Westminster Abbey
Learning

Maths at the Abbey– teachers' notes

Thank you for downloading this resource. We hope that it will be a useful teaching tool during your visit to Westminster Abbey.

As we continue to grow our free catalogue of teaching resources, we'd really appreciate a few minutes of your time to let us know what you liked and what could be improved. Please complete this five-question survey.

Throughout this trail students will be asked to add, subtract, round up or down, multiply and divide. You may wish to remind students of these before starting the trail.

1) The cloisters

Use the ruler on this page to measure your own foot in centimetres. Write down the measurement. **Individual answer.**

Round up or down to the nearest centimetre. **Individual answer e.g. if the measurement is 11.4cm, the answer would be 11cm. If the measurement is 11.5cm, the answer would be 12cm.**

Choose a floor stone in the cloisters and use your foot to estimate:

- The length of the stone. **Individual answer.**
- The perimeter of the stone. **Individual answer.**

Stride down one side of the cloisters, counting your strides. Estimate the distance you have just walked in metres. **The length of one cloister is approximately 30 metres.**

Estimate the perimeter of the cloisters in metres: **The perimeter of the cloisters is approximately 120 metres (the length of one side multiplied by four).**

Students might enjoy measuring their feet against the ruler printed on page two of the trail. Encourage them to round the measurement up or down to the nearest centimetre for ease. Students may walk respectfully on any of the stones (some are gravestones, and some are memorials) and they may choose any stone to measure. An adult stride measures roughly 1 metre so younger students should be encouraged to make their stride as wide as possible to approximate 1 metre. You can choose any of the four cloister corridors for the measuring the cloister activity. Each of the cloister corridors is roughly 30 metres in length.

The cloisters is the name for the quadrangle of corridors where this trail begins. Find a quiet space and explain that most of what you can see of Westminster Abbey was built over 700 years ago by 'master masons' and craftsmen/women who had to work out complicated designs and measurements without the aid of calculators! People estimated measurements using parts of their body.

The memorial to astronomer Edmond Halley is located in the south cloister, on the wall. Its location is marked on the map as stop 1).

‘Halley’s Comet’ was last seen in 1986. When can we expect to see it again? **2061.**

Work out how old you will be in the year that Halley’s Comet returns. **Individual answer.**

Halley’s Comet was last seen in 1986 and it will next be seen in 2061. (In fact, the comet’s orbit varies between 72-80 years). To work this out subtract the current year from 2061. Add your age to the answer.

Move towards the north-west corner of the cloisters and enter the Abbey. Follow the route round to stand in front of the Great West Doors.

2) The nave

How much heavier is the tenor bell than the treble? **(Subtract the treble bell weight from the tenor bell weight). The tenor bell weighs 1284kg more than the treble bell.**

If the average weight of an adult is 60kg, roughly how many adults would weigh the equivalent of the tenor bell? **(Divide 1530 by 60 to get the answer). Roughly 25 or 26 adults would weigh the equivalent of the tenor bell.**

What do you think these Roman numerals mean?
III = 3
V = 5
X = 10
L = 50
C = 100
D = 500
M = 1000

Take a few minutes to look up and all around you. Remind students that highly skilled craftsmen/women built this church over 700 years ago. Turn your back on the nave so that you are facing the Great West Doors and to the right, you may notice a little door.

Students may be interested to know that the largest and heaviest bell in Britain is the Olympic bell. The Olympic bell weighs 22 tonnes and was made for the 2012 London Olympics. It can be seen at the Olympic Park. Students may already know their Roman numerals but if not, this is an opportunity to work them out in small groups.

3) Isaac Newton

Can you work out when he (Isaac Newton) was born and when he died? **The memorial text tells us that Newton was born on 25th December 1642 and that he died on 20th March 1726*.**

Can you write today’s date in Roman numerals? **The date would be a number between 1-31 (I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII, XIV, XV, XVI, XVII, XVIII, XIX, XX, XXI, XXII, XXIII, XXIV, XV, XVI, XVII,**

XVIII, XXIX, XXX, XXXI). The year will begin MMXX ... just add V or VI etc at the end, for example 2025 would be MMXXV.

Isaac Newton's memorial is to the left of the gold screen at the east end of the nave. Look for the Roman numerals on the memorial:

NAT. XXV DEC. A.D. MDCXLII (Date of birth).
OBIIT. XX. MAR. MDCCXXVI (Date of death). length.

The memorial text tells us that Newton was born on 25th December 1642.

M = 1000 + DC = 600 + XL = 40 + II = 2

You may need to explain that in Roman numerals, to get the number 600 you need to write '500 + 100' or DC. To get the number 40 you need to write '10 taken from 50' or XL.

The memorial tells us that Newton died on 20 March 1726*.

M = 1000 + DCC = 700 + XX = 20 + VI = 6

*The date of death is given in contemporary Old Style dating, which in present dating is 1727.

Go through the gates of the golden screen and you will find yourself in the quire. This is where the Westminster Abbey choirs sing.

4) The quire

Look around you. What shapes can you identify in the decorations? **Students might see shapes including circles, trefoils, triangles and quatrefoils.**

What do you think the trefoil might represent in a church? **The Holy Trinity - one God worshipped as three distinct persons (Father, Son and Holy Spirit).**

What shape is the whole church built in? **The church is built in the shape of a cross.**

Why might this shape have been chosen for the church building? **The cross is the key symbol of Christian faith because Jesus died on a cross before being resurrected three days later. Christians believe Jesus died so that all could be saved.**

Students can see all sorts of interesting shapes from here. Check they can see circles and trefoils amongst the woodwork designs and the stonework. Move your group towards the High Altar and look up. Students may spot that they are standing in a cross-shaped church. Christians believe that Jesus was killed on a cross so that all could be saved. The circle represents eternity (like a ring) and therefore also represents God, who is described as having no beginning and no end. The trefoil represents the Holy Trinity (one shape but in three parts), just as Christians believe in one God worshipped as three distinct persons: God the Father, God the Son and God the Holy Spirit.

Sacred geometry is when shapes have special meanings in a church. Other special shapes include:

- **Quatrefoil** (flower shape with four petals) can represent the four Gospels of Matthew, Mark, Luke and John.

- **Cinquefoil** (flower shape with five petals) can represent the five wounds of Jesus on the cross (a nail in each hand and each foot plus a spear in his side).

5) Cosmati Pavement

Complete the answers below by multiplying by 3 to get your next answer.
Hedgehogs live for 3 years. (Multiply 3 x 3 to get your next answer).
Dogs live for 9 years. (Keep multiplying each answer you get by 3!).
Horses live for 27 years.
Man lives for 81 years.
Stags live for 243 years.
Ravens live for 729 years.
Eagles live for 2187 years.
Whales live for 6561 years.
The world will end in the year 19,683!

Discuss: How important was maths to the design and building of Westminster Abbey? **Some of the most complex designs in church architecture could be achieved through the ability to draw a circle, a square and a straight line. Geometric shapes take on a special meaning within the context of a church. This is called sacred geometry. Symmetry is used in the windows and decorations to show that there is order and planning behind the creation of the world.**

The Cosmati Pavement once contained a riddle which has now disappeared. The riddle was supposed to predict the date of the end of the world. The riddle involved multiplying by three. Students could have a go at working this out on paper or they could leave this until they get back to school and can use a calculator. You may wish to reassure students that this is just a riddle made up by someone who lived 700 years ago!

6) Rose window

How many lines of symmetry does a circle have? **Infinite (endless).**

Draw the lines of symmetry on this rose window. How many can you find? **There are four lines of symmetry (one vertical, one horizontal and two diagonal lines of symmetry).**

Complete this window design to make it symmetrical. **Replicate the design in reverse.**

How many lines of symmetry can you find in this design? **One line of symmetry vertically down the middle.**

The circular rose windows found in Gothic churches like Westminster Abbey hold a special meaning. The circular shape symbolises eternity, while the intricate patterns reflect the complexity of the universe and God's creative design for the world.

7) Lady Chapel

Write down something you can buy for around £1 today. **A second-class stamp, a pint of milk, a small packet of sweets.**

In Tudor times, £1 would be equivalent to £700 today. Calculate how much seven Tudor pounds would be worth in today's money. **(Multiply 7 by 700 to get the answer). £7 in Tudor pounds would be worth £4,900 today.**

This is Henry VII's Lady Chapel at Westminster Abbey. On completion, it was described as 'the wonder of the world'. No expense was spared in the building of it. The total cost is thought to be around £20,000, an enormous sum at that time. Most of the Tudor monarchs are buried here, although Henry VIII is at St George's Chapel, Windsor.

8) Poets' Corner

If the ace is worth 1 point, how many points do all the cards in the hearts add up to? **The total sum of all the heart cards would be 85 (1+10+10+10+10+9+8+7+6+5+4+3+2=85).**

Students may enjoy searching for Lewis Carroll's memorial stone on the floor. The memorial to Lewis Carroll has a circular design on it. This circular design represents the rabbit hole though which Alice fell in Carroll's famous book, 'Alice's Adventures in Wonderland'. Carroll was a mathematics lecturer at Oxford University. More than 100 writers are buried and memorialised in Poets' Corner.