Learning times tables

From 2019/20 all pupils at the end of KS2 will undergo an online test of their ability to recall their times tables up to 12 x 12. Not all pupils will find committing their times table to memory to be an achievable task, particularly those with SEND. Successful learning of the times tables will depend upon a range of factors that will require identification of the following aspects:

- What pre-requisite skills does the pupil bring to the learning?
- Are pupils developmentally ready for this?
- Does the teaching being provided to learn tables match their abilities and preferences?
- Do pupils in a class share common reasons for the difficulty in acquiring this knowledge?
- How do variations in short and long term memory affect the outcomes?
- What action can a teacher take if the pupil is a poor at sequencing?
- What levels of motivation and perseverance does the pupil have?
- What will be the effect on anxiety levels and self-esteem if the pupil fails to attain competence in times tables?

There are no single, simple answers to these questions which suggests that one method for teaching tables to be used with everyone, is unlikely to bring about successful outcomes.

Rote learning. Pupils who are poor at sequencing will find rote learning extremely difficult and continuing along this path will only cause unnecessary confusion and frustration. Rote learning as a class activity also gives an opportunity for the pupil to hide – with tables for instance, some will know the tune but not the words, so this is an inefficient approach to learning the multiplication facts. Rote learning also makes no connection with other tables. Instead:

a) Many maths learners need to start at the manipulation stage. Therefore unrelated to age, pupils with weak recall of maths facts will require concrete materials to support the understanding of the concept of multiplication. Once this has taken place and pupils become secure in their knowledge then they will be able to move to abstract learning and then to application stage, evidencing that they are able to apply their knowledge.

b) Focus on increasing mental calculation skills. If a pupil is unable to recall 7 x 4 for instance, can they use their knowledge of the 2 times table (doubling) to help them find the answer i.e. 7 x 2 (14) + 7 x 2 (14) = 28.

c) Demonstrate to them that being able to be successful at times tables is achievable even if they have sequencing and recall difficulties, by breaking the task down into successful steps. See below:

1) Pupils need to be taught from the beginning the commutative association of multiplication facts so they realise that 4 x 6 is the same as 6 x 4. Once this is secured then the learning of times table facts is halved. This can be modelled by using a multiplication square for tables from 0 to 12. Here there are a possible **169 facts to learn** but by taking account of the commutative law, this is then reduced to **91** as **78** are commutative and there are **13** square numbers.

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

2) Learn 0 x table: Answer always 0. **25** facts (only **13 new facts** taking into account commutative law). 169-25 = **144** facts left to learn (85%)

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

3) Learn 1 x table: Answer is same as given number e.g. 1 x 7 = 7. **23** facts (only **12 new facts** taking into account commutative law.) 144 - 23 = **121** facts left to learn (72%)

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

4) Learn 10 times table: Answer always add 0 to the given number e.g. 3 x 10 = 30. **21** facts (only **11 new facts** taking into account commutative law.) 121-21 = **100** facts left to learn (59%)

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

5) Learn 2 x table: Answer always double e.g. 6 x 2 = 12. **19** facts (only **10 new facts** taking into account commutative law.) 100-19 = **81** facts left to learn (48%)

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

6) Learn 5 x table: Answer always ends with 0 or 5. **17** facts (only **9 new facts** taking into account commutative law.) 81-17 = **64** facts left to learn (38%)

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

7) Learn 3 x table: Answer always adds up to 3, 6 or 9. **15** facts (only **8 new facts** taking into account commutative law.) 64 – 15 = **49** facts left to learn (29%)

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

8) Learn 9 times table: Answers always adds up to 9 apart from x 11 and x 12. **13** facts (only **7** new facts taking into account commutative law). 49-13 + **36** facts left to learn (21%)

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

9) Learn 11 times table: Digits repeat apart from x 11 and x 12. **11** facts (only **6 new facts** taking into account commutative law. 36 -11 = **25** facts left to learn (15%)

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

10) Learn square numbers: **5 new facts** to learn. 25 -5 = **20** facts left to learn (12%)

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

11) Learn 4 x table: Answer doubling x 2 e.g. 6 x 4 = 6 x 2 + 6 x 2 = 24. 8 facts (only **4 new facts** taking into account commutative law. 20-8 = **12** facts left to learn (7%)

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

12) Learn the remaining tables: **12** facts (only **6** taking into account commutative law: : 6 x 7/7 x 8, 6 x 8/8 x 6, 6 x 12/12 x 6; 7 x 8/8 x7, 7 x 12/12 x 7; 8 x 12/12x 8 (100%)

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

Resources
There are many free online games and activities available to support pupils to practise their tables: Visit **www.topmarks.co.uk** for a variety of online games that offer rehearsal and reinforcement of developing knowledge. These include
- **Connect4Factors** – in which 1 or 2 players have to line up given multiples of the same number.
- **Timestables Grid** – place answers on the grid in timed or untimed sessions. Players can choose whole grid or just individual tables to try.
- **Learn Your Tables** – choose to answer as many as you want on the keypad, drag the answer over the question or take a test.
- **Factors and Multiples –** play The Legend of Dick and Dom game to help make an antidote to the plague spreading across the kingdom. Suitable for older KS2 and KS3 pupils.
- **Loop Cards** – complete a loop by rearranging the question/answer cards to the outside of the screen so they match up. Similar to playing dominoes.   Players can choose multiplication or division and which table to try.
- **Multiple Wipeout** – burst the balloons which are multiples of a given number. Tables from 2 to 12.

An American site, **Cool Math 4 Kid**s has lessons and online games. It has information on how multiplication works and activities to promote remembering of multiplication facts, using flash cards which can be printed out and coloured in. There are also games such as the **Timernator** which tests how many times tables' facts you can answer in one minute. **www.coolmath4kids.com**

www.multiplication.com./games/all-games has several different games to play. **Knockdown** is an 18 level game involving knocking down all the boxes. If the player misses, they have to answer a multiplication question in order to continue. In **Cave Run** the player has to answer questions on the way to collect coins and the levels increase as you progress. **Math Models** is a game in in which the player can answer questions in banks of 10 to earn rewards to change a model's outfit.

The Study Maths site has two simple activities that may be of value; the **Beat the Clock** game is one in which players have 10 seconds to answer as many multiple choice questions as they can, and in **Detention Dash,** players have to complete the multiplication grid as fast as possible. **http://preview.tinyurl.com/p75uft7**

www.learn-timestables.com is a site in which players can select the tables from 1 to 10 which they want to learn. The player then has up to 10 seconds to answer each question. There is a coloured overview which gives an indication of how well you know a particular fact. Green is good, red is not so good. There are around 15 questions on each table.

Quick fire times tables   **http://preview.tinyurl.com/znf67wg**

Carol Vorderman's Video Class – Pop Music Times Tables has initial instruction on multiplication as well as different pop song tunes to learn the tables. It begins with the 2, 5 and 10 tables before moving on to the 3, 11, 4 and 6s and ends with 7, 8 and 9s. Tunes are played twice firstly giving the answer and then a second time for pupils to provide it. This video is about 50 minutes in length. **www.youtube.com/watch?v=Y9QNN6KIxMo**

For games and puzzles to aid the learning of tables there is a **Times Table Fun Pack** on **The School Run** website. This provides lots of puzzles, games and resources to print out to help with the x 2 to x 12 times tables.**www.theschoolrun.com**

The **TES Connect** site also has access to many games, worksheets, tests, problem solving activities as well as access to Teachers TV. Users need to register to use this site. **http://preview.tinyurl.com/l2ynpxe**

Two useful publications to help with teaching times tables include:
- **What to do when you can't learn the times tables** by Steve Chinn. This guides the reader through learning the tables from x 0 to x 10, but not in numerical order. Published by Egon Publishers, it costs £12.50. **www.egon.co.uk**
- **Perform with Times Tables**, by David J. Sharp is a 1:1 coaching manual for multiplication and division. It deals with fact families and times tables. It costs £18 or £15.50 each if five or more books are bought. **www.powerof2.co.uk**