Non-Verbal Reasoning Digital 8–14
Guidance and Information for Teachers
Digital tests from GL Assessment

Non-Verbal Reasoning Digital (NVR Digital) is part of a range of standardised tests available in both paper and digital editions from GL Assessment. The development of digital editions of Non-Verbal and Verbal Reasoning, as well as major series such as Progress Test in Maths and New Group Reading Test (NGRT), is a response to the need for schools to test large numbers of pupils at regular intervals and to make that process as efficient as possible, by automating the scoring, analysis and reporting. At the same time, by developing digital editions of established tests, teachers and pupils can be assured of the robustness of these tests. Companion digital tests for Verbal Reasoning are also available from GL Assessment, enabling you to gain a more detailed overview of pupils’ reasoning ability and their verbal strengths and weaknesses.

NVR Digital is an important test and one on which decisions about, for example, setting, giftedness or interventions may be made, in conjunction with teacher assessment and an evaluation of pupil performance throughout the year.

NVR Digital must be administered in a formal test environment in which pupils are made aware that they are taking a test and that the usual expectations of behaviour and constraints of a test session will be in place. Pupils’ experience of working at a computer may lead to the impression that taking a test using a computer is not as important as the more familiar test session in the school hall or rearranged classroom. They may expect to spend time in the computer suite on less formal activities, engaging in learning that is presented in a highly visual or even game-like way. While GL Assessment digital tests do engage pupils, they are tests and must be approached in the same way as the more familiar paper test process.
Introduction to *Non-Verbal Reasoning Digital*

The digital editions of *Non-Verbal Reasoning* comprise the same tests as the paper edition. They have identical questions, but pupils click on their answers on screen, using a mouse, rather than filling in a pupil booklet.

*See page 7 onwards for a detailed description of the test content.*

**Use of NVR Digital**

*NVR Digital* is available at three levels of difficulty, aimed at pupils of the approximate ages indicated in the table below.

<table>
<thead>
<tr>
<th>Level</th>
<th>Age Group</th>
<th>England &amp; Wales</th>
<th>Scotland</th>
<th>Northern Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVR 8&amp;9</td>
<td>7:03 to 10:03</td>
<td>Year 3–4</td>
<td>Primary 4–5</td>
<td>Year 4–5 (P4–P5)</td>
</tr>
<tr>
<td>NVR 10&amp;11</td>
<td>9:03 to 12:03</td>
<td>Year 5–6</td>
<td>Primary 6–7</td>
<td>Year 6–7 (P6–P7)</td>
</tr>
<tr>
<td>NVR 12–14</td>
<td>NVR 11:03 to 15:03</td>
<td>Year 7–8</td>
<td>Secondary 1</td>
<td>Year 8–9 (F1–F2)</td>
</tr>
</tbody>
</table>

*Table 1.1 – Levels of difficulty*

There is a slight age overlap between the different NVR tests. In general, the tests are most suited to pupils of the age indicated in the test title, but as there is a slight overlap with the test above and below (in the case of the upper two tests), in some instances you may have a choice of two tests for any one pupil. If in doubt, pupils of borderline age who are expected to be low scoring should take the test for the younger age range, whereas able pupils should take the test for the older age range.

**Timing**

The *NVR Digital* tests are timed and start with a short practice section that should take no longer than 15 minutes (although this is untimed).

The test timing is controlled by the computer and a countdown clock is displayed throughout each test. If pupils finish the test before the allotted time is up, they are invited to check the answers given.

The test timings are as follows:

<table>
<thead>
<tr>
<th>Test</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVR 8&amp;9</td>
<td>40 minutes (25 minutes for main test; allow c. 15 minutes for practice questions)</td>
</tr>
<tr>
<td>NVR 10&amp;11</td>
<td>45 minutes (30 minutes for main test; allow c. 15 minutes for practice questions)</td>
</tr>
</tbody>
</table>

*Table 1.2 – Test timings*
Administration

For information on Sittings go to:

https://help.testingforschools.com/display/HOH/Sittings

When the test is accessed, the title screen will then appear. This can be used as a holding screen.

Pupils should then click on ‘next’. The onscreen and audio instructions will then start. These explain the nature of the test.
Then some practice questions are presented to familiarise pupils with the types of question in the test and to give them practice in how to answer.

During the practice session, walk around the class to check that pupils understand what they are doing. When the pupil is ready, he or she can start the test and the strict timing begins.

When pupils have finished the test, they should go back and check their answers if they have time. The test will end automatically when the time has run out.

Pupils with special assessment needs

No pupil should be automatically excluded from taking NVR Digital since it is designed to measure pupils’ reasoning ability.

The test environment

Each pupil will need a computer, headphones (for the introductory screens) and a mouse. All equipment needs to be in working order.

Pupils should be told that they are going to take a test and the purpose of it should be explained: ‘to find out what you can do or where you may need help’ or ‘to let your teacher next year know what you can do’. Pupils should be told that they must work in silence, and that if they have a query they should raise their hand and wait for the teacher to approach them. Answer any questions at this stage and explain that you cannot help with any of the test questions, but that they should try to do their best and at the end go back to check their work.

While pupils are taking the test, the teacher should walk around the room to check they are progressing appropriately, that they are not having difficulty with the methods of answering questions and, importantly with digital tests, that they have not rushed through the test without attempting to answer questions.
Unexpected incidents during a test session

As with the paper tests, should anything unexpected occur during the test session, the incident should be recorded and appended to the group report for the specific group of pupils. This will allow the incident to be taken into account when scores are being compiled.

If there is a failure in your computer system while pupils are taking the test, it will not be possible to re-enter the test at the point at which the failure occurred. In this instance, pupils will need to re-take the complete test.

If pupils complete the test and the system then fails, it may be possible to retrieve results, and therefore reports, from the GL Assessment back-up server.

NVR Digital Testwise reports

A number of different reports are available on Testwise as soon as the pupils complete the tests:

1. Standard NVR Reports
2. Export CSV Results
3. Key Stage 2 Indicators
4. Key Stage 3 Indicators
5. NVR and VR Combined Report
6. NVR Cluster Report (available for LAs or school clusters)
7. NVR and VR Combined Cluster Report (available for LAs or school clusters)

Each report is described briefly in turn.

**Standard NVR Report**
This report includes:

- Comparison of mean raw and standard age scores by group, eg gender
- Comparison of group and national standard age score distributions
- Pupil listing reporting raw score, standard age score, stanine, national percentile rank and group rank. Listing can be sorted by pupil name or by standard age score.

**Export CSV Results**
Pupils’ scores are exported to a Comma Separated Variable (CSV) file, which you can view in Excel.

**Key Stage 2 Indicators**
Report showing the likely distribution of Key Stage 2 levels in English, maths and science across the whole group and for individual pupils (available from 2010).

**Key Stage 3 Indicators**
Similar information is provided to that described for Key Stage 2 above (available from 2010).

**NVR and VR Combined Report**
A combined standard report for those who have taken both tests. It includes a listing of pupil standardised scores and a visual/verbal profile, highlighting at-a-glance relative strengths and weaknesses in the two forms of reasoning across the group.
**NVR Cluster Report**
A standard report for LAs or school clusters providing a school-by-school comparison for results of all schools that have taken NVR.

**NVR and VR Combined Cluster Report**
A combined standard report for LAs or school clusters providing a school-by-school comparison for results of all schools that have taken both tests.

**What do the NVR Digital tests comprise?**

*Non-Verbal Reasoning* tests the ability to recognise similarities, analogies and patterns in unfamiliar designs. These reasoning processes are widely accepted as being fundamental to pupils’ ability to understand and assimilate new information and ideas. They enable pupils to make sense of new information and to relate it to what they already know. The processes are used whenever and wherever pupils learn, such as recognising similarities between words when learning to read and spell, identifying number patterns or even seeing an analogy between instructions for building a model and recipes for baking. Scores on this test will therefore give an indication of how easily pupils will acquire new concepts and master new material in a wide range of school subjects, based on their current levels of functioning. Using designs rather than words allows reasoning processes to be assessed independently of language skills.

**Types of questions**
The types of questions included in the test provide easily understood ways of assessing the key reasoning processes, without confounding the assessment with any other irrelevant knowledge or skills. For example, there are no reading requirements and no pictorial material used, as understanding of pictures often requires culturally-specific knowledge. Also, the mathematical knowledge needed is very limited, eg counting to three. Further, the test uses designs in which the need to create, maintain and manipulate precise mental images of shapes – sometimes known as ‘spatial visualisation’ – is at a very low level. (GL Assessment also publishes separate *Spatial Reasoning Tests.*)

**NVR 8&9**
This test contains the three following types of question:

- **Classification questions**
  These questions assess the ability to see similarities. Pupils have to find another member of a set.
  
  *Example:* Choose which of the shapes along the bottom should go in the big oval.

```
?  x  x
A    B    C    D
```

- **Series questions**
  In these questions, pupils have to see the similarity between a row of figures and use this to predict the next figure in the row.
Matrix questions
In this type of question, pupils have to find the relationship between the rows and columns of a matrix, and use this to deduce the missing figure.

Example: Choose which little box completes the pattern in the big box.

NVR 10&11
This test contains the two following types of question:

Classification questions
These questions assess the ability to see similarities. Pupils have to find another member of a set.

Example: Decide which of the five shapes next to the large oval also belongs inside the oval.

Matrix, series and analogy questions
These questions assess a variety of non-verbal reasoning processes to varying degrees. Pupils have to see similarities between different figures within a design and then identify patterns or analogies between different areas of the design, to find the missing pieces. The questions are presented in a number of different styles:

Matrices. These are either 2 × 2 or 3 × 3 matrices, which contain elements of series and analogies.
Horizontal rows. The first example is a series question and the second example can be solved as a series or as an analogy.

Star shapes. Pupils have to identify patterns or analogies between different areas of the design.

Two triangles. This is another way of presenting a set of analogies.
This test contains two basic types of question: classification questions and matrix, series and analogy questions.

- **Classification questions**
  These questions assess the ability to see similarities. Pupils have to find another member of a set.

  *Example: Decide which of the six shapes below the large oval also belongs inside the oval.*

- **Matrix, series and analogy questions**
  These questions assess a variety of non-verbal reasoning processes to varying degrees. Pupils have to see similarities between different figures within a design and then identify patterns or analogies between different areas of the design. In all of these questions, the pupils indicate their answers by deciding which of the six figures is the missing one, but the questions are presented in a number of different styles:

  **Matrices.** These are either $2 \times 2$, $2 \times 3$ or $3 \times 3$ matrices, which contain elements of series and analogies.

  **Horizontal rows.** The first example is a series question and the second example is essentially an analogy.
Star shapes. Pupils have to identify patterns or analogies between different areas of the design.

Two triangles. This is another way of presenting a set of analogies

Using NVR scores in schools

You can use the test results to enhance your knowledge of the pupils in your class and to inform your teaching strategies. For example, although pupils are unlikely to score exactly the same mark in a reasoning test as in a curriculum test, it may be that pupils with non-verbal reasoning scores that are much higher than scores in a subject-based test would be able to raise their curriculum performance after targeted teaching. Conversely, it may be that a school whose pupils score lower on non-verbal reasoning than their curriculum attainment is particularly effective in its teaching. The same Non-Verbal Reasoning tests could also be used to monitor successive year groups of pupils to determine differences in ability that are largely unaffected by teaching.

Non-verbal reasoning tests are significant in assessing the overall reasoning ability of all pupils. It is well known that some people find reasoning with shapes and designs much easier than with words and sentences, whereas the converse is true for others. Using a non-verbal test helps to identify those who reason best with spatial concepts and who may eventually prove to have relative strengths in subjects like mathematics, science, design and technology. Another advantage of non-verbal tests is that, since they involve no reading,
they are a valuable means of assessing pupils who speak English as an additional language, and pupils who are thought to have specific difficulties with language-based work.

The main uses of NVR scores are:

- to identify an individual pupil’s cognitive strengths and weaknesses in order to inform teaching and learning
- to compare the performance of groups of pupils, in order to identify needs and to target resources better
- to identify pupils, or groups of pupils, who may be underachieving.

Schools may also find the scores useful in describing the overall calibre of groups of pupils: whole intakes to a school; classes within a school; ethnic groups of pupils; girls and boys. It may happen, for instance, that one year’s intake has a much higher average NVR score than previous years’. This would lead to higher expectations of the group’s GCSE performances.

The progress of groups of pupils – teaching groups, ethnic groups, boys and girls – can similarly be monitored against the stable baseline of their reasoning ability, as shown by their NVR scores.

The combined use of the Non-Verbal and Verbal Reasoning tests is recommended as a means of identifying pupils whose abilities using the medium of language differ substantially from their abilities using visual media. In this way, their potential is more likely to be recognised and can be exploited in personalising their learning experiences to ‘play to their strengths’.

**Interpreting unexpectedly low scores**

Caution needs to be exercised when interpreting unexpectedly low scores. High scores present few interpretative problems and provide unequivocal evidence – unless the pupils have copied from a neighbour, or guessed with unusual luck. Interpreting unexpectedly low scores is far more complex.

Work systematically through possible explanations for the poor performance:

1. **Review the test session.** Did pupils fully understand what had to be done? Did they complete the practice questions correctly? Are there any reasons why they might have been distracted, worried or insufficiently motivated?
2. **Consider pupils’ overall experience of timed, formal testing.** Was this a new and stressful experience for them? Did they understand the need to work quickly? The pattern of answer choices may yield some clues about how a pupil worked. For example, of two pupils scoring 10, one may have randomly guessed every question and scored 10 by chance, whereas the other could have gained full marks on the only ten questions attempted.
3. **Look at pupils’ scores in relation to other test scores and attainment in different subjects.** A pupil who does much better on a verbal test than on this non-verbal one may simply have a strong bias to verbal thinking and will therefore be more likely to succeed in linguistic subjects. In contrast, if a pupil has uniformly low scores, it may be advisable to consider the pupil’s home environment, or whether his or her schooling has been seriously interrupted. It may be possible to improve test scores and other measures of intellectual development with appropriate intervention. Controversy surrounds the question of how far reasoning ability can be improved by specific training, but the educationally more optimistic view is that people from deprived backgrounds, especially the young, can substantially increase their reasoning ability if given appropriate help.
Understanding the NVR scores

Raw score

The raw score is simply the total number of correct answers obtained by the pupil. These scores can be converted to three types of normative scores called standard age scores (SAS), stanines and percentiles. These are described below.

Standard age score (SAS)

One way to make a raw score more readily understandable would be to convert it to a percentage: for example, ‘33 out of 50’ becomes 66%. However, the percentage on its own does not tell us the average score of all the pupils or how spread out the scores are, whereas standard age scores do relate to these statistics.

In order to provide a standard age (or standard score) scale, some tests are standardised so that the average standard age score for any age group is always 100. This makes it easy to tell whether a pupil is above or below the national average. The spread of scores (the ‘standard deviation’) is also set to plus or minus 15 points, so that for any age group about two-thirds of the pupils in the national sample will have a standardised score of between 85 and 115. NVR and VR were standardised in 1992 using a national sample of maintained and independent schools in England and Wales.

Number of schools the tests were standardised with:

- NVR 8&9: 204 schools
- NVR 10&11: 192 schools
- NVR 12–14: 317 schools

Raw scores are converted to standard age scores that allow you to compare the level of cognitive development of an individual with the levels of other pupils in the same age group. The properties of standard age scores mean that approximately two-thirds of pupils in the age group score between 85 and 115, approximately 95 per cent score between 70 and 130, and over 99 per cent score between 60 and 140. Figure 1.1 shows the frequency distribution, known as the normal distribution, for standard age scores, stanines and percentiles.

Figure 1.1: The normal curve of distribution showing the relationships of stanines, national percentile ranks (PR) and standard age scores (SAS)
Standard age scores have three particular benefits, as described below.

- **They place a pupil’s performance on a readily understandable scale.** As we have seen above, standard age scores allow a pupil’s performance to be readily interpreted. It is immediately deducible from the score itself that a non-verbal reasoning score of 95 indicates a level of performance just below the national average, but well within the average range.

- **An allowance can be made for the different ages of the pupils.** In a typical class the oldest pupils are very nearly 12 months older than the youngest. Almost invariably, older pupils achieve slightly higher raw scores in tests and examinations than younger pupils. However, standard age scores are derived in such a way that the ages of the pupils are taken into account by comparing a pupil only with others of the same age. An older pupil may in fact gain a higher raw score than a younger pupil, but have a lower standardised score. This is because the older pupil is being compared with other older pupils in the norm group. Pupils of different ages who gain the same standard age score have done equally well, with each being judged in relation to their standing among pupils of their own age.

- **Scores from different tests can be meaningfully added or compared.** Standardised scores for most tests cover the same range, from 60- to 140+. Hence a pupil’s standing, in say mathematics and English, can be compared directly using standardised scores. It is not meaningful to add together raw scores from tests of different length or difficulty. However, should you wish to add standardised scores from more than one test – for example, in order to obtain a single overall measure of attainment – they can be meaningfully combined.

**Stanines**

Standard scores run from 60- to 140+ and give differentiated, finely graded information on the performance of each pupil. However, sometimes a shorthand summary is more useful. Stanines, short for ‘standard nines’, are just nine summary score bands calculated directly from the standard scores, as shown in Table 1.3. Based on the national standardisation, we can say what proportion of pupils are expected within each stanine, and these are also given in the table. The broad nature of stanines minimises over-interpretation of small, insignificant differences among test scores. Stanines are therefore particularly useful in reporting test information to pupils and to parents, as they are relatively easy to understand and interpret.
Table 1.3: Stanines score bands for NVR

**National percentile rank (NPR)**

This indicates the percentage of pupils in the national sample who obtain a standard age score at or below a particular score. For example, a pupil with a standard age score of 108 has a national percentile rank (NPR) of 70. He or she has performed as well as, or better than, 70 per cent of pupils of his or her age group. An NPR of 50 is average for an age group.

**Confidence bands**

Pupils’ standard scores are also shown as a vertical line with a horizontal line showing the 90 per cent confidence band. It is recognised that any test score represents a performance on a particular day, and the score should therefore be placed within such a confidence band. If the test were taken again, nine times out of ten one would expect the score to fall within this range.

<table>
<thead>
<tr>
<th>Description</th>
<th>Stanine</th>
<th>% of pupils</th>
<th>Corresponding percentiles (NPR)</th>
<th>Corresponding SAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>9</td>
<td>4</td>
<td>97 and above</td>
<td>127 and above</td>
</tr>
<tr>
<td>Above average</td>
<td>8</td>
<td>7</td>
<td>90–96</td>
<td>119–126</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>12</td>
<td>78–89</td>
<td>112–118</td>
</tr>
<tr>
<td>Average</td>
<td>6</td>
<td>17</td>
<td>59–77</td>
<td>104–111</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>20</td>
<td>41–58</td>
<td>97–103</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>17</td>
<td>23–40</td>
<td>89–96</td>
</tr>
<tr>
<td>Below average</td>
<td>3</td>
<td>12</td>
<td>12–22</td>
<td>82–88</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>7</td>
<td>5–11</td>
<td>71–81</td>
</tr>
<tr>
<td>Very low</td>
<td>1</td>
<td>4</td>
<td>4 and below</td>
<td>73 and below</td>
</tr>
</tbody>
</table>
Checklist for teachers

Before the test session

- Allocate sufficient time in the computer suite for each test.
- All machines should have sound and headphones. (Please note, headphones are needed for the introduction and practice questions only.)
- Pupils need to use a mouse to click on the answers.
- Use a whiteboard to guide your pupils through the instruction screens (optional).
- Inform pupils which test they are taking during the session.
- Provide pupils with the access code to take them directly to the test.
- Stop pupils clicking on ‘Take Test’ until everyone is clear about what they are doing.

Testwise Technical Support Team

If you have any problems using Testwise, email the Testwise Technical Support Team at support@gl-assessment.co.uk.

You can view our full Testwise Support Services on our website:

https://www.gl-assessment.co.uk/support/online-testing-support/