

**Scottish Survey of Literacy and Numeracy (SSLN)  
2015**

**Numeracy**

**Survey Design Document**

## CONTENTS

<b>1. Policy Framework</b>	<b>3</b>
1.1 Survey aims and objectives	3
1.2 Parameters	4
1.3 Framework: Curriculum for Excellence (CfE)	6
1.4 Modes of administration	7
1.5 Other survey comparisons	7
1.6 Reporting	8
<b>2. Technical Design</b>	<b>9</b>
2.1 Sampling strategies	9
2.1.1 Pupils (written booklets, practical assessments and pupil questionnaire)	
2.1.2 Teachers (teacher questionnaire)	10
2.2 Survey components	11
2.2.1 Component 1: Written booklets	11
2.2.2 Component 2: Practical assessments	14
2.2.3 Component 3: Pupil questionnaires	15
2.2.4 Component 4: Teacher questionnaires	15
2.3 Material distribution strategies	16
2.4 Coding and marking strategies	17
2.5 Analysis methodology	18

# 1. Policy Framework

## 1.1 Survey aims and objectives

<b>Title</b>	SSLN 2015 - Numeracy								
<b>Timescale</b>	May 2015								
<b>Aim</b>	<p>The SSLN provides information about pupil achievement, measuring national standards of attainment in numeracy and literacy in alternate years which local authorities, schools and Ministers can use for purposes of quality assurance, self evaluation and improvement.</p> <p>The principal aim of the 2015 survey is to provide national estimates of numeracy achievement at P4, P7 and S2 with reference to the relevant Curriculum for Excellence (CfE) level for each stage, and enable comparisons to be made with SSLN 2011 and SSLN 2013 (numeracy) results. An important additional purpose is to inform improvements in learning and teaching at classroom level.</p> <p>The SSLN 2015 (numeracy) results will be published as National Statistics.</p>								
<b>Reporting level</b>	Reporting will be at national level, with achievement breakdowns by gender, deprivation and CfE curriculum organiser.								
<b>Margin of error</b>	The survey should be designed with the aim of having a maximum margin of error of +/- 2 percentage points for main national estimates.								
<b>Stages and levels to be assessed</b>	<p>The following CfE levels are to be assessed for the following stages:</p> <table border="1" data-bbox="480 1462 965 1617"> <thead> <tr> <th>Stage</th> <th>CfE Level</th> </tr> </thead> <tbody> <tr> <td>P4</td> <td>First</td> </tr> <tr> <td>P7</td> <td>Second</td> </tr> <tr> <td>S2</td> <td>Third</td> </tr> </tbody> </table>	Stage	CfE Level	P4	First	P7	Second	S2	Third
Stage	CfE Level								
P4	First								
P7	Second								
S2	Third								
<b>Objectives</b>	<p>The SSLN 2015 (numeracy) has the following primary objectives (prioritised):</p> <ol style="list-style-type: none"> <li>1. to monitor and report nationally on standards of achievement in numeracy at the P4, P7 and S2 stages, overall and broken down by gender and deprivation, and enable monitoring of numeracy achievement over time.</li> <li>2. to identify areas of numeracy strengths and weaknesses among pupils in Scotland to help inform policy initiatives and learning and teaching practices in the classroom.</li> </ol>								

	<p>3. to gather information and report nationally on pupils' and teachers' experiences of learning and teaching numeracy, along with their views about this experience.</p> <p>4. to trial new SSLN assessment materials.</p>
--	---

## 1.2 Parameters

<b>Scale</b>	<ul style="list-style-type: none"> <li>• All schools in Scotland, except special schools, will be invited to take part in the survey. Primary schools with only one pupil at <b>both</b> primary stages (P4 and P7) and secondary schools that have fewer than 5 pupils at S2 are not obliged to participate in the survey.</li> <li>• The SSLN Team will work with local authorities to ensure the survey is undertaken in the most efficient way and include consideration of manageability for schools and pupils where possible without jeopardising the quality of the survey.</li> <li>• Booklets for the younger stages should be designed to take less time for a pupil to complete than booklets for the older stages (approx 40 mins at P4, 60 mins at P7 and S2).</li> <li>• The maximum that any individual pupil will be asked to undertake is the equivalent of two written booklets, a questionnaire (approx 15 - 30 mins), and a practical assessment (approx 15 mins).</li> </ul>
<b>Equality and accessibility</b>	<ul style="list-style-type: none"> <li>• The survey design will ensure that the SSLN is accessible to as many people as possible, both in participation and dissemination.</li> </ul>
<b>Timing</b>	<ul style="list-style-type: none"> <li>• The survey will be conducted in schools between 5<sup>th</sup> May 2015 and 5<sup>th</sup> June 2015.</li> </ul>
<b>Conduct</b>	<ul style="list-style-type: none"> <li>• There are three pupil survey components to be administered by teachers within the schools: <ol style="list-style-type: none"> <li>1. written booklets</li> <li>2. practical assessments</li> <li>3. pupil questionnaires</li> </ol> </li> <li>• The fourth element is the teacher questionnaire.</li> </ul>
<b>Gaelic</b>	<ul style="list-style-type: none"> <li>• Gaelic language pupils are treated in exactly the same way as English language pupils during the selection of the sample. No effort is made to deliberately include or exclude Gaelic language pupils. Survey components (booklets, questionnaires etc.) will be translated as appropriate; provided upon request and marked separately by Gaelic speakers. The</li> </ul>

	<p>results from Gaelic pupils will be included within the national level results. There will be no separate reporting of Gaelic results.</p>
<b>Overlap with other activity</b>	<ul style="list-style-type: none"> <li>• The survey will take account of developments with the numeracy units within the National Qualifications for Mathematics.</li> <li>• The survey will, where relevant, complement evidence gathered through Scotland’s participation in PISA (Programme for International Student Assessment).</li> </ul>
<b>Data handling issues</b>	<ul style="list-style-type: none"> <li>• Gaining consent - all parents/carers of pupils selected to participate in the SSLN will be sent a letter informing them that their child has been selected and that the data will not be released in any form that would make the identification of their child possible. Parents/carers may remove their child from the survey if they wish. If they do not do so, they will have consented by default to the data release conditions described in the letter.</li> <li>• Data Protection Act (DPA) – to comply with the DPA, pupil assessment data and pupil and teacher questionnaire responses gathered during the survey must be treated anonymously. The Scottish Candidate Number may be used to anonymously link SSLN data with other data collections within Scottish Government (SG) Education Analytical Services (EAS).</li> <li>• SG Policy Decision – no data will be released that enables individual schools to be identified.</li> <li>• Freedom of Information (Scotland) Act - any analysis or data not protected by the DPA or additional special FOI exemptions may be requested. Individual level data collected for statistical purposes are exempt from such requests.</li> <li>• Decision whether to comply with data requests – the EAS SSLN Team will only comply with a specific request if it can be done within the conditions detailed above and in accordance with relevant Scottish Government release of data protocols. Consideration will also be given to costs of such requests and whether any charges should be made.</li> </ul> <p>The Scottish Government strives to encourage the use of the extensive SSLN datasets for additional analysis and research by Local Authorities, academics or other bona fide third parties. Any such requests will be handled in line with the above restrictions.</p>

### 1.3 Framework: Curriculum for Excellence (CfE)

<p><b>Structure</b></p>	<p>The CfE framework provides detailed information on the numeracy experiences and outcomes from Early Years provision through to S3. The CfE experiences and outcomes are set out in lines of development which describe progress in learning. They are designed to provide a range of rich, creative and engaging learning experiences for pupils at each curriculum level and (for numeracy) are grouped into eight curriculum organisers:</p> <ul style="list-style-type: none"> <li>○ estimation and rounding</li> <li>○ number and number processes</li> <li>○ fractions, decimal fractions and percentages</li> <li>○ money</li> <li>○ time</li> <li>○ measure</li> <li>○ data and analysis</li> <li>○ chance and uncertainty</li> </ul> <p>Implicit within these outcomes are a range of concepts and skills which pupils need to develop if they are to be successful learners of numeracy. These skills include both ‘basic skills’ such as being able to add, subtract, multiply and divide and higher order skills, for example involving reasoning and the application of numeracy in both familiar and novel situations.</p>
<p><b>The framework for assessment</b></p>	<p><a href="#">‘Building the Curriculum 5: A Framework for Assessment’</a> provides guidance on the assessment approaches for CfE. Assessing achievement within and through CfE levels takes account of the key aspects of effective learning and progress. In order to progress within a level, learners should be able to demonstrate confidence, proficiency and security across the three aspects of assessment (breadth, challenge and application). This survey therefore should assess performance in numeracy in line with the principles of assessment for CfE, by showing that pupils:</p> <ul style="list-style-type: none"> <li>○ have achieved a <b>breadth</b> of learning across the numeracy experiences and outcomes;</li> <li>○ can respond to the level of <b>challenge</b> set out in the experiences and outcomes, and are moving forward to more challenging learning in some aspects;</li> <li>○ can <b>apply</b> what they have learned in new and unfamiliar situations.</li> </ul>
<p><b>Survey components</b></p>	<p>In order to achieve the aims and objectives for this SSLN the following survey components will be used:</p> <ol style="list-style-type: none"> <li>1. Written booklets (2 per pupil) – containing atomistic (short task) items and multi-item (extended) tasks (incorporating a</li> </ol>

	<p>source datasheet and a series of questions).</p> <p>2. Practical assessments (1 per pupil) – will assess aspects of the numeracy experiences &amp; outcomes that are best measured in a practical way.</p> <p>Survey components 1 and 2 will be used in combination to report numeracy attainment at a national level by stage, gender, deprivation category and curriculum organiser.</p> <p>3. Pupil Questionnaire – will be used to report nationally on pupils’ experiences of numeracy learning.</p> <p>4. Teacher Questionnaire – will be used to report nationally on teachers’ experiences of teaching numeracy.</p> <p>The survey will also include a pre-test of literacy materials for future surveys.</p>
--	--

#### 1.4 Modes of administration

<b>Written booklets</b>	Pencil and paper booklets will be used for the assessment of the numeracy experiences and outcomes. Booklets designed to assess at a single level will be used (P4=1 <sup>st</sup> level, P7=2 <sup>nd</sup> level, S2=3 <sup>rd</sup> level).
<b>Practical assessments</b>	Single level practical assessments will be in the form of a one-to-one pupil and teacher interaction, covering a subset of numeracy experiences and outcomes.
<b>Pupil questionnaires</b>	Pupils will be invited to complete an online questionnaire about their numeracy learning experiences and opinions.
<b>Teacher questionnaires</b>	Teachers will be invited to complete an online questionnaire about their numeracy teaching experiences and opinions.
<b>Literacy pre-test</b>	The literacy pre-test assessments will reflect the design of future literacy surveys.

#### 1.5 Other survey comparisons

<b>International surveys</b>	Overall results from PISA may be compared with the SSLN by considering high level findings and trends. Although PISA does not align directly with CfE, the SSLN should allow broad comparison with this international evidence to help establish the importance of numeracy within CfE.
------------------------------	---

## 1.6 Reporting

<b>Nature of reports</b>	The SSLN results will be disseminated via the following reports: <ol style="list-style-type: none"><li>1. Headline report with accompanying survey design document and supplementary data tables.</li><li>2. Professional Learning Resources which are based on more detailed analysis of national data to support and inform improvements in learning and teaching practice in the classroom.</li></ol>
<b>Timescale</b>	The SSLN reports will be published during the following periods: <ol style="list-style-type: none"><li>1. Headline Report – May 2016.</li><li>2. Professional Learning Resources – further numeracy materials to be published by Education Scotland.</li></ol>



## 2. Technical Design

### 2.1 Sampling strategies

#### 2.1.1 Pupils (written booklets, practical assessments and pupil questionnaire)

<b>Sampling frame</b>	The sampling frame is made up of all P4, P7 and S2 pupils from all schools in Scotland (including Gaelic and Independent schools) with the exceptions of those at special schools and a small number of schools withdrawn from the survey by their local authority.
<b>Sample size</b>	<p>The sample size is based on a fixed number of pupils per participating school, 2 per primary school and 12 per secondary school.</p> <p>With approximately 2,100 primary schools and 410 secondary schools being asked to participate, the sample size per stage will be approximately:</p> <ul style="list-style-type: none"> <li>• P4 = 4,200 pupils</li> <li>• P7 = 4,200 pupils</li> <li>• S2 = 4,920 pupils.</li> </ul>
<b>Sampling strategy</b>	<p>All schools will be invited to take part in the survey and the pupils from participating schools will be selected using a disproportionate stratified random sample (fixed number per school).</p> <ul style="list-style-type: none"> <li>• The number of pupils to be sampled from each participating school is as follows: <ul style="list-style-type: none"> <li>P4 = 2 pupils per school</li> <li>P7 = 2 pupils per school</li> <li>S2 = 12 pupils per school</li> </ul> </li> <li>• Primary schools must have a minimum of 2 pupils at either of the relevant stages (i.e. P4 or P7) to participate, otherwise they are not obliged to take part.</li> <li>• At S2, where there are not enough pupils in a school to meet the requirements (i.e. 12 pupils), all available pupils will be selected, subject to a minimum of 5. If there are fewer than 5 pupils at S2 then the school is not obliged to take part.</li> <li>• Within strata (schools) simple random sampling will be used with a 50/50 gender split in the pupil sample from each school (if this is not possible, the closest numbers of pupils to a 50/50 split should be used). Pupils with no recorded gender on the Pupil Census will be removed from the sampling frame.</li> </ul>

	<ul style="list-style-type: none"> <li>• A retrospective sample check will be run to ensure that it reasonably reflects the population’s deprivation distribution. The SSLN uses three deprivation categories: <ul style="list-style-type: none"> <li>- pupils living in areas with most deprivation (top 30%)</li> <li>- pupils living in areas with least deprivation (bottom 30%)</li> <li>- the remaining ‘middle’ 40% of pupils.</li> </ul> </li> </ul> <p>The deprivation categories are derived from pupils’ home postcodes, or by school postcodes where home postcodes are not available, and the latest available Scottish Index of Multiple Deprivation (SIMD) data.</p>
--	---

### 2.1.2 Teachers (teacher questionnaire)

<b>Questionnaire versions</b>	<p>There are three versions of the teacher questionnaire:</p> <ol style="list-style-type: none"> <li>1. primary teachers</li> <li>2. secondary Mathematics teachers</li> <li>3. secondary non-Mathematics teachers.</li> </ol>
<b>Sampling frame</b>	<p>For primary stages:</p> <ul style="list-style-type: none"> <li>• all P4 teachers from half of the participating schools will be invited to complete a questionnaire</li> <li>• all P7 teachers from the remaining half of schools will be invited to complete a questionnaire.</li> </ul> <p>In participating secondary schools the following teachers will be asked to complete a questionnaire:</p> <ul style="list-style-type: none"> <li>• two S2 Mathematics teachers (selected at random)</li> <li>• two teachers from each of the following curriculum groups (selected at random): <ul style="list-style-type: none"> <li>○ Expressive Arts and Languages;</li> <li>○ Social Studies, Religious &amp; Moral Education and Health &amp; Wellbeing;</li> <li>○ Sciences and Technology;</li> <li>○ Support for Learning(SfL).</li> </ul> </li> </ul>
<b>Sample Size</b>	<p>There will be approximately 2,100 primary schools and 410 secondary schools participating.</p> <p>Approximate sample sizes will be:</p> <ul style="list-style-type: none"> <li>• 3,000 primary teachers</li> <li>• 820 secondary Mathematics teachers (subject to confirmation from participating schools on the number of S2 Mathematics teachers within their school)</li> <li>• 3,280 secondary non-Mathematics teachers.</li> </ul>

## 2.2 Survey components

### 2.2.1 Component 1: Written booklets

<b>Booklet allocation</b>	Each participating pupil will be allocated two written booklets using a cartwheel/spiral allocation design. This allows each booklet to be distributed equally amongst the total pupil sample at each survey stage in a way that ensures an overlap between groups of pupils attempting each booklet.
<b>Types</b>	<p>Each written booklet will comprise three sections:</p> <ul style="list-style-type: none"><li>- Sections A &amp; C: atomistic (short task) items</li><li>- Section B: multi-item (extended) task.</li></ul> <p>Each booklet will be produced in two versions – A and B. Version B of each booklet will swap the first and last sections so that the atomistic items are asked in a different order.</p> <p>Each multi-item task will be based on a source datasheet with a number of associated questions.</p> <p>Each booklet will include a variety of items and, across the whole survey rather than necessarily individually, will allow pupils to demonstrate breadth of learning, the ability to answer challenging questions, and the opportunity to apply their learning in new and different contexts.</p>
<b>Sources</b>	<p>The tasks and items used to assess numeracy are a mixture of:</p> <ul style="list-style-type: none"><li>• newly developed, pre-tested atomistic items</li><li>• newly developed, pre-tested multi-item tasks</li><li>• existing items which were used in the 2011 and 2013 surveys.</li></ul>
<b>Number of booklets</b>	Total = 60 booklets (each in two versions differing by question presentation order). This equates to 20 booklets per stage.

<p><b>Min. number of tasks and items</b></p>	<p><b>Atomistic tasks</b></p> <p><u>P4</u> There are 16 atomistic items per booklet. Hence, 20 booklets (same items will appear in each version, A &amp; B, of each booklet) = 320 atomistic items.</p> <p><u>P7 and S2</u> There are 20 atomistic items per booklet. Hence, 40 booklets (same items will appear in each version, A &amp; B, of each booklet) = 800 atomistic items, 400 per stage (or CfE level).</p> <p><b>Multi-item tasks</b></p> <p>There is one multi-item task per booklet. Hence, 60 booklets = 60 multi-item tasks in total, 20 per stage (or CfE level). The multi-item tasks at P4 will have 6 items, with all other multi-item tasks (i.e. P7 and S2) containing 8 items.</p>
<p><b>Min. pupils per task</b></p>	<p>A minimum of 300 pupils are required to complete each task in order to carry out robust task level analysis. Aim to target 400 pupils per task to allow for attrition.</p>
<p><b>Item/task sampling</b></p>	<p>In order to robustly monitor change over time, a representative minimum of 75 per cent of both atomistic items and multi-item tasks will remain constant across surveys. The remaining items will be items that were pre-tested by pupils in previous surveys and that aim to maintain the distribution described below as closely as possible.</p>

**Item/task distribution**

**Atomistic Items**

The booklets within each CfE level will comprise items which reflect a spread of CfE numeracy organisers and degrees of challenge. Across the survey, the booklets must contain a spread of item formats (e.g. open response, multiple choice, mixed, etc.) and include a minimum of 70 per cent contextual items.

**CfE numeracy organisers:**

The distribution of items across the survey by organiser, stage and level should approximately follow the table below. These figures represent the proportion of items to be used across the whole survey at each stage, including atomistic items, multi-item tasks and practical assessment items.

Organiser	Stage (CfE Level)			
	P4 (1 <sup>st</sup> )	P7 (2 <sup>nd</sup> )	S2 (2 <sup>nd</sup> ) (3 <sup>rd</sup> )	
Estimation & Rounding	6%	5%	-	5%
Number Processes	28%	20%	18%	10%
Fractions, decimal fractions and percentages	13%	15%	5%	10%
Money	9%	15%	-	12%
Time	13%	15%	5%	7%
Measure	13%	15%	6%	6%
Data and Analysis	13%	10%	-	10%
Chance and Uncertainty	6%	5%	-	5%

Note that, since many applications of numeracy at 3<sup>rd</sup> level are based purely on 2<sup>nd</sup> level numeracy skills, items selected for the S2 booklets will be from both the 2<sup>nd</sup> level and 3<sup>rd</sup> level as shown in the table.

**Level of challenge:**

The survey items are classified into three categories of 'level of challenge' – low, medium and high. The survey should reflect an equal spread of items across all three levels of challenge – i.e. one third low challenge, one third medium challenge, and one third high challenge, as far as possible.

### 2.2.2 Component 2: Practical assessments

<b>Practical allocation</b>	Each participating pupil will be allocated one practical assessment. The practical assessments will be distributed equally amongst the total pupil sample at each survey stage to ensure a representative group of pupils attempt each assessment.
<b>Types</b>	All practical assessments will be in the format of a one-to-one interview with either the classroom teacher or another member of teaching staff.
<b>Sources</b>	The practical assessments are all newly developed and pre-tested for the SSLN.
<b>Task sampling</b>	The bank of practical assessments was developed by the Scottish Qualifications Authority (SQA) for the SSLN. For this survey, all practical assessment tasks from the 2013 survey will be re-used (80% of the tasks from the 2011 survey).
<b>Task distribution</b>	<p>Each practical assessment will contain interactive tasks consisting of:</p> <ul style="list-style-type: none"> <li>• four mental maths questions (one for each mental maths operator - addition, subtraction, multiplication and division)*</li> <li>• two other tasks (estimation, money, measure or chance &amp; uncertainty) with four associated questions.</li> </ul> <p>Each practical assessment will be worth 12 marks in total.</p> <p><u>Notes</u> * Two mental maths questions will be presented to the pupil orally, with pupils not allowed to write anything, and two will be written down to allow pupils to read the questions.</p>
<b>Min. number of assessments</b>	10 per stage.
<b>Min. pupils per assessment</b>	A minimum of 300 pupils are required to complete each assessment in order to carry out robust task level analysis. The survey aims to achieve 400 pupils per assessment to allow for attrition.

### 2.2.3 Component 3: Pupil questionnaires

<b>Pupil allocation</b>	Each pupil participating in the numeracy assessment will be invited to complete an online pupil questionnaire.
<b>Types</b>	There will be two versions of the pupil questionnaire – one for P4 pupils and one for the P7 and S2 pupils – to ensure language suitability for the stages concerned.
<b>Format</b>	The questionnaire consists of five sections with the purpose of collecting information about: <ol style="list-style-type: none"> <li>1. the pupil's learning in school</li> <li>2. what the pupil thinks about their learning</li> <li>3. how confident the pupil feels about learning</li> <li>4. what the pupil thinks about numeracy</li> <li>5. school and home</li> </ol>

### 2.2.4 Component 4: Teacher questionnaires

<b>Teacher allocation</b>	All sampled teachers are invited to complete an online teacher questionnaire.
<b>Types</b>	There are three versions of the teacher questionnaire: <ol style="list-style-type: none"> <li>1. primary teachers</li> <li>2. secondary Mathematics teachers</li> <li>3. secondary non-Mathematics teachers</li> </ol>
<b>Format</b>	The questionnaire consists of four sections with the purpose of finding out about: <ol style="list-style-type: none"> <li>1. the teacher and their teaching (including confidence in teaching different aspects of numeracy)</li> <li>2. pupils' learning and assessment</li> <li>3. pupils' activities in lessons</li> <li>4. use of resources.</li> </ol>

### 2.2.5 Component 5: Literacy pre-test

<b>Pre-test Allocation</b>	One P4 pupil at half of primary schools, one P7 pupil at remaining half of primary schools and two S2 pupils at all secondary schools are sampled to pre-test materials for future literacy surveys.
----------------------------	--

## 2.3 Material distribution strategies

<p><b>Assessment materials</b></p>	<p><b>Written booklets</b> are randomly allocated to pupils at the appropriate stage using a cartwheel/spiral design.</p> <p>Across schools, within the pupil stage as a whole, all booklets, and all versions of every booklet, should be allocated to equal, or nearly equal, numbers of pupils, with as balanced a gender distribution as possible. Where pupils are asked to complete two or more booklets, the allocation of booklets should be balanced across test sessions (i.e. used as a first booklet as often as a second booklet).</p> <p>A <b>practical assessment</b> will be ‘fixed’ to every second written booklet, and will therefore be allocated at random with the written booklet allocation.</p> <p>This method ensures that there are no clusters of booklets within any particular school, thus minimising the possibility of school effects.</p> <p>The proposed cartwheel allocation with 20 booklets per stage (2 versions, A &amp; B) would follow the design below:</p> <table border="1" data-bbox="448 1070 1398 1930"> <thead> <tr> <th>Pupil</th> <th>Written Booklet 1</th> <th>Written Booklet 2</th> <th>Practical assessment</th> <th>Pupil</th> <th></th> </tr> </thead> <tbody> <tr><td>1</td><td>1A</td><td>2B</td><td>P1B</td><td>21</td><td rowspan="20">same as for pupils 1-20 but with A&amp;B reversed</td></tr> <tr><td>2</td><td>2B</td><td>3A</td><td>P1A</td><td>22</td></tr> <tr><td>3</td><td>3A</td><td>4B</td><td>P2A</td><td>23</td></tr> <tr><td>4</td><td>4B</td><td>5A</td><td>P2B</td><td>24</td></tr> <tr><td>5</td><td>5A</td><td>6B</td><td>P3B</td><td>25</td></tr> <tr><td>6</td><td>6B</td><td>7A</td><td>P3A</td><td>26</td></tr> <tr><td>7</td><td>7A</td><td>8B</td><td>P4A</td><td>27</td></tr> <tr><td>8</td><td>8B</td><td>9A</td><td>P4B</td><td>28</td></tr> <tr><td>9</td><td>9A</td><td>10B</td><td>P5B</td><td>29</td></tr> <tr><td>10</td><td>10B</td><td>11A</td><td>P5A</td><td>30</td></tr> <tr><td>11</td><td>11A</td><td>12B</td><td>P6A</td><td>31</td></tr> <tr><td>12</td><td>12B</td><td>13A</td><td>P6B</td><td>32</td></tr> <tr><td>13</td><td>13A</td><td>14B</td><td>P7B</td><td>33</td></tr> <tr><td>14</td><td>14B</td><td>15A</td><td>P7A</td><td>34</td></tr> <tr><td>15</td><td>15A</td><td>16B</td><td>P8A</td><td>35</td></tr> <tr><td>16</td><td>16B</td><td>17A</td><td>P8B</td><td>36</td></tr> <tr><td>17</td><td>17A</td><td>18B</td><td>P9B</td><td>37</td></tr> <tr><td>18</td><td>18B</td><td>19A</td><td>P9A</td><td>38</td></tr> <tr><td>19</td><td>19A</td><td>20B</td><td>P10A</td><td>39</td></tr> <tr><td>20</td><td>20B</td><td>1A</td><td>P10B</td><td>40</td></tr> </tbody> </table>					Pupil	Written Booklet 1	Written Booklet 2	Practical assessment	Pupil		1	1A	2B	P1B	21	same as for pupils 1-20 but with A&B reversed	2	2B	3A	P1A	22	3	3A	4B	P2A	23	4	4B	5A	P2B	24	5	5A	6B	P3B	25	6	6B	7A	P3A	26	7	7A	8B	P4A	27	8	8B	9A	P4B	28	9	9A	10B	P5B	29	10	10B	11A	P5A	30	11	11A	12B	P6A	31	12	12B	13A	P6B	32	13	13A	14B	P7B	33	14	14B	15A	P7A	34	15	15A	16B	P8A	35	16	16B	17A	P8B	36	17	17A	18B	P9B	37	18	18B	19A	P9A	38	19	19A	20B	P10A	39	20	20B	1A	P10B	40
Pupil	Written Booklet 1	Written Booklet 2	Practical assessment	Pupil																																																																																																												
1	1A	2B	P1B	21	same as for pupils 1-20 but with A&B reversed																																																																																																											
2	2B	3A	P1A	22																																																																																																												
3	3A	4B	P2A	23																																																																																																												
4	4B	5A	P2B	24																																																																																																												
5	5A	6B	P3B	25																																																																																																												
6	6B	7A	P3A	26																																																																																																												
7	7A	8B	P4A	27																																																																																																												
8	8B	9A	P4B	28																																																																																																												
9	9A	10B	P5B	29																																																																																																												
10	10B	11A	P5A	30																																																																																																												
11	11A	12B	P6A	31																																																																																																												
12	12B	13A	P6B	32																																																																																																												
13	13A	14B	P7B	33																																																																																																												
14	14B	15A	P7A	34																																																																																																												
15	15A	16B	P8A	35																																																																																																												
16	16B	17A	P8B	36																																																																																																												
17	17A	18B	P9B	37																																																																																																												
18	18B	19A	P9A	38																																																																																																												
19	19A	20B	P10A	39																																																																																																												
20	20B	1A	P10B	40																																																																																																												



<b>Pupil questionnaires</b>	Pupil questionnaire login details will be sent to all participating schools. Teachers are asked to arrange for the pupils to complete the questionnaires online at a convenient time under their supervision.
<b>Teacher questionnaires</b>	Teacher questionnaire login details will be sent to all participating schools.

## 2.4 Coding and marking strategies

<b>Written booklets</b>	<p><u>Coding and data capture</u></p> <p>Coding options are developed from the marking schemes created by task developers as amended during the task review process. <b>These coding options are final and will only be changed for subsequent surveys where agreed to be essential. This is to allow accurate attainment monitoring over time.</b></p> <p>A web-based tool for creating survey forms is used to collect pupil responses and analyse results. 120 different survey forms, one for each booklet (and version), are created. Each question is an item in the booklet and each response option is a coding option, including 'blank' and 'other'.</p> <p><u>Marking</u></p> <p>All the assessment items are dichotomously scored. In the majority of cases there is a single correct answer meriting a mark. In other cases the mark could be gained from any one of a number of alternative types of response, or from some combination of responses.</p> <p>Once all the item level responses are processed in this way, test scores are produced for pupils who have completed all their allocated booklets.</p>
<b>Practical assessments</b>	There will be 30 different practical assessments (10 per stage) and 60 different survey forms. Coding, data capture and marking will be processed in the same way as for the written booklets (see above).

## 2.5 Analysis methodology

<p><b>Written booklets &amp; practical assessments</b></p>	<p>The data from the written booklets and practical assessments will be combined and the overall results will be used to report numeracy achievement.</p> <p><u>Pupil level analysis</u> The final validated and marked test data will be summed up to pupil level, so each pupil will have a percentage test score (the total score over all assessments they have completed), then aggregated to the national level.</p> <p><u>Mean score analysis</u> The final validated and marked test data can be analysed at item level and aggregated.</p> <p>Analysis will be presented by various factors including:</p> <ul style="list-style-type: none"> <li>• stage (CfE level)</li> <li>• gender</li> <li>• deprivation category</li> <li>• numeracy organiser</li> </ul> <p>Jackknife standard error estimates will be used to calculate the size of errors in order to show levels of precision in the analyses.</p> <p>The following final percentage scores will be used to assign pupils to categories. The exact category thresholds have yet to be decided but will approximately be:</p> <table border="1" data-bbox="448 1263 1406 1601"> <thead> <tr> <th></th> <th>P4</th> <th>P7</th> <th>S2</th> </tr> </thead> <tbody> <tr> <td>Not yet working within the level</td> <td>&lt; 9%</td> <td>&lt; 19%</td> <td>&lt; 34%</td> </tr> <tr> <td>Working within the level</td> <td>9% - 50%</td> <td>19% - 50%</td> <td>34% - 50%</td> </tr> <tr> <td>Performing well at the level</td> <td>50% - 75%</td> <td>50% - 75%</td> <td>50% - 75%</td> </tr> <tr> <td>Performing very well at the level</td> <td>&gt; 75%</td> <td>&gt; 75%</td> <td>&gt; 75%</td> </tr> </tbody> </table> <p>Other possible pupil level analysis includes:</p> <ul style="list-style-type: none"> <li>• the range of performance between pupils.</li> <li>• the links between the characteristics identified from the pupil questionnaire and the pupil's attainment levels.</li> <li>• the achievement profile in relation to the different organisers.</li> <li>• the characteristics of those who are "low achievers" and "high achievers".</li> </ul>		P4	P7	S2	Not yet working within the level	< 9%	< 19%	< 34%	Working within the level	9% - 50%	19% - 50%	34% - 50%	Performing well at the level	50% - 75%	50% - 75%	50% - 75%	Performing very well at the level	> 75%	> 75%	> 75%
	P4	P7	S2																		
Not yet working within the level	< 9%	< 19%	< 34%																		
Working within the level	9% - 50%	19% - 50%	34% - 50%																		
Performing well at the level	50% - 75%	50% - 75%	50% - 75%																		
Performing very well at the level	> 75%	> 75%	> 75%																		

<b>Pupil questionnaires</b>	Pupil questionnaire results will be validated, analysed and reported at a national level.
<b>Teacher questionnaires</b>	Teacher questionnaire results will be validated, analysed and reported at a national level.
<b>Data weighting</b>	<p>Pupil and teacher response data for the survey will be weighted separately.</p> <p><u>Pupil data</u> Population estimates will be calculated using data weighting. This will address as much as possible imbalances in the national sample at each stage.</p> <p>Individual weights will be applied to pupil data to account for imbalances between the survey sample and the population as a whole with regard to:</p> <ul style="list-style-type: none"> <li>• school size – this will address the fact that the pupil sample at small schools is a higher proportion of total schools pupils than the national distribution.</li> <li>• non-responding schools – this will ensure that any systematic differences in performance between participating and non-participating schools will not unfairly bias the national results.</li> <li>• population demographics (gender and deprivation) – this will account for any difference between the survey sample and the total population with respect to gender and deprivation.</li> </ul> <p>The final weight for each pupil will combine each of these individual weights.</p> <p><u>Teacher questionnaire data</u> Individual weights will be applied to teacher questionnaire data to account for differences between the survey sample and the full population of school teachers across Scotland with regard to:</p> <ul style="list-style-type: none"> <li>• school size –this will account for individual non-responding teachers. At secondary it will also account for, for example, the higher proportion of teachers being sampled from small secondary schools than the national distribution.</li> </ul> <p>Response data from primary school teachers will not need to be weighted to account for school size as all class teachers of the stage were sent a questionnaire (therefore number of responses for each primary should be in proportion to the school size). Weighting will still need to be applied where only a proportion of primary teachers have responded within a school.</p> <ul style="list-style-type: none"> <li>• non-responding schools – to be applied at a local authority level.</li> </ul>

<b>Sampling error estimation</b>	Due to the way in which the pupil sample is drawn the standard formulas used to calculate the standard error from a simple random sample would not be appropriate. Standard errors are therefore calculated empirically, using the jackknife procedure.
<b>Over time analysis</b>	2011 was the baseline year for CfE numeracy achievement and a core set of tasks and items was selected to allow analysis over time in future surveys. This core set will be a representative minimum 75 per cent of the total set of tasks and items used in this survey.