

Round 2: Geometry

1. OBJECTIVES

- To develop fluency in geometry.
- To develop mathematical reasoning.
- To promote problem solving skills.

2. DESCRIPTION & RATIONALE

A key issue in problem solving is the need to sustain the activity. Much school mathematics follows a pattern of closed questions where the solution is quickly known. With the absence of coursework from GCSE, there is little incentive to run activities over several lessons where students experience the position of the professional mathematician exploring an uncharted territory. This requires resolve and tenacity. This is beautifully explained by the mathematician Andrew Wiles in the introduction to the BBC Horizon programme 'Fermat's Last Theorem', which can easily be found with an internet search.

Round 2 requires students to use standard national curriculum skills in solving geometric problems with angle relationships, Pythagoras' theorem, area, perimeter and volume and similar figures. However, they do this in the context of a card game where situations are presented with variable values. A restricted set of numbers are available and players must find a set of values which are one solution to the given situation. This requires a detailed knowledge of the situations and the ability to be flexible in checking different solutions.

Gridlines Geometry Game.

This card game which has been specially designed by the developer of the tournament materials. Three members from each team work on three geometric problems. They can work individually or collectively. They are given 10 number cards which can be combined to make a large but limited variety of values. They need to find a set of values that will work as a solution to one of the geometric problems. Some of their three may not be possible with the number cards available.

- In the tournament rounds, three team members will sit at a table with a teacher judge and play the game as presented in the rules with the aim of completing as many problems as possible in a continuous 15-minute round. When a problem is solved, they need to explain their solution to the judge. If correct, it is replaced and new numbers become available.

3. SCHOOL ACTIVITIES

In Class

The problem cards are coded as M for mensuration (area and perimeter), V for Volume (and similar figures), A for angle relationships and P for Pythagoras. These cards can easily be separated into topic sets and shown in class settings when that topic is being taught (e.g. with a visualizer). The GridLines Geometry software can also be used for displaying cards in class, and notably for checking solutions. Students can find one solution to the given card. Students can explain why what they present is indeed a solution. Many different solutions can be presented. Groups can then discuss the differences and similarities between solutions.

Clubs and Tournament

1. Make sure students are familiar with the geometric skills needed. For some students it may be necessary to teach them specific skills ahead of their place in the scheme of work. These include all the requirements of the geometry section of the national curriculum for area, perimeter and volume, angle relationships, Pythagoras' theorem and similar figures.
2. Work on activities designed to help students get comfortable with using variables in describing geometric relationships. Links to three activities are given in the student guide.
3. The Gridlines Geometry game packs contain a set of cards designed to help players get started. These are coded as level 0 in the puzzle set.
4. Students are now ready to play the full Gridlines: Geometry game. The detailed rules are given in full in the student guide.
5. In readiness for the online heats, let students practice the format to be used in the heats. Deal 3 problem cards and 10 number cards. Three students working together must solve the puzzles. There is no restriction on discussing or writing notes.
6. The GridLines Geometry software currently only runs on Windows computers (although a phone App version is in development). It is an excellent resource for students to practice and to check their solutions.

4. MATERIALS

1. We supply 5 copies of the Gridlines Geometry game in the school equipment pack. These will be needed for practice. The packs can easily be subdivided for many groups to practice, although it is important to share out the cards of different difficulty levels (shown by the blue circle, level 0, 1, 2 or 3 on the puzzle cards) according to need and readiness.
2. The full game is available as a downloadable Windows software package on the Count on Us web site. This can be used for practice play or as a classroom resource.
3. In the student guide:
 - a. Links to online activities.
 - b. Full rules for the Gridlines Geometry game.

5. AT THE COUNT ON US SECONDARY CHALLENGE

Playing the Gridlines Geometry game.

- Play an uninterrupted 15-minute round according to the game pack rules.
- As soon as any problem is solved, the solution is shown and explained to a table judge, not written down. Then the problem card is put to one side for scoring and replaced so there are always three problems in play.
- Any number cards used in the solution are placed at the bottom of the number card pack and replaced.
- Players have three “I give up” cards allowing the replacement of any number of problem and/or number cards.
- Three team members are playing at any one time. They can work together or separately on one or more problems at a time as they choose, discussing and writing notes freely.
- Substitutions can be made at any time so long as only 3 players are working at the table.

