

Freehand Circle Drawing



<https://spiremaths.co.uk/fcdc/>

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Resources

Original mathematical idea

MEI Maths Item of the Month: January 2010 – at the bottom of the page
http://www.mei.org.uk/index.php?section=resources&page=month_item

Winning poster

<http://mei.org.uk/files/SeniorTMC2008poster-final2.pdf>

Spire Maths adapted ideas: interactive whiteboard, video and pdf files

For an ActivInspire (Promethean) flipchart file

<https://spiremaths.co.uk/wp-content/uploads/FreehandCircleDrawing.flipchart>

For a Smart Notebook file

<https://spiremaths.co.uk/wp-content/uploads/FreehandCircleDrawing.notebook>

For World Championship of 2007


<http://www.mathstube.org.uk/watch.php?vid=3869b39ab>

The World Champion of 2007 in action

<http://www.mathstube.org.uk/watch.php?vid=aa2de73ae>

IWB pages (adapting MEI materials)

Freehand circle drawing



The medieval Italian painter Giotto (1266/7 – 1337) is said to have sent the Pope a perfect circle that he had drawn freehand in evidence of his ability to do some decorative work. This became known as Giotto's 'O'.

How would you judge a freehand circle-drawing competition?

Discuss! You can assume that, in judging the drawing competition, you have access to any measuring instruments. You can also assume that you are allowed to set any rules of the drawing competition.


This task was set for the poster round of 2008 national final of the Senior Team Mathematics Challenge organised by the Further Mathematics Network and the United Kingdom Mathematics Trust. Teams of four sixth form students were given one hour to produce a response to this question in the form of a poster. The content of the winning poster was used to produce this poster which was distributed to schools in England.

(MEI: Maths Item of the month - January 2010)

<http://mei.org.uk/files/SeniorTMC2008poster-final2.pdf>

Freehand circle drawing

The competition




World Freehand Circle Drawing Championship

February 22, 2007

Cock and the Lion

Ottawa, Ontario

The champion in action



The mathematics idea: see January at the bottom of the page below

<http://mei.org.uk/files/SeniorTMC2008poster-final2.pdf>

Freehand circle drawing



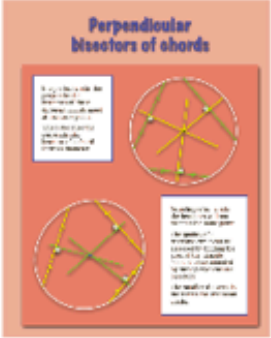
How would you judge a freehand circle-drawing competition?

Senior Team Mathematics Challenge 2008

<http://mei.org.uk/files/SeniorTMC2008poster-final2.pdf>

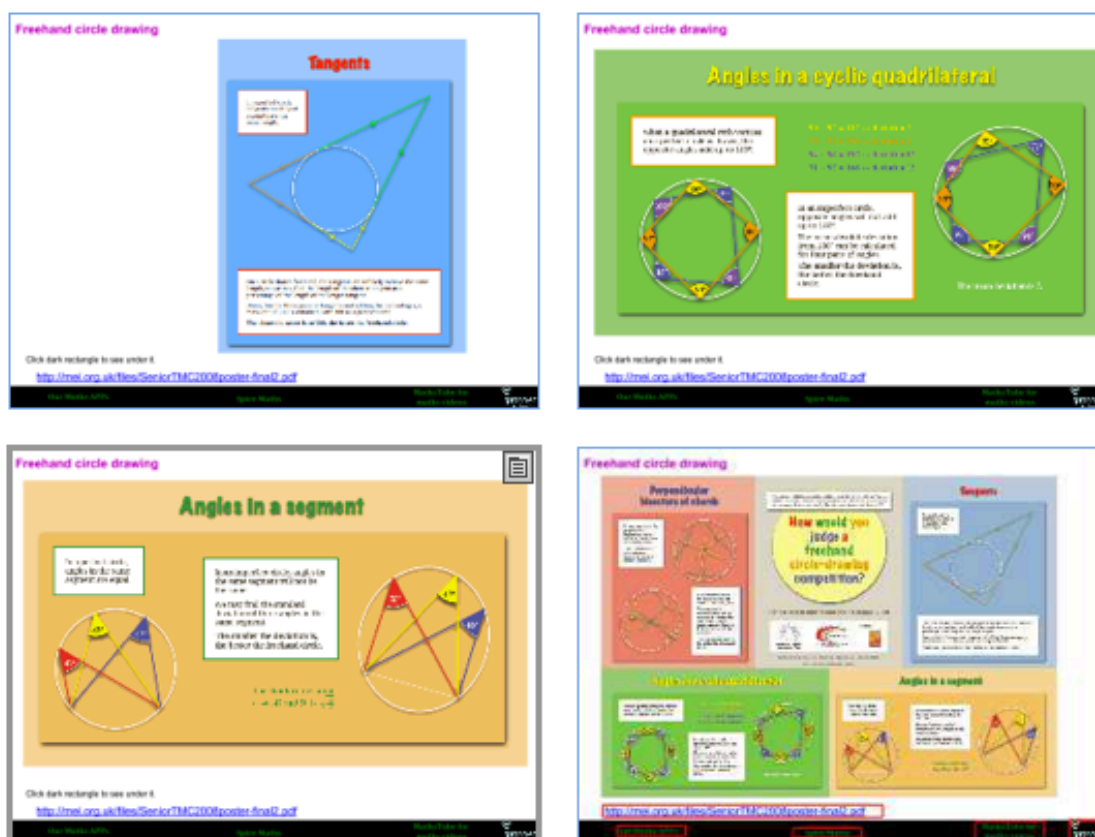
Freehand circle drawing

Perpendicular bisectors of chords



Click dark rectangle to see under it

<http://mei.org.uk/files/SeniorTMC2008poster-final2.pdf>

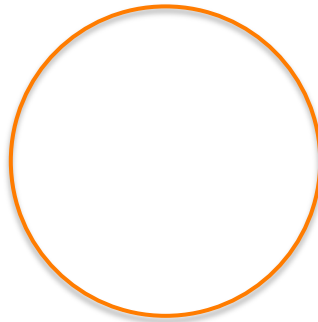


Art work featured in diagram above by [Suman Vaze](https://sites.google.com/site/vazeart/theorems&constructions) found at:
<https://sites.google.com/site/vazeart/theorems&constructions>

Possible Lesson (Revision for KS4)

Page 1 of IWB file (MEI outline of project)

Introduce background from MEI item (you could also talk to the art department about this):



"The medieval Italian painter Giotto (1266/7-1337) is said to have sent the Pope a perfect circle that he had drawn freehand in evidence of his ability to do some decorative work. This became known as Giotto's 'O'.

"How would you judge a freehand circle drawing competition?"

Discuss! You can assume that, in judging the drawing competition, you have access to any measuring instruments. You can also assume that you are allowed to set any rules of the drawing competition.

This task was set for the poster round of 2008 national final of the Senior Team Mathematics Challenge organised by the Further Mathematics Network and the United Kingdom Mathematics Trust. Teams of four sixth form students were given one hour to produce a response to this question in the form of a poster. The content of the winning poster was used to produce this poster which was distributed to schools in England."

Page 2 of IWB file

In 2007 there really was a 'world championship' in this. I suggest that you do not show either of these until everything is finished.

Pages 3 - 7 of IWB file

For these I used the IWB camera to split the poster into five parts – the challenge and the mathematical properties of the circle. I covered the diagrams of the four mathematical properties so that they could not be seen (so that I could use the titles, such as "Perpendicular bisector of chords" as a hint as to how the class might judge the accuracy of circles.

Page 8 of IWB file

The whole poster.

The lesson

You need to decide when to show the video clips: it helps if you do not show them early on (though you may want them to be aware of the method that all the entrants seem to use).

You will also need to determine what makes a fair attempt (i.e. does it have to join to make the complete circle or can you allow a gap – see video of competition).

I set up two competitions: all pupils have to enter the A3 paper version and can opt into the IWB version. Each is organised into groups of 4 pupils (they can be different for each competition).

A3 paper version

Each individual can have two sheets of paper and can use 3 of the sides of this to practice their freehand circle drawing (no tools or aids at all allowed). Get class to agree that circles need to be large. Within the group they then have to consider properties of a circle and judge someone else's practice examples. Discussion time then allowed.

Bring class together as a group to discuss skills and tactics, then into the judging. See what might be suggested – this is where you can offer IWB pages 4 to 7 (titles first and then if necessary the rest of the content).

Come up with an agreed class scoring method, e.g. these are based on posters with highest point score winning in the group – (but original data should be kept). Here is a way to use MEI poster scoring methods.

- Perpendicular bisectors of chords: smallest triangle area 5 points, then 3, then 2 then 1 (for a group of 4 pupils)
- Tangents: closest to 300 points as per poster = 5 points etc.
- Angles in a cyclic quadrilateral: lowest mean absolute deviation = 5 points etc.
- Angles in a segment: lowest standard deviation = 5 points etc. (if you have not covered this you could use range between largest and smallest)

Ask each pupil to judge a circle from the practice attempts using some/all of the methods. Then they can have their 'real' go on the last side of the paper and you can look for group winners.

Find an overall winner from the group winners by having each group score one diagram then use a different scoring system depending on the number of groups of 4 that you have.

Whole board version

In groups of 4 pupils have one practice turn at drawing a large circle on the IWB (or your non-electronic equivalent): each one on a different page. Find a way to judge them: e.g. by eye; by comparing each with a circle drawn on the IWB using the circle drawing tool, looking for overlap (or not); by same as paper methods. You need to watch time on this.

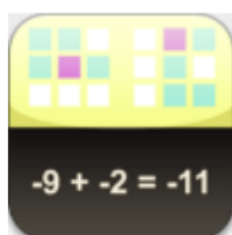
You could run this as an out of lesson activity to look for the best freehand circle drawer in each year.

Our iPad and iPhone resources

Search for Jamtec on the AppStore. We also have other non-mathematics apps. Prices correct at 6 October 2015.



[Age-ulator](#) Free: [Randomised](#) £0.79



[Directed Numbers](#) £0.79: [Equivalents](#) £0.79: [Multiplication Pairs](#) £0.79



[Maths Charts for Jenny Eather](#) Free:
[Maths Charts for Jenny Eather \(Deluxe version\)](#) £3.99



[Grids4Maths](#) £0.79: [GeoDraw](#) £0.79 (iPad only)

Education APPs from Apple

[Half price for volume purchase of some Education APPs](#)

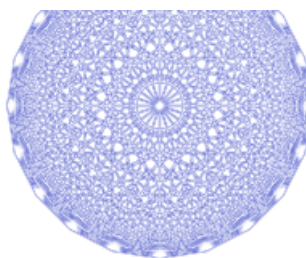
Maths APPs for iPads and iPhones



GEO DRAW

Available on iPad iOS 5.0 or later!

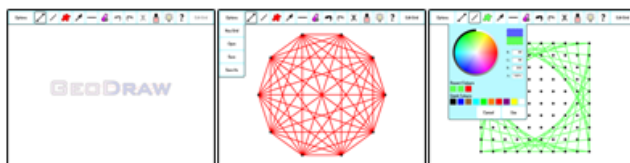
(iPad only)



Grids
Circular
Isometric:
horizontal
Isometric: vertical
Polar



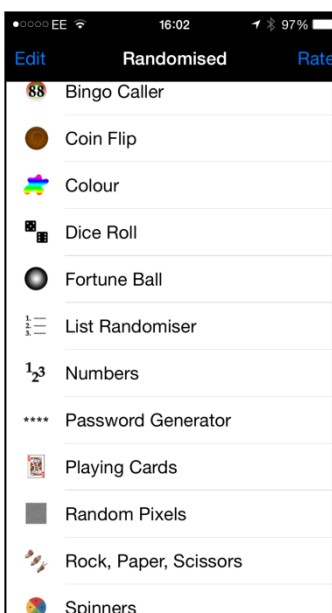
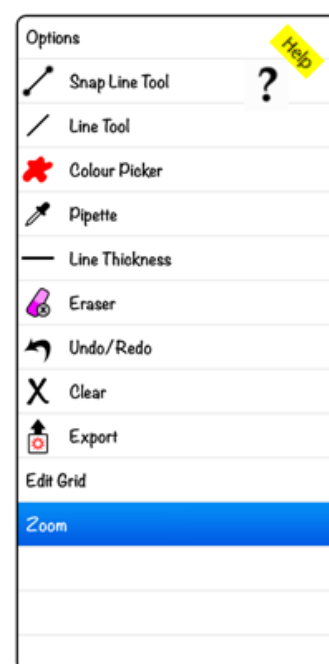
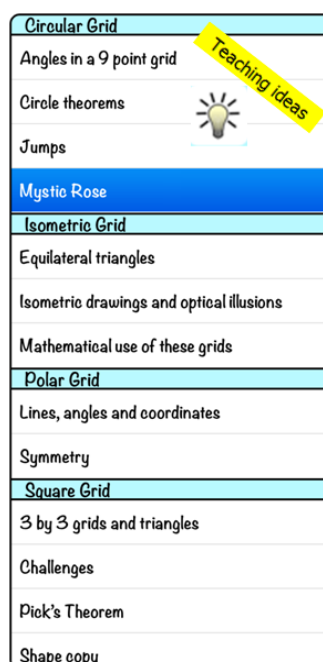
£0.79



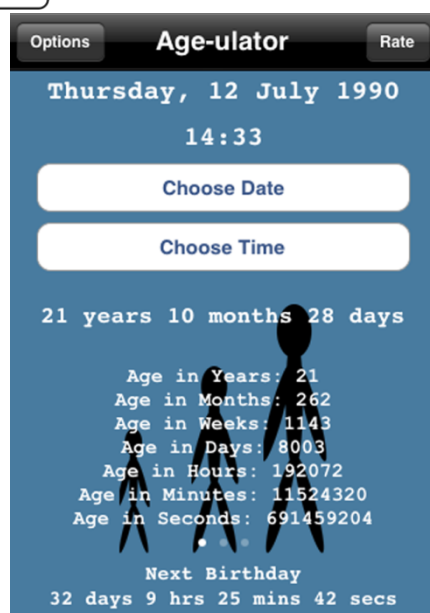
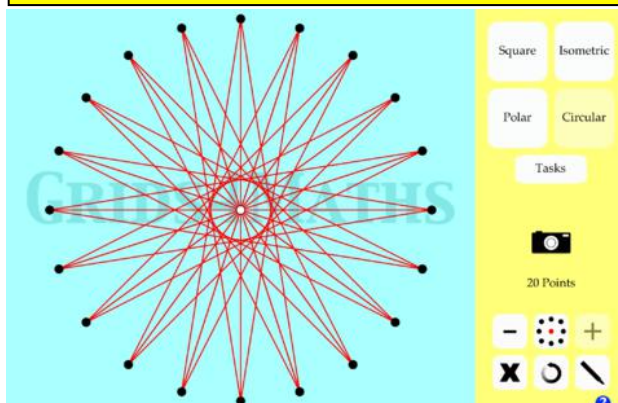
Change
Number of grid points
Grid point size
Line thickness
Line colour

- GeoDraw offers users a choice of 5 grids for use in mathematics and D&T lessons. Send/export images with/without grid using: Bluetooth, Email, Facebook, Twitter and into Pages or Keynote.

Eligible for VPP discount (see next page).

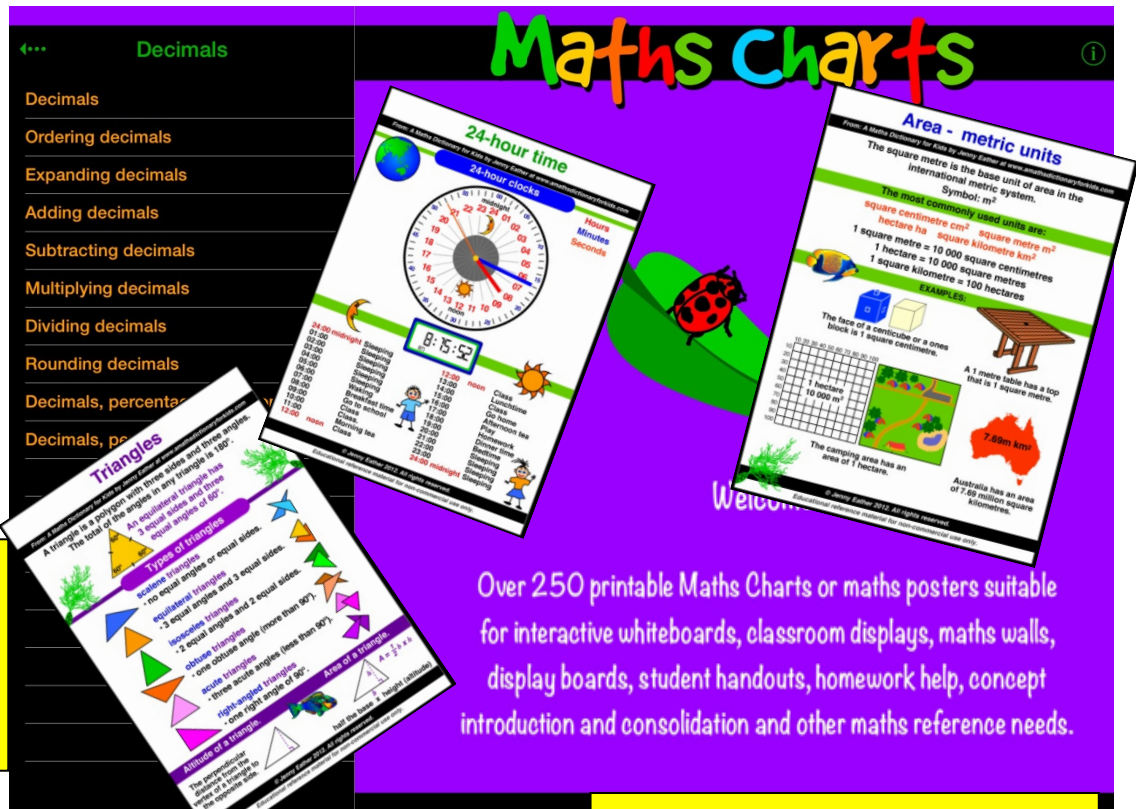


Randomised (79p): for probability lessons.
Age-ulator (free): for large number work and problem solving.
Grids4Maths (79p): much simpler version of GeoDraw for iPhones.



We've teamed up with Jenny Eather to bring her Maths Charts web resources to the iPad/iPhone. Try Maths Charts by Jenny Eather for free, then buy full Deluxe version for £3.99 (half this if you sign up for VPP with Apple and buy 20 or more copies).

Volume Purchase Programme (VPP) lets you buy Apple apps at discount rate of half price for 20 or more of the same app.



Over 250 printable Maths Charts or maths posters suitable for interactive whiteboards, classroom displays, maths walls, display boards, student handouts, homework help, concept introduction and consolidation and other maths reference needs.

$\frac{3}{8}$	$\frac{4}{5}$	$\frac{5}{8}$	$\frac{16}{36}$	$\frac{24}{30}$	$\frac{35}{63}$
$\frac{1}{9}$	$\frac{4}{9}$	$\frac{5}{9}$	$\frac{27}{36}$	$\frac{8}{72}$	$\frac{21}{56}$
$\frac{3}{5}$	$\frac{1}{7}$	$\frac{3}{4}$	$\frac{40}{64}$	$\frac{3}{21}$	$\frac{24}{40}$

Maths Pairs (£1.49) – three App bundle: eligible for VPP discount Directed Number, Equivalent and Multiplication Pairs (or 79p each).

7	x	1	=	Show
7	x	2	=	Show
7	x	3	=	Show
7	x	4	=	Show
7	x	5	=	Show
7	x	6	=	Show
7	x	7	=	Show
7	x	8	=	Show
7	x	9	=	Show
7	x	10	=	Show
7	x	11	=	Show
7	x	12	=	Show



Contact and further details:
In school training can be arranged to support implementation. www.jamtecstoke.co.uk
contact@jamtecstoke.co.uk

$64 \div 8$	$72 \div 12$	$48 \div 8$	9	6	5
$40 \div 8$	$70 \div 7$	$20 \div 4$	10	9	5
$72 \div 8$	$21 \div 3$	$81 \div 9$	8	6	7