GCSE Advance Information Webinar for Mathematics

Review of adaptations and content information for GCSE mathematics 2022

16-03-22 : 1530

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https://maths.hias.hants.gov.uk

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Open resources

Secondary

GCSE 2022

GCSE 2022

Find out more

- Edexcel Foundation Exam aid formula sheet 2022
- Edexcel Higher Exam aid formula sheet 2022
- GCSE Mathematics - Advance Information Guidance 2022
- OCR Advance Information for Summer 2022
- Edexcel GCSE Mathematics Advance Information
- AQA Advance Information for Summer 2022

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Agenda (1)

- Advance information on exam content from (AQA, Edexcel, OCR)
- A quick look at the formula sheets (F and H)
- Cognitive Psychology: six strategies for effective learning and remembering
- Discussion around exam preparation and revision
  (to be developed in session 2)

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This webinar is to support your thinking around how best to prepare your students for GCSE maths 2022:

GCSE exams are being adapted this year by Ofqual (the exams regulator) and the DfE

Part of a larger ‘safety net’ to reduce the impact of lost learning due to the coronavirus

The adaptations for GCSE maths for 2022 are:

- A formula sheet which will be available in the exam
- Advance notice of certain topics that will appear on the exam papers

- **If you haven’t done so already, go to your exam board’s website and download this information**
- Make sure your students are familiar with the formula sheet and can select and use the information appropriately
- They will get a new copy in each exam, so fine to give everyone their own copy and encourage them to make notes/write on this version as required.

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Foundation Tier Formulae Sheet

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Taken from OCR website Nov2021

Perimeter, Area and Volume

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

Area of a trapezium $= \frac{1}{2}(a+b)h$

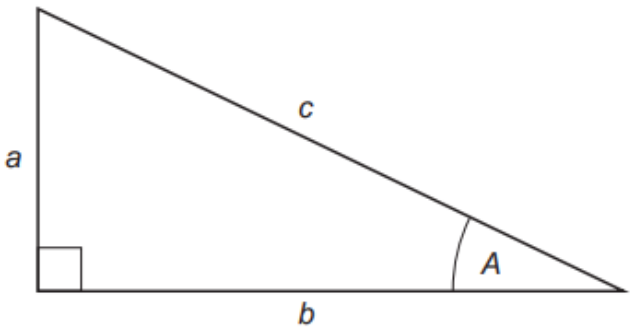
Volume of a prism = area of cross section × length

Where r is the radius and d is the diameter:

Circumference of a circle = $2\pi r = \pi d$

Area of a circle = πr^2

Pythagoras' Theorem and Trigonometry



In any right-angled triangle where a, b and c are the length of the sides and c is the hypotenuse:

$a^2 + b^2 = c^2$

In any right-angled triangle ABC where a, b and c are the length of the sides and c is the hypotenuse:

$\sin A = \frac{a}{c}$ $\cos A = \frac{b}{c}$ $\tan A = \frac{a}{b}$

Opposite
Adjacent
Hypotenuse

Compound Interest

Where P is the principal amount, r is the interest rate over a given period and n is the number of times that the interest is compounded:

Total accrued $= P\left(1 + \frac{r}{100}\right)^n$

Probability

Where $P(A)$ is the probability of outcome A and $P(B)$ is the probability of outcome B:

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

Higher Tier Formulae Sheet

Perimeter, Area and Volume

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

Area of a trapezium $= \frac{1}{2}(a+b)h$

Volume of a prism = area of cross section × length

Where r is the radius and d is the diameter:

Circumference of a circle $= 2\pi r = \pi d$

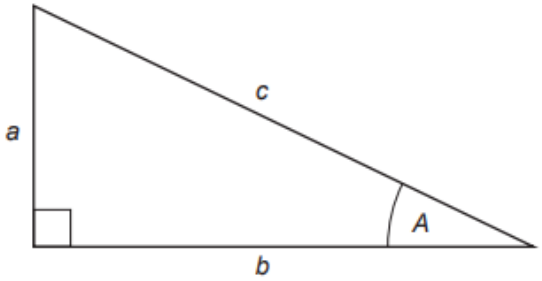
Area of a circle $= \pi r^2$

The Quadratic Formula

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Pythagoras' Theorem and Trigonometry



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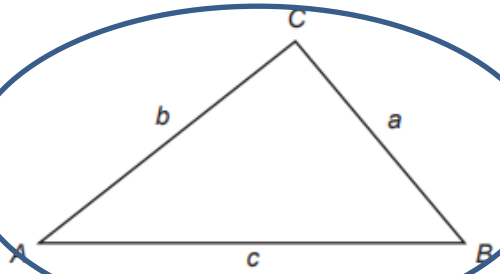
$$\sin A = \frac{a}{c} \qquad \cos A = \frac{b}{c} \qquad \tan A = \frac{a}{b}$$



In any triangle ABC where a, b and c are the length of the sides:

sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$

Compound ~~Interest~~

Where P is the principal amount, r is the interest rate over a given period and n is the number of times that the interest is compounded:

$$\text{Total accrued} = P\left(1 + \frac{r}{100}\right)^n$$

Probability

Where $P(A)$ is the probability of outcome A and $P(B)$ is the probability of outcome B:

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \text{ and } B) = P(A \text{ given } B)P(B)$$

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Taken from OCR website Nov2021

Advance information for maths

This information is taken directly from the websites of the three main exam boards (Edexcel, AQA and OCR)

This webinar is an interpretation of the published information and is not endorsed by the exam boards.

You should contact your exam board with any specific queries

All three main exam boards have followed a similar pattern for their advance information

- Information is available for all papers and for both Foundation and Higher tiers
- Information is provided for each paper individually, and collated as a whole for the paper series
- The topic descriptions are broad (e.g. Number; Fractions; Fractions of an amount)
- The topic descriptions are not in question order
- It would appear from the guidance that the advance information will not apply to low-tariff (low mark) questions, or to synoptic (multiple topic) questions
- Advance information will not directly provide answers to other low-tariff questions (explored later)

Low-Tariff Questions

- The Joint Council for Qualifications (JCQ) states that, by ‘low-tariff’, they mean questions that attract fewer marks. For maths, it would seem reasonable to conclude that these will be procedural questions on traditionally ‘basic’ topics, usually attracting one or two marks
- Terminology used by Edexcel and OCR in their guidance
- AQA does not go into the same level of detail, but since the JCQ refers to and defines low-tariff questions, it is reasonable to assume that all three exam boards interpret this in the same way

Write 5.22223 correct to one decimal place

(1 mark)

Factorise 20y + 5

(1 mark)

Low-Tariff Questions

Note that advance information does contain references to topics that typically attract fewer marks so it is reasonable to conclude that ‘easier’ topics appearing in the advance information will be assessed at a slightly higher level and be worth more marks.

For Foundation, this includes:

- Order of operations
- Fraction addition
- Percentages of amounts

For Higher, this includes:

- Solving linear equations
- Product of primes
- Four operations

Low-Tariff Questions

Note that advance information does contain references to topics that typically attract fewer marks so it is reasonable to conclude that ‘easier’ topics appearing in the advance information will be assessed at a slightly higher level and be worth more marks.

Maybe something like:

Find $\frac{2}{5}$ of 20

(1 mark)

Simple procedural question

Amelia has £20

She spends $\frac{2}{5}$ of her money

What amount does she have left ?

(2 marks)

Contextual, multi-step question requiring some decoding of the text

Advance information will not directly provide answers to other low-tariff questions

(A bit of guess work here !)

For example;
Multiplying out brackets appears in the advance information for OCR Foundation Paper 2, and this will attract at least two marks. Therefore, it's unlikely we'd see a one-mark question on expanding brackets such as 'expand $2(x - 4)$' on the same paper.

Due to the lengths of the lists produced by the exam boards, it is unlikely that every 'easy' topic on the advance information lists would be assessed at a higher level

Synoptic questions

A question that requires students to use and apply knowledge and skills from multiple topic areas.

GCSE maths exams do not explicitly have a synoptic assessment element in the way that some other specifications do.

However, there is some degree of implicit synoptic assessment on the GCSE maths papers.

These are questions that we probably refer to as ‘problem-solving’ , where students are expected to identify and apply several different strategies.

Given that $x^2 : (6x - 4) = 1 : 2$

Find the possible values of x

(3 marks)

Here, we see a non-standard presentation of a quadratic as a ratio
A good strategy would be to re-write this as a quadratic and then factorise.
The predominant strategy employed was trial and improvement !

Given that $x^2 : (6x - 4) = 1 : 2$

Find the possible values of x

(3 marks)

$x^2 : (6x - 4) = 1 : 2$

So $x^2 = 3x - 2$

And $x^2 - 3x + 2 = 0$

Leading to $(x - 2)(x - 1) = 0$ and thus $x = 2$ or $x = 1$

Synoptic questions : What do the exam boards say ?

OCR:
In their general guidance, OCR explicitly states that “topics not included in the advance information may still be assessed in low tariff items or synoptic questions”.

Edexcel:
Edexcel states that “teachers […] should bear in mind that prior learning in a key idea or topic area […] might be required for students to be able to answer questions fully. This is particularly the case, for instance, for synoptic questions”.

AQA:
AQA does not specifically mention synoptic questions in their guidance, but we can assume they have taken a similar approach.

How much content that is not on the list should we teach?

Both the JCQ and exam boards have been very clear that they don't want the advance information to result in teaching a narrower range of content.

However, in the specific guidance for maths, there is some implication that many of these deeper problem-solving questions will draw from the listed content.

For example:

Edexcel states: "students' responses to questions may draw upon knowledge, skills and understanding **from across the content listed** when responding to questions"

AQA states: "students and teachers should consider how to revise other parts of the specification, for example to review whether other topics may provide knowledge which helps your understanding **in relation to the areas being tested** in June 2022"

I think we can interpret this as :
While any topic from the specification could be required to answer deeper problem-solving questions, given the scope of the content lists produced by the exam boards, it is fairly likely that the majority of these questions will draw on elements from the advance information.

How best to use the advance information ?

The aim of advance information, as stated by the DfE, is to support **revision** and communicate the **focus** of the examinations

It is not intended to narrow teaching or revision.

Statements from the exam boards support this so it is important that we emphasise to students that this should be used to **guide their revision focus**, rather than as a definitive list of topics to revise.

As advance information does not apply to low-tariff questions, it is reasonable to assume that the lists give an indication of:

- Easier topics requiring a higher level of thinking beyond one-step procedure
- Harder topics asked in a fairly procedural manner
- Multi-step questions in the same broad topic
- More in-depth problem-solving requiring applications of listed topics, or combinations of listed topics, or their prior knowledge.

Combined content domain questions

The boards have stated that a given question may require content from more than one area of maths on the list.
For example:

In a group of people;
$\frac{3}{5}$ have brown hair

30% have blonde hair

What percentage of people have neither brown nor blonde hair?

(2 marks)

This question requires students to apply knowledge of fractions *and* percentages of amounts.

What other inferences can we draw from the advance information?

A couple of points that might be useful for teaching.

(These will depend on the exam board you're using and the tier of entry.)

The advance information can provide focus for revision

For example, the collated content for Edexcel Foundation mentions Pythagoras' theorem and exact trigonometric values but does not include an explicit mention of 'trigonometry' (as appears on the Higher guidance). From this, we might surmise that students are unlikely to be asked about trigonometry in right-angled triangles, particularly on the calculator papers, so this could be a topic to skim when revising, particularly for those aiming for a grade 4 or lower.

What other inferences can we draw from the advance information?
(continued)

Foundation and Higher overlap

Crossover content questions are designed for target grade 4 or 5 students.
We can assume that these will be the most challenging on the Foundation paper, and the least challenging on the Higher paper.

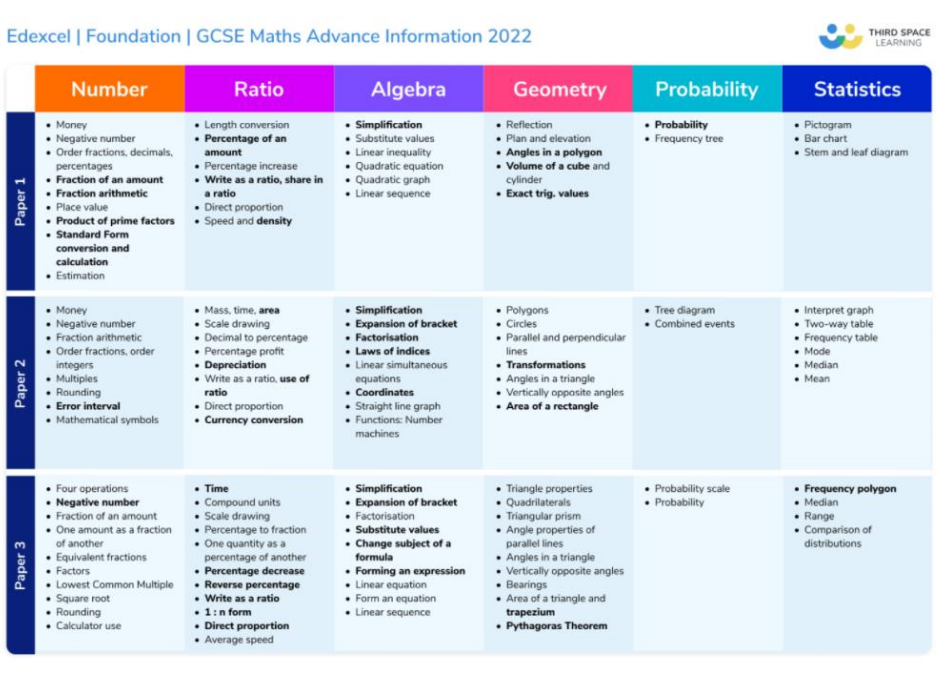
A topic appearing on both lists is not a guarantee that it will be assessed in the crossover section. For example, simplification appears in both Foundation and Higher lists for Edexcel; but this is such a broad-reaching topic so we should expect it to be assessed in different ways on each tier.

However, for topics such as error intervals, and standard form conversion and calculation, which appear on both Edexcel Foundation and Higher papers, these are likely to refer to the same question appearing on both tiers, which gives an indication of expected difficulty.

Advance information by exam board and tier

An interpretation of the information that is not designed to be an in-depth analysis, but a starting point to begin drawing together ideas about what the papers may look like!

This information is produced with grateful thanks to Christine Norledge ,writing for 3rd Space Learning.
Christine is a former secondary Maths teacher, currently working as a freelance author. She also has a resource-sharing website and YouTube channel.



Edexcel | Foundation | GCSE Maths Advance Information 2022

THIRD SPACE LEARNING

	Number	Ratio	Algebra	Geometry	Probability	Statistics
Paper 1	• Money • Negative number • Order fractions, decimals, percentages • **Fraction of an amount** • **Fraction arithmetic** • Place value • **Product of prime factors** • **Standard Form conversion and calculation** • Estimation	• Length conversion • **Percentage of an amount** • Percentage increase • **Write as a ratio, share in a ratio** • Direct proportion • Speed and **density**	• **Simplification** • Substitute values • Linear inequality • Quadratic equation • Quadratic graph • Linear sequence	• Reflection • Plan and elevation • **Angles in a polygon** • **Volume of a cube** and cylinder • **Exact trig. values**	• **Probability** • Frequency tree	• Pictogram • Bar chart • Stem and leaf diagram
Paper 2	• Money • Negative number • Fraction arithmetic • Order fractions, order integers • Multiples • Rounding • **Error interval** • Mathematical symbols	• Mass, time, **area** • Scale drawing • Decimal to percentage • Percentage profit • **Depreciation** • Write as a ratio, **use of ratio** • Direct proportion • **Currency conversion**	• **Simplification** • **Expansion of bracket** • **Factorisation** • **Laws of indices** • Linear simultaneous equations • **Coordinates** • Straight line graph • Functions: Number machines	• Polygons • Circles • Parallel and perpendicular lines • **Transformations** • Angles in a triangle • Vertically opposite angles • **Area of a rectangle**	• Tree diagram • Combined events	• Interpret graph • Two-way table • Frequency table • Mode • Median • Mean
Paper 3	• Four operations • **Negative number** • Fraction of an amount • One amount as a fraction of another • Equivalent fractions • Factors • Lowest Common Multiple • Square root • Rounding • Calculator use	• **Time** • Compound units • Scale drawing • Percentage to fraction • One quantity as a percentage of another • **Percentage decrease** • **Reverse percentage** • **Write as a ratio** • **1 : n form** • **Direct proportion** • Average speed	• **Simplification** • **Expansion of bracket** • Factorisation • **Substitute values** • **Change subject of a formula** • **Forming an expression** • Linear equation • Form an equation • Linear sequence	• Triangle properties • Quadrilaterals • Triangular prism • Angle properties of parallel lines • Angles in a triangle • Vertically opposite angles • Bearings • Area of a triangle and **trapezium** • **Pythagoras Theorem**	• Probability scale • Probability	• **Frequency polygon** • Median • Range • Comparison of distributions

For each exam board and tier , a summary content table and a document that makes some ‘best guesses’ on individual paper content has been produced .

I have put these in your open resources folder.

Summary

Advance information:

- can be used flexibly by centres to achieve its purpose of supporting revision. Advance information should not, however, be used to narrow teaching and learning.
- can be used by teachers in supporting their students' revision and referred to by students in their revision and final examination preparation.
- cannot be brought into the examinations.
- is not at a level that allows questions to be predicted or answers prepared.
- students' preparation for examinations should continue to focus on knowledge and understanding that can be applied appropriately in the context of unseen examination questions.

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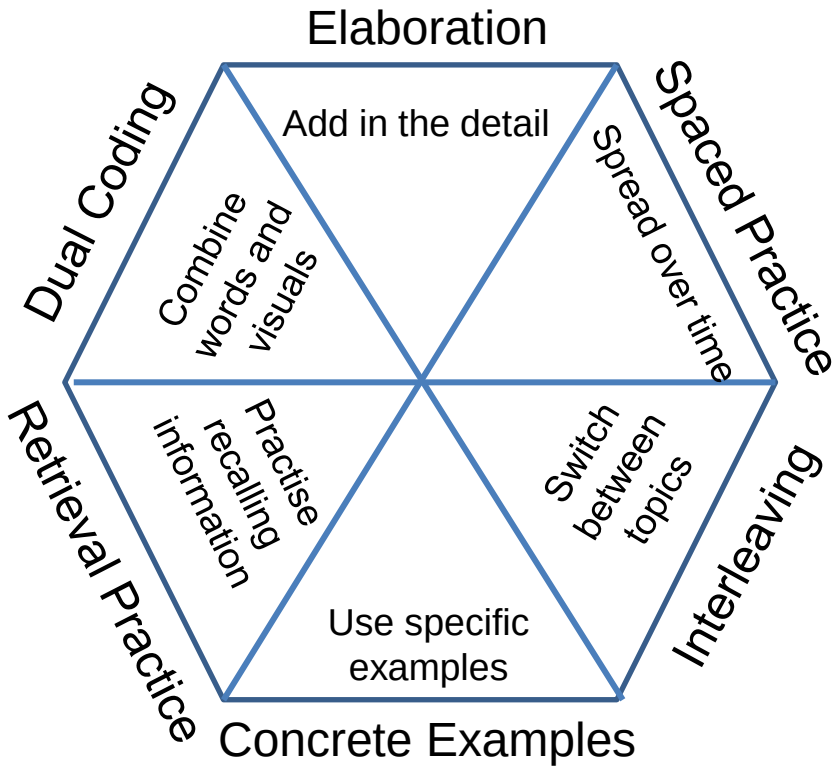
Cognitive Psychology:
Six strategies for effective learning and remembering



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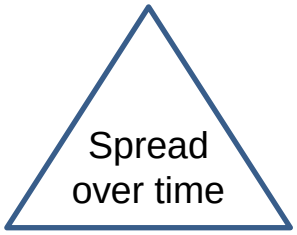

Spaced Practice

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Planning strategies: Spaced practice

Spaced (or distributed or spiral) practice involves repetitions spaced out over time, leading to greater retention of information in the long run (as opposed to massing - the same number of repetitions close together).

Teachers can introduce spacing to their students in two ways:

- by creating opportunities to revisit information throughout the term, or year; and
- by helping older students to create their own spaced study schedules

Space out study of a topic over time (A…….A…….A)

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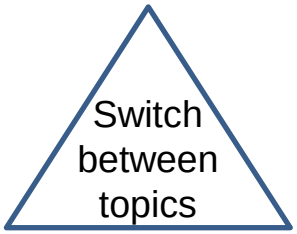

Interleaving

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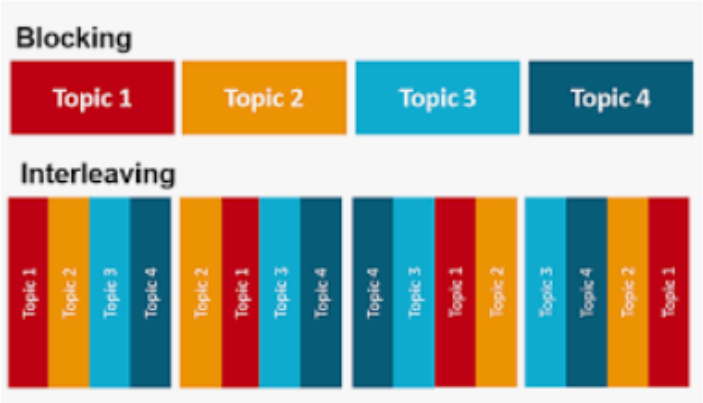
Planning strategies: Interleaving

Interleaving is another scheduling technique that can increase learning efficiency. Interleaving occurs when different ideas or problem types are tackled in a sequence, as opposed to the more common method of attempting multiple versions of the same problem in a given study session (known as blocking)

Switch between ideas while studying (ACB / CBA / BCA topics)



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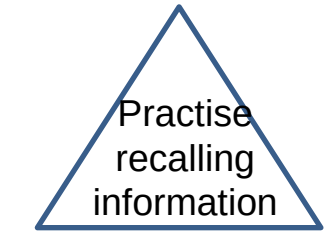

Retrieval Practice

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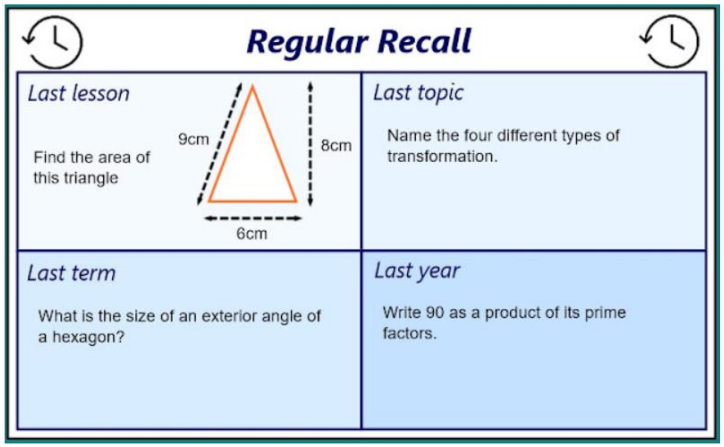
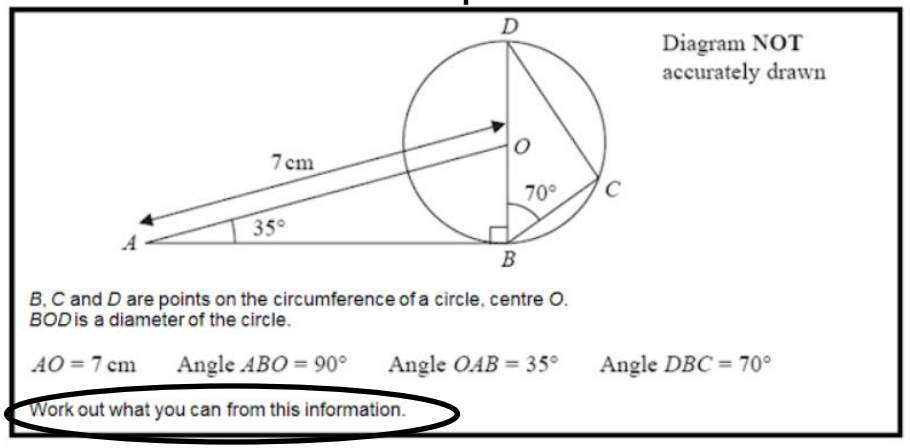
Reinforcement: Retrieval Practice

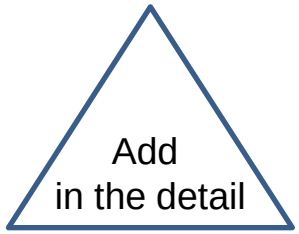
While tests are most often used for assessment purposes, they can also be used to strengthen the memory of the tested information. Practising retrieval improves higher-order, meaningful learning, such as transferring information to new contexts or applying knowledge to new situations .When students sit down to study, their primary strategy should always involve retrieval practice.

Practise bringing information to mind



Goal free problems





Elaboration

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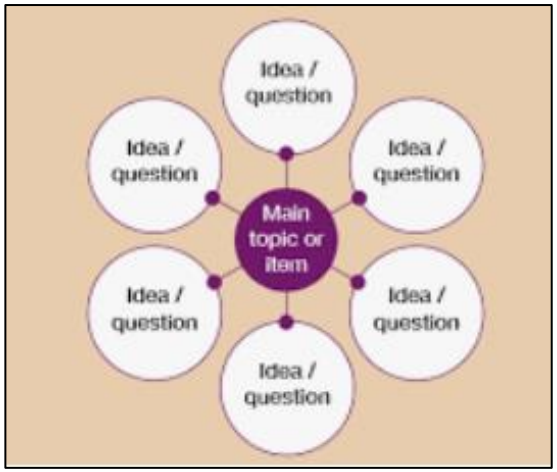
The development of understanding: Elaboration

Elaboration involves connecting new information to pre-existing knowledge and describing things in many details. In practice, elaboration could mean many different things, but the common thread is that elaboration involves adding features to an existing memory.

Explain and describe ideas with many details



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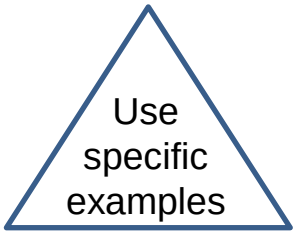

Concrete Examples

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The development of understanding: Concrete examples

Providing supporting information can improve the learning of key ideas and concepts. Specifically, using concrete examples to supplement content that is more conceptual or abstract in nature can make the ideas easier to understand and remember

Use specific examples to understand abstract ideas

$2^n \div 2^m = 2^{n-m}$

$2^7 \div 2^3 = 2^4$

$$\frac{2x2x2x2x2x2x2}{2x2x2}$$

$2^n \div 2^m = 2^{n-m}$

$2^8 \div 2^2 = 2^6$

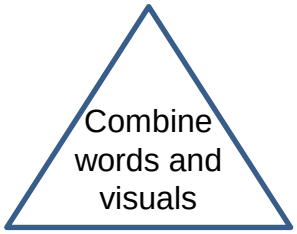
$$\frac{2x2x2x2x2x2x2x2}{2x2}$$

$5^n \div 5^m = 5^{n-m}$

$5^8 \div 5^2 = 5^6$

$$\frac{5x5x5x5x5x5x5x5}{5x5}$$

Link to cancelling fractions and writing powers out ‘long-hand’
Develop the specific examples into general and then more complex ones
Use variation or ‘intelligent practice



Dual Coding

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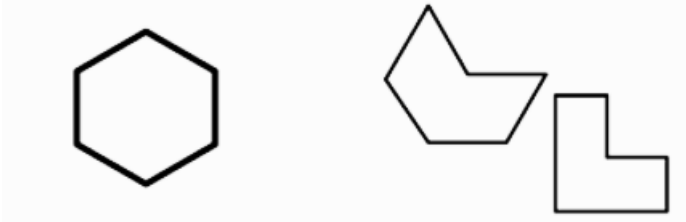
The development of understanding: Dual Coding

More information can be conveyed through a simple drawing or diagram than through several paragraphs of text. Pictures convey information succinctly and are often more memorable than words. Verbal and pictorial information is processed through separate channels or information codes in the brain. Dual coding theory suggests that providing both verbal and pictorial representations of the same information enhances learning and memory.

Given that pictures are generally remembered better than words, it is important to ensure that the pictures students are provided with are helpful and relevant to the content they are expected to learn. If students are provided with useful visual examples, this can decrease conceptual errors.

Combine words and visuals

‘A hexagon has 6 edges’



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Revision and final curriculum provision for Year 11

What are your plans ?

Practice exams and strategies.
Good tips for revision
Interventions
Last minute ‘make the difference’ ideas.

GCSE Revision Webinar for Mathematics

Effective preparations and revision techniques for GCSE mathematics 2022

01-03-22: 1530

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