

KS3

Theme: Carnival Science



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Amusement parks and local fairs are a big part of summer memory-making for many families, at least in non-pandemic times.

Standing in long lines at amusement parks may be out this summer, but we've got fun science activities you can line up for a whole week's worth of carnival-inspired STEM!

Could you set up a fun outdoor amusement-park-style event using some of the activities listed here? Yes! From amusement park games to roller-coaster-inspired builds and even some fun with mirrors, this week's Summer of STEM roundup gives you a number of exciting ways to explore carnival-themed science. With each of these ideas, you can design or build something awesome that can be used as part of a homemade amusement park! (Don't forget to design some fun tickets, too!)

Now for those plant and animal lovers, how about Carnival Science in the garden or local park where you can have fun exploring nature, whether it is minibeast hunting or rock painting.




Whichever tickles your fancy you will find a selection of activities and projects for you to choose from.

We all hope you enjoy the different tasks. Have fun and remember to share those photos at: office@bwf.education or on the Woodside twitter page.

Please see a few of our ideas below:

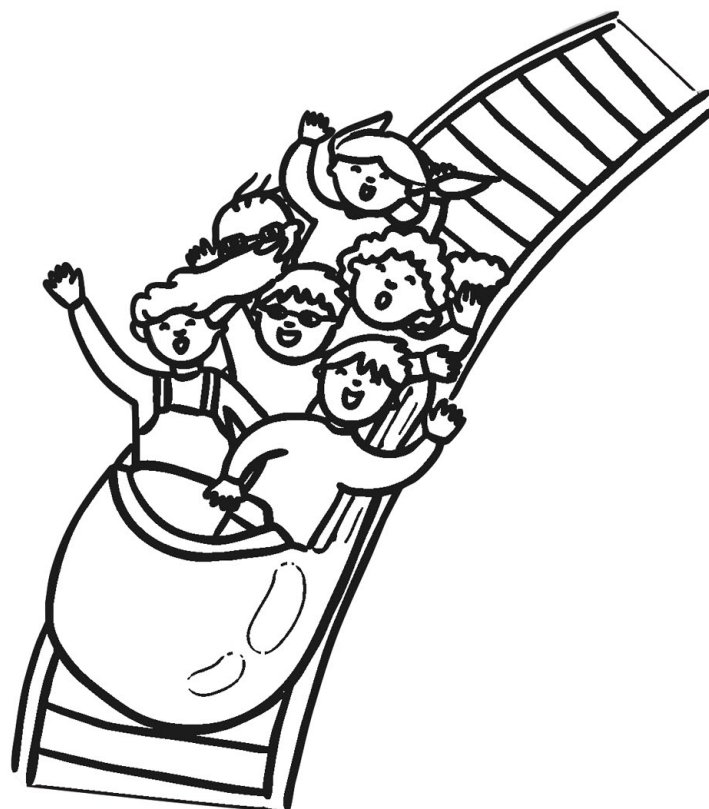
	Task		
	Theme park role play	Resources: theme park posters, tickets, attraction list, writing	

		frame, banner: included below.	
	Design own fun tickets for the amusement park	Paper, colouring pencils	
	Design and build your own roller coaster	Activity sheet below	
	Make a cereal box marble run	Activity sheet below	
	Penny racers and screaming balloons	Activity sheet below	
	Simple catapult	Activity sheet below	
Have you ever heard anyone say the chance of something happening is "50-50"? In this activity, you will do some calculations and then test if your calculations hold true for reality!	What are the chances - a probability STEM activity	https://www.sciencebuddies.org/STEM-activities/probability?from=Blog	
In this science activity, you will get to investigate balance using marshmallows, skewers, and toothpicks. Sticky, yummy balancing fun!	Circus-Trick Science: How to Balance Anything	https://www.sciencebuddies.org/STEM-activities/balance-marshmallows?from=Blog	

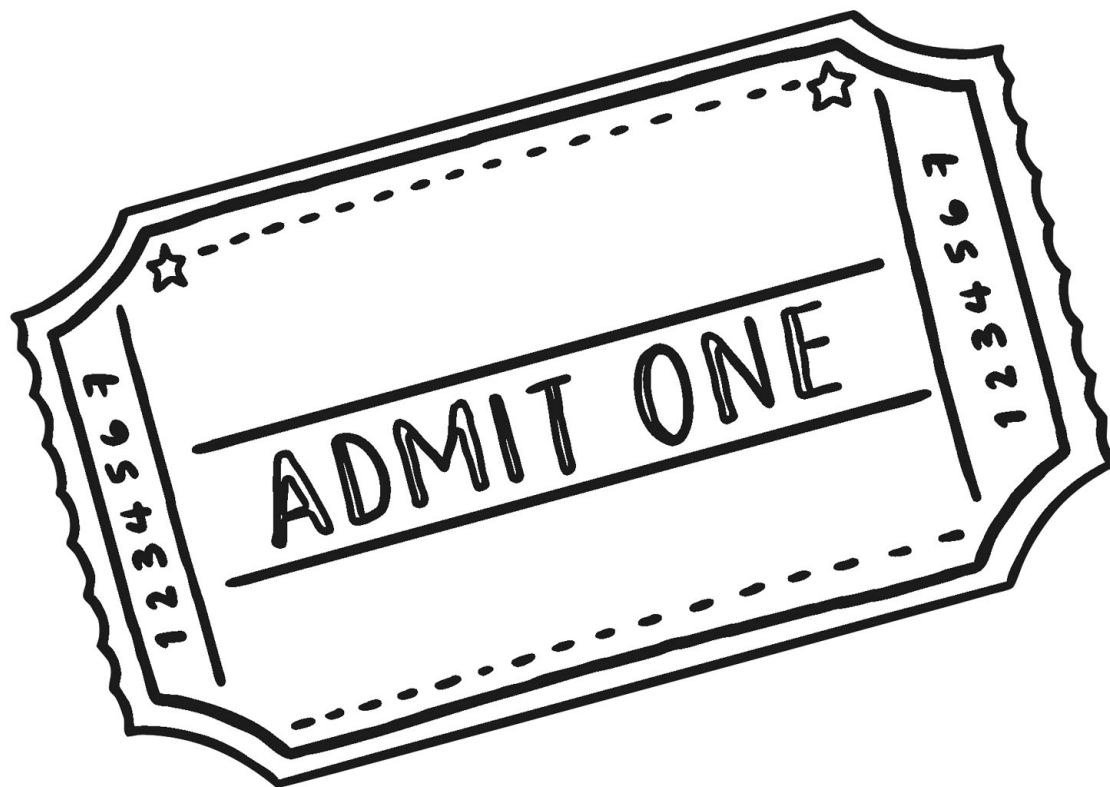
	Build a Paper Rollercoaster	https://www.sciencebuddies.org/stem-activities/paper-roller-coaster?from=Blog#summary	
	Build a Popsicle Stick Catapult	https://www.sciencebuddies.org/stem-activities/popsicle-stick-catapult?from=Blog	
	Build a Marble Roller Coaster	https://www.sciencebuddies.org/stem-activities/marble-roller-coaster?from=Blog	
	Theme park colouring	Activity sheets below	
	Can knock down!	https://www.carnivalsavers.com/can_knock_carnival_game.html	Activity sheet below
	DIY FISH CUP GAME	https://www.carnivalsavers.com/fish_cup_carnival_game.html	Activity sheet below

		e.html	
	Popsicle Stick Chain Reaction -STEM activity	https://www.sciencebuddies.org/stem-activities/popsicle-stick-chain-reaction?from=Blog	



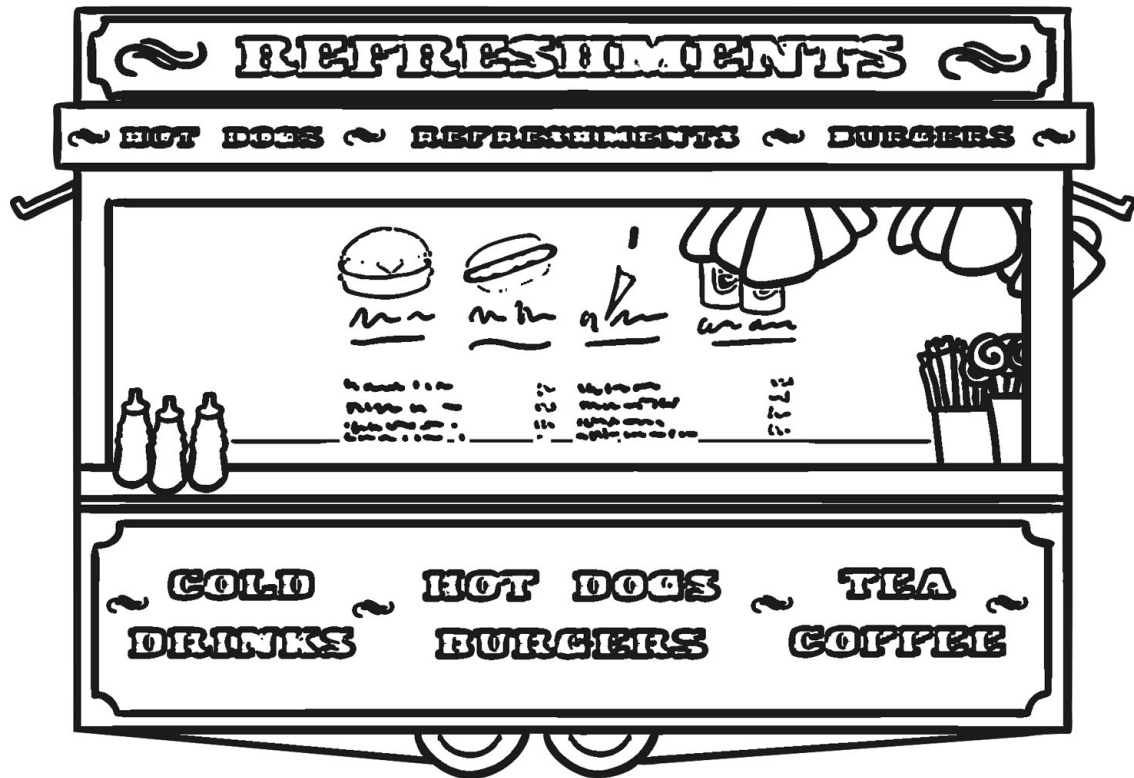


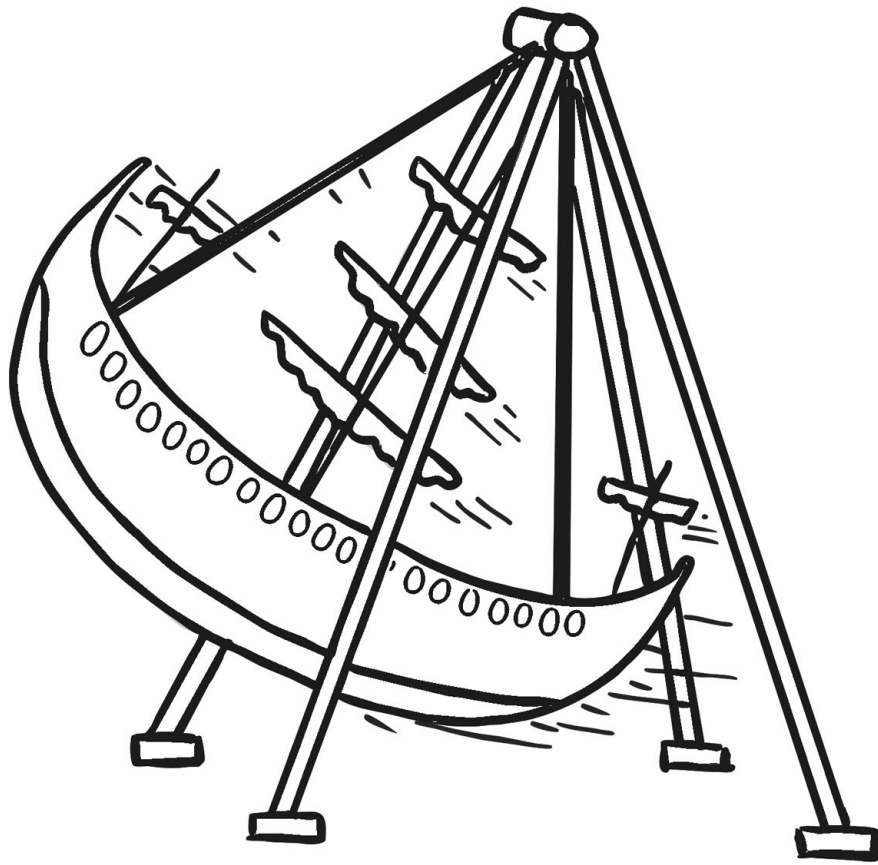












Design and Build Your Own Rollercoaster

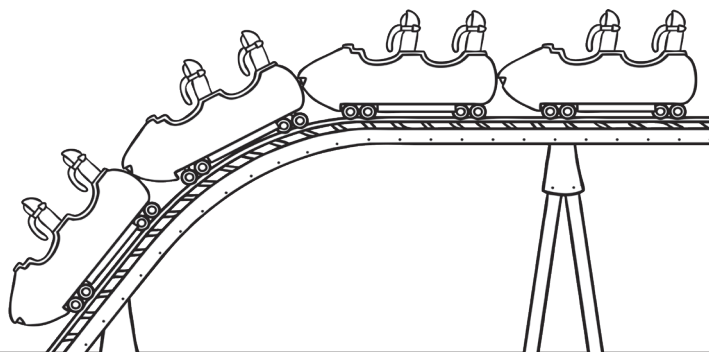
Test Stages

Complete the table below with the materials you are testing and notes on how they perform in the test.

Material	What was it good at?	What was it bad at?

Complete the table to show which materials you will use for the different features.

Feature	Best material	Notes/things to think about
360° loop		
45° drop		
High section at 1.5m or above		



Design

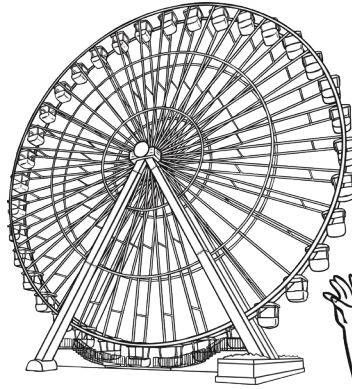
Use this space to design your rollercoaster.

You will need to include labels for each part and notes of measurements as well as materials.

Evaluation

Tick the features you included:

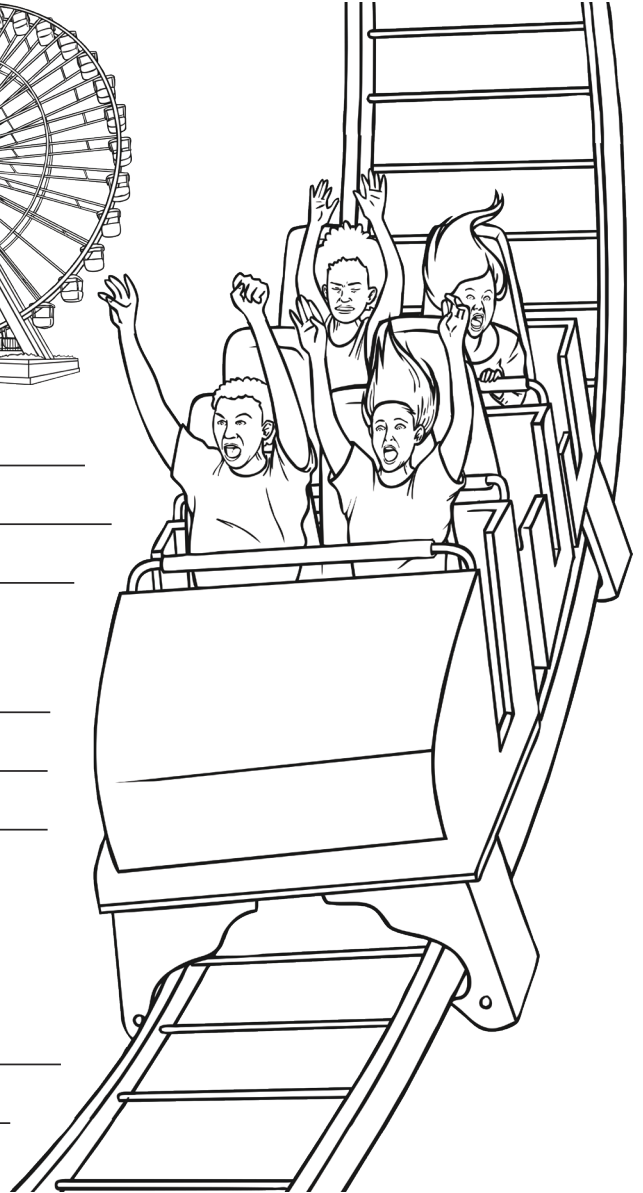
- ☐ 45° drop
- ☐ 360° loop
- ☐ High section at 1.5m or above
- ☐ Full length at least 2m



What worked well and why?

What didn't quite work and why was this?

If you were to build this again what would you change?



What did you like from other people's designs?

Do you think you would like to be a rollercoaster designer and why?

Making a Cereal Box Marble Run

Ever wondered what to do with those empty cereal boxes?

Follow these simple instructions to make a cereal box marble run.

You will need:

- 2 cardboard cereal boxes
- glue
- sticky tape
- scissors
- marbles



1.



Start off with your empty cereal box. Tape the lid shut and then cut off the front panel (take care, scissors are sharp!). Make sure you leave a little ledge at the bottom. This will stop the marbles rolling out everywhere when they reach the end of the run.

2.



Then take the detached front panel and cut it into three strips. Bend them at the ends and cut a notch on one side for the marble to run through.

3.



Next, take a little extra cardboard from another cereal box and fold the end of it and tape it onto the bottom. The folded end makes the marble run tilt back a little bit so the marble goes down the holes and doesn't fall out of the box.

4.



Finally, tape the strips into the box and cut a little hole at the top to drop the marble through. Then go and find some marbles!

Design a Rollercoaster Teacher Guidance

This is a great STEM and teamwork activity for KS2 children.

Preparation

- The design sheets for drawing would be useful on A3 paper. These can be stapled together into a booklet at the end.
- Prepare the children by watching some videos of rollercoasters and looking at photographs.
- All materials need to be big enough for a marble (around 10mm+ diameter) to run down easily (22mm diameter is perfect).
- Forward planning needs to be done for collection of materials as well as length of time allocated to the activity and the storing of materials during the making.

You will need:

- Design sheets for the children
- Sticky tape and metre rulers (for propping up parts and securing)
- One marble for each group to test the rollercoaster
- A range of materials, including cardboard tubes, plain cardboard, boxes and plastic tubes (a 2m long piece of plumbing pipe can be purchased quite cheaply from DIY stores)
- Plumbing pipe to be cut in half by an adult if needed
- Flexible tubing for the 360° loop
- Small pieces of these materials for use during the testing stages

Organisation

- Mixed ability groups of between two and five
- You may want to spend a whole day doing this activity or split it over a week.

Tip and tricks

- Send a letter home for materials beforehand as there may be families with plenty of tubing going spare.
- If budget allows, each team could be given a 2m length of plumbing pipe which can be sawn easily with junior hacksaws for design and corners. (Check your school's policy and risk assessment before considering the use of junior hacksaws.)
- Use sticky tape and metre rulers to support parts of the rollercoaster.
- A covered tube will stop the marble from falling out of the loop or other parts.
- The 45° drop should be used to get enough speed to finish the run and complete the 360° loop. Note how this is done with a big drop at the start of most rollercoasters.
- Make it real by giving the rollercoasters a name and even making an advertisement for them on video or paper.
- Use this as a cross-curricular and writing/presenting activity.

Simple catapult



In this activity a simple catapult is constructed from a plastic spoon, wine cork, and rubber band. Any small object that can fit in a spoon can be used to launch. Simple physics through Newton's Laws of Motion are observed. Engineering is incorporated by constructing the catapult, and mathematics is touched by doing a simple calculation of distance of launched item.

Materials

Corks

Plastic Spoons

Rubber bands

Jelly Beans

Measuring Tape

Display Board for Recording Students Distances

Marker

Instructions

- 1, Start by wrapping spoon mid- handle in rubber band, then attaching to wine cork in crossed manner, as can be seen below.
2. Then place jelly bean on spoon, and launch by pressing down on bottom of handle
3. Record distance.

<https://catherineodson.com/2015/01/23/putting-the-cat-in-catapult/>

Make and knock down tin cans/bottles

Collect some empty tin cans and cover them in paper or paint them using paint and PVA glue mix. Once dry arrange them as shown in the picture and take turns throwing small balls to see how many you can knock down.



Throwing balls into buckets

Arrange some buckets at an angle and practise throwing balls into them. How many can you get inside the bucket?



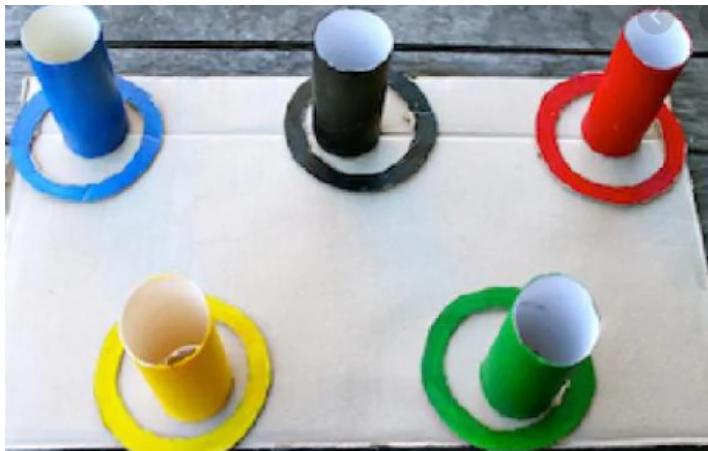
Hook the duck

Use a small swimming pool or a washing up bowl and fill halfway with water. Put in some plastic ducks that have hooks attached (alternatively use a net) and use a hook to hook the ducks and pull them out. How many can you get in two minutes?



Hoopla

You will need any kind of cylinder object you have at home (toilet rolls, pringles tube, empty spice jars etc) which can be stuck to a piece of cardboard if required. Then use some more cardboard to make the rings if you don't have any. Object of the game is to throw the ring over one of the posts. How many can you get?



Target game

Make some targets and attach these to a wall outside. The targets can be colours, numbers or letters. Fill a bucket with water and get some small sponges/foam balls. Wet a sponge and throw it at a target. Which number/colour or letter can you get?



Centripetal Force and Gyroscopic Stability: Penny Racers and Screaming Balloons

Penny Racers

- Place a penny inside a balloon, blow it up and tie it.
- Hold the balloon like a bowling ball and shake it gently in a circular motion
- The penny should soon begin to spin around on its edge in circles inside the balloon
- See how fast you can make the penny spin
- Stop moving the balloon and see how long the penny continues to spin inside

Screaming Balloons

- Place a hex nut inside a balloon, blow it up and tie it.
- Hold the balloon like a bowling ball and shake it gently in a circular motion
- The hex nut should soon also begin to spin around on its edge in circles inside the balloon, but this time it will make a loud screaming sound as it spins. The faster it goes, the louder and higher pitched the sound.

What's Happening: When you shake the balloon the penny or nut begins to bounce around and will soon find itself spinning along its edge simply due to random interactions, but once it does, because of the shape of the penny (or nut) the spinning motion produced is very stable and it will tend to keep spinning, especially if you continue to pump it at the right frequency (much like pushing someone on a swing). This is called gyroscopic stability, and it's what keeps a gyroscope pointing the same direction, a top spinning, or a rolling bicycle wheel from falling over. The round walls of the balloon also force the penny or nut to roll in a circle about the centre of the balloon. This is called centripetal force, and it will keep the penny rolling until friction eventually slows it down, but since the frictional force is very small and the penny is rolling very fast, it can keep going for a very long time. If it's spinning horizontally, as it slows it will roll in smaller and smaller diameter circles and move down the side of the balloon.

While the penny rolls around inside the balloon almost silently, the nut makes a screaming sound as it rolls. This is because the corners of the nut bounce as they hit the balloon and cause it to vibrate, or move back and forth very quickly. As the balloon vibrates, it in turn vibrates the air molecules nearby which creates sound waves. The faster the balloon vibrates, the faster the frequency of the sound waves and the higher the pitch will be. As the nut moves faster it

also has more momentum and makes the balloon move farther with each vibration, which pushes more air and makes the sound louder.

Variations: Try to make the penny spin in different directions. Try different shaking motions to start the penny spinning. Once it is spinning fast, turn your whole body and the penny should continue to roll more or less) in its original direction, just like a gyroscope. Try 2 pennies, or even 3 inside the same balloon. They might crash into each other at first, but you should find it quite easy to make all the pennies line up side-by-side and spin together. With a penny spinning fast, gently toss the balloon into the air and observe what happens as the centre of mass of the system changes.

Theme Park

f a r i l o g f l u m e t a
m n o i t a p i c i t n a m
h e l t e r s k e l t e r u
i c l c e a s m s t e a l e
d r e m f l c d e k r d e s
n t r g o u d o d g e m s t
u i c g y f q f a r g i u t
o c o e q u n u q u i s o i
r i a m u s e m e n t s r c
g t s h i j k l m u o i a p
r t t t s c r e a m i o c a
i r e s d o d j u m s n o n
a q r u v q u e s a e c g l
f u a t t r a c t i o n s f

admission
amusements
anticipation
attractions

carousel
dodgems
fairground
helter skelter

log flume
queuing
rollercoaster
scream

Theme Park Answer Sheet

f a r i t o g f l u m e t a
 m n o i t a p i c i t n a m
 h e l t e r s k e l t e r u
 i c l c e a s m s t e d l e
 d r e m f l c d e k r d e s
 n t r g o u d o d g e m s t
 u i c g y f a f a r g i u t
 o c o e q u n u q u i s o i
 r i a m u s e m e n t s r c
 g t s h i j k l m u o i a p
 r t t t s c r e a m i o c a
 i r e s d o d j u m s n o n
 a q r u v q u e s a e c g l
 f u a t t r a c t i o n s f

admission
 amusements
 anticipation
 attractions

carousel
 dodgems
 fairground
 helter skelter

log flume
 queuing
 rollercoaster
 scream

STEM Challenge: Perfect Playground Design

An Activity Linked to Unicef's Playground Challenge

Article 31 of UN Convention on the Rights of the Child states that **all children have the right to play**. By doing your Playground Challenge for Unicef, you will be helping their work to support children around the world access all of their rights.

Did you know, not all children have safe places to play? If you could design the perfect playground for children anywhere in the world, what would it look like?

You will need:

- Playdough or modelling clay
- Art straws (or normal ones)
- Cocktail sticks
- Paper, card
- Foil (optional)
- Tape, glue
- Scissors



What to do:

1. Take a good look around your playground or school field.
2. Discuss and make a list of the features of a 'perfect' playground. What should it look like? What should it have?
3. In teams, draw a plan of what would feature in your perfect playground. You could draw the equipment or markings you would like or search for images on the Internet and stick them on to your plan.
4. Now for the fun part! Select your tools and equipment and work together to build a model of your perfect playground.
5. You may decide to work in pairs or groups to complete the different parts of the design. You could make a list of things that need making and work individually to complete them. Just remember, work together to create your finished model.

Key Questions:

What do children enjoy playing at a playground?

Do you need a lot of small items or fewer, larger pieces of equipment?

How will you construct each part of your playground?

Should you include quiet spaces?

How will you strengthen each structure?

What age groups will your design be for?

Have you considered all abilities?

Is size important?

What is the best material to use?



This image shows a full page of blank graph paper. The grid consists of thin, light gray horizontal and vertical lines that intersect to form a series of small, uniform squares across the entire surface. There are no margins, text, or other markings on the paper.

Make a Tabletop Football Game

An Activity Linked to Unicef's Playground Challenge

Soccer Aid for Unicef is the world's biggest charity football event. In 2018, stars such as Robbie Williams, Usain Bolt and Sir Mo Farah will play alongside footballing legends to raise money to help children in danger around the world.

Be inspired by Soccer Aid and create your own legendary football match with this tabletop football activity. Why not add it to your fundraising efforts and hold your own tabletop Soccer Aid Challenge?

You will need:

- A shoebox
- Green paper
- A pen for the field markings
- Scissors
- 4 wooden dowel rods
- 10 wooden pegs
- Paint and felt-tip pens in two colours
- Ruler
- Table tennis ball



What to do:

1. Take a shoebox and remove the lid.
2. Place the box onto a sheet of green paper, draw around the base and cut out the rectangle.
3. Draw the markings of a football field on the green paper.
4. Once complete, stick the green paper into the shoebox to create your playing field.
5. Around the outside or inside edges, you could add cut out images from newspapers or magazines to create a football crowd scene.
6. On the short sides of the shoebox, measure and draw the goals. Make sure they are high enough for the ball to fit through and the goal is at the very bottom edge, so the ball can escape. (A rectangle about 5cm x 10cm should work, but this will also depend on the size of your box.)

7. Cut around each rectangle to leave an opening for the goals.
8. On one long side of the box, draw a horizontal line high enough for the ball to pass underneath and for the pegs to move freely when attached to the wooden dowel rods.
9. On this line, measure four evenly-spaced points. At each point, carefully make a hole large enough for the dowel rods to fit through.
10. Repeat steps 8 and 9 on the opposite side of the shoebox, making sure the four points line up with the opposite side.
11. Paint the tips of each dowel rod, alternating between team colours.
12. Push the dowel rods through the holes, alternating the team colours. You could wrap coloured tape or string around the ends of these.
13. Colour the wooden pegs in team colours and clip them to the coloured dowelling in team formations.
14. Find a friend, drop a table tennis ball onto the centre circle and start your game!

