



# Resource Pack for Secondary Schools

Scotland



**Teacher's Notes for Resource Sheets SR1–SR35**

Maths Year 2000 Scotland Resource Pack: Secondary Schools

Booklet and accompanying Resource Sheets SR1–SR35 published November 2000

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# Resource Pack for Secondary Schools

## Introduction

This resource pack includes resources and ideas which have been used in schools during Maths Year 2000. The Resource Sheets enclosed are in photocopyable form, and can be used in a range of ways. Answers, where applicable, are also provided on yellow sheets.

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**Resource Sheets:  
SR1–SR3  
Year: S1–S6**

**Resource Sheets**

Sample questions from the competitions:

SR1: Junior Division

SR2: Middle Division

SR3: Senior Division

## **Mathematical Competitions**

### **Scottish Mathematical Challenge (Secondary divisions)**

- Scotland-wide competition run by Scottish Mathematical Council (SMC).
- No entry fee.
- Question rounds are based on problem-solving. Pupils work independently.
- The problems are banded into three levels: Junior (S1–S2); Middle (S3–S4); and Senior (S5–S6).
- The first round reaches schools in early September, and is to be returned in early November. The second round arrives in October for submission in late January.
- The competition is organised in five regions, with regional centres of the Universities of Aberdeen, St Andrews, Edinburgh, Glasgow and Paisley.
- Each regional centre holds an awards ceremony during the summer term.
- Teachers distribute the problems, gather the solutions and send them for marking.
- Contact: Information is distributed to schools either directly or via the local authority. In case of difficulty, contact the Chairman of the National Committee, Bill Richardson, Kintail, Longmorn, Elgin, IV30 8RJ (Tel: 01343 860 450).

## Mathematical Competitions

### Mathématiques sans Frontières

**Resource Sheets:  
SR4–SR5  
Year: S4–S5**

- Team competition for pupils from S4 and S5.
- 10 questions for S4, 13 questions for S5, one question has to be read and answered in a foreign language (French, German, Italian or Spanish).
- No entry fee, every pupil that takes part receives a small prize.
- All questions have to be answered in 90 minutes, with the class submitting a single answer for each question.
- A training test is sent out in December, with the competition set in March, and prize-giving in mid-June.
- Contact: Brian Connelly, Adviser in European Education, North Lanarkshire Council, Kildonan Street, Coatbridge, ML5 3BT, email: [Brian\\_Connelly@nleducation.org.uk](mailto:Brian_Connelly@nleducation.org.uk), <http://www.hw.ac.uk/msf/>

#### **Resource Sheets**

Sample questions from the competition:

**SR4:** Question in foreign languages

**SR5:** Questions in English

**Resource Sheets:  
SR6–SR8  
Year: S1–S6**

**Resource Sheets**

Example questions from  
the competitions

**SR6:** Junior Challenge

**SR7:** Intermediate  
Challenge

**SR8:** Senior Challenge

## **Mathematical Competitions**

### **UKMT Maths Challenges**

- UK-wide competitions, run by the United Kingdom Mathematics Trust.
- Entry fee (as at November 2000): £6 for 10 pupils.
- The Junior Maths Challenge is for S1 and S2 pupils, and is held at the start of May.
- The Intermediate Maths Challenge is for pupils in S4 and below, and is held in early February.
- The Senior Maths Challenge is open to all, and is held in November.
- The Junior and Intermediate Challenges takes an hour, and the Senior Challenge takes 90 minutes.
- Each Challenge consists of 25 multiple-choice questions, with penalty marking to discourage guessing.
- Certificates are awarded to successful candidates.
- The top pupils from each Challenge are invited to take part in follow-up events, including the British Mathematical Olympiad, which leads to the annual International Mathematical Olympiad.
- Teachers are required to organise the test and issue certificates, and submit results to the UK Maths Trust offices. For the Senior Challenge, teachers have to mark the papers.
- Contact: UKMT, Maths Challenges Office, School of Mathematics, University of Leeds, Leeds, LS2 9JT. Tel: 01 13 233 2339, Email: [ukmt@amsta.leeds.ac.uk](mailto:ukmt@amsta.leeds.ac.uk), Web: <http://www.mathcomp.leeds.ac.uk/>

## Mathematical Competitions

### Enterprising Mathematics

**Resource Sheets:  
SR9–SR13  
Year: S2–S3**

- Team competition run by individual Education Authorities in Scotland, with a national final. No entry fee.
- Pupils work in teams of four, with no more than two members of the team in S3, and the remainder from S2.
- Education Authorities organise heats, and the winning team qualifies for the Scottish final held in November.
- Education Authorities determine the format of the competition. Typically there are five rounds, played out over an afternoon:
  - Round 1: The Poster Competition. A week or two before the event, teams are given a theme to prepare. On the day of the competition, the teams have to create a poster based on the theme, incorporating answers to questions given on the day.
  - Round 2: Team Contest. A set of questions, with the team submitting a single answer to each, after discussion.
  - Round 3: Speed Contest/Station Contest. Teams spend a short set time at a set of "stations", each with a problem. The team provides a single answer.
  - Round 4: Swiss Contest/Head to Head. The four individuals in each team play strategy games individually against members from other teams. Players are required to make their moves within a short time limit (usually 15 seconds).
  - Round 5: Relay Contest. Teams are split into pairs, placed at different ends of the competition room, and are set problems. One pair cannot begin answering a question until the other pair has finished answering a question.
- Contact: Information is distributed to schools via the local authority. For further information, contact Clive Chambers, Westerlea House, Alyth Road, Blairgowrie, PH10 7DY, email: Clive641@AOL.com

#### Resource Sheets

Sample questions from the competition:

**SR9:** The Poster Competition (Fabulous Fibonacci)

**SR10:** Team Contest

**SR11:** Speed Contest/Station Contest Puzzle

**SR12:** Swiss Contest (Spot the Rule)

**SR13:** Relay Contest (Quiz Questions)

**Resource Sheets:  
SR14–SR19, SR31  
Year: S1–S6**

**Resource Sheets**

Sample questions from competitions:

SR14–SR18: Quiz rounds of the 2000 Challenge

SR31: “Countdown”

SR19: Number Challenge

## **Mathematical Competitions**

### **Other Competitions**

Examples of team activities that can be re-created within a school or class. The format can be adapted to suit individual circumstances.

#### **2000 Challenge**

- 4 team members in 8 teams, given questions as a team. Teams submit written answers, no calculators are allowed.
- There are five rounds, of about 20 minutes, interspersed with “Countdown” challenges. Each round consists of a number of puzzles. Points are awarded for correct or partially correct answers.
- All team members receive certificates, and the winning team and runners-up receive prizes or medals.
- Event takes about 2 hours.

#### **Number Challenge**

- A quiz for individual pupils or teams of two or more pupils.

## Maths Clubs

Many schools throughout Scotland run maths clubs for pupils, at lunchtimes or after school. The activities they undertake vary from school to school, and will depend on the duration of the club sessions and the interests of the pupils attending. Listed below is a selection of ideas for activities which could be used in a maths club.

### Ideas for Activities

- Puzzlecards: Photocopy each puzzle or activity onto coloured card (use different colours to differentiate activities), and if possible, laminate them to prolong their life.
- Investigations: Example investigations are enclosed as Resource Sheet SR23–SR25.
- Questions from previous years UKMT Maths Challenges, Enterprising Maths competitions, Scottish Mathematical Challenges and Mathématiques sans Frontières competitions can be useful sources of puzzles.
- Commercial Games and Puzzles: Soma Cube, Connect 4, Connections, Downfall, GO, Number Yahtzee, Othello and other strategy and puzzle games can be a good way to encourage mathematical thinking.
- Games and Puzzles that are easy to make include Triominoes, Pentominoes, and the Tower of Hanoi.
- CD-ROMs and Games on the Internet.
- Further ideas are contained in a number of books. See the Appendix for a listing.

### Funding

Education Extra, the foundation for after-school activities provides a total of £125 000 in grants of up to £2500 to help schools set up or sustain any activity running out of normal school hours. Application forms and guidance notes are sent to head teachers in November. The closing date for applications is the end of January, and schools are informed of the result of their bid by the end of the spring term.

<http://www.educationextra.org.uk/>

**Resource Sheets:  
SR1–SR13,  
SR20–SR25  
Year: S1–S6**

### Resource Sheets

Sample puzzlecards:

**SR20:** Pentagon Construction

**SR21:** Mathematical Bingo

**SR22:** Train Tickets Problem

Sample investigations:

**SR23:** Funny Money

**SR24:** Möbius Strips

**SR25:** Penrose Tiles

**SR1–SR13:** Questions from competitions

**Resource Sheets:**  
**SR26–SR32**  
**Year: S1–S4**

**Resource Sheets**

SR26–SR30: Loop cards

SR31: Countdown

SR32: Targets

## **Mental and Oral Games**

### **Loop Cards**

Sets of cards for use with groups or classes. Each pupil is given at least one card, which has an answer and a question on it. The teacher or a pupil starts off the chain of questions and answers, by reading out a start question. The activity finishes when the last card is read out.

If the activity is timed with penalties for wrong answers or when answers are given by other pupils, motivation can be increased. Cards can be created for all levels of ability and a selection is included as Resource Sheets SR26–SR30.

### **Countdown**

Written or oral quiz, based on the popular Channel 4 programme Countdown. Six numbers are chosen, from two sets: {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} and {25, 50, 75, 100}. A target number is then set, and the object of the game is to achieve the target number using any or all of the six numbers only once, using addition, subtraction, multiplication and division.

A variation on this activity is presented in Resource Sheet SR32 "Targets". Using four numbers and a target number, the participant has to make a sum from all four numbers that equals the target number.

# Applications of Mathematics

**Resource Sheets:  
SR33–SR34  
Year: S3–S6**

## Mathematics at Work

Maths=Top Jobs, a campaign from Maths Year 2000 and Maths@Work, aims to show how mathematics is important in a wide variety of careers. Examples of different careers that require maths are published on the Maths Year 2000 website.

## Mathematics in the Real World

These problems have been adapted from “Mathematics on the Job” (<http://www.vsc.c.c.tn.us/msee/eduege.htm>) for use in Scotland. The authors of the website collected problems from industry, with realistic numerical values wherever possible.

## Further Ideas

### Linking with industry

Some schools have Industrial Advisers, individuals with an industry or commercial background, who can help to provide practical examples of the applications of mathematics.

Neighbourhood Engineers is a UK-wide scheme funded by the Engineering Council. The programme offers practical support to assist local schools. Engineering is a discipline that requires an understanding of mathematics, and so your local Neighbourhood Engineer may be able to assist you in providing practical examples to your pupils.

Neighbourhood Engineers is coordinated by SATRO West Scotland (Tel: 0141 330 6396, Email: [satro@gla.ac.uk](mailto:satro@gla.ac.uk)) and North Scotland SATRO, (Tel: 01224 274188, Email: [gordon.shanks@setpoint.org.uk](mailto:gordon.shanks@setpoint.org.uk)).

Some schools manage to arrange industrial visits which help to reinforce classroom mathematics and can provide “real” material to study. Inevitably, such activities need to be organised by local schools, perhaps with help from the their local Education Business Partnership.

## Web sites

Pass Maths (for students aged 16+) and NRICH both contain a variety of articles on applications of mathematics and maths in the real world. <http://pass.maths.org> and <http://nrich.maths.org>

RAFtarget.com: Aimed at S3–S4 General students. Provides examples of applications of maths in a variety of situations in the RAF, including Air-Sea Rescue, Navigation, and Sport. <http://www.RAFtarget.com>

Maths@Work is a project from the Institute of Mathematics and its Applications. They helped to organise the Maths Year 2000 Maths = Top Jobs campaign, and are also sending a Maths@Work video to all secondary schools. <http://www.mathsatwork.co.uk>

### Resource Sheets

SR33: Mathematics at Work handout

SR34: Mathematics in the Real World questions

## **Funding For Mathematics Projects**

Details correct as of October 2000.

### **Edinburgh Mathematical Society Enrichment Fund for Mathematics in Schools**

- Every year £2000 is set aside to support projects for which funding is not available from normal school sources. There is a limit of £350 for individual awards.
- Applications should contain a description of activity proposed, who will benefit and in what way, a financial breakdown of expenditure involved, details of other applications made to support the activity and an explanation of why normal school funds will not support the work.
- Awards are made in the period October – September. Early submission of applications is encouraged and details should be lodged by the end of June in the period. Applications are normally decided within six weeks.
- Details and application from: The Honorary Secretary, Edinburgh Mathematical Society, Department of Mathematics and Statistics, University of Edinburgh, James Clerk Maxwell Building, The King's Buildings, Edinburgh. EH9 3JZ  
[http://www.maths.ed.ac.uk/~edmathsoc/schools\\_enrichment.html](http://www.maths.ed.ac.uk/~edmathsoc/schools_enrichment.html)

### **Education Extra: The Foundation for After-School Activities**

- Education Extra Awards provide £125,000 in grants of up to £2500 to help schools set up or sustain any activity running out of normal school hours.
- Application forms and guidance notes are mailed to every head teacher in November each year and are also available on their web site.
- The closing date for applications is the end of January. Schools will be informed of the result of their bid by the end of the spring term.
- Details on web site: <http://www.educationextra.org.uk/> or from: Awards Applications, Education Extra, 17 Old Ford Road, London, E2 9PL, telephone: 0208 709 9912, email: [s.donovan@educationextra.org.uk](mailto:s.donovan@educationextra.org.uk)

### **London Mathematical Society Education Committee Grants**

- Grants support such activities as popular lectures, exhibitions, masterclasses, mathematical competitions, etc., that help to encourage joint mathematical ventures between higher education institutions and schools, or the development of projects that would improve the 'Public Image of Mathematics'.
- Any application for support should contain a brief description of the proposed event or project with an outline of expected expenses, and details of other sources of support.
- Applications are considered at meetings of the Education Committee in September, January and April
- Details and application from: Dr S.A. Huggett, School of Mathematics & Statistics, University of Plymouth, Drake Circus, Plymouth, PL4 8AA. <http://www.lms.ac.uk/>

## Appendix

### Books

Title	Author	Publisher	ISBN
Secondary Maths Club Pack		The Mathematical Association	0 906588 359
Juggling Jugs and other Investigations	Teresa Carr	Royal Society of Edinburgh	0 902198 08 4
Maths Challenge: Books 1 – 3	Tony Gardiner	Oxford University Press	
Mathematical Activities	Brian Bolt	Cambridge University Press	0 521285 186
The Penguin Dictionary of Curious and Interesting Puzzles	David Wells	Penguin	0140148752
Maths Challenge Yearbooks		UKMT	

### Websites

Maths Year 2000 Scotland	<a href="http://www.mathsyear2000scotland.org.uk/">http://www.mathsyear2000scotland.org.uk/</a>
Scottish Virtual Teachers' Centre	<a href="http://www.svtc.org.uk/">http://www.svtc.org.uk/</a>
National Grid for Learning Scotland	<a href="http://www.ngflscotland.gov.uk/">http://www.ngflscotland.gov.uk/</a>
Scottish Mathematical Council	<a href="http://www-maths.mcs.st-and.ac.uk/~smc/">http://www-maths.mcs.st-and.ac.uk/~smc/</a>
Mathématiques sans Frontières	<a href="http://www.hw.ac.uk/msf/">http://www.hw.ac.uk/msf/</a>
UKMT Maths Challenges	<a href="http://www.mathcomp.leeds.ac.uk/">http://www.mathcomp.leeds.ac.uk/</a>
The Mathematical Association	<a href="http://www.m-a.org.uk/">http://www.m-a.org.uk/</a>
Maths at Work	<a href="http://www.mathsatwork.co.uk/">http://www.mathsatwork.co.uk/</a>
Mathematics on the Job	<a href="http://www.vsccl.tn.us/msee/eduedge.htm">http://www.vsccl.tn.us/msee/eduedge.htm</a>
Pass Maths 16+	<a href="http://pass.maths.org/">http://pass.maths.org/</a>
NRICH	<a href="http://rich.maths.org/">http://rich.maths.org/</a>
RAFTarget.com	<a href="http://www.RAFTarget.com/">http://www.RAFTarget.com/</a>

### Further Sources of Questions and Resources:

Centre for Innovation in Mathematics Teaching (CIMT)	<a href="http://www.ex.ac.uk/cimt/">http://www.ex.ac.uk/cimt/</a>
1000 Problems	<a href="http://www.1000problems.com/">http://www.1000problems.com/</a>
The Number Years Maths Quiz	<a href="http://www.jquinn.oxj.edu/numberyears/">http://www.jquinn.oxj.edu/numberyears/</a>
Liverpool Mathematical Society Funmaths Roadshow	<a href="http://www.m-a.org.uk/bc/live.htm">http://www.m-a.org.uk/bc/live.htm</a>
The History of Mathematics Archive	<a href="http://www-history.mcs.st-and.ac.uk/history/">http://www-history.mcs.st-and.ac.uk/history/</a>
Ivars Petersen's Mathsland, Science News:	<a href="http://www.sciencenews.org/">http://www.sciencenews.org/</a>
Eric Weisstein's World of Mathematics	<a href="http://mathworld.wolfram.com/">http://mathworld.wolfram.com/</a>
World of Escher	<a href="http://www.worldofescher.com/">http://www.worldofescher.com/</a>
The Geometry Junkyard	<a href="http://www.ics.uci.edu/~eppstein/junkyard/">http://www.ics.uci.edu/~eppstein/junkyard/</a>

## Appendix continued

### CD-ROMs

Title	Publisher	Notes
Various titles	Learning and Teaching Scotland	
Paraphernalia	Scottish Cultural Resources Access Network	Includes graphing work and calculation
Livingston	Scottish Cultural Resources Access Network	Concentrates on geometry of town planning etc.

### Contact Addresses

Association of Teachers of Mathematics, 7 Shaftesbury Street, Derby DE28 8YB

Tel: 01332 346599, Web: <http://www.atm.org.uk/>

Education Extra – The Foundation for After-School Activities, 17 Old Ford Road, London, E2 9PL

Tel: 0208 709 9912, e-mail: [s.donovan@educationextra.org.uk](mailto:s.donovan@educationextra.org.uk),

Web: <http://www.educationextra.org.uk/>

Edinburgh Mathematical Society, Department of Mathematics and Statistics, Edinburgh University,

The King's Buildings, Edinburgh, EH9 3JZ

Web: <http://www.maths.ed.ac.uk/~edmathsoc/>

Learning and Teaching Scotland, 74 Victoria Crescent Road, Glasgow, G12 9JN

Tel: 0141 337 5000, Fax: 0141-337-5050, Web: <http://www.LTScotland.com/>

London Mathematical Society Education Committee, c/o Dr S.A. Huggett, School of Mathematics &

Statistics, University of Plymouth, Drake Circus, Plymouth, PL4 8AA

Web: <http://www.lms.ac.uk/>

The Mathematical Association, 259 London Road, Leicester. LE2 3BE

Tel: 0116 2210013, Web: <http://www.m-a.org.uk/>

Mathématiques sans Frontières, c/o Brian Connelly, Adviser in European Education, North Lanarkshire

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email: [Brian\\_Connelly@nleducation.org.uk](mailto:Brian_Connelly@nleducation.org.uk), <http://www.hw.ac.uk/msf/>

The Royal Society of Edinburgh, 22-26 George Street, Edinburgh, EH2 2PQ

Tel 0131 240 5000, Fax 0131 240 5024, Email: [publications@rse.org.uk](mailto:publications@rse.org.uk)

Scottish Cultural Resources Access Network (SCRAN), Abden House, Edinburgh EH16 5HP

Tel: 0131 662 1211, Fax: 0131 662 1511, Web: <http://www.scran.ac.uk/>

Scottish Mathematical Council, c/o Bill Richardson, Kintail, Longmorn, Elgin, IV30 8RJ

Web: <http://www-maths.mcs.st-and.ac.uk/~smc/>

UKMT, Maths Challenges Office, School of Mathematics, University of Leeds, Leeds, LS2 9JT.

Tel: 0113 233 2339, Email: [ukmt@amsta.leeds.ac.uk](mailto:ukmt@amsta.leeds.ac.uk), Web: <http://www.mathcomp.leeds.ac.uk/>

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<http://www.mathsyear2000scotland.org.uk/>



**SCOTTISH EXECUTIVE**

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