

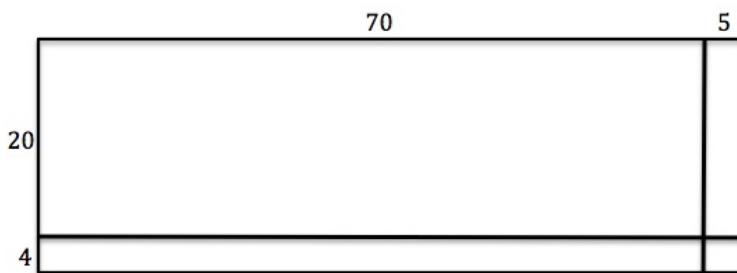


TWO BY TWO PUZZLE

×	20	4	
70	1400	?	1680
5	?	20	120
	1500	?	1800

Find numbers to replace the ? marks to solve this two by two multiplication puzzle.

Can you explain how it works?



How does this diagram connect with the multiplication?

Use the two grids BELOW to do the two multiplications in a similar way:

72×25

50×36

What do you notice? Why is this happening?

×			

×			

HELP

SPOT THE MISTAKE										
How do these methods work? Find the mistake and put it right.										
$\begin{array}{r} 29 \\ \times 51 \\ \hline 145 \\ 290 \\ \hline 435 \end{array}$	<table border="1"><tr><td>x</td><td>20</td><td>9</td></tr><tr><td>50</td><td>1000</td><td>450</td></tr><tr><td>1</td><td>20</td><td>9</td></tr></table> $\begin{aligned} 29 \times 51 \\ &= 1000 + 450 + 20 + 9 \\ &= 1479 \end{aligned}$	x	20	9	50	1000	450	1	20	9
x	20	9								
50	1000	450								
1	20	9								
$\begin{aligned} 29 \times 51 \\ &= 30 \times 51 - 51 \\ &= 1530 - 51 \\ &= 1479 \end{aligned}$	$\begin{aligned} 29 \times 51 \\ &= 29 \times 50 + 29 \\ &= 145 \times 100 + 29 \\ &= 1450 + 29 \\ &= 1479 \end{aligned}$									

Work with a partner to check all the calculations in these boxes and to correct the mistakes. Remember that you need to think about place value, that is about tens and units.

This will show you how the calculation in the puzzle on page 1 works.

SPOT THE MISTAKE												
How do these methods work? Find the mistake and put it right.												
$\begin{array}{r} 79 \\ \times 8 \\ \hline 642 \end{array}$	<table border="1"><tr><td>x</td><td>70</td><td>9</td><td>TOTAL</td></tr><tr><td>8</td><td>560</td><td>72</td><td>632</td></tr></table>	x	70	9	TOTAL	8	560	72	632	$\begin{aligned} 632 \div 8 = \\ \boxed{80 \times 7 + 8 \times 9} \div 8 = 79 \end{aligned}$		
x	70	9	TOTAL									
8	560	72	632									

SPOT THE MISTAKE <https://aiminghigh.aimssec.ac.za/years-4-7-spot-the-mistake/>

NEXT

Make up a similar multiplication task of your own using different numbers.

SOLUTION

×	20	4	
70	1400	280	1680
5	100	20	120
	1500	300	1800

The three multiplications give the same answer.

This is because we make 75 into 25 (make it one third of the size) and then make 24 three times bigger (3 times its size).

For 50×36 we double 25 and halve 36.

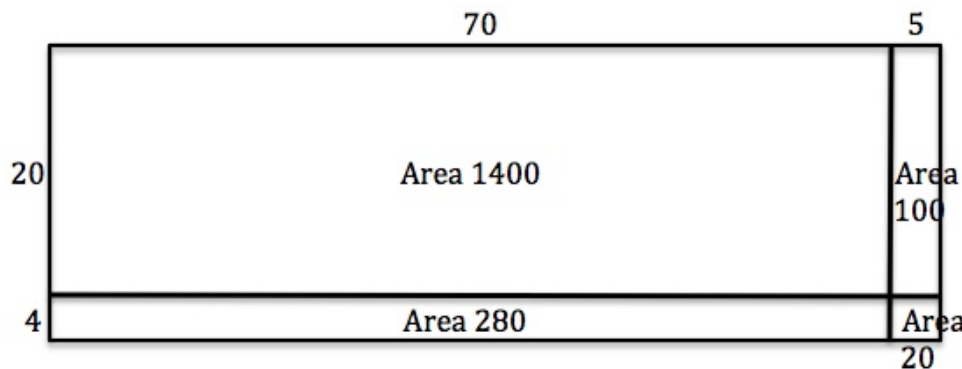
×	20	5	
70	1400	350	1750
2	40	10	50
	1440	360	1800

×	30	6	
50	1500	300	1800
0	0	0	0
	1500	300	1800

More multiplications of whole numbers that give the same answer are:

100×18
 200×9
 150×12
 $300 \times ?$, ...

Can you write down any more?



The large rectangle has area 75×24 . It is split into 4 smaller rectangles with areas 70×20 , 70×4 , 5×20 and 5×4 .

The total area of the 4 smaller rectangles must be the same as the area of the large rectangle.

NOTES FOR TEACHERS

Diagnostic Assessment This should take about 5–10 minutes.

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 for D”.

1. 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.
2. It is important for learners to explain the reason for their answer otherwise many learners will just make a guess.
3. It is important for learners to explain the reason for their answer To practise communication skills.
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.

$$\begin{array}{r} 56 \\ \times 74 \\ \hline \end{array}$$

- (A) 120
(B) 130
(C) 3,144
(D) 4,144



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.**
6. The concept is needed for the lesson to follow, so explain the right answer or give a remedial task.

D. is the correct answer. Learners should be able to pick this answer by estimation, roughly the calculation is $60 \times 70 = 4200$.

Common Misconceptions

A. These learners may have got the wrong answer by adding the numbers and not carrying the 10 from the units column to the tens column.

B. These learners have added the numbers.

C. These learners have not carried the 1000 from the hundreds column to the thousands column.

<https://diagnosticquestions.com>

Why do this activity?

This activity turns practice in the grid method of multiplication into a puzzle that often seems like a game to learners. Learners will re-construct the method for themselves and see how it works and then apply it to other multiplications. Being asked “What do you notice” helps learners to be able to look out for patterns and to notice connections. This is a very important skill in problem solving in general and in mathematics in particular. By discussing the reasons why the different multiplications give the same answer, both in pairs and with the whole class, learners develop communication skills, visualisation and numeracy. This discussion lays foundations for understanding the connection between arithmetic, geometry and algebra, also for the use of scaling and also factors and multiples.

Learning objectives

In doing this activity students will have an opportunity to:

- practise multiplication of 2 digit numbers by 2 digit numbers;
- gain a deeper understanding of the process of multiplication;
- gain a deeper understanding of the process of the connection between multiplication and areas of rectangles and how to use this to visualise number calculations.

Generic competences

In doing this activity students will have an opportunity to develop visualization and problem solving skills.

Suggestions for teaching

FORMATIVE ASSESSMENT

Start with the **diagnostic question**. Tell the class that they must **listen carefully** to the reasons given by other learners and try to decide if their own answer was right or wrong. As always ask learners to explain why he or she gave their answer and DO NOT say whether it is right or wrong but simply thank the learner for giving the answer. Then ask the learners to put fingers up for the answer to the diagnostic question a second time. Then use an area diagram to explain why the answer is 4 144.

INTRODUCING THE ACTIVITY

Next, either write the **Two by Two Puzzle** on the board or give learners worksheets copied from page 1.

FEEDING BACK – WHOLE CLASS DISCUSSION

Learners should work in pairs. Call for the attention of the whole class from time to time and ask learners to explain what they have done at each step to the whole class.

HELP FOR LEARNERS WHO ARE STRUGGLING

DEVELOPING COMMUNICATION SKILLS

If some pairs are struggling ask one of a pair who are succeeding to swop places with one of another pair who are struggling so that they can explain what has to be done and help the learner who was struggling. Tell the class that some of the learners who were struggling will be asked to explain the next step to the whole class so the more successful learners must give the best possible explanation so that **both of them understand very well what is going on**.

Key questions

- Can you explain?
- What do you notice?
- What is the same there?
- What is different there?
- Can you see a connection?
- What id the connection there, can you explain it?

Follow up

Spot the mistake <https://aiminghigh.aimssec.ac.za/years-4-7-spot-the-mistake/>
Target Multiplication

<https://aiminghigh.aimssec.ac.za/years-4-7-target-multiplication/>