SCIENCE OF LEARNING

CONFERENCE 2025

PLATINUM SPONSORS

compnow

GOLD SPONSORS

Nelson

SWITCH

Retrieval & Rehearsal: Why? And the strategies for implementation

Dr Nathaniel Swain & Brendan Lee

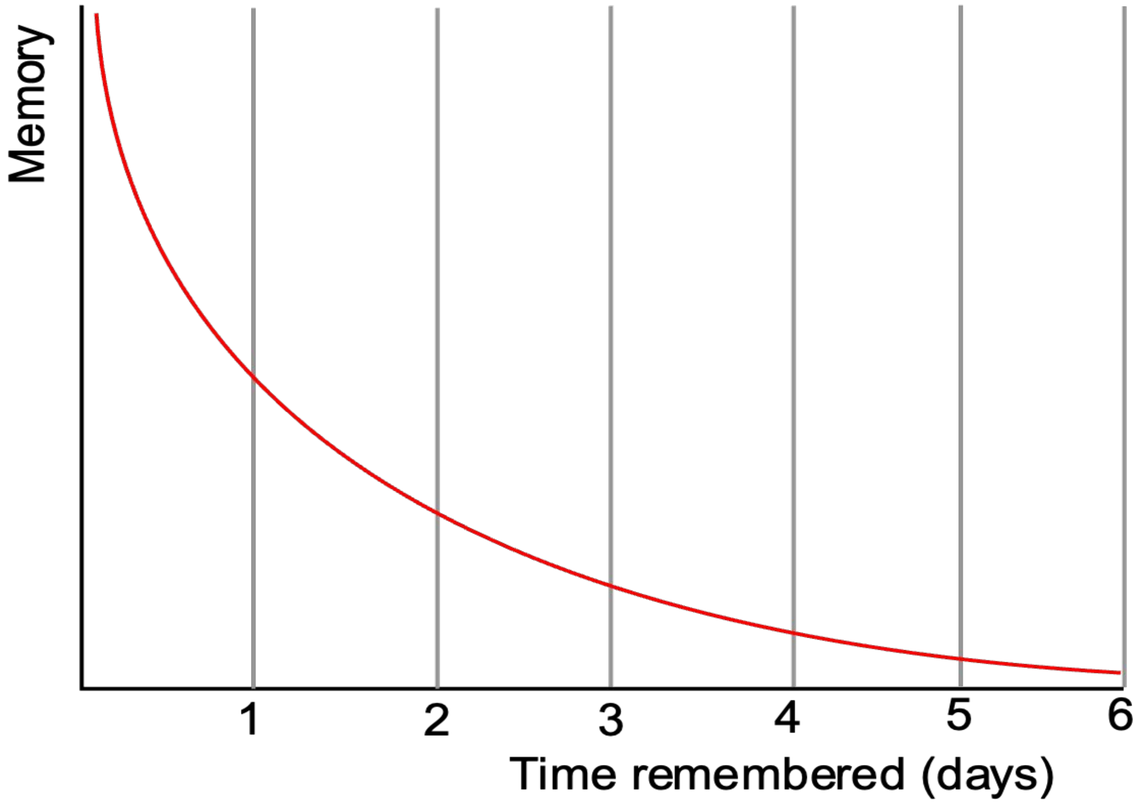
Retrieval & Rehearsal

Why do we need retrieval practice?

The DO’s and DON’Ts of retrieval practice

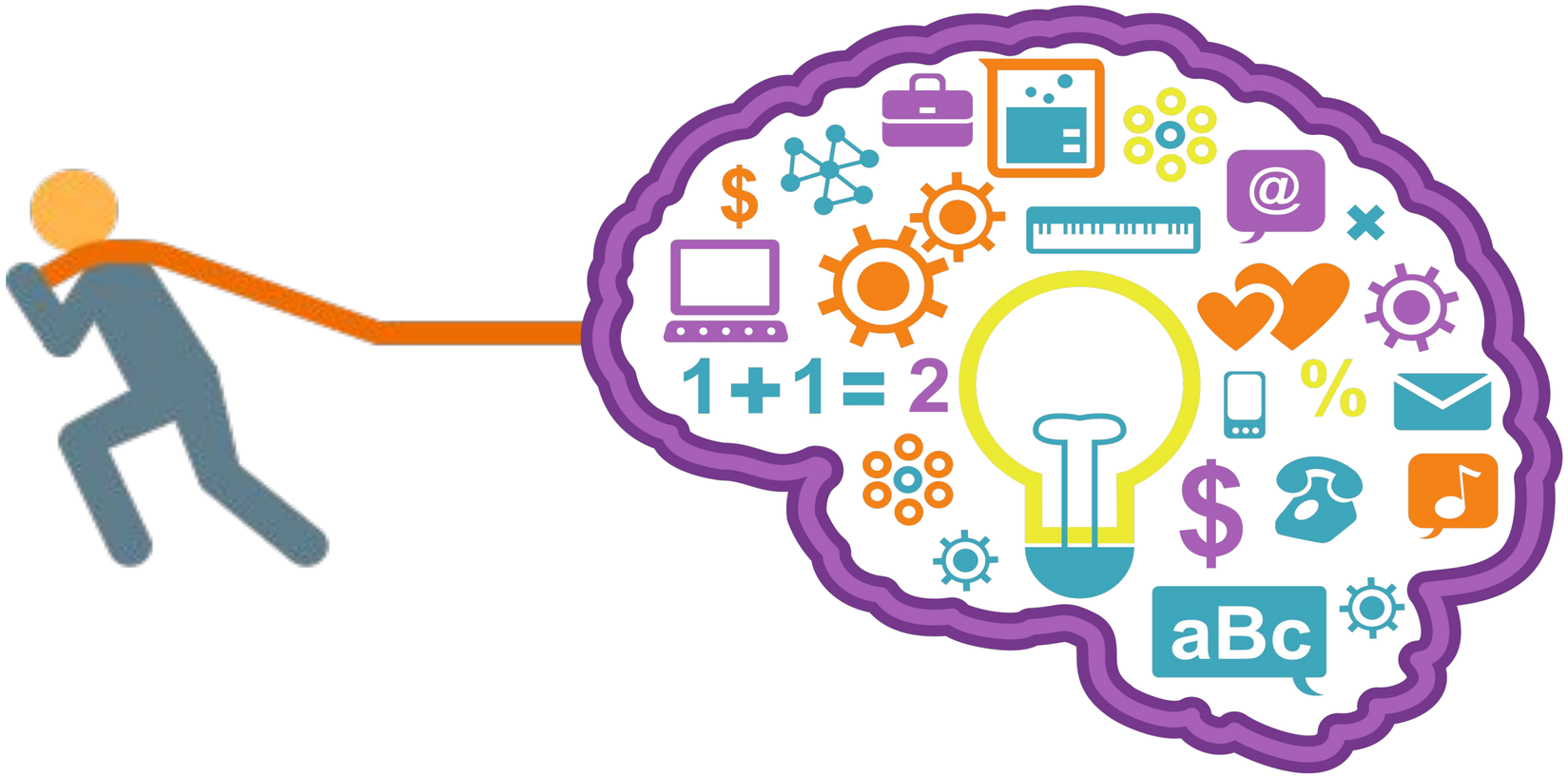
Why do we need retrieval practice?

Ebbinghaus’ Forgetting Curve



https://commons.wikimedia.org/wiki/File:ForgettingCurve.svg

Retrieval practice is pulling information out

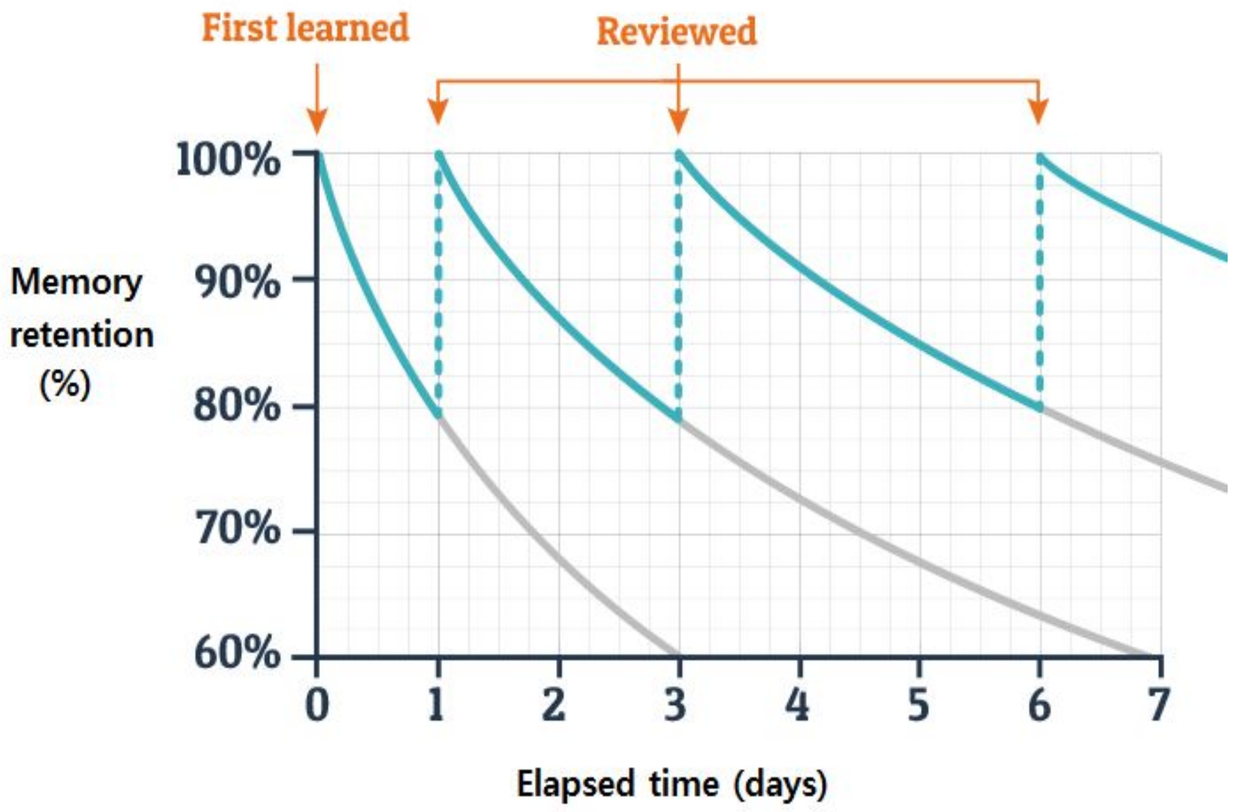


(Agarwal & Bain, 2019)

Retrieval practice is not giving new information

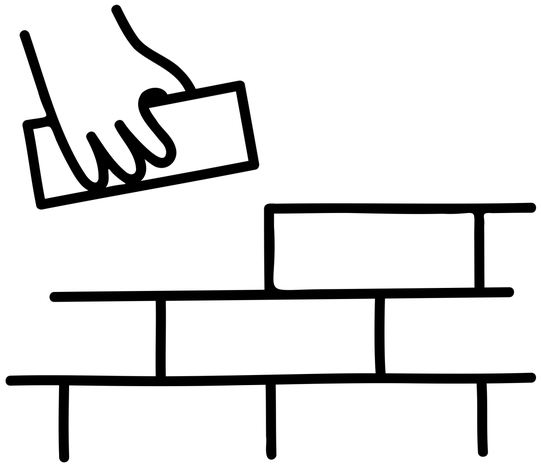
(Agarwal & Bain, 2019)

The Effects of Spaced Repetition on Learning



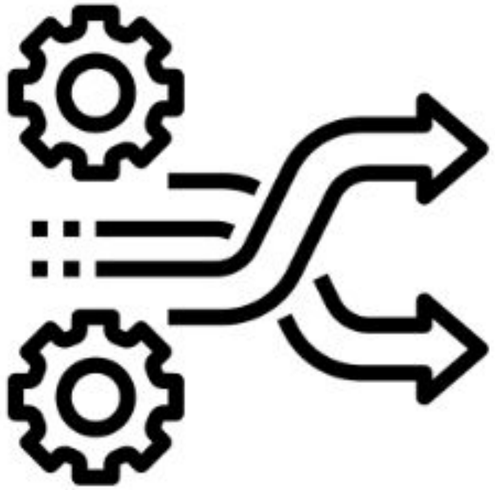
Chun & Heo, 2018

Layers of Learning



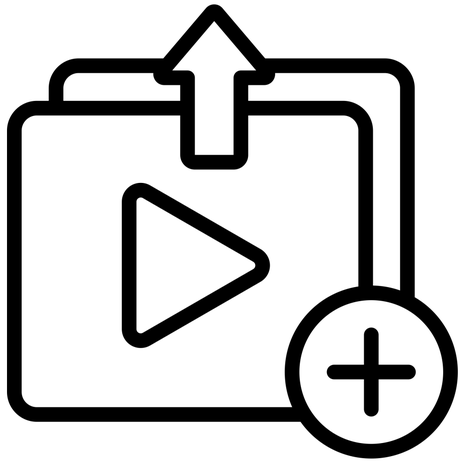
Accretion

The basic accumulation or building up of facts and information



Tuning

Occurs when new information means that an existing schema needs to be modified

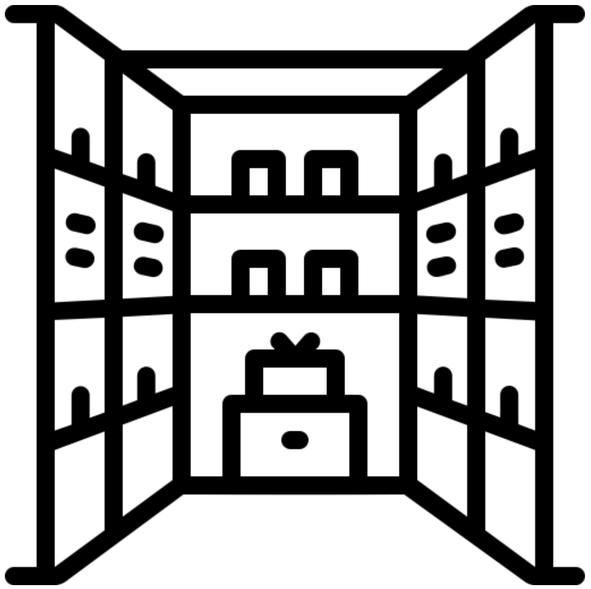


Restructuring

Where completely new schema need to be created based on new facts or information

(Rumelhart & Norman, 1978)

Memory relies on the strength of two areas



Storage strength

Retrieval strength

(Bjork & Bjork, 1992)

“Every time that information is retrieved, or an answer is generated, it changes that original memory to make it stronger”

Kate Jones (2020) Retrieval Practice

The DO’s and DON’Ts of retrieval practice

SCIENCE OF LEARNING

💡 Not every retrieval effort generates the same effect

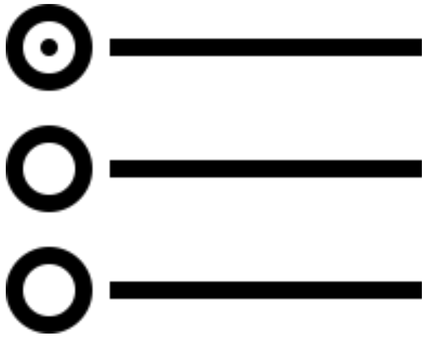
Desirable Difficulties

The Sweet Spot

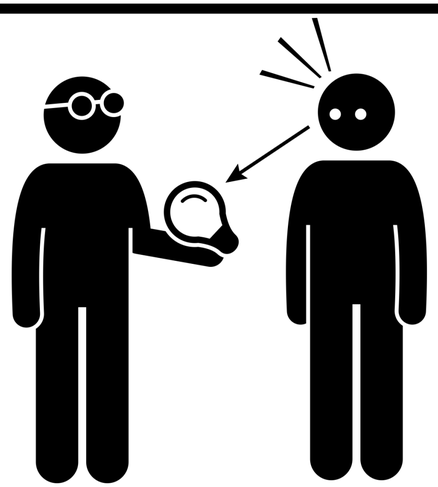
- Retrieval

Types of Retrieval

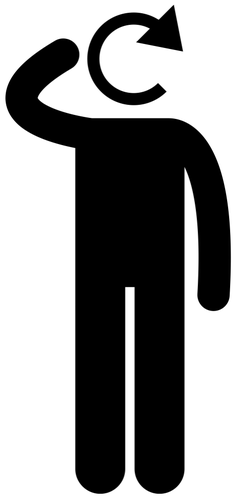
Review



Recognition



Cued-recall



Free-recall

Less → More

Level of Retrieval Effort

(Tulving, 1968)

Skip Counting by 4s

Let's skip forwards by 4s, starting from 4.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

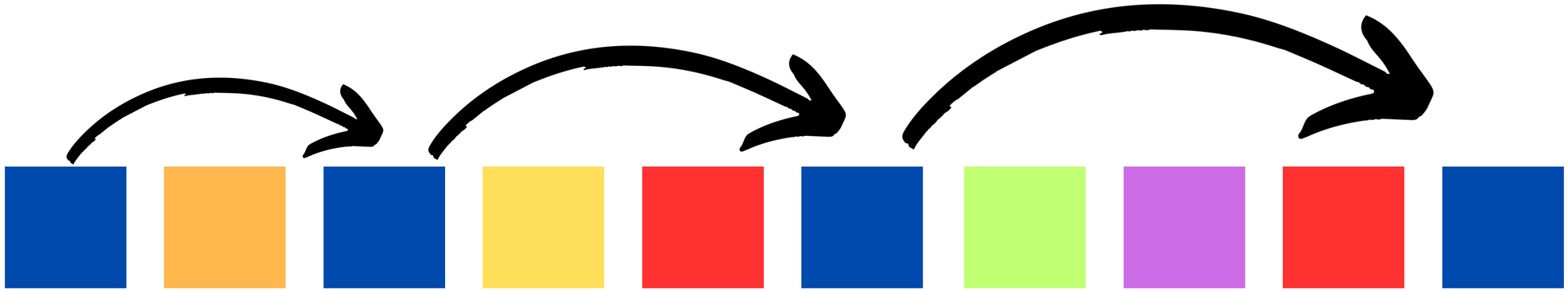
List multiples of 5

Desirable Difficulties

The Sweet Spot

- Retrieval
- Spaced

Spaced

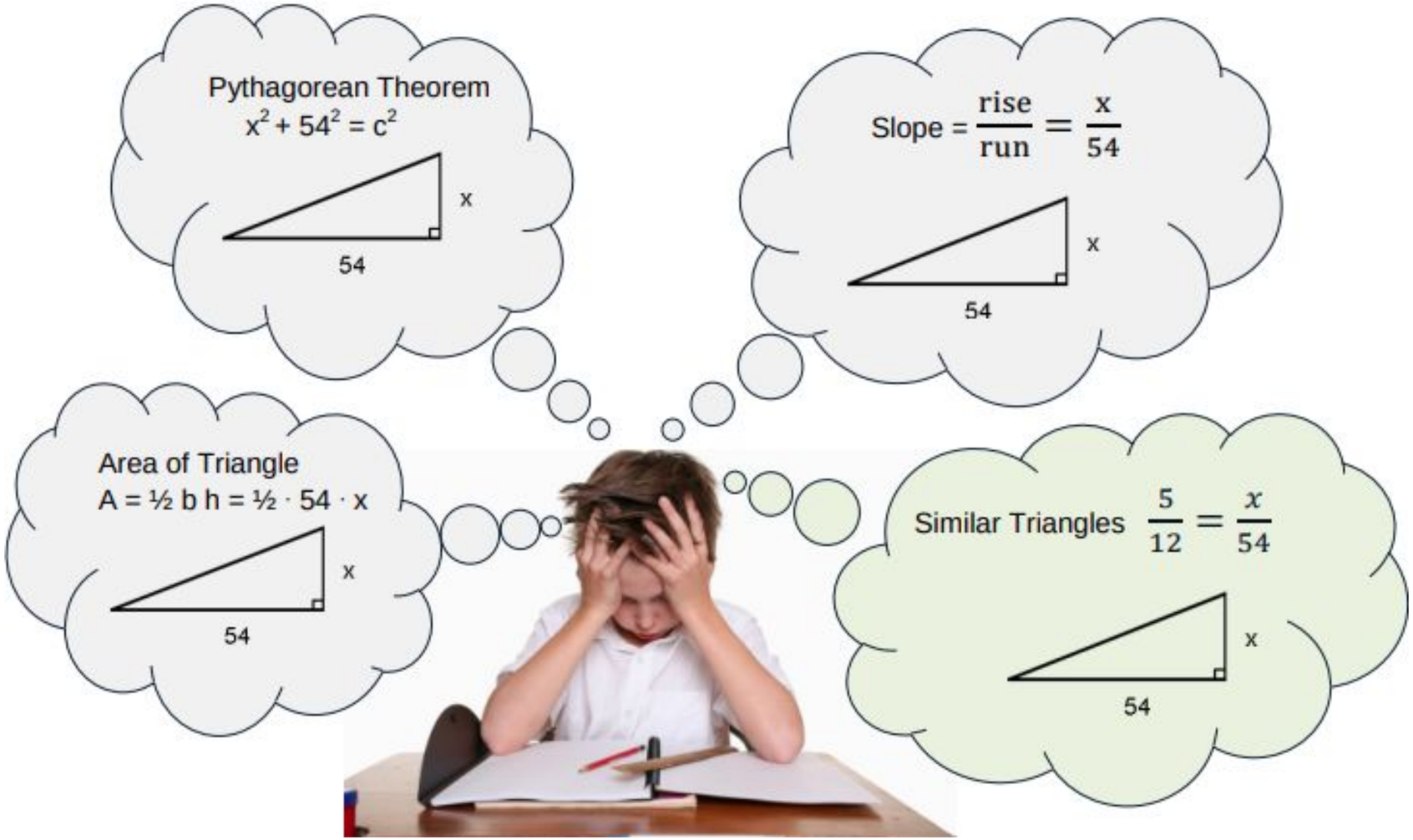


Massed

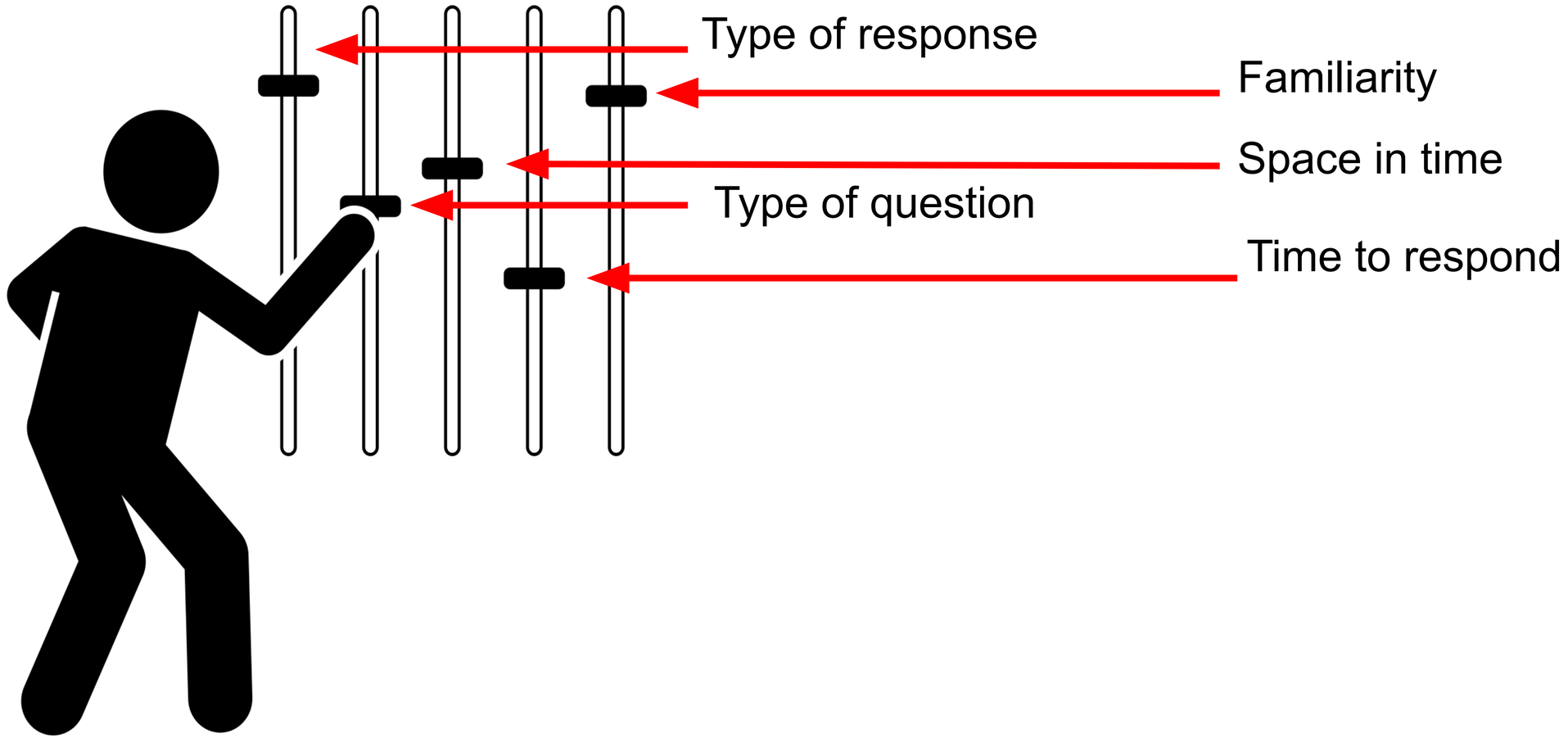
Desirable Difficulties

The Sweet Spot

- Retrieval
- Spaced
- Interleaved



(Rohrer et al, 2017)


Type of response
Familiarity
Space in time
Type of question
Time to respond

💡Retrieval practice is not the time for new learning

Daily Review

- A short, fast-paced session (10-15 minutes)
- Requires students to recall previously-learnt information
- Involves no new learning
- Whole-class instruction

Pace

- Quick and snappy
- Students should have no time to become distracted or disengaged
- Setting up routines is essential

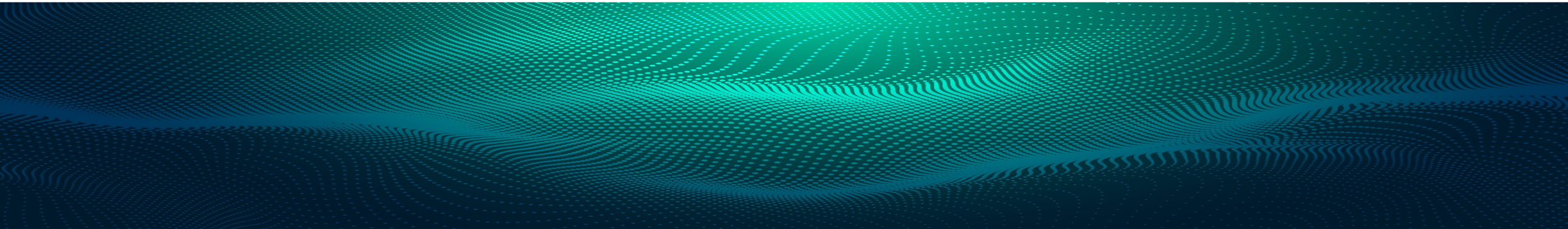
Setting up routines for daily review

- Expected behaviours
  - volume
  - collecting and packing up equipment
  - turn and talk partners

Adaptations

- Content – breadth and depth of examples
- Seating arrangements
- Additional prompting
- Access to scaffolds

What if my students don't know it??



Leave it for a Lesson – Or *Brief* Reteach

- Can it be resolved quickly?
- Make a note to come back to it
- Don't fall into trap of retrieval -->lesson

💡 Retrieval practice isn't just about going through the motions

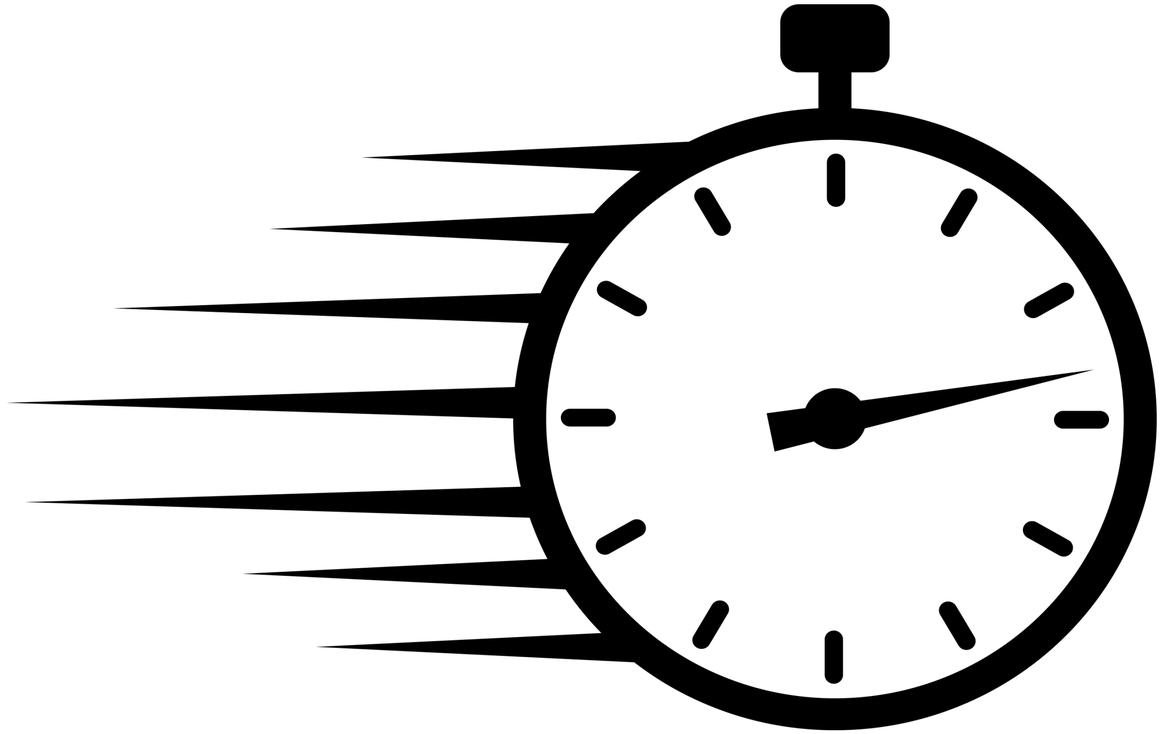



Fig.5
Fig.3
Fig.10
Fig.18

💡Retrieval practice is not just recall slides

Flash card slides can be great!

See the examples from David Morkunas next...

units of time

years in a millenium

1000

compass directions

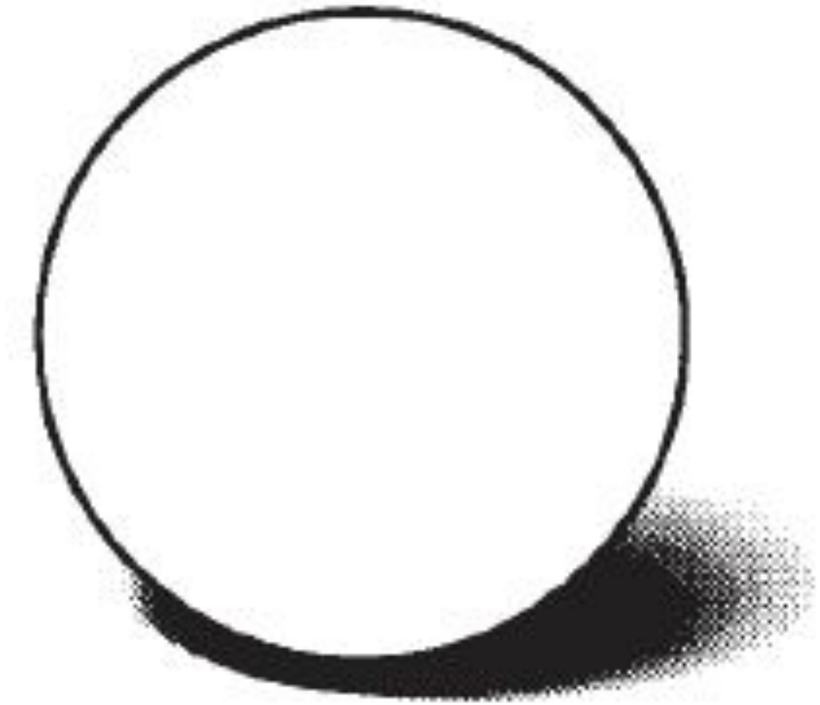
Northeast

NE

units of measurement

KB kilobytes

3d solids



sphere

units of time

days in October

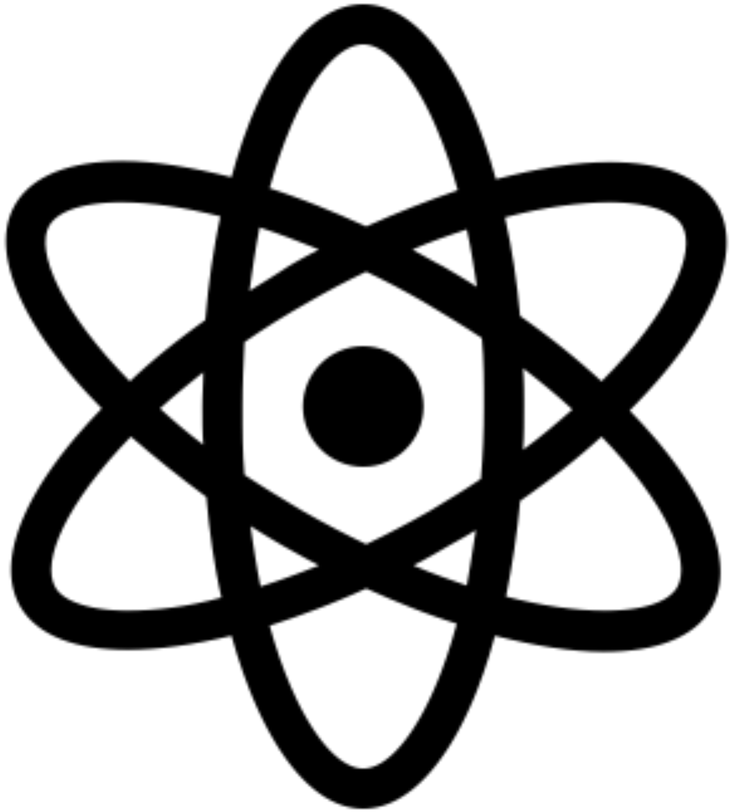
31

units of time

days in September

30

But also aim for tasks that go beyond recall



Beyond recall

- Multiple choice (non-verbal / written)
- Short answer (whiteboard, workbook)
- Skill based – multiple problems to solve
- Brain dump
- Open-ended
- "Explain the error" + "Explain why" prompts – *brief but challenging*

(Agarwal & Bain, 2019)

SKIP COUNTING by 9s

M

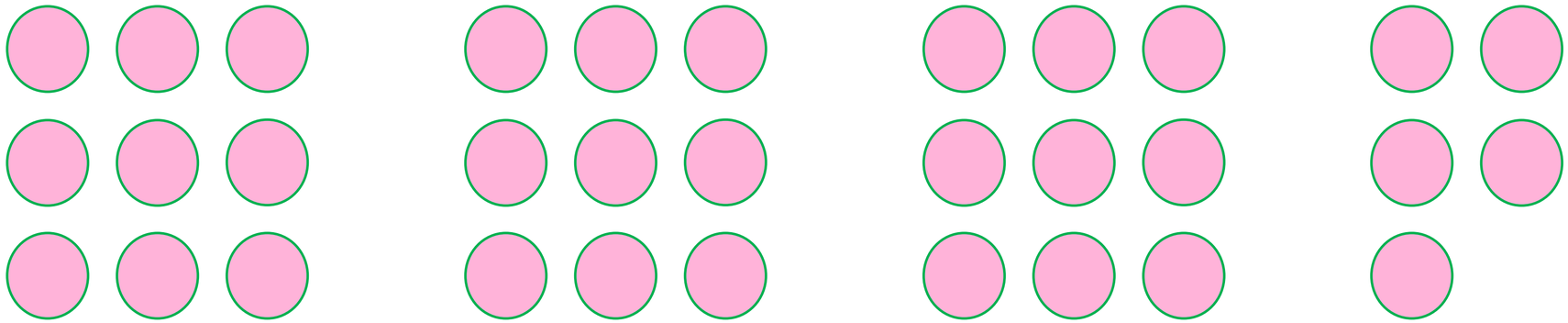
Let's skip count forwards by 9s, starting from 9.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

SUBITISING

M

How many objects are there? 32



Half the collection. 16

Double the collection. 64

Divide by 8. 4

MULTIPLICATION FACTS – x9

1 x 9 = 9	3 x 9 = 27	6 x 9 = 54
10 x 9 = 90	7 x 9 = 63	8 x 9 = 72
2 x 9 = 18	5 x 9 = 45	9 x 9 = 81
4 x 9 = 36		

18 x 9 = 162	5 x 90 = 450	60 x 90 = 5,400
385 x 9 = 3,465	66 x 39 = 2,574	139 x 9 = 1,251

vertical addition with renaming

W

Write the following questions on your whiteboard vertically and solve.
Make sure you say the algorithm softly to yourself while you work.

a)
$$\begin{array}{r} {\scriptstyle 11} \\ 367 \\ +\ 384 \\ \hline 751 \end{array}$$

b)
$$\begin{array}{r} {\scriptstyle 11} \\ 268 \\ +\ 435 \\ \hline 703 \end{array}$$

c)
$$\begin{array}{r} {\scriptstyle 22} \\ 467 \\ 588 \\ +\ 268 \\ \hline 1323 \end{array}$$

d)
$$\begin{array}{r} {\scriptstyle 1\ 11} \\ 8.466 \\ +\ 3.894 \\ \hline 12.360 \end{array}$$

Brain dump – Retrieval

Write down everything you know about changes of state versus chemical reactions.

SCIENCE OF LEARNING

CONFERENCE 2025

PLATINUM SPONSORS

compnow

GOLD SPONSORS

Nelson

SWITCH