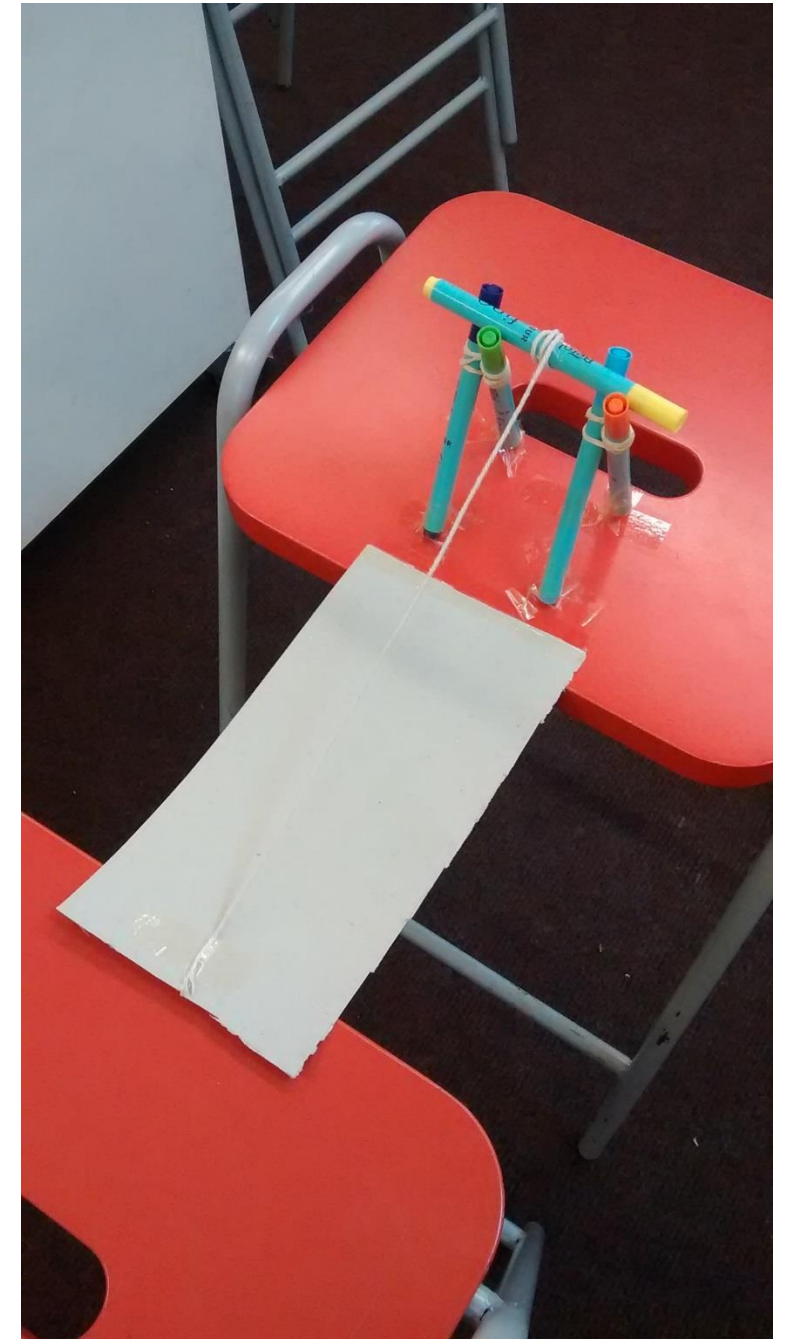


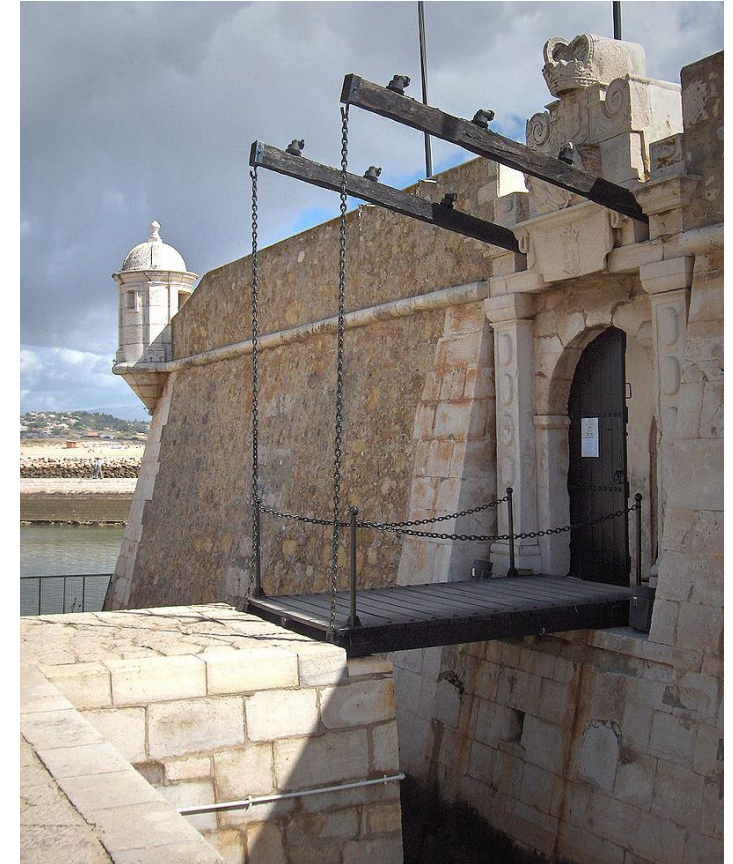
# Teacher notes

- You will probably need to demonstrate how to connect (lash) pens together using elastic bands in a figure of 8 to create the structure, and how to balance a pen on top to wind the string up and down.
- The structure will need to be taped firmly on to the top of the stool.
- The engineering and problem solving challenge here comes from observing that the pen holding the string keeps falling off and coming up with ways to secure it, as well as engineering a more sophisticated winding mechanism e.g. a wheel or handle on one or both ends of the pen. **It is not just building the design in the photo.**
- Some groups also included ways to secure the string to hold the drawbridge up, or used two strings like the two chains in the PowerPoint drawbridge photo.
- Card – half the top of a pizza box works well



# STEM Challenge Project

## Drawbridge challenge



Winding mechanisms part 1

# Learning Intentions

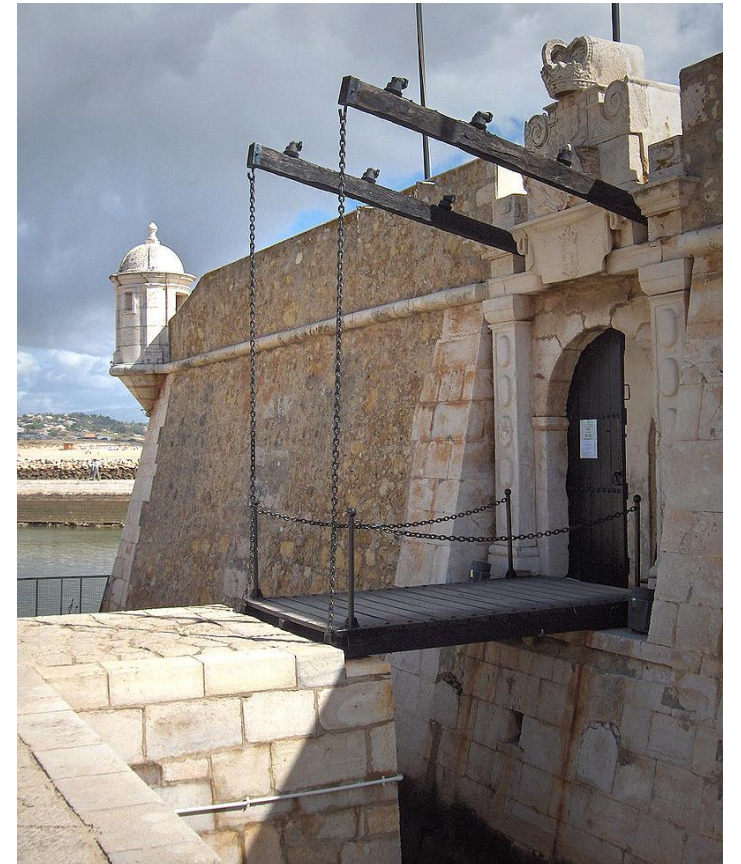
- To build up our **STEM skills**:
  - Teamwork
  - Communication
  - Creativity
  - Critical Thinking
  - Resilience
  
- To use the **engineering design process** to solve a problem

# What are your success criteria for this project?

- I would like to get better at
  - teamwork
  - communication
  - creativity
  - critical thinking
  - resilience
- How can you get better at this? Write down some strategies for yourself.
- At the end you will decide if you have been successful.

# Drawbridge challenge

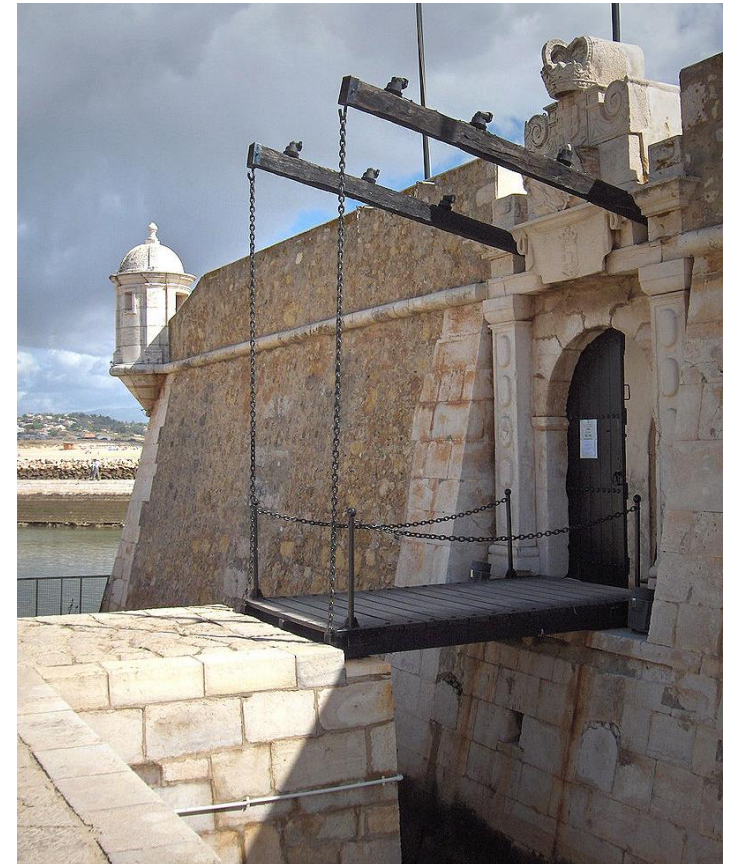
- A drawbridge is a type of moveable bridge often used at the entrance to castles.
- The castle was surrounded by a moat and the drawbridge could be raised and lowered.
- You are a drawbridge engineer who has been asked to design a drawbridge for a castle.





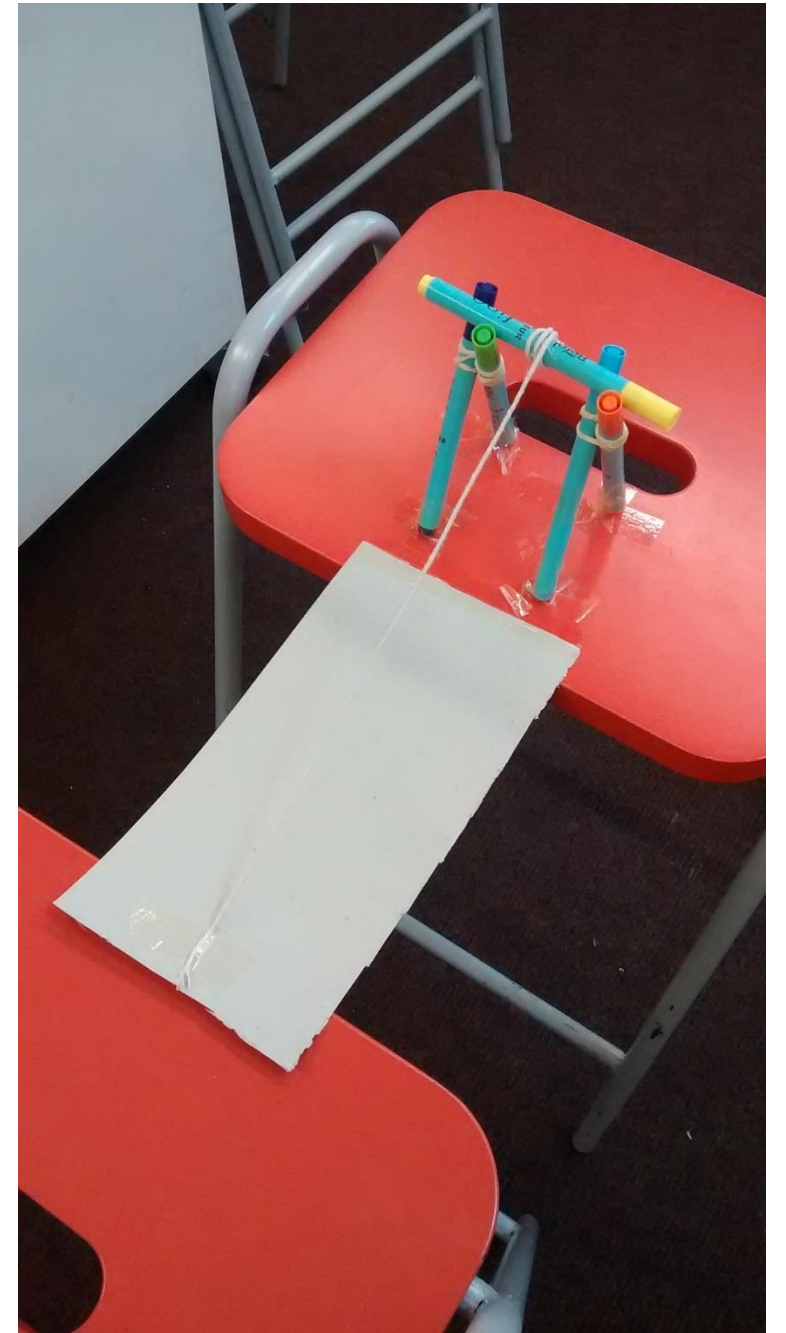
# Drawbridge challenge

- What are the problems with this task?
- What can you predict being difficult?
- Imagine how you could solve this problem.

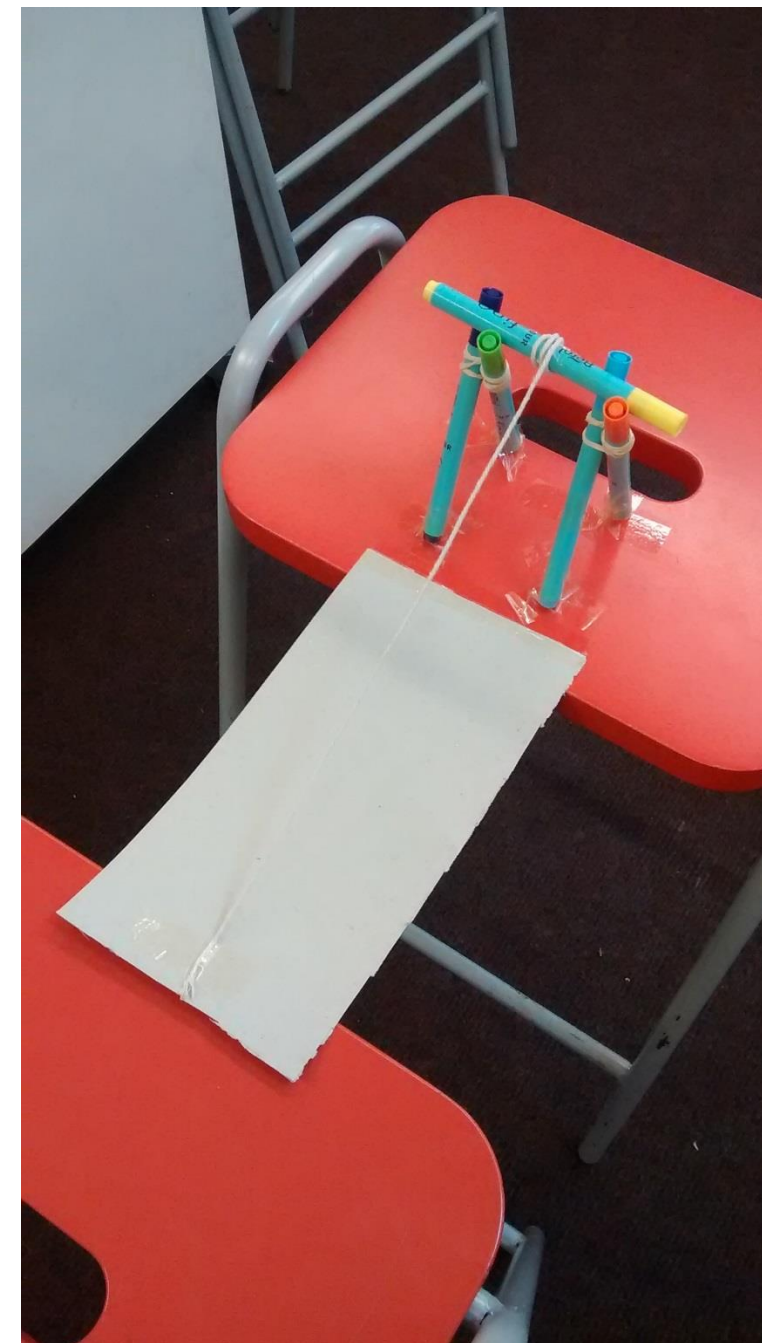
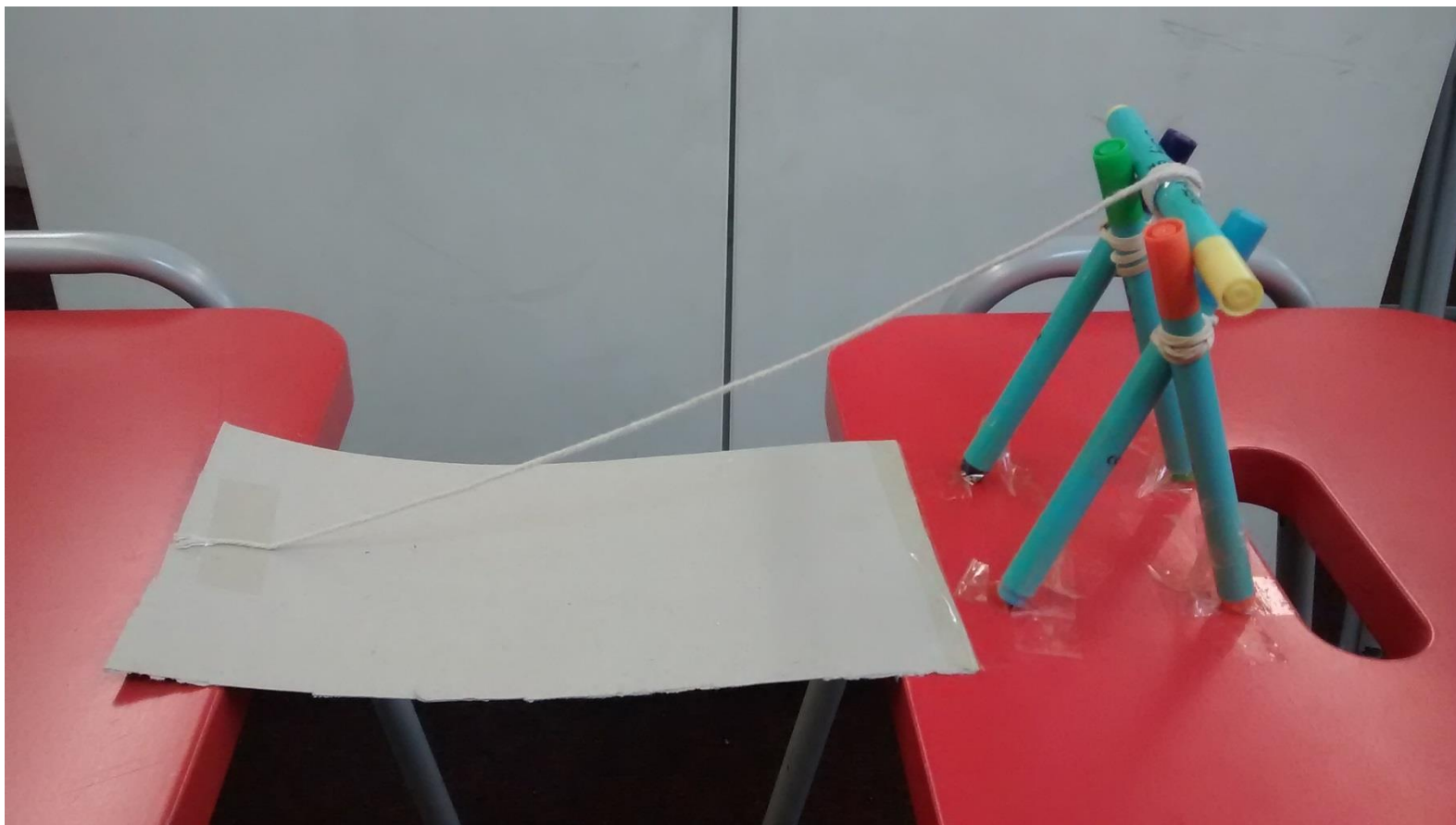


# Drawbridge challenge

- Design and build a **drawbridge** between 2 stools.
- You must be able to raise and lower the drawbridge using a winding mechanism.
- The bridge must be at least 20cm long.
- You will be given a choice of materials:
  - **Card – 1 piece**
  - **Felt-tip pens – max 5**
  - **Elastic bands – max 2**
  - **Lollypop sticks – max 6**
  - **Paperclips – max 4**
  - **String – 2 pieces**
  - **Sellotape**
- Test your drawbridge and try to improve it
- Extra challenge – how much weight can it hold?



# Basic drawbridge







# What can you learn from others?

- **Learning loop** – look at other people’s work.
- How did other groups tackle the STEM challenge?
- Which ideas did you see that were successful?
- What did you see that hadn’t worked, or that you wouldn’t use?

# Evaluation

- Discuss how your team approached the STEM challenge today
  - What did you learn today?
  - Which STEM skills did you develop?
- How could you improve your design?
- Can you think of another similar STEM challenge you could set yourself to try at home?

# STEM Challenge Project

Build a well  
challenge



Winding mechanisms part 2

# Learning Intentions

- To build up our **STEM skills**:
  - Teamwork
  - Communication
  - Creativity
  - Critical Thinking
  - Resilience
  
- To use the **engineering design process** to solve a problem





# What did we learn last lesson?

- How did other groups tackle the STEM challenge?
- Which ideas did you see that were successful?
- What did you see that hadn't worked, or that you wouldn't use?

# Well

- <http://no-ads-youtube.com/video/wildfilmsindia/villagers-collecting-water-from-bore-well-using-a-pulley-in-uttar-pradesh?v=HDzbKfVQKa4> 1 min

# Build a well challenge

- Design and build a **bucket to collect water from a well.**
- You must be able to raise and lower the bucket using a **winding mechanism.**
- The winding mechanism will sit on the edge of a stool and you will lower the bucket down, collect water from a jug, and raise the bucket up again.
- You will be given a choice of materials:
  - **Felt-tip pens – max 5**
  - **Elastic bands – max 2**
  - **String – 1 long piece**
  - **Foil – 1 piece**
  - **Straws – max 4**
  - **Lollypop sticks – max 6**
  - **Paperclips – max 4**
  - **Card scraps – max 1**
  - **Sellotape**
  - **Jug of water**
- Test your design and try to improve it



# Winding mechanism

- You will need to use a similar winding mechanism as you used for your drawbridge.
- What went wrong with the basic winding mechanism?
- How will you improve the winding mechanism and its structure?
- How will you adapt your design to create a well?







# What can you learn from others?

- **Learning loop** – look at other people’s work.
- How did other groups tackle the STEM challenge?
- Which ideas did you see that were successful?
- What did you see that hadn’t worked, or that you wouldn’t use?

# Evaluation

- Discuss how your team approached the STEM challenge today
  - What did you learn today?
  - Which STEM skills did you develop?
- How could you improve your design?
- Can you think of another similar STEM challenge you could set yourself to try at home?

# Self-assessment at end of project

- We have been developing our STEM skills by doing STEM challenges:
  - Collaboration
  - Communication
  - Critical thinking
  - Creativity
  - Resilience
- Use a felt-tip pen to update your previous self-assessment sheet.
  - Tick the boxes to show how you feel about each STEM skill.
  - Circle the STEM skills you feel you have developed during these STEM challenges.