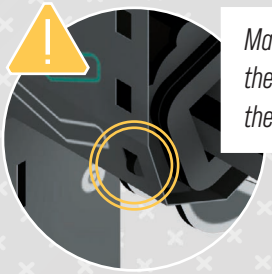


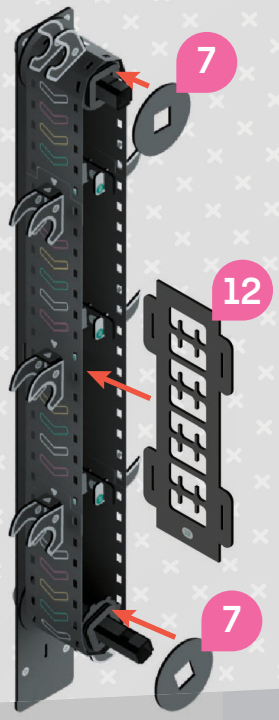


Match the direction of the arrows on the belt and side panel



Make sure the teeth on the gear slot through the holes in the belt

16



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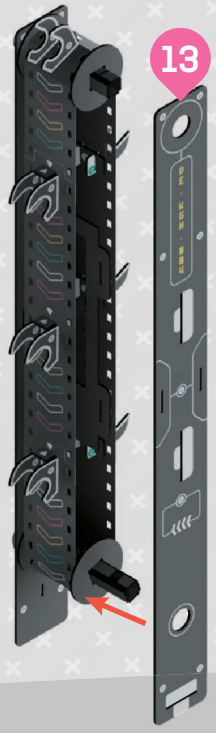

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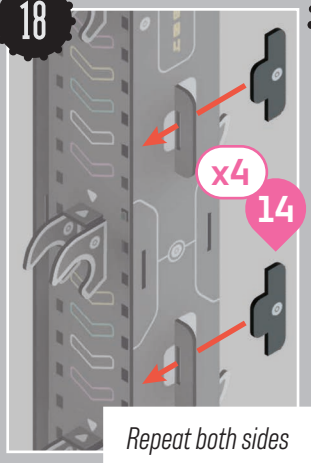
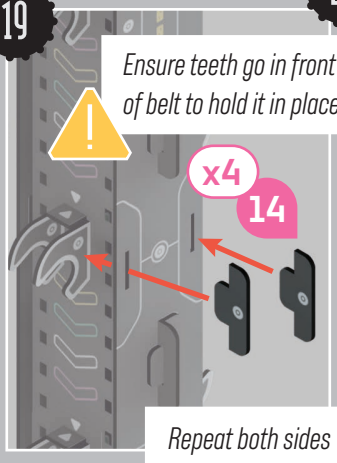


Repeat both sides

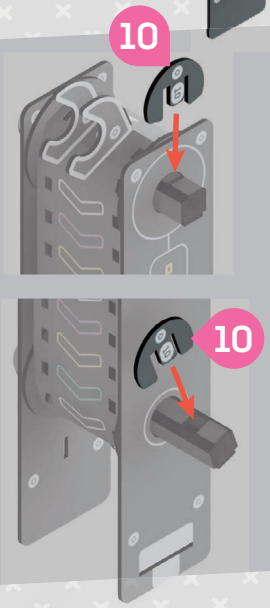
19



Ensure teeth go in front of belt to hold it in place

Repeat both sides

20



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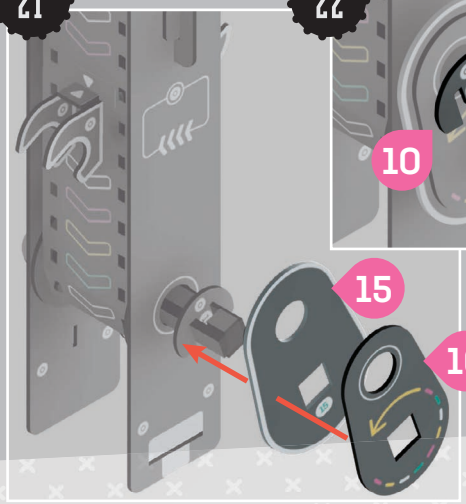

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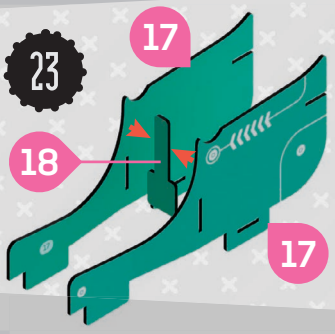

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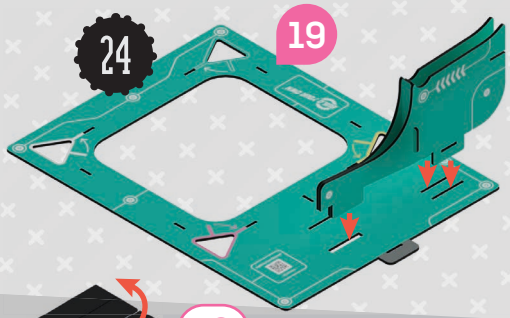

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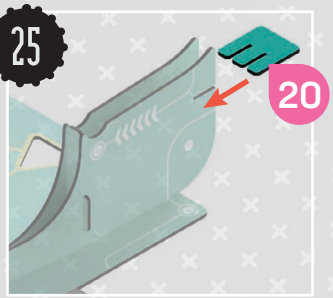

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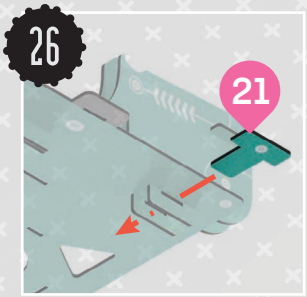

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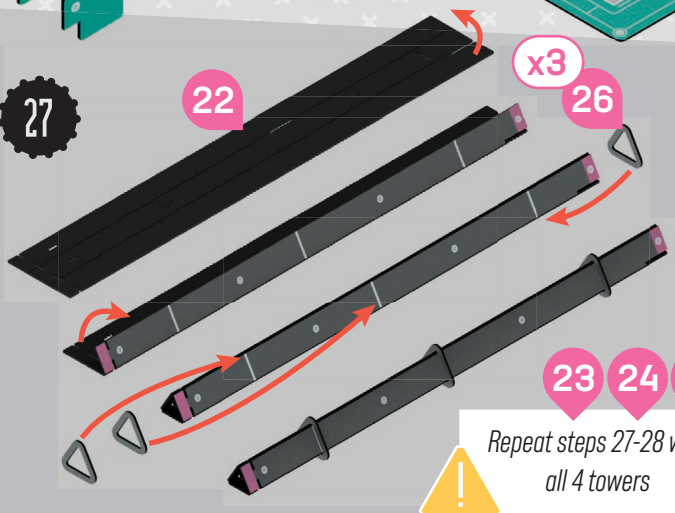
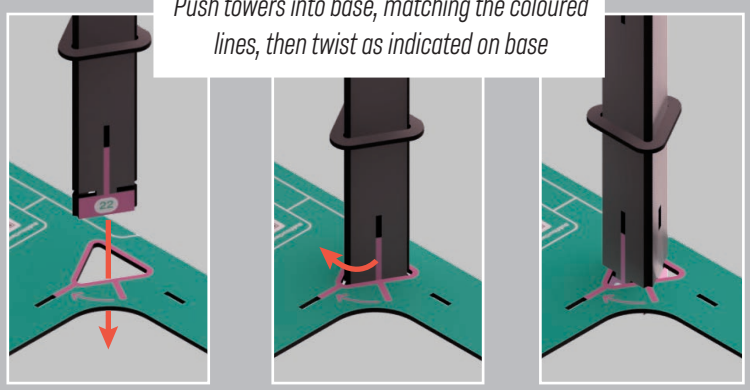


Repeat steps 27-28 with all 4 towers

28

Push towers into base, matching the coloured lines, then twist as indicated on base



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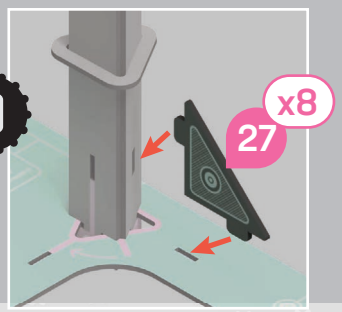
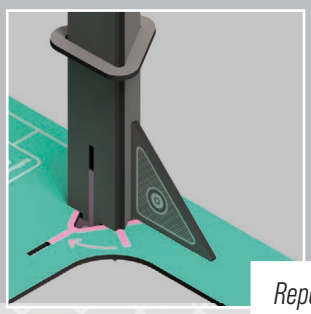
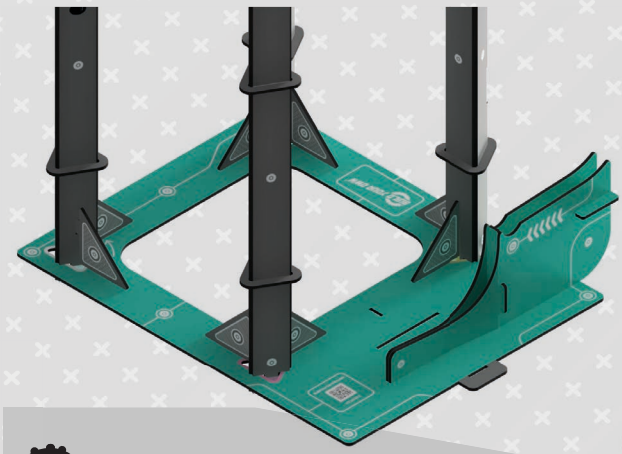




Repeat for all towers

30



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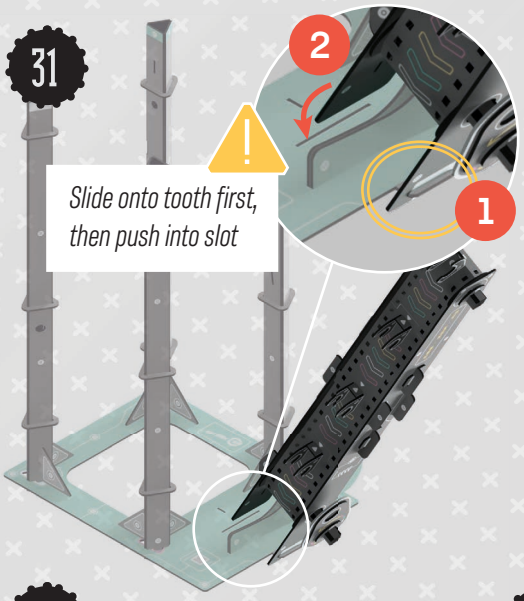
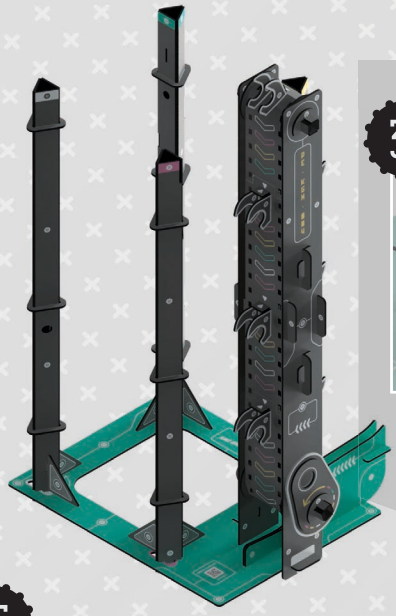


Slide onto tooth first, then push into slot



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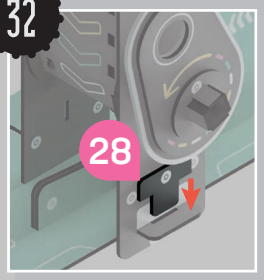

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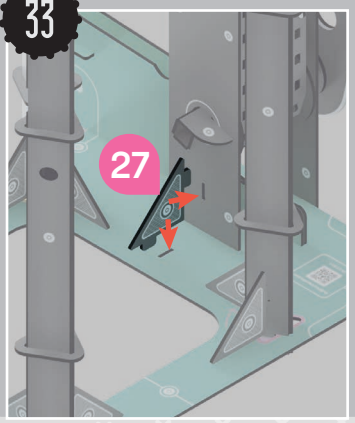

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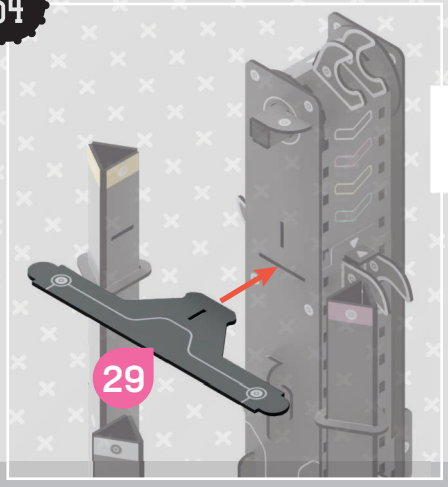

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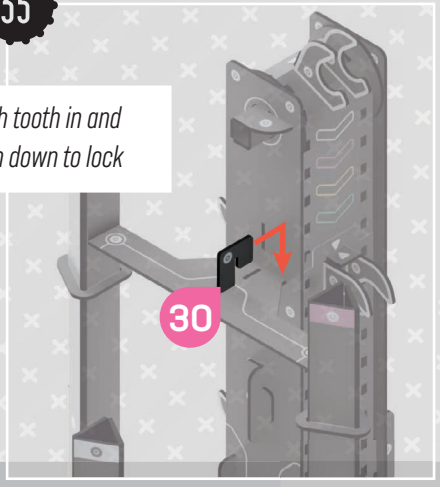
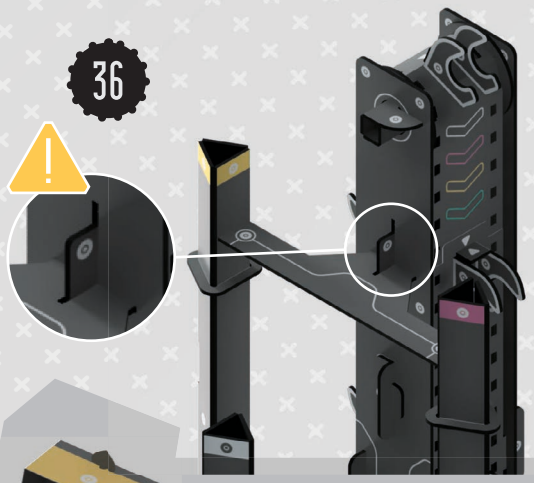


Push tooth in and then down to lock

36



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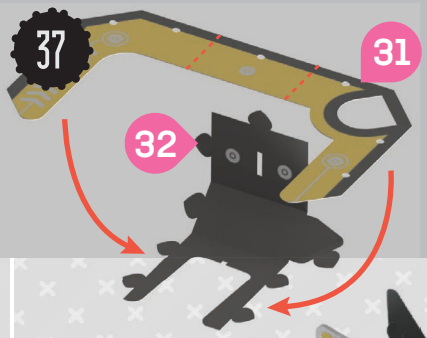

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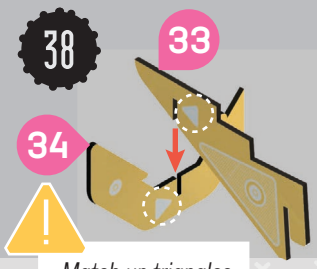
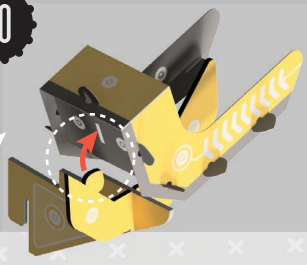


Match up triangles

39

40



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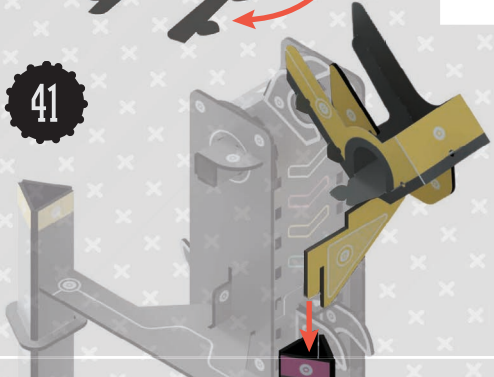

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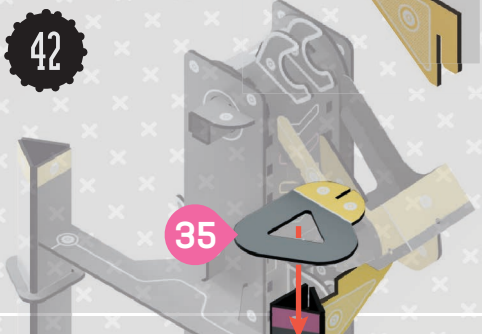

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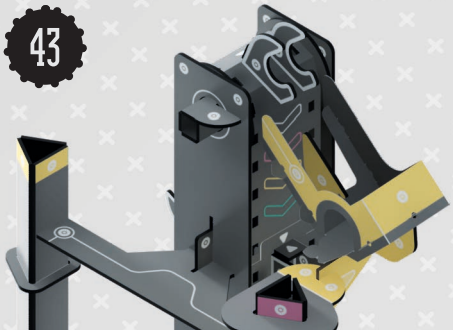

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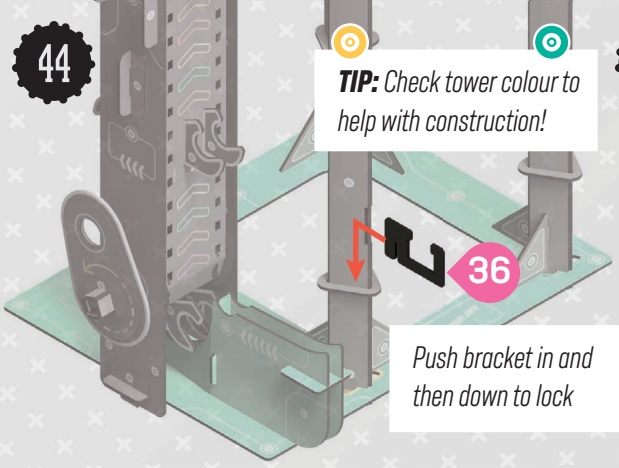
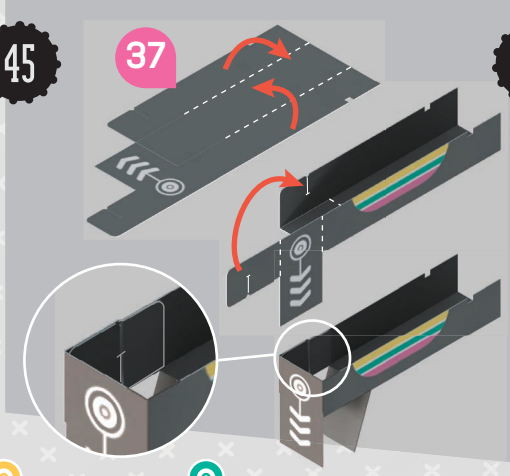


TIP: *Check tower colour to help with construction!*

Push bracket in and then down to lock

45



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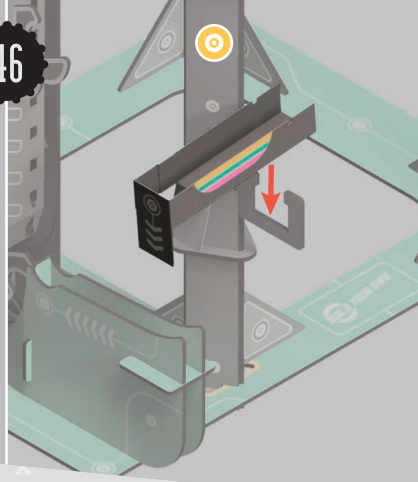

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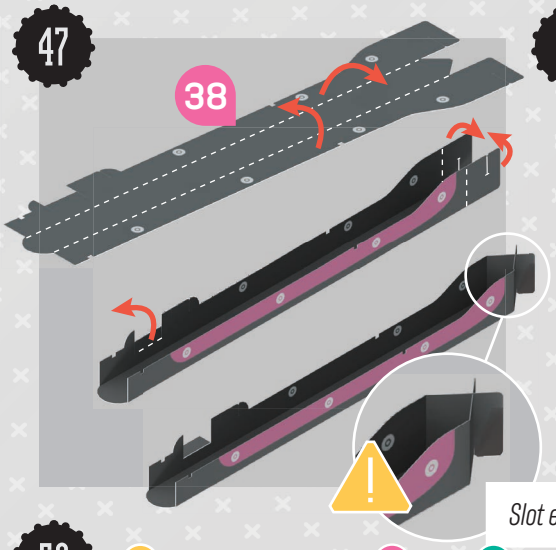

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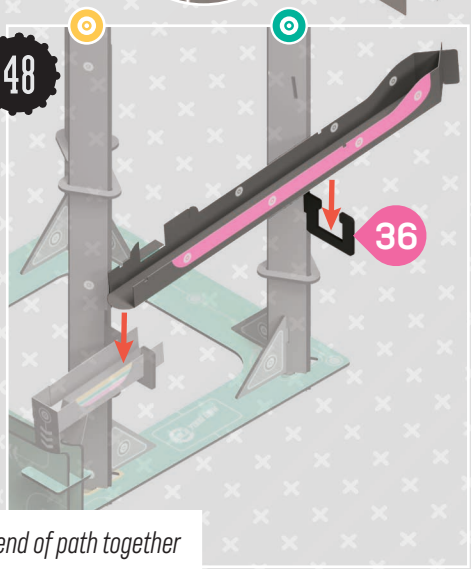
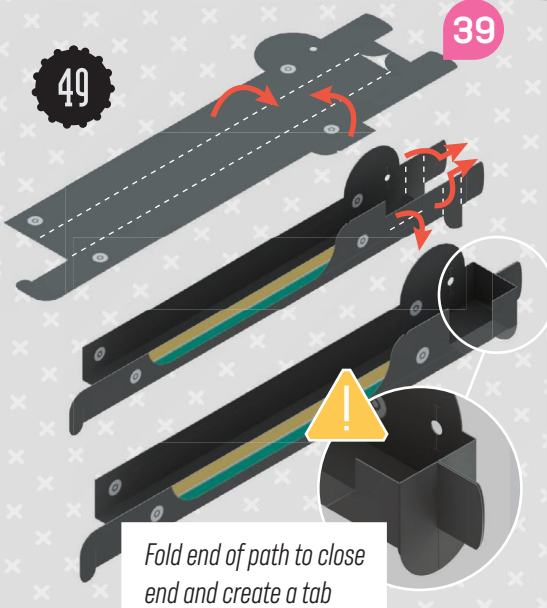


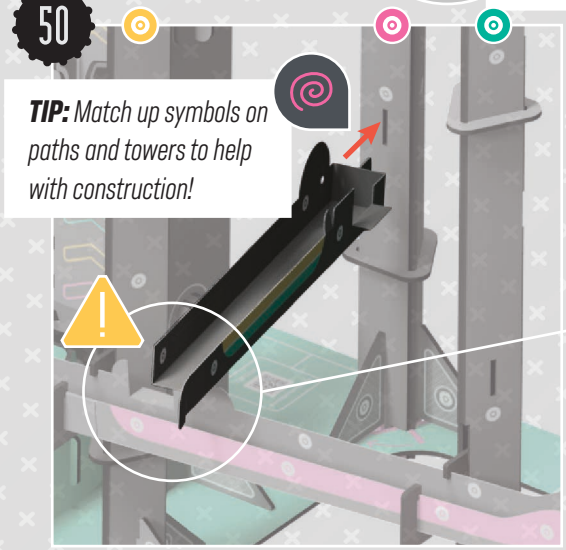
Slot end of path together

49



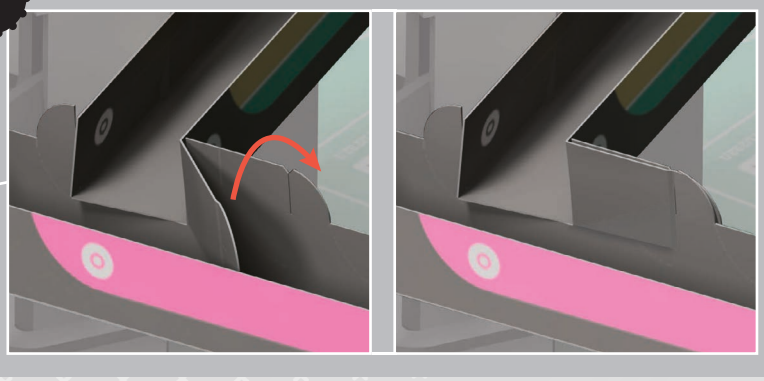
Fold end of path to close end and create a tab

50



TIP: *Match up symbols on paths and towers to help with construction!*

51



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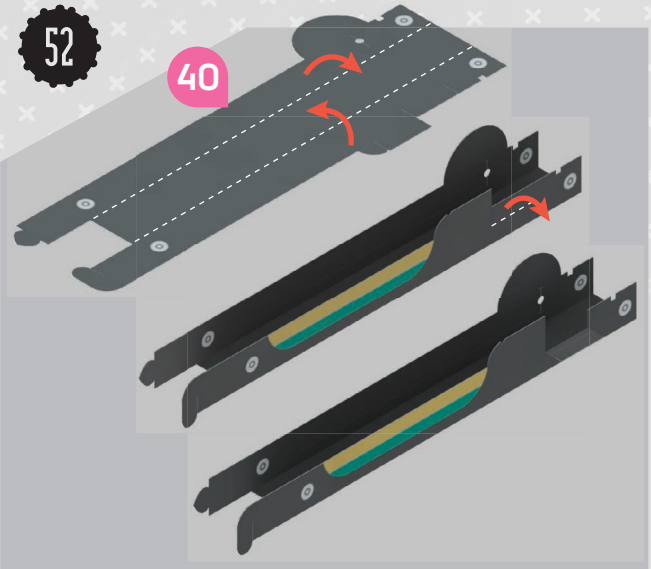

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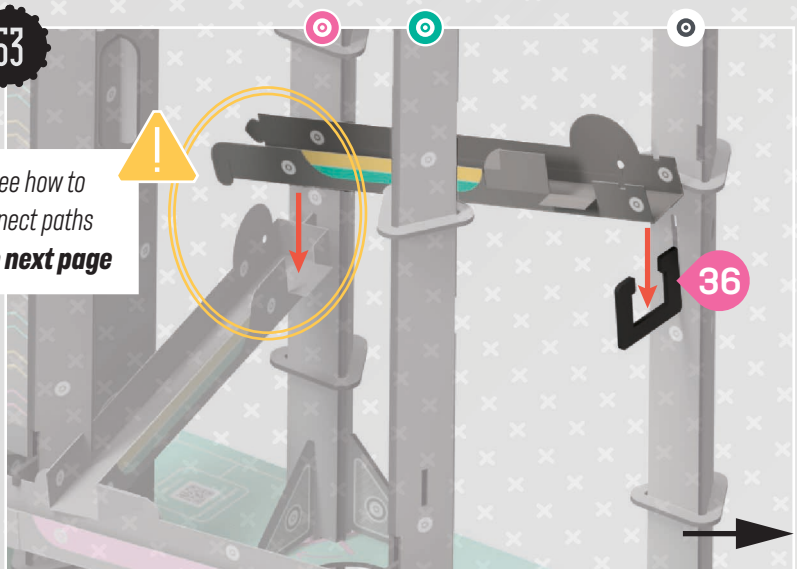

To see how to connect paths ***see next page***

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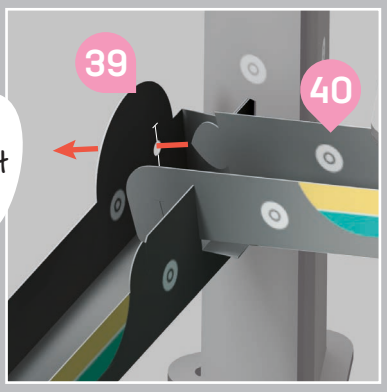
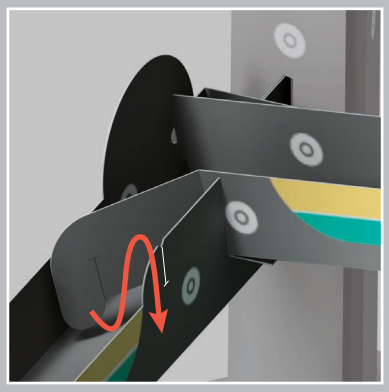
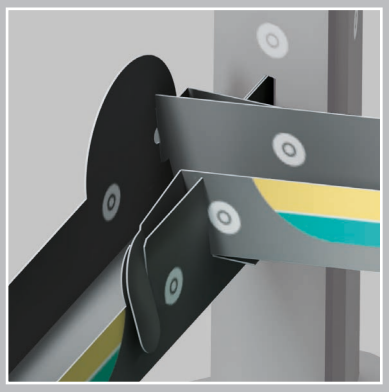
Yo! Use this same method to connect all paths!







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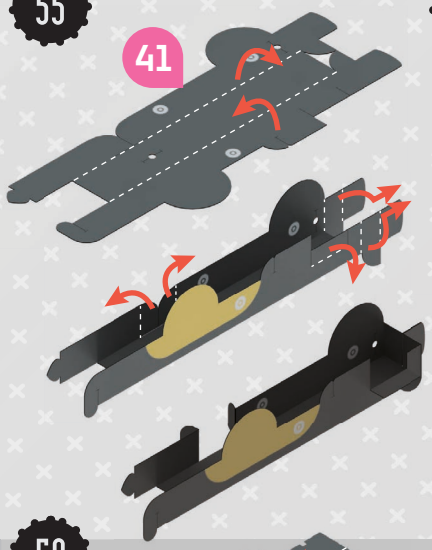

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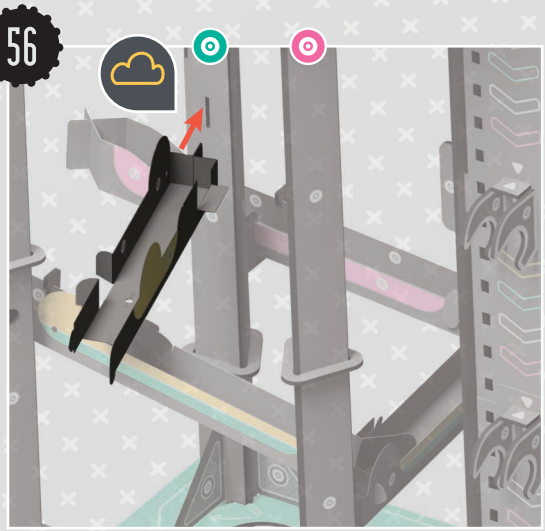

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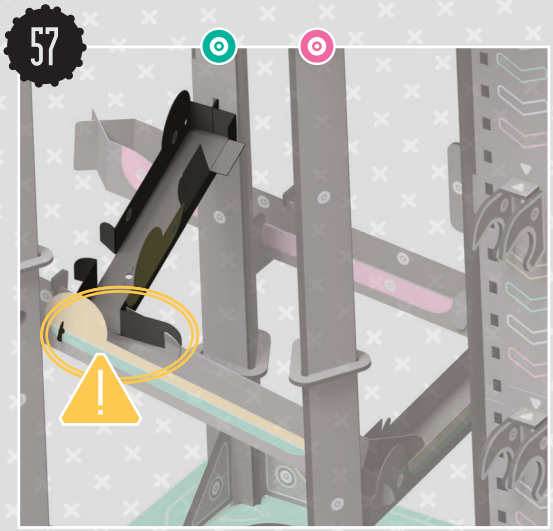

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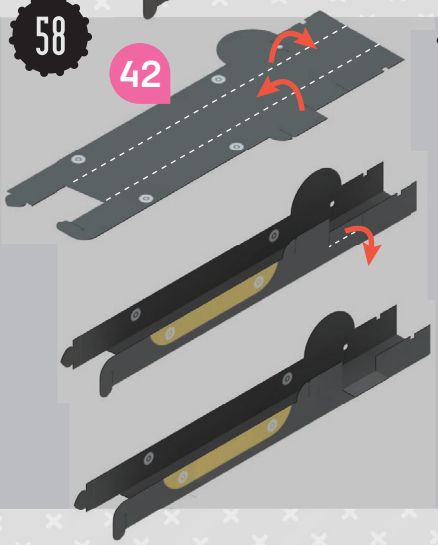

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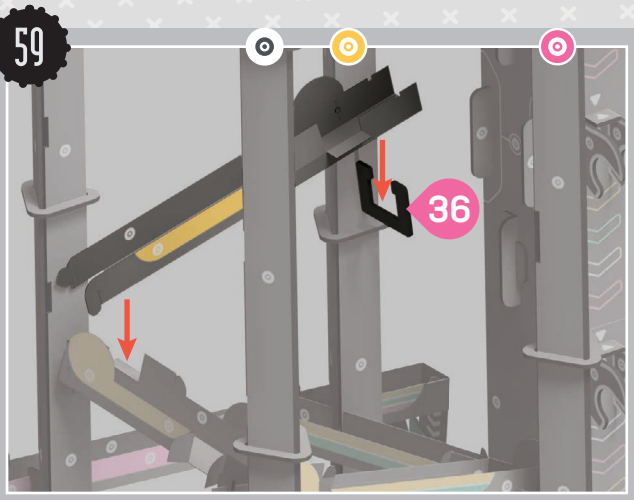

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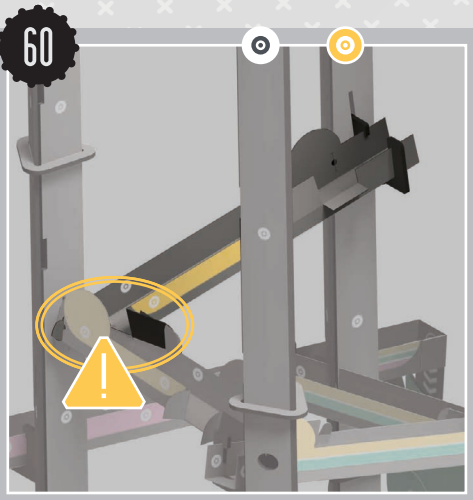

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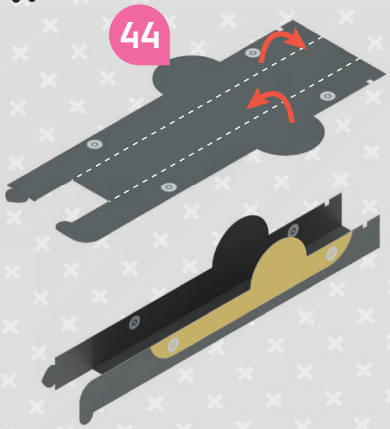

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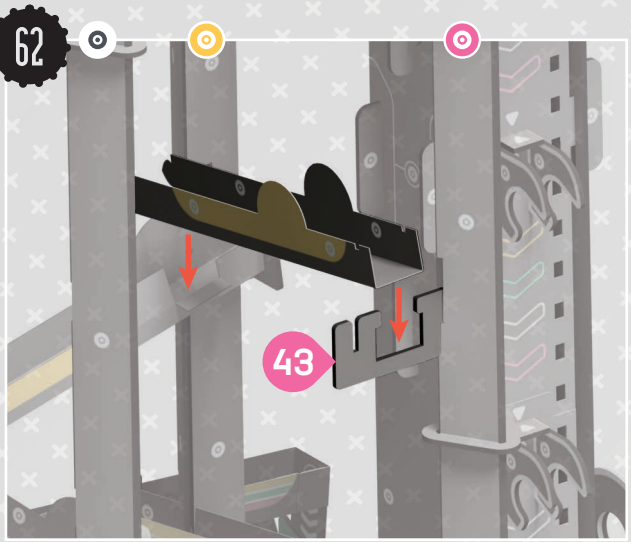

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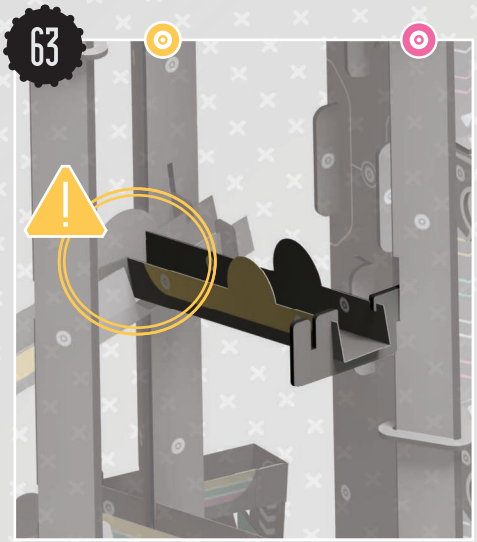

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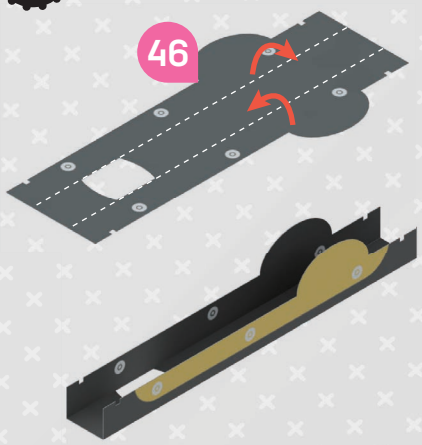

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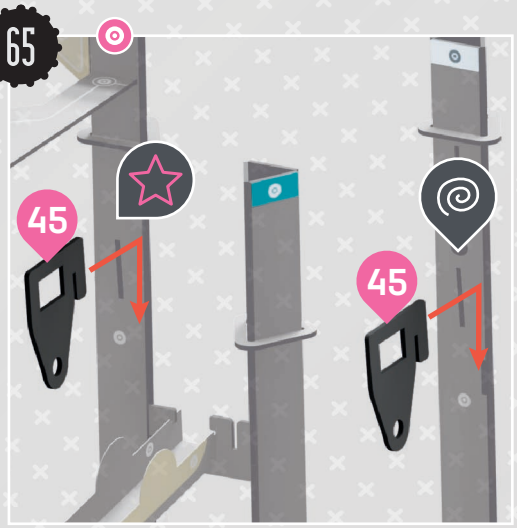
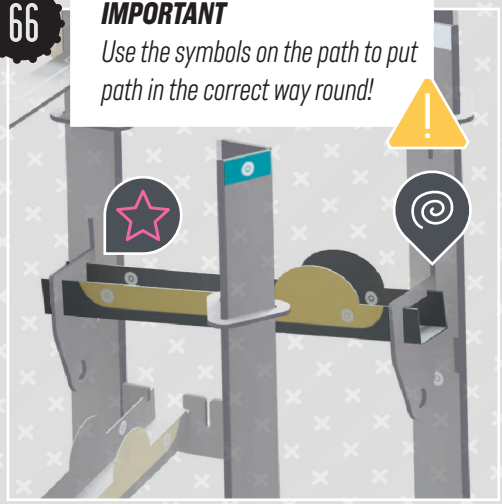


66

IMPORTANT

Use the symbols on the path to put path in the correct way round!



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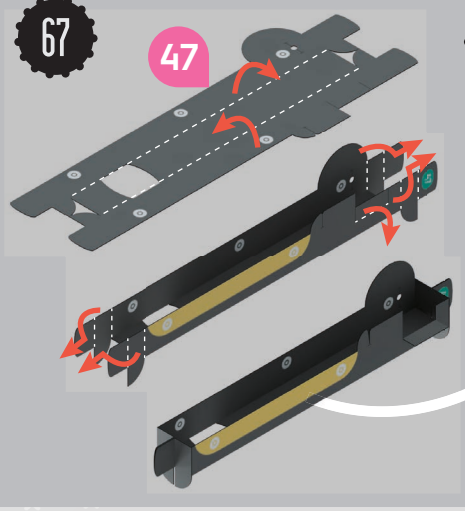

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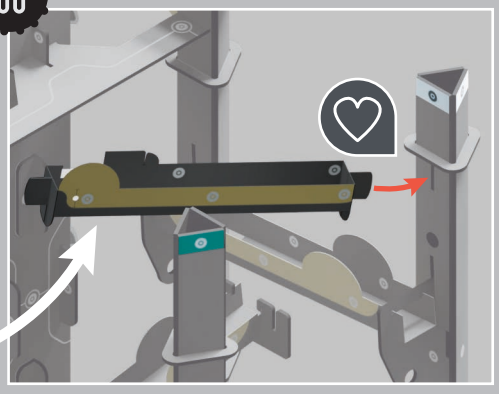

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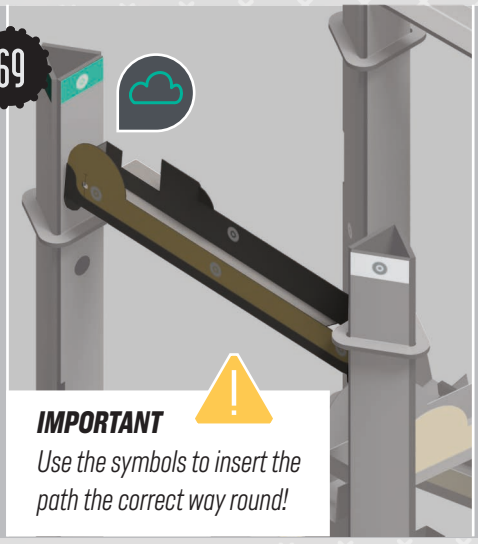
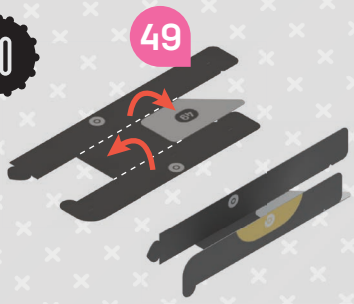


IMPORTANT

Use the symbols to insert the path the correct way round!

70



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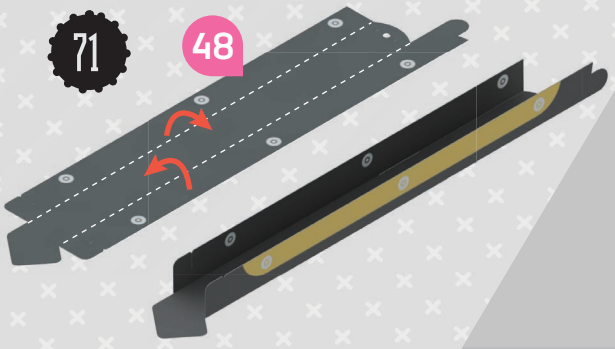

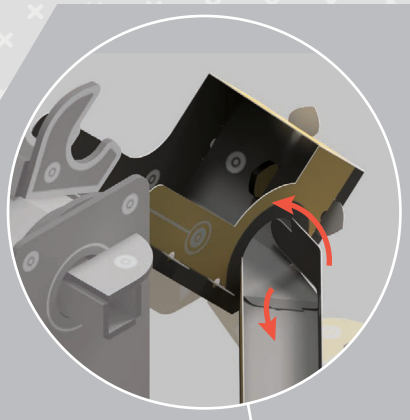

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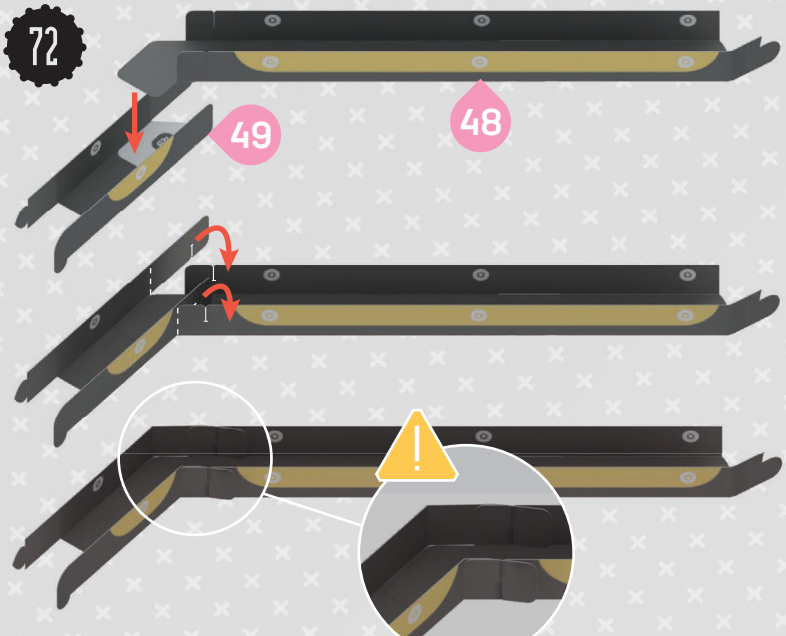

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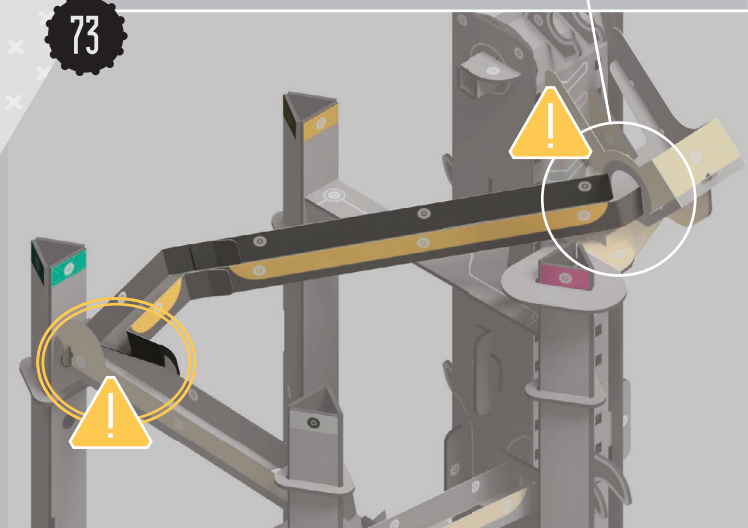


BUILD YOUR OWN®

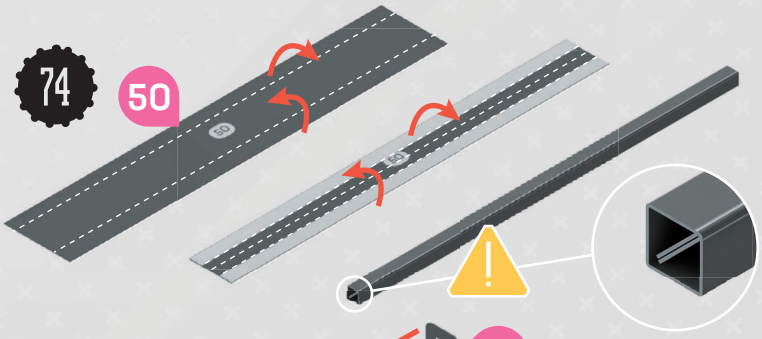
MARBLE RUN

WARNING!

- Use only under adult supervision and/or guidance - Only to be used by persons capable of understanding the safety aspects concerning misuse of the product.
- Recommended age 8+ NOT suitable for children under 3 years
- Small parts could be a choking hazard
- Retain these instructions for future reference
- DO NOT leave the marble run unattended, especially with younger children who may not be familiar with the risks mentioned above.
- Always count and pack up the marbles after use

Instruction Booklet 2

74



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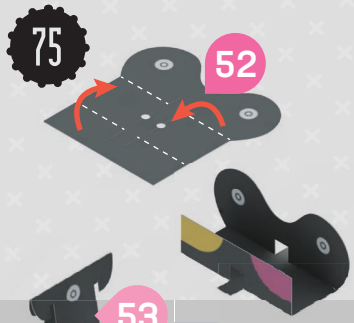
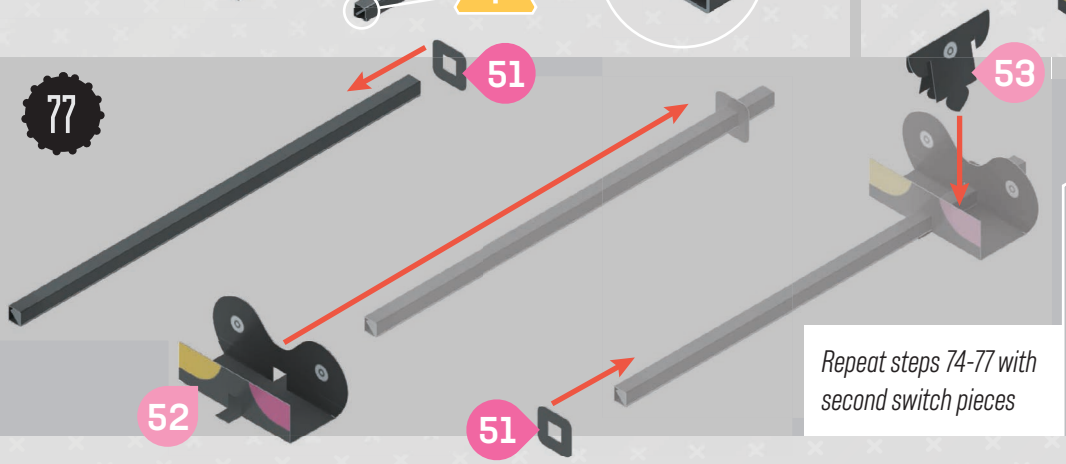
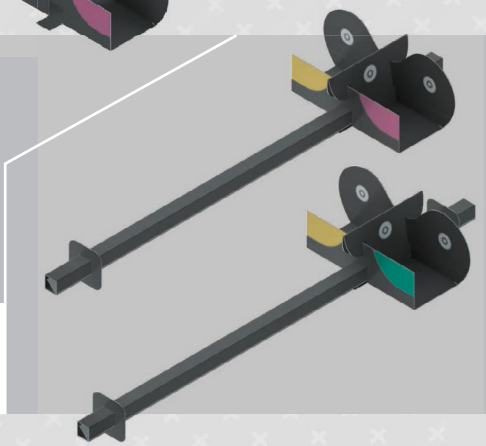


76

77



Repeat steps 74-77 with second switch pieces



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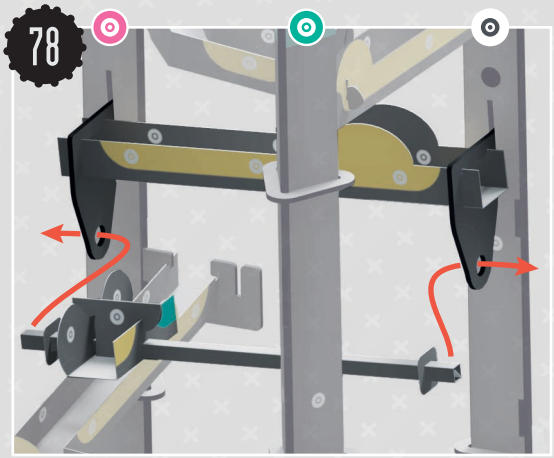
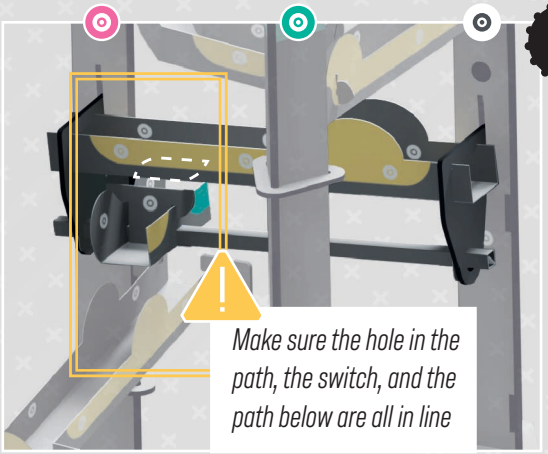
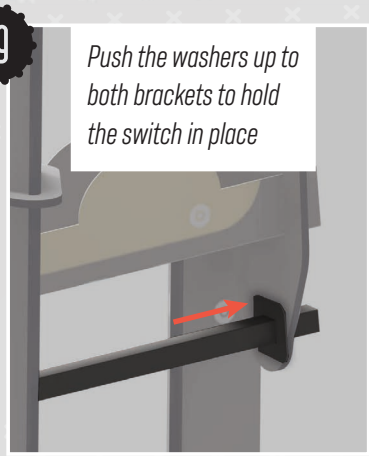




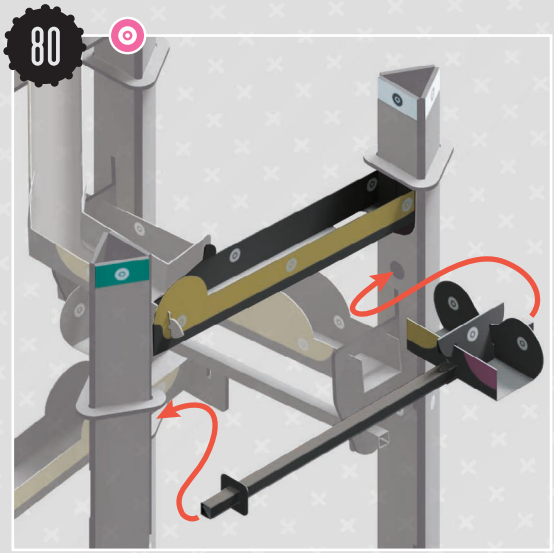
Make sure the hole in the path, the switch, and the path below are all in line

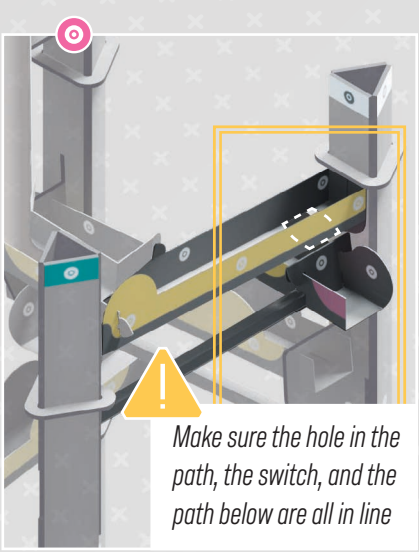
79



Push the washers up to both brackets to hold the switch in place

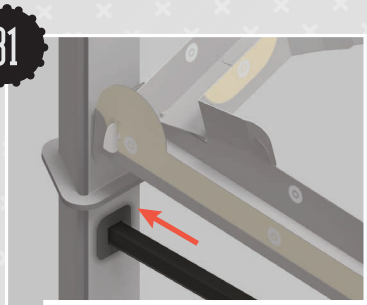
80





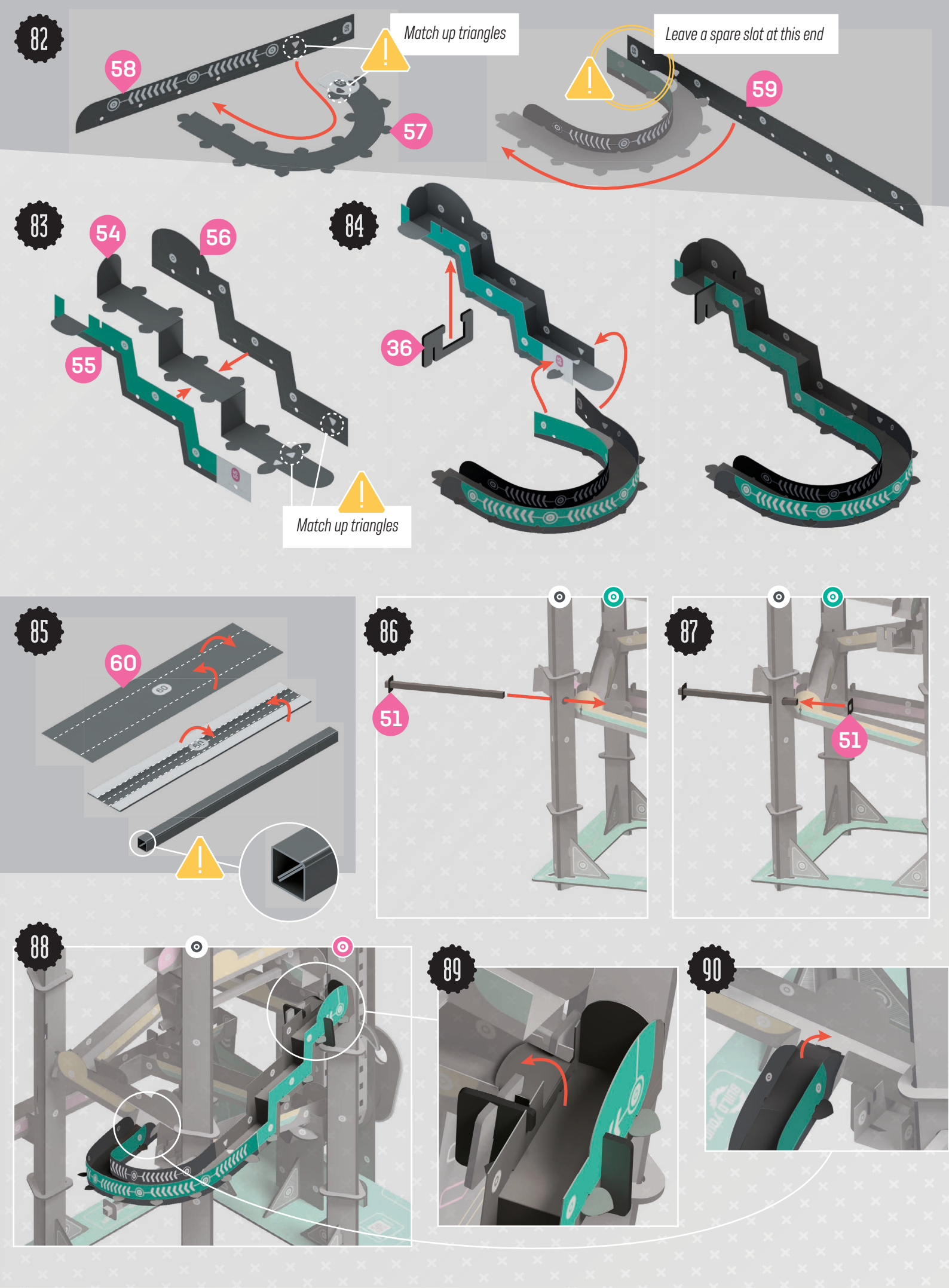
Make sure the hole in the path, the switch, and the path below are all in line

81

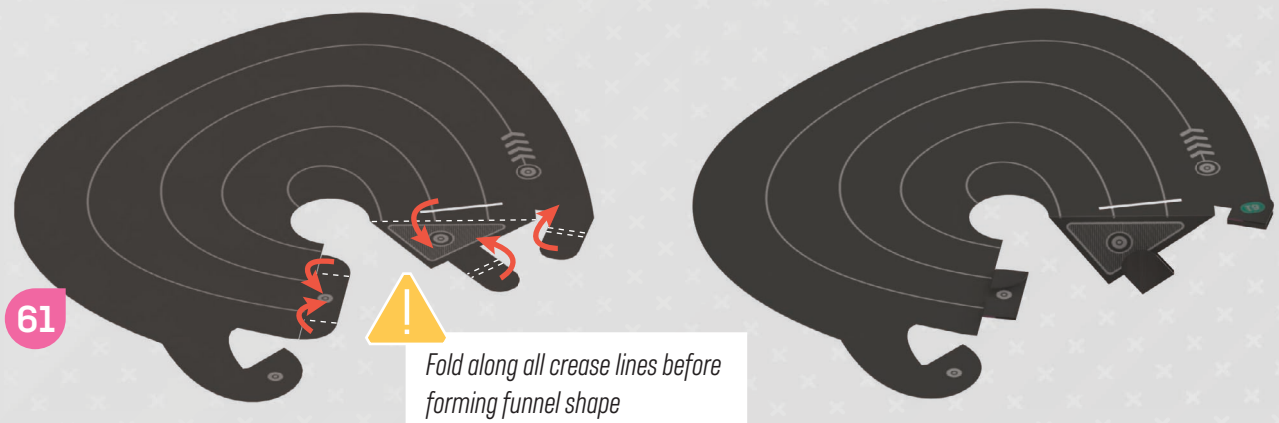


Push the washers up to both towers to hold the switch in place

Yo! See the back pages for troubleshooting guide and science facts!

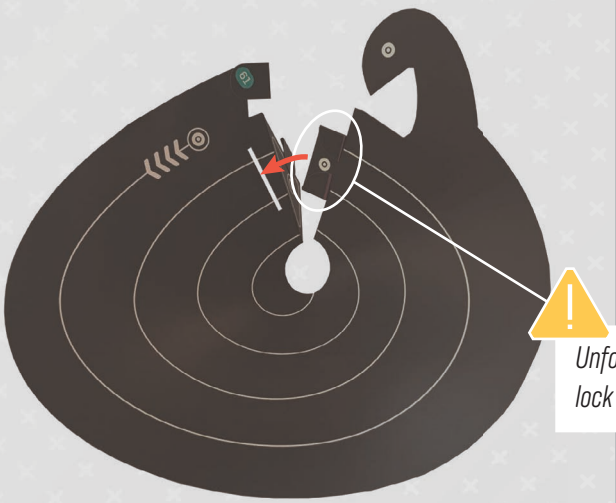

82
58
Match up triangles
57
Leave a spare slot at this end
59
83
54
56
55
Match up triangles
84
36
85
60
86
51
87
51
88
89
90

91



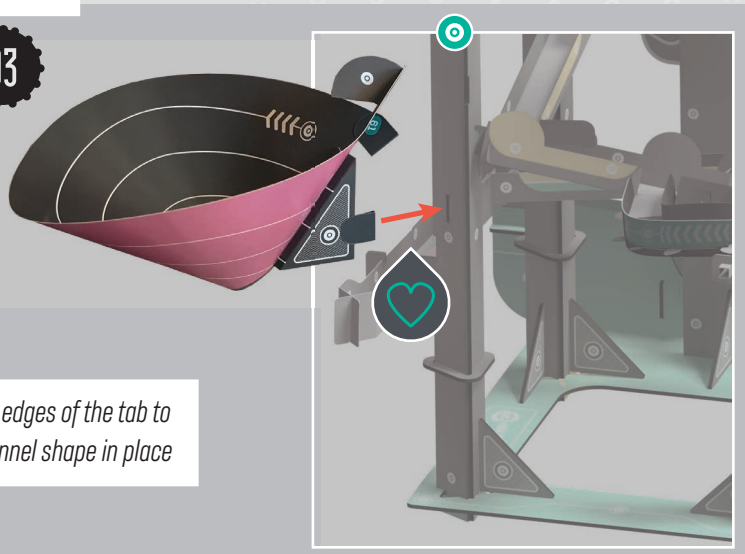
Fold along all crease lines before forming funnel shape

92



Unfold the edges of the tab to lock the funnel shape in place

93



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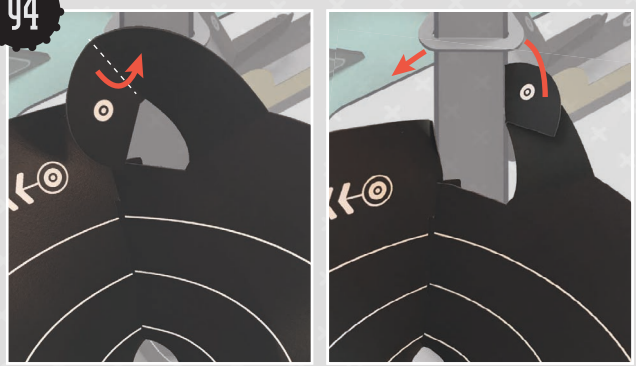

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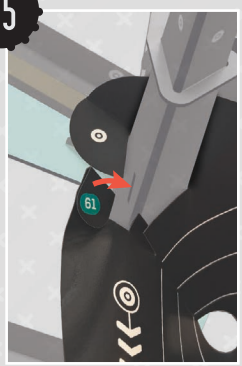

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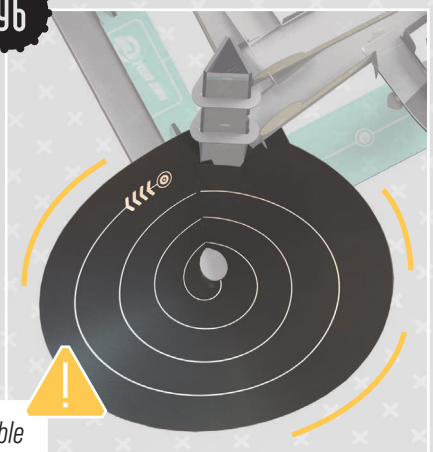
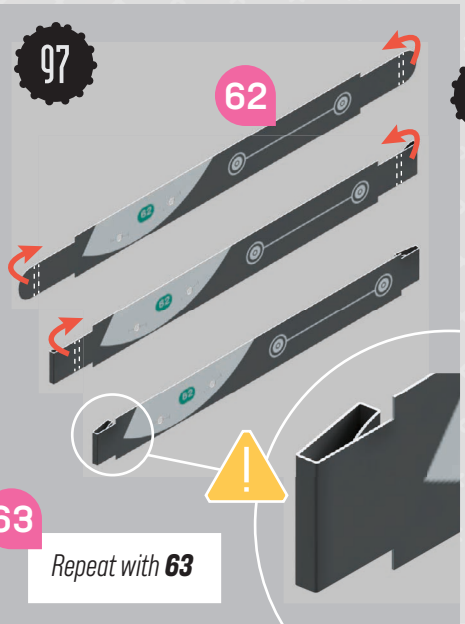


Make sure the funnel is as round in shape as possible

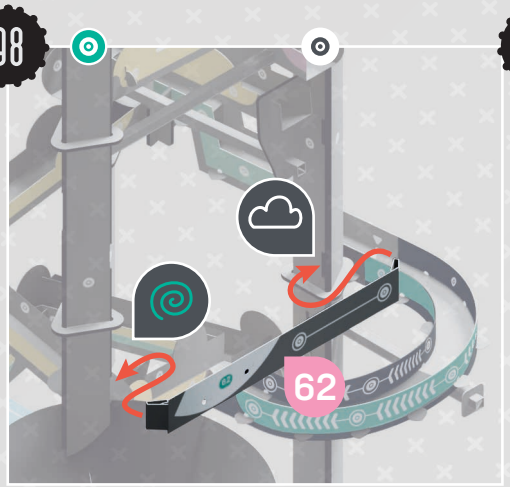
97



63

*Repeat with **63***

98



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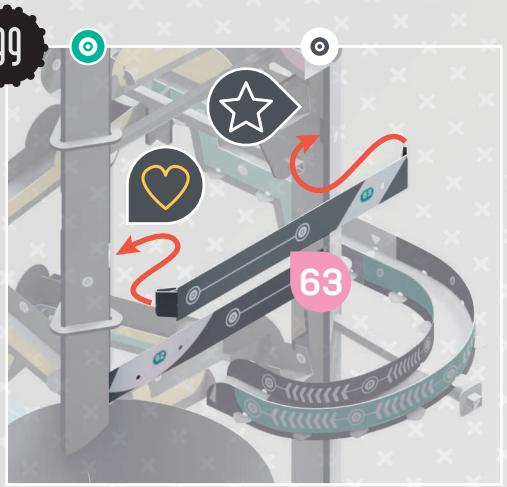

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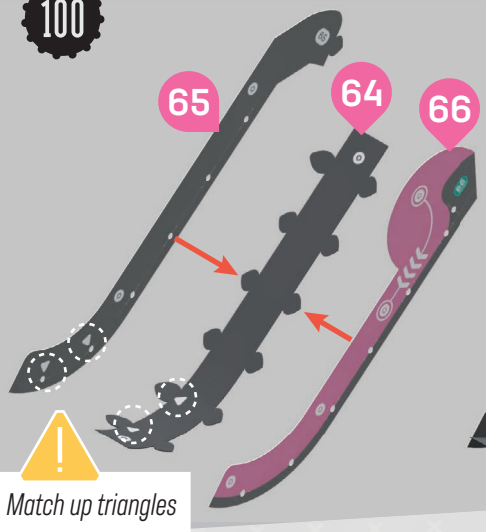
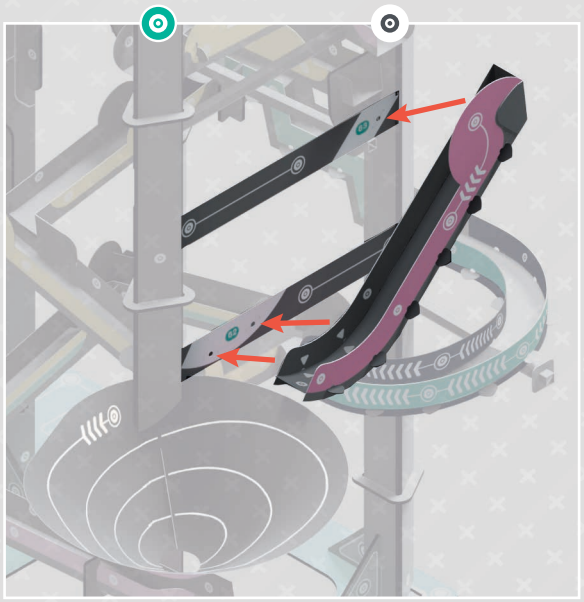


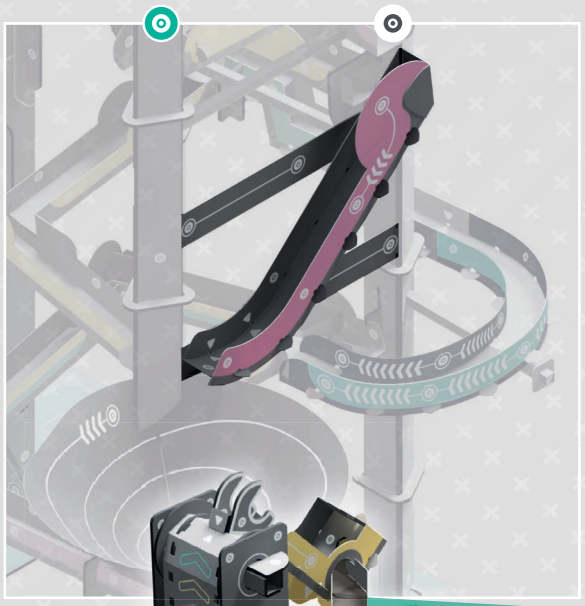
Match up triangles

101

Fold around end and slot in to lock

102





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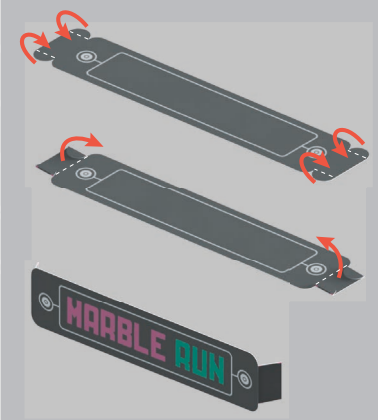

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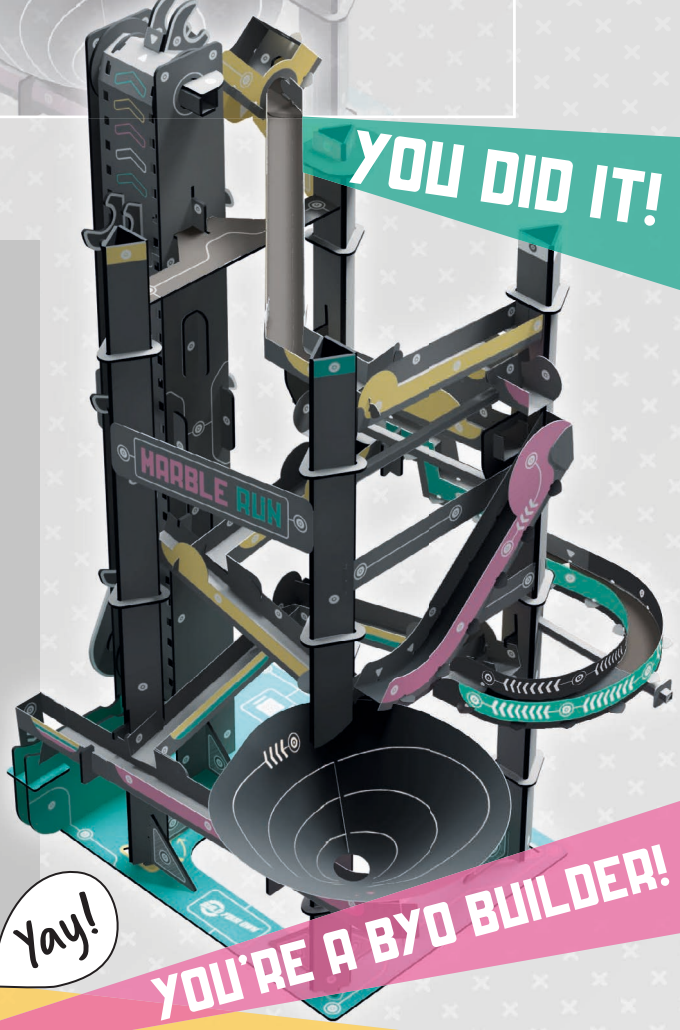


YOU DID IT!

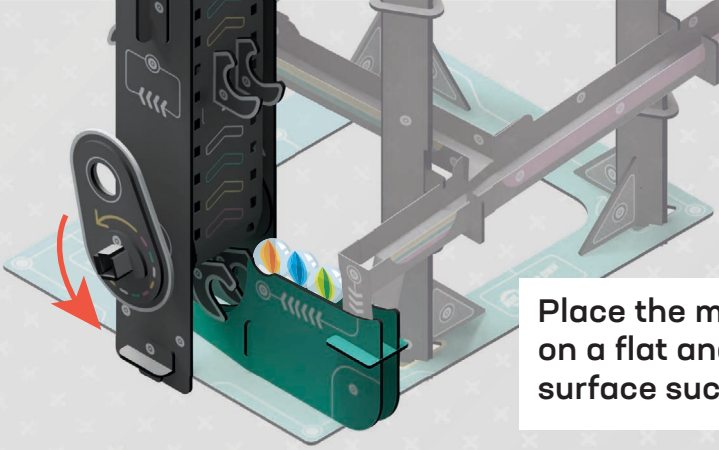
YOU'RE A BYO BUILDER!

#BYOMARBLERUN

Troubleshooting Guide

Picking up marbles

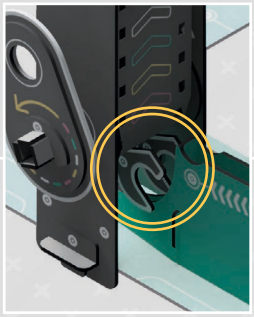
Place some marbles on the starting track. Turn the handle SLOWLY and carefully, ensuring you are turning it the correct way (check the arrow on the handle) The hooks will pick up the marbles and lift them to the top of the marble run, ready to make their way down the paths!



Place the marble run on a flat and stable surface such as a table

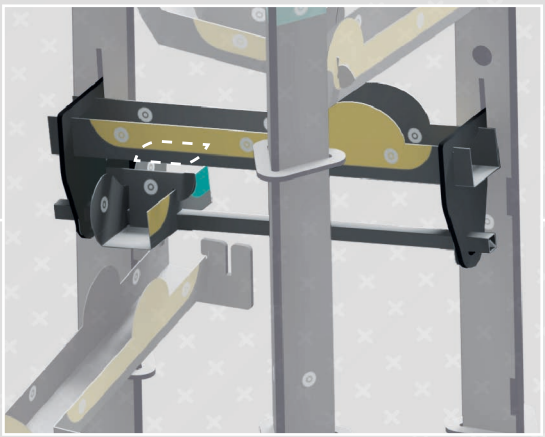
When I turn the handle the belt doesn't move properly

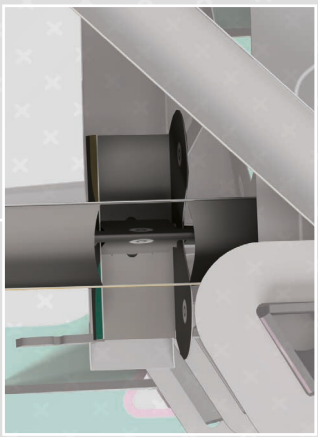
First, **stop turning** the handle, you could break something otherwise! Check if the hooks are stuck at the marble pick-up point or the marble drop off point. Also, check if the teeth of the gears at the base of the elevator are slotted into the holes in the belt.



Switches not working?

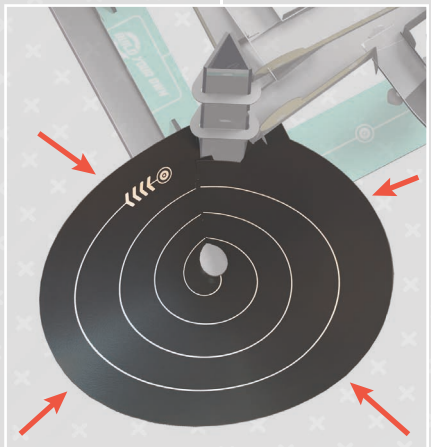
The switches should allow the marble to take 3 different routes down the marble run! If they are not working try checking that the **hole** in the path, the **switch** itself and the **path below** are all lined up. Try looking from above to double check! Also, check the washers are pushed right up to the brackets/towers so that the switch can't change position! Finally, make sure there is nothing getting in the way of the switches flipping backwards and forwards.





Help! The marble keeps flying out of the funnel

This probably means that the funnel is not the right shape. Try gently pushing in the sides to encourage the funnel to be more rounded and less oval shaped.



Why is the belt slipping and becoming baggy?

This means that you have not pushed in the hooks (2) far enough. Try taking the belt off and pushing all the hooks all the way possible and locking in place with the teeth (3).

I have another question

We'd love to help! Find us here:

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@BYOKits

@BYOKits

Yo! Need more help?

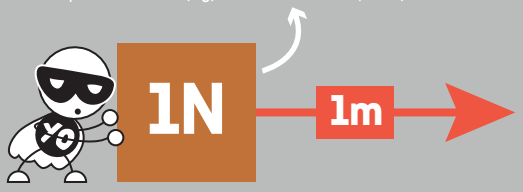
SCAN FOR VIDEO INSTRUCTIONS AND MORE FUN STUFF!

buildyourownkits.com

Marble Run Science

A Newton is a measure of force. It is equal to mass (kg) x acceleration (ms^{-2})

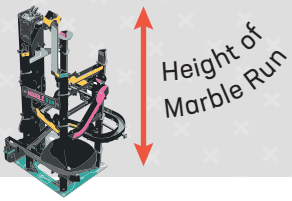
Energy is measured in Joules (J). 1J is the amount of energy used to move 1 Newton (N) by 1 metre (m)



Potential Energy

Potential Energy is the energy stored in an object when it is held at a height. When the marble reaches the top of the marble run it has potential energy which can be calculated by:

Mass x Gravity x Height

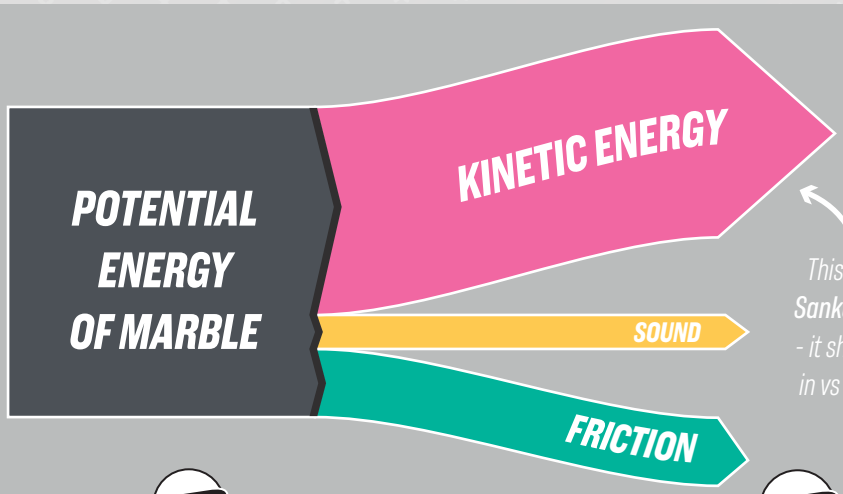


5g = 0.005kg x 10ms^{-2} x 0.5m = 0.025J

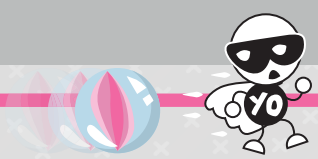
Conservation of Energy

"Energy cannot be lost or gained - it can only be transformed from one form to another"

When a marble goes down the Marble Run, the marble starts with Potential Energy. When it is released, this energy is transferred to Kinetic Energy, sound, and lost to friction.



This is called a Sankey Diagram - it shows energy in vs energy out!



Kinetic Energy

Kinetic Energy is the energy of an object when it is moving. To calculate the kinetic energy of the marble going down the Marble Run, you use the equation:

$$\frac{1}{2} \times \text{Mass} \times \text{Velocity}^2$$

Velocity is another word for speed! The equation for speed is:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

So if the marble travelled travelled 3m in 1 second, it would be moving at 3 metres per second! This means the kinetic energy of the marble would be:

$$\frac{1}{2} \times 0.005 \times 3^2 = 0.0225J$$

Sound

Not all of the Potential Energy is converted to Kinetic Energy. Some of the energy is transferred to sounds - listen out when a marble moves down the Marble Run!

~0.0005J

Friction

The remainder of the energy is lost as friction as the marble moves along the paths. Try rolling a marble on carpet and on a smooth table - which one moves faster? Smooth surfaces have less friction, so the marble will move faster, as less of the Kinetic Energy is lost to friction!

~0.002J

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