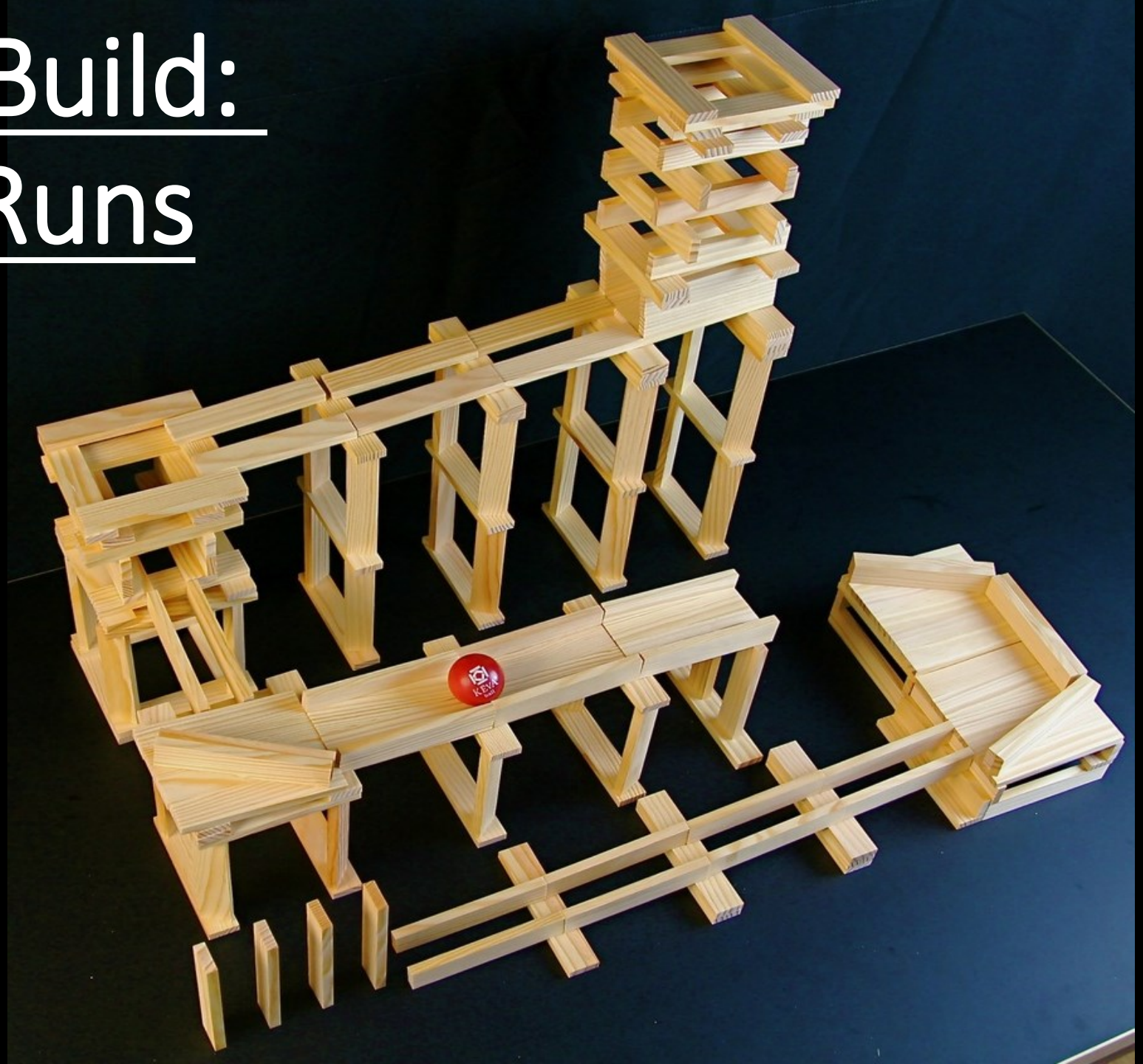
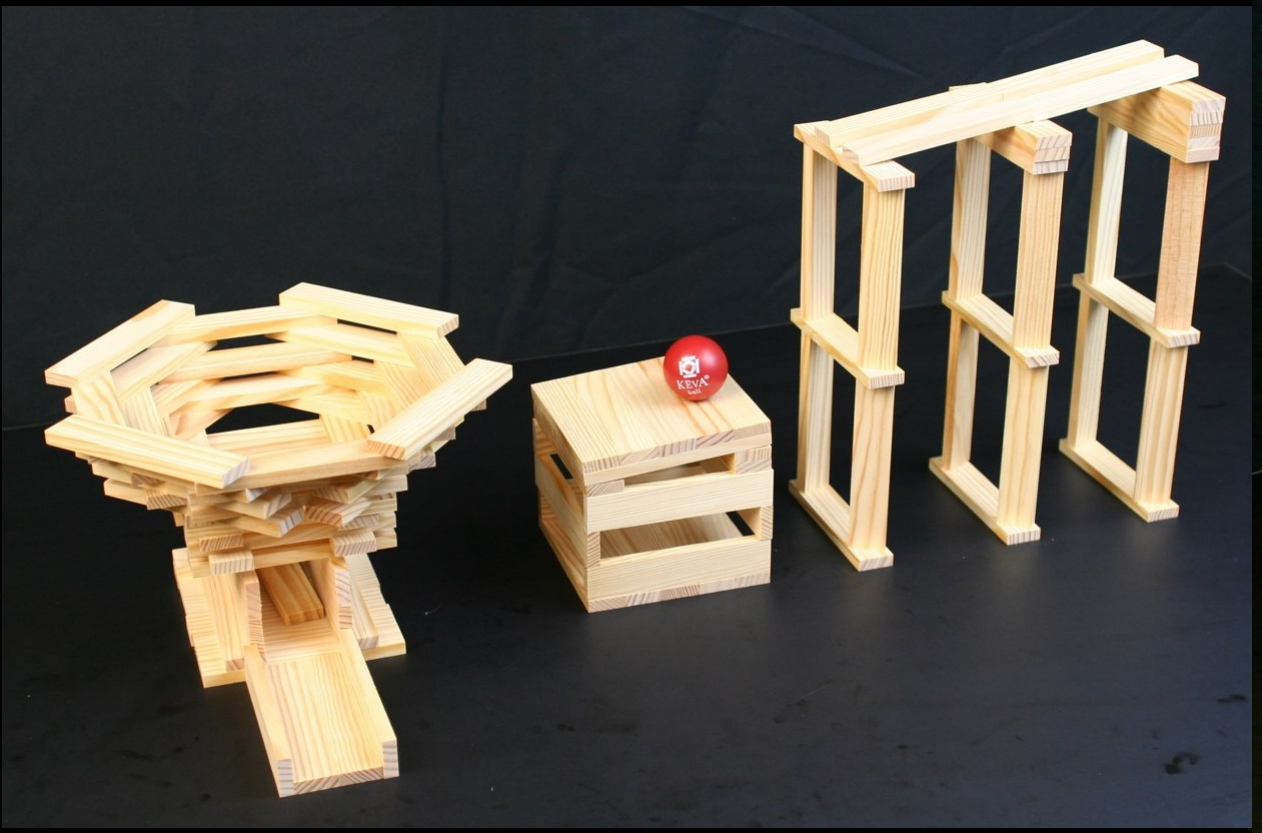
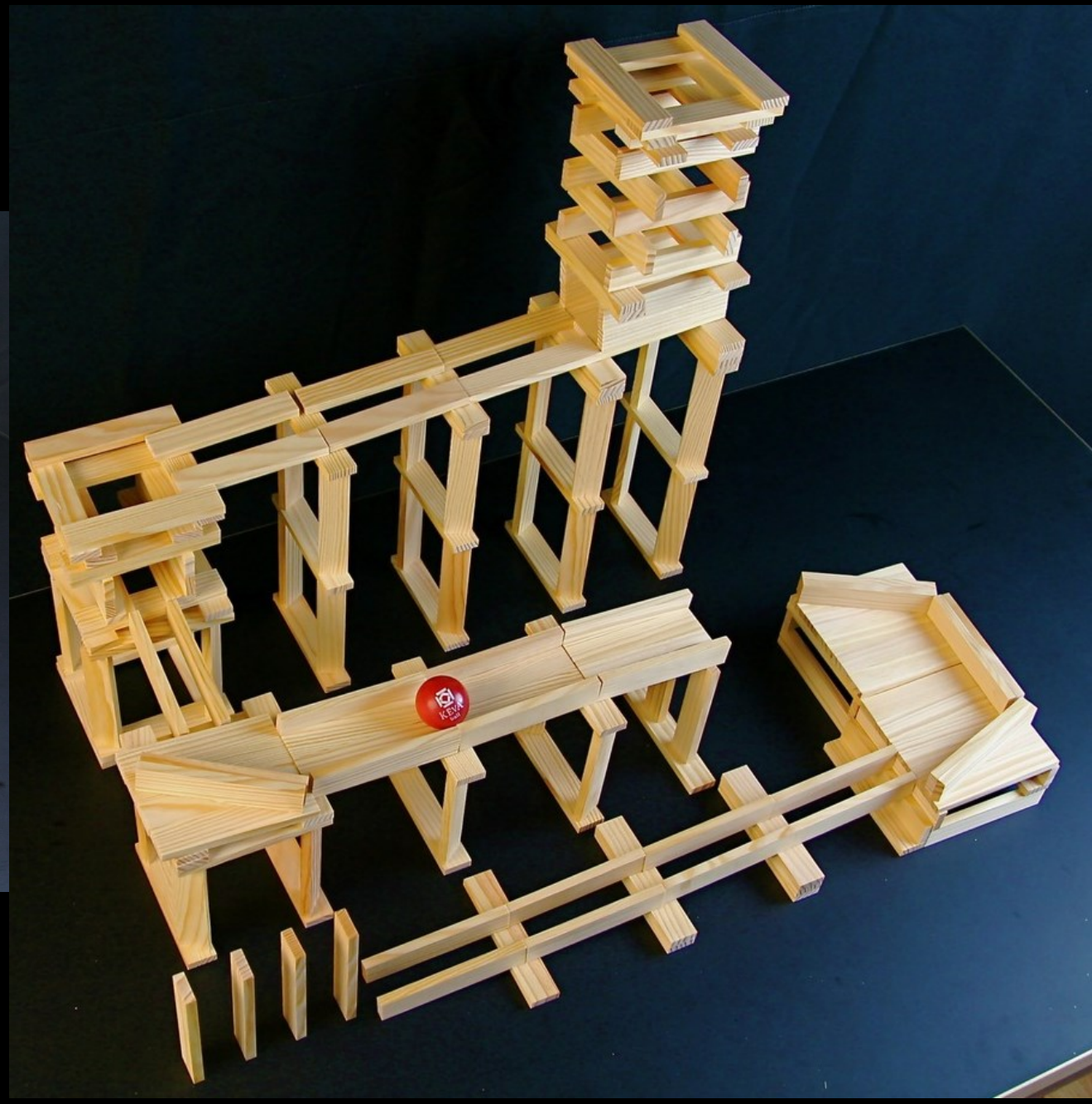
Design & Build: Marble Runs



What is a contraption?
What is a chute?
What is a KEVA plank?

https://youtu.be/uXSqbQ3vzo4?list=UULYbvuVkmPOaS4yV8ZQVKVg


KEVA


KEVA

KEVA Planks can be stacked in 4 ways:

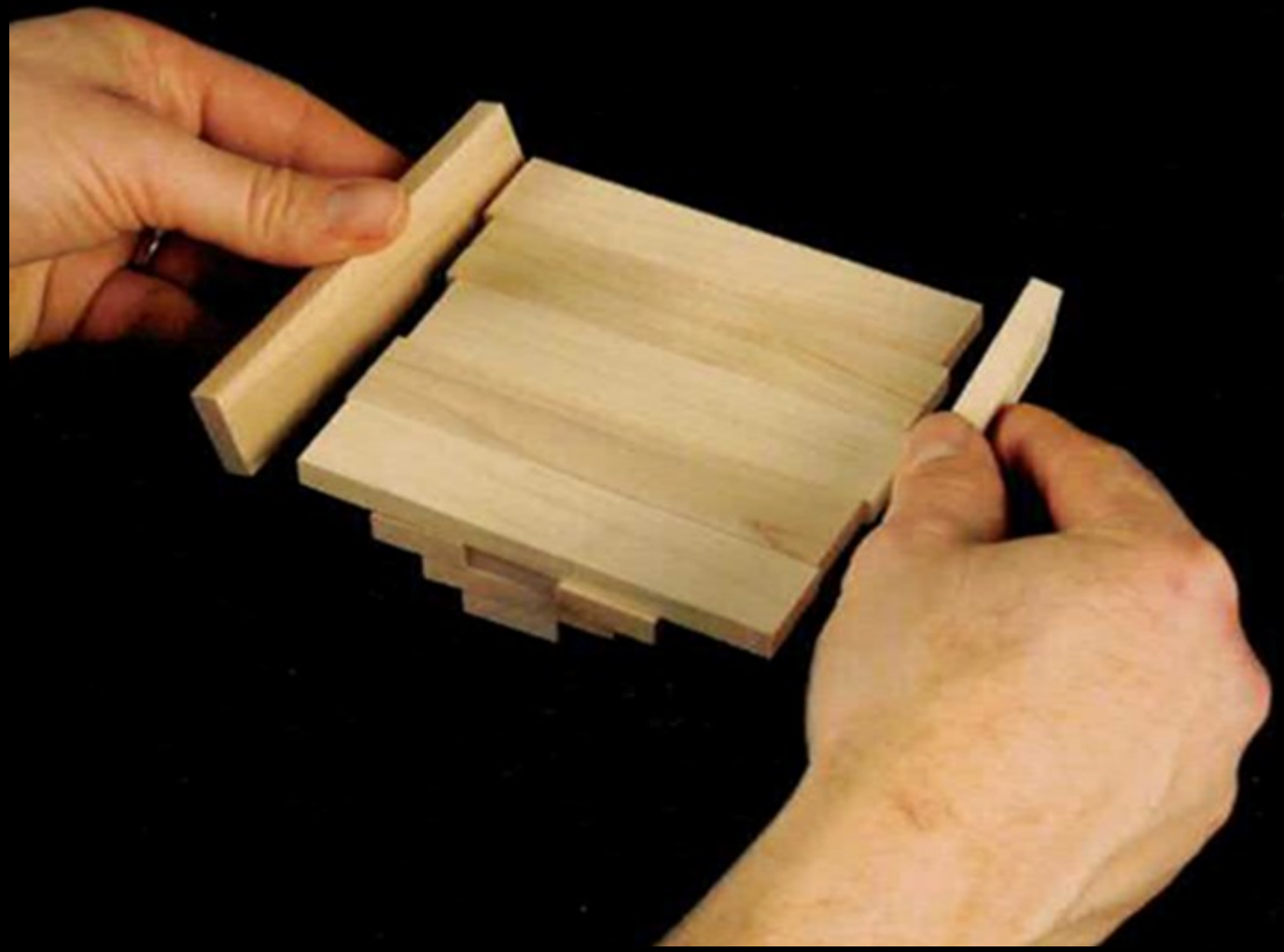
-Flat

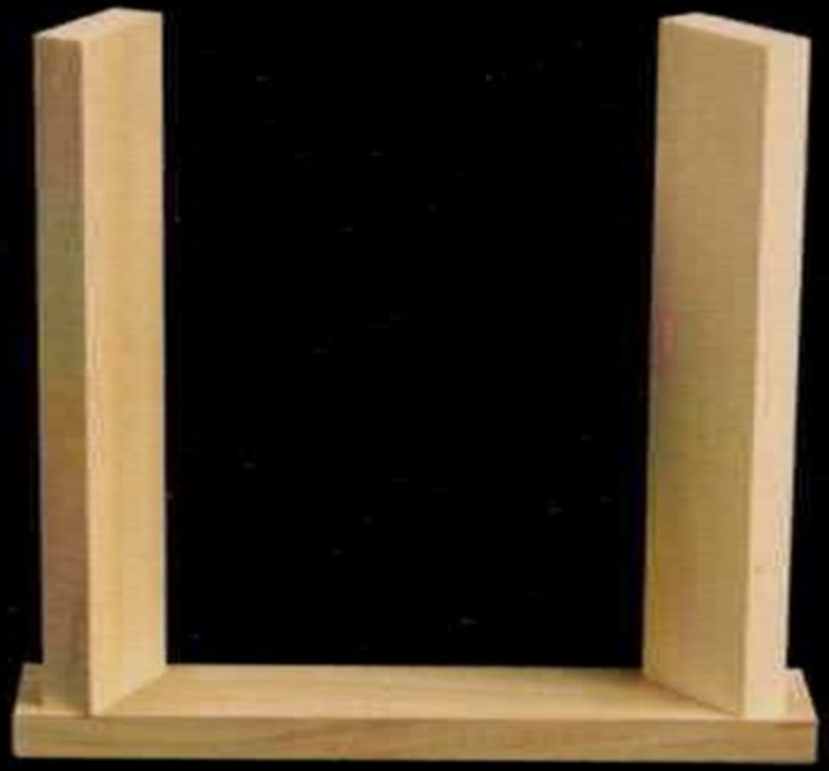
-Leaning

-On Edge

-Upright

Use planks as a tool to make rows perfectly straight.





Upright planks are more stable if they are angled toward each other rather than parallel. Place a plank on top of the uprights to stabilize them and prevent the "domino effect."

Exploratory Play

10 minutes

Guided Play

10 minutes

The Invention Process

Trial and Error

Make frequent trials as you build to see if the ball will do what you expect it to do.

Easy Does It

Gentle slopes and slower speeds make it easier to control the ball movements.

Moveable Structures

Build towers on square bases so their position can be easily adjusted.

Like Sandcastles

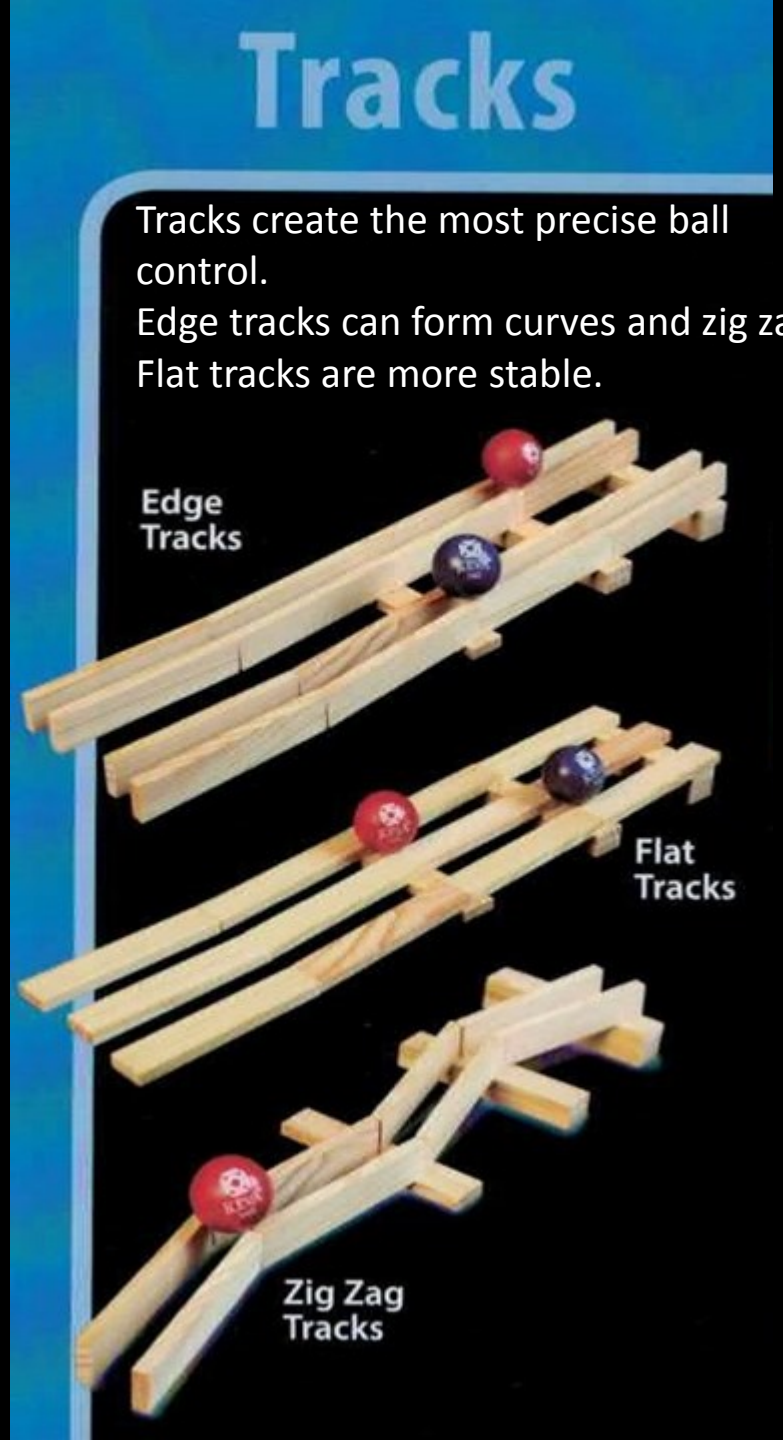
Remember that Contraptions are temporary. They will eventually fall out of alignment. The goal is to successfully get the ball through the Contraption one or more times.

Building Contraptions creates one problem after another… yes, problems are good.

Problem: *The ball won't move.*
Solution: Place the ball on a sloped plank.
Problem: *The ball falls off the side of the plank.*
Solution: Add sides to the plank (create a chute).

Contraptions invite the builder to work through the invention process to create interesting new structures:

What do you want the ball to do? *(problem)*
How might you accomplish this? *(creative idea)*
Build a structure. *(prototype)*
Try it out. *(experiment)*
Did it work? *(evaluate)*
Revise your plan. *(improvement)*
Repeat.



Challenge 1:

Create a track for your ball to move down

If you make the track wider, the ball goes slower.

If you make the track too narrow, the ball is more likely to leave the track.

Experiment to find the best spacing for your tracks.

Challenge 2:

Chutes

Create a chute for your ball to move down

The chute is a basic way to move the ball. Add stability with double plank side rails.

Challenge 3:

Trestles

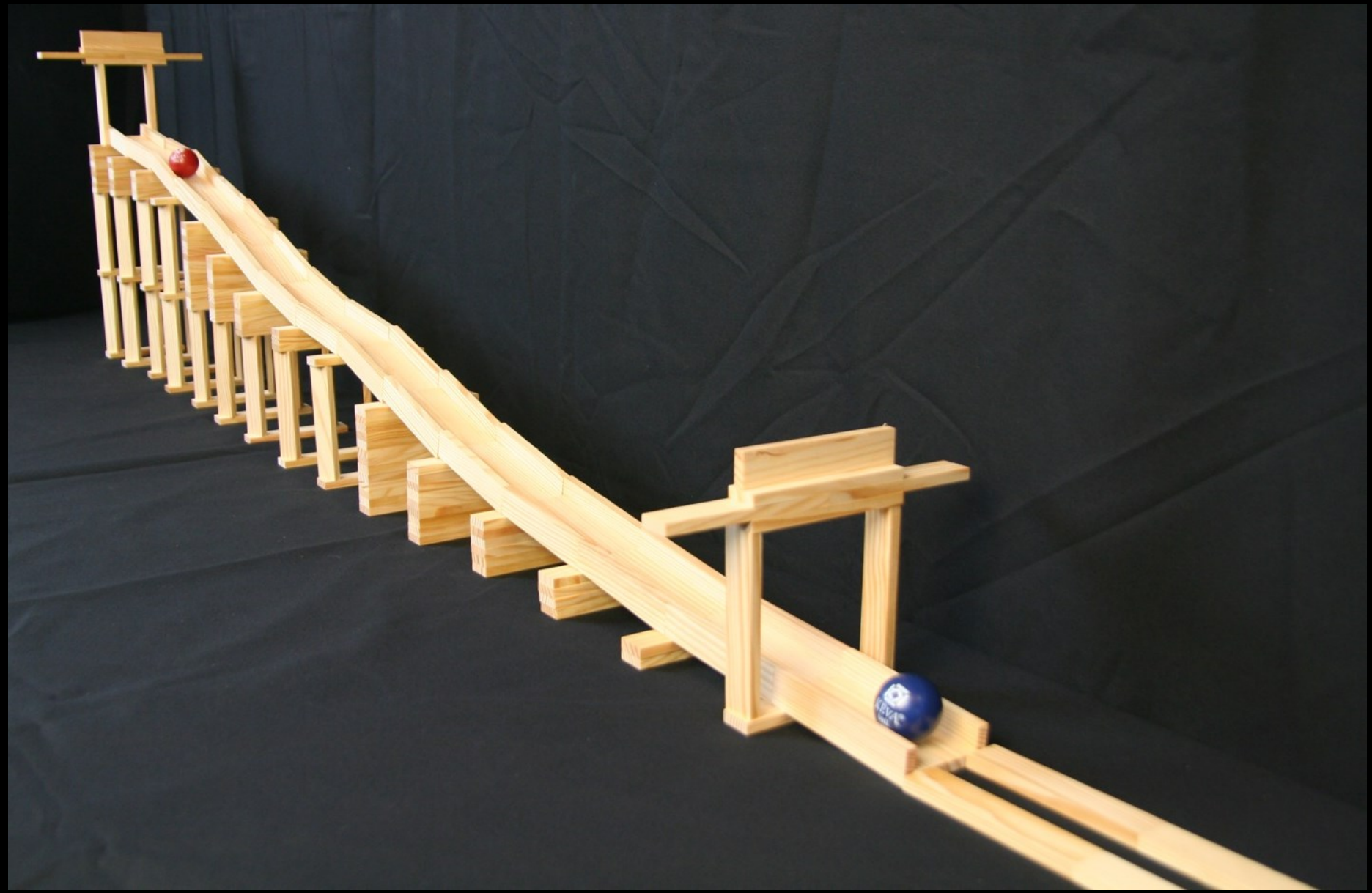
A flat track elevated on trestles.

Create a trestle for your ball to move down

*Remember to angle your support planks

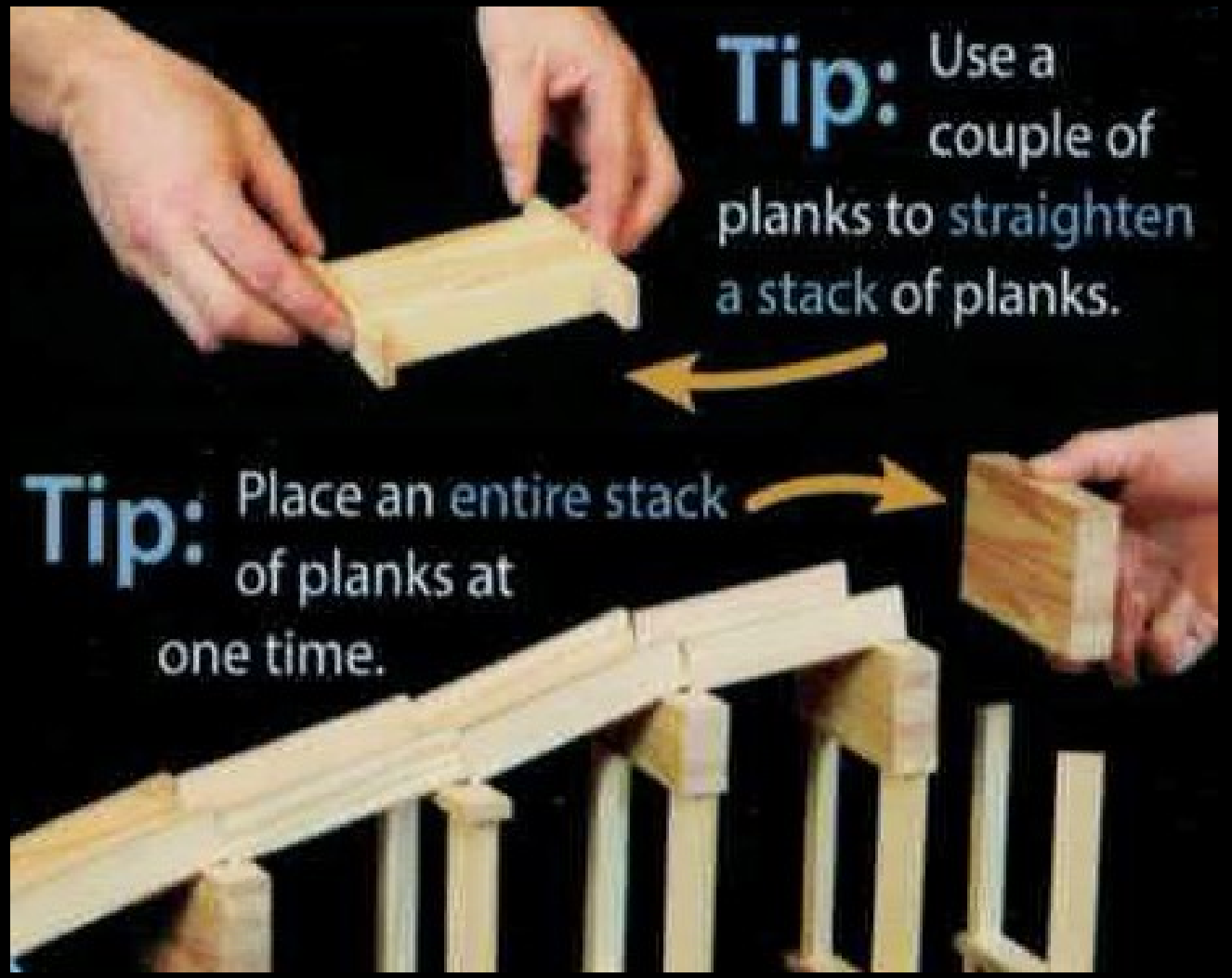
Can you add a second track?

Using these 3 techniques, can you make a slide for your ball?



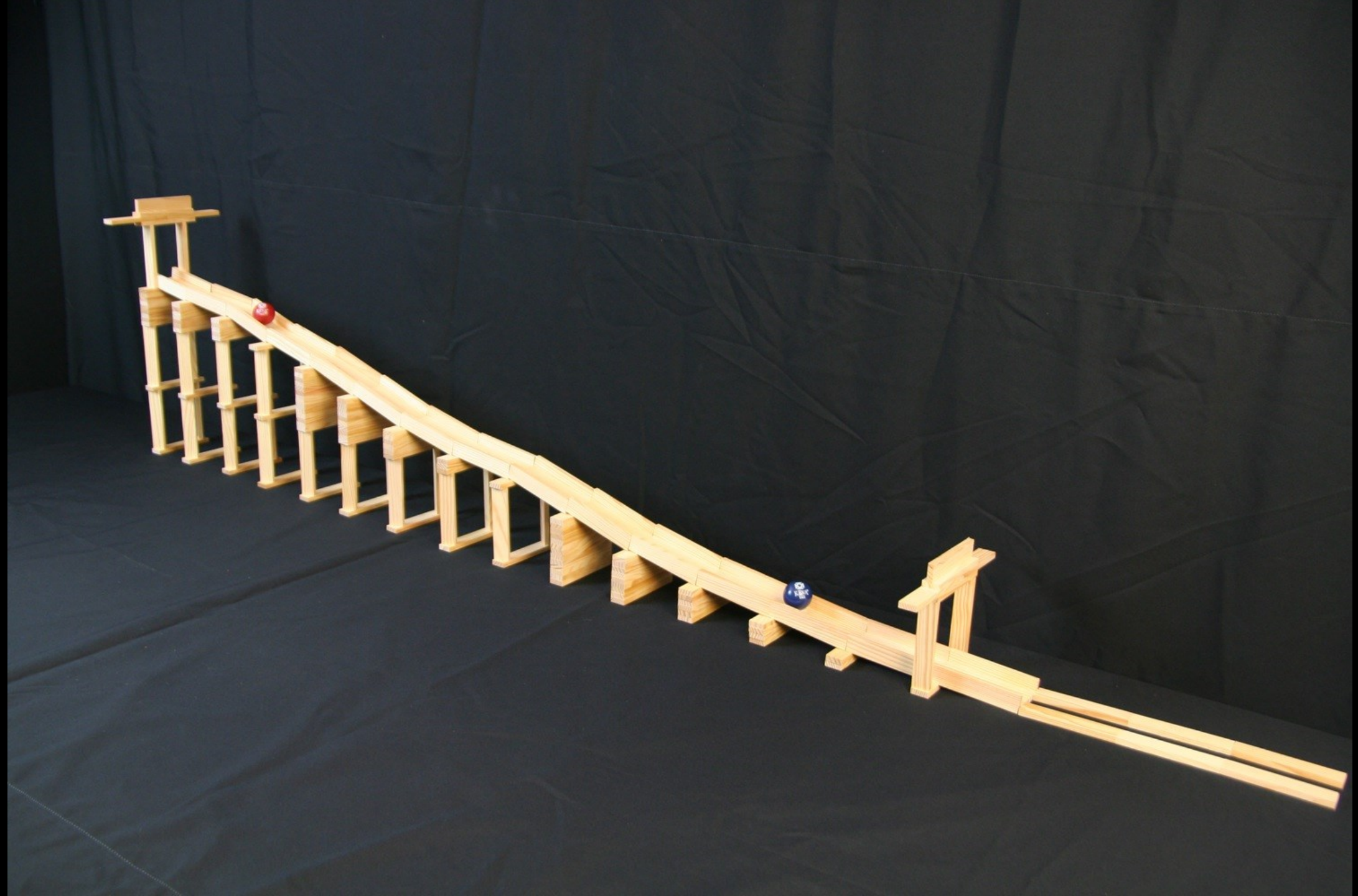
Step 1

The upright supports should be angled (not parallel) for the best stability.


Tip: Use a couple of planks to straighten a stack of planks.
Tip: Place an entire stack of planks at one time.

Step 2

Experiment with the height change from stack to stack.



Create, test, improve, repeat!

Need a challenge?

Add some planks at the end of the slide (like dominoes) for the ball to knock over.

Use the ball to start a domino chain reaction!

Ready, Set, Go!

With a partner, you are going to
create a track to race to the finish!

Create side by side
lanes for racing action.

Step 1

Build the ramp,
making sure to alter
the support heights to
give it enough slope.

Step 2

Add the lanes and bumper finish.
Merging the lanes into a single file makes it easier to know who won the race.

Step 3

Build the top beam of the starting gate on a flat surface

*Extension – Not necessary

Tip: Carefully lift the beam with two hands and place it onto the upright posts.
Easy to do with this tip – almost impossible without it!
Create large or small beams the same way.

*Extension – Not necessary

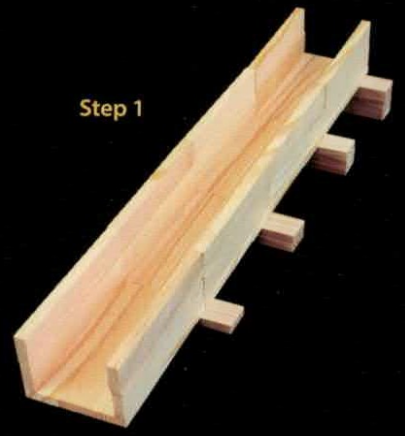

Instead of a bumper finish, try
extending a flat run out to see
how far the balls will roll!

Extra Time?

Trough

A *trough* has sides high enough that the KEVA ball can travel under any planks laid across the top — creating *tunnels* or double decker effects.

Step 1

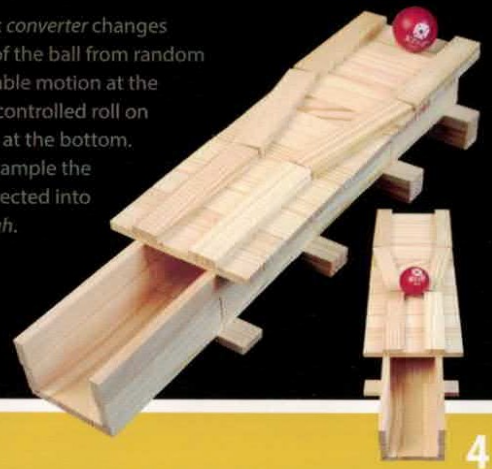


Step 2

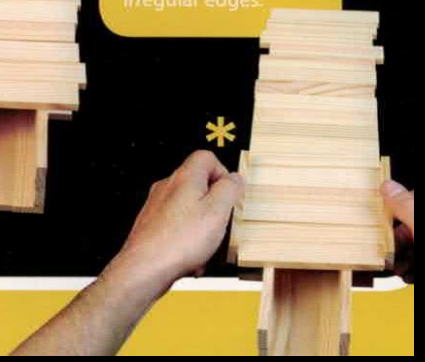
Ideas: Create a smooth sloping surface on top or leave a little space between the planks for a bumpy railroad *track*.

Track Converter

The *track converter* changes motion of the ball from random and variable motion at the top to a controlled roll on the *track* at the bottom. In this example the ball is directed into the *trough*.

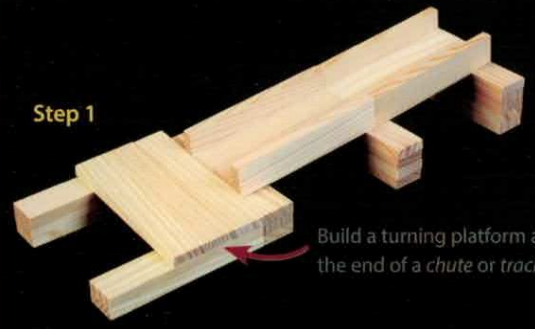


Tip: Use a couple of planks to easily straighten irregular edges.



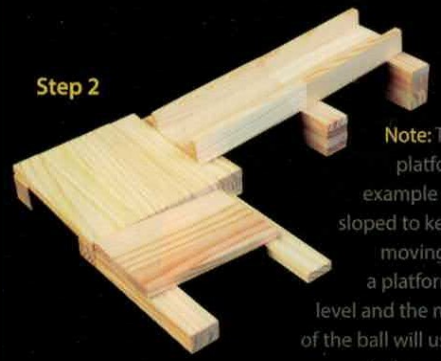
U-Turn

Step 1



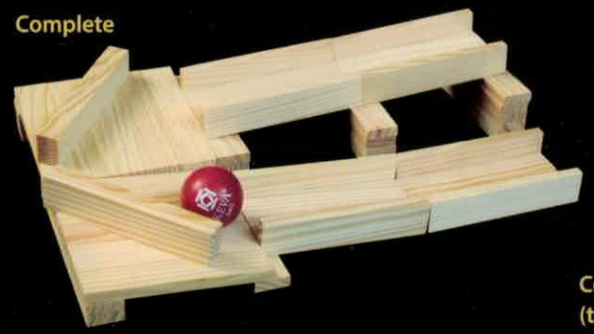
Build a turning platform at the end of a *chute* or *track*.

Step 2

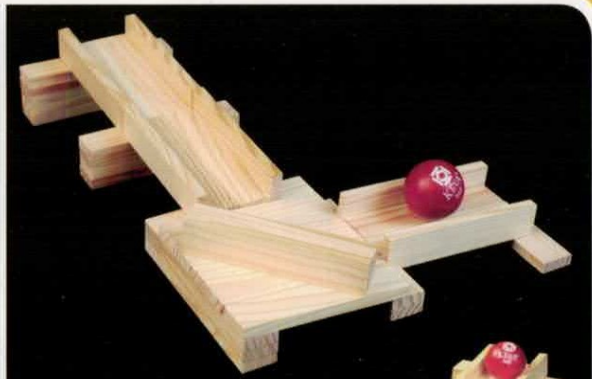


Note: The turning platforms in this example are slightly sloped to keep the ball moving. However, a platform could be level and the momentum of the ball will usually carry it through the turn.

Complete

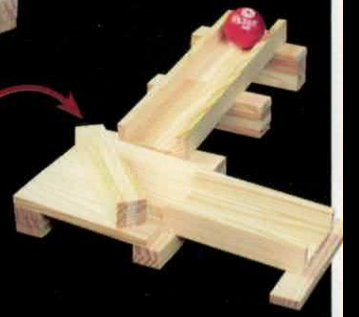


L-Turn



Bumper

Adjust the angled bumpers until the ball makes the proper turns. Use three or more planks to make the bumper more stable.



Complete (top view)