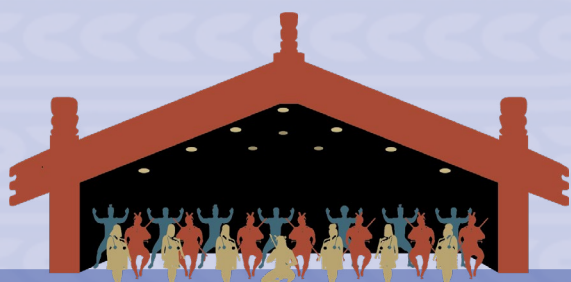


Aratohu kaiako Kaiako guide

PAT Pāngarau | PAT Mathematics

This guide is intended to
assist kaiako in the use of
**ONLINE AND PAPER
ASSESSMENTS**



PAT
PROGRESSIVE ACHIEVEMENT TEST

 **NZCER**
Rangahau Mātauranga o Aotearoa

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The PAT Pāngarau | PAT Mathematics assessments are available as paper-based versions, and online through NZCER Assist (<https://www.nzcerassist.org.nz/login>). The previous versions of the PAT Mathematics assessments are no longer supported.

Mō ngā pātai me ngā tohutohu

For questions or advice

E-mail assessmentsservices@nzcer.org.nz or call Assessment Services on (04) 802 1630

Mō te tautoko me ngā raraunga puta noa i te kura

For support with school-wide data

E-mail educationadviser@nzcer.org.nz or call Education Advisers on (04) 802 1386



Kia ora,

Thank you for taking the time to read this kaiako guide. The guide is designed to introduce you to the refreshed version of PAT Pāngarau | PAT Mathematics and help you understand how it can be used. It is also designed to help you understand the vision behind the refresh. NZCER's intention in carrying out the refresh has been to develop assessments that can better support the kind of learning and teaching that leads to equitable outcomes for all ākonga. Central to this is a commitment to the individual ākonga who sit the assessments. It is vital that they are able to engage in the assessments and that the results are used to promote their learning, affirm their identities, and uphold their wellbeing.

This guide represents NZCER's first step on the journey towards supporting kaiako to use the refreshed assessments with these commitments in mind. We intend to keep going, and to produce updates to the guide along with other support materials that will promote effective use of the assessments. Please look out for these.

The guide begins with a short explanation of equity and assessment and describes the background to the refresh. It then outlines the purpose of the assessments and provides some guidelines and advice around their use.

We hope that the refreshed assessments are useful for all your ākonga and that they can assist you to promote rich learning and strong kaiako-ākonga relationships.

Ngā mihi,

The NZCER PAT Pāngarau | PAT Mathematics development team

Ngā whakamoemiti

He tino hīkoi roa te whakahou i ngā PAT Pāngarau | PAT Mathematics me te tini o ōna panonitanga. E whakamoemiti ana te ngākau ki te tokomaha kua hīkoi tahi me mātou.

Tēnei te whakawhetai atu ki ērā i piri mai ki te kaupapa ngā PAT Pāngarau | PAT Mathematics i ngā tau o mua. Kua noho ā koutou mahi hei kahupapa mō ngā mahi o ēnei rā, ā, ka pērā haere tonu hei te urutaunga o ā mātou aromatawai, hei whakaata i te horopaki ahurei o Aotearoa.

Kua tautokona tēnei kaupapa e te Williams Family Trust, ā, ka nui ā mātou mihi mō tēnei mahi mutunga mai o te whai tikanga.

Tēnei te mihi atu ki ō mātou hoa mahi i Rangahau Mātauranga o Aotearoa | New Zealand Council for Educational Research (NZCER) mō ā rātou mahi nui mō tēnei kaupapa. E mihi ana hoki ki a Adam Errington mō ngā whakaahua i tino mārama ai ngā PAT Pāngarau | PAT Mathematics, i tōia mai ai te huhua o te rangatahi puta noa i Aotearoa ki te kaupapa.

Hei kupu whakamutunga, ka nui te mihi ki ngā ākonga, ki ngā kaiako hoki i whai wāhi ki ngā wāhanga maha o te whakahoutanga. E mihi ana mātou ki a koutou mō koutou i tahuri mai ki te tiri i ō koutou mōhiotanga, wheako anō hoki.

Me kore ake koutou, i tutuki pai ai te kaupapa.

Acknowledgments

Refreshing the PAT Pāngarau | PAT Mathematics has been a complex journey of change. We would like to thank the many people who have embarked on this journey with us.

We would like to gratefully acknowledge those who have been involved with the PAT Pāngarau | PAT Mathematics development in the past. We have built on your mahi and will continue to do so as our assessments evolve to reflect the unique context of Aotearoa New Zealand.

This project has been generously supported by the Williams Family Trust, and we extend our heartfelt thanks for committing to such important mahi.

We are grateful to our colleagues at Rangahau Mātauranga o Aotearoa | New Zealand Council for Educational Research (NZCER) who have contributed to this mahi. Thanks to Adam Errington for the illustrations that made the PAT Pāngarau | PAT Mathematics more accessible and appealing to a wider range of rangatahi across Aotearoa New Zealand.

Finally, we would like to express our sincere gratitude to the ākonga and kaiako who participated in various phases of the refresh. We are grateful for your willingness to share your knowledge and experiences.

This project would not have been possible without you all.

Kupu Māori

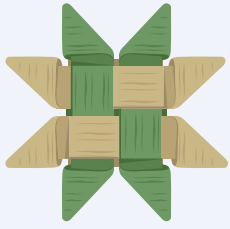
NZCER is committed to acting as an advocate and motivator in the revitalisation of te reo Māori. As part of our PAT refresh, we have welcomed opportunities to include more te reo Māori in our assessment tools.

In the *Aratohu kaiako* | *Kaiako guide* we use the terms ākonga and learner interchangeably to talk about all young people. In the text, kaiako refers to all teachers, and kura refers to all schools. We use the terms ākonga Māori, kaiako Māori, and kura Māori to refer to Māori learners, Māori teachers, and Māori language immersion schools respectively. In the *Aratohu kaiako* | *Kaiako guide* we use the term whānau to refer to all parents, caregivers, and extended family members.

We recommend familiarising yourself with the assessments before using them. If you are unsure of any kupu Māori please use a Māori dictionary such as Te Aka Māori Dictionary <https://maoridictionary.co.nz>

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1. Te ̄oritetanga me te aromatawai

Equity and assessment

An equitable system recognises that some people are advantaged compared with others and focuses on providing appropriate resourcing and pathways that allow those without the advantages to succeed. The OECD describe an equitable education system as one that is fair and inclusive.¹

When assessment is equitable, no particular group has advantage over another, and achievement cannot be predicted by the cultural, linguistic and socioeconomic backgrounds of learners. In the Aotearoa New Zealand schooling system, a disproportionate number of ākongā Māori, Pacific learners, ākongā from low socio-economic backgrounds, and ākongā with additional needs achieve at significantly lower levels than their peers in mathematics. Assessment practices and differences in opportunities for learning have contributed to these inequitable outcomes.

NZCER strongly encourage kaiako to critically engage with multiple sources of assessment data and provide all ākongā with opportunities to build on their languages, cultures, and identities as strengths; and by doing so reach their full potential as learners of mathematics.

NZCER is committed to improving equity in education by supporting and catering for those groups of ākongā who have been under-served by the education system. These groups include ākongā Māori, Pacific learners, students from low socioeconomic backgrounds, and students with additional learning needs. In 2022, NZCER completed a significant refresh of the PAT Mathematics assessments. This refresh was intended to make PAT Mathematics more culturally relevant, authentic, and accessible.

The refresh resulted in nine core PAT Mathematics assessments (Assessments 1 to 8, and a Foundation Assessment, 1A). All refreshed content was reviewed within a robust resource development process, piloted, trialled nationally, and results were used to calibrate the updated material onto the existing PAT Mathematics scale. Use of the scale means that results from refreshed assessments can be compared with previous results, as well as existing norms.

Transforming assessment is complex and requires a journey of change. Through embarking on the equity-focused refresh, NZCER has made some important improvements to PAT Pāngarau | PAT Mathematics. However, this journey is ongoing and at NZCER we are continuing to explore ways to transform standardised mathematics assessments.

¹ Organisation for Economic Co-operation and Development | OECD. (2008). *Ten steps to equity in education: Policy brief*. <https://www.oecd.org/education/school/39989494.pdf>

2. Te whāinga o ngā aromatawai

Purpose of the assessments

PAT Pāngarau assessments are part of a suite of standardised assessments that were developed by NZCER), specifically for learners in Years 3–11. These assessments are research-based and have been carefully developed for use in Aotearoa New Zealand English-medium contexts. Each assessment can be used at multiple year levels and achievement is reported on a common measurement scale.

The PAT Pāngarau assessments are intended to be used as low-stakes assessments. The assessments are not designed to be used for the purposes of streaming or ability grouping.

These assessments are designed to support kaiako and tumuaki to:

- understand where ākongā are at in their learning at a specific point in time
- identify what progress ākongā are making
- identify patterns of strengths and areas of need for individuals and groups of learners
- make informed decisions about the kinds of teaching methods, programmes, and materials that are most suitable for their learners
- communicate with whānau and parents about their child's progress, strengths and next steps.

It is important to remember that PAT Pāngarau assessments are just one source of evidence of learning and provide a snapshot at a particular moment in time. To be properly interpreted, the results should be supplemented by other forms of information about the achievement of each learner.



3. Ngā kai o roto i ngā aromatawai

Content of the assessments

Assessment in mathematics and statistics should reflect the concepts, strategies, and habits of mind that are most important for ākongā to learn. PAT Pāngarau assessments target the big mathematical and statistical ideas that ākongā need to know and understand in order to make progress through the Aotearoa New Zealand curriculum and Te Mātaiaho. Items are anchored in the content that underpins the curriculum learning area of mathematics and statistics. Namely:

Mātauranga tau | Number

Taurangi | Algebra

Ine | Measurement

Āhuahanga | Geometry

Tauanga | Statistics

Tūponotanga | Probability

There are limits to how mathematics and statistics can be presented using a multiple-choice assessment format. However, the assessment items require thought and conceptual understanding, not just the use of learnt or memorised procedures. While it is difficult to reflect all the processes that are required for doing mathematics—such as explaining, justifying, and communicating ideas—there are many items that involve problem solving, generalising, and reasoning.



4. Te kōwhiri i te aromatawai tika Choosing the right assessment

Static assessments

Table 1 summarises the differences between adaptive and static assessments.

Table 1 Key features of adaptive and static assessments

Adaptive assessment	Static assessment
Ākonga get their own mix of questions targeted at their achievement level. Detailed individual reporting but no group item level reporting.	All ākonga in the group respond to the same questions. This supports item level reporting at both individual and group level.
The assessments include a variety of question types such as multiple choice, drag and drop, and sorting questions.	Only multiple-choice questions are used.
Ākonga need to answer each question before they can go on to the next question.	Ākonga can omit a question and come back to it later.
Ākonga cannot change an answer once they have answered a question and pressed 'next'.	Ākonga can return to a question and change their answers.

Each of the refreshed assessments has been designed with a year level in mind. However, each assessment can be used productively at other year levels. This is important because ākonga of the same age can be at very different points in their learning, and all ākonga can demonstrate progress.

When selecting an assessment it is important to consider whether the level of difficulty is appropriate for the ākonga concerned. Assessments that are too easy or too difficult will not provide precise or useful measures. It is for

kaiako to use their professional judgement to decide which assessment best suits any particular individual or group to be assessed.

Table 2 shows the year levels which each static assessment is designed for. If in doubt, use the assessment recommended (in bold) for the year level of ākonga.

Table 2 Recommended static assessments (online and paper) for each year level

Year levels	Recommended assessments*
3	1A
4	1, 2
5	1, 2 , 3
6	2, 3 , 4
7	3, 4 , 5
8	4, 5 , 6
9	5, 6 , 7
10	7, 8**
11	8**

*Bold print indicates the assessment that was originally created for each year level
 ** This assessment is intended for the end of Year 10 or the start of Y11



Ngā aromatawai e rua nga wa i te tau Assessments twice a year

Schools can use PAT assessments twice a year as part of a wide range of tools and data sources to track learning progress. Typically, schools administer PATs at the beginning of Term 1 and as late in Term 4 as scheduling allows. However, it is important to note that PATs cannot provide precise measures of progress within a single school year. Instead, they help build trend information over a student’s time at school, providing insights into their overall learning progress.

NZCER encourages the use of the PAT Pāngarau computer adaptive testing for twice yearly assessments. Compared to static tests, adaptive tests better target each individual student’s level of achievement. This leads to more precise measures of their current achievement and the progress they have made. In addition, repeating the same static assessment can introduce variables like practice effects*, which may obscure a student’s true progress. Static tests can provide useful point-in-time assessment information. They are useful when paper tests are required and when teachers are interested in how a class or cohort of students within the school are doing on a set of common questions.

* A practice effect in assessment refers to improved test performance when a student takes the same test more than once, not due to learning or progress, but because of increased familiarity with the test format or content.


5. PAT Pāngarau Adaptive

When ākonga are administered a computer adaptive test (CAT), the assessment is automatically tailored to their achievement level as they proceed through it. Computer adaptive assessments use selection rules to select items from a pool of items that are estimated to be around the achievement level of ākonga. This estimate becomes more precise as ākonga respond to more items.

The adaptive assessment is measured and reported on the same scale as PAT Pāngarau. Because the assessment is tailored to the achievement level of each ākonga, the scale scores generated from adaptive assessments are generally more precise than those generated using static assessments.



6. Te whakamahi i ngā aromatawai Using the assessments

It is recommended that kaiako preview the assessment prior to administering them with ākonga. Kaiako can preview the online assessment via the preview icon  on the dashboard in NZCER Assist.

Te wā | Timing

Ākonga are expected to work independently and have **45 minutes to complete the questions**. The whole assessment, including administration, will take about **60 minutes** to complete. It is up to kaiako to monitor the timing.

NZCER's piloting and trialling work has indicated that most ākonga finish the assessments within 45 minutes. Some kaiako have told us that they would like their ākonga to have more time to complete the assessment, so that ākonga can maximise the opportunity to show what they know. If PAT Pāngarau assessments are going to be used to compare results with the normative information, it is important that the standardised 45-minute time allowance is followed. However, kaiako and kura may make the decision to extend the time accommodation, depending on the purpose of using the assessments in their particular context.

Te whakamahi tātaitai, rūri (tauine), ētahi atu tautoko pāngarau rānei


Using calculators, rulers, or other mathematical supports

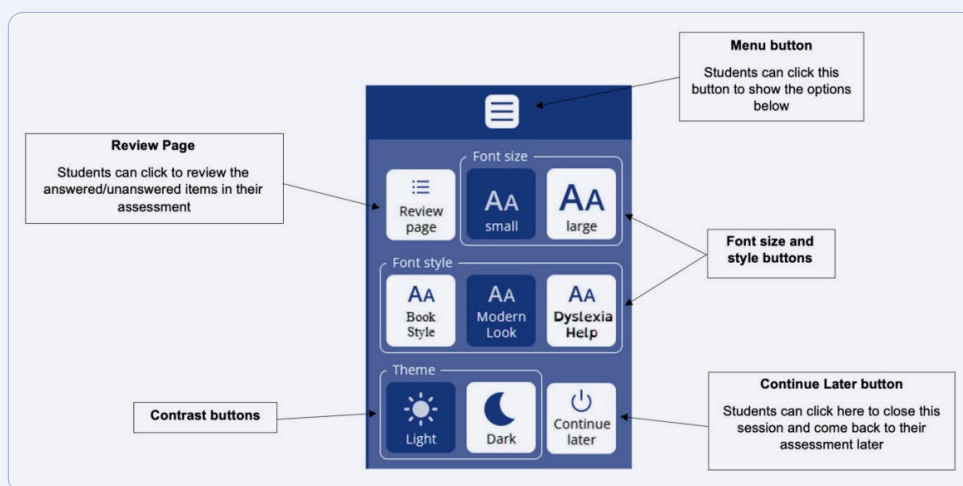
Ākonga are encouraged to use scrap paper for working out. In order to be able to compare results with the normative information, ākonga **cannot** use calculators, rulers, protractors, or other mathematical supports.


7. Te whakahaere i ngā aromatawai tuihono

Administering the online assessments

Ākonga can complete the assessments on a range of devices including iPads, tablets, or Chromebooks. However, ākonga may need to scroll to view some questions when using devices with smaller screens.

1. Give ākonga the URL (www.nzceronline.org.nz) and ensure everyone has found the site. Ākonga may need to adjust their browser to avoid the need to scroll (for example, the browser could be set to 90%).
2. When you are ready, invite ākonga to log in with their tokens. Ākonga will be greeted with a welcome and a screen that asks them to confirm who they are (e.g. "Are you Tiana Baker?"). If the name on the screen is correct, ask ākonga to click the 'Yes' button. If the name on the screen is incorrect, check that they are using the correct token.
3. Ākonga can click on this icon  to choose options for:
 - font (including dyslexic font)
 - text size



All of the online PAT assessments have an audio option. Ākonga can click on this symbol:  to have the question read to them.

4. Read through the instructions, example questions, and each of their alternative answers with ākonga. Check to see that ākonga can select the answer they want to choose and confirm their response by selecting the 'Next' button.
5. Emphasise to ākonga:
 - This assessment is all about your current understanding and skills in mathematics.
 - Have a go at all the questions, even if the question is hard.
 - Always choose the option you think is the best answer.

- If you change your mind after selecting an answer, you can go back and change your answer (not available in the adaptive assessment).
- Any working can be done on scrap paper, but calculators, rulers or other mathematical supports cannot be used.
- At the end of the assessment, you will get the opportunity to revisit any questions you might have missed (not available in the adaptive assessment).

Ka pai!
Please check that you have answered all the pātai.

1. Symbols	2. Hāngi fundraiser	3. Fudge tray	4. Wiremu's birthday
5. Buying milk	6. Cereal	7. Pet show animals	8. Measuring cup
9. Camping	10. Doing multiplication	11. Number pattern	12. Kapa haka
13. Adding Fraction	14. Bead necklace	15. Fish	16. Favourite colours
17. Marble jar	18. Busy skatepark	19. What number	20. Six times table
21. Tivaevae	22. Using multiplication	23. Missing number	24. Flag training
25. Dot pattern	26. Looking East	27. How many tiles?	28. Folding a net
29. Recycling bottles	30. Anticlockwise	31. Tree planting	32. Reflection
33. Miniball goals	34. Toki Pounamu	35. 100 more	36. Beads on a frame

Items with unanswered questions appear in bold. Click on the boxes to return to these items.

- Karawhiua! Go for it!

Watch a short video about the PATs: <https://www.youtube.com/watch?v=b83Lugfxg4U>

Te urutanga tuihono | Online accessibility

Ngā aromatawai tuihono | Online assessment

Online assessment may not suit all ākonga. Neurodiverse ākonga, or those who are unfamiliar with online devices or online learning situations, may find the online mode of delivery a barrier to responding. These ākonga may be better served with the paper-based assessment. Ultimately, the mode of assessment should reflect the classroom learning situation and be responsive to the needs of the individual ākonga.

Ngā atahanga, ngā pūpānui mata, me ngā tūtohu alt Images, screen readers, and alt tags

All images have alt tags to describe their content for a screen reader. However not all assessment items are fully accessible: a number of assessment items require viewing of a graph or shape or other visual information source. These items rely on the visual recognition of an attribute, and such items cannot be described sufficiently for screen readers without changing the nature of the item.

Some images are described with the term “illustration” to indicate that the images do not contain information required for the assessment item.

8. Te whakahaere i ngā aromatawai PAT puka Administering the PAT assessment booklets

1. Give ākonga the appropriate PAT puka | booklet and puka whakatau | answer sheet
2. When everyone is ready, ask ākonga to fill in their details in the spaces provided in the puka whakatau | answer sheet. Kaiako may want to fill in details for younger ākonga.
3. Read through the instructions, example questions, and each of their alternative answers with ākonga. Check to see that ākonga have all found the correct part of their answer sheets and have shaded the option appropriately.
4. Emphasise to ākonga:
 - This assessment is all about your current understanding and skills in mathematics.
 - Have a go at all the questions, even if the question is hard.
 - Always choose the option you think is the best answer.
 - If you change your mind after selecting an answer, you can go back and change your answer.
 - Any working can be done on scrap paper, but calculators, rulers or other mathematical supports cannot be used.
 - At the end of the assessment you can go back and check your answers.



Te pānui i ngā aromatawai ki ngā ākonga Reading the assessments to ākonga

You are welcome to read questions to any ākonga having difficulty during the assessment. However, avoid explaining what the questions mean. If any ākonga have a great deal of difficulty understanding the instructions or questions, the assessment may not be suitable for them. Likewise, if an ākonga appears unusually stressed, do not continue with the assessment (see **Section 4 Choosing the right assessment**).

9. Te hoatu kaute me te whakamārama i ngā kitenga

Scoring and interpreting results

Te kaute | Scoring

All questions are automatically marked when the assessments are completed online. Once responses are in the system NZCER Assist can generate a range of individual group and school reports (see the section about Reports).

For paper tests ākongā data can be entered into the Assist site to immediately generate reports. Assist users choose the assessment they want to enter data for, click on the **'Manage Learners'** icon under the 'Actions' area, then select the 'Data entry' icon next to the ākongā they want to enter data for. The data entry process supports both keyboard and mouse input and the question text and correct answer for each question is indicated onscreen. Data can only be entered for tests in the current calendar year.

Ngā pūrongo | Reports

Scale scores and reports are available on **NZCER Assist** (<https://www.nzcerassist.org.nz/login>) immediately after ākongā have completed their assessment. NZCER Assist provides kaiako and kura with comprehensive reporting and ongoing support from the Assessment Services team and Education advisors.

There are a range of reports available and each one provides a different perspective on ākongā achievement. For example:

- Individual reports
- Year group reports
- School wide reports
- Item reports
- List reports.

Information about how to generate and interpret the reports is available on the Assist site <https://www.nzcerassist.org.nz/login>.

Ngā kaute tauine | Scale scores

The scores for an assessment are based on the number of questions that ākonga have answered correctly. This number is sometimes referred to as the raw score. By themselves, raw scores are difficult to interpret. They are bound to the particular test that was used and do not link the achievement to a progress continuum that maps the range of knowledge and skills that have been assessed.

For PAT Pāngarau the raw score is converted to a scale score on the PAT Pāngarau measurement scale (PATM). This PATM scale is common to all the PAT Pāngarau assessments and allows achievement to be compared and tracked over time regardless of which assessments were administered.

Every assessment item has been located on the same scale. This provides a sense of their relative difficulty and each learner's scale score can be interpreted in terms of the kinds of questions they are likely to answer successfully. They are expected to have less success with questions located **above** their scale score and greater success with those located **below** their scale score. For instance, ākonga are expected to correctly answer about 50% of the questions located at the same position on the scale as their scale score. Being able to compare a learner's achievement level with the difficulty level of questions can be useful when examining which questions were answered correctly. For instance, when a learner has not correctly answered a question located well below their scale score, this could indicate an area of need in their future learning.

Te tūranga kura | Score precision

It is important to remember that no assessment can produce totally precise results. The scale scores represent the most probable location on the scale given the raw score on a particular test, at any one time. On reports generated by NZCER Assist, the scale scores are presented with a margin of error that gives a range of values within which we can be fairly confident the learner's achievement lies. Learners who achieve very low or very high raw scores on an assessment will have greater margins of error associated with their scale scores than other learners.



10. Te Whakamahi i PAT Pāngarau hei whakapiki i te pai o te whakaako me te ako

Using PAT Pāngarau to improve teaching and learning

The primary purpose of assessment is to improve teaching and learning. Assessment, teaching, and learning are tightly interwoven.² Assessment for the purpose of improving learning involves the focused and timely gathering, analysis, interpretation, and use of ākongā assessment information that can provide evidence of what ākongā understand, know, and can do and underpin next steps for teaching and learning.

Assessment data can be collected using a range of approaches, and at multiple points in time. These approaches might include:

- observations
- learning conversations
- collecting ākongā work samples
- conducting ākongā self and peer assessments
- using assessment tools created by kaiako.



More formal, standardised assessments such as Progressive Achievement Tests (PATs) have an important role to play alongside informal and in-the-moment formative assessment approaches. The most important consideration is that they are used purposefully with the ultimate aim of improving teaching and learning.

Te whakamahere mō te whakaako me te ako

Planning for teaching and learning

Looking deeper into PAT data can support kaiako to decide what the next mathematics or statistics learning focus should be, and to plan for teaching. Kaiako can analyse, interpret, and use the data to:

- gain insight into current ākongā knowledge and understanding in mathematics and statistics
- pinpoint where ākongā are on their learning pathway
- determine what next steps are needed for ākongā to progress.

Where available, learner reports include additional information for kaiako, such as common mathematical misconceptions and direct links to the Assessment Resource Banks (ARB) resources (<https://arbs.nzcer.org.nz/>). These are useful for drilling down to find out more about what ākongā are doing and thinking, and to target teaching in specific areas of need.

Te huritao mō te whakaako me te ako **Reflecting on teaching and learning**

Importantly, using the data and reports from PAT Pāngarau assessments supports kaiako to reflect on their own teaching practices, and gain insight into the impact of their teaching.

Reflective questions kaiako can ask about the data include:

- What patterns can you see—for instance, across questions representing the different strands of mathematics or the options selected for a particular question?
- What mathematical ideas do your ākonga cope with well?
- What mathematical ideas are your ākonga finding difficult?
- Are there common themes across groups of ākonga who did or did not excel?
- How have ākonga experiences and opportunities to learn mathematics and statistics in the classroom affected achievement?
- What could you change in your mathematics and statistics teaching to support achievement and equitable outcomes for all ākonga?



Kia kotahi te hoe
Working together as one

11. Kupu Māori

NZCER are committed to acting as an advocate and motivator in the revitalisation of te reo Māori. As part of our PAT refresh, we have welcomed opportunities to include more te reo Māori in our assessment tools. We have also included some words from Pacific languages.

For any translations please use an online Māori dictionary such as Te Aka Māori Dictionary <https://maoridictionary.co.nz>.

Kupu	Assessment
Nau mai, haere mai, Pātai, Kia kaha!, Ka nui te mihi ki a koe	1A - 8
Marae	1A, 1, 5
Hāngī	1, 2
Pipi, Poi, Wharekai	1
Kapa haka, Kurī, Ngeru, Rāpeti, Toki pounamu	2
Whānau	2, 5, 8
Harakeke, Kūmara, Mere pounamu, Whetū	3
Waka ama	4
Matariki, Waka taua	5
Kī-o-rahi, Rima, Rua, Tahī, Toru, Whā	6, 8
Rā matua	7, 8
Rā taunaki, Te Ika-a-Māui, Te Waipounamu	7
Whāriki	8

12. Pacific words

Word	Assessment
Panikeke	1A, 1
Siapo	1
Kilikiti, 'Otai	4
Puletasi	7,8
Pa'u, Pa'u mango, Pate	8



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