A Quick Guide : version française

Multiplication Patterns

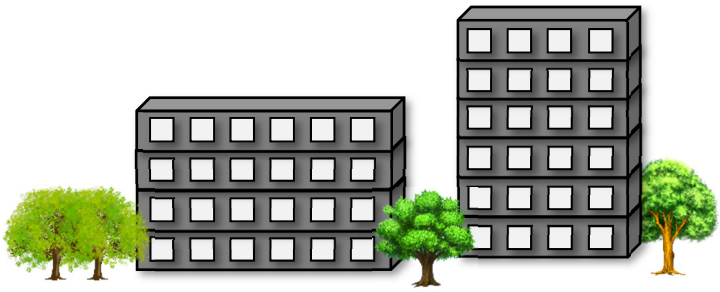
The Power of Ten system is based on the belief that the natural mode of the brain is to search for patterns. Noticing a pattern delivers a feeling of satisfaction – a feeling that something has been accomplished.

Preparation for an All the Facts sheet

There are 132 math multiplication facts when the times tables for 0, 1, 2, 3 …10 are listed.

The first major pattern that most children learn is that 4 + 2 gives the same answer as 2 + 4. This is known as the Principle of Conservation and also known as the Commutative Principle. It is not important for students to know the names of this very important pattern, but it is one that is solidly embedded in the brain of students learning all their adding facts. Understanding and applying this pattern to the list of 132 facts cuts the list in half. If a student is memorizing the multiplication facts, then 4 x 6 is different from 6 x 4 and the arrays for these two multiplication facts are different in their orientation, but the same in their total amount (product).

An apartment building with 4 floors and 6 apartments on each floor is different than an apartment building with 6 floors and 4 apartments on each floor – but they both have 24 apartments. This seems obvious, but it is a crucial and important pattern.



Now that the list has been reduced from 132 facts to 66 facts, it is possible to know 45 of the 66 facts by patterns that are readily learned without any instruction. These 45 facts have been listed on the 'Multiplication Pattern Facts' sheets. [See pages 3-6 of this document.]

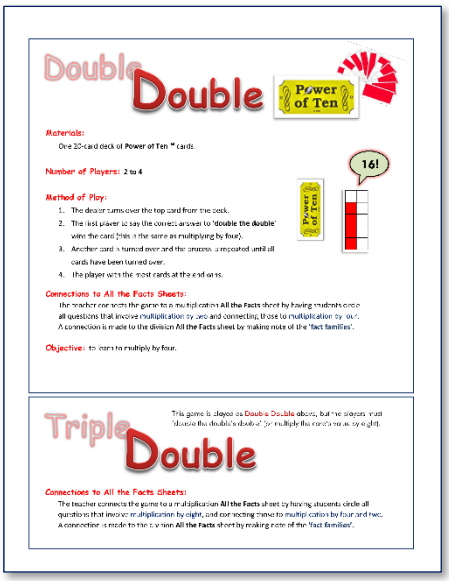
The 'Multiplication Pattern Facts' sheets have been created for students who find the All the Facts sheet with 66 questions intimidating. Students should be allowed no more than 10 minutes to complete the sheet. They should be asked to leave out any questions they do not know without counting or drawing.

The 45 facts on the 'Multiplication Pattern Facts' sheet are all learned as patterns – they do not require any memorization. The teacher should organize instruction so that students discover the following patterns (the order is not important, and the video starts with the 'twos' – it depends on the class). The patterns should not be taught but should be described by students (*see video part 3 on the website*). The students then become the teachers and the facts seem easier to learn. On the website there are six videos on teaching the multiplication facts. To watch the first four parts as one whole, go to https://vimeo.com/10968680

The order of the patterns is presented as follows but, in the videos, the first pattern a student identified as easy was the 'two times table' so that is where the day started.

- Zero
- One
- Two – which is the doubles pattern learned earlier in adding (may have been memorized)
- Ten
- Five – which is connected to ten

When a student knows these patterns, the teacher can encourage the student to connect the facts of four to the twos and then connect the facts of four to the eights by playing *Double-Double* and *Triple Double* games.



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At this point the teacher moves to the All the Facts sheets and investigates the patterns in the facts of 9. Do not teach the finger rule for 9 because it is a trick that has no meaning for most teachers and students. Also, if you don't want to see adults using their fingers, why teach it?

Les patrons de la multiplication – COMMENÇONS

Pré – Tous les faits – FORMULAIRE **A** (45)

0 x 1 =	4 x 5 =	10 x 1 =	2 x 6 =
2 x 3 =	2 x 10 =	1 x 4 =	6 x 0 =
10 x 9 =	7 x 2 =	8 x 5 =	0 x 10 =
0 x 2 =	3 x 5 =	4 x 0 =	10 x 6 =
7 x 5 =	1 x 5 =	5 x 0 =	5 x 6 =
1 x 7 =	9 x 2 =	1 x 8 =	10 x 10 =
5 x 9 =	2 x 4 =	5 x 2 =	8 x 2 =
6 x 1 =	3 x 10 =	1 x 3 =	10 x 7 =
4 x 10 =	10 x 8 =	5 x 5 =	2 x 1 =
9 x 0 =	3 x 0 =	0 x 8 =	9 x 1 =
2 x 2 =	0 x 7 =	1 x 1 =	5 x 10 =
0 x 0 =			

Analyse – FORMULAIRE A

Correctes _____ # Omis _____ # d'erreurs _____

Nom: _____ Date: _____

Une fois la feuille corrigée et toutes les erreurs encerclées, l'élève devrait:
[étape 1] – **corriger toutes les erreurs**– elles auraient dû être encerclées par l'enseignant(e)
[étape 2] – faire les questions qui ont été **omises**

Faire le lien entre les patrons et les faits restants

Pré – Tous les faits – FORMULAIRE **A** (21)

7 x 8 =	**9 x 6 =**	**4 x 4 =**	**3 x 4 =**
8 x 9 =	**4 x 8 =**	**3 x 7 =**	**6 x 8 =**
3 x 3 =	**7 x 4 =**	**4 x 6 =**	**7 x 7 =**
9 x 4 =	**6 x 7 =**	**3 x 9 =**	**6 x 6 =**
8 x 3 =	**9 x 9 =**	**8 x 8 =**	**6 x 3 =**
7 x 9 =			

Les CONNECTEURS utiles – FORMULAIRE A (8)

2 x 8 =	**2 x 2 =**	**7 x 2 =**	**9 x 2 =**
4 x 2 =	**6 x 2 =**	**2 x 5 =**	**2 x 3 =**

Analyse ton travail – FORMULAIRE A – Liez les patrons

# Correctes	# Omis	# d'erreurs
_____	_____	_____

Nom: _____ **Date:** _____

Une fois la feuille corrigée et toutes les erreurs encerclées, l'élève devrait:
[étape 1] – **corriger toutes les erreurs**– elles auraient dû être encerclées par l'enseignant(e)
[étape 2] – faire les questions qui ont été **omises**

Les patrons de la multiplication – COMMENÇONS

Pré – Tous les faits – FORMULAIRE **B** (45)

1 x 0 =	5 x 4 =	1 x 10 =	6 x 2 =
3 x 2 =	10 x 2 =	4 x 1 =	0 x 6 =
9 x 10 =	2 x 7 =	5 x 8 =	10 x 0 =
2 x 0 =	5 x 3 =	0 x 4 =	6 x 10 =
5 x 7 =	5 x 1 =	0 x 5 =	6 x 5 =
7 x 1 =	2 x 9 =	8 x 1 =	10 x 10 =
9 x 5 =	4 x 2 =	2 x 5 =	2 x 8 =
1 x 6 =	10 x 3 =	3 x 1 =	7 x 10 =
10 x 4 =	8 x 10 =	5 x 5 =	1 x 2 =
0 x 9 =	0 x 3 =	8 x 0 =	1 x 9 =
2 x 2 =	7 x 0 =	1 x 1 =	10 x 5 =
0 x 0 =			

Analyse – FORMULAIRE B

# Correctes	# Omis	# d'erreurs
_____	_____	_____

Nom: _____ **Date:** _____

Une fois la feuille corrigée et toutes les erreurs encerclées, l'élève devrait:
[étape 1] – **corriger toutes les erreurs**– elles auraient dû être encerclées par l'enseignant(e)
[étape 2] – faire les questions qui ont été **omises**

Faire le lien entre les patrons et les faits restants

Pré – Tous les faits – FORMULAIRE **B** (21)

8 x 7 =	**6 x 9 =**	**4 x 4 =**	**4 x 3 =**
9 x 8 =	**6 x 4 =**	**7 x 3 =**	**8 x 6 =**
3 x 3 =	**4 x 7 =**	**6 x 4 =**	**7 x 7 =**
4 x 9 =	**7 x 6 =**	**9 x 3 =**	**6 x 6 =**
3 x 8 =	**9 x 9 =**	**8 x 8 =**	**3 x 6 =**
9 x 7 =			

Les CONNECTEURS utiles – FORMULAIRE B (8)

8 x 2 =	**2 x 2 =**	**2 x 7 =**	**2 x 9 =**
2 x 4 =	**2 x 6 =**	**5 x 2 =**	**3 x 2 =**

Analyse ton travail – FORMULAIRE B – Liez les patrons

# Correctes	# Omis	# d'erreurs
_____	_____	_____

Nom: _____ **Date:** _____

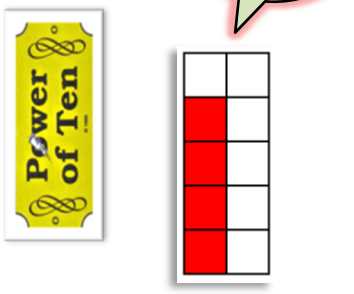
Une fois la feuille corrigée et toutes les erreurs encerclées, l'élève devrait:
[étape 1] – **corriger toutes les erreurs**– elles auraient dû être encerclées par l'enseignant(e)
[étape 2] – faire les questions qui ont été **omises**

Double Double

Materials:

One 20-card deck of **Power of Ten™** cards.

Number of Players: 2 to 4



Method of Play:

1. The dealer turns over the top card from the deck.
2. The first player to say the correct answer to **'double the double'** wins the card (this is the same as multiplying by four).
3. Another card is turned over and the process is repeated until all cards have been turned over.
4. The player with the most cards at the end wins.

Connections to All the Facts Sheets:

The teacher connects the game to a multiplication **All the Facts** sheet by having students circle all questions that involve multiplication by two and connecting those to multiplication by four. A connection is made to the division **All the Facts** sheet by making note of the **'fact families'**.

Objective: to learn to multiply by four.

Triple Double

This game is played as Double Double above, but the players must 'double the double's double' (or multiply the card's value by eight).

Connections to All the Facts Sheets:

The teacher connects the game to a multiplication **All the Facts** sheet by having students circle all questions that involve multiplication by eight, and connecting those to multiplication by four and two. A connection is made to the division **All the Facts** sheet by making note of the **'fact families'**.