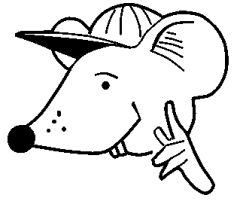


MATHEMATICS



N.S. Yr. 6 P.67

**Develop and refine written methods
for multiplication.**

Equipment

Pencil, paper.

MathSphere

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Concepts

Children should understand that approximating an answer is important in many contexts and may be used to see if the answer to a problem looks reasonable.

In many cases, an approximate answer is all that is needed. Eg. If it is calculated that a house needs 32.6 litres of paint for redecoration, one would probably buy 35 or even 40 litres as paint in 5 litre cans.

In this module, we are looking at estimating an answer and then using ideas that lead to a formal, written method of multiplication.

Method 1.

Eg. $2\,637 \times 7$

First an approximate answer.

The answer to $2\,637 \times 7$ is approximately $3\,000 \times 7 = 21\,000$

Now perform the sum by using the fact that $2\,637$ is $2\,000 + 600 + 30 + 7$.

$$\begin{aligned} 2\,637 \times 7 &= (2\,000 + 600 + 30 + 7) \times 7 = 2\,000 \times 7 + 600 \times 7 + 30 \times 7 + 7 \times 7 \\ &= 14\,000 + 4\,200 + 210 + 49 \\ &= \underline{18\,459} \end{aligned}$$

Method 2.

This method can be used when multiplying three digit numbers by two digit numbers.

Eg. 462×37 First an approximate answer: $500 \times 40 = 20\,000$

Split the two numbers into $(400 + 60 + 2) \times (30 + 7)$ and multiply each part in the first number by each part in the second number. This is best done in a table.

	400	60	2
30	12 000	1 800	60
7	2 800	420	14

Add up the six answers:

$$\begin{aligned} 462 \times 37 &= 12\,000 + 1\,800 + 60 \\ &\quad + 2\,800 + 420 + 14 \\ &= \underline{17\,094} \end{aligned}$$

Concepts (Contd)

We are now moving towards standard written methods. Don't forget to encourage estimates with these problems.

Method 3.

Eg. $2\,637 \times 7$

Writing **method 1** vertically, we have:

$\begin{array}{r} 2637 \\ \times 7 \\ \hline 14000 \\ 4200 \\ 210 \\ 49 \\ \hline 18459 \end{array}$	leading to:	$\begin{array}{r} 2637 \\ \times 7 \\ \hline 18\,459 \\ \hline 4\,2\,4 \end{array}$
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Method 4.

Eg. 462×37

$$\begin{array}{r} 462 \\ \times 37 \\ \hline 13860 \\ 3234 \\ \hline 17094 \\ \hline 1 \end{array}$$

Method 5. Extending these ideas to simple decimals.

Eg. 5.63×7

$$\begin{array}{rcl} 5.00 \times 7 & = & 35.00 \\ 0.60 \times 7 & = & 4.20 \\ 0.03 \times 7 & = & \underline{0.21} \\ & & 39.41 \end{array}$$

N.B. (Particularly to parents working with children at home). There are a lot of ideas covered in this module and children will need some considerable time to understand them all. Spread the work out over several months and make sure children understand each step thoroughly before moving to the next.



Now that you can do some multiplication sums in your head, we are going to see how you can write down more difficult ones.

Always begin with an estimate of the answer.

Let's say we want to multiply **3 772** by **6**.

First, we estimate the answer: **3 772 × 6** is approximately **4 000 × 6 = 24 000**

Now, let's do the sum. First we split the first number into thousands, hundreds, tens and units and then we multiply each part by **6**.

$$3\,772 \times 6 = (3\,000 + 700 + 70 + 2) \times 6$$

Then we multiply each part by 6 :

$$\begin{aligned} \text{So: } 3\,772 \times 6 &= (3\,000 + 700 + 70 + 2) \times 6 \\ &= 3\,000 \times 6 + 700 \times 6 + 70 \times 6 + 2 \times 6 \\ &= 18\,000 + 4\,200 + 420 + 12 \end{aligned}$$

$$\text{So: } 3\,772 \times 6 = \underline{22\,632}$$

Now, what's difficult about that?

Here is another one to look at:

Multiply **5 824** by **9**. Estimate: **6 000 × 9 = 5 400**

$$\begin{aligned} 5\,824 \times 9 &= (5\,000 + 800 + 20 + 4) \times 9 \\ &= 5\,000 \times 9 + 800 \times 9 + 20 \times 9 + 4 \times 9 \\ &= 45\,000 + 7\,200 + 180 + 36 \end{aligned}$$

$$\text{So: } 5\,824 \times 9 = \underline{52\,416}$$



Let's try one together.

You fill in the boxes.



Multiply 2 354 by 6. Estimate: $2\ 000 \times 6 = 12\ 000$

$$2\ 354 \times 6 = (\quad + 300 + \quad + 4) \times 6$$

$$= \quad + \quad + \quad + 24$$

So: $2\ 354 \times 6 =$

Ready for another?

You fill in all the boxes this time.



Multiply 5 316 by 4. Estimate: $5\ 000 \times 4 = 20\ 000$

$$5\ 316 \times 4 = (\quad + \quad + \quad + \quad) \times 4$$

$$= \quad + \quad + \quad + \quad$$

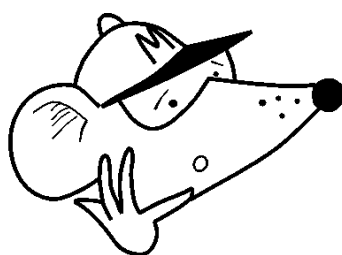
So: $5\ 316 \times 4 =$

Now try these on your own. Don't forget to do an estimate first.



- a. $2\ 315 \times 2$ b. $3\ 261 \times 3$ c. $4\ 523 \times 5$ d. $6\ 234 \times 4$
- e. $3\ 527 \times 7$ f. $7\ 833 \times 5$ g. $8\ 325 \times 9$ h. $5\ 372 \times 6$

If we have a three digit number multiplied by a two digit number, we can split the first number into hundreds, tens and units and multiply by the tens and units in the second number.



Is this as hard as it sounds?

No, it's dead simple.
Watch this.....



Let's multiply 436×27 . **Estimate:** $400 \times 30 = 12\ 000$

Split **436** into $400 + 30 + 6$ and **27** into $20 + 7$

Put the first numbers along the top of a table and the second down the side, like this:

Now multiply the numbers at the top by the numbers down the side and put the answers in the table.

	400	30	6
20	8 000	600	120
7	2 800	210	42

All you need to do now is to add them up:

$$\begin{aligned}
 &436 \times 27 \\
 &= 8\ 000 + 600 + 120 + 2\ 800 + 210 + 42 \\
 &= \underline{11\ 772}
 \end{aligned}$$

Now try these yourself. Don't forget to an estimate first.

a. 423×32 b. 513×18 c. 263×26 d. 476×33

e. 749×58 f. 993×84 g. 741×73 h. 895×96

Let's multiply 4 386 by 9

Estimate: $4\ 000 \times 9 = 36\ 000$

$$\begin{array}{r}
 4386 \\
 \times \quad 9 \\
 \hline
 36000 \quad (4\ 000 \times 9) \\
 2700 \quad (300 \times 9) \\
 720 \quad (80 \times 9) \\
 54 \quad (6 \times 9) \\
 \hline
 39474
 \end{array}$$

We can also set these sums out vertically, like this:



So the answer is 39 474

Let's try another one.

Let's multiply 6 427 by 6. Estimate: $6\ 000 \times 6 = 36\ 000$



$$\begin{array}{r}
 6427 \\
 \times \quad 6 \\
 \hline
 36000 \quad (6\ 000 \times 6) \\
 2400 \quad (400 \times 6) \\
 120 \quad (20 \times 6) \\
 42 \quad (7 \times 6) \\
 \hline
 38562
 \end{array}$$

So the answer is 38 562

Now try these on your own. Don't forget to do an estimate.



a. $5\ 234 \times 5$

b. $4\ 386 \times 7$

c. $6\ 243 \times 8$

d. $4\ 864 \times 9$

e. $7\ 422 \times 8$

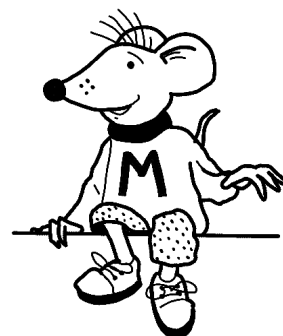
f. $5\ 847 \times 6$

g. $7\ 543 \times 8$

h. $2\ 528 \times 7$

Here is a slightly different method.

Lay the sum out vertically again and carry figures into the next column to the left as necessary.



Let's multiply 4 723 by 6. Estimate: $5\ 000 \times 6 = 30\ 000$

$$\begin{array}{r} 4\ 723 \\ \times \quad 6 \\ \hline 28\ 338 \\ \hline 4\ 1\ 1 \end{array}$$

Don't forget the carry figures.

So the answer is 28 338

Here is another example.

Let's multiply 6 249 by 8. Estimate: $6\ 000 \times 8 = 48\ 000$

$$\begin{array}{r} 6\ 249 \\ \times \quad 8 \\ \hline 49992 \\ \hline 1\ 3\ 7 \end{array}$$

Don't forget the carry figures.

So the answer is 49 992

Now try these! Don't forget to do an estimate first.

a. $2\ 635 \times 3$

b. $8\ 536 \times 5$

c. $4\ 855 \times 7$

d. $1\ 836 \times 3$

e. $9\ 867 \times 9$

f. $6\ 734 \times 8$

g. $7\ 365 \times 6$

h. $8\ 512 \times 7$



When we have a three digit number multiplied by a two digit number, we can still put the numbers underneath each other.



Let's multiply 436 by 27. Estimate: $400 \times 30 = 12000$

$$\begin{array}{r}
 436 \\
 \times 27 \\
 \hline
 8720 \\
 3052 \\
 \hline
 11772
 \end{array}
 \quad
 \begin{array}{l}
 (436 \times 20) \\
 (436 \times 7)
 \end{array}$$

So the answer is 11 772

Here is another example.

Let's multiply 534 by 98. Estimate: $500 \times 100 = 50\,000$

$$\begin{array}{r}
 534 \\
 \times 98 \\
 \hline
 48060 \\
 4272 \\
 \hline
 52332
 \end{array}
 \quad
 \begin{array}{l}
 (534 \times 90) \\
 (534 \times 8)
 \end{array}$$



So the answer is 52 332

Now try these! Don't forget to do an estimate first.



- a. 523×32 b. 562×23 c. 143×52 d. 425×63
 e. 862×74 f. 581×62 g. 994×19 h. 475×27

Lastly, we can use what we have learnt to multiply some decimals.



Let's multiply **3.67** by **8**. **Estimate:** $4 \times 8 = 32$

$$3.00 \times 8 = 24.00$$

$$0.60 \times 8 = 4.80$$

$$0.07 \times 8 = \underline{0.56}$$

$$\underline{29.36}$$

Notice how the units, the tenths and the hundredths are lined up vertically.

So the answer is 29.36

Here is another example.

Let's multiply **5.83** by **9**. **Estimate:** $6 \times 9 = 54$

$$5.00 \times 9 = 45.00$$

$$0.80 \times 9 = 7.20$$

$$0.03 \times 9 = \underline{0.27}$$

$$\underline{52.47}$$

Notice how the units, the tenths and the hundredths are lined up vertically.

So the answer is 52.47

Now try these! Don't forget to do an estimate first.



a. 6.31×8

b. 8.53×4

c. 7.34×2

d. 9.57×6

e. 4.61×5

f. 8.52×7

g. 7.33×3

h. 9.37×8

Answers**Page 5**

$$2\,354 \times 6 = (2\,000 + 300 + 50 + 4) \times 6 = 12\,000 + 1\,800 + 300 + 24 = 14\,124$$

$$5\,316 \times 4 = (5\,000 + 300 + 10 + 6) \times 4 = 20\,000 + 1\,200 + 40 + 24 = 21\,264$$

- a. 4 630 b. 9 783 c. 22 615 d. 24 936
e. 24 689 f. 39 165 g. 74 925 h. 32 232

Page 6

- a. 13 536 b. 9 234 c. 6 838 d. 15 708
e. 43 442 f. 83 412 g. 54 093 h. 85 920

Page 7

- a. 26 170 b. 30 702 c. 49 944 d. 43 776
e. 59 376 f. 35 082 g. 60 344 h. 17 696

Page 8

- a. 7 905 b. 42 680 c. 33 985 d. 5 508
e. 88 803 f. 53 872 g. 44 190 h. 59 584

Page 9

- a. 16 736 b. 12 926 c. 7 436 d. 26 775
e. 63 788 f. 36 022 g. 18 886 h. 12 825

Page 10

- a. 50.48 b. 34.12 c. 14.68 d. 57.42
e. 23.05 f. 59.64 g. 21.99 h. 74.96