

Primary Mathematical Challenges

Welcome to the 2018-2019 Scottish Primary Mathematical Challenges. This package contains

This Welcome Page (including Section Information)
The Primary Guidelines
Round 1 Questions
Information About Payments and Data Protection
How to Enter your School and Pupil Names on the Marks Website
The Annual Poster
A Book Order Form

In 2018-2019, the name of the Section Organiser is not on the question paper. Their details are on the website but are repeated here for convenience:

Section 1

Aberdeen City; Aberdeenshire; Highland; Moray; Orkney Islands; Shetland Islands;
Western Isles
Helen Martin (h.martin@abdn.ac.uk)
Dept. of Curr. Studies, University of Aberdeen, Faculty of Education, MacRobert Building,
Aberdeen AB24 5UA

Section 2

Angus; Clackmannanshire; Dundee City; Falkirk; Fife; Perth & Kinross; Stirling
Rachel Norman (ran@cs.stir.ac.uk)
Department of Computing Science and Mathematics
University of Stirling, Stirling FK9 4LA

Section 3

East Lothian; Edinburgh City; Midlothian; Scottish Borders; West Lothian
Eric Brown, c/o Ruth Forrester (ericb@exseed.ed.ac.uk)
University of Edinburgh, Moray House Institute of Education,
Charteris Land, Holyrood Rd., Edinburgh, EH8 8AQ

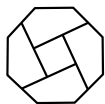
Section 4

Argyll & Bute; Dumfries & Galloway; East Ayrshire; East Dunbartonshire;
East Renfrewshire; Glasgow City; Inverclyde; North Ayrshire; North Lanarkshire;
Renfrewshire; South Ayrshire; South Lanarkshire; West Dunbartonshire
John Winter (john.winter@strath.ac.uk)
Lord Hope Building, 141 St James Road, Glasgow G4 0LT

The competition timetable for 2018-2019 is as follows:

<i>Set</i>	<i>Last date for receipt of questions by schools</i>	<i>Last date for receipt of solutions from pupils</i>
<i>I</i>	Friday 24 August 2018	Friday 28 September 2018
<i>II</i>	Friday 19 October 2018	Friday 23 November 2018
<i>III</i>	Friday 11 January 2019	Friday 8 February 2019

If there are organisational difficulties you may contact me: Bill Richardson (wpr3145@gmail.com).



The Scottish Mathematical Council

MC homepage: www.scot-maths.co.uk/

MATHEMATICAL CHALLENGE 2018-2019

PRIMARY DIVISION

GUIDELINES FOR TEACHERS

1. **Mathematical Challenge** is a problem-solving competition open to pupils educated in Scotland. The aim of the competition is to promote mathematics as a source of interest and pleasurable achievement through challenging problems requiring for their solution only simple techniques and logic. The competition was introduced in 1976 for pupils at secondary school level. As the Scottish Mathematical Council recognised that there are younger children in upper primary who would benefit from the challenge of confronting interesting mathematical problems pitched at an appropriate level of difficulty, the primary competition was introduced in 1994.

Please ensure that all teachers involved in the competition see these Guidelines.

2. Three sets, each of three problems, will be available for downloading from the documents website www.wpr3.co.uk/MC/materials, according to the timetable in §11 overleaf. The problems will also be available on the Mathematical Challenge Web pages. Pupils will have a month or more to attempt the problems and schools must send their solutions to be received by the local section organiser by the prescribed date. The local organiser's name and address are given on the first page of the documents website above and in the Contacts section of the Web pages.
3. **A registration fee is normally payable by participating schools. For a primary school the fee is £8 for the first 10 entrants and half this amount for each subsequent batch of 10 entrants or part thereof. A fee form is included with the downloadable pack of materials. For individual participants NOT entering through a school, the fee is £8.**
4. **Solutions must be the unaided efforts of the individual pupil.** No help should be given by teachers, parents or others except to encourage clear explanation of how the problem was solved. It is assumed that pupils, in the normal course of their mathematics class work, will have met and practised a range of suitable strategies for solving problems. **The work for the competition should be undertaken in the pupils' own time. Group working is NOT appropriate in Mathematical Challenge.** Teachers are free to use past problems over a wider range of ages and abilities to suit their classroom practice.
5. Entrants are allowed to use a calculator. No problems set in **Mathematical Challenge** require the use of a computer package (e.g. a spreadsheet) to obtain a correct solution. If computer software is used, then a proper mathematical explanation of its use is essential.
6. **The competition is aimed at the more able mathematics pupils in the upper primary classes. Please be aware that a large number of entries from one school can impose a considerable strain on the organisation and marking of the competition. Teachers should therefore exercise their judgement to avoid the submission of totally inadequate entries. Note that batches of essentially identical entries are not acceptable, and will be returned unmarked.**
7. At the top of page 2 of each problem sheet there is a proforma for the entrant's name, school and year. Photocopies of this should be used when submitting the entries. **Solutions should be on A4 sized paper and stapled in the top left hand corner.** Plastic wallets or other covers should not be used. Entries will not be returned.

8. The marking scheme for each problem is as follows:
- 4 : a completely correct solution, with full explanation.
 - 3 : a solution, with explanation, which is correct apart from minor omissions.
 - 2 : an attempt which contains ideas towards a solution (with explanation) but not necessarily solving the problem.
 - 1 : an indication of an interesting idea or method, but not necessarily one which could lead to a correct solution.

Explanations which show the pupil has gained some insight into the problem will gain credit even if the solution is not correct. **A solution without any explanation will be given no credit, even if the answer is correct.**

9. All Sections use a software package to assist in the processing of the results. **A Record of Entries must be made electronically by the school**, or it will not be possible to process the results.
- Go to the marks website: <https://www.scottishmathschallenge.org.uk/>
 - Choose “School Login” and enter your login details or “Register here” to set up a new account.
 - When you have logged in, go to "Add/Edit Entrants" _ enter the names and school year of each entrant.
 - The marks will eventually appear on the “Marks page”.
 - Messages from the organiser may also appear there on the first page from time to time.

Use a paper copy of the ‘Printable version of details and entrants’ from the marks website as a cover sheet for the school's entries. This contains the school details and the alphabetical list of entrants in each section, as entered on the website. All entries submitted will be marked even if earlier problem sets are missed.

10. There are three classes of award: **Gold**, **Silver** and **Bronze**. Award winners will be selected on the basis of their performance in the solutions submitted. To win an award it will normally be necessary to submit entries to all three sets of problems.

11. The competition timetable for 2018-2019 is as follows:

<i>Set No.</i>	<i>Last date for receipt of questions by schools</i>	<i>Last date for receipt of solutions from pupils</i>
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12. **The problems of earlier sessions form an excellent resource.**

Primary Mathematical Challenges was published by The Scottish Mathematical Council in April 2002. It contains all the problems (with full solutions) which have been offered to primary schools since their initial involvement in 1994-1995 up to the 2000-2001 academic year as well as some problems from the Junior Division. Copies can be obtained from Bill Richardson, Kintail, Longmorn, Elgin, IV30 8RJ, price £5 (inc. p & p.).

In addition, it seems unlikely that any further books will be printed so questions and solutions for 2006-2011 can be accessed at: www.wpr3.co.uk/MC-archive/
Comments on the usefulness of these to wpr3145@gmail.com would be welcome.

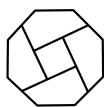
For the secondary competition, the books *Mathematical Challenges III*, *Mathematical Challenges IV*, *Mathematical Challenges V* and *Mathematical Challenges VI* contain all problems (with full solutions) used in the years 1994-1995 to 2005-2006. These are also available at £7.50, £8, £8 and £8 (respectively).

13. If you have any questions to ask or points to make about the competition, please contact the local organiser for your section, whose name and address are given in the Contacts section of the Mathematical Challenge Web pages

www.scot-maths.co.uk

as well as on the materials download menu page

www.wpr3.co.uk/MC/materials



The Scottish Mathematical Council

www.scot-maths.co.uk

MATHEMATICAL CHALLENGE 2018–2019

Entries must be the unaided efforts of individual pupils.

Solutions must include explanations and answers without explanation will be given no credit.

Do not feel that you must hand in answers to all the questions.

CURRENT AND RECENT SPONSORS OF MATHEMATICAL CHALLENGE ARE

*The Edinburgh Mathematical Society, The Maxwell Foundation, Professor L E Fraenkel,
The London Mathematical Society and The Scottish International Education Trust.*

The Scottish Mathematical Council is indebted to the above for their generous support and gratefully acknowledges financial and other assistance from schools, universities and education authorities.

Particular thanks are due to the Universities of Aberdeen, Edinburgh, Glasgow, Heriot Watt, St Andrews, Stirling, Strathclyde and to George Heriot's School, Gryffe High School, Kelvinside Academy and Northfield Academy.

Primary Division: Problems I

P1.1. Grace and Noah play a two-person game in which the winner gains 2 points and the loser loses 1 point.
If Grace won exactly 4 games and Noah had a final score of 6 points, how many games did they play?

P1.2. Early on a very hot day, a greengrocer places 20 kilograms of courgettes on display outside his shop. At that moment, the courgettes are 99% water. It turns out to be the hottest day of the year, and as a result, the courgettes dry out a bit. At the end of the day, the greengrocer has not sold a single courgette, and the courgettes are only 98% water. What weight of courgettes does he have at the end of the day?

P1.3. On a coastline there are three lighthouses.
The first light shines for 3 seconds, then is off for 3 seconds.
The second light shines for 4 seconds, then is off for 4 seconds.
The third light shines for 5 seconds, then is off for 5 seconds.
All three lights have just come on together.

When is the first time that all three lights will be off?

When is the next time that all three lights will come on at the same moment?

END OF PROBLEM SET I

CLOSING DATE FOR RECEIPT OF SOLUTIONS :

28 September 2018

Look out for Problems II in October!

Look on the SMC web site: www.scot-maths.co.uk for information about Mathematical Challenge.



SMC

Mathematical Challenge Problems I

PRIMARY DIVISION

2018-2019

PLEASE USE CAPITALS TO COMPLETE

SURNAME

OTHER NAME(S)
(underline the one
you prefer)

SCHOOL

AGE

YEAR OF STUDY

P

FOR OFFICIAL USE

Marker

Marks

1	2	3	Total

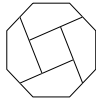
— — — — - **CUT ALONG HERE** — — — —

Please write your solutions on A4 paper and staple the above form to them.

PLEASE WRITE YOUR NAME ON EVERY PAGE.

Send your entry through your school to the organiser of the section.

For further information on the competition, please see the School Materials which have been distributed to schools. A copy of these Materials can be obtained from <http://www.wpr3.co.uk/MC/materials/index.html>. There are separate links for primary and secondary schools. This page also includes a list of authorities in each section and names and addresses of section organisers.



The Scottish Mathematical Council

MATHEMATICAL CHALLENGE (PRIMARY)

Registration Fee 2018–2019

Participating schools are required to pay a registration fee. The fee covers all three sets of problems. The primary school fee is £8 for 1-10 entrants (in Round 1), £4 for the next 10 and so on. A cheque made payable to

SMC Mathematical Challenge

should be attached to this form (but see below) and

returned with the first set of problems.

School details	Name
	Telephone
	Address
	Education Authority (where appropriate)
Contact teacher	Name
	email address (if used)

Payments: we prefer to be paid by cheque but if this is not possible we will accept payment by BACS. Our account is:

SMC MATHEMATICAL CHALLENGE

The details are: 83-06-08 1054 8147.

The reference you provide **must** include the school postcode followed by the school name.

Data Protection

Our policy is attached. By completing and returning this form we will assume that you have read it and accept it.

Data Protection and Privacy Policy for the SMC Maths Challenge

In the following, the data referred to is stored on the computer used for entering pupil and school details and for recording pupil performance. Access to all such information is password protected.

For each **entrant** the data stored is:

- surname, other name, school, year of study, and (after marking) the marks for each question. Permission to record this data is given by completing the tear-off form attached to the solutions.

For each **school** the data stored is:

- school name, address, phone, Primary or Secondary, LEA (Local Education Authority area), whether independent, contact teacher name and e-mail, and other information you want to add (if any).

Teachers have access, by logging in with their username and password, only to the data for their own school and its entrants, and are responsible for communicating results and awards to their entrants.

Section Organisers have access, by logging in with their username and password, only to data about schools and entrants within their own Section.

Designated members of the Maths Challenge National Committee have access, by logging in with their username and password, to all the data in the database to facilitate running the challenge.

No data will be kept for more than 4 years. This would allow for production of comparative reports over 3 years for the Scottish Mathematical Council Journal.

The data is stored on a secure server.

Contact: *scottishmathschallenge@gmail.com*

Last update: 23/8/18

Using the marks website

A Record of Entrants must be made on the marks website by the school or it will not be possible for the section organiser to later add the marks for each entrant.

Go to the website:

<https://www.scottishmathschallenge.org.uk/>

If you have used the website for your school in a previous year and can remember the username and password log in as usual.

Otherwise choose

"Register here"

which enables you to enter your details and create a password. Your username will be your email address so please make sure that you enter this correctly. The system will send you an email with an activation link: click on this link to verify your email address and then log in.

You will need your username and password each time you log in.

Once logged in click on the link

"Edit School Details"

Check that all the contact details are correct, making changes as necessary. In particular, make sure that you select primary or secondary and the relevant local authority whenever you make changes.

Later, when you have a pile of entries, or a list of entrants, log in again and go to

"Add/Edit Entrants"

and enter

- the division (only for secondary pupils),
- the names, and
- the school year of each entrant.

When all your entrants have been added, to get a printout to send with your entries go to

"Printable version of details and entrants"

When the marks for each round are released, to view the marks for your school go to

"Marks page"

On the main page after you log in you may, from time to time, see messages from the section organisers.

NOTE: If you experience difficulties with the website please contact either
your section organiser or
Helen Martin h.martin@abdn.ac.uk

SMC Login to your account

USERNAME

PASSWORD

LOGIN

Don't have an account? [Register here](#)

Forgotten password? [Click here](#)

Scottish Maths Challenge: School Main Page

Logged in as h.martin@abdn.ac.uk at .

Secondary Section

Address:

LEA: null LEA

[Edit School Details](#)

0 entrants so far.

[Add/Edit Entrants](#)

[Printable version of details and entrants](#)

[Marks Page](#)

[Marks Archive](#)

[Change Password](#)

[Change Username](#)

[Logout](#)

No messages.

If you have any problems with this site please contact the regional organiser.

[Back to school main page](#)

Please enter or edit your school details

SCHOOL NAME

SCHOOL ADDRESS

POSTCODE

PHONE

Primary Secondary

Local Authority:

Aberdeen

* Independent Schools: select the Local Authority in which you are located from the drop down list above and check this box.

COMMENT

UPDATE DATA

Entrant List:

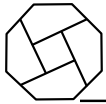
Division	First Name	Surname	Year	Action
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Add New:

Primary Add Entrant

[Back to school main page.](#)

If you have any problems with this site please contact the regional organiser.



The Scottish Mathematical Council

www.scot-maths.co.uk

MATHEMATICAL CHALLENGE

2018–2019



On a coastline there are three lighthouses. The first light shines for 3 seconds, then is off for 3 seconds.

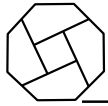
The second light shines for 4 seconds, then is off for 4 seconds.

The third light shines for 5 seconds, then is off for 5 seconds.

All three lights have just come on together. When is the first time that all three lights will be off?

When is the next time that all three lights will come on at the same moment?

See your teacher for details of the competition problems.



The Scottish Mathematical Council

www.scot-maths.co.uk

MATHEMATICAL CHALLENGE

2017–2018

Did you solve it?

Jonas travels 26 miles in 3 hours, partly on foot and partly by bike. He walks at 4 mph and cycles at 12mph.

For what length of time does Jonas walk?

How far does he cycle?

Solution

If Jonas walked for 3 hours, he would cover 12 miles. So, he need to make up 14 miles by cycling. His extra speed is 8mph and at that speed he would need to travel $1\frac{3}{4}$ hours to cover 14 miles.

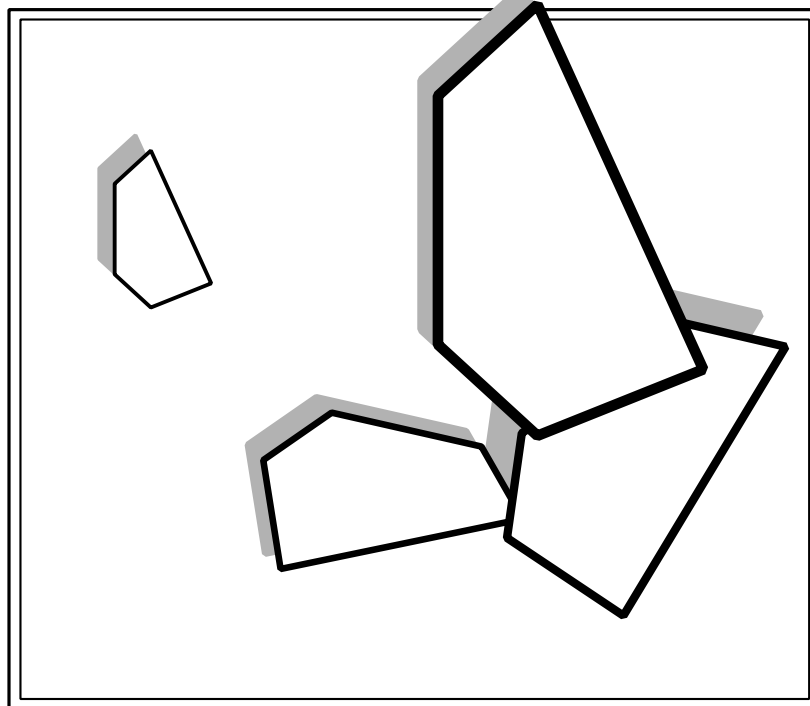
So he must walk for $1\frac{1}{4}$ hours and cycle for $1\frac{3}{4}$ hours.

Check: $1\frac{1}{4} \times 4 = 5$; $1\frac{3}{4} \times 12 = 21$ and $5 + 21 = 26$ as required.

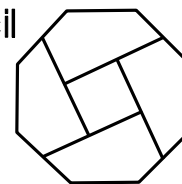
There is a second solution available on the Maths Challenge website:

See your teacher for details of the competition problems.

Mathematical Challenges VI



The Scottish Mathematical Council



Mathematical Challenges VI	2003-2006	£8.00 ×	_____	_____
Mathematical Challenges V	2000-2003	£8.00 ×	_____	_____
Mathematical Challenges IV	1997-2000	£8.00 ×	_____	_____
Mathematical Challenges III	1994-1997	£7.50 ×	_____	_____
Primary Mathematical Challenges	up to 2001	£5.00 ×	_____	_____
		Total	_____	_____

Copies of any of these can be obtained from

Bill Richardson, Kintail, Longmorn, Elgin IV30 8RJ

Cheques with order are preferred.

Cheques should be made payable to 'SMC Mathematical Challenge'.

email enquiries:- wpr3145@gmail.com

Your name and address:
