



SHAPING SUCCESS ACTION RESEARCH PROJECTS

**FINAL REPORT ON THE SHAPING SUCCESS AR PROJECT –
USING TECHNOLOGY TO MOTIVATE AND ENGAGE GCSE
MATHS LEARNERS**

Basingstoke College of Technology

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For further information regarding the Shaping Success Action Research programme and this project go to <https://ccpathways.co.uk/practitioner-research/otla-7/>.

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Final report - Using technology to motivate and engage GCSE maths learners

Basingstoke College of Technology

This project's premise was to use an action research approach to investigate digital learning and the effectiveness of learner-led digital activities. This includes not just what programs and software work best, but also which methods and approaches engage learners most successfully. We have used technology with our learners for a number of years but we aimed to refine it, with promising results.

Summary

I am Joe Wydrzynski, the project lead and a maths lecturer at Basingstoke College of Technology (BCoT). We aimed to detail what methods of delivery will be best suited to fully engage Further Education (FE) GCSE maths re-sit learners. Looking at how learners engage in lessons and how this affects their progression is a passion of the maths team and the College. Developing digital learning has been a significant part of the College's development for a number of years.

As re-sitting students, in a vocational FE college with minimal entry requirements, we get a diverse cohort. We wanted to establish the best strategies for digital participation for our learners. We feel that properly planned flipped learning helps define the learner's maths experience at the College and provides a different process than school. Due to the pandemic, we also wanted to ensure effective learner engagement for a potential year of remote learning. Lastly, we wanted to improve digital confidence and competence in the teaching team.

Our research built on the College's decision to introduce an extra hour of flipped maths learning each week and we set out to determine how best to digitalise our workbooks and which method of online assessment would be most suitable.

We focused the action research project on enabling better general digital fluency, wanting to ascertain what works best from a variety of software, increasing our motivation to experiment. We also examined what works in a digitally focussed, learner-led flipped learning methodology in comparison to a conventional teacher-led approach and how each of these approaches influence engagement and achievement.

Rationale

As a leading college in technology, we've been successfully embedding all forms of digital learning. A few years ago, the College decided that in addition to learners having three hours of maths lessons a week, they would have an extra hour of flipped maths learning. This included supervision from non-maths specialists and almost exclusive use of the artificial intelligence (AI) focused maths website, Century. This, combined with WiFi difficulties, meant that these sessions did not go very well.

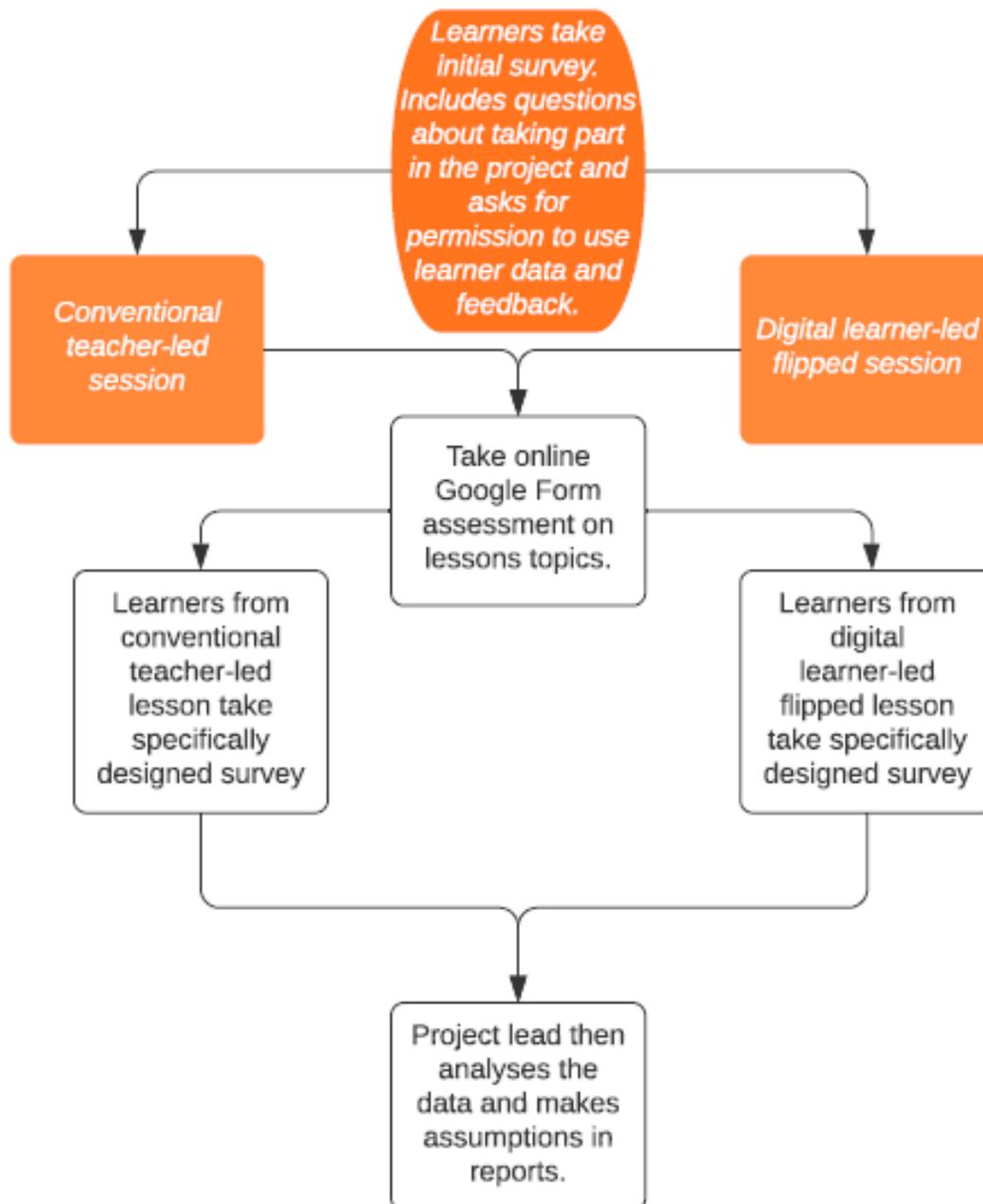
As a department, it was difficult to regain learners' trust in using technology in maths, especially if they also had a negative experience using maths-based technology at school, with programs such as MyMaths (Dowker, Sarkar, and Looi, 2016). Adding into the equation the challenge of being in the middle of a global pandemic, I thought it wise to focus on how to adapt and refine our use of technology to improve both staff and learner capability and willingness for using all kinds of digital tools/ applications. Our research focus included, but was not exclusive to, how best to digitalise our workbooks and which method of online assessment is most suitable.

The project's focus was always on how to improve success with our demographic of learners, considering factors such as their particular socio-economic backgrounds and previous grades. We decided to make the project a general betterment in overall digital fluency, rather than putting the focus on a particular tool/ app. The reasons for this are varied but, essentially, this is due us wanting to ascertain what works best from a variety of different software and not wanting to be limited in scope, thus increasing colleagues' motivation to experiment.

Almost all learners who previously did not achieve a Grade 4 at GCSE maths, will sit GCSE again at the College. A very small percentage take Functional Skills (FS) qualifications. This impacts engagement and strategies for resource management, as learners who may have just scraped a Grade 1 will be doing GCSE again. We wanted to ensure that their learner experience is the best it could possibly be.

Process for assessing and surveying learners

Joe Williams |



Activities

As is common with the nature of action research, our activities have evolved and changed throughout the year. There is further detail in Appendix 7 showing how the learning resources and strategies we have used have developed:

Appendix 7 numbers	Appendix contents
A 1 - 18	Adapted resources (including workbooks, assessments, collated data, feedback and analysis)
B 1 - 5	Digital Tools (including online classrooms, tech enhanced questions and Jamboard)
C 1 - 4	Mastering online maths delivery
D 1 - 9	Synchronous and asynchronous learning
E 1 - 6	Rubrics

At the beginning of the project, we had an ideal of what 'teacher-led learning' entailed and what 'learner-led flipped digital learning' would involve.

Teacher-led learning (A3) is essentially what happens in an average GCSE maths class. A teacher lectures from the front on the class, presenting a variety of topics at their discretion. Learners have access to a paper workbook. The teacher might wander around checking learners' work and possibly go through some model answers on the board. The lesson may then include a plenary exercise or assessment at the end of the lesson.

Learner-led flipped digital learning (A4) is the opposite in many regards; it is somewhat asynchronous but always occurs with a teacher present. The teacher informs learners where to locate resources and then can spend the rest of the lesson supporting and working preventively. Learners take the lead on their learning, dictating the speed (timeframe suggestions are provided) and order and are also given some freedoms on work presentation. Tutoring can be identified via videos and slides. Answers are often located digitally, sometimes timed, so the teacher can spend time really focusing on either stretching some learners' knowledge or spending that bit more time those who are struggling. Whilst often heavily structured, the learner-led element comes from learners not having everything directly presented in a lecture to them and instead independence is encouraged. Towards the end of a session, the teacher would then have learners take an assessment (Nouri, 2016).

At first, we used learner sets (that are split by previous GCSE maths grade and vocational area) and embedded differing teaching and learning techniques to see what was most effective in our lessons. For example, one group had a standard

teacher-led maths lesson whilst another group completed the exact same work but with resources digitalised. The group that had the resources digitalised worked via a laptop in a more learner-led digital approach (A1). Both groups then completed the same assessment upon completion of learning (A2).

Later in the year, especially when moving to remote learning, we switched to almost all learners having a teacher-led digital lesson. When appropriate, these sessions became learner-led for particular topics. This developing pedagogy did alter our feedback focus too, and all the allocated weeks are detailed further in the appendices (D1-3).

One word of warning I would offer for those who are intending to take part in a similar project, do be careful about the initial week when you introduce new technology. You will read further ahead about an issue I had at the start of the project. Start simpler than you might first intend and slowly build fluency.

Assessment

We focused on both summative and formative assessment (A5 and A6), to help evidence the research outcomes. This focus would enable us to see if the interventions we had made helped the learners to make progress in their maths learning. The plan has always been flexible, so if a particular group simply cannot perform with a learner-led approach, we switched instead to a teacher-led lesson and left the learner-led approach for another time or used it with another group. The learner-led groups comprised 6 sample sets throughout the year to ensure that the learning was not disrupted nor were learners put at any form of disadvantage.

At the end of the class, both groups (teacher-led and learner-led) used the same online Google Form assessment to assess their progress in that lesson's topic (D1/ D2/ D3/ A7). The data we required was recorded via online self-marking assessments in order to compare who scored better out of the teacher-led group and the learner-led group. I populated the data onto formula-prepared spreadsheets (Appendix 7, A8).

Through Google Forms analytics (A9), we could instantly produce the data on these assessment results (A10/ A11/ D4). Whilst this data is subjective and many variables were at play, it gave an initial indication of differing levels of progress using the teacher-led or learner-led approaches. However, it is the learner and teacher feedback, which was the most important aspect throughout the action research project (A12/ A13).

Feedback

Gathering feedback from small focus groups of learners and teachers was imperative to decide how we could best adapt the assessment process for the following session. (A14/ A15). All learners involved completed a survey (A16/ A17/A 18) asking what they personally felt worked or did not work for them. The feedback from learners and staff was of vital importance to this research and is how we will truly have gauged what parts of the teacher-led and learner-led approach worked for our learners. I have also conducted class discussions where appropriate.

Example

An important feedback topic that came up with most of the class was how I had instructed the learners to answer questions. When planning new digital approaches, we discovered that we had to be careful that the pressure placed on learners' digital skills did not detract from the maths that we were ultimately trying to teach them.

To keep the integrity of the work document in place, I asked learners to answer questions via the comment feature instead of writing all over the document. This is often used in workplaces and industries. It keeps the document tidy and is easy for the teacher to see what has been answered.

This process proved to be rather advanced for most learners and required higher levels of computer skills than I envisaged learners needing. Whilst some learners were able to understand this practice and therefore improve their digital skills, the focus of the lesson had moved away from maths and heavily onto IT. Therefore, we adapted the original resources to suit the needs of the learners for the following sessions and an example of this refinement is shown below.

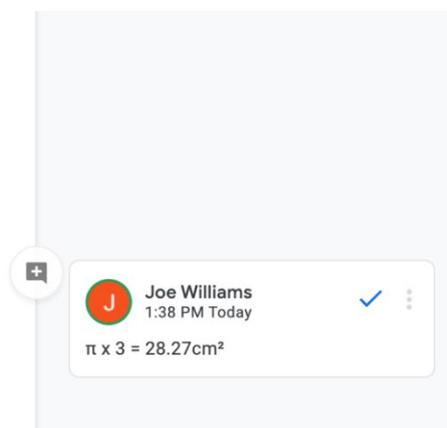
First attempt with learners:

By using the comments feature, the integrity of the page stays the same in the live document. If a learner uses 20 lines 200 words to answer a question, all of the questions will be kept on the same page and place as they were previously.

A mobile phone mast has a range of 3km.



Calculate the area of the shaded region.
Give your answer to 2 decimal places.



The group struggled with this. Therefore, we listened to their advice and used the format below going forward:

A circular fishpond has radius 2.5m

Calculate the area of the fishpond.
Include units for your answer.

AMBER

Please show your workings in the box to the right	$\pi r^2 = \pi \times 2.5^2$
Please show your answer in the box to the right	19.6m ²

Learners now had a dedicated place to demonstrate working out and answer the question, in a similar vein to most exam questions. Teachers still continue to use the comment feature for marking work, assessing and providing feedback.

Another benefit of this approach is that it seems that learners who have had a digital action research lesson, seem to be better at answering the questions in the correct format, for example by using specialist maths symbols such as ² and ÷. Overall scores for topics that might be easier on paper than digital, such as angles and linear graphs, have been lower in comparison to topics that typically work well digitally, like ratio and percentages. This is only an 8% difference than the average across the whole cohort, so not a vast difference. However, our scores for learners taking part in the project have generally been higher than those but this may be due to the groups we had chosen to take part. However, there is no denying that it is interesting and yet another reason for why we will push for even more digitally-focussed provision next year.

Professional learning: Evidence of changes in teaching, learning and assessment practices

Firstly, the feedback we received from learners has been extremely detailed, well balanced and incredibly useful. I will admit that I was not particularly convinced that we would get much honest feedback from most of our learners based on my previous experiences working with them.

Our engaged and motivated learners were likely to support the project. Many of our learners dislike maths lessons however, due to being forced to be retake the course, and so I thought these learners would offer little or no feedback. We have completed surveys before, from asking about how learners would prefer the lesson structure, to

asking if learners want to have revision classes, but as a department we had never tried asking for opinions on resources and delivery.

What we have received has both humbled and inspired us. Here are a few of the quotes we received:

"It is great that the college want to get better, to help us to get better".

"The stuff we did today (taking part in the project) made me feel like I'm involved in something that will make me actually get a grade 4".

"I've never felt so good at using computers".

"It has made me realise that I can use my phone to revise as I don't have a computer at home".

We have placed additional quotes and feedback from the team in Appendix 4.

Some of the most useful and, subjectively, most important feedback, has come from learners who do not participate much in lessons, Due to the project, we now know why. From this feedback, we have so far implemented the following changes:

1. We have become more mindful that the pressure placed on learners' digital skills must not detract from the maths that we were ultimately trying to teach them. At the same time, we have capitalised on the finding that the learners answering questions online seem better at answering questions in the correct format, using specialist maths symbols.
2. The paper and digital workbooks have been designed differently, so learners can edit their digital work in a more natural and simple way, including providing a dedicated space to demonstrate working out. This is a template we now use for all physical and online workbooks. This refinement became vital during lockdown's remote learning. 89% of learners asked agreed that the new layout was better. On questioning one of the learners involved in the case study on which type of format of workbook that he preferred, he gave the following feedback:

"It is better that I know where to write now as before it was messy.

I like when work looks tidy, it makes me want to try harder" - IB. (D5/ D6/ D7)

3. Our weekly exit ticket assessments that used to be taken at the end of lessons were designed to test learners' knowledge on all of the topics taught in that lesson (D8). We now do mini assessments (topic tickets), at the end of each topic being taught, then move on to the next topic before a further topic ticket and repeat (D9). This break-up in assessment has helped engagement

and learners generally prefer this method (69%). Staff have also agreed that this is more suitable for our demographic.

4. When completing a project session, we started to teach the independent part of the lesson in small segments (30 minutes), rather than a large portion (1 hour 20 minutes). This was to keep up motivation, as most classes didn't like being left to their own devices for long periods (57%). Teachers also noticed motivation drop after the 40-minute mark. Commonly, learners enjoyed working independently across the whole cohort (73%). However, learners felt that a flipped learning session of longer than an hour was undesirable. We found that many adult learners (21+ years) did not appreciate independent parts of the lessons, whether half an hour or more (54%).
5. Learners like using technology and tell us that they see the advantages of being confident with its use. They found challenging topics difficult whether they were using digital mediums or not but felt they performed better using a computer. However, the adult group, more than any other, appreciated the independent aspect the least. This may well be because of their level of maths comprehension (a lower grade than previous groups). In teaching, we know that, generally, those learners who are of a lower ability will struggle to work independently. I now have some quantifiable evidence. These learners scored, on average, 27% lower than usual in their assessment when learning independently. This could be because of the topics that came up or because the digital aspects of their learning, but many in the group (50%) made clear that they do not wish to have an independent session again.
6. We have had a large amount of positive survey results in regard to both digital learning and independent studying. The following percentages are for surveys given to all areas of the cohort, throughout the year.
 - Learners generally feel their technical skills have improved because of the project (71%).
 - 67% felt that their ability to use technology within maths increased over the year due to taking part.
 - 65% felt like they are more likely to independently try to revise at home from now on and 69% are likely to do so via digital mediums.
 - 74% agreed that they are now more confident in using software related to maths to revise.
 - 71% said that they have to be skilled in digital areas in order to flourish in their futures (up from 48% in the first term).

Secondly, the other aspect of the research that we are proudest of is the increasing ability in technical skills, not just with respect to the learners but also regarding staff engaging in digital resource making. This upskilling could not have come at a better time, due to a series of national lockdowns.

A member of the team said:

“While I have generally felt a level of comfortability with technology, I feel that this year has opened my eyes to how digital resources can be so beneficial in streamlining our usual processes and opening doors for more collaborative working.

In recent circumstances, where we all have had to adapt our approaches, experimentation with technology has also taught me how online digital means can provide students with access to learning outside of the standard classroom environment and helped me gain a more flexible mindset to delivering the subject.”

The last academic year, our teaching team were teaching remotely for about 9 months. Both the main curriculum (for remote learning) and the project has involved the learners using digital resources, which in turn means the teaching team has had to use and adapt resources. While our teaching team are open to new ideas, some of the staff have not always been confident in their own digital skills.

We have now seen colleagues use Google Classroom for the first time, to great effect. We have also witnessed new staff develop and create digital workbooks for the learners to use, which are improving all the time in terms of presentation and adaptability. This has all accumulated confidence with digital teaching and learning. Further quotes can be seen in the Appendix 7 (B1/ B2).

Due to having to use the same programs that the learners are using in order to teach the specification, the team have embraced this and advanced their own knowledge on how these systems work. The feedback we received from the learners has not only helped us with the project but has also helped us to prepare our remote learning package. Our team now know how best to make resources to suit online delivery.

Staff have, for the first time:

- Made live question Google Doc workbooks (B3)
- Created assessments on Google Forms and Jamboards (via iPads) (B4)
- Opened their teaching practice, to try new things on Mathwhiteboard, Dr. Frost and Mathsbot.
- Learned how to utilise a new marking tool, the Googledocs ‘Rubric’ (Google, 2021)

These developments will ensure that we improve our best practice and will lead to the team becoming stronger, with the learners rightly benefiting.

A statement from the deputy project lead:

"You could say I entered into the digital revolution that we now find ourselves in by dragging my heels. I was not the most enthusiastic advocate for the use of technology, when let's face it the exam is on paper!

Through participating in the OTLA 7 action research project my confidence has grown tremendously. I have completed some truly wonderful CPD with the ETF and I cannot thank the OTLA enough for all the support they have given me and the team.

Being a part of the project has allowed me to focus and develop digital learning in a way that I would not have done without the project. The action research has enabled me to be a part of the digital journey and I feel that I have; with the learners, participated in this adventure together. The opportunities to reflect and hear feedback from learners has opened up a different approach and is something which has been incredibly valuable not just to myself but the team as a whole.

I now feel confident to try new approaches and embed digital learning to enhance maths lessons rather than feel that it is something which I would try and fit in at the end of the lesson.

I am truly humbled and amazed by not only the learner's openness and adaptability to new approaches, but also the team as a whole. Joe has led the project in such a way that we have all felt part of it and has brought us a team closer together.

I am now looking forward to our next steps and continuing the great work that the project has enabled us to achieve."

If we did not have the rich feedback from the learners, this development would not have happened and the year definitely would not have been as seamless and successful as it has been. We feel the project has helped the team really listen to our learners.

We truly feel that engaging learners and staff on the project has raised expectations all round. Having the learners appreciate and understand that we are trying to improve our best practice in order to help them and knowing we need their assistance, gives the course a specialist and nurturing aspect. It has also helped us realise exactly what the learners can actually achieve.

Another important factor was a realisation of learners' appreciation of how we want to improve, in order to help them develop. This process is now becoming a mastery, as we look to become excellent at this practice. We are always looking to provide the department with a prestigious and high-status appeal.

We have now been asked if we could let other colleges come and see how we organise our online and digital practice, including our research project. We have presented our methods and findings to networking events for a number of years now and been asked to present again. This work is boosting our teams' confidence, tremendously.

Evidence of improved collaboration and changes in organisational practices

Due to our successes, confidence has risen fantastically in the team, especially in regard to digital ability and perseverance to try new things. One great example of this was the team adopting a new digital semi self-marking tool, the Googledocs Rubric.

Due to remote learning, we needed to find a way of assessing the learners' ability on a group of topics at the end of half term two. One of the staff members, who has not had a particularly large role in the project, went ahead and discovered the required software. This included learning how to use it, trialling it and then us using it with our entire cohort. Rubric makes marking on a computer very quick and efficient (E1/ E2/ E3). This worked really well and we will use it in the future for at least one assessment if not more per year. I believe that this would not have happened if we had not been so successful with embedding the research feedback and ideas. Once sureness and buoyancy takes hold, a person is more likely to experiment and have the willpower to succeed.

In the past, it was often only me introducing new technology from within the team. Witnessing experienced staff members now also having an increased confidence to experiment, has been an exceptional experience. Watching experienced staff members become experts in teaching with an iPad, using Jamboard and happily moving to using the Google suite, has been a brilliant experience. The fact that some staff may have been reluctant in using such applications previously only makes the development in their practice more meaningful (Ghurbhuran, 2020).

Evidence of improvement in learners' achievements, retention and progression

We decided which learners we would track in the first term.

I chose a male learner (IB) and female learner (DE). IB was at the College last year whilst DE was a new learner to the College last September. We struggled at times to follow DE throughout the year, as her attendance became an issue. Fortunately, we still managed to gather a reasonable amount of data and feedback from both learners.

IB came to the College in 2019, with a special educational needs background. IB originally achieved a Grade 1 at school, sitting an exam in summer 2019. IB had a fantastic academic year at the College last year. He came to us from a specialist school and has various learning needs. He is extremely hard working and most importantly for the project, very approachable and open to giving feedback. When we performed a survey in the past, he offered meaningful suggestions. IB struggles with using technology so is therefore a learner who I knew would provide much useful qualitative feedback. IB improved to a Grade 3 with last academic year's predicted grades. He also achieved a Grade 3 on the November re-sit. After another impressive year, we are hoping he achieves the elusive Grade 4.

DE was always going to be a particularly interesting learner to engage in a case study, due to having a very unfavourable experience with maths at school. She recalled many instances when she had been let down in terms of tuition. Fortunately, she has really enjoyed her time in maths at the College. DE became more and more confident throughout the year, to the point where she was happy to demonstrate her

methods to the class. She is also open to giving feedback. DE found remote learning difficult during the previous lockdown, so as with IB, she provided a real test for how adaptive our digital provision was. DE received a Grade 3 in last year's centre assessed grades.

It has been an overwhelmingly encouraging involvement for both and we predict that both learners will progress/achieve this year.

IB has had an incredible year. It is wonderful to see a learner from an educational needs background develop so rapidly. He once struggled with using technology and would actively try to find alternative solutions to having use it but is now asking, while in lesson, if he can revise on a computer. This has been excellent to observe.

DE struggled throughout the year for various reasons, so we missed many opportunities to gather feedback. However, her willingness and perseverance to work independently, using College videos and Century, is more than I could have asked for. She is a learner who once said, "doing maths on a computer is pointless". We have seen a nervous learner who could not complete a worksheet without asking for help grow into a confident learner who will happily catch up on missed work at home. This is the exact kind of scenario and outcome we were hoping for at the beginning of the project.

I have included fuller evidence and scope in the appendices (Appendix 4) for both of these learners, including outcomes and improvements.

Another element we are particularly proud of is the attendance of the main cohort. This includes both progress when going remote and when learners returned to college for face-to-face teaching. Our remote learning package provided by the department was both structured and purposeful. This, in no small part, is because of the action research project and learner feedback received. We strived to produce quality online lessons. Having members of the team with digital backgrounds made it work all the better. As we were able to keep our teaching and learning engaging throughout the lockdowns, our attendance upon returning face-to-face was surprisingly good. In comparison to other courses at the college, we are proud of how many learners attended since returning to college for face-to-face lessons.

Throughout the year, it has been interesting analysing how the data has developed and changed. For example, at the beginning of the year, a particular class felt that the digital parts of the lesson meant that overall; they did not perform as well as normal (72%). However, the same class were asked the same question near the end of the year (post another lockdown) and the result was completely different (20%). This kind of development in perception of technology was a common theme. When we asked a different class after their first flipped learning digital lesson whether they felt that they are more or less likely to try a lesson like this again, only 54% said yes. When asked again later in the year, the same class answered 85% 'yes'. The department, as well as the project, clearly had proved its worth in creating a better digital learning environment.

Learning from this project

Staff confidence, cohesion and adaptability

We now have a more confident team in terms of their digital skills as well as personal willpower to try out innovative pedagogical methods. Embedding the perseverance to grow with the learners and adapt new techniques has been an emerging theme from this year. I find that the newer members of the team have developed fresh confidence in their ability and are happier to go ahead with their own decisions, from picking out differentiated tasks to creating shared presentation resources.

Some of the more senior staff members, who may have not been comfortable with their own technical abilities, have now developed to the point where they are willingly trying new software then introduce it to the team. The project, with the pandemic impetus, has helped the team develop and become more determined to move even more towards being a digitally specialist area.

It isn't only staff who have improved with confidence towards using digital means and methods. We have seen some great examples of our project having a positive effect on learners' perception towards digital learning. Since returning to face-to-face classes, most of the team have had multiple learners opt to use a laptop for class revision, which would have been an utmost rarity in the past.

- 81% of the learners asked said they are more likely to use technology to learn independently in lessons from now on.
- 63% said they are more likely to want to use technology in ALL lessons (including vocational).
- Learners have become happier to use Century (71% said they found it useful for learning how to use fractions) in comparison to a few years ago, when a majority of learners disliked using Century.

In conclusion, our mix of digital mediums/ methods to sit alongside the traditional approaches (that we now know work with our demographic), has resulted in one of the most positive experiences the department has had in many years. The success is all the more notable due to the fact that it has also been a year of a global pandemic. We are extremely proud of what we have achieved.

References

Dowker, A., Sarkar, A., & Looi, C. Y. (2016) *Mathematics Anxiety: What Have We Learned in 60 Years?* *Frontiers in psychology*, 7, 508. Retrieved on 30/06/2021 <<https://doi.org/10.3389/fpsyg.2016.00508>>

Ghurbhurun, R. (2020) *If we don't upskill teachers in digital skills, learners will suffer.* *Jisc*. Retrieved on 30/06/2021 <https://www.jisc.ac.uk/blog/if-we-dont-upskill-teachers-in-digital-skills-learners-will-suffer-30-nov-2020>

Google (2021) *Create a Rubric using Googledocs.* Google. Retrieved on 06/07/2021 <<https://sites.google.com/a/mail.brandman.edu/edsu-533-classroom-tutorial/create-a-rubric-using-google-docs>>

Nouri, J. (2016) *The flipped classroom: for active, effective and increased learning – especially for low achievers.* *International Journal of Educational Technology in Higher Education* 13, 33. Retrieved on 30/06/2021 <http://educationaltechnologyjournal.springeropen.com/articles/10.1186/s41239-016-0032-z>

Appendix 1 – The project team

Project Role	Name	Job Role
Project Lead	Joe Wydrzynski	GCSE Maths Lecturer
Deputy Lead	Sophie George	Course Director of GCSE maths
Project team	Tom Digweed	GCSE Maths Lecturer
	Dan Digweed	GCSE Maths Lecturer
	Caroline Fosbury	GCSE Maths Lecturer
	Tessy Manoj	GCSE Maths Lecturer
Project Mentor	Lynne Taylerson (ccConsultancy)	
Research Group Lead	Gail Lydon (ccConsultancy)	

Appendix 2 – Background information about the region

Basingstoke statistics for socioeconomic diversity:

<https://www.ilivehere.co.uk/statistics-basingstoke-hampshire-2678.html>

Appendix 3 – Topics and adapted resources

Action Research designated topics, resources adapted for digital use and dates:

1. Angles and Proportion

Workbook Doc

Digital - 1st Action Research Learner Survey for GCSE maths via Google Form

28th September 2020 – 2nd October 2020

2. Interior/Exterior Angles and Ratio

Presentation Slide

Workbook Doc

Digital - 2nd Action Research Learner Survey for GCSE maths via Google Form

5th October 2020 - 9th October 2020

3. BIDMAS & Sequences

Presentation Slide

Digital - 3rd Action Research Learner Survey for GCSE maths via Google Form

12th October 2020 – 16th October 2020

4. Substitution, Coordinates & Linear Graphs

Presentation Slide

Workbook Doc

Digital - 4th Action Research Learner Survey for GCSE maths via Google Form

19th October 2020 – 23rd October 2020

5. Percentages & Expanding Single/Double Brackets

Presentation Slide

Workbook Doc

Digital - 5th Action Research Learner Survey for GCSE maths via Google Form

2nd November 2020 – 6th November 2020

From this point onwards, due to going into a further lockdown, we couldn't continue with having some learners have a conventional class, as we couldn't continue with face to face teaching. Therefore, we changed tactic. Instead, on some weeks, all learners would take part in the digital flipped learning approach. Some other weeks, simply one class would have an independent focused lessons and in those weeks, I would then compare the average results of the class, compared to the rest of the cohort. This change in strategy helped us keep gaining invaluable data and collating instrumental feedback. As with other changes we had to make because of the pandemic, it actually ended up aiding the project.

6. Frequency trees, Probability & Recap of Solve

Presentation Slide

Workbook Doc

Whole cohort Learner Survey via Google Form

18th January 2021 – 22nd January 2021

7. Probability Trees and Estimation

Presentation Slide

Workbook Doc

H4 class Learner Survey via Google Form

24th January 2021 – 30th January 2021

8. Significant Figures & Standard Form

Presentation Slide

Workbook Doc

J4 class Learner Survey via Google Form

1st March 2021 – 5th March 2021

9. Exam question practice

Presentation Slide

Workbook Doc

E4 class Learner Survey via Google Form

8th March 2021 – 12th March 2021

10. Problem Solving

Presentation Slide

Workbook Doc

Whole cohort Learner Survey via Google Form

15th March 2021 – 19th March 2021

Appendix 4 - Case studies (learner journey), data and feedback

Learner journey feedback

An example of how we gathered the feedback for the two learners that we used in the case study.

Week 1:

Feedback from learner: IB

“Working out is easier on paper. PowerPoint is good for independent work due to not waiting for the teacher to answer.

Find working online good but don't like the Chromebooks (at the college)

Liked being left to study at my own pace.

When retyping the working out, helped me get my head around it better than writing”

“It was helpful meeting at the end of the session when I had a one to one (with my teacher)”.

Scored 74% in his exit ticket when part of the topics was taught digitally.

Scored 60% in his exit ticket when all the topics were taught conventionally.

Lead analysis:

We did start to adapt our online workbooks to make it easier for learners to provide working out within the Google Doc. I tried to use Jamboard as a tool for learners to sketch and write working out on, including use of iPads (B5). However, this was an overload of new equipment and software. I decided to slowly start to embed technology as this particular learner (and group), whilst willing to try new tools, were not confident.

Week 2:

Feedback from learner: DE

“Prefer to work on maths on paper. I did like having the instructions and questions on the computer but didn't like how we showed working out. I prefer the newer way of showing working out (compared to last time). Is easier. Don't like working on my own. It's better when the teacher shows what to do”

Didn't like that work was set in different ways.

Did appreciate the one to one at the end of the session.

Scored 59% in her exit ticket when part of the topics was taught digitally.

Scored 60% in his exit ticket when all the topics were taught conventionally.

Lead analysis:

Whilst a different learner to the previous feedback, it is still promising to see a learner notice and appreciate the changes, I made to the digital workbook (C1). I then developed the template of workbooks again, using a different theme and style. With a big emphasis on space and simplicity (C2)

Week 3:

Feedback from learner: IB

Preferred (the adapted resources) this week. Liked knowing where to answer questions.

Found some of the topics hard to do independently so had to ask the teacher for parts of the lesson.

Scored 71% in his exit ticket when part of the topics was taught digitally.

Scored 63% in his exit ticket when all the topics were taught conventionally.

Feedback from learner: DE

Learner found it easier to work this week on the Doc.

Felt knowledge of how to use 'the' Google 'package' has improved.

Scored 30% in her exit ticket when part of the topics was taught digitally.

Scored 18% in his exit ticket when all the topics were taught conventionally.

Lead analysis:

I was pleased that both learners stated about ease of use of the workbook. Particularly good to see learners feel that through taking part in the project; it has increased their ability in using the Google package.

Week 6:

Feedback from learner: IB

Learner did not have access to a laptop so had to use a phone from home. Learner found this troublesome. Learner enjoyed how we incorporated use of Century (particularly difficult on the phone) and online games such as Kahoot, into a remote lesson. However, learner did find that using a phone for the starter Jamboard activity easier than usual as using a touch screen was more precise to write/draw in comparison a mouse or touch pad.

Found some of the topics hard to do independently so had to ask the teacher for parts of the lesson.

Feedback from learner: DE

Learner stated it was easier to work this week on the Doc. "I like it (layout) and how it is similar to before but also better".

Learner felt knowledge of how to use 'the' Google 'package' has improved.

Learner likes the one to one sessions that we offer at the end of the lesson.

Action Research class with specially designed resources - Scored 77% on the exit ticket.

Rest of cohort - Scored 60% on the exit ticket.

Lead analysis:

We knew that the applications we use in remote lessons were better suited to a computer device rather than a phone/tablet. Various learners had mentioned this before. We have tested it on our own mobile devices to see how the functions differ. However, depending on which style of phone a person uses, whether apps have been downloaded from an e-store or if a learner has access to a stable WIFI connection, are all varying factors to someone's online learning experience. I spoke to IB at the time and asked if he had downloaded any apps for Docs, Jamboard, etc. He had not. I suggested downloading all the apps that we may use in a future lesson. He later said Docs was much better in the app compared to website. On the mobile website, learners could not translate shapes, however on the app; it lets you move the shapes. We were wary of learners' socioeconomic backgrounds, including how this might affect their experiences online. The college lent hundreds of Chromebooks to learners. However, not every learner was able to get one.

Week 7:

IB:

"I found probability really hard. I have not learnt it before (in such detail). It was hard to learn from reading Joe's presentation or watching his video, as I had questions I wanted answered before moving on. Like how he decided the denominator on the two dice question. I remembered that I could still ask Joe (during the independent part of the lesson). I messaged him on Google Hangouts and he got back to me straight away. I also found it tough the use the computer to answer questions on inequalities. It was hard to edit the image to move the circle to the right points on the number line."

"I like that everything is organized and I can find my work but what I think really helps is when I talk to my teacher one to one."

Action Research class with specially designed resources - Scored 43% on the exit ticket.

Rest of cohort - Scored 51% on the exit ticket.

Lead analysis:

We do try to encourage learners to work as independently as possible during flipped learning parts of the lesson. Some hardworking learners, such as IB, often try to figure things out for themselves, a value I try to encourage with all my learners. Unfortunately, sometimes that perseverance can become stubbornness. Therefore, we just need to ensure that we remind learners that they can still ask for help whilst working independently. The way the questions in regards to inequalities were devised, was done to the best of our ability. However, it was rather fiddly to work with and learners, who struggle to use computers or do not have fine motor skills, can find this task troublesome. In a similar vein to when learners struggle with protractors and compasses.

IB also mentioned how much he values the one to one time that we provide learners with at the end of sessions.

Week 8:

IB:

"I liked using the computer for standard form. As the questions were set out well and made it straight forward to work out how many spaces to move the point. Having the questions bigger and being able to zoom in and out also makes it good to have on the computer. I know Joe (sometimes) finds it hard to read my (hand) writing so this has stopped that problem. Standard form should always be (taught) like this.

I thought the videos that Joe made were good. I would like if they were there every lesson. I have always found algebra hard and being able to rewind bits I found hard was good. I do not like stopping a teacher talking so this helped me a lot. They were made really well".

Action Research class with specially designed resources - Scored 83% on the exit ticket.

Rest of cohort - Scored 49% on the exit ticket.

Lead analysis:

As IB mentioned, he has struggled in the past to keep his work tidy. Having the large or small decimal numbers in set tables and boxes, helped learners keep the standard form in order. Especially when counting on how many decimal places the decimal point has moved (C3/C4). In a similar vein to how the Singapore method (bar

modeling) has helped revolutionise how we teach ratio questions, this did it a lot easier for the whole class. Some learners 'got' standard form for the first time.

The next point that IB mentions is also incredibly valid. Working on computers often does help to increase equality and inclusivity. For example, a learner who has visual impairments, can increase the size, change colour and underline text. If a learner has hearing impairments, we can make sure videos have captions. A learner with physical limitations may also find working on a specially prepared computer much viable than that of a paper workbook.

In addition, the score on the exit ticket was extremely high as was the difference between this average and that of the mainstream. Therefore, we will defiantly teach it like this in the future.

Week 10:

IB:

"I like when Joe showed me how to use BUCKS. I found this usual for answering exam questions. Having the Slides easy to get to helps. I do not have to remember as much. I know keep the front page of the (online) book for writing notes. I copied down what BUCKS (what the acronym stood for) is. I got used to drawing on the shapes today. I can do this much neater than I can on paper. It was good to be able to draw shapes within the shape to help me work out the area."

DE:

"It made the lesson better when I was shown how to get to the PowerPoint. Being able to go back over stuff really helps. I do not get things very quickly so going back is great. The videos (that Joe showed last week) were great. I looked at them (out of lesson) and found that it helped me do some stuff I haven't done before (like factorising)."

Lead analysis:

It is wonderful to read that the learners are both supportive of the provision we offer and the resources we have created. Learners explaining how they themselves have also adapted the work to suit their needs and wants is also highly satisfactory. One great aspect with having an online curriculum is the advantage of learners being able to access their work at any time. DE mentions that she missed a class but caught up later, by watching the videos I made for the class, in her own time. The turbulent nature of the pandemic meant that some learners struggled to attend, but ensuring all resources are accessible, meant that learning always prevailed.

Case study conclusion:

The feedback from both learners is humbling to read. It is honest, detailed and grew in quality as the year went on. It is interesting to see that both learners struggled with accessing the work at the start of the year and how the end of the project, it is fantastic to see both have risen in confidence. This is in part to us adapting to the learners needs and in part, the learners adjusting to using online resources. It is inspiring to reread the feedback and see what a difference this year made to both learners. For this upskilling to come during a global pandemic, with those necessary skills that the learners will need for the future, only makes the success worthier.

Main cohort data and feedback

I am going to first detail some of the feedback we have received from the learners via surveys. We are going to look at feedback and assessment results from a technological perspective. As in from a digital aspect rather than the independent study side which I will detail afterwards.

Week 1 Survey results:

The group consisted of engineering and hairdresser learners. In total, the class contained 24 learners of almost three quarter female.

We asked these questions to a group in the first week of the project:

On a scale of 1-5 (1 being not at all and 5 being extremely important), how important for your future do you feel it is to be good at using technology?

Learners generally scored high with a mean average of 4.2/5 (84%).

On a scale of 1-5 (1 being not at all and 5 being very positive), how positive do you feel about using technology in maths?

Learners generally scored high with a mean average of 3.4/5 (68%).

At the end of the lesson, we asked this question:

Do you feel you performed better working digitally?

28.6% of learners felt that they worked better digitally.

Would you ever use technology to learn maths at home?

42.9% said yes.

Judging from how the learners answered the previous questions, it seems that either the learners were actually less able at using technology than they first thought or it was how we designed the content/resources that has made the learners feel otherwise.

Week 1 - Learner feedback and focus group:

Class contained 24 learners.

Learner 1 – (Technology) made me work slower because of the format of work. Can't edit the question.

Learner 2 - Found it easy. Happy to use computers in lessons as I do in my main course. I think it's good to be able to use computers for all different types of lessons as we will do stuff like this in our jobs.

Learner 3 - Prefer to work on maths on paper. I did like having the instructions and questions on the computer but didn't like how we showed working out.

Learner 4 - I found it much easier working on a laptop. I feel that it suited my working type. I did more questions than usual.

Learner 5 - Working out is easier on paper. PowerPoint is good for independent work due to not waiting for the teacher to answer.

Learner 6 - Chromebook not easy to use. Be better to have a proper laptop.

Learner 7 - Didn't like using the comment feature to answer questions.

General class comments:

Computers work well for learning but not for answering maths questions.

Liked being left to study at my own pace.

When retyping the working out, helped me get my head around it better.

Did not like that work was set in different ways to what we normally do.

Week 1 - What we have done to improve:

We have since adapted the Docs to make the format easier to work with and ensuring where to answer the questions is straightforward. We included a workout box and answer box on learners Docs.

We encourage learners to do their working out on paper if it helps. I have also shown the class how to use Jamboard for working out. We will see if learners adopt to using it.

Week 2 - Learner feedback and focus group:

Here are some quotes from the group:

“(Digital working) made me work slower because of the format of work. Can't edit the question” (this answer was in response to what the learner did not like about the lesson. I think he meant notes in his working out and he mentioned earlier about not being able to draw on a geometry question)”.

“(I) found it good. I would like to use computers in all maths lessons. I found it easy to keep things neat. It was nice not having to scribble things out.”

“Made me too slow as I can't use computers.”

“Like that we had all the work on one post. Meant I didn't have to find out what page we are on or doing the wrong questions again.”

Asking at the end of the session on learners' opinions, it was made clearer why learners changed their mind. One reason, as many made clear, it was because of the laptops we use in the college which the learners were not used to using (Chromebooks). The minimalistic, web-browser-based Chrome OS is a different experience from Windows and MacOS.

Week 2 What we have done to improve:

Other than what I mentioned previously on evolving on how we produce our workbooks for ease of use, another frequent comment was that learners felt they were slower working on the computer. I did remind learners that it is not about the speed of task completion but rather the quality of learning that takes place, i.e. making the learning memorable. To ensure that it was not a fault of the teacher, I went through in detail of best practice on how to complete the work. I had some of the more confident learners also demonstrate how they worked through the tasks, including hints and tips of using the software.

When planning new digital approaches, we discovered that we had to be careful that the pressure placed on learners' digital skills does not detract from the maths that you are ultimately trying to teach them.

Starting from this week, we tried a new set up of doing the AR part of the lesson after the break. Thus, students are comfortable in the class for the day. They would have been taught in the conventional manner for an hour and 20 minutes. We hope that this makes the independent part less monotonous. Also gives better reflection of both types of learning in one day so learners can make a better comparison as their comprehension will be higher. Although it took a few weeks to perfect the timings.

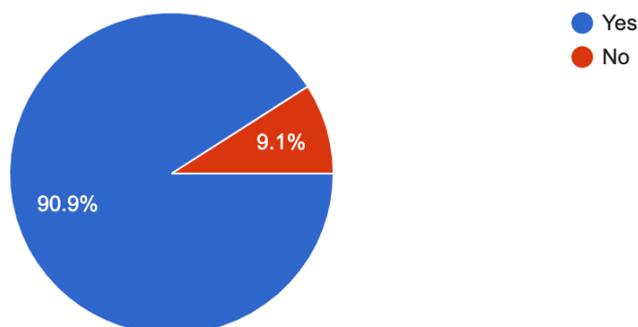
Week 3 Survey results:

For the next project session, we analysed the independent aspect of the project. This group consisted mainly of male construction learners. It is worth pointing out that this group really disliked using technology to answer maths questions. They complained to the teacher throughout the class about it.

We asked these questions to a group in the third week of the project:

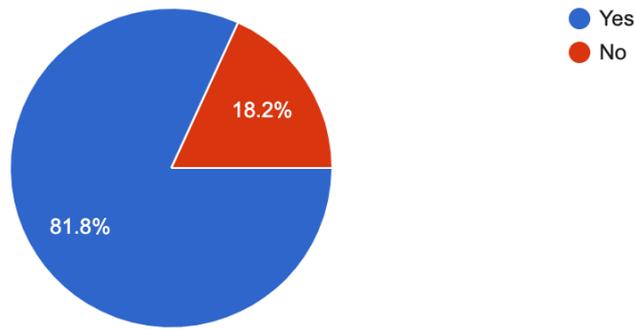
Do you feel you performed better working independently?

11 responses



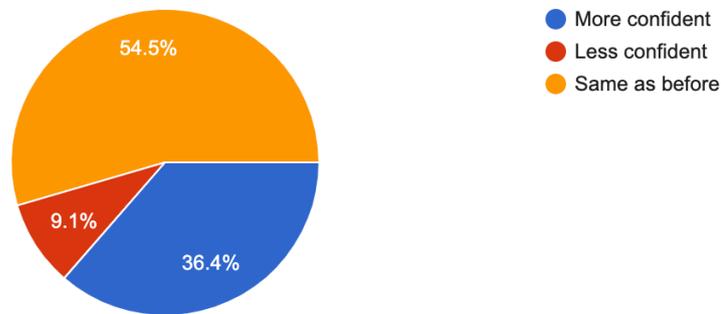
Do you feel that you would be more likely to try working independently from now on?

11 responses



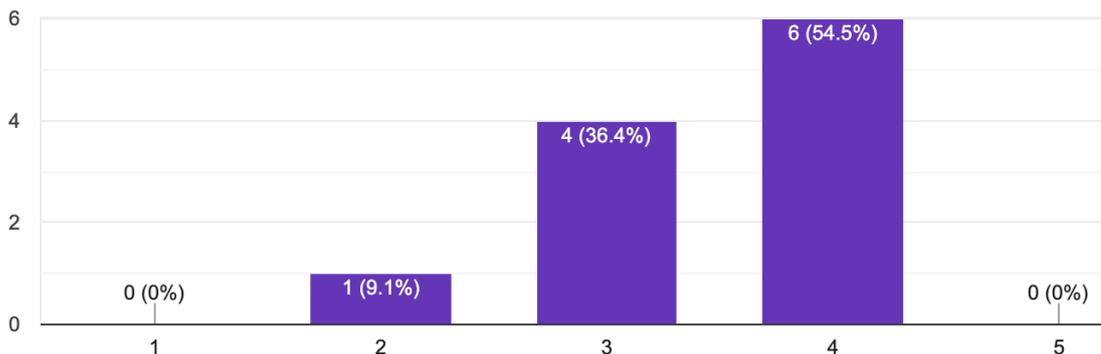
After today, would you feel confident revising independently?

11 responses



On a scale of 1-5 (1 being bad and 5 being great), how would you feel about doing a lesson like today again?

11 responses



Week 2 Summary:

Almost overwhelmingly, this group particularly (as have most), liked being left alone to work at their own pace through the work. Upon looking at whether it was successful, in terms of assessment from that particular lesson, we had mixed results. A learner who we have given a working grade of 4, completed very little work. He scored a 22% on one of the topics of lesson compared to an average of 63% in other weeks. However, others in the class scored higher than their average (2

learners) but most stayed around the same percentage. Showing that at least for this group and week, independent learning was enjoyed and desired in the future, although it showed little change in their assessment score. However, when comparing their overall score in comparison to the rest of the cohort, this group's average score was higher.

Week 3 Learner feedback and focus group:

We were not as able to generate as much feedback with this particular group. However, what we did receive was similar to the previous group.

“(We should ensure that we create a) better lay out of workbook”

“not sure how to use the workbook”

“book work better and easier to use”

We took this feedback on and adapted our workbook to be even easier to access. We are ensuring to give more detailed demonstrations on how to use the digital tools. Interestingly, we are seeing a correlation between certain vocational areas and ability to use digital means of learning but that is for another, future research project.

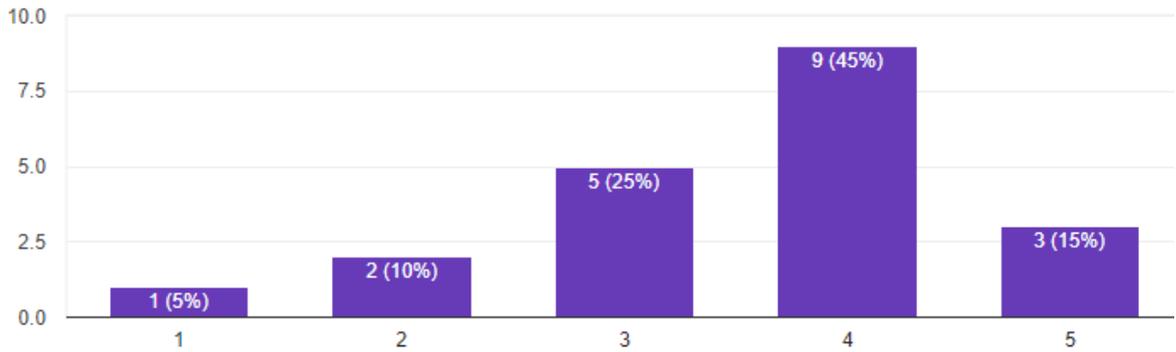
Week 4 Survey results:

This is our first week of having a properly mixed class. For example, the vocational areas are varied, including 6 different courses. The gender split is also 60% to 40%. The group contained 20 learners in total. Also for the first time, we chose to do the research with a Tier T class. Tier T stands for Tier two and three. As in that is the grade/s that the learners are hoping to progress too. The previous two weeks of action research have been Tier F classes, as they are aspiring for a grade four or five.

On a scale of 1-5 (1 being not at all and 5 being very positive), how positive do you feel about using technology in maths?

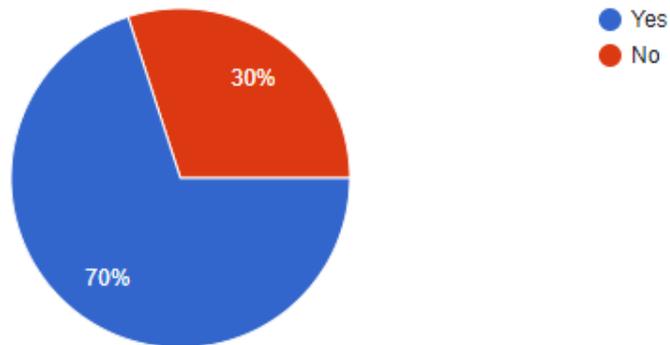


20 responses



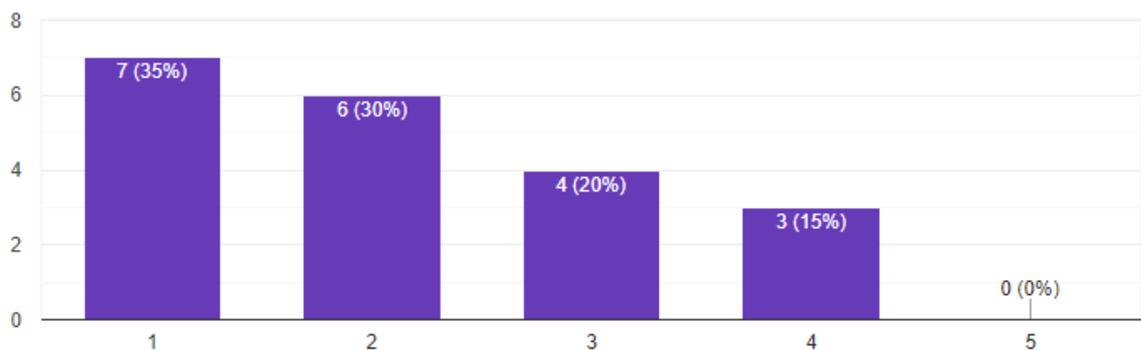
Do you feel you performed better working digitally?

20 responses



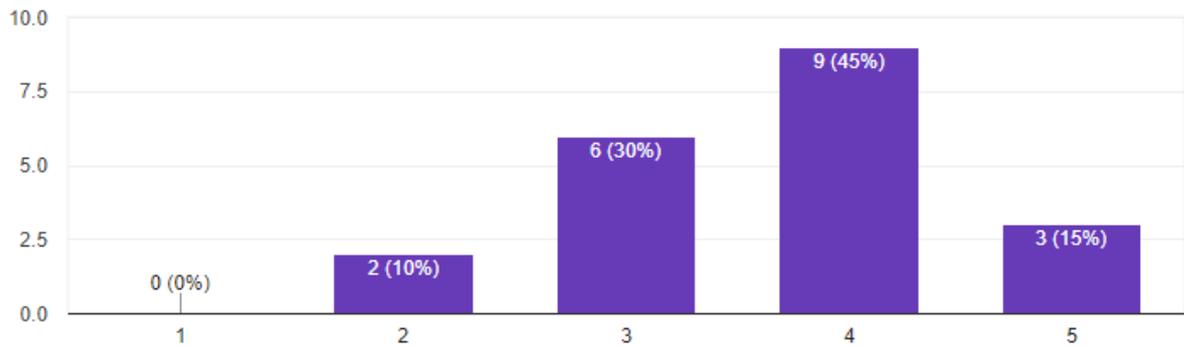
On a scale of 1-5 (1 being easy and 5 being very hard), how difficult did you personally find it using technology in maths today?

20 responses



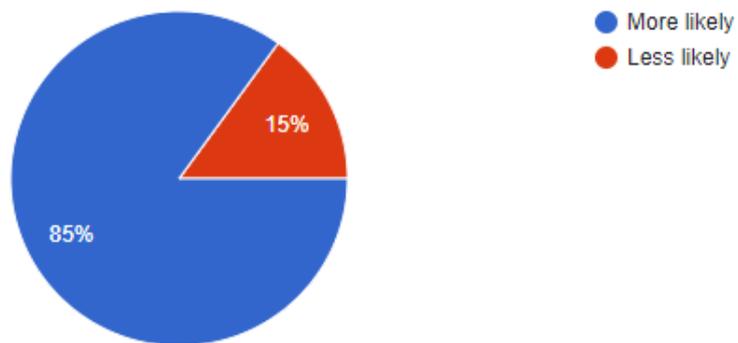
On a scale of 1-5 (1 being not at all and 5 being extremely important), how important for your future do you feel it is to be good at using technology?

20 responses



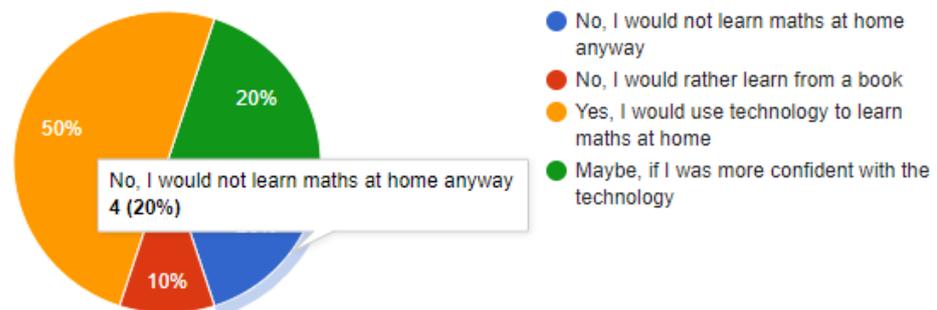
Do you think that you would be more likely or less likely to try and use technology for learning maths in the future?

20 responses



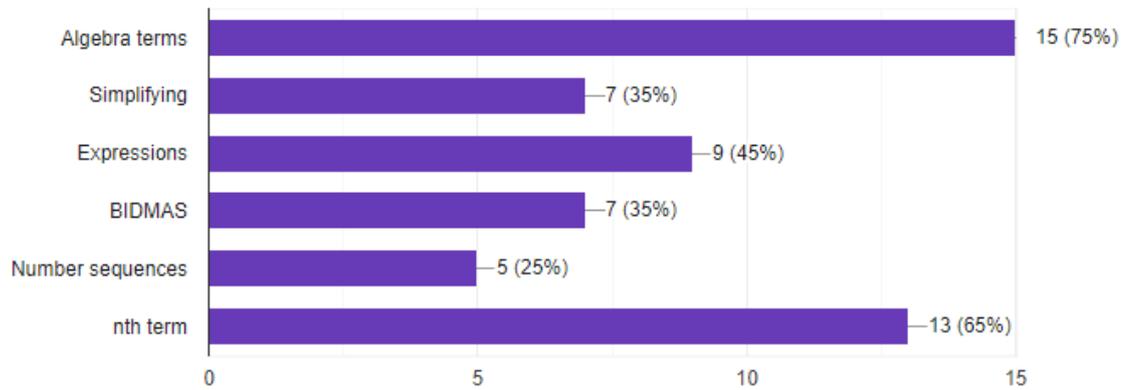
Would you ever use technology to learn maths at home?

20 responses



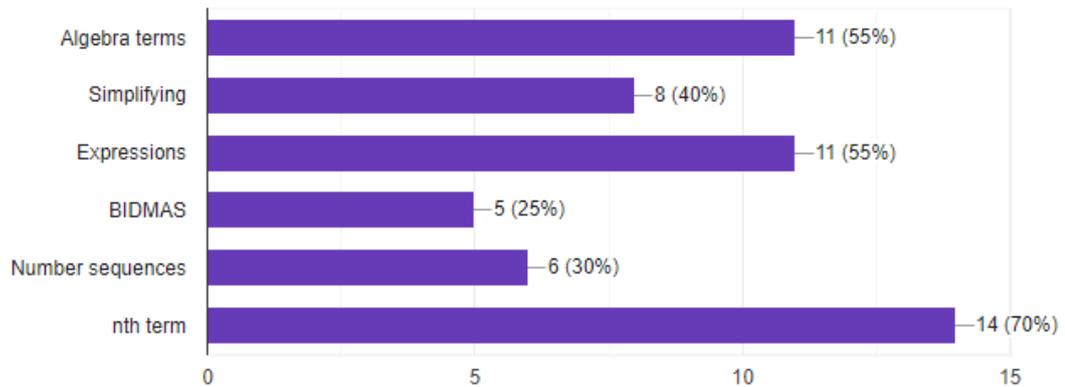
Tick the topic/s that you found generally difficult in maths today (you can tick as many as you need):

20 responses



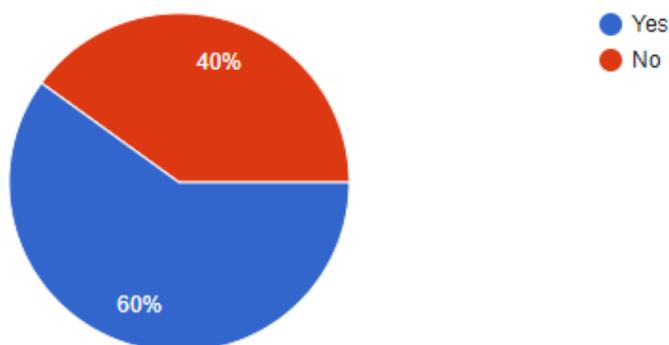
Tick the topic/s that you found difficult in maths today because of using technology (you can tick as many as you need):

20 responses



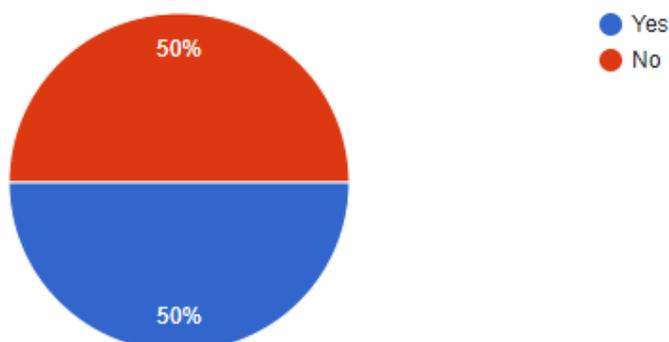
Do you feel you performed better working independently?

20 responses



Do you feel that you would be more likely to try working independently from now on?

20 responses



Week 4 Summary:

In summary, this class answered in a similar trend to the previous classes in regards to digital learning. They generally liked it, wanted to do it again, saw the advantages of being confident with technology, found the same topics difficult whether using digital mediums or not as well as they felt they performed better when using a computer. However, this group, more than any other large group yet, appreciated the independent aspect the least. This may well be because of their maths comprehension due a lower grade than the previous groups. In teaching, we know that, generally, those learners who are of a lower ability will struggle to work independently. I now have some quantifiable evidence. These learners scored, on average, 27% lower than usual in their assessment. This could be because of the topics that came up or the digital part of their learning but many in-group (50%) made clear that they do not wish to have an independent session again. However, that is just over a quarter difference in assessment score, when in comparison to the previous two weeks with the higher ability groups, when it was almost the same.

It proved to be better and more beneficial to these learners to only have part of the lesson digitalised. Doing so after the break seems to be best. This is due to the fact that learners are happier in taking part then (100% of learners asked said they preferred to work independently after the break rather than before the break) and our Exit ticket scores had risen when following this model (by 29%)

Schedule from now in an AR week (week 4 - week6):

Intro/Starter 20 mins

Topic 1 taught 15 mins

Workbook 15 mins

Topic 2 15 mins

Workbook 15 mins

Break 20 mins

AR topic 1 15 mins

AR topic 2 15 mins

Exit ticket 20 mins

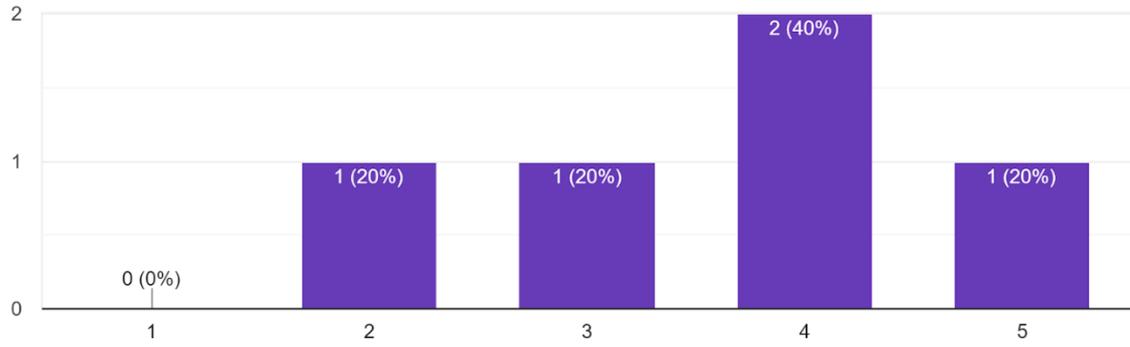
Learner survey 10 mins

Focus group 10 mins

Week 5 Survey results:

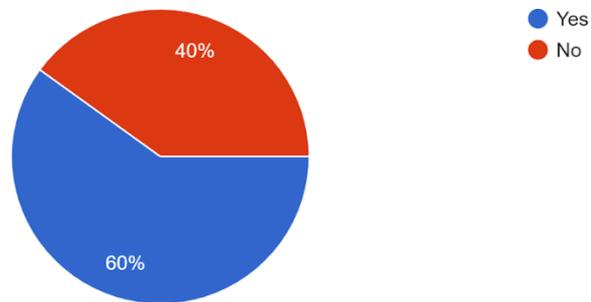
On a scale of 1-5 (1 being not at all and 5 being very positive), how positive do you feel about using technology in maths?

5 responses



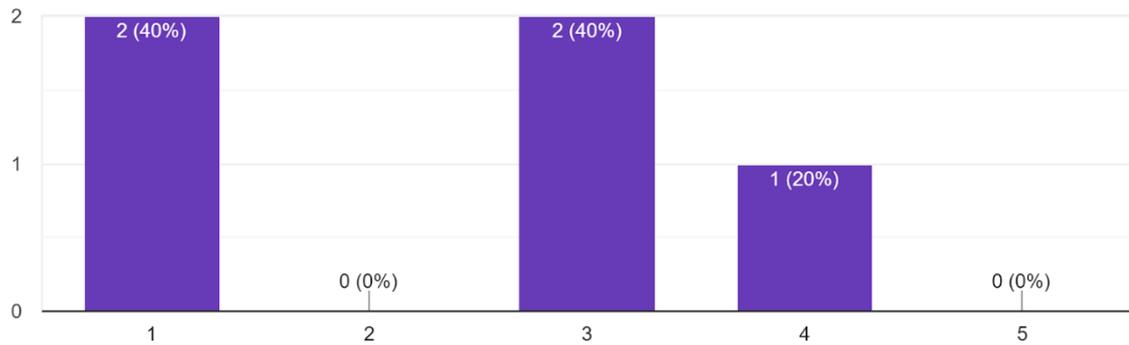
Do you feel you performed better working digitally?

5 responses



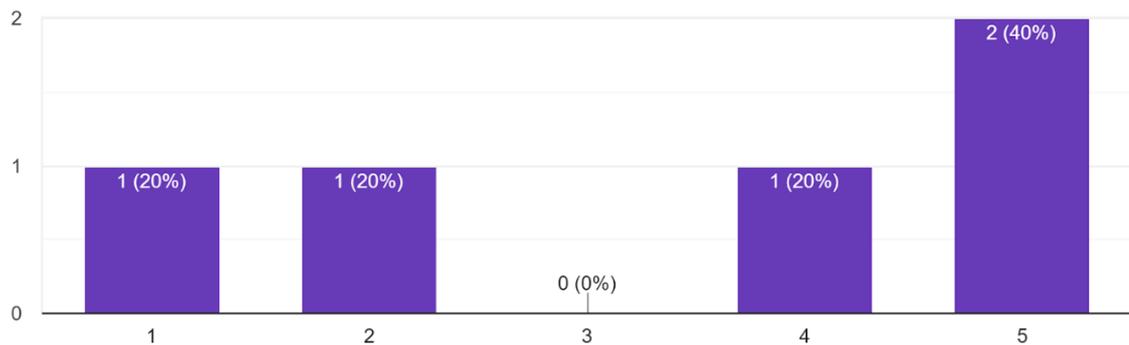
On a scale of 1-5 (1 being easy and 5 being very hard), how difficult did you personally find it using technology in maths today?

5 responses



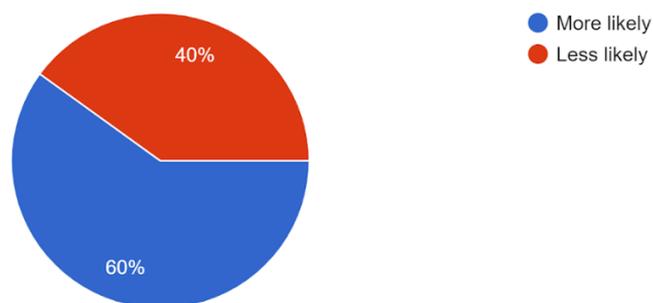
On a scale of 1-5 (1 being not at all and 5 being extremely important), how important for your future do you feel it is to be good at using technology?

5 responses



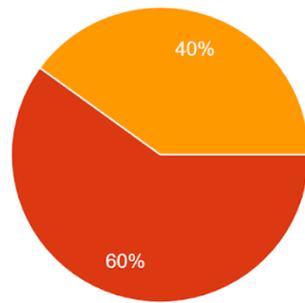
Do you think that you would be more likely or less likely to try and use technology for learning maths in the future?

5 responses



Would you ever use technology to learn maths at home?

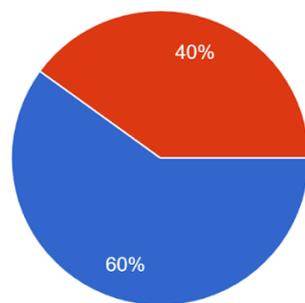
5 responses



- No, I would not learn maths at home anyway
- No, I would rather learn from a book
- Yes, I would use technology to learn maths at home
- Maybe, if I was more confident with the technology

Do you feel you performed better working independently?

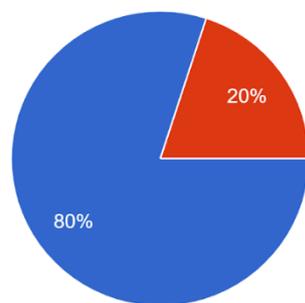
5 responses



- Yes
- No

Do you feel that you would be more likely to try working independently from now on?

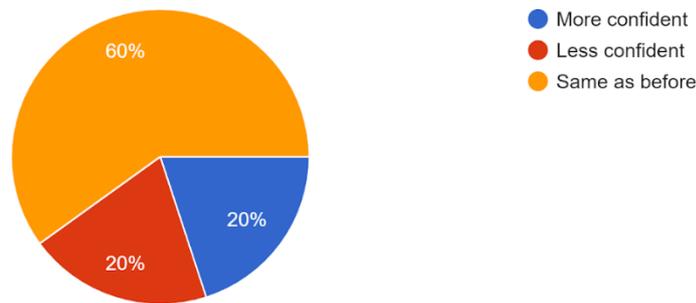
5 responses



- Yes
- No

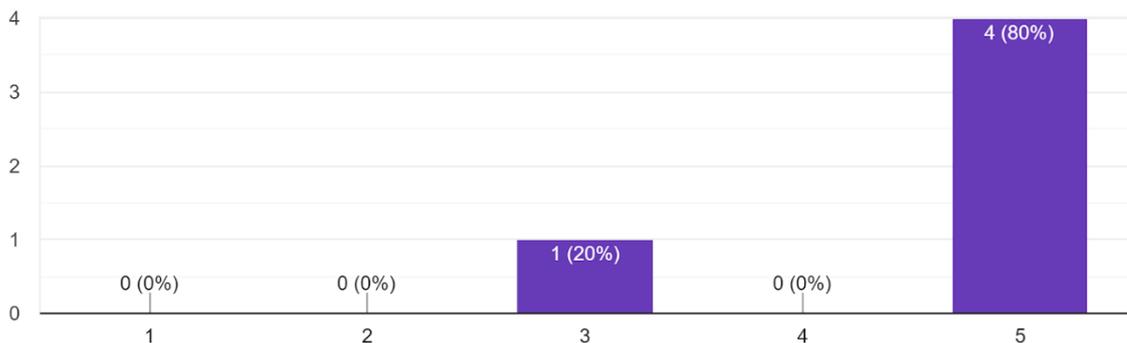
After today, would you feel confident revising independently?

5 responses



On a scale of 1-5 (1 being bad and 5 being great), how would you feel about doing a lesson like today again?

5 responses



Week 5 Summary:

We went into lockdown at this point. All mainstream face-to-face classes were cancelled with immediate effect. We did not have enough time to change the week's project to suit an online remote lesson. Fortunately, an adult face-to-face class still went ahead, with only a handful of the learners. Therefore, we were still able to get learners to use the resources and take part in assessments and surveys. Here is an interesting comment made by a learner in the class:

"As I am deaf, I rely on subtitles when watching a video. Unfortunately, there is no subtitles for every topic on Century when watching the video. Video with subtitled would be very useful."

From here on, we made sure to locate alternative videos that could be used in the future, for if a video has no subtitles. Fortunately, Google Meet (our streaming teaching platform) has a live caption option as well as any YouTube video that either we have produced or decided to use.

Week 6 Summary:

My analysis for this week instead focused on comparing scores/feedback between those learners who completed their learning in an independent setting and those who did not.

Frequency Trees was always going to be a difficult topic to digitalise. We have evolved over the year from this at the start of the remote year (E4) to this by the end of the year (E5/E6).

In general, the following scores were gathered in comparing the class that took part in the project for this week and the main cohort.

Action Research class with specially designed resources - Scored 77% on the exit ticket.

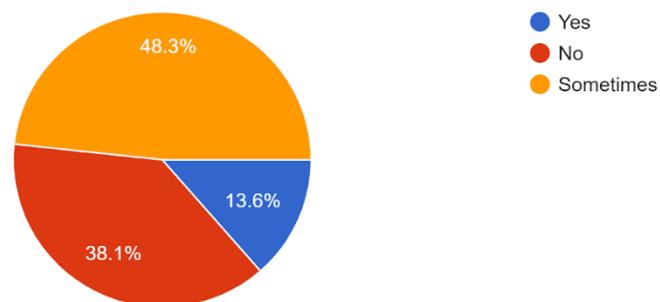
Rest of cohort - Scored 60% on the exit ticket.

More interestingly, particularly in regards to frequency trees, we scored 60% for the project class and then 58% for the main cohort. Possibly showing that even when difficult to edit on the computer like how it was initially, learners still struggle with this topic across the board.

Week 8 Survey results:

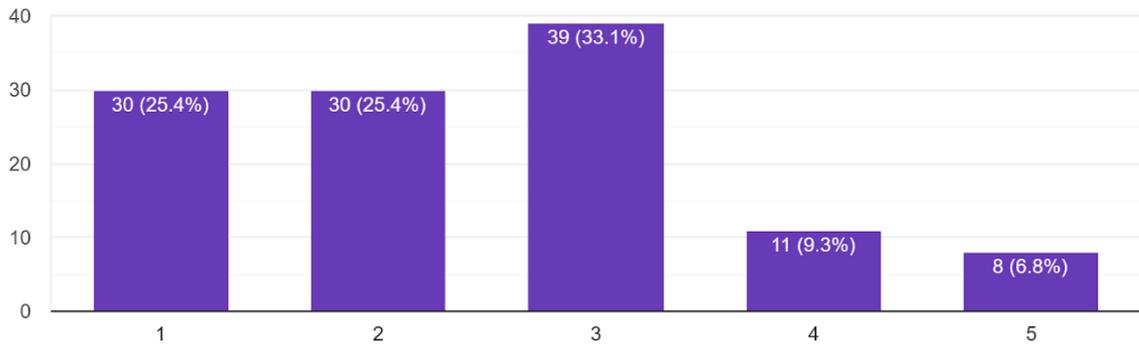
Do you feel you perform better working at home remotely in comparison to working at the college in person?

118 responses



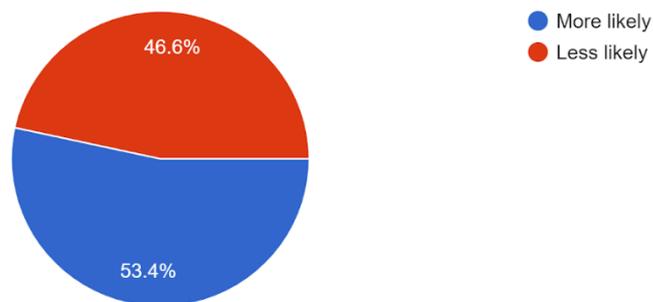
On a scale of 1-5 (1 being easy and 5 being very hard), how difficult did you personally find it using technology in maths today? (Not the maths we did, the technology we used)

118 responses



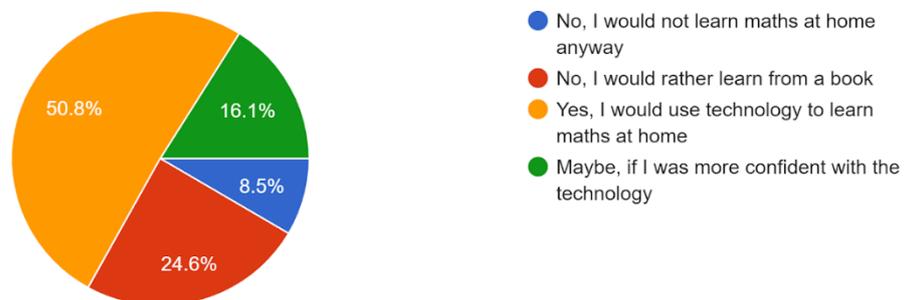
Do you think that you would be more likely or less likely to try and use technology for learning maths in the future?

118 responses



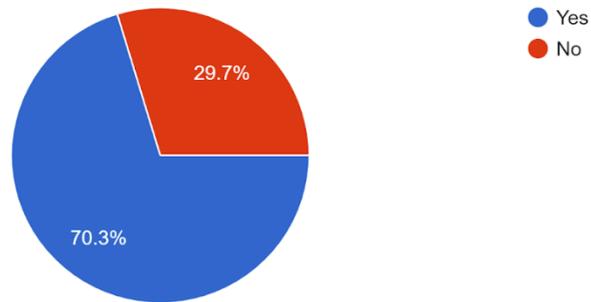
Would you ever use technology to learn maths at home out of lesson time?

118 responses



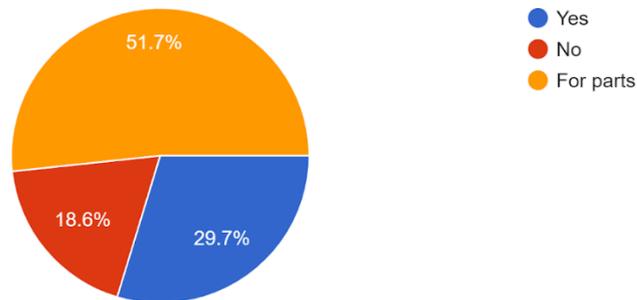
When we did the Algebra recap today, it was independent. Do you feel you performed better working independently?

118 responses



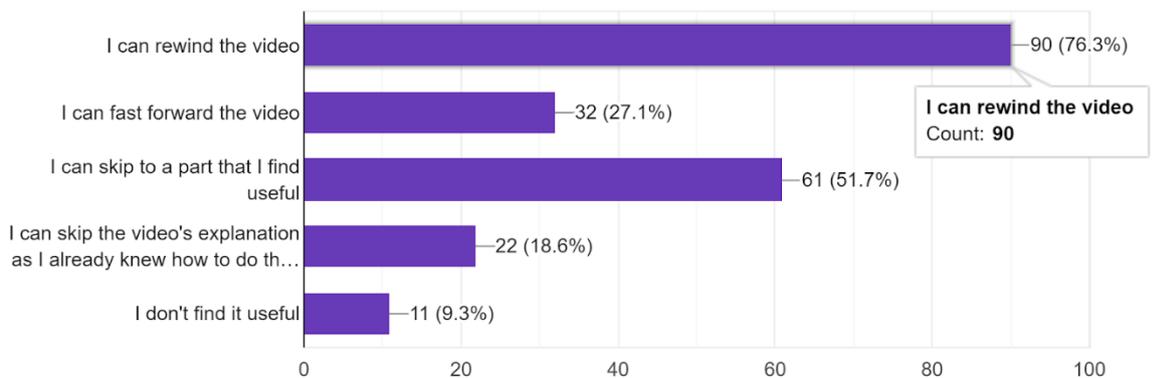
Did you like learning from a video?

118 responses



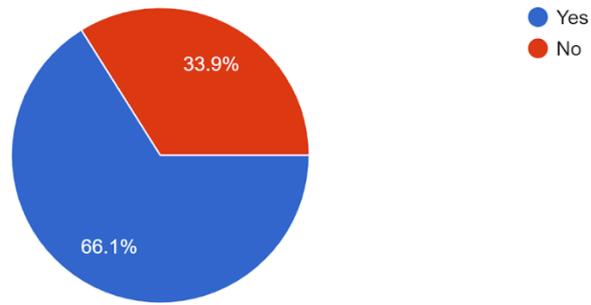
When doing remote lessons, what would you find useful learning from a video (pick as many as you see fit)

118 responses



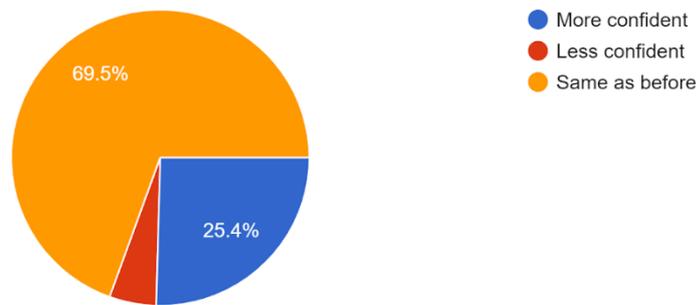
Do you feel that you would be more likely to try working independently from now on?

118 responses



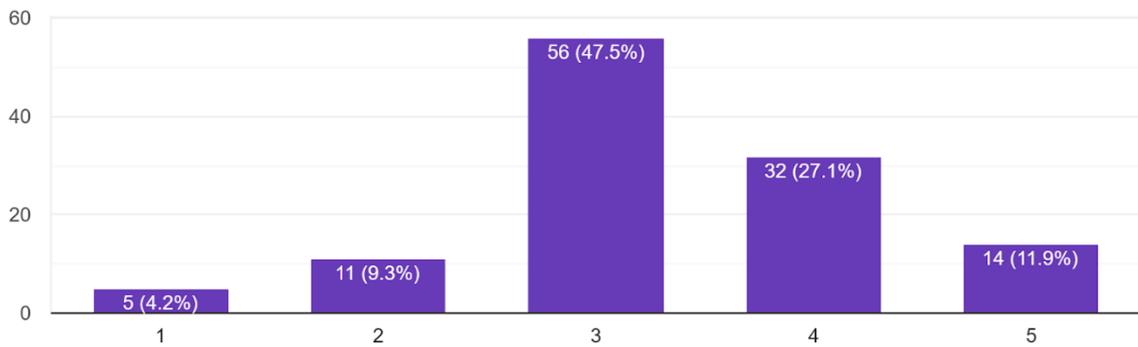
After today, would you feel confident revising independently?

118 responses



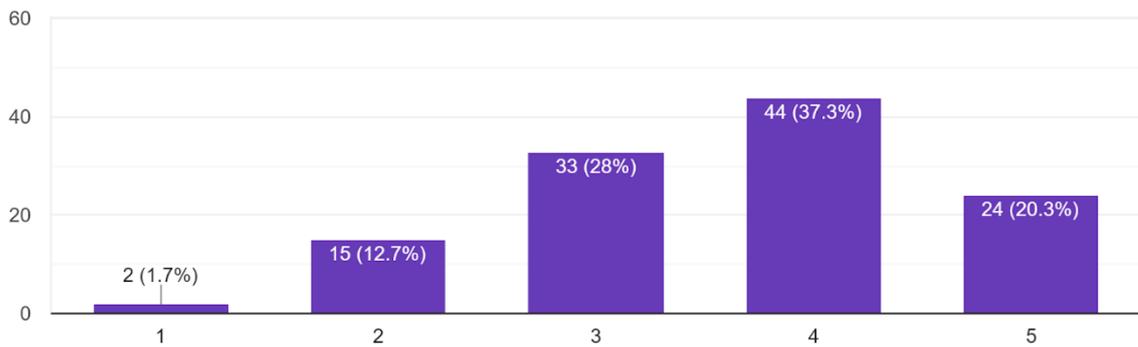
On a scale of 1-5 (1 being bad and 5 being great), how would you feel about doing a lesson using a video again?

118 responses



On a scale of 1-5 (1 being not at all and 5 being very positive), how positive do you feel about using technology in maths?

118 responses



Week 8 - Learner feedback and focus groups:

We asked learners to answer this question: **How do you feel we could have digitalised the work better?**

I think it goes really well especially for graphs and more drawing tasks it was executed well

The video was a great idea, however need more details with the topic that is currently being worked on now or in the near future E.g. detail for the method of completing the sum and more complex questions need to be shown how it can be done in the video.

its fine as is i think.

I think it's great the way it is. Easy to get a hold of the work and easy to complete.

not sure

its good already dont change it

I think it's been really great looking at the circumstance.

Personally I think we should be able to do graphs easier on computer and on phone because there were times when I couldn't finish the work. Also more support for those that need it.

I'm not sure

You couldn't , the work is all there for me and i can stop and start the videos as i please this is great for me as i can go at my own pace not the teachers as sometimes i can feel a little bit rushed .

I think it was good, I enjoyed the videos I just do not like remote working as it all goes too fast and it isn't very interactive, It just isn't for me

Find a way to tie-together the different offerings from Century, Barton, Maths Genie etc.

There should be a way to mute the tutor as when we were supposed to be watching the video the tutor was talking to another student and it was very difficult to focus on one or the other.

Yes struggling could not finish exams and my area has network issues affecting me when doing assignments

editing/writing answer in workbook felt a bit problematic sometimes

It couldn't be better, you're doing good

was well explained and easy to follow, although when got confused, needed support. i think this week was quite hard in general so that why i struggled.

Some great quotes from the focus group at the end of a session:

"I really liked that the person in the videos is from BCoT. It makes it better when you know the teacher or know they're from the same college. Teachers are much better here than at school as they go through it slower and make it simple."

"The workbook was hard to follow whilst watching the videos. I had to keep switching between and it confused me."

"The videos were great to work from. I haven't done something like that before."

Week 8 Summary:

There is a lot to unpack here. You will notice that some of the questions in the survey have changed from the standard format and that the amount of learners involved is much higher than usual. As we were remote at the time, we decided to try some new approaches with multiple classes across a week. The project aspect of the lesson was to use pre-recorded videos, recorded by myself, on various topics within algebra. Ranging from sub topics that learners often find easy such as simplifying, to more difficult topics like factorising.

The plan was for that part of the lesson to be almost exclusively independent. However, if a learner requires support due to any needs, then that would of course, be facilitated. Also, if a learner asked for help or requires more tuition, that was also provided. We never wanted a learner to be at any disadvantage during the project.

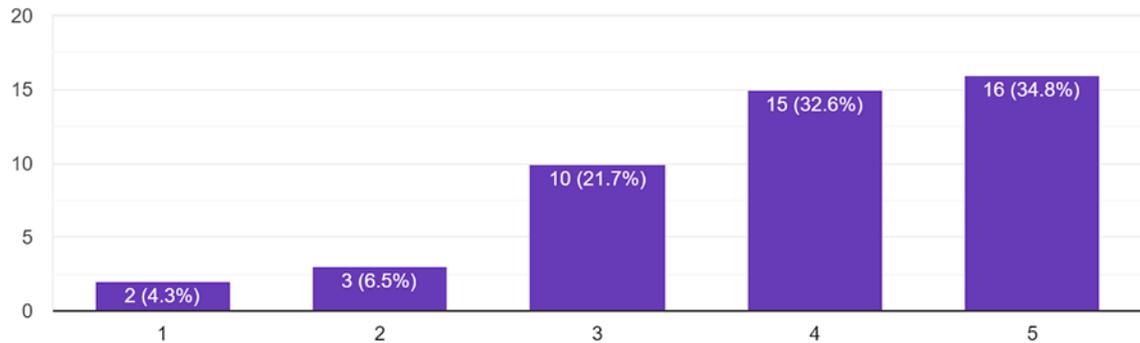
It seemed learners found learning from a video useful. 81.4% said that they either liked it or liked it 'for parts'. This is an encouraging amount. In the future, we will look to embed more videos into our curriculum.

As like almost every other previous AR week, we asked learners in the survey: How do you feel we could have digitalised the work better? We received some really helpful and humbling feedback. Usually, we do not get much more than; "it's good" or "I didn't like it", hence why I have not provided much previously. However, I decided this week to make the question, a required question. Meaning that everyone taking the survey would have to contribute an answer. It is not something I would do in every survey but used sparingly, it worked really well.

Week 9 Survey results:

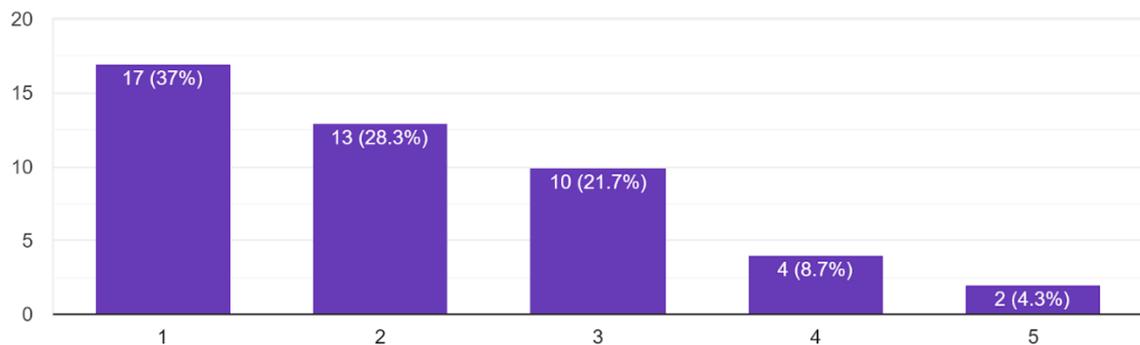
On a scale of 1-5 (1 being not at all and 5 being very positive), how positive do you feel about using Century today?

46 responses



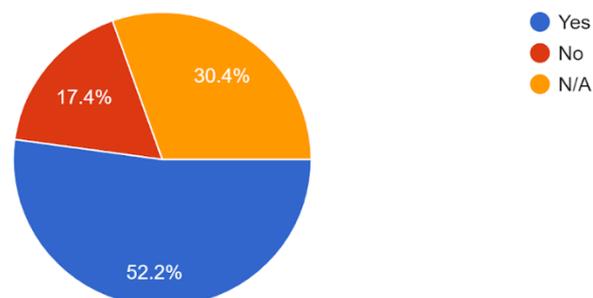
On a scale of 1-5 (1 being easy and 5 being very hard), how difficult did you personally find it using Century in maths today? (not the actual maths but the technology)

46 responses



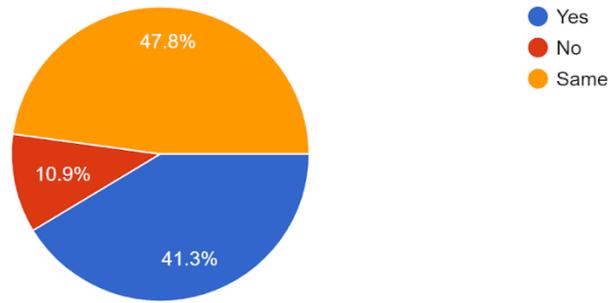
Do you feel you performed better working independently today than last week?

46 responses



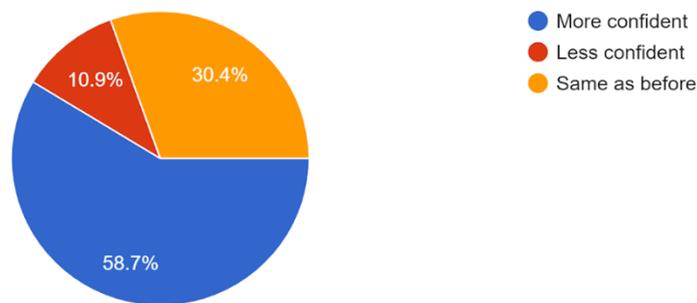
Do you feel you performed better working digitally today than last week?

46 responses



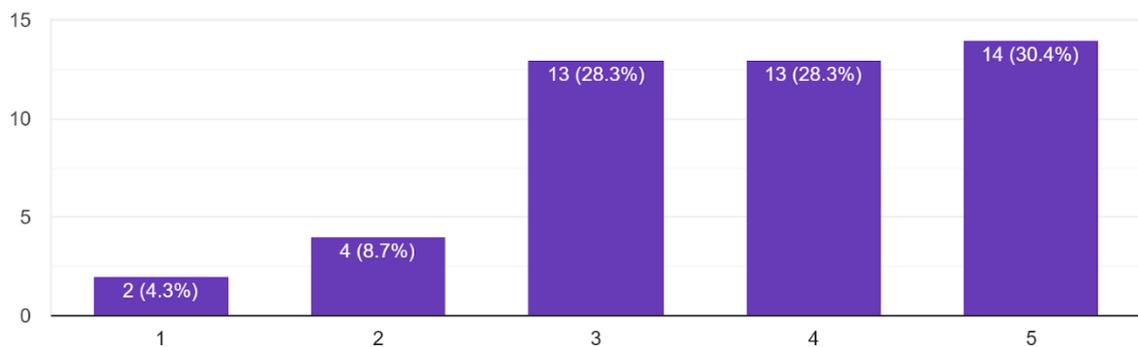
After today, would you feel confident revising completely independently on Century?

46 responses



On a scale of 1-5 (1 being bad and 5 being great), how would feel about doing a lesson like today again? I.e Century

46 responses



Week 9 - Learner feedback and focus groups:

How did you feel about using Century? If you liked it, how come? If you didn't like it, why?

It's very easy to use

I do like using century, however sometimes can be a bit complex to understand the method of a question

I loved it, it helped me understand a lot of maths questions I didn't know before.

its amazing highly recommend

i liked it as it was easy to find and it explained the tasks well

i liked century cos its simple and very easy to work through it

Because its so confusing plus I don't like the layout. Bring Joe videos back!!!!

I find Century doesn't help me

it was easier to work with than the last independent learning (learning from videos)

I thought it was good, simple to use

It's a lot easier to use

i liked it because i havent done anything like it before

This was my first time using it today and its really great it shows me what my weaknesses and strengths are , i am definitely going to be using this much more for revision to ensure i get that grade 4 to pass my mocks in the coming weeks .

i liked it. its easy to use and works well

I like doing different topics in Century because it gives you a very good idea of how you perform in a certain topic. E.g Ratio and proportion or Adding or diving fractions. Really positive experience.

i like using century as i find it easy to understand and follow the vidoes

It was fine and easy to find and do the work.

it was easy and clear

it was nice to be independent and revise, like i needed that type of support in i need t revise like its knowing i have someone there to help me

i liked it because the videos show us how to do it

good, easy to use

it was okay and easy to use

Its okay but not my favourite way of revising.

i liked it, i learned a lot with those videos

It was easy to use, it only mentions the important questions, not ones that won't be useful

it was good

I like century as you can go at your own speed and also can go back and retake the nugget as many times as you like

Found it good, especially as it explains before on how to do it

i liked using century because it has every thing that you have to revise for the gcse all the subjects on there and i like that it gives you a video on the topic then gives you the questions.

it was standard and easy to use

i like it, but it doesnt work at all on my phone it seems.

gives you the ability to revise anywhere, relatively easy to navigate.

Its very helpful because it talks you through step by step before hitting you with the hard questions

I liked using century as it is very easy to work on areas you that feel you need to work on.

Was very laggy and kept lagging

Week 9 Summary:

As is made quite clear from the survey and feedback, the premise of the project for this week was to use Century. I devised a plan that involved using Century in small chunks, due to previous learner feedback. The topics learners learnt using Century today, was using the four functions with fractions. There was a difficulty increase between each of the topics. The instructions were prepared for ease of use for the learners. Here is an example of the instructions:

Century links for Week 23 AR - Fractions

Multiplying Fractions:

Precise name of topic on Century:

Multiplying Fractions 1 [MF4.23]

Pathway to get to search bar:

- Log into Century Tech via the website - <https://app.century.tech/login/>
- Locate your vertical toolbar on the right side of the page.
- Click on 'My Courses'.
- Click on 'Mathematics - FE GCSE - Foundation'.
- Locate the search bar near the top of the page, in the middle of the screen.
- Then copy and paste Multiplying Fractions 1 [MF4.23]

Or alternatively, click on the link below:

We were interested to see how learners got on with the instructions. Our aim was to monitor how learners follow the instructions, as we were attempting to give less prompting than usual and analyse how learners perform.

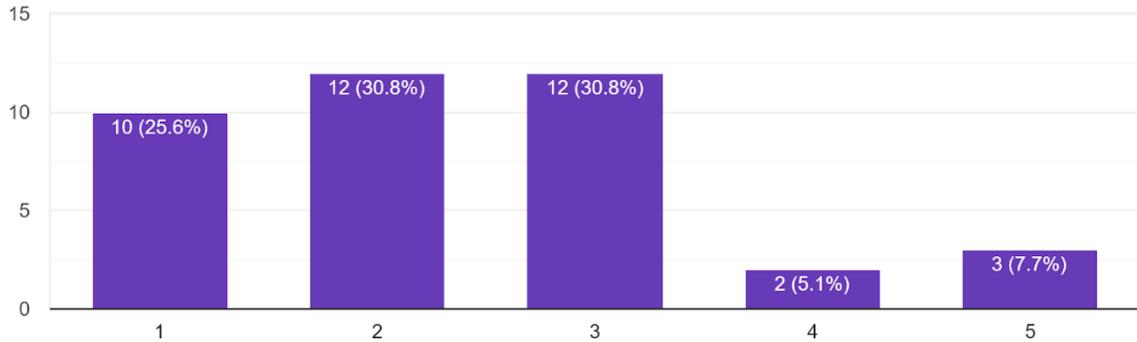
Evidently, from the survey and feedback, Century was well received with these classes.

The results for learners who learnt fractions through Century, received an average score of 71%, in comparison to those that learnt fractions through more traditional means, received an average score of 39%. This could be for many factors. For example, those that learnt via Century was in total, 46 learners, whilst the rest of the cohort numbered 550+. I did ensure that the sample size for those that used Century had differing previous grades. Still, interesting data to comprehend.

Week 10 Survey results:

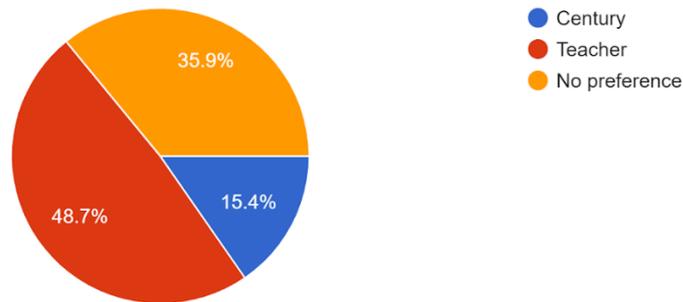
On a scale of 1-5 (1 being easy and 5 being very hard), how difficult did you personally find it using Century in maths today?

39 responses



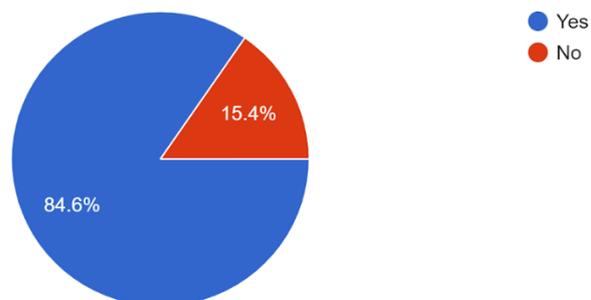
In the lesson today, did you prefer learning from Century (working independently) or from your teacher (not independently)?

39 responses



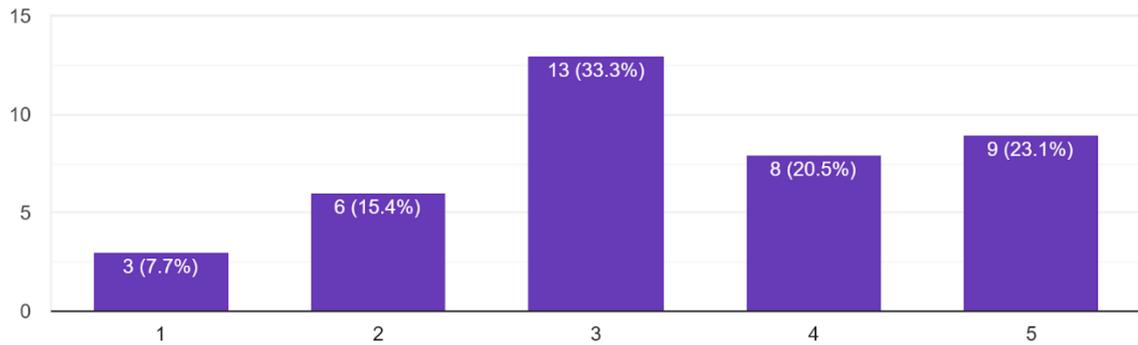
Are you planning on revising for your mocks?

39 responses



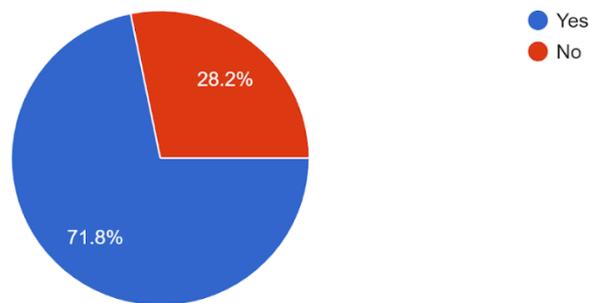
On a scale of 1-5 (1 being not at all and 5 being very positive), how positive do you feel about using Century in maths?

39 responses



Would you use Century to revise for your mocks?

39 responses



Week 10 - Learner feedback and focus group:

"I like using Century as I don't have to wait for the teacher to mark my work or show the answer".

"I don't like asking for help so it is good that Century lets me work through explanations and then questions to test myself".

"It is good that my teacher will show some topics but we also learn some ourselves (on Century). This makes the lesson not as boring".

Week 10 Summary:

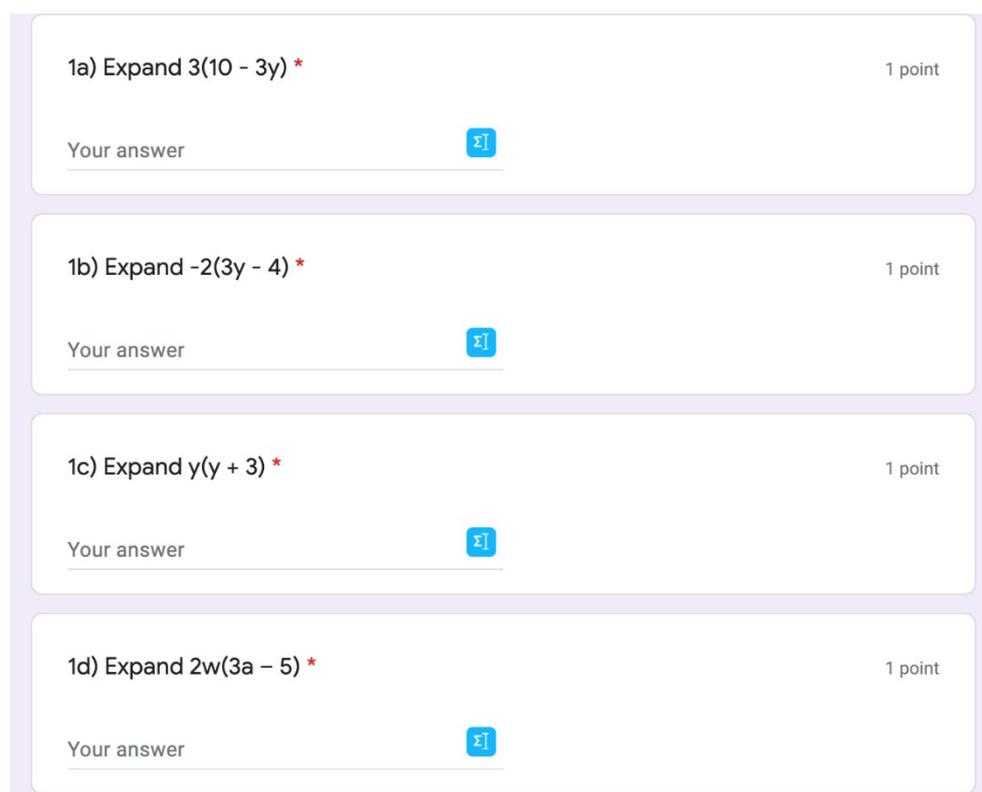
Once again, it is positive to see learners have a productive experience on Century. I can't stress enough of the importance of embedding it correctly into the curriculum. We use it in short bursts, for specifically picked topics and are present for when learners are working on it. We asked a set of interesting questions "Are you planning on revising for your mocks?" (84.6% said yes) then followed by "Would you use Century to revise for your mocks?" (71.8% said yes). It is fantastic to see that so many learners intend to revise and even better to know it is through digital means. This would have been unheard of in previous years.

Appendix 5 - Digital methods to sit alongside traditional approaches

I have shown a few methods of how we are receiving feedback, learner work and surveys. I am now going to go into detail of an area that I have yet to fully demonstrate.

Firstly, I mentioned that all our learners, even those learners who are not taking a direct part in the project, take weekly online assessments. These are almost always via Google Forms. Generally, the assessments are on the subject of the last lesson's topics, to hopefully ascertain whether a learners' comprehension of a topic has stayed within recall memory. These assessments are all automatically saved and can be accessed and evaluated at any time.

Below are two examples of what the assessments look like. We sometimes use EquatIO, so that learners can use the right maths symbol or present the maths in the correct fashion.



The image shows a vertical stack of four assessment questions, each in a separate white box with a light purple border. Each question is followed by a text input field labeled 'Your answer' and a blue EquatIO icon (a square with a sigma symbol and a vertical bar). The questions are:

- 1a) Expand $3(10 - 3y)$ * 1 point
- 1b) Expand $-2(3y - 4)$ * 1 point
- 1c) Expand $y(y + 3)$ * 1 point
- 1d) Expand $2w(3a - 5)$ * 1 point

3a)

Oliver's salary is £18,000 and he is due to get an increase of 4%.
How much will this increase be?

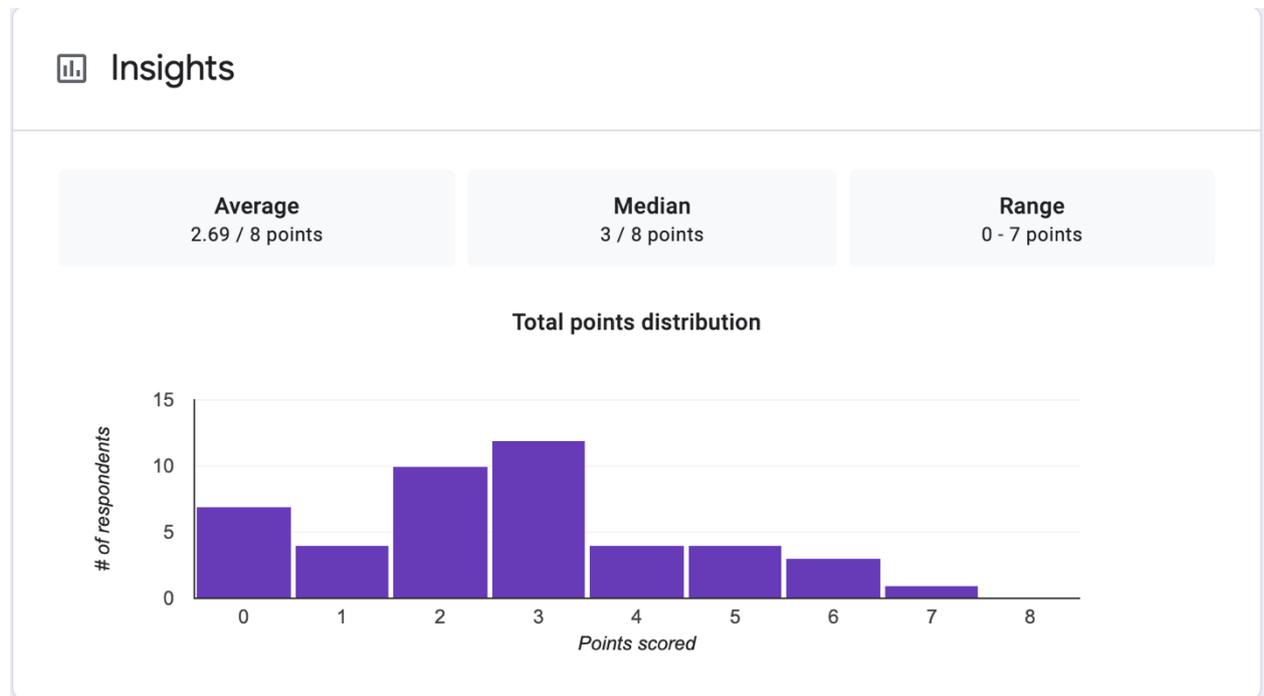
3a) What is the increase in salary from the question above? *

1 point

Your answer

Here is what the results section looks like:

Below is an example of average overall scores of learner's assessments from a recent week.



Below is an example of frequently missed questions. It's good to quickly see where learners are struggling at a glance.

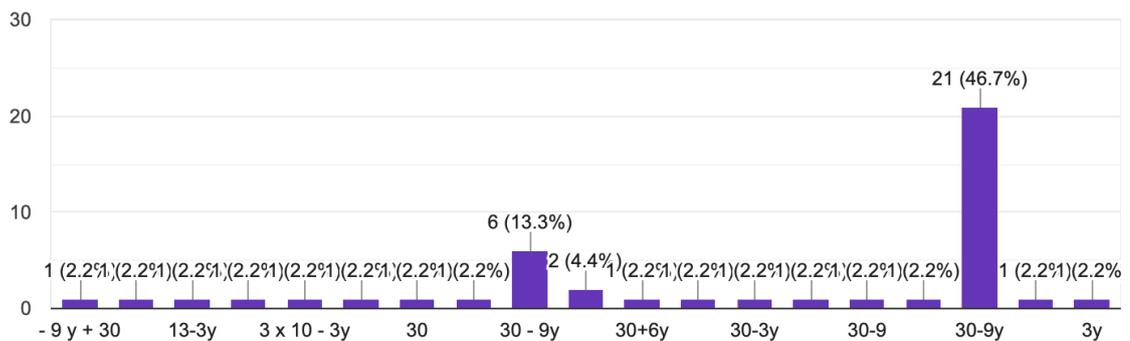
! Frequently missed questions ?

Question	Correct responses
1b) Expand $-2(3y - 4)$	7 / 45
1c) Expand $y(y + 3)$	13 / 45
1d) Expand $2w(3a - 5)$	16 / 45
Expand and Simplify: $2(4b + 5) + 3(b - 1)$	0 / 45
2a) What is the sale price from the question above?	20 / 45
4a) What is your answer for the question above?	9 / 45

Below is an example of an answered question and all the answers provided. This is great for finding common mistakes and patterns that may be present.

1a) Expand $3(10 - 3y)$

45 responses



Below is an example of a class and their responses, all on one spreadsheet to quickly assess and compare.

1a) Expand $3(10 - 3y)$	1b) Expand $-2(3y - 4)$	1c) Expand $y(y + 3)$	1d) Expand $2w(3a - 5)$	Expand and Simplify: $2(4 - 2a)$ What is the sale price	3a) What is the increase
$30 - 9y$	$-6y + 8$	y at the power of 2 $+3y$	$6wa - 10$	$11b + 7$	176
$30 - 9y$	$-6 + 8$	$y^2 + 3y$	$6wa - 10w$	$11b + 7$	176
$30 - 9y$	$-6y + 8$	$y^2 + 3y$	$6wa - 10$	$11b + 7$	170
$30 - 9y$	$-6y - 8$	$y^2 + 3y$	$6aw - 10w$	$8b + 10 + 3b - 3 = 11b + 7$	28.8
$30 - 9y$	$8 - 6y$	$Y^2 + 3y$	$6wa - 10w$	$11b + 7$	176
$30 - 9y$	$-6y - 8$	$y^2 + 3y$	$6wa - 10w$	$11b + 7$	176
$30 - 9Y$	$-6Y - 8$	$Y^2 + 3Y$ Y SQUARED $+3$	$6WA - 10W$	$8B + 10 + 3B - 3 = 11B + 7$	176
$3y$	$4y$	$3y$	$2w$	2	152
$30 - 9y$	$-6y - 8$	$y^2 + 3y$	$6aw - 10w$	$11b + 13$	144
$30 - 9y$	$-6y - 8$	$2y + 3y$	$6wa - 10w$	$11b + 6$	144
$30 - 9y$	$-6y + 8$	y squared $+3y$	$6aw - 10w$	$11b + 7$	144
$30 - 9y$	$-6y + 8$	$2(3y - 4)$	$36aw - 60w$	$11b + 7$	120
$3 \times 10 - 3y$	$-2y \times 3y - 4$	$y \times y + 3$	$2 \times w \times 3 \times a - 5$	$18b + 2b$	144
$30 - 9y$	$-2y + 8$	y squared $+3y$	$6aw - 10w$	$11b + 7$	144
$30 - 3y$	$-6 - 4$	0	0	0	130
$-9y + 30$?	$y^2 + 3y$?	15	176
$-9y + 30$	$-6y + 8$	Y squared $+ 3y$	$6aw - 10w$	$11b + 7$	176

Lastly, the team fully adopted the use of Google Docs for digital workbooks. Especially helpful during our various times teaching remotely.

The Google Doc workbook that learners use whilst taking part in a digital lesson, are all shared with the maths team and therefore can be analysed whenever. This feature was especially useful when we go to compare feedback and results between terms. The live nature of Docs was great to monitor learners work during remote lessons. We could check on progress and see what was written and importantly, when.

A shop sells CDs and DVDs.

In one week the number of CDs sold and the number of DVDs sold were in the ratio 3:5
The total number of CDs and DVDs sold in the week was 728

Work out the number of CDs sold.

<u>Working out</u>	<u>Answer</u>
$3 + 5 = 8$ $728 / 8 = 91$ $3 \times 91 = 273$	273 cd's

Working out	Answer
a) HCF=2 b) HCF=5 c) HCF=3 d) HCF=5 e) HCF=3 f) HCF=4 g) HCF=5 h) HCF=8 i) HCF=5 j) HCF=7 k) HCF=10 l) HCF=9	a) $2(2x+3)$ b) $5(3x+4)$ c) $3(3y-4)$ d) $5(x+3)$ e) $3(2x-1)$ f) $4(x+2)$ g) $5(y-5)$ h) $8(w+3)$ i) $5(2y+3)$ j) $7(2w+3)$ k) $10(2y-3)$ l) $9(3x+2)$

Green

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— 🔍 +

Team quotes and feedback:

Direct participation in the project

"I assisted in collating survey result evidence obtained throughout the year. The format used for these surveys was Google Forms, which effectively displays these answers as pie charts and tables. Furthermore, using Google docs enabled me to easily copy these results to a central location and, using Google Drive, share these findings directly with Joe. The fact that these applications worked so well together in unison really helped to streamline this process."

"This year, a duty of mine was to research and develop techniques in target setting for our learners in maths in a digital format. This focused on providing an accessible method for learners, which could allow the transfer of information easily to our college system. Google docs provided a platform which allowed for the convenient creation of templates which utilise clear 'fill in the blank' prompt boxes, which could then be used in conjunction with our college VLE to deliver individual digital copies to learners, which could then be monitored in real-time time by teachers."

Indirect participation in the project

“Despite having a background in teaching subjects with a heavy emphasis on digital methods, this last year has encouraged me to explore and consider a number of different methods in delivering maths in a digital form, of which I had not even previously given thought to. I am pleased to work with a team who worked collaboratively in applying problem solving in delivering challenging topics in creative digital forms, to provide material which is accessible to learners and allowed the continued quality of learning for our students. This has broadened my views on methods which could be commonplace in the classroom, in addition to the traditional, paper based learning that many associate with maths.”

Appendix 6 - Final conclusion, recommendations and moving forward:

A move to an almost full digital learning provision, but with at least 50% of learner work to be completed on paper:

Our learners have taken to digital learning for a number of years, especially in light of this year when we undertook the research project as well as a number of lockdowns. What most learners agreed upon, is that they generally liked learning via digital means, however, a lot still want access to paper work and to have designated workbooks. We have been making our own paper workbooks for a number of years, combining 'real' exam questions and an amalgamation of worksheets from Corbett Maths, Maths Genie and other similar websites. These workbooks have always been well received by our learners. In the future, we can ensure that the physical workbooks are the same as the digital workbooks. Therefore, if we go into a further lockdown in the future, we can easily switch between digital and paper workbook learning, whenever it is appropriate.

We always felt it important that learners have a workbook created by the college, as having the typical CGP book, clearly did not work at school. Having resources created with the college logo on, both digital and physical, helps create a culture of excellence, of academic shift, that the learners require in order to change their mindsets.

From the research taken, I would recommend a provision that would look like the following:

- Presentations to always be accessible via digital means. Have the lecturer still present on a whiteboard at the front of the class, but learners have the presentation and other class resources ready on say a laptop, to encourage stretch and challenge as well as independent study. Preferable for answers to be released digitally, throughout the lesson so the teachers time can be spent on prevention and monitoring.
- Workbooks to be a 50 - 50 mix of paper and digital. Continue to specialise and improve our workbooks. Depending on topic, will help decide which resources to digitalise.
- Assessments to almost all be digital. These include both summative and formative assessments. We do weekly mini assessments, these have all been digital this year (Google Form), we should keep them as so, as learners are now accustomed to the process and see the benefits of instant feedback. When undertaking progress assessments, we should have the majority of these as digital, as the (almost) instant feedback (via Rubric) makes the marking process much quicker. This all frees up the teacher's time to instead focus on prevention and improving the learners craft through target setting.

More time in the curriculum allocated for independent learning:

We saw through much of the feedback how much our learners appreciated and benefited from independent learning. It became clear from early on, that our learners with a previous grade three took to this style of flipped learning and learner led approach. Their scores also matched this (+19% in comparison to teacher led learners of the same previous grade).

However, learners with a previous grade 1 or 2 seemed to struggle more. Whilst these learners still said they liked they generally liked the independent study time (62%), they did receive lower scores than the learners who had a teacher led session (-7%).

More use of videos in the curriculum:

Another element that proved a success, both in terms of learner opinion and assessment achievement, were the videos I recorded. As mentioned earlier in the report, having tutorial videos recorded by a recognisable teacher, from within the college, helps with engagement and relatability. When originally going into the first lockdown, I would record videos on how to access our digital provision. With both of these sets of videos, the whole team would use, therefore bringing a standardisation process to video learning.

The college recently invested in some Lightboards - <https://www.youtube.com/watch?v=wCOuu0-o5YI>. I'm looking forward to trailing these out. This will only help increase the feel of prestigious that is much desired for engagement and motivation, within both the teaching faculty and the learner experience.

Our learners' preference and like for Century Tech:

As I mentioned at the start of the report, when Century was first introduced to our learners, it was not demonstrated in a desirable fashion. The department learnt from these mistakes and have completely turned our learners' opinions around. To read the learners glowing recommendations for Century, was a highlight of the project and year. The more learners become confident on Century, will often mirror their confidence in mathematics as a whole (as demonstrated with IB and week 8's assessment results and feedback). We cannot imagine another online platform that would provide all the benefits that Century does for OUR learners.

It is also important to note that 71.8% of learners said that they would use Century to revise for the mocks. The use of Century increased massively in the run up to the mocks.

The importance of one-to-one sessions with learners, especially when providing a digital provision:

Throughout collating my findings, one area that learners mentioned a lot when talking in focus groups was that whilst they liked the learner led provision myself and team developed, especially the autonomous nature of it, what they wanted and required in addition, was one to one support. Essentially, a personal tutorial, in a similar scope to what students at most universities receive. Due to an action research project the college took a few years ago, with Lynne from OTLA, the college implemented the findings. This being in the form of one to one tutorials at the end of maths lessons. These half an hour sessions usually entail seeing at least two learners a lesson. We have one lesson a week that is 2.5 hours plus the 0.5 hour for one to one. Learners, who wish to improve, benefit well from these sessions and every learner I asked who is aspiring for a grade 4 or above, were positive about these sessions.

The need for a more robust and effective target setting procedure:

We have tried for a number of years to develop a meaningful and effective target setting protocol. This year I devised a much more streamlined and purposeful process that made it much easier for learners to designate topics to focus on. However, in the main, learners did not really appreciate the uses or truly take ownership of their learning in this regard. Upon talking to the learners about it, they clearly saw it as a 'tick box' exercise. Therefore, we have the tools but not the emphasis to excel in this regard. This is something that the whole college needs to improve upon, but like with our digital provision, we could lead the way.

Appendix 7 - Evidence references (A1-18, B1-5, C1-4, D1-9 and E1-6)

Appendix 7 numbers	Appendix contents
A 1 - 18	Adapted resources (including workbooks, assessments, collated data, feedback and analysis)
B 1 - 5	Digital Tools (including online classrooms, tech enhanced questions and Jamboard)
C 1 - 4	Mastering online maths delivery
D 1 - 9	Synchronous and asynchronous learning
E 1 - 6	Rubrics

A1:

Wk 5.1 Ratio Workbook

File Edit View Insert Format Tools Add-ons Help See new changes

100% Normal text Calibri 14

Ratio

1. Fred and Mark are sharing £400 in the ratio 2:3
How much money does Mark get?

Please insert your working out in the row below:

$2+3 = 5 \quad 400/5=80 \quad 80 \times 3 = 240$

Inset your answer below:

240

2. I have 20 litres of mixed squash and need to work out how much water I used.
The Ratio is 1 part squash to 3 parts water.
How much water did I use?

Please insert your working out in the row below:

$1+3=4 \quad 20/4=5 \quad 5 \times 3$

A2:

1) Below is are two shapes. Questions are further below.

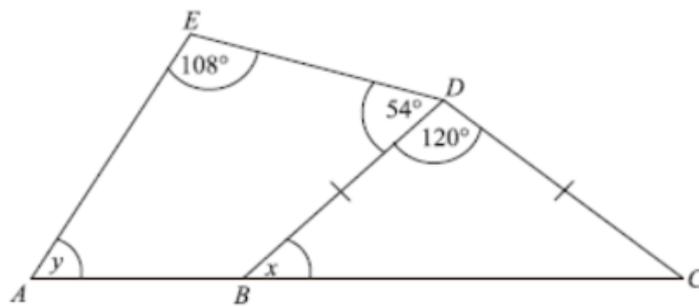


Diagram NOT accurately drawn

In the diagram, ABC is a straight line and $BD = CD$.

1a) From the image above, what is the size of angle marked x ? *

1 point

Your answer _____

1b) From the image above, what is the size of angle marked y ? *

1 point

Your answer _____

A3 (teacher led workbook):

3. Amy, Beth and Colin share 36 sweets in the ratio 2 : 3 : 4
Work out the number of sweets that each of them receives.

Amysweets
Bethsweets
Colinsweets
(Total 3 marks)

4. Fred has a recipe for 30 biscuits.
Here is a list of ingredients for 30 biscuits.

Self-raising flour : 230g
Butter : 150g
Caster sugar : 100g
Eggs : 2

Fred wants to make 45 biscuits.

(a) Complete his new list of ingredients for 45 biscuits.

Self-raising flour :
Butter :
Caster sugar :
Eggs :

Grill has only 1 kilogram of self-raising flour. She has plenty of the other ingredients.

(b) Work out the maximum number of biscuits that Grill could bake.

A4 (learner led workbook):

9. Probability

Amber

There are only red counters, blue counters and green counters in a bag. There are 5 red counters. There are 6 blue counters. There is 1 green counter.
Jim takes at random a counter from the bag.

(a) (i) Work out the probability that he takes a red counter.

(ii) Work out the probability that he takes a counter that is not red.

(3 marks)

Calculations	Answer
i)	i)
ii)	ii)

A5 (topic ticket):

Question 1

Here is a list of ingredients for making 16 mince pies.

Ingredients for 16 mince pies

240 g of butter
350 g of flour
100 g of sugar
280 g of mincemeat

Elaine wants to make 64 mince pies.

How many grams of butter will Elaine need to make 64 mince pies? *

2 points

Your answer

A6:

4.

$$\frac{3}{5} - \frac{2}{7}$$

5.

$$\frac{3}{4} + \frac{2}{9}$$

<u>Calculations</u>	<u>Answer</u>
3. $4 \times 12 = 48$ $3 \times 12 = 36$ $1 \times 4 = 4$	<input data-bbox="967 824 1225 891" type="text" value="40"/> <input data-bbox="967 891 1225 958" type="text" value="48"/>
4. $3 \times 9 = 27$ $2 \times 4 = 8$ $27 - 8 = 19$ $4 \times 9 = 36$	<input data-bbox="967 1043 1225 1111" type="text" value="19"/> <input data-bbox="967 1111 1225 1178" type="text" value="35"/>
5. $4 \times 9 = 36$ $4 \times 2 = 8$ $3 \times 9 = 27$ $8 + 27$	<input data-bbox="967 1223 1225 1290" type="text" value="35"/> <input data-bbox="967 1290 1225 1357" type="text" value="36"/>

A7:

Week 5: Exit Ticket for Week 4 topics: Angles and Proportion

Please answer the questions exactly as instructed, as this assessment is self marking. Don't worry about answering with unit of measure. I.e. £, m, Kg, etc. Unless you're asked to do so.

If you are unsure on a question, you can always skip it. To do so, please put 0 as the answer. However, we'd recommend having a guess at all questions. This may show your understanding of the question, even if the answer is incorrect.

Questions will say if you can use a calculator.

Good luck!

Your email will be recorded when you submit this form

Not joe.williams@staff.bcot.ac.uk? [Switch account](#)

* Required

Full name: *

Your answer

Learner number: *

Your answer

A8:

Week 17: Exit Ticket (Responses) ☆ 📄 🔄

File Edit View Insert Format Data Tools Form Add-ons Help Last edit was seconds ago

100% £ % . 0 123 Default (Ar...) 10 B I A

Score	1a) Using the image	1b) Using the same	How did you feel ab	2a) Using the image	How did you feel ab	3a) Using the image	3b) Using the image	3c) Using the image	How did you feel ab
3/6	6 1/9			1	0.19	1 1/4		0 1/12	
3/6	5 4/36			5 0.34		5 1/4		0 1/12	
3/6	answer one 44	4/36		3	0.34	3 1/2		0 2/12	
3/6	5 4/36			3	0.04	3 1/2		0 2/12	
1/6	16 4/36			4	0.21	3 1/6	1/6	1/12	
1/6	15 4/36			3	0.2	2 1/2	1/6	1/6	
3/6	5 4/36			4	0.34	3 1/6		0 1/6	
1/6	3 4/36			2	20	2 1/6		0 1/6	
1/6	40 1/9			2 ?		2 1/4	1/2	1/6	
2/6	9 32/36			3	0.66	3 1/2		0 1/6	
4/6	5 4/36			5	0.34	3 1/2		0 1/6	
4/6	5 1/4			4	0.34	5 1/2		0 1/6	
4/6	5 4/36			2	0.34	2 1/2		0 1/6	
2/6	2 1/4			5	0.4	3 1/2		0 2/12	
0/6	9 4/36			2	15	1 1/6	1/6	1/6	
4/6	5 1/4			3	0.34	3 1/2		0 1/6	
4/6	5 4/36			5	0.44	5 1/2		0 1/12	
3/6	a1- 44 a2-39 a3- 36 a4-5 1/4			3	0.28	3 1/2		0 1/12	
2/6	5 1/4			3 ?		1 1/2	1/6	1/6	
0/6	48 4/36			2	0.17	2 1/6	1/4	2/12	
4/6	5 4/36			5	0.34	5 1/2		0 2/12	
5/6	5 1/9			3	0.34	3 1/2		0 1/6	
3/6	5 4/36			3	0	1 1/2		0 1/6	
4/6	5 1/9			2	0.17	2 1/2		0 1/6	
4/6	44 4/36			5	0.34	5 1/2		0 1/12	

A9:

1a) Expand $3(10 - 3y)$ * 1 point

Your answer

1b) Expand $-2(3y - 4)$ * 1 point

Your answer

1c) Expand $y(y + 3)$ * 1 point

Your answer

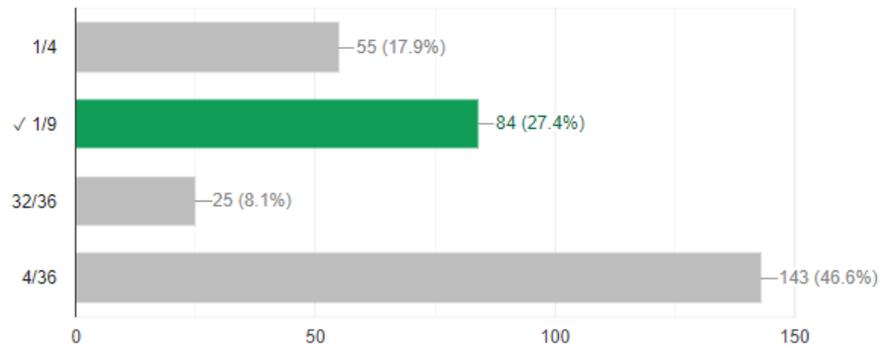
1d) Expand $2w(3a - 5)$ * 1 point

Your answer

A10:

1b) Using the same image above (1), a girl is chosen at random. What is the probability that the girl failed the test? (answer in simplest form)

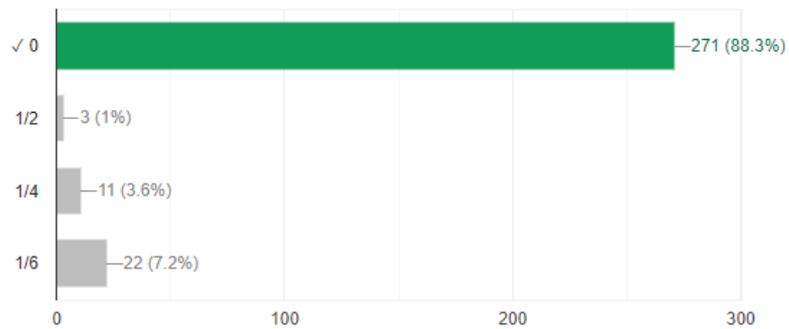
84 / 307 correct responses



A11:

3b) Using the image above again (3), what is the probability of Magnus scoring a 7 on his dice?

271 / 307 correct responses



A12:

Week 1 - Learner feedback and focus group:

Class contained 24 learners.

- 1- Made me work slower because of the format of work. Can't edit the question.
- 2- Found it easy. Happy to use computers in lessons as I do in my main course. I think it's good to be able to use computers for all different types of lessons as we will do stuff like this in our jobs.
- 3- Prefer to work on maths on paper. I did like having the instructions and questions on the computer but didn't like how we showed working out.
- 4- I found it much easier working on a laptop. I feel that it suited my working type. I did more questions than usual.
- 5- Working out is easier on paper. PowerPoint is good for independent work due to not waiting for the teacher to answer.
- 6- Chromebook not easy to use. Be better to have a proper laptop.
- 7- Didn't like using the comment feature to answer questions.

A13:

General comments:

Computers work well for learning but not for answering maths questions.

Liked being left to study at my own pace.

When retyping the working out, helped me get my head around it better.

Didn't like that work was set in different ways.

A14:

Case study comments:

Feedback from learner: IB

Preferred the adapted resources this week. Liked knowing where to answer questions. Found some of the topics hard to do independently so had to ask the teacher for parts of the lesson.

Scored 71% in his exit ticket when part of the topics were taught digitally.
Scored 63% in his exit ticket when all the topics were taught conventionally.

Feedback from learner: DM

Was easier to work this week on the Doc.
Felt knowledge of how to use 'the' Google 'package' has improved.

Scored 30% in her exit ticket when part of the topics were taught digitally.
Scored 18% in his exit ticket when all the topics were taught conventionally.

A15:

Week 3 - Learner feedback:

This group seemed to enjoy digital and independent learning more than last week's class. Whilst a few had issues with their technology skills as well as our equipment malfunctioning, generally seemed like a positive experience. The class was 20.

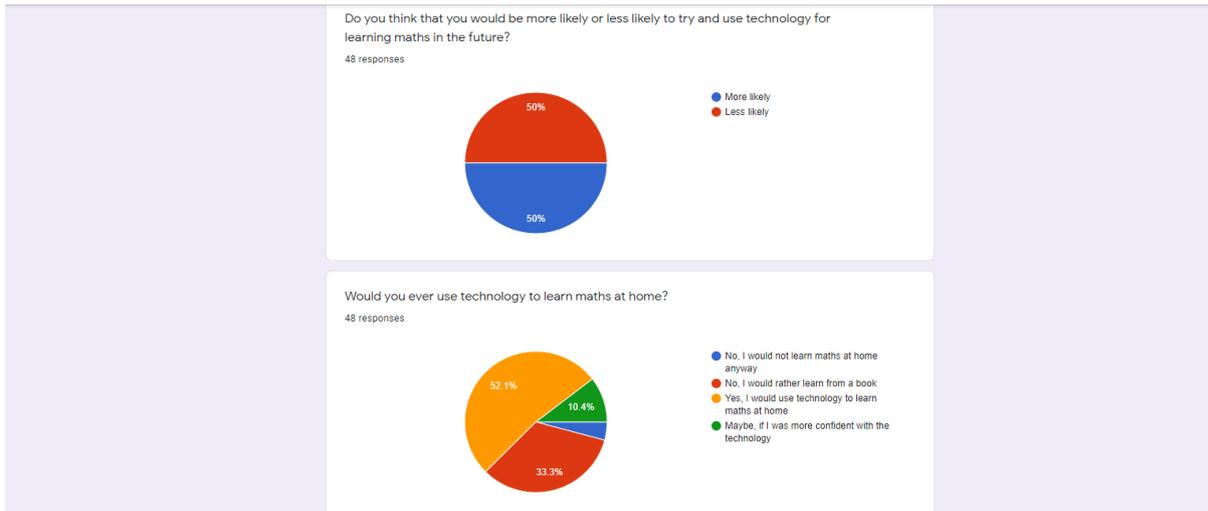
A16:

The screenshot shows a digital survey interface for a GCSE maths learner. The survey is titled "Digital - 6th Action Research Learner Survey for GCSE maths" and has 49 responses. It contains three questions:

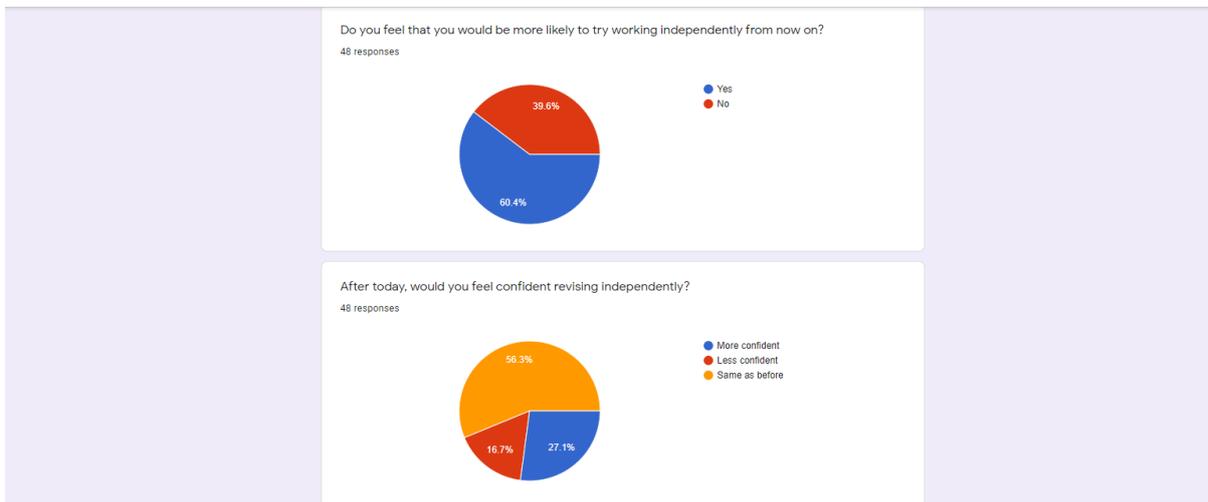
- Question 1:** "On a scale of 1-5 (1 being not at all and 5 being very positive), how positive do you feel about using technology in maths?" The scale is 1 (Not at all) to 5 (Very positive).
- Question 2:** "Do you feel you performed better working digitally?" with options Yes and No.
- Question 3:** "On a scale of 1-5 (1 being easy and 5 being very hard), how difficult did you personally find it using technology in maths today?" The scale is 1 (Easy) to 5 (Very hard).

The interface includes navigation icons (back, forward, search, etc.) and a "Send" button.

A17:



A18:



B1:

GCSE Maths Tier F

Stream **Classwork** People Grades

1. Introduction

- PowerPoint Posted Sep 7, 2020
- Checklists Edited Sep 17, 2020
- Learner Survey Posted Sep 7, 2020

2. Area, Perimeter, Compound Shapes, Freque...

- PowerPoint, workbook document and revisi... Posted Sep 14, 2020
- Answers for Week 2 workbook Posted Sep 21, 2020
- Answers for revision booklet Number 1 Posted Sep 21, 2020

3. Scatter Graphs, Pie Charts & Surface Area

- PowerPoint, workbook document, exit tick... Posted Sep 21, 2020

12. Volume, Indices ...
13. Pythagoras
14. Constructions
15. Ratio and Factor...
16. Parallel lines, Be...
17. Frequency trees...
18. Probability Tree...
19. Venn Diagrams, ...
20. Two Way Tables
21. Recap of Data H...
22. Standard Form a...
23. Exam question ...
24. Problem Solving
25. Mock 1

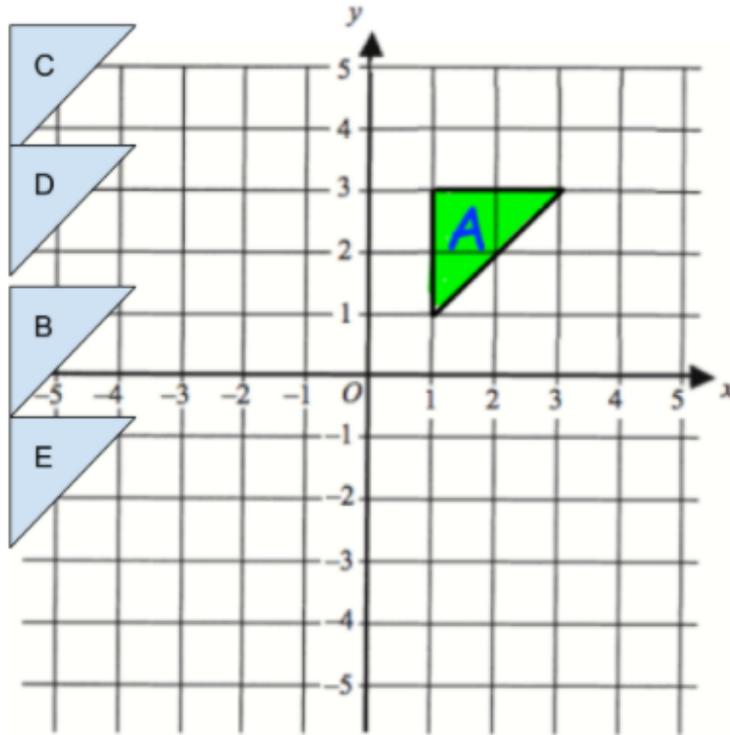
B2:

Translations

Green

To answer this question you will need to click on the diagram, select Edit from the menu and then drag and drop the triangles into the correct place. Save and Close when you have completed the move.

1)



ff

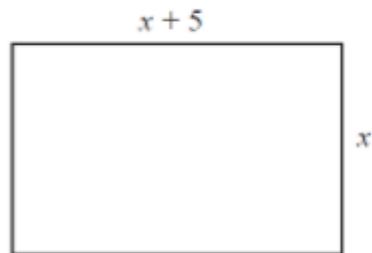
- a) Translate Shape A by the vector $(1, 2)$ Move a triangle B to the correct location.
- b) Translate Shape A by the vector $(2, -4)$ Move triangle C to the correct location.

B3:

Algebra and Shape

Red

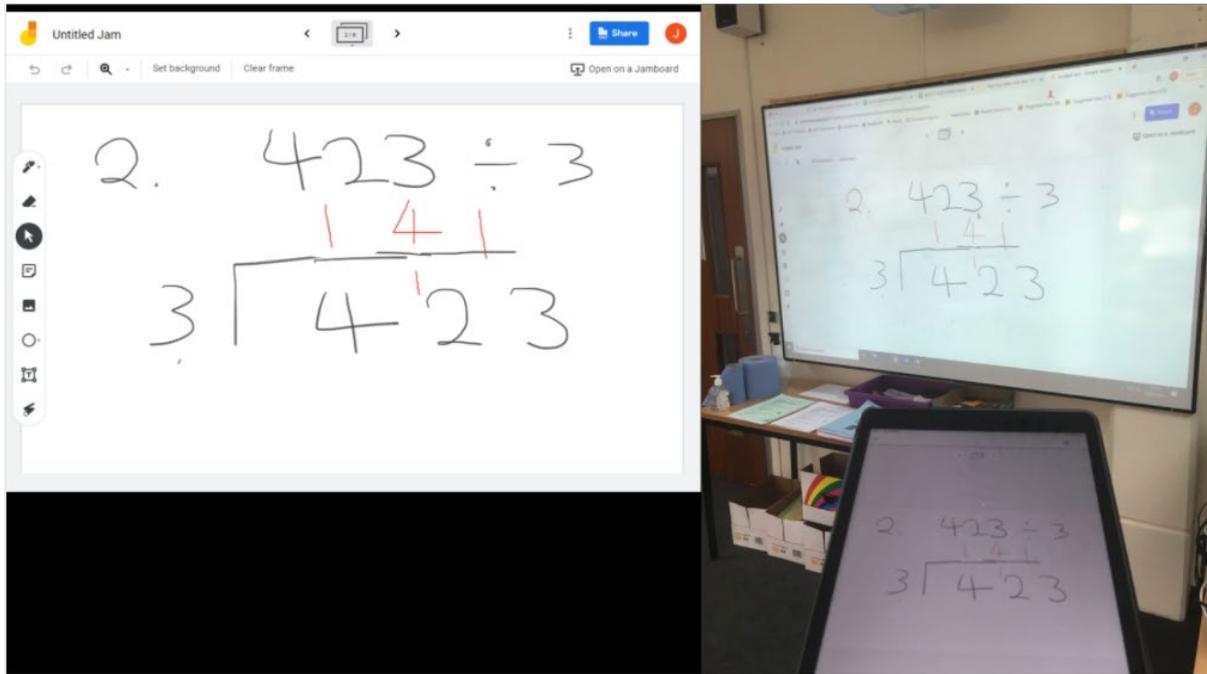
- 1) The width of a rectangle is x centimetres.
The length of the rectangle is $(x + 5)$ centimetres.



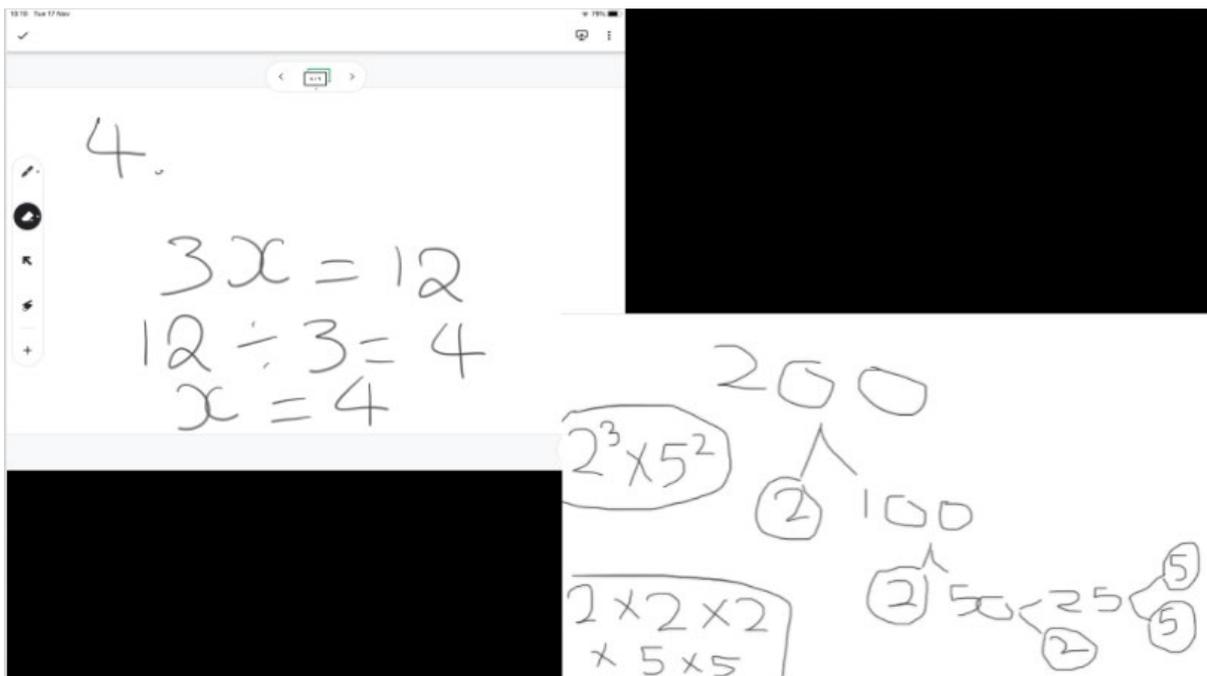
a) Find an expression, in terms of x , for the perimeter of the rectangle. Give your answer in its simplest form.

b) If $x = 6$, what is the perimeter of the rectangle in centimetres?

B4:



B5:



C1:

9. The ratio of dogs to cats is 5:3
The ratio of fish to dogs is 6:1
- Find the ratio of cats to fish.
Give your answer in its simplest form.

Please insert your working out in the row below:

Inset your answer below:

C2:

- 3.
- Joanne sees this special offer in a shop.

Special Offer	
iPod	£189
Headphones	£25
Buy both items and receive a 4% discount	

Joanne buys both items.

How much does she pay?

Please show your working out in the box to the right:	
Please show your answer in the box to the right	

C3:

Notation Equivalents

Standard Notation	Scientific Notation	E Notation	Standard Form
357096	3.57096×10^5	3.57096e5	3.57096×10^5
124.7	1.247×10^2	1.247e2	1.247×10^2
0.005600	5.600×10^{-3}	5.600e-3	5.600×10^{-3}
0.00098	9.8×10^{-4}	9.8e-4	9.8×10^{-4}

C4:

355300033435

$$3.55300033435 \times 10^{11}$$

D1:

GCSE Maths Tier F

Stream **Classwork** People Grades

11. Translation, Vect...
12. Volume, Indices ...
13. Pythagoras
14. Constructions
15. Ratio and Factor...
16. Parallel lines, Be...
17. Frequency trees...
18. Probability Tree...
19. Venn Diagrams, ...
20. Two Way Tables
21. Recap of Data H...
22. Standard Form ...
23. Exam question ...
24. Problem Solving

Joe Williams posted a new assignment: Week 22: Topic Ticket 1 Standard F... Due Mar 5, 11:59 PM

Posted Mar 1

149 Turned In 166 Assigned

Week 22: Topic Ticket 1 - ...
Google Forms

Add class comment...

Joe Williams posted a new material: Algebra recap videos

Posted Mar 1

Watch the videos. At the end of each video, complete the related questions in the workbook. Then ask your teacher for the answers. After that, move onto the next video and repeat.

Introduction for Algebra ...
Video

Expanding Brackets.webm
Video

Factorising.webm
Video

Expanding Double Brack...
Video

D2:

Week 22: Topic Ticket 1 - Standard Form

Please answer the questions exactly as instructed, as this assessment is self marking. Don't worry about answering with unit of measure. I.e. £, m, Kg, etc. Unless you're asked to do so.

If you are unsure on a question, you can always skip it. To do so, please put 0 as the answer. However, we'd recommend having a guess at all questions. This may show your understanding of the question, even if the answer is incorrect.

Questions will say if you can use a calculator.

Good luck!

Your email will be recorded when you submit this form
Not joe.williams@staff.bcot.ac.uk? [Switch account](#)

* Required

Full name: *

Your answer

Learner number: *

Your answer

D3:

1) Write the following in Standard Form:

a) 40000 *

1 point

- 4×10^4
- 40×10^3
- 4.0×10^5
- 4×100^2

b) 0.00000008 *

1 point

- 0.8×10^{-4}
- 80×10^{-5}
- 8×10^{-7}
- 8×10^{-8}

How did you feel about the topic above? (1 being 'struggled' and 5 being 'confident') *

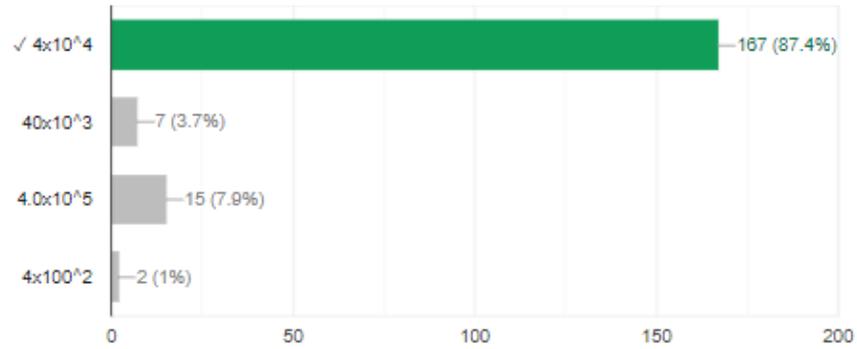
1 2 3 4 5

D4:

1) Write the following in Standard Form:

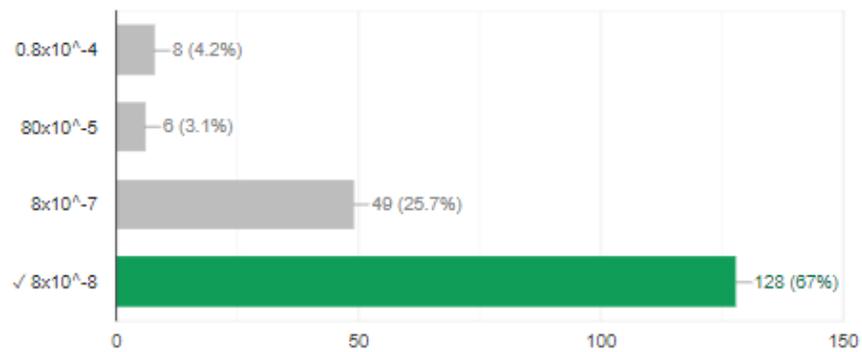
a) 40000

167 / 191 correct responses



b) 0.00000008

128 / 191 correct responses



Algebra: simplify

GREEN

1)

Simplify

(i) $c + c + c + c$

.....

(ii) $p \times p \times p \times p$

.....

(iii) $3g + 5g$

.....

(iv) $2r \times 5p$

.....

(4)
(Total 4 marks)

2)

(a) Simplify $5p + 2q - 3p - 3q$

.....

(2)

D6:

First counter	Second counter								
<p><i>Write the correct fractions in each of the table cells below.</i></p>									
<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px; text-align: center;">A</td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px; text-align: center;">B</td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px; text-align: center;">C</td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px; text-align: center;">D</td> <td style="width: 20px; height: 20px;"></td> </tr> </table>		A		B		C		D	
A		B		C		D			

D7:

<p>3. There are 5 red pens, 3 blue pens and 2 green pens in a box.</p> <p>Gary takes, at random, a pen from the box and gives the pen to his friend.</p> <p>Gary then takes at random another pen from the box.</p> <p>Work out the probability that both pens are the same colour.</p>	
Calculations	Answer

D8:

17. Frequency trees, Probability & Recap of Sol... ⋮

 PowerPoint and Stretch & Challenge	Edited Jan 18
 Workbook	Due Jan 22
 Exit Ticket Week 17	Due Jan 22, 11:59 PM
 Learner Led activity	Posted Jan 14
 Answers for workbooks and exit ticket	Posted Jan 25

D9:

24. Problem Solving ⋮

 PowerPoint, S&C and extra resources	Posted Mar 15
 Online workbook	Due Mar 19
 W24 Topic Ticket 1: Problem Solving	Due Mar 19
 W24 Topic Ticket 2: Data Handling Recap	Due Mar 19
 Century links for Week 24 AR - Targets	Posted Mar 15
 Learner Survey	Posted Mar 15
 Answers for the S&C	Posted Mar 22

E1:

Topic	Questions	Possible Marks	Actual Marks	Overall Percentage
Number	1-4	11	6	55
Probability	5-7	9	7	78
Shape	8-10	8	6	75
Data	11-12	8	7	88
Ratio & Proportion	13-14	7	5	72
Algebra	15-17	7	5	72
Total		50	36	72

GCSE Mathematics

Progress Test 3

Calculator (50 marks)



E2:

Grade

36/50

Rubric 36/50

Q1 1/2

Q2 1/3

Q3 1/3

Q4 3/3

Q5 3/3

Q6 2/2

E3:

4. Derick is shopping at the supermarket. He is buying food for himself and his mum.

He buys £23.43 worth of shopping for himself and £12.19 for his mum.

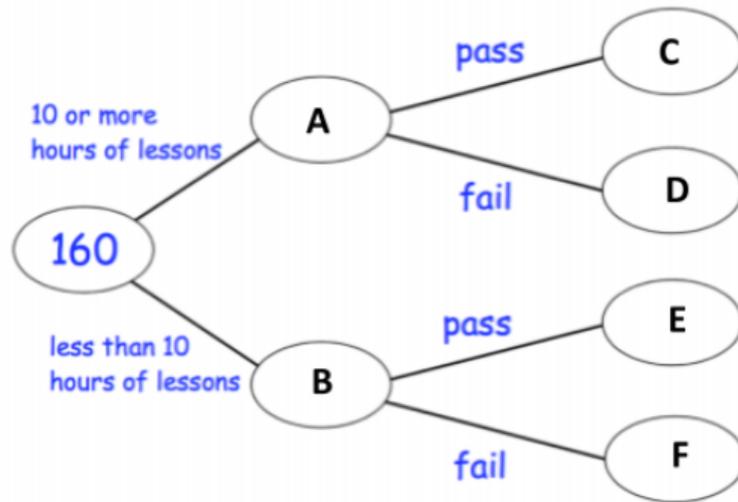
Derick has a voucher that means he gets 8% off the total amount.

He also has a voucher for 20% off that can only be used on his mums shopping.

Work out how much Derick will pay for his and his mums shopping.

Calculations	Answer
$12.19/10=1.21$ $1.21 \times 2 = 2.42 = 20\%$ $12.19 - 2.42 = 9.77$ $23.43 + 9.77 = 33.20$ $33.20/100 = 0.332$ $0.332 \times 8 = 2.656$ $33.20 - 2.656 = 30.54$	£30.54

E4:

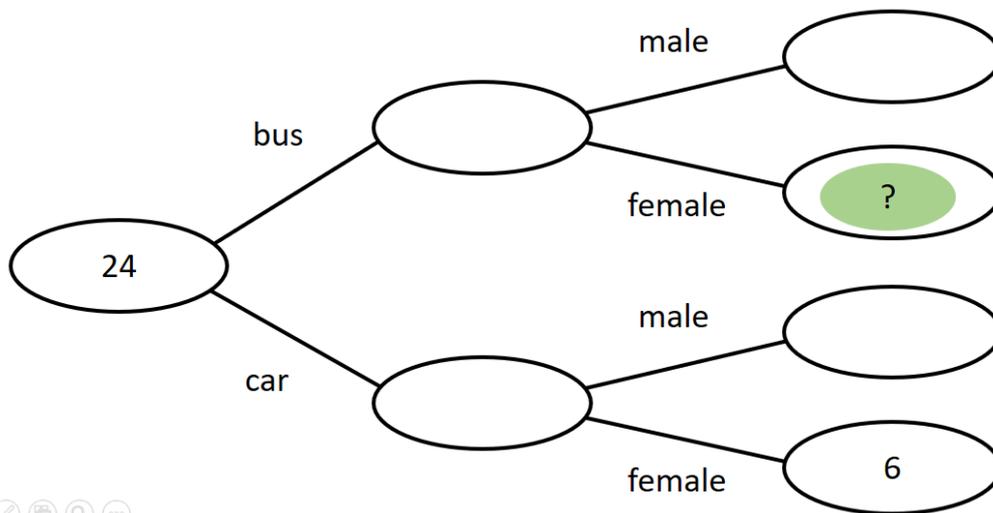


Please show your answer in the box to the right	A =
	B =
	C =
	D =
	E =
	F =

E5:

$\frac{1}{3}$ of those surveyed took a bus.

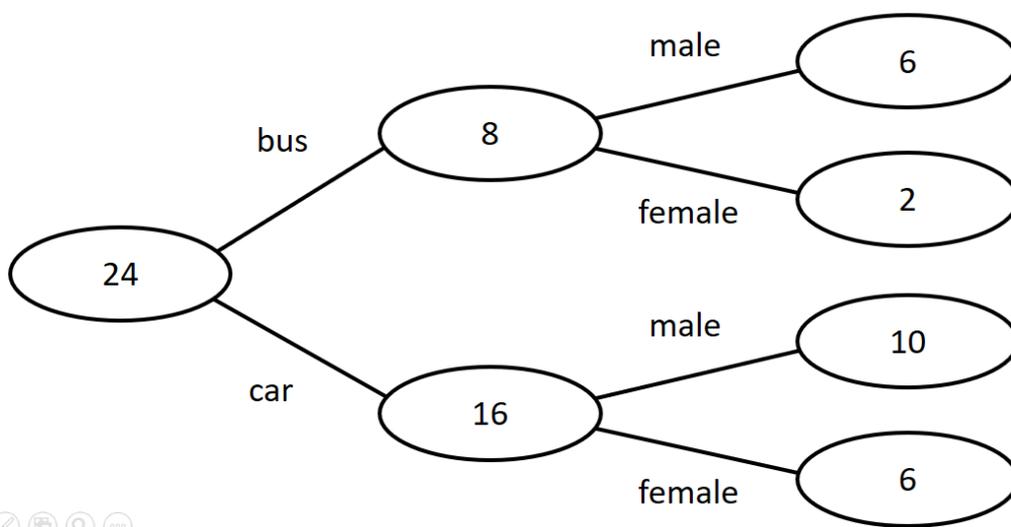
The ratio of female bus riders to male bus riders is 1 : 3



E6:

$\frac{1}{3}$ of those surveyed took a bus.

The ratio of female bus riders to male bus riders is 1 : 3



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