MAGIC OF 37

Complete the number sentences by putting a number or × or = in the box:

37 × 3 □ 111
37 × □ = 222
37 □ 9 = 333
37 × □ = 444
□ × 15 = 555
37 □ 18 = 666
□ × 21 = 777
37 × 24 □ 888
□ × 27 = 999

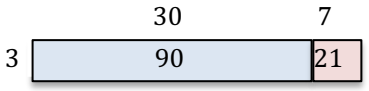
Work by yourself, first complete the number sentences and then explain why the pattern occurs.

Carry on these multiplications up to 37 × 54 and then explore the pattern that you get.

Work with a partner and talk about what you notice about this pattern. Then write down everything that you notice.

HELP

Look at the diagram and think about 37 × 3.



This multiplication is 30 × 3 add 7× 3.

So, 37 × 3 = 90 + 21 = 111.

If you multiply by 6 instead of 3 then you double the answer.

37 × 6 = 111 × 2 = 222.

Can you complete all the number sentences now?

NEXT

BEAUTIFUL NUMBERS

Can you work out the numbers to replace the marks?

? × 9 + 7 = 88
? × 9 + 6 = 888
? × 9 + 5 = 8888
? × 9 + 4 = 88888
? × 9 + 3 = 888888
? × 9 + 2 = 8888888
? × 9 + 1 = 88888888
? × 9 + 0 = 888888888

? -

NOTES FOR TEACHERS

SOLUTION

37 × 3 = 111	**37 × 30 = 1110**
37 × 6 = 222	**37 × 33 = 1221**
37 × 9 = 333	**37 × 36 = 1332**
37 × 12 = 444	**37 × 39 = 1443**
37 × 15 = 555	**37 × 42 = 1554**
37 × 18 = 666	**37 × 45 = 1665**
37 × 21 = 777	**37 × 48 = 1776**
37 × 24 = 888	**37 × 51 = 1887**
37 × 27 = 999	**37 × 54 = 1998**

The pattern occurs because each line is a multiple of 111. So each line is made from adding 111 to the product in the line before.

Why do this activity?

This activity can be a lesson starter. It only takes about ten minutes. It is an ideal activity for an **inquiry based lesson** as it gives learners practice in multiplying 2 digit numbers by 1 and by 2 digit numbers. It helps to reinforce what they already know and, at the same time, it challenges them to extend their mathematical thinking and to notice and explain number patterns. It also gives learners the chance to explore the continuation of the pattern for themselves.

Learning objectives

In doing this activity students will have an opportunity to:

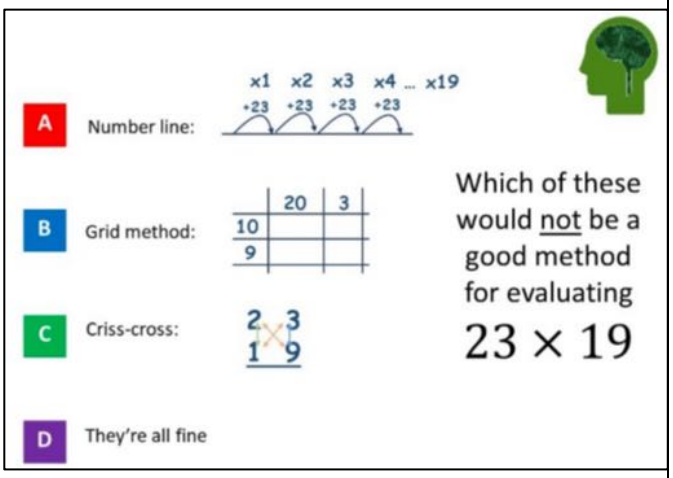
- practise multiplying 2 digit numbers by 1 and 2 digit numbers;
- develop an understanding of multiples and factors.

Generic competences

- **think mathematically,** reason logically and give explanations and proofs;
- **visualize** and interpret patterns.

Diagnostic Assessment This should take about 5–10 minutes.

1. Write the question on the board, say to the class:
   "Put up 1 finger if you think the answer is A, 2 fingers for B, 3 for C and 4 fingers for D".
2. Notice how the learners responded. Ask a learner who gave answer A to explain why he or she gave that answer and DO NOT say whether it is right or wrong but simply thank the learner for giving the answer.
3. It is important for learners to explain the reasons for their answers to develop communication and clear thinking.
4. Then do the same for answers B, C and D. Try to make sure that learners listen to these reasons and try to decide if their own answer was right or wrong.



5. Ask the class again to vote for the right answer by putting up 1, 2, 3 or 4 fingers. Notice if there is a change and who gave right and wrong answers.

A. is the correct answer because the 'adding on' method requires a lot of calculations, is much slower and less efficient and liable to error.

Common Misconceptions

A. Learners who struggle to master multiplication often cling to the misconception that they can work with repeated addition because they can get correct answers that way.

B. This is a good method but some learners may not have met it.

C. This is the standard algorithm, though some learners may understand how to use it and may think it is not a good method.

D. Learners who don't understand the limitations of the 'adding on' method will think all the methods are fine. https://diagnosticquestions.com

Suggestions for teaching

If you decide not to use this activity as a lesson starter, then first do the diagnostic question, giving the class two opportunities to vote for the correct answer as usual.

Ask 'why is the first method not a good one?'

Give the example 3 + 3 + 3 + 3 + 3 = ? which gives the same answer as 3 × 5 = ?

Encourage the class to discuss why this is true and yet the adding on method is not a good method of doing multiplication.

If you decide to use the activity as a lesson starter then, before the lesson, write on the board:

37 × 9 =

37 × 21 =

and start the lesson by asking the learners to complete these multiplications.

While they are doing this copy the question on the blackboard, or give out paper copies, and tell the learners to do it as soon as they have finished the two multiplication sums. The learners should normally work individually on this task but, when they get to explaining the pattern, you might suggest that they work in pairs and talk to each other about it..

Finally have a whole class discussion about the pattern and why it occurs.

Key questions

- What do you notice about these number sentences?
- Can you see multiples of 37? What are they?
- Can you see multiples of 111? What are they?
- What are the factors of 111?
- What are the factors of 222? etc.
- What are the factors of 1221?

Follow up

Two by two puzzle https://aiminghigh.aimssec.ac.za/two-by-two-puzzle/

Target Multiplication https://aiminghigh.aimssec.ac.za/target-multiplication/

Magic 13837 https://aiminghigh.aimssec.ac.za/magic-13837/

Note: The Grades or School Years specified on the AIMING HIGH Website correspond to Grades 4 to 12 in South Africa and the USA, to Years 4 to 12 in the UK and school years up to Secondary 5 in East Africa.
New material will be added for Secondary 6.
For resources for teaching A level mathematics (Years 12 and 13) see https://nrich.maths.org/12339
Mathematics taught in Year 13 (UK) & Secondary 6 (East Africa) is beyond the SA CAPS curriculum for Grade 12

	Lower Primary Approx. Age 5 to 8	Upper Primary Age 8 to 11	Lower Secondary Age 11 to 15	Upper Secondary Age 15+
South Africa	Grades R and 1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
East Africa	Nursery and Primary 1 to 3	Primary 4 to 6	Secondary 1 to 3	Secondary 4 to 6
USA	Kindergarten and G1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
UK	Reception and Years 1 to 3	Years 4 to 6	Years 7 to 9	Years 10 to 13