Mathematics trail

This pack includes

- Activity sheets
- Teachers notes

Heritage Lottery Fund

The London canal museum is an interactive hands on centre for learning all about the canals in London and the UK. The museum was built as an Ice warehouse in the 1850s and includes the original ice wells used to store the six hundred tonnes of ice imported from Norway. it was owned by Carlo Gatti, the famous ice cream manufacturer and entrepreneur.

It offers adults and children of all ages the opportunity to experience the local canal environment at first hand. The ice wells at the museum and their connection to the Gatti Family, and provide an atmospheric backdrop to the story of the people who lived and worked on the canals for over a hundred years.

The mathematics trail is a set of stimulating activities for Key stage two students that encourages strategic thinking and lateral problem solving.

The pack comprises of seventeen work sheets which are organised into two (numbered levels). These can be used to differentiate for mixed ability groups.

National curriculum links

- Problem solving
- Data handling
- Interpreting data
- Shape, space and measurement
- Mental maths

Activity sheets

At home in a narrowboat
Weighing
Coal
Time line
Ice well
Journeys
Symmetry
Estimate

At Home in a Narrowboat 1

In about 1840, the narrowboat men's families began to live in the boats

The cabins were very small, so that most of the boat could be used to carry goods.

Go into the cabin of the *Coronis* and measure some of the furniture.

Write down the measurements on the activity sheet.

Furniture and measurements:

Now cut out the furniture on the activity sheet and arrange it in the boat.

At Home in a Narrowboat 2

In about 1840, the narrowboat men's families began to live on the boats.

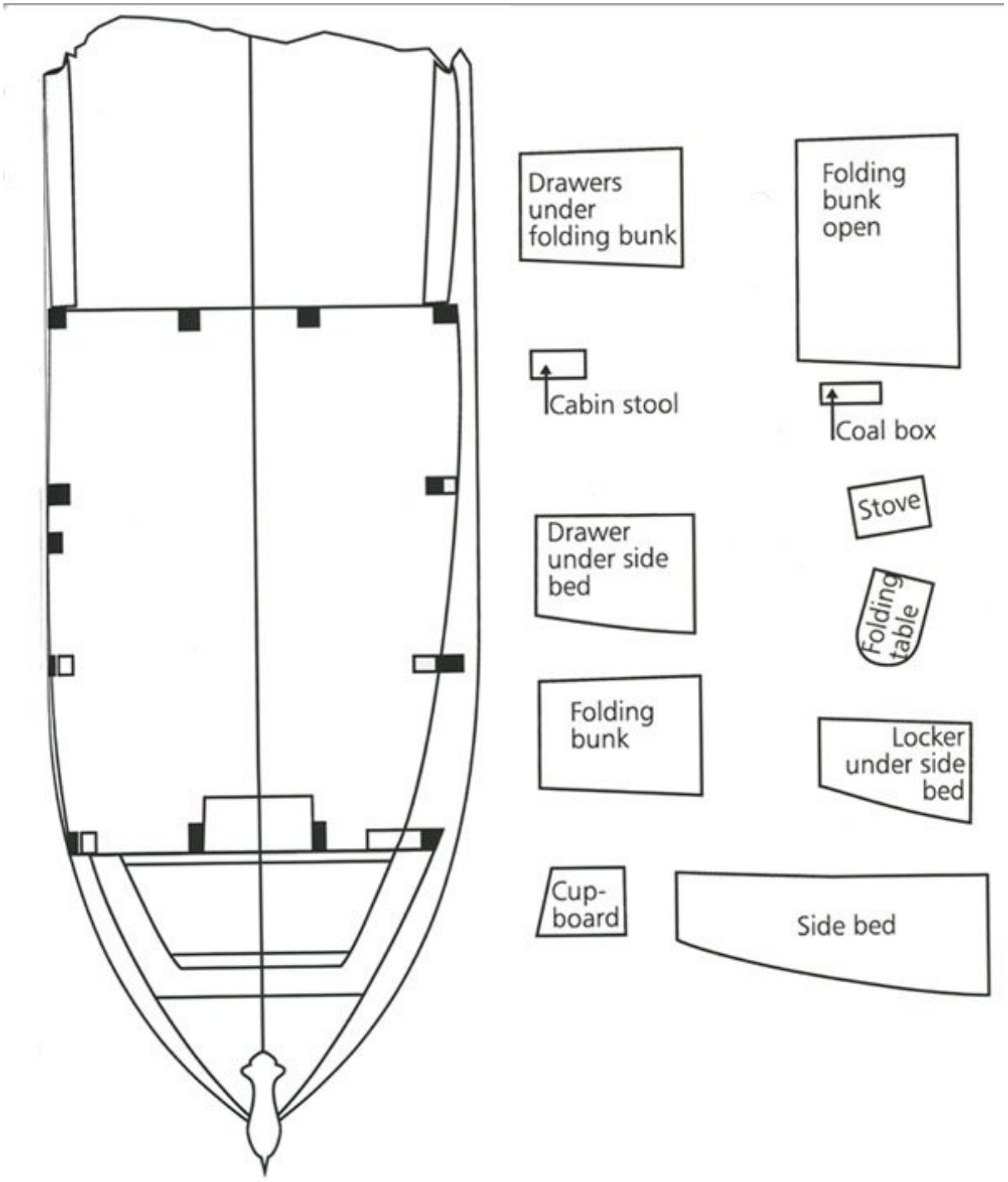
The cabins were only small, so that most of the boat could carry goods.

Measure the dimensions of the Coronis cabin and write them on the activity sheet.

Now measure the different pieces of furniture and record you findings on the activity sheet.

Draw your own plan of the cabin and decide where you are going to place the furniture:

Coronis Activity Sheet



Weighing 1

It is important for a narrowboat man to know how much the cargo on the boat weighs.

How many pounds does a sack of coal weigh?

(As your teacher puts the weights onto the scales add them up to find out)

A pack of coal weighs _____ pounds

Do you weigh more or less than the bag of coal?

What did boatmen use to find out how heavy a boat was?

A boat contains 50 sacks of cargo, and weighs 9,500 kg

An empty boat weighs 7,000 kg

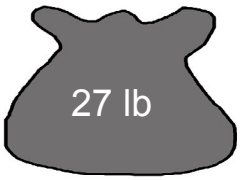
Calculate the weight of one sack of cargo:

The answer……...

Weighing 2

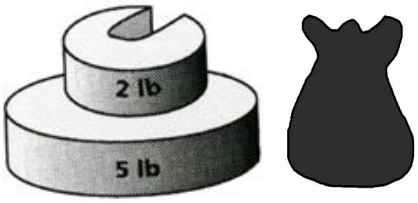
The narrowboat men have to weigh out different quantities of grain into sacks.
They use the scales and these weights:

Show how they could weigh out these quantities:



Make one up and swap with a friend.

Here are the weights that you can use:



You need to decide what quantity of grain you need in your sack.

Find out the weight of each of the three small sacks in the museum.
500g is about 1lb.
About how many kilograms do each of your sacks weigh?

Coal 1

Narrowboats were used to deliver coal from Limehouse Docks.

A small sack of coal weights 5 lb:

How many lb of coal are there in 3 sacks?

Make up a problem like this for a friend.

Draw three things in the museum that you think weigh about the same as the small sack:

Coal 2

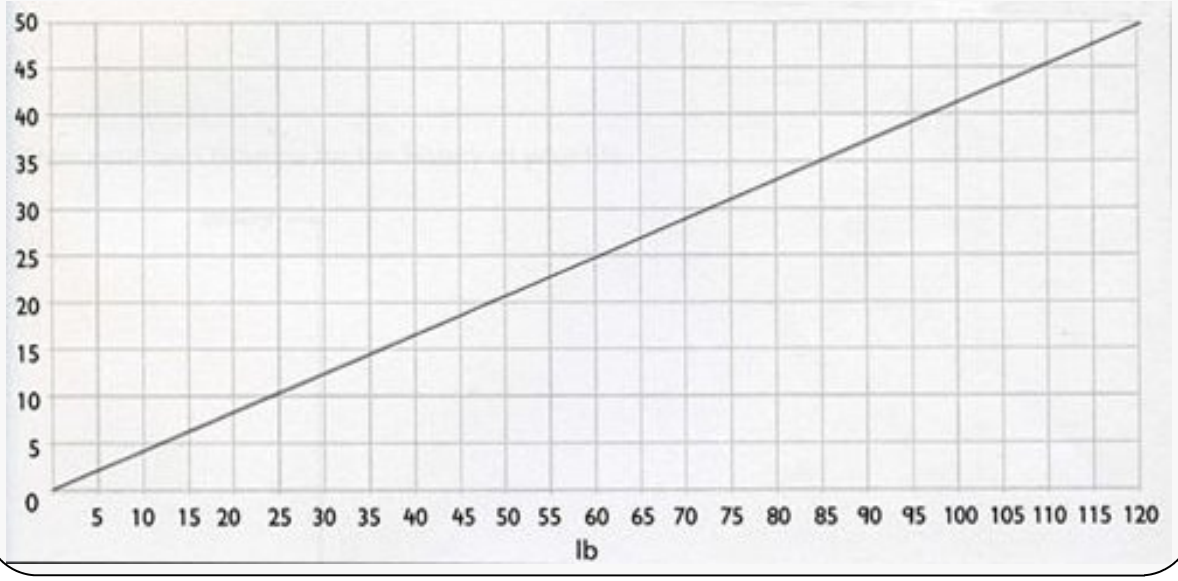
One sack of coal weighs half a hundredweight, or 56 lb.

How much do you think this is in kilograms?

Put a circle around your estimate:

15 kg 25 kg 35 kg

Now use work out the answer using the conversion graph:



Sacks of coal by weight

Nutty slack…….58 lb

Anthracite chips…27 lb

Coalite……..105 lb

This notice is in pounds. Use the conversion graph to rewrite the notice in kilograms →

Sacks of coal by weight

Nutty slack……...kg

Anthracite chips……..kg

Coalite……..kg

Time Line 1

Look at the displays and notices around you in the museum

Write down ten different dates:

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

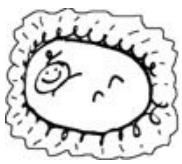
Choose one of the dates and draw what happened then:

Write down some dates that are important in your life

1.
2.
3.
4.
5.

Draw a timeline for the history of your life:

today



I was born

Time Line 2

Look at the area of the museum you are in. On the time line, fill in ten important dates shown on the notices. Write down what happened on these dates.

2000

1950

1900

1850

1800

1750

Choose three of these dates and work out how many years there are between each pair.

Dates:

…….

…….

…….

Years between:

…….

…….

…….

Ice Well 1

Look down into the ice well. Imagine you are standing at the bottom, next to the wall.

How many of your friends would need to stand, feet on shoulders, to reach the top?

Write down their names in the box:

Explain how you worked it out:

……

……

……

……

……

Ice Well 2

Look down the ice well. Imagine you are standing at the bottom, next to the wall.

How many of your friends would need to stand, feet on shoulders, to reach the top?

…….friends

Now work out the depth of the well. Explain

how you worked it out.

……

……

……

……

……

……..

The answer …….

Ice blocks were stacked up in layers.

Each ice block was about 50 cm high.

How many layers of ice blocks would fit to the top of the ice well?

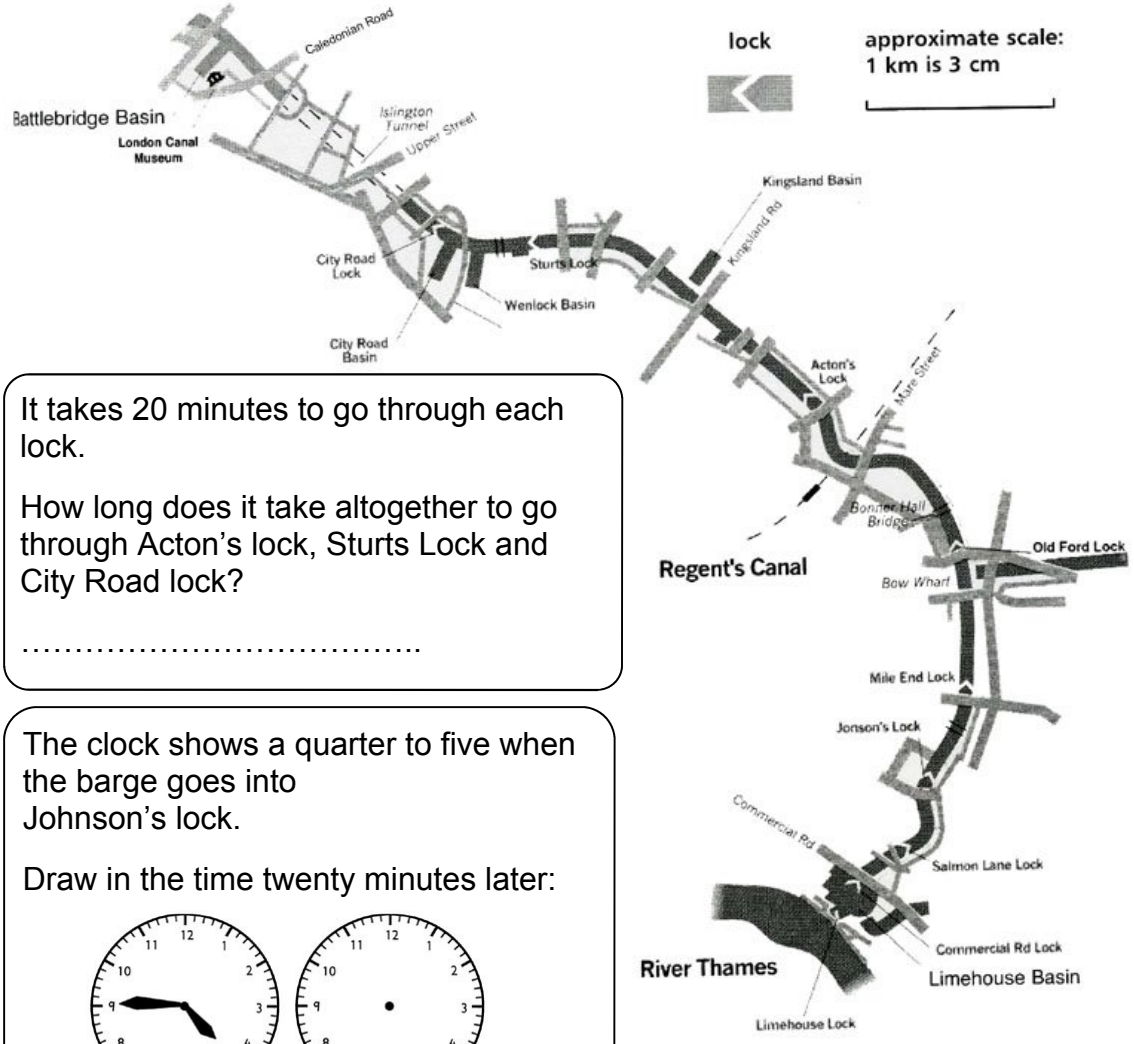
The answer……...

Journeys 1

Barges took ice from Limehouse Basin to Battlebridge Basin.

With your finger, trace the path from Limehouse Basin to Battlebridge Basin.

How many locks are there along the route? ……. locks



It takes 20 minutes to go through each lock.

How long does it take altogether to go through Acton's lock, Sturts Lock and City Road lock?

……..

The clock shows a quarter to five when the barge goes into Johnson's lock.

Draw in the time twenty minutes later:

Make up a journey that goes through four locks.
Write down where your barge starts, the names of the four locks and where your barge finishes:

……

……

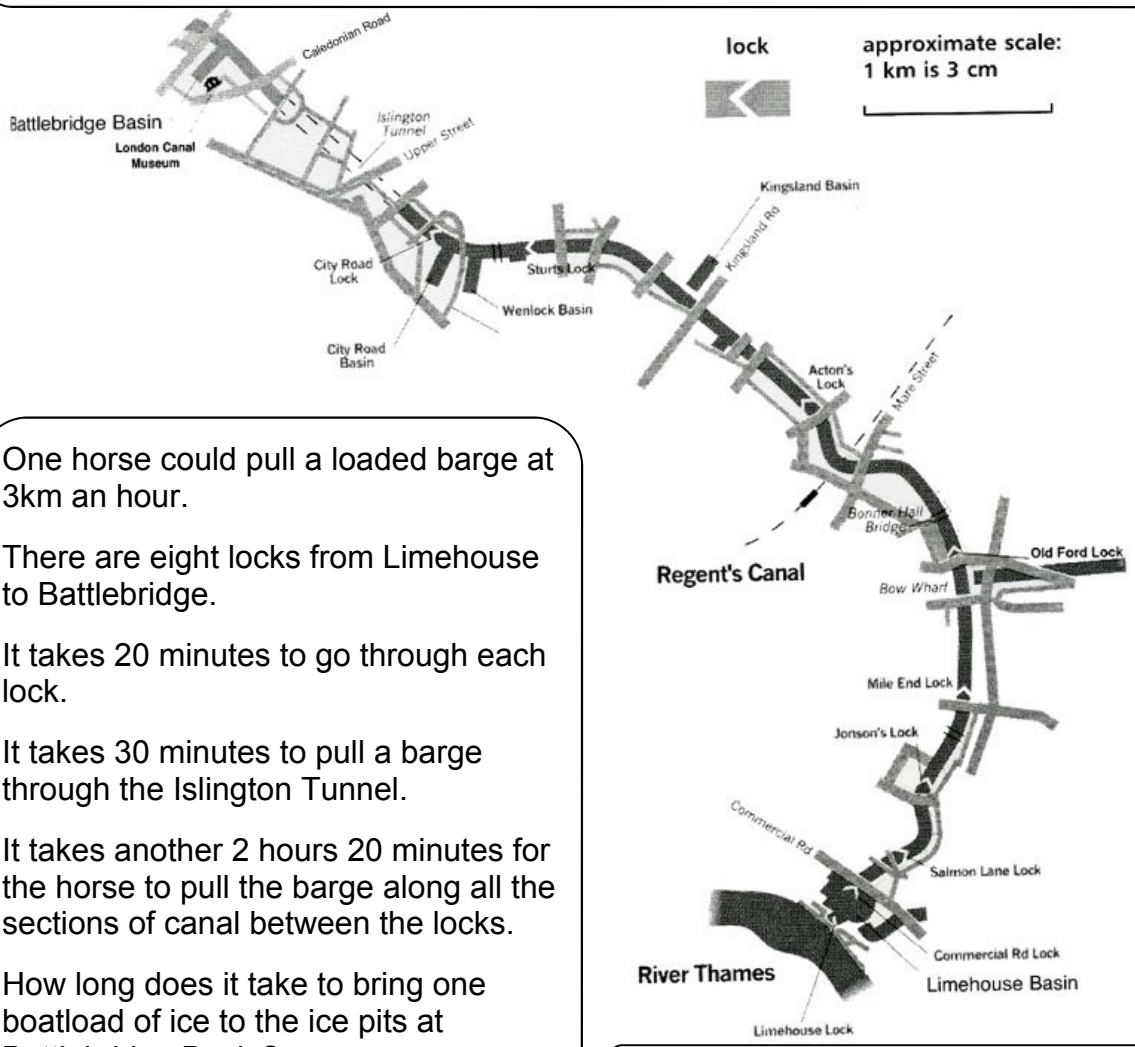
Journeys 2

A barge carries 50 tons of goods.

In 1857 Carlo Gatti imported 350 tons of ice from Norway to Limehouse Basin.

From Limehouse, barges took the ice to the ice pits at Battlebridge Basin.

How many boatloads did it take to get 350 tons of ice from Limehouse to the ice pits?



One horse could pull a loaded barge at 3km an hour.

There are eight locks from Limehouse to Battlebridge.

It takes 20 minutes to go through each lock.

It takes 30 minutes to pull a barge through the Islington Tunnel.

It takes another 2 hours 20 minutes for the horse to pull the barge along all the sections of canal between the locks.

How long does it take to bring one boatload of ice to the ice pits at Battlebridge Basin?

How long does it take to bring 350 tons of ice from Limehouse to Battlebridge Basin?

Answer 1. ……..

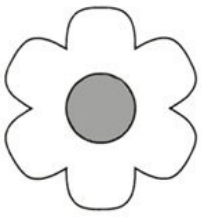
Answer 2. ……..

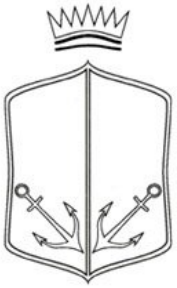
Symmetry 1

The families living on narrowboats had decorative designs painted on their boats and on the things they used.

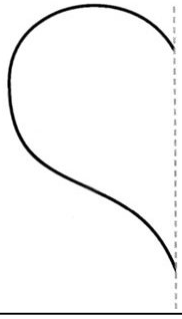
These designs are usually symmetrical.

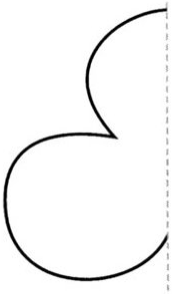
Draw a line of symmetry on these shapes:





Complete these symmetrical shapes:

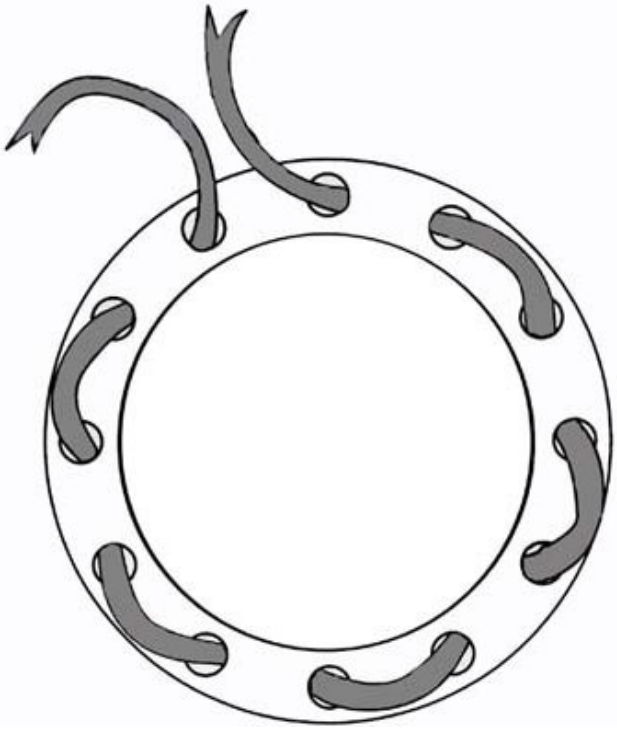




Look at the things in the museum that the families used.

Find some symmetrical patterns.

Draw a symmetrical pattern on this plate:



Symmetry 2

The families living on narrowboats had decorative designs painted on their boats and on the things they used.

These designs are usually symmetrical.

Find some symmetrical patterns on the narrowboat *Coronis*

Look at the writing on the side of the boat. Find the name of the boat.

Write it down here in capital letters:

……

Now put a mirror along the dotted line.

Look at the name in the mirror.

Which letters stay the same and which letters change when they are reflected?

Now put the mirror to the right of the name.

Which letters stay the same and which letters change when they are reflected?

Explain why this pattern is not symmetrical:

……

……

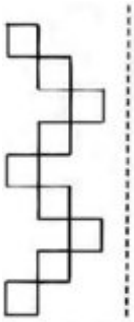
……

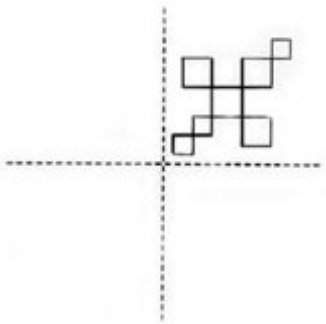
……

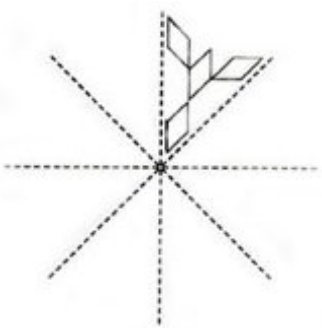
……

Look at the patterns on the lace in the museum.

Complete these symmetrical lace patterns





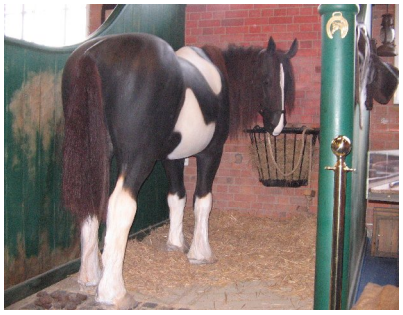


Find a repeating lace pattern that runs along an edge.
Draw a line of the pattern:

Estimate

The first floor gallery was originally stables for the horses that delivered the ice around London.

One stable has been reconstructed, complete with horse.



Look at the evidence on the walls of the gallery and estimate the number of stables there were.

What evidence did you find?

How many horses were originally kept here?

Teachers' notes

At Home in a narrowboat 1

Solve simple word problems involving measures and explain how the problem was solved

Measure and compare using standard units

Relate 3D pictures to shapes of them

- Discuss how important it is to use every bit of space in the cabin, including drawers under the bed and cupboards above the bed.
- Help children to identify which is the shortest and which is the longest piece of furniture.
- Children can use tape measures, centimetre rulers or metre sticks to measure the different items of furniture.
- Discuss with the children the plan of the boat and of the furniture, and where you look to make a plan (from above)

At home in a narrowboat 2

Solve problems involving length

Estimate and check using metric units, and record in decimal form

Visualise 3D shapes from 2D drawings

- Children should use tape measures marked in centimetres, and measure and record to the nearest centimetre.
- Discuss with the children how to draw the furniture to scale.
- Having seen inside the Cabin of the *Coronis*, children might want to arrange some pieces of furniture above or below others, rather than put them all alongside on their drawing.
- Encourage children to explain their reasoning for placing the furniture on their plans.

Weighing 1

Solve simple word problems involving measures and explain how the problem was solved

Measure and compare by direct comparison to determine which weight is heavier

- The Children can only choose from 5 lb, 2 lb, and 1 lb weights to make up 4 lb, 6 lb and 8 lb. Some children may use trial and error to do this, rather than calculation.
- Ask the children to hold a different weight in each hand and say which is the heavier and which is the lighter.
- Challenge the children to find a different way of balancing a weight, such as 5 lb, with other weights.

Weighing 2

Solve problems involving mass

Recognise the approximate equivalence between commonly used imperial units and metric units.

- Encourage the children to calculate the weights they need first rather than use trial and error.
- The children could try and estimate the weight of each of the small sacks by holding the sack in one hand and trying weights in the other.
- Ask the children to explain how they worked out the equivalent weights in kilograms.

Weighing 3

Try handwritten sheet here?

Coal 1

Measure and compare by direct comparison by suggesting which weight is heavier.

Solve simple word problems involving measures and explain how the problem was solved.

Use mental calculation strategies to solve measurement problems.

- Ask the children to hold a different sack of coal in each hand and say which is the heavier and which is the lighter, or whether they feel about the same.
- Children may use different methods to solve this problem, such as counting on in fives, or knowing that 5 and 5 are 10 or adding another 5, or by multiplying. Discuss the problem using the 5 lb sack of coal as a model.
- If children have difficulty in finding or remembering objects that weigh about 5 lb, ask them instead to think of three things that are lighter and three things that are heavier.

Coal 2

Solve problems involving mass

Recognise the approximate equivalence between commonly used imperial and metric units.

Interpret a line graph in which intermediate values have meaning.

- Discuss with the children the names of different imperial measures. Ask children to suggest what things to measure using these. For example, they may know their own weight in stones and pounds, and that a pint of milk is less than a litre of milk.
- If the children are uncertain about the weights, tell them that 1kg is 2.2 lb.
- Use a calculator, and set the constant function to convert lb to kg. You do this by keying in the formula you are going to use (2.2 x x = 0) Then put in the kg weight you wish to convert. For example, key in = to find out how many pounds are equivalent to 7 kg (15.4 lb)

Time Line 1

Understand and use the vocabulary related to time

Solve problems involving time

- Explain that the dates show the year, not the year and the month. Compare some of the dates the children see with this year's date.
- Make sure the children can read the dates in the conventional way: for example 'Nineteen thirty eight'.
- You may need to help the children decide significant dates in their own life, such as the year of their birth, and the current year.

Time Line 2

Use the vocabulary related to time

Solve problems involving time

Choose and use ways of calculating to solve problems

- Talk to the children about how to estimate the position of each date on the line.
- Discuss with them the meaning of millennium, century and decade.
- Encourage children to use efficient mental strategies for calculating the difference in years between the two dates.

Ice Well 1

Solve simple word problems involving measures and explain how the problem was solved

Measure and compare by using uniform and non-standard units

- Discuss with the children how they can use the layers of bricks, for example, to help their estimates.
- They could think about whether it mattered if the friends were all different heights.
- It is likely that children will have a range of suggestions for solving this problem. If they work in pairs they can discuss different strategies.

Ice Well 2

Suggest suitable units to estimate or measure length

Solve problems using measures

- The ice well has currently been excavated to a depth of between 15 and 18 feet (4.6 to 5.5 metres). This is about half way.
- Discuss with the children the level of accuracy that is appropriate for estimating the depth of the ice well. For example, it is reasonable to estimate to the nearest half metre.
- Children should be able to calculate mentally how many layers of ice blocks would fit into the ice well. You could discuss the actual depth of the ice well, once it has been completely excavated, and how many more layers of ice blocks could be fitted in.

Journeys 1

Solve simple word problems

Solve story problems involving time

Read the time from clocks

- There are eight locks from Limehouse to Battlebridge Basin
- It would take an hour to go through three locks, not counting the time taken between the locks. The horse pulled the barge slowly, at about 3km an hour. Discuss with the children how it would be possible to walk at the same rate as the horse, so the journeys would be at walking pace.
- The boat would come out of the lock at five past five. Offer children different starting times, and see if they can work out 20 minutes later from each of these times. Some children could work out the problem in reverse: if the boat came out at 4.45, what time did it do in?

Journeys 2

Use all four operations to solve word problems involving measures

Solve story problems using units of time

- It would take seven boatloads to carry 350 tons of ice. Children will use different mental strategies to solve this problem, such as the repeated addition of 50, multiplication, division and knowledge of place value.
- One boatload would take 5 hours 30 minutes. That is, 8 x 20 minutes, plus 30 minutes, plus 2 hours 20 minutes.
- Discuss with the children the implications of the time taken by the barges, the return journeys of the barges, the need for more than one barge to take the full 350 tons, and the overall organisation of the enterprise. Children should consider that it was not economical to move empty barges, so other goods would need to be carried back to Limehouse.

Symmetry 1

Recognise and sketch a line of symmetry

Complete a symmetrical pattern by drawing

- Make sure children have mirrors to check the lines of symmetry.
- Children can check each other's completed symmetrical shape with a mirror.
- Ask children to describe the symmetrical patterns they see, and encourage them to identify the mirror line.

Symmetry 2

Recognise reflective symmetry in 2D shapes

Complete symmetrical patterns with one or two lines of symmetry

Make patterns by repeatedly translating a shape

- When children look at the painted boat pattern they should use a mirror to decide why it is not symmetrical. They can place the mirror along the centre of the pattern both vertically and horizontally. They should look at both sides of the mirror to decide which parts of the pattern do not have reflective symmetry. The pattern 'nearly works' each time, but not quite. Encourage children to discuss how they would alter the pattern to make it symmetrical.
- When you reflect the name along the horizontal line, the 'C', 'O', and 'I' all remain the same. When you reflect the name along the vertical line, only the 'O' and the 'I' remain the same:

- Children could look at other words in the museum and do the same with them
- They can use mirrors to check each other's lace patterns to see if they really are symmetrical.
- They can make lace patterns with paper, and cut out the wholes with scissors, by folding the paper symmetrically more than once.

Estimate

- *Text to go here*