Maths Challenge KS4

This Book Belongs to

_____

Welcome to Leeds Castle

There are 5 sections in this booklet and they are not linked. Although they follow the standard visitor route, you can complete them in any order you want.
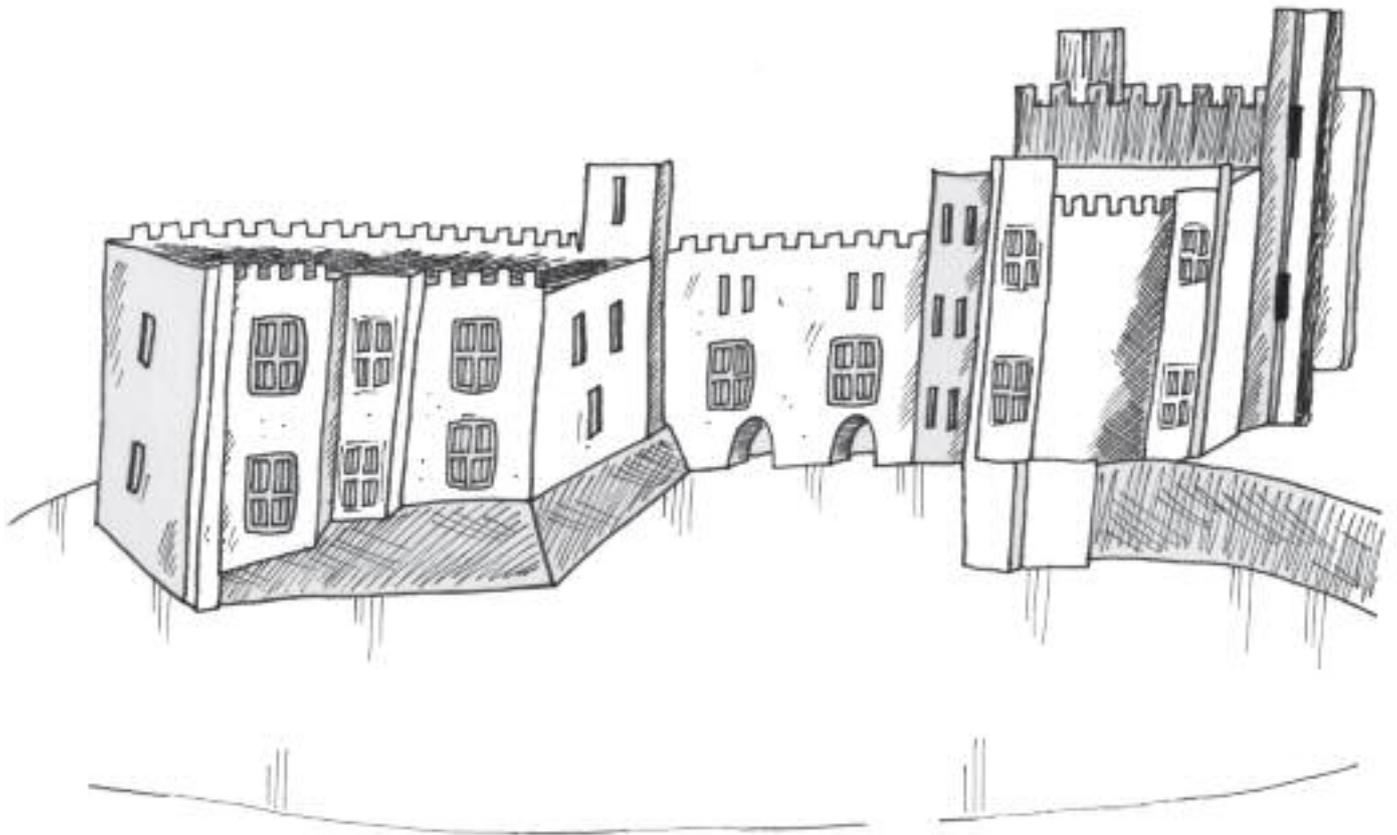
Staying safe

Leeds Castle is set in 500 acres of parkland, which has a variety of wildlife inhabitants. It is a visitor attraction with lots of water in the grounds. Please do not touch any of the wildlife, they may bite and please stay away from the water, it's very cold if you fall in.

Section 1

The Wood & Cascade Gardens

Leeds Castle sits in 500 acres of land, which includes a Woodland Garden, the Cascade Garden, the Culpeper Garden, the Lady Baillie Garden as well as several stretches of water from small streams to the Great Lake, not forgetting the Castle Moat!
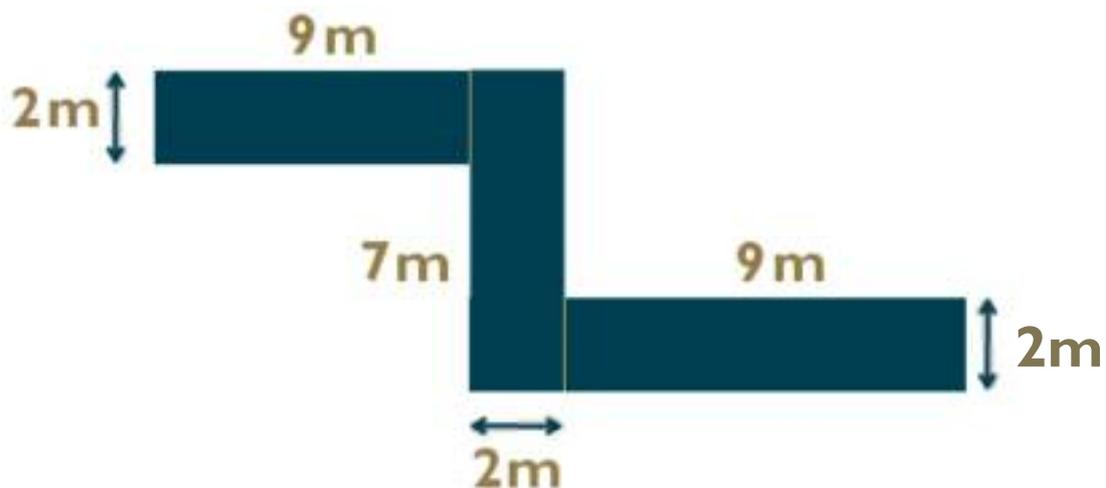When you have gone through Ticket Check, walk to the bridge over the stream. Once over the bridge, look to your left where you will see ………..

The Footbridge

Go to the middle, from here you will get your first sight of the castle.
This bridge was rebuilt in 2010 by the 70 Gurkha Field Support Squadron.

1)   Work out the decking area of the bridge

Answer: _____

2)   If decking costs £15 per m^2 how much would the materials cost to resurface the bridge?

Answer: _____

Section 2

The Great Water opposite the Mill

Ratty in the Wind in the Willows was not a rat, but a Water Vole.

Water vole numbers have declined dramatically. There has been a loss of 90% of the population over the past 3 decades, due mainly to predation from mink, pollution and loss of habitat The water vole is now the most endangered mammal species in the UK.

Water voles are small animals that do not live for very long. They are very strong swimmers and can swim up to 500m on the surface or 15m underwater. They usually live in small family groups. They live in waterside burrows, which they dig in the banks of slow-flowing lowland rivers and canals, or ponds and streams – wherever the water level is fairly constant. They are generalist herbivores eating a large variety of bankside vegetation.
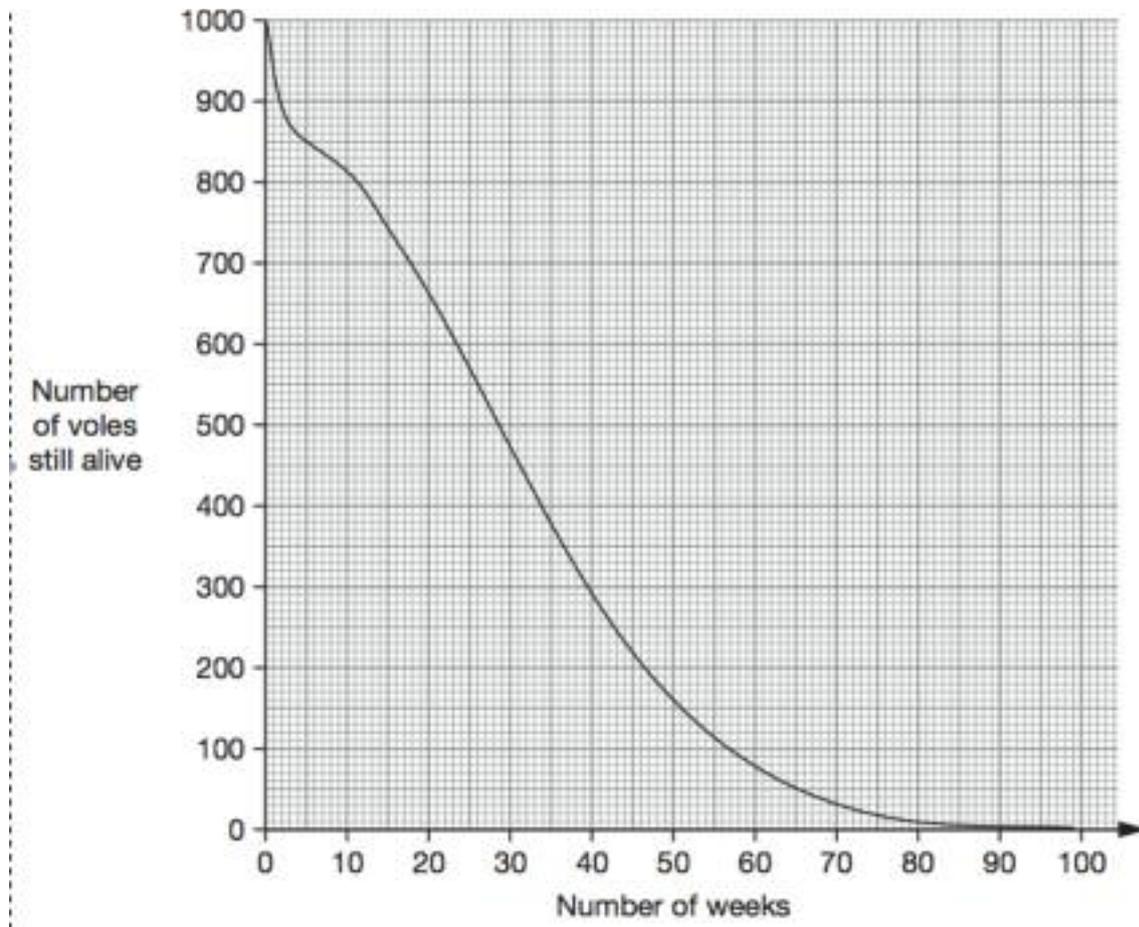
There are several key areas on the Leeds Castle Estate which have high populations of Water Vole and we are dedicated to their preservation.

Section 2

The Great Water opposite the Mill

In a recent study a scientist recorded data on 1000 voles that were born on the same day. The graph shows how many voles were still alive after a given number of weeks.

3) Using the graph estimate the probability that a water vole will live to be at least 20 weeks old.

Answer: _____

4) A water vole is 40 weeks old. Estimate the probability that it will live to be at least 50 weeks old.

Answer: _____

Section 2

Outside The Castle

Leeds Castle was originally the site of a manor built for the Royal Saxon Family. It was then a Norman stronghold, later becoming a Royal palace, and was for 300 years the home of Kings and Queens of England. In 1552 King Edward VI granted the Castle to Sir Anthony St Leger, thus commencing the 400 years of private ownership. A major rebuilding programme of the front part of the Castle was undertaken by the Wykeham Martin family and completed in 1823. One hundred years later the Castle was bought by an Anglo American heiress, Lady Baillie, who carried out a 2 year restoration programme on the Gloriette.
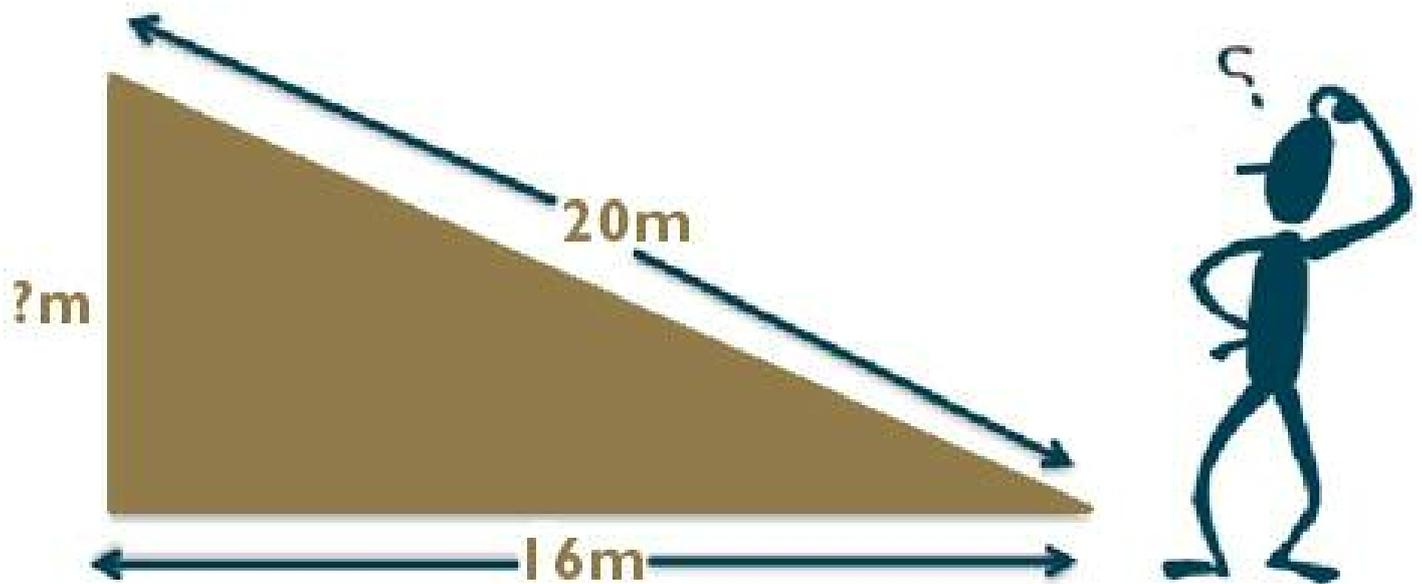
On her death, she bequeathed the Castle and its surrounding park to the Leeds Castle Foundation.

Section 2

The Castle

5) Using your knowledge of a Pythagorium triangle work out the approximate height of the twin towers at the front of the castle are.

?m

20m

16m

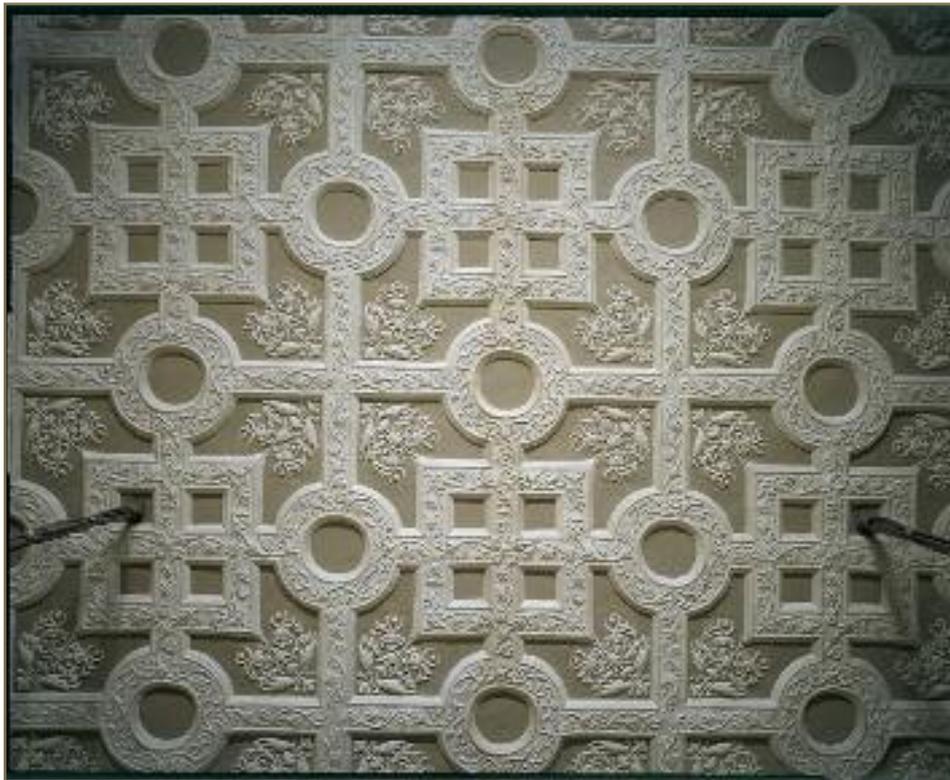Answer: ——————————————————————————————

Notes and Calculations

Section 3

The Heraldry Room

Having walked around the Moat and come in through the cellars, you have now arrived in the Heraldry Room

Look up to the ceiling where you will see a beautiful Jacobean strapwork* ceiling. This was introduced in the 1920s by Lady Baillie's architect at the time, Owen Little. It was cast from moulds which had been taken from originals dating from about 1620.

Admire the symmetry.

6)   How many circles are there and how many squares? **

Answer: _____

*Strapwork
Decorative work, consisting of interlacing straplike bands, often used in low relief on ceilings, screens, and panels.

** Clue - there are 4 smaller squares in each large square.

Section 3

The Lower Bridge Corridor

Walk down the corridor and observe the pikes and armour.

7)   What is the ratio of pikes on the left to pikes on the right?

Answer: _____

8)   If a pikeman earned 0.0025p a day. How many days did he have to work to pay for his pike that cost 0.20p?

Answer: _____

Pikemen made up about one third of the infantry at the beginning of the English Civil Wars. At this time, they were the hard hitting element within any army. Armed with a 16-18 foot pike they fought in close formations known as blocks. They would engage the enemy at close quarters where their weight in numbers would hopefully overwhelm them. Should this 'push of pike fail' then they would draw their swords and try to slash their way through the ranks.

Each man wore armour made up of a helmet or pot, a breastplate, a backplate, a gorget to protect the neck and a pair of thigh defences called tassets.

A pikeman's armour weighed about 11 kg.

9)   If 1 pound (lb) = 0.45 kg How much would a Pikeman weighing 10 stones* weigh in his armour?

Answer in kgs: _____

*There are 14 pounds in 1 stone

Section 3

The Lower Bridge Corridor

10)   1 shilling (s) = 5p, 6 pence (d) = 2.5p: there are 20 shillings in 1 pound (£) and 12 pence in 1 shilling. From the chart below work out the total cost of kitting out a Pikeman.

Answer: _____

Cost of Pikemans' armour	Pounds (£)	Shillings (s)	Pence (d)
The Breast		6	6
Tassets		4	6
The comb'd headpiece lined		4	6
The gorgett lined		3	6
All to be lined with red leather		3	0
Pike Staff		4	0
TOTAL			

11)   Convert the answer into today's money.

Answer: _____

Notes and Calculations

Section 3

Henry VIII Banqueting Hall

Walk through the Queen's Room and Gallery and make your way to the end of the Banqueting hall where you will see the large picture entitled.

The Embarkation of Henry VIII to the Field of the Cloth of Gold

The best-documented royal visit to Leeds was in 1520, when Henry VIII, with his Queen, Catherine of Aragon and a huge retinue of over 5000 people, spent a night at the Castle on his way from Greenwich to northern France for a ceremonial meeting with Francis I of France. This meeting became known from its magnificence as the Field of the Cloth of Gold and was held as a celebration of the intended Peace Treaty between England and France. The festivities lasted 17 days and the Royal records show that venison from Leeds Park and butter from the dairies were supplied for use at the meeting.

Section 3

Henry VIII Banqueting Hall

The speed the ship travelled at was measured using a 'log', which was a piece of wood attached to rope. This rope had knots tied into it and as the ship travelled, the rope was reeled out and the wood was left floating. The knots left behind were counted in order to see how many knots were travelled within a certain period of time, and this was measured using a sand glass.   Distance at this time was described as 'leagues', measured by putting pegs in a board. I knot = 1.15 mph

12)   The distance from Dover to Calais is approximately 25 miles. If Henry sailed at an average speed of 7 knots per hour how long would the journey have taken?
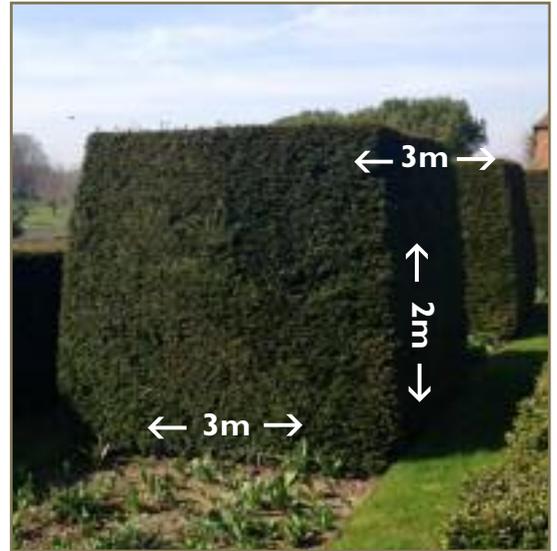

Answer: _____

Section 4

The Culpeper Garden

The Culpeper garden occupies the site of the castle's kitchen garden. It was transformed in 1980 by Russell Page into a large cottage garden. It takes its name from the family which owned the castle in the 17th century.

Each hedge is 3m x 3m x 2m

Look at the hedging along the path leading to the maze.

The truncated square pyramid is a special case of a pyramidal frustum for a square pyramid. Let the base and top side lengths of the truncated pyramid be *a* and *b*, and let the height be *h*. Then the volume of the solid is... $V = \frac{1}{3}\left(a^2 + ab + b^2\right)h.$

This formula was known to the Egyptians ca. 1850 BC.

Assume that the hedges are 3m x 3m x 2m tall and there are 12 of them.

13)   Using the given formula work out the total volume of the box hedge running alongside the Culpepper gardens.

Answer: _____

Section 4

The Maze and Grotto

The maze was created in 1987 using 2,400 yew trees. When viewed from the centre, part of its plan mirrors a queen's crown.

Assume that a team of 6 gardeners worked on creating the maze and that each gardener could plant 12 trees per hour.

They all worked from 8 – 4, taking 1 hour for lunch, a fifteen minute break in the morning and again in the afternoon.

Unfortunately, after 2 days work, one gardener caught a cold and didn't come back to work.

14) How long would it take to plant the maze?

Answer: _____

15) The average time taken to complete the maze is 20 minutes, how long did it take you?

Answer: _____

Notes and Calculations

Section 5

This booklet is made from 5 rectangular pieces of paper.
Each piece of paper measures 300mm x 210mm
The mass of the paper is 80g per m^2.

16) Calculate the mass of the booklet and give your answer correct to 2 significant figures.

Answer: _____

The table below shows information about the rainfall recorded at two castles in the United Kingdom.

Place	Mean Rainfall	No. of months	Months
Edinburgh Castle	10cm per month	8	Feb - Oct
	20 cm per month	4	Nov - Jan
Leeds Castle	5 cm per month	9	May - Jan
	40cm per month	3	Feb - April

17)   Which of the places has more rainfall on average over the whole year?

Answer: _____

Section 5

The Wildlife

One Canada Goose eats approximately 3 – 4lbs grass and defecates 2 -3lbs per day
In general then, we are going to assume that one of our geese expels an average of 2lbs each per day.

One Mute Swan eats 8lbs of vegetation per day. Working on the assumption that the swan then expels 2/3 of its intake, just as the goose does, one of our swan expels an average of 5lbs per day.

Ducks have a very varied diet and eat foods such as flies, dragonflies, roots, seeds, small fish, insects, water snails and even frogs. We are going to assume that given their size, they will defecate a quarter the amount that a goose does, so an average of ½ lb per day.
We currently have 141 geese, 26 swans and approximately 180 ducks living on the estate at Leeds castle.

18)   How much poop does Leeds Castle have in a leap year?! Convert your answer to Kilogrammes

Answer: _____

Hint: 1lb = 0.45Kgs

*Bearing in mind that we also have 7 Peacocks, 3 Peahens and 1 Peachick living on site … that's an awful lot of **** in a year.

Notes and Calculations