

Worked Solutions: The Lattice Multiplication Method

Q1. (a) 52×34

The grid is already filled in. We add along the diagonals, starting from the bottom right corner.

		5	2		
1	1	5	0	6	3
7	2	0	0	8	4
		6	8		

Diagonals from bottom right:

$$\text{1st: } 8 = 8,$$

$$\text{2nd: } 0 + 0 + 6 = 6,$$

$$\text{3rd: } 2 + 0 + 5 = 7,$$

$$\text{4th: } 1 = 1.$$

Reading the digits from left to right gives 1768. So $52 \times 34 = 1768$.

Q1. (b) 68×47

		6	8		
3	2	4	3	2	4
1	4	2	5	6	7
		9	6		

Diagonals from bottom right:

$$\text{1st: } 6 = 6,$$

$$\text{2nd: } 5 + 2 + 2 = 9,$$

$$\text{3rd: } 4 + 3 + 4 = 11 \quad \text{write 1 and carry 1,}$$

$$\text{4th: } 2 + 1 = 3.$$

Reading the digits gives 3196. So $68 \times 47 = 3196$.

Q2. (a) 34×25

Fill the cells: $3 \times 2 = 06$, $4 \times 2 = 08$, $3 \times 5 = 15$, $4 \times 5 = 20$.

		3	4	
0	0	6	0	8
8	1	5	2	0
		5	0	

Diagonals: 0; $2 + 5 + 8 = 15$ so write 5 carry 1; $1 + 0 + 6 + 1 = 8$; 0. The digits are 0850, so $34 \times 25 = 850$.

Q2. (b) 243×17

Fill the cells: $2 \times 1 = 02$, $4 \times 1 = 04$, $3 \times 1 = 03$, $2 \times 7 = 14$, $4 \times 7 = 28$, $3 \times 7 = 21$.

		2	4	3	
0	0	2	0	4	0
4	1	4	2	8	2
		1	3	1	

Diagonals from bottom right: 1; $2 + 8 + 3 = 13$ so write 3 carry 1; $2 + 4 + 4 + 0 + 1 = 11$ so write 1 carry 1; $1 + 0 + 2 + 1 = 4$; 0. The digits are 04131, so $243 \times 17 = 4131$.

Q3. 1.7×4.3

		1	•	7	
0	0	4	2	8	4
7	0	3	2	1	3
•		3	1		

Diagonals: 1; $2 + 3 + 8 = 13$ so write 3 carry 1; $0 + 2 + 4 + 1 = 7$; 0. The digits are 0731. The decimal point of 1.7 is after the first column, and the decimal point of 4.3 is after the first row. The two lines meet in the middle of the grid, and the diagonal leaves at the bottom left corner. So the point goes between the second and third digits: 07.31. Hence $1.7 \times 4.3 = 7.31$.

Q4. (a) 0.6×4.5

Fill the cells: $0 \times 4 = 00$, $6 \times 4 = 24$, $0 \times 5 = 00$, $6 \times 5 = 30$.

	0	•	6	
0	0		2	4
		0		4
2	0		3	5
		0		5
	7		0	

Diagonals: 0; $3 + 0 + 4 = 7$; $0 + 2 + 0 = 2$; 0. The digits are 0270. The decimal point is after the first column and first row, so the trace leaves at the bottom left corner. The point goes between the second and third digits: $02.70 = 2.7$. So $0.6 \times 4.5 = 2.7$.

Q4. (b) 12.4×0.3

Fill the cells:

	1	2	•	4	
0	0	0	0	0	0
		0		0	0
0	0	0	1	2	3
		3	6		3
	3	•	7	2	

Diagonals: 2; $1 + 6 + 0 = 7$; $0 + 3 + 0 + 0 = 3$; $0 + 0 + 0 = 0$; 0. The digits are 00372. The decimal point of 12.4 is after the second column, and the decimal point of 0.3 is after the first row. The lines meet one column in from the left, and the diagonal leaves through the bottom edge between the third and fourth digits. So the point goes between 3 and 7: $003.72 = 3.72$. So $12.4 \times 0.3 = 3.72$.

Q5.

Using $0.6 \times 4.5 = 2.7$:

- (a) $6 \times 45 = 270$. (Both numbers multiplied by 10, so the answer is 100 times larger.)
- (b) $0.06 \times 4.5 = 0.27$. (The first number divided by 10, so the answer is 10 times smaller.)
- (c) $60 \times 0.45 = 27$. (The first number multiplied by 100, the second divided by 10, so the answer is 10 times larger.)

The digits 27 stay the same because the significant digits have not changed; only the place value changes.

Q6. (a) 24×3.65

Fill the cells:

Diagonals: 0 ; $2 + 0 + 4 = 6$; $1 + 2 + 2 + 2 = 7$; $1 + 1 + 6 = 8$; 0 . The digits are 08760. The decimal point of 24 is on the right corner, and the decimal point of 3.65 is after the first row. The trace leaves at the bottom left corner, so the point goes between the third and fourth digits: $087.60 = 87.60$. The order costs £87.60.

Q6. (b) 0.35×16

Fill the cells:

Diagonals: 0; $3 + 8 + 5 = 16$ so write 6 carry 1; $1 + 0 + 3 + 0 + 1 = 5$; 0; 0. The digits are 00560. The decimal point of 0.35 is after the first column, and the decimal point of 16 is on the bottom corner. The trace leaves through the bottom edge between the third and fourth digits, giving $005.60 = 5.60$. The tap loses 5.6 litres.

Q7. (a) 1.45×38

$$1.45 \times 38 = 1.45 \times (40 - 2) = 58 - 2.90 = 55.10. \text{ Kofi pays } \pounds 55.10.$$

Q7. (b) 4.8×2.5

$4.8 \times 2.5 = 12.0$. The area is 12 cm^2 (the trailing zero is not written).

Q8. Practice

(a) $73 \times 48 = 3504$

- (b) $5.2 \times 3.6 = 18.72$
- (c) $0.9 \times 0.7 = 0.63$
- (d) $126 \times 34 = 4284$
- (e) $8.4 \times 0.25 = 2.1$
- (f) $1.06 \times 3.5 = 3.71$

Q9. Why the diagonals work

- (a) $40 \times 6 = 240$ and $7 \times 30 = 210$. Both are whole numbers of tens, so they both contribute to the tens column.
- (b) In 47×36 , the 4 in 47 really means 40, and the 3 in 36 really means 30. The cell for 4×6 represents $40 \times 6 = 240$, and the cell for 7×3 represents $7 \times 30 = 210$. Both products have the same place value (tens). Every cell on the same diagonal contributes to the same place value in the answer, so their digits are added together. This is why we add along diagonals, and why a total of 10 or more carries into the next diagonal.

Q10. 0.48×0.25

- (a) 0.48 and 0.25 are both less than 1, so their product must be less than 1. But 1200 is greater than 1, so it cannot be right.
- (b) The correct product is 0.12.

		0	•	4	8	
0	0	0	0	0	0	0
0	0	0	0	1	6	•
•	0	0	8	4	0	2
1	0	2	0	0	0	5
	2	0	0			

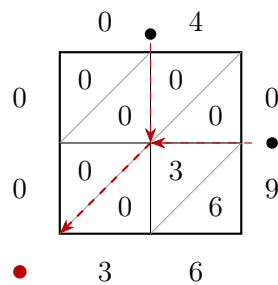
The diagonals give 0; $4 + 0 + 6 = 10$ so write 0 carry 1; $2 + 1 + 0 + 8 + 0 + 1 = 12$ so write 2 carry 1; $0 + 0 + 0 + 0 + 0 + 1 = 1$; 0; 0. The digits are 001200. The decimal point of 0.48 is after the first column and the decimal point of 0.25 is after the first row. The trace leaves through the left-hand side between the second and third digits, giving $00.1200 = 0.12$.

Q11.

A three-digit number has 3 digits, and a four-digit number has 4 digits. The grid has 3 columns and 4 rows, so it has $3 \times 4 = 12$ cells. Each cell needs one single-digit multiplication. So the method needs 12 single-digit multiplications.

Q12.

One example is $0.4 \times 0.9 = 0.36$. Using the lattice method with 04 and 09:



Diagonals: 6; $3 + 0 + 0 = 3$; $0 + 0 + 0 = 0$; 0. The digits are 0036. Both decimal points are after the first column/row, so the point goes between the second and third digits: $00.36 = 0.36$. So $0.4 \times 0.9 = 0.36$.

Q13.

Zainab is partly right. In the lattice method, you do not carry while filling in the grid, because each cell holds a single-digit multiplication and its two digits are written separately (tens above the diagonal, units below). However, you do carry when adding along the diagonals. For example, in Q1(b) 68×47 , the third diagonal sum was $4 + 3 + 4 = 11$, so we had to write 1 and carry 1 into the next diagonal. So carrying still happens, just at the addition stage rather than during the multiplication.