As Creatives

Engineers Ireland

STEPS

# The Heritage Trail

## Engineering Through the Ages


**Downloadable Engineering Activities**

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ENGINEERS IRELAND
STEPS

# Parke's Castle: Going Back in Time - Brian's Boat

## Before You Start!

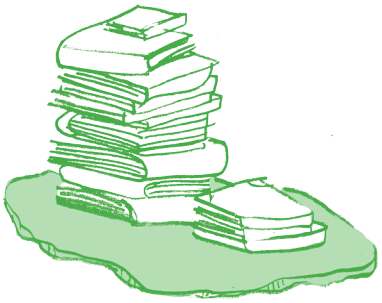
| | |
|---|---|
| Resources | See the list below. Apart from possibly spaghetti and a carrot, all should be readily available |
| Time Required | 30 – 60 minutes |
| Group Sizes | Individuals or pairs |
| Supervision | Younger children may some support with construction |
| Curriculum Links* | Science (materials, floatation) |
| Notes | The activity involves water – so choose an appropriate space to work in (and suitable clothing!). |

**all of the activities have links to both Irish history and Irish geography.*

### Engineering Connection!

Understanding floatation isn't just important to marine engineers. How does a standard toilet flush work? It's all about floatation!

# Parke's Castle:
# Going Back in Time – Brian's Boat



Parke's Castle wasn't the first on this site – an earlier one was built by Brian O'Rourke! Brian doesn't seem to have been the most loyal of people, offering his services to anyone he thought might reward him. It all came back to bite him, though – and he was forced to flee his home, leave Scotland – and go to Ireland.

To commemorate this voyage, your challenge is to build a boat – using only resources in this list (you don't have to use them all, though!):

- Newspaper
- Spaghetti
- String
- Sticky tape
- Lolly sticks
- Small carrot (or something of a similar size and weight!)

Once you have designed and built your boat, test it by placing it in a basin of water. If you're feeling brave, put a small carrot in it (to represent Brian). And if you're feeling really brave, create a few waves – it must have been a choppy trip across the Irish Sea!

**Things to Think About:**

- How will you make your boat as **waterproof** as possible?
- How will you make your boat as **stable** as possible?

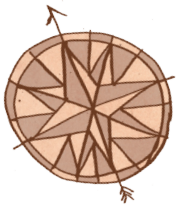
**Recording Your Work:**

If you'd like to, you can print the worksheet accompanying this challenge – allowing you to keep a record of your work.

I must go down to the seas again,
to the lonely sea and the sky,
And all I ask is a tall ship
and a star to steer her by!

(from *Sea Fever*, by John Masefield)

# Going Back in Time - Brian's Boat - The Worksheet!



1. Draw a labelled picture of your completed boat in the box.

2. On a scale of 1 – 10, how **waterproof** was your boat?
1 means *Not At All Waterproof!* ... 10 means *Extremely Waterproof!*

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

3. On a scale of 1 – 10, how **stable** was your boat?
1 means *Not At All Stable!* ... 10 means *Extremely Stable!*

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

4. Did you test your boat with "Brian" aboard? If so, how did it perform?

5. Did you test your boat in choppy conditions? If so, how did it perform?

# Engineering Through the Ages

ENGINEERS IRELAND
STEPS

# Parke's Castle: Looking at Leitrim

## Before You Start!

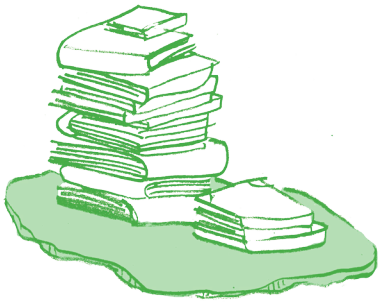
| | |
|---|---|
| Resources | None apart from printing (and, if you do print, scissors) |
| Time Required | 30 – 45 minutes |
| Group Sizes | Individuals or pairs |
| Supervision | Younger children may some supervision with cutting |
| Curriculum Links* | Maths (2D shapes, patterns) |
| Notes | This activity will definitely be less challenging if you print out the appropriate sheets |

**all of the activities have links to both Irish history and Irish geography.*

## Engineering Connection!

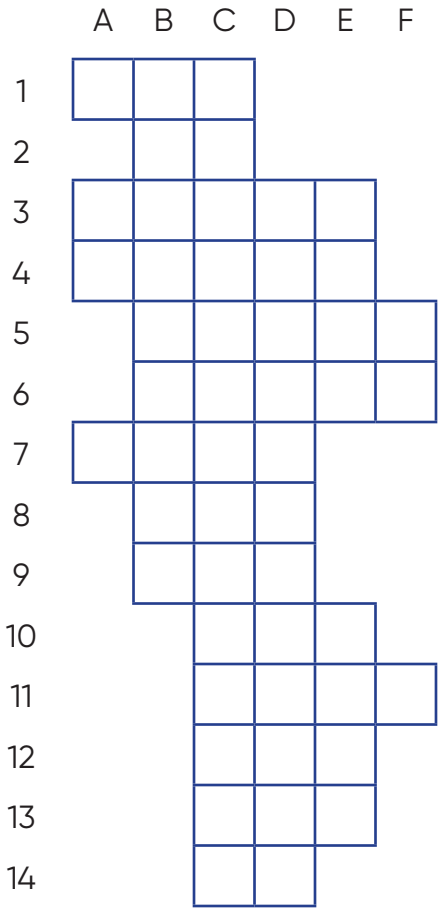
The abilities to identify patterns and use space effectively and efficiently are vital to a whole range of different engineering sectors – from electronics to electrics, from transport systems to traffic control and from vaccine manufacturing to vacuum cleaner maintenance!

# Parke's Castle: Looking at Leitrim



Parke's Castle was built by Robert Parke – and rapidly became one of the most important buildings in County Leitrim.

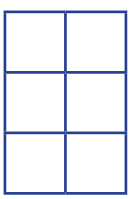
Here's a graphic to show the rough shape of the county. You might find this challenge easier if you cut the shape out (or ask an adult to cut it out for you) – there's a large copy on page x of this document.




And here are some more, smaller shapes. Again, you might find this challenge easier if you cut these shapes out (or ask an adult to cut them out for you) – there are copies on page x of this document.

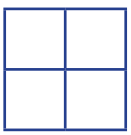
A

B

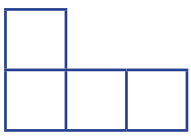


C

D



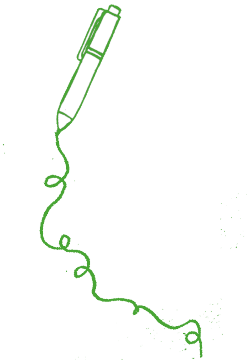
E



F

**Recording Your Work**

If you'd like to, you can print the worksheet accompanying this challenge – allowing you to keep a record of your work. The answers are at the very end of this document – but try not to take a sneaky peek until you have completed the challenge?



**The Challenge**

The challenge is to identify which of the smaller shapes you would need to enlarge parts of Country Leitrim. Be careful – as some of the pieces will need to be rotated to fit (which is why is might be easier to cut them out)!.

**Area 1:** which piece would you need to complete a rectangle covering squares 7B to 7F and squares 9B to 9F?

**Area 2:** which piece would you need to complete a rectangle covering squares 1B to 1E and squares 2B to 2 E?

**Area 2:** which piece would you need to complete a rectangle covering squares 10B, 11B, 12B, 13B and 14B?

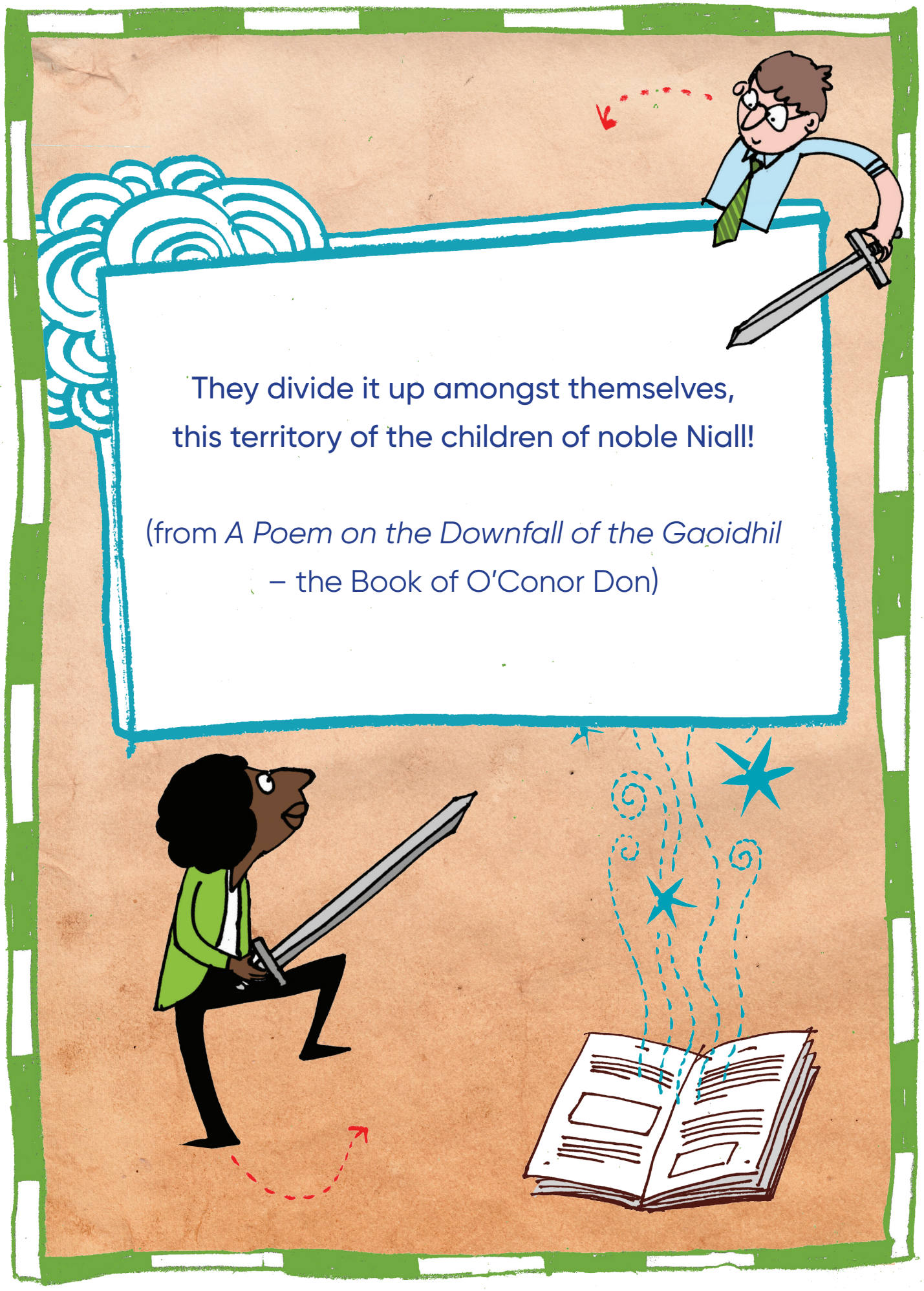
**Area 3:** which piece would you need to complete a rectangle covering squares 5A and 6A?

**Area 4:** which piece would you need to complete a rectangle covering squares 12F, 13F, 14E and 14F?

**Area 5:** which two pieces would you need to complete a rectangle covering squares 1A to 1F and squares 2A to 2F?

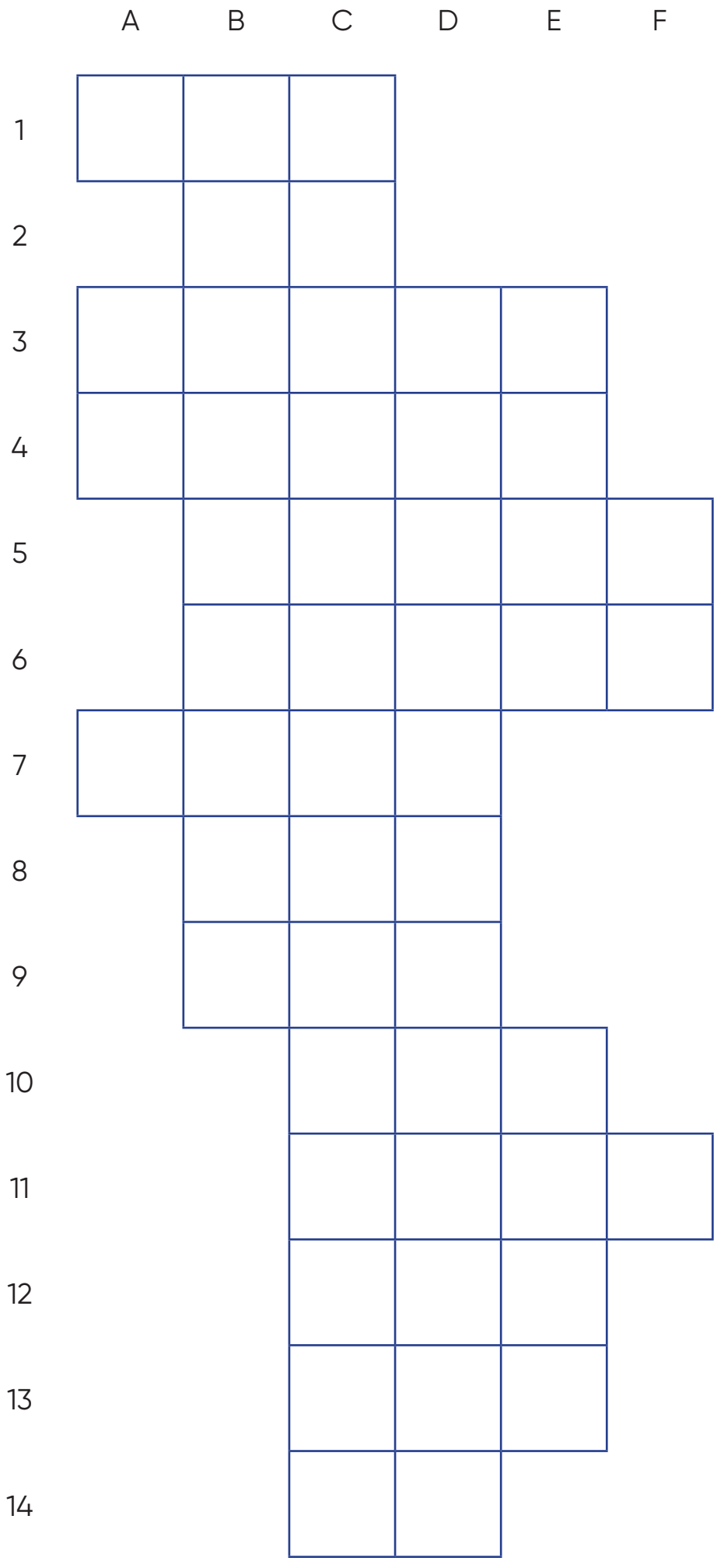
**Area 6:** which piece would you need to complete a rectangle covering squares 12C to 12F, 13C to 13F and 14C to 14F? … Where else could you use this shape to complete a rectangle?

**Area 7:** you want to create a triangular area in column A through a diagonal line from the bottom left corner of 14C to the top left corner of 11A. You are going to use four copies of piece A – but you will have to trim each one to the right size. What will each one look like when you have finished?

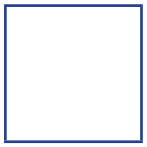


They divide it up amongst themselves,
this territory of the children of noble Niall!

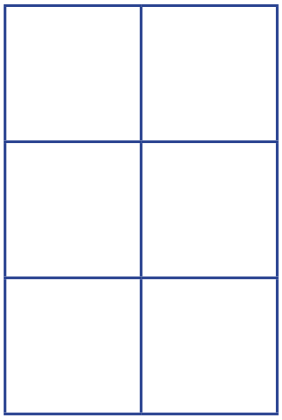
(from *A Poem on the Downfall of the Gaoidhil*
– the Book of O'Conor Don)



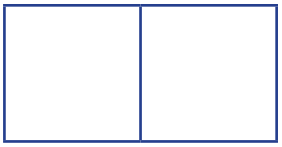
A



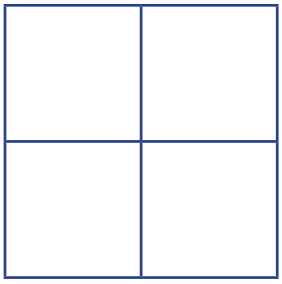
B



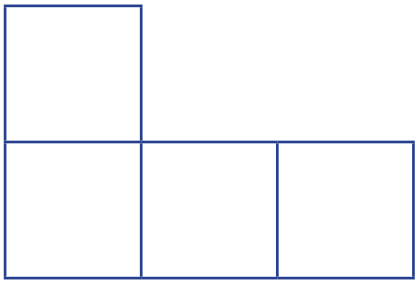
C



D

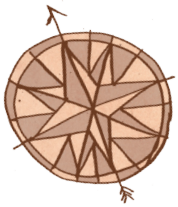


E



F

# Looking at Leitrim - The Worksheet!



**Area 1:**
Which shape did you use?

Draw a picture of the completed area.

**Area 2:**
Which shape did you use?

Draw a picture of the completed area.

**Area 3:**
Which shape did you use?

Draw a picture of the completed area.

**Area 4:**

Which shape did you use?

Draw a picture of the completed area.

**Area 5:**

Which shapes did you use?

Draw a picture of the completed area.

**Area 6:**

Which shape did you use?

Draw a picture of the completed area.

Where else could you have used the shape?

Area 7:

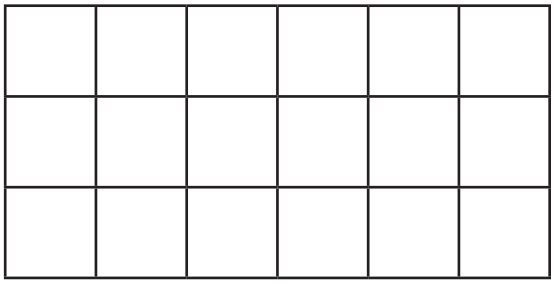
Draw the four shapes you ended up with.

# Looking at Leitrim - The Answers!

Area 1:
Which shape did you use?

**B**

Draw a picture of the completed area.



Area 2:
Which shape did you use?

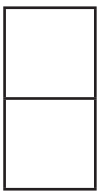
**D**

Draw a picture of the completed area.

Area 3:
Which shape did you use?

**F**

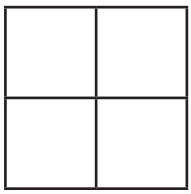
Draw a picture of the completed area.



Area 4:
Which shape did you use?

**C**

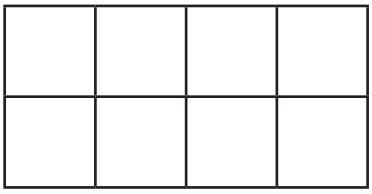
Draw a picture of the completed area.



Area 5:
Which shape did you use?

**A and B**

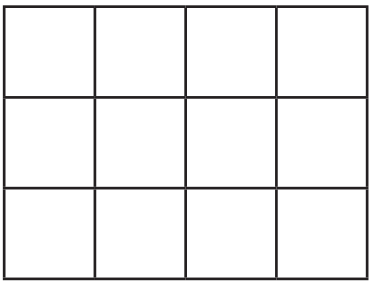
Draw a picture of the completed area.



Area 6:
Which shape did you use?

**E**

Draw a picture of the completed area.

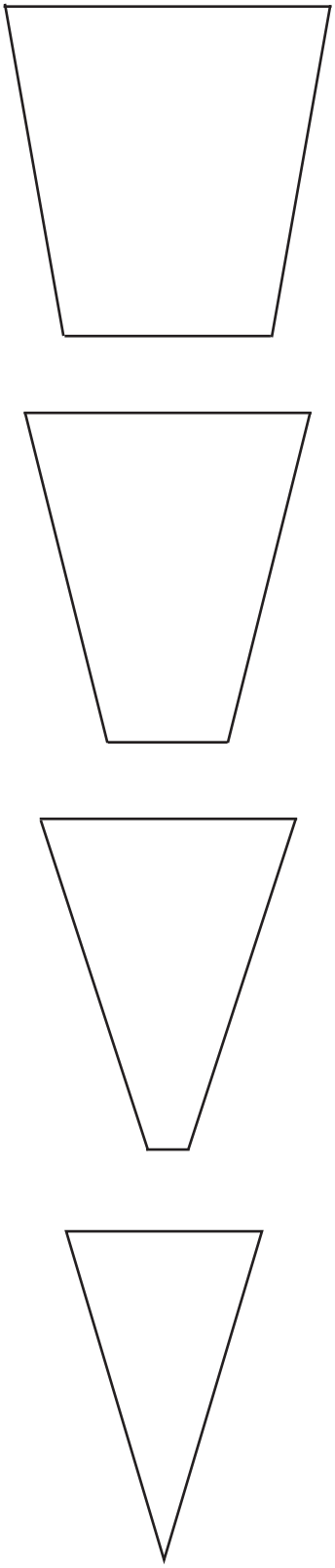


Where else could you have used the shape?

**To cover 8A, 9A, 10A and 10B**

Area 7:

Draw the four shapes you ended up with.



# Engineering Through the Ages

ENGINEERS IRELAND
STEPS

# Parke's Castle: Sealing the Ceiling!

## Before You Start!

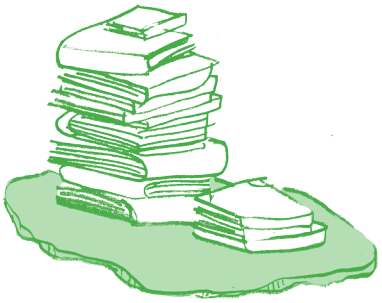
| | |
|---|---|
| Resources | See below. All should be readily available – although you might need to collect some cardboard boxes! |
| Time Required | 60 minutes + |
| Group Sizes | Individuals, pairs or small groups |
| Supervision | Younger children may some supervision with cutting |
| Curriculum Links* | Maths (2D shapes, measuring, estimation), Science (materials, forces) |
| Notes | This activity is quite fiddly + testing both patience and resilience! |

**all of the activities have links to both Irish history and Irish geography.*

## Engineering Connection!

Large buildings with big open spaces have provided challenges for engineers for centuries – from the great cathedrals of the past to the shopping malls of today!

# Parke's Castle: Sealing the Ceiling!



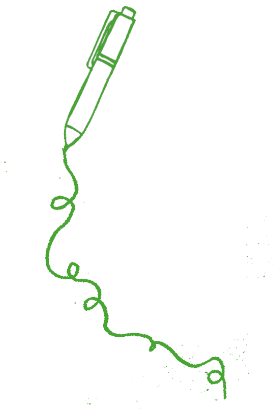
Parke's Castle's Banquet Hall has an astonishing ceiling, supported by timbers of solid Irish oak. And it has to be astonishing – as it has to support the weight of the entire structure above it! This challenge will see you attempting to build your own ceiling – and testing it!

**You Will Need:**

- An empty cardboard box (a cereal box is ideal) ...
- Four sheets of cardboard – at least the size of the largest side of your box ...
- Pencil or pen ...
- Ruler ...
- Scissors ...
- Sticky tape ...
- Three tins (baked bean tins are perfect – but don't eat the beans until you've finished!)

**Recording Your Work:**

If you'd like to, you can print the worksheet accompanying this challenge – allowing you to keep a record of your work.



**The Process:**

*Note: some of the cutting out is going to be fiddly – so you might need to ask an adult to help.*

Step 1:

Carefully cut out the largest side of your box. This will be your ceiling – and the rest of the box will be the Banquet Hall.

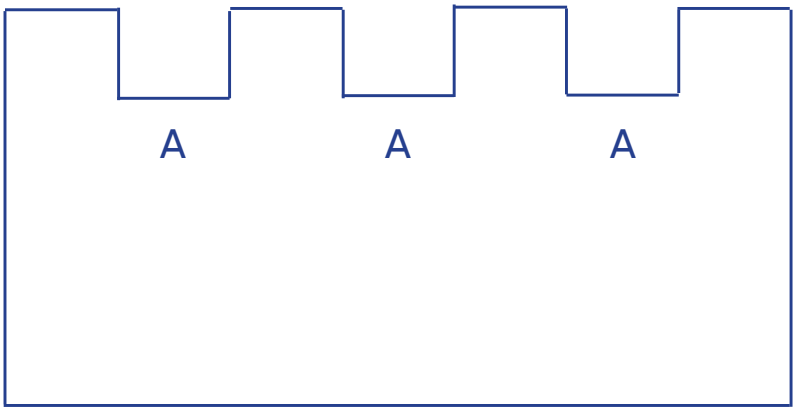
Step 2:

Cut twelve notches in the tops of the walls of your Banquet Hall. The notches marked A in the diagram in the diagram need to be about half a centimetre deep – and the notches marked B a little deeper.

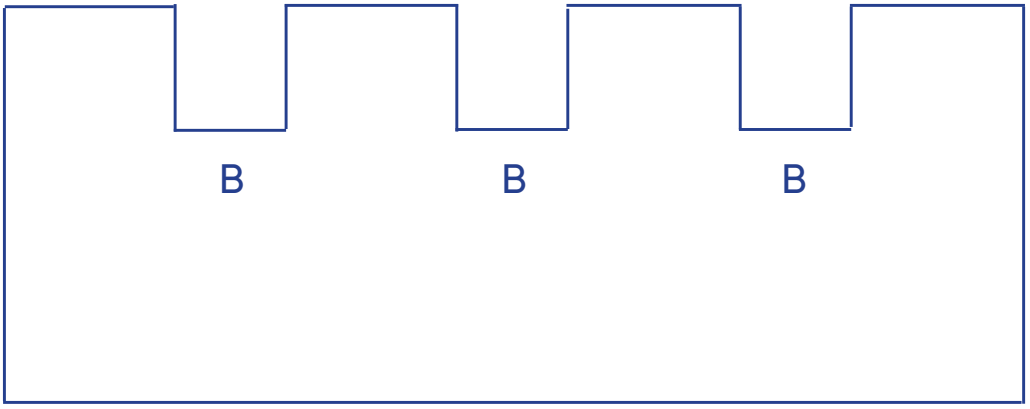
This diagram isn't to scale – but it might help (the spaces indicate the notches).

- Use a pen/pencil and ruler to mark out your notches first.
- You'll need to be accurate – the notches **must** line up with each other!

End Walls




Side Walls




Step 3:
Mark up the ceiling to show exactly where the notches on the walls are.

Step 4:
Use some of the extra cardboard to make three "beams" to go across the width of your hall.

- Simply cutting strips won't be enough to support the weight when you test your ceiling. So how are you going to make sure that your beams are strong enough? You're going to cut notches in the beams soon – so you'll need to bear this in mind, too.
- Your beams will need to be a bit longer than the width of your Banquet Hall – as they are going to sit in the notches marked B. This will affect the length, the width and the thickness of your beams.

Step 5:
Cut three notches along the length of your beams, about half a centimetre deep.

- Be careful – these new notches need to line up with the notches marked A!

Step 6:
Place the beams on your ceiling so that they will line up exactly with the notches marked B. Fix them in place with sticky tape.

Step 7:
Use some of the extra cardboard to make three "beams" to go across the length of your hall.

- Simply cutting strips won't be enough to support the weight when you test your ceiling. So how are you going to make sure that your beams are strong enough? You're going to cut notches in the beams soon – so you'll need to bear this in mind, too.
- Your beams will need to be a bit longer than the length of your Banquet Hall – as they are going to sit in the notches marked A. This will affect the length, the width and the thickness of your beams.

Step 8:
Place these beams on your ceiling so that …

- They line up exactly with the notches marked A …
- They sit in the notches in the beams that you have already put in place.

Fix them in place with sticky tape.

Step 9:
Carefully lower your ceiling on to the shell of your Banquet Hall – with the beams facing the inside of the room.

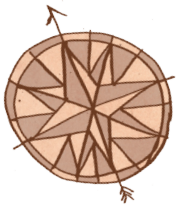
Step 10:
Test your construction …

- Place one of your tins on top of the ceiling (where exactly will you put it?). How does the ceiling respond? What about the walls?
- Put a second tin in place (where exactly will you put it?). How does the ceiling respond? What about the walls?
- Put the third tin in place (where exactly will you put it?). How does the ceiling respond? What about the walls?

The roof of this court
is too high to be yours!

(from *Love's Labour's Lost*,
by William Shakespeare)

# Sealing the Ceiling - The Worksheet!



Once you have cut the notches, draw a scale diagram to show a bird's eye view (a "plan") of the shell your Banque Hall.

Once you have made it, draw a scale diagram to show a plan of your ceiling (showing the side with the beams).

When you put the first tin in place, how did the ceiling respond? What about the walls?

When you put the second tin in place, how did the ceiling respond? What about the walls?

When you put the second tin in place, how did the ceiling respond? What about the walls?

# Engineering Through the Ages

ENGINEERS IRELAND
STEPS

# Parke's Castle: The Courtyard – Well, Well, Well!

## Before You Start!

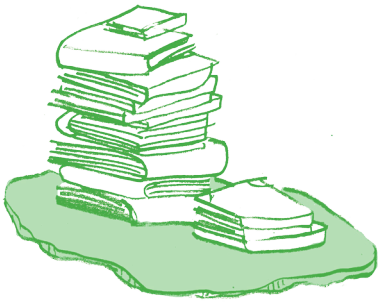
| | |
|---|---|
| Resources | See below. All should be readily available – although you might need to collect a few inner tubes from toilet rolls! |
| Time Required | 45 - 60 minutes |
| Group Sizes | Individuals, pairs or small groups |
| Supervision | Younger children may some supervision with cutting |
| Curriculum Links* | Maths (measuring), Science (forces, magnets) |
| Notes | You'll need a bit of space for this challenge! |

**all of the activities have links to both Irish history and Irish geography.*

## Engineering Connection!

Winches can provide enormous pulling power – and they've been doing it for a long time! It's thought that engineers used them in the Persian Wars to tighten the cables of bridges they built for their armies – two and a half thousand years ago!

# Parke's Castle:
# The Courtyard - Well, Well, Well!



The inhabitants of Parke's Castle were able to benefit from a well in the Courtyard, drawing fresh water from the ground deep beneath. As well as being convenient, this would help those living there survive if the castle ever came under siege! This challenge will see you attempting to build your own well – and testing it!

**You Will Need:**

- Cardboard tube (the inner tube of a toilet roll is ideal)
- Straws (three should be enough)
- String
- Scissors
- Sticky tape
- Small magnet (from a fridge magnet)
- Selection of small magnetic objects (small enough to fit inside the tube)

**The Challenge:**

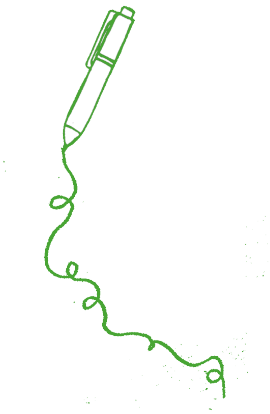
- The cardboard tube will form the "body" of your well, standing upright on a flat surface. Your small metallic objects will be at the bottom of the body. You will be making a winch to allow you to use the magnet to "capture" the objects.
- The straws will provide the framework above the body (you might want to ask an adult to help with any cutting). One of these will be the horizontal winch around which the string is wound.
- You'll need to attach the small magnet to the end of the string.

**Things to Think About:**

- How will you make sure that the horizontal winch can rotate freely?
- How will you make sure that all parts of the structure are strong enough to raise objects from the well?

**Recording Your Work:**

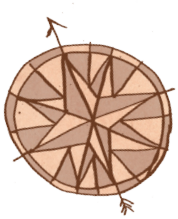
If you'd like to, you can print the worksheet accompanying this challenge – allowing you to keep a record of your work.



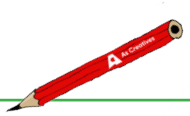
If herein your siller cast,
A wish may well come true at last!

(inscription on the
*Letham Glen Wishing Well*, Scotland)

# The Courtyard - Well, Well, Well! - The Worksheet!



1. Draw a labelled picture of your completed well in the box.



2. On a scale of 1 – 10, how **stable** was your well?
1 means *Not At All Stable!* ... 10 means *Extremely Stable!*

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

3. On a scale of 1 – 10, how well did your **winch** work?
1 means *Not At All Well!* ... 10 means *Extremely Well!*

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

4. Could you adapt your design so that you could attempt to select which objects you take from the well? Use the box to draw a labelled picture of your adapted design.

# Engineering Through the Ages

ENGINEERS IRELAND
STEPS

# Parke's Castle: Pigeon Tower? Pigeon Power!

## Before You Start!

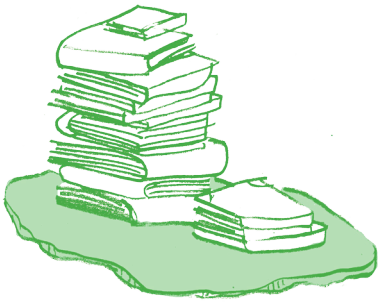
| | |
|---|---|
| Resources | See below. All should be readily available. |
| Time Required | 30 - 45 minutes |
| Group Sizes | Individuals or pairs |
| Supervision | Younger children may some supervision with cutting |
| Curriculum Links* | Maths (measuring, accuracy), Literacy (writing) |
| Notes | This activity is quite fiddly + testing both patience and resilience! |

**all of the activities have links to both Irish history and Irish geography.*

### Engineering Connection!

Lots of adventure parks have zipline rides today – but in mountainous regions they've been used for many years to help in both communication and transporting goods!

# Parke's Castle:
# Pigeon Tower? Pigeon Power!



Parke's Castle is not unusual in having a Pigeon Tower – because in medieval times Irish castles were required by law to keep messenger pigeons! This challenge will see you attempting to build two of your own Pigeon Towers – and passing messages between them!

**You Will Need:**

- Two long cardboard tubes (the inner tubes of kitchen rolls are ideal)*
- String
- Scissors
- Bulldog clip (a paper clip will do)
- Card (for your pigeon!)

** if you don't have any kitchen roll tubes, you can make your own from carefully rolled and taped cardboard.*

**Recording Your Work:**

If you'd like to, you can print the worksheet accompanying this challenge – allowing you to keep a record of your work.

**The Process:**

*Note: some of the cutting is going to be fiddly – so you might need to ask an adult to help.*

Step 1:

- Carefully cut a small hole (Hole 1) 1.0cm from the end of one of your tubes. The hole needs to be wide enough – and smooth enough – for the string to pass freely through.
- Cut a second hole (Hole 2) directly opposite Hole 1 – so that your string will be able to pass freely though both Holes 1 and 2.
- Carefully cut a small hole (Hole 3) 1.0cm below Hole 2. The hole needs to be wide enough – and smooth enough – for the string to pass freely through.
- Carefully cut a small hole (Hole 4) 1.0cm below Hole 1. The hole needs to be wide enough – and smooth enough – for the string to pass freely through.
- Repeat the whole process for your second tube.

Step 2:

- Secure one of the tubes by tying it to a stable object – a chair leg, for example.
- Repeat for the second tube. Make sure that there is a clear run between the two tubes – ie nothing in the way!

Step 3:

- Thread one end of your string through Hole 1 on Tube 1 (going from the outside in) ...
- Pass the string back out of the tube again - through Hole 2 ...
- Pass it down and back into the tube through Hole 3 ...
- And pass it back out of the tube through Hole 4.

Step 4:

- Pull the string along until you reach the second tube – threading it through Hole 4 ...
- Hole 3 ... and Hole 2.

Step 5:

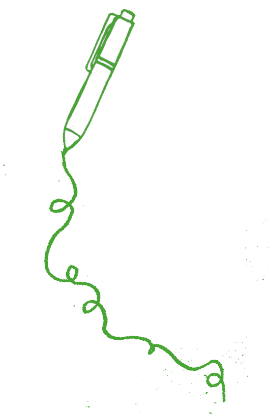
- Pass the other end of the string through Hole 1 on the second tube – and cut it off.
- Tie the two ends together in a small but tight knot (the knot mots be small enough to pass through the tubes).

Step 6:

- Make your pigeon!
- It's up to you how you do this – but you must be able to attach a message to it (using a groove to grip the message, for example – or a slot mechanism in which it can be inserted).
- Write a message – and attach it to your pigeon.

Step 7:

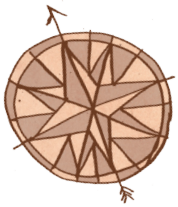
- Using the bulldog clip, attach your pigeon to the upper string on one of the Pigeon Towers.
- Ask a friend or family member to keep watch at the second Pigeon Tower – ready to receive the message. Their job is to pull the upper string towards them. You might both need to help keep the lower string moving freely.
- Once they have received the message, ask them to write a reply – and send it back to you!



The pigeon –
of all things that walk or fly
Or swim or creep,
the best cared-for and happiest!

(from *Pigeons*, by James Henry)

# Pigeon Tower? Pigeon Power! - The Worksheet!



1. Draw a labelled picture of your completed Pigeon Towers system in the box.

2. Did you have to make any adjustments to your design as you tried it out? What were they?

3. How could you adjust the design so that it would still work if one Tower was elevated (eg at the top of the stairs)?

4. Draw a picture of this adjusted design.