**Y12 AS Mathematics**

**5 Co-ordinate Geometry 1.5 weeks**

## Teaching objectives

**a** To review knowledge of straight lines from GCSE.

**b** To ensure students understand and have efficient routines for finding gradients, midpoints and parallel and perpendicular lines.

**c** To understand and know efficient routines for finding the equations of straight lines.

**d** To gain fluency and develop problem solving skills in the context of the equations of straight lines.

**e** To extend GCSE knowledge of circles centred on the origin to circles with any centre.

**f** To understand how to use Pythagoras’ Theorem to verify the equation of a circle.

**g** To revise properties of circles from GCSE

**h** To gain fluency and develop problem solving skills in the context of equations of circles

**i** To be able to find the equations of tangents and radii of circles

**Resources for advance preparation:**

[**MEI: Tilted Square Problem**](https://integralmaths.org/sow-resources.php) – 1 sheet per student

[**UM: Lots of lines**](https://undergroundmathematics.org/geometry-of-equations/lots-of-lines) – card sort (students can cut up)

[**UM: Simultaneous Squares**](https://undergroundmathematics.org/geometry-of-equations/simultaneous-squares) – 3 scenarios printed

[**UM: Teddy Bear**](https://undergroundmathematics.org/circles/teddy-bear) – 1 sheet per student

[**KM:Treasure Hunt**](http://www.kangaroomaths.com/free_resources/ks5/resources/session1/circlegeometry/treasurehunt/) – 1 set cut up

[**KM: True, sometimes, never**](http://www.kangaroomaths.com/free_resources/ks5/resources/session1/circlegeometrytruesometimesnever.ppt)– card sort

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|  | **Starter** | **Main teaching**  Including key questions, key teaching points, models and resources | **Notes**  Including Support and Extension | **Consolidation/Plenary**  Including key questions and homework |
| **1** | [**MEI: Tilted Square Problem**](https://integralmaths.org/sow-resources.php) in pairs (extended starter) | Students to demonstrate their solutions (any student from any pair must be ready to demonstrate their working for any of their completed boxes).  If necessary, help them to refine their methods so that they have clear strategies for:   * finding a mid-point * finding gradients   Ensure they understand the relationship between parallel and perpendicular lines | Pair strong with middle, middle with weak and be prepared to support any of the middle/weak pairings.  Geogebra could be used here. | [**UM: Lots of lines**](https://undergroundmathematics.org/geometry-of-equations/lots-of-lines) in pairs  **Homework:** Routine practice from old resources, or **Integral Exercise level 1** |
| **2** | **Integral: Activity 4: questions to assess and reinforce learning.** Answers on mini-whiteboards; must give different answer from anyone sitting near them. | Lead students through generalising the method for finding the equation of a straight line with gradient m, going through the point (*a*, *b*). Extend to cases where the gradient has to be found, ie a line through (*a*1, *b*1) and (*a*2, *b*2).  Could use [**UM: The equation of a straight line**](https://undergroundmathematics.org/geometry-of-equations/the-equation-of-a-straight-line). | Students often confuse *x, x*1, *x*2, *y*, *y*1 and *y*2. Using (*a*, *b*) as the particular point when developing the formula should make this easier, though they will need to work with the standard form later. | [**UM: Simultaneous Squares**](https://undergroundmathematics.org/geometry-of-equations/simultaneous-squares). Display first task on board.  Perhaps have the 3 scenarios printed separately (they will fit on a single sheet).  **Homework:**  Routine practice including exam type questions from old resources, or **Integral Exercise level 2** |
|  | **Starter** | **Main teaching**  Including key questions, key teaching points, models and resources | **Notes**  Including Support and Extension | **Consolidation/Plenary**  Including key questions and homework |
| **3** | [**RISP 21: Arithmagon 8**](http://www.s253053503.websitehome.co.uk/risps/risp21.html); students to devise their own problems to swap | Problem Solving:  [**UM: Can we find the coordinates of this tilted rectangle?**](https://undergroundmathematics.org/geometry-of-equations/r6366)  Other problems from [**UM: Geometry of Equations**](https://undergroundmathematics.org/geometry-of-equations) or elsewhere. |  | Students share solutions  or  Look at a problem together  Or  Summarise key learning points from these 3 lessons.  **Homework:**  New exam questions and/or **Integral Exercise Level 3** and/or problem from [**UM: Geometry of Equations**](https://undergroundmathematics.org/geometry-of-equations) |
| **4** | Mini-whiteboards: recap of completing the square | Use **Integral: Explore Circle Equations** (Geogebra) to review students’ knowledge of the equations of circles. How do we know these equations define circles? What happens if we move the centre? Derive the general equation of a circle. |  | [**UM: Teddy Bear**](https://undergroundmathematics.org/circles/teddy-bear) or simpler matching activity  **Homework:**  Routine practice from old resources  or  [**UM: Teddy Bear**](https://undergroundmathematics.org/circles/teddy-bear) |
| **5 & 6** | **A GCSE starter/revision resource on applying circle theorems** | Problem Solving:  **Integral: Activity 1: Problem-solving shorts**  or  **Activity 2: finding the circle through 3 points**  or  [**Risp 9: A circle property**](http://www.s253053503.websitehome.co.uk/risps/risp9.html)  or  [**KM: coordinate geometry treasure hunt**](http://www.kangaroomaths.com/free_resources/ks5/resources/session1/circlegeometry/treasurehunt/)  or  [**KM: circle geometry true/sometimes/never**](http://www.kangaroomaths.com/free_resources/ks5/resources/session1/circlegeometrytruesometimesnever.ppt) |  | Students to present solutions.  Discuss methods of solution, reasoning, efficiency.  **Homework:**  Topic assessment |