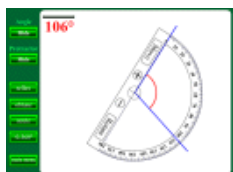


A new angle on interactive whiteboards

Despite Ofsted guidelines many teachers still find themselves using the interactive whiteboard as nothing more than a glorified projector screen. If this is a habit you've slipped into then you may well be wondering whether it was worth all the hassle and expense of getting a board installed in the first place. After all, the only benefit of a whiteboard is the ability to interact with your computer via your finger or an electronic stylus depending on which brand of board you use.

In fact it is precisely this simple capability that can transform lessons as this exemplar maths lesson shows. The software, which is freely available online, makes full use of the touch sensitivity of your board. All you need is a connection to the Internet and it will work with any brand of whiteboard.

The software has been designed specifically for teachers who use interactive whiteboards for whole-class activities. Just type the following web addresses into your browser to check them out:

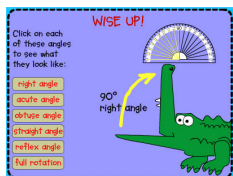


eChalk: Estimating and measuring angles

<http://www.echalk.co.uk/Maths/angleEstimator/EstimatingAngles.htm>

eChalk: Categorising angles

<http://www.echalk.co.uk/Maths/Angles/angles.swf>



BBC Revisewise: wise up to angles

http://www.bbc.co.uk/schools/revisewise/maths/shape/15_act.shtml

eChalk: Polygon tool

<http://www.echalk.co.uk/Maths/polygonTool/PolygonTool.htm>



TIP: When viewing the eChalk resources you can increase the viewable area by clicking on **View** (at the top of the screen in your web browser window) and selecting **Full Screen**.

Application

The lesson plan is based on an hour-long session but could be easily adapted to fit other situations.

It fits into the curriculum with:

- KS2 Unit 8 of the National Numeracy Strategy 'Angles, 2D & 3D shapes, perimeter and area'
- KS3 Shape, space and measure 'Use angle measure: distinguish between and estimate the size of acute, obtuse and reflex angles'.

Resources

- Protractors and rules.
- Wipe-clean miniature whiteboards for pupils (show-me boards).
- Copies of the worksheet for each pupil.
- An Internet connection to use the free interactive whiteboard resources.
- An interactive whiteboard.

Objectives

- To be able to distinguish between acute, obtuse and reflex angles.
- To be able to accurately estimate the size of an angle between 0 and 360 degrees.

Starter activity (5 minutes)

Mental maths: Give the pupils the 'quick fire' questions shown on the right. The pupils write down their answers on their 'show-me' boards.

After the activity ask questions that highlight the link between these numbers and important angles, for example:

- Where have you seen these numbers before?
- What is an angle?
- What do angles measure?
- What do we measure angles in?
- How many degrees in a full turn?
- What's the special name for 90 degrees?

$4 \times 9 =$	36
$4 \times 90 =$	360
$360 \div 2 =$	180
$90 \times 3 =$	270
$90 \div 2 =$	45
$360 \div 4 =$	90
$\frac{1}{4} \times 360 =$	90
$\frac{3}{4} \times 360 =$	270

What is an angle? (5 minutes)

Use the *eChalk: angle estimator* then select the *angle drag activity*.

This resource is found at:

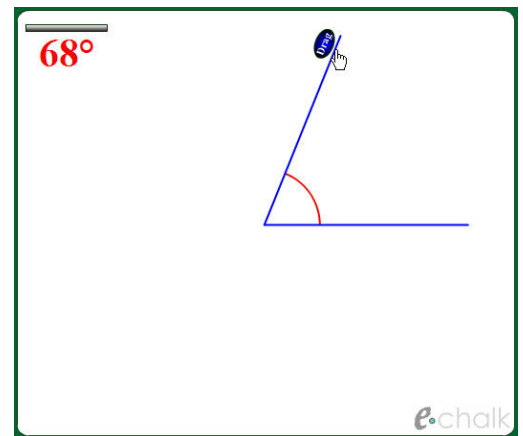
<http://www.echalk.co.uk/Maths/angleEstimator/EstimatingAngles.htm>

The software will allow you to draw an angle of any size. The size of the angle is shown in the top left corner. Use the program to demonstrate:

- An angle measures a turn about a point.
- An angle is a measure of a turn between two lines.
- Angles are measured in degrees ($^{\circ}$).

Be sure to point out the significance of 45° , 90° , 180° , 270° and 360° .

Angle drag activity

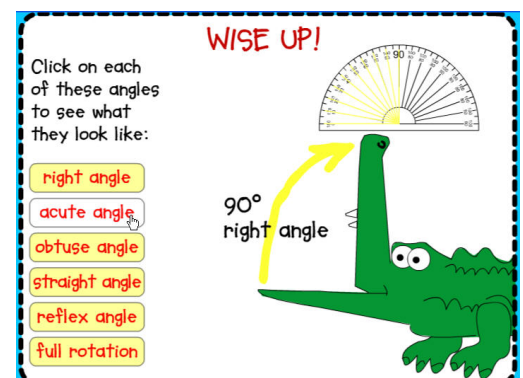


Identifying angles (5 minutes)

Use the *BBC Revisewise: wise up to angles* tutorial to explain what acute, obtuse and reflex angles are. Pupils enjoy watching the willing crocodile dislocating his jaw in order to demonstrate a reflex angle.

This resource is found at:

http://www.bbc.co.uk/schools/revisewise/maths/shape/15_act.shtml

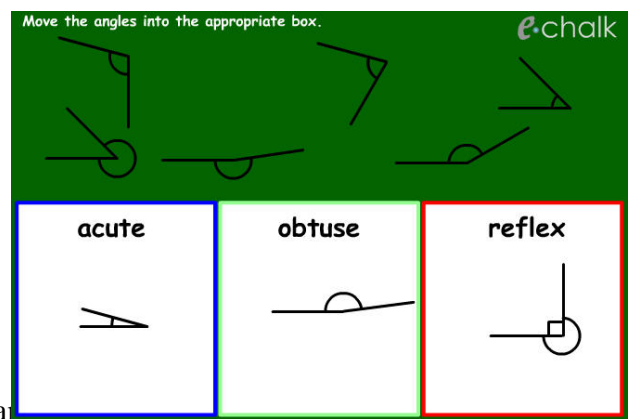


Categorising angles (10 minutes)

To check the pupil's understanding of acute, obtuse and reflex angles open the *eChalk: Categorising angles* activity.

This resource is found at:

<http://www.echalk.co.uk/Maths/Angles/angles.swf>



Choose pupils to come to the board (one at a time) and drag an

A useful feature of this activity is that automated marking is switched off, so if the angle is placed incorrectly it doesn't fly back to its original position. This enables the teacher to control the pace of the lesson. If a child puts an angle in the wrong place it remains there giving the teacher time to question the class about where it should really be. When the class agree that it is in the wrong place *then* you can move it. Pupils often learn more from a corrected mistake than from a perfect answer.

Worksheet exercise (10 minutes)

Explain to the class that it is fairly easy to decide whether an angle is acute, obtuse or reflex but giving an accurate estimation of an angle in degrees in quite another matter.

Before you can accurately estimate the size of an angle it is important to be able to identify some important angles (45° , 90° , 180° , 270° and 360°).

Hand out the worksheet 'Important Angles'.

Angle estimation games (15 minutes)

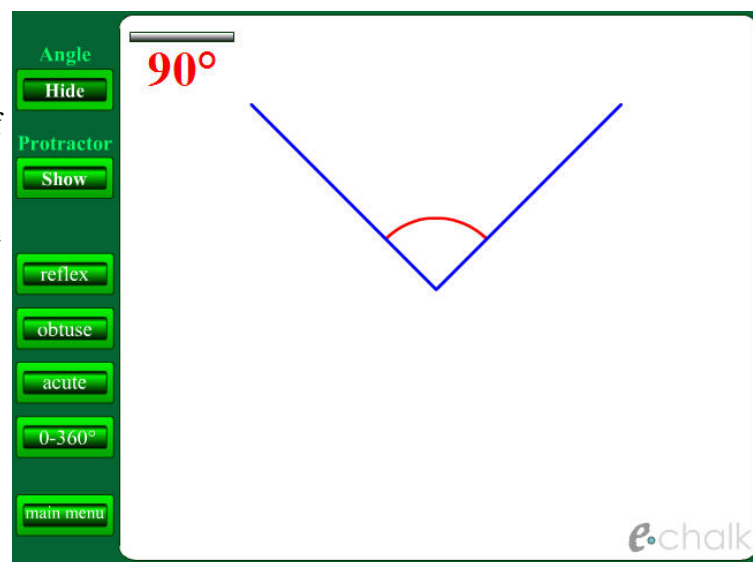
Now the pupils are ready to start estimating the size of angles. As you run through the following whole-class games you will see a marked improvement in pupil's ability to determine angles. Your only problem will be controlling the stampede of pupils wanting to play on the whiteboard.

Game 1

Use the *eChalk: angle estimator* then select the *angle estimator activity*.

This resource is found at:

<http://www.echalk.co.uk/Maths/angleEstimator/EstimatingAngles.htm>



- 1 To play this game the pupils need their show-me boards. Start by pressing the *hide* button to cover the value of the angle.
- 2 To begin press one of the *acute*, *obtuse* or *reflex* buttons. Every time you press the *acute* button the program will generate a random acute angle (pressing the *obtuse* and *reflex* buttons produces the corresponding effect). Give pupils a few seconds to write down their estimation on their show-me boards. You can then reveal the answer by pressing the *show* button under the text saying 'angle'.
- 3 To add a bit of spice to the game use the following points system. If a child correctly guesses an angle they get zero points. For every degree the estimate is out the pupil gains a point. The lowest score at the end of the game is the winner.

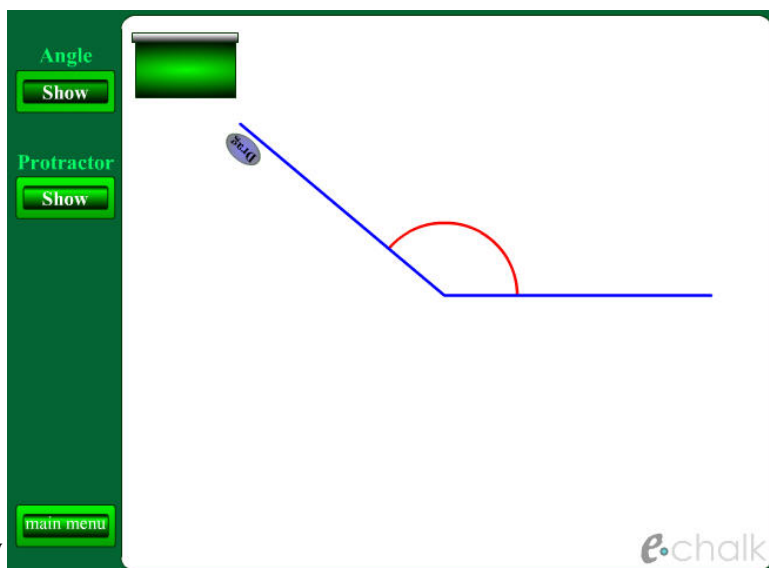
Game 2

Use the *eChalk: angle estimator* then select the *angle drag activity*.

This resource is found at:

<http://www.echalk.co.uk/Maths/angleEstimator/EstimatingAngles.htm>

- 1 To play this game the pupils will need their show-me boards. As for game 1 start by pressing the *hide* button to cover the value of the angle.
- 2 Now the teacher chooses an angle (say 122°) and then selects a pupil to come to the interactive whiteboard to create that angle. They do this by dragging the ellipse marked 'drag'.
- 3 To involve the rest of the class in this activity you ask them whether the angle estimated by the pupil is smaller than the target angle (i.e. 122°) or bigger. They then write 'too small' or 'too big' on their show-me boards. Now it's time to press *show* to reveal the angle and who guessed correctly.



Plenary (10 minutes)

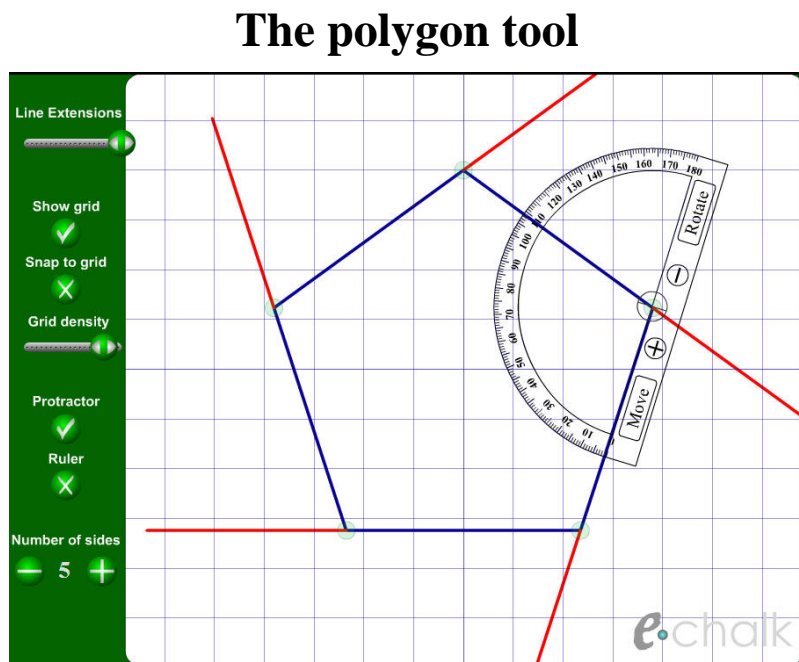
Ask pupils to work in pairs to answer the following questions:

- What shapes can you think of with just acute angles?
- What shapes can you think of that have only obtuse angles?
- What shapes have combinations of acute and obtuse angles?

Give the pupils chance to think about these questions before using the *eChalk: polygon tool* to illustrate the answers visually.

This wonderful resource is found at:

<http://www.echalk.co.uk/Maths/polygonTool/PolygonTool.htm>

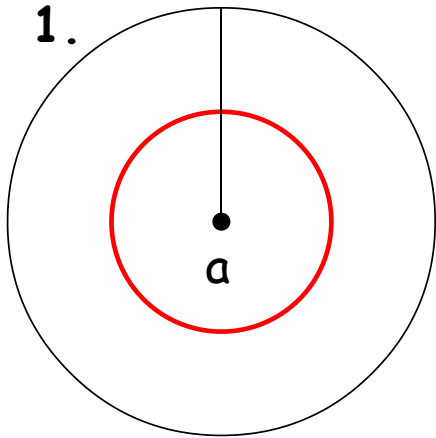


DR IESTYN JONES has been teaching with whiteboards since their introduction to the classroom. He is the creator of the acclaimed site www.echalk.co.uk which has quickly become the resource of choice for teachers. He also delivers training seminars for Dragonfly Training on teaching with interactive whiteboards in science and maths.

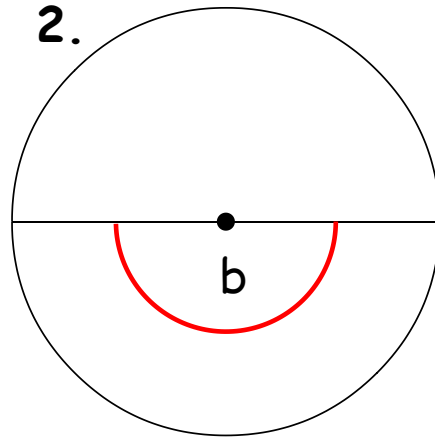
e.chalk ...more power to your elbow

Important Angles

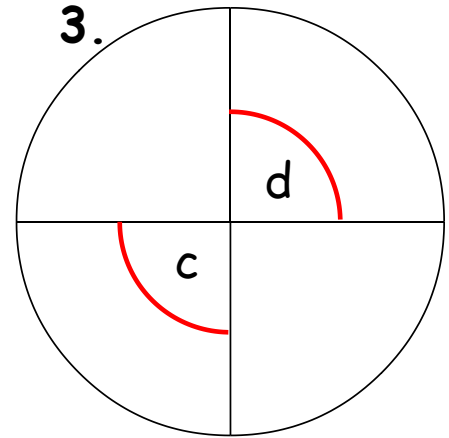
All the circles below have been divided into equal sectors. Use this fact to calculate the angle sums.



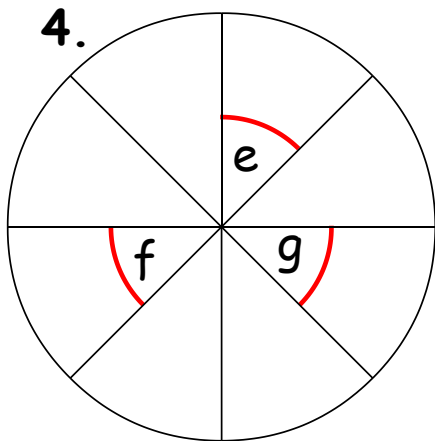
$$a =$$



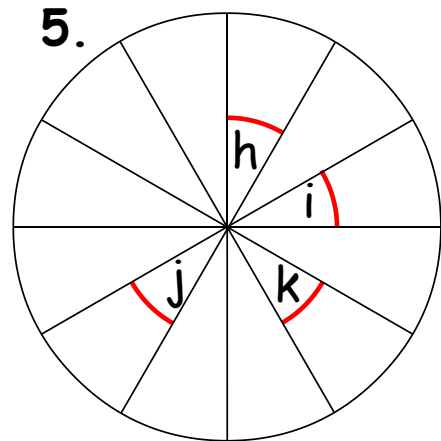
$$b =$$



$$c =$$
$$c + d =$$



$$e =$$
$$f + g =$$
$$e + f + g =$$



$$h =$$
$$k + j =$$
$$k + i + h =$$