

# Learning times tables and about multiplying through arrays

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## Educational context

This activity group builds on the introduction to the repeated adding structure of multiplying introduced in Number, Pattern and Calculating 2, Calculating 8, with the emphasis on helping children to develop recall of the 2, 3, 5 and 10 times tables. The remaining activities look at the commutative property of multiplying in a money context and then at the array as a model for multiplying. The space travel context is continued with children building arrays to find how seats could be arranged in moon buggies using the familiar multiples of 2, 3, 5 and 10. Children then write two number sentences for each array to encourage understanding of the commutative property of multiplying.

## Learning opportunities

- To begin to develop recall of the 2, 3, 5 and 10 times tables.
- To realize that multiplying can be represented by building arrays.
- To understand that multiplying has a commutative property.

## Words and terms for use in conversation

array, product, multiplying sentence, commutative property, balances, equal, equivalent, equation, times table, multiplication table

## Assessment opportunities

Look and listen for children who can:

- Use the words and terms for use in conversation effectively.
- Recall some multiplying facts from 2, 3, 5 and 10 times tables.
- Work in an organized way to build arrays.
- Describe an array with two multiplying sentences.
- Derive a corresponding commutative fact when given a multiplying sentence.

## Explorer Progress Book 2b, pp. 18–19

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

## Explore More Copymaster 23: Times Table Lotto

After completing work on Activity 6, give children Explore More Copymaster 23: Times Table Lotto to take home.



## Calculating

## Focus activities

### Activity 1: Using '× 2', '× 5' and '× 10' to calculate amounts of money with 2p, 5p and 10p coins

**Have ready:** Numicon Shapes, Numicon 10s Number Line, number rods, Numicon 1–100 cm Number Rod Track, purses containing five 10p coins, four 5p coins and six 2p coins, *Numicon Software for the Interactive Whiteboard* (optional)

#### Step 1

Explain you have saved 2p, 5p and 10p coins in your purse. Ask children how to find out the total. Give children a purse of coins and time to experiment. Discuss their ideas. Look and listen for children sorting coins into sets and counting in twos, fives and tens.

#### Step 2

Discuss children's methods and whether different number sentences could be written for each set of coins. Look and listen for children who suggest adding number sentences, and those who suggest multiplying or 'times' number sentences. Discuss and agree that, while we could write adding sentences, multiplying sentences would be much quicker. Write:

$$5 \times 10p$$

$$4 \times 5p$$

$$6 \times 2p$$

#### Step 3

Ask children how using Shapes or rods could help with finding totals. Look and listen for those who suggest using 10-shapes, 5-shapes and 2-shapes on the 10s Number Line, or rods in the Number Rod Track to find the product for each group of coins, e.g.  $6 \times 2p$  (see [Figs 1 & 2](#)). Agree that the totals are the same with both sorts of apparatus.

#### Step 4

Ask children to find the products for the multiplying sentences ( $5 \times 10p = 50p$ ,  $4 \times 5p = 20p$ ,  $6 \times 2p = 12p$ ).

#### Step 5

Ask children how they will calculate the total amount saved. Look and listen for children who suggest the adding sentence:  $50p + 20p + 12p = \square$ . Give children time to calculate the total and complete the number sentence. Agree you have saved a total of 82p.

### Activity 2: Understanding the term 'times tables'

**Have ready:** Numicon Shapes, Numicon 10s Number Line, number rods, Numicon 1–10 Number Rod Track

#### Step 1

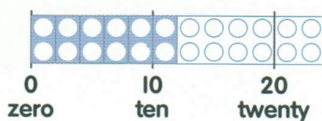
Refer to the previous activity and how children worked out the totals for each sort of coin saved. Discuss and agree that it would have been much quicker if we could have recalled all the multiplying facts that we needed in this activity, e.g. if we 'just knew' what six 2s are.

#### Step 2

Start a discussion by asking children when we use the word 'table'. Discuss their suggestions and share different situations. Agree that it can be a piece of furniture we eat or work at and that it can also be a chart where we read information, such as a train time table, or bus time table where we look up times of buses and trains. Some children may already have heard of 'times tables', make clear that these are different from bus time tables.

#### Step 3

Ask all children if they have heard of 'times tables' and what they think this means. Look and listen for any children who make a connection with multiplying and ask them to share their ideas. Explain to all children that 'times tables' are charts or tables of multiplying sentences and that learning these is very useful because then they will be able to quickly recall facts when they are working on problems, instead of working out the products each time.





### Activity 3: Writing the 10 times table

**Have ready:** Numicon 10-shapes, Numicon 1–10 Number Rod Track, number rods

#### Step 1

Explain to children that they probably already know several multiplying facts for the 10 times table, so that is a good place to start. Explain that tables can be shown both with Shapes or number rods, so you will show it with both and that when they have written down the times tables they can look for patterns in the numerals to help learn them.

#### Step 2

Explain to children they are now going to write the 10 times table.

Put out one 10-shape and a 10-rod in the Number Rod Track. Ask children to say and write the multiplying sentence  $1 \times 10 = 10$  (see Fig. 3).

#### Step 3

Continue to place 10-shapes and 10-rods asking children to write down each multiplying sentence in turn underneath one another. Continue up to  $10 \times 10 = 100$  (see Fig. 4).

#### Step 4

When children have completed their table, ask them what patterns they can see in the numerals. Discuss the patterns they see.

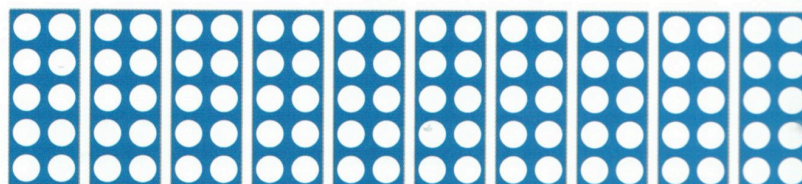


$$1 \times 10 = 10$$



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$$\begin{aligned} 1 \times 10 &= 10 \\ 2 \times 10 &= 20 \\ 3 \times 10 &= 30 \\ 4 \times 10 &= 40 \\ 5 \times 10 &= 50 \\ 6 \times 10 &= 60 \\ 7 \times 10 &= 70 \\ 8 \times 10 &= 80 \\ 9 \times 10 &= 90 \\ 10 \times 10 &= 100 \end{aligned}$$



### Activity 4: Writing the 2 times table

**Have ready:** Numicon 2-shapes, Numicon 1–10 Number Rod Track, number rods

Repeat Activity 3 with 2-shapes and 2-rods in the Number Rod Track.

### Activity 5: Writing the 3 times table

**Have ready:** Numicon 3-shapes, Numicon 1–10 Number Rod Track, number rods

Repeat Activity 3 with 3-shapes and 3-rods in the Number Rod Track.

### Activity 6: Writing the 5 times table

**Have ready:** Numicon 5-shapes, Numicon 1–10 Number Rod Track, number rods

Repeat Activity 3 with 5-shapes and 5-rods in the Number Rod Track.

After completing work on this activity, give children the opportunity to take home and complete Explore More Copymaster 23: Times Table Lotto. This will help children to learn the 2, 3, 5 and 10 times table.

### Activity 7: Beginning to notice that multiplying is commutative using money

**Have ready:** Numicon Shapes, Numicon 10s Number Line, number rods and Numicon 1–10 Number Rod Track, Numicon Pan Balance, ten 2p, ten 5p and five 10p coins, Numicon Software for the Interactive Whiteboard (optional)

#### Step 1

Explain that you have been saving up and you have ten 2p coins. Ask children how this could be written as a multiplying sentence. Look and listen for children who suggest writing  $10 \times 2p = 20p$ .

#### Step 2

Tell children your friend has saved two 10p coins. Ask them to suggest how this could be written as a multiplying sentence. Look and listen for children who suggest writing  $2 \times 10p = 20p$ .



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## Step 3

Ask children to show these with Shapes on the 10s Number Line (see Fig. 5) and with rods in the Number Rod Track (see Fig. 6). Agree that both multiplying sentences have the same total or product, and that the amounts of money are equal.

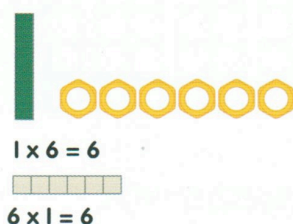
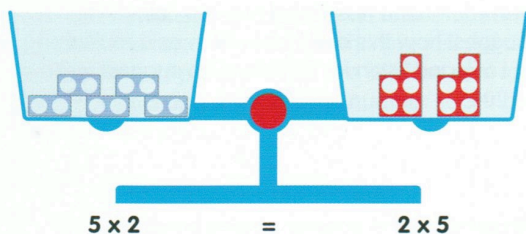
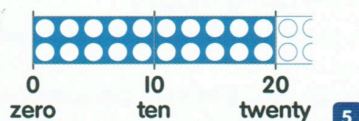
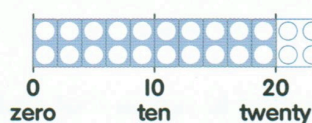
## Step 4

Repeat with five 2p coins and two 5p coins. Agree that both multiplying sentences have the same total or product, and that the amounts of money are equal.

Show that the pairs of amounts are equal with Shapes in the Pan Balance (see Fig. 7).

## Step 5

Repeat with five 10p coins and ten 5p coins. Agree that both multiplying sentences have the same total or product, and that the amounts of money are equal.



## Activity 8: Making arrays for 6 noticing the commutative property of multiplying

**Have ready:** Numicon Baseboards, Numicon Coloured Pegs, number rods

## Step 1

Set the scene by referring back to the moon buggies. Ask children to investigate how the six seats in a moon buggy could be arranged in rows. Give them a choice of apparatus and time to work on this and discuss their arrays, e.g. one row of six which could be arranged vertically or horizontally, two rows of three and three rows of two.

## Step 2

First, take an example of one row of six. Ask children if they could show this with number rods. Discuss and agree that this could be shown with one 6-rod or six 1-rods. Show children that we could write a multiplying sentence for each of these,  $1 \times 6 = 6$  and  $6 \times 1 = 6$  (see Fig. 8).

## Step 3

Now take an example of an array with two rows of three. Ask children if this could be shown with number rods. Give them time to experiment. Look and listen for children who take two 3-rods and arrange them as a rectangle. Ask children which multiplying sentence could be written for this. Look and listen for children suggesting  $2 \times 3 = 6$  and ask them to write it (see Fig. 9).

## Step 4

Now look at one of the examples of three rows of two and ask children if they could show this with number rods. Again, give them time to experiment. Look and listen for children who take three 2-rods and arrange them as a rectangle. Again, ask them for the multiplying sentence and to write it (see Fig. 10).

## Step 5

Ask children to compare the arrays and the multiplying sentences for  $2 \times 3$  and the  $3 \times 2$  (see Figs 9 & 10). Look and listen for those who notice that both arrays of Pegs show the Numicon Shape pattern for 6, that both arrays of number rods are the same sized rectangle, and both multiplying sentences have the same product although one is two times 3 and the other is three times 2.





## Practice and discussion

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### Activity 9: Making arrays for 10

**Have ready:** Numicon Baseboards, Numicon Coloured Pegs or Counters

#### Step 1

Ask children how ten seats in a moon buggy could be arranged in rows. Give children Baseboards and Pegs to experiment (see Fig. 11).

#### Step 2

Discuss how they can check there are ten in the single row – children are likely to suggest counting. Compare this with the two rows of five seats and five rows of two seats and ask children how they can check there are ten. Look and listen for children recognizing the Numicon 10-pattern.

#### Step 3

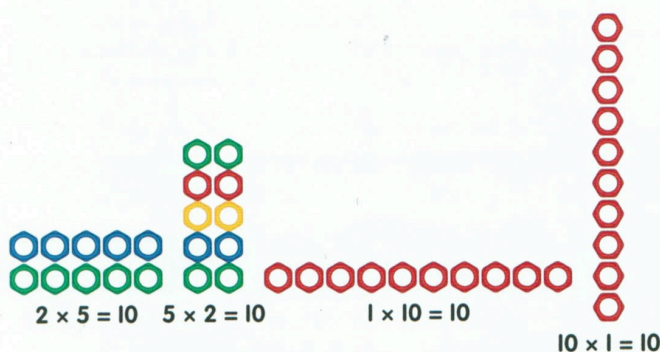
Ask children to show these arrays with rods (see Fig. 12).

#### Step 4

Discuss with children how these arrays could be represented as multiplying sentences. Agree that we could write  $1 \times 10 = 10$ , which represents 1 times 10 seats and  $10 \times 1$  representing 10 times 1 seat in a row,  $2 \times 5 = 10$  and  $5 \times 2 = 10$ . Label the arrays with multiplying sentences.

#### Step 5

Ask children to compare the arrays for  $2 \times 5$  and  $5 \times 2$ . Look and listen for those who notice that both arrays of Pegs show the Numicon Shape pattern for 10, that both have the same sized rectangle, and the same product although one is two times 5 and the other is five times 2.



### Whole-class

- Discuss with children how and when the mathematics they have been learning could help them in solving problems.
- Give children practice in reciting 2, 3, 5 and 10 times tables.
- Show children a multiplying sentence from the times table they are learning and ask them for the multiplying sentence that comes before, and the multiplying sentence that follows.
- Show children a multiplying sentence from the 2, 3, 5 and 10 times tables and ask them which table it comes from. Ask for the first multiplying sentence in that times table.
- Bring in some objects that show arrays, e.g. an egg box, a muffin baking tray, a pack of yoghurts. Discuss the arrays and how these might be written as multiplying sentences.

### Independent

#### Paired or individual work for Activity 1

**Have ready:** Numicon Shapes (five of each of the 2-, 3-, 5- and 10-shapes), Numicon 10s Number Line, number rods (five of each of the 2-, 3-, 5- and 10-rods), Numicon 1–100 cm Number Rod Track, Numicon Pan Balance, Numicon Spinner with 0–5 times Spinner Overlay (cut from photocopy master 40)

Children sort the Shapes or rods into piles, spin and pick up that number of Shapes or rods from their chosen pile, place them on the appropriate number line and write the multiplying sentence. Together, they investigate whether the same total can be reached by using another type of Shape or rod from those available. Children will find that in this case there are no equivalent facts for numbers that end in 5 in the 5s sequence.

#### Paired work for Activities 3, 4, 5 and 6

**Have ready:** Numicon Post Box, Empty Box Multiplication Sentences for 2, 3, 5 and 10 Times Tables (cut from photocopy masters 16a and 16b)

The first child posts an incomplete multiplying sentence through the Post Box. The second child writes the product and posts it back. Both players check the product using apparatus if there is any doubt.

#### Paired work for Activities 3, 4, 5 and 6

**Have ready:** Numicon Shapes or number rods, 100 Square (photocopy master 2)

Children decide whether to work with the 2, 3, 5 or 10 times table and whether to use Shapes or number rods.

They build their chosen times table with Shapes or rods and write the multiplying sentences in order. They then colour the products for that times table by colouring them on the 100 square.

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**Paired work for Activities 3, 4, 5 and 6**

**Have ready:** Numicon Shapes, Numicon Post Box, small pieces of paper

The first child takes some Shapes and posts them through the Post Box to their partner. The second child writes the multiplying sentence on a small piece of paper and posts it back. The first child then completes the sentence with the product. Repeat with children taking turns to post the Shapes.

**Paired work for Activity 7**

**Have ready:** Numicon Shapes, Numicon 10s Number Line, number rods, Numicon 1–100 cm Number Rod Track, Multiplying Expressions for 2, 3, 5 and 10 Times Tables (cut from photocopy master 20)

The first child takes a multiplying expression card (cut from photocopy master 20), collects the corresponding Shapes or rods and puts them along the 10s Number Line or Number Rod Track.

The second child builds the commutative multiplying sentence alongside.

The players record both multiplying sentences. Repeat, taking turns to take the multiplying card.

**Paired work for Activity 8 and 9**

**Have ready:** Numicon Coloured Pegs, Multiplying Sentences for 2, 3, 5 and 10 Times Tables (cut from photocopy master 21)

The first child selects a multiplying sentence card (cut from photocopy master 21), e.g. ' $3 \times 4 =$ '. The second child arranges Pegs into three rows of four and says the product. Both children draw the array and write the two multiplying sentences.

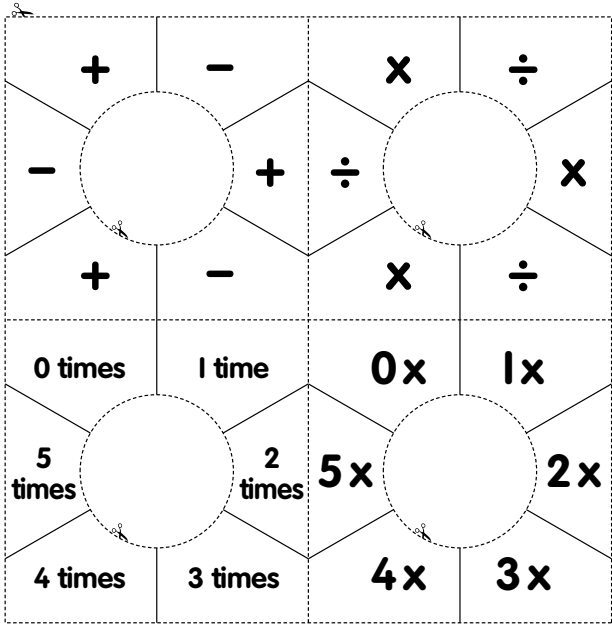
**Paired work for Activities 8 and 9**

**Have ready:** Multiplying Sentences for 2, 3, 5 and 10 Times Tables (cut from photocopy master 21), number rods

The first child selects a multiplying sentence card (cut from photocopy master 21), e.g. ' $4 \times 10 =$ '. The second child shows the multiplication as an array built with rods, e.g. four 10-rods side by side, and says the product. The first child now builds an array to show the commutative multiplication, e.g. by placing ten 4-rods side by side on top of the four 10-rods.

**Individual work for Activities 8 and 9**

The child builds an array using 2-, 3-, 5- or 10-rods and records it by colouring the array on squared paper. The child then writes two multiplying sentences for the array.



<input type="text"/> x 2 = 0	0 x <input type="text"/> = 0	<input type="text"/> x 3 = 0	0 x <input type="text"/> = 0
<input type="text"/> x 2 = 2	1 x <input type="text"/> = 2	<input type="text"/> x 3 = 3	1 x <input type="text"/> = 3
<input type="text"/> x 2 = 4	2 x <input type="text"/> = 4	<input type="text"/> x 3 = 6	2 x <input type="text"/> = 6
<input type="text"/> x 2 = 6	3 x <input type="text"/> = 6	<input type="text"/> x 3 = 9	3 x <input type="text"/> = 9
<input type="text"/> x 2 = 8	4 x <input type="text"/> = 8	<input type="text"/> x 3 = 12	4 x <input type="text"/> = 12
<input type="text"/> x 2 = 10	5 x <input type="text"/> = 10	<input type="text"/> x 3 = 15	5 x <input type="text"/> = 15
<input type="text"/> x 2 = 12	6 x <input type="text"/> = 12	<input type="text"/> x 3 = 18	6 x <input type="text"/> = 18
<input type="text"/> x 2 = 14	7 x <input type="text"/> = 14	<input type="text"/> x 3 = 21	7 x <input type="text"/> = 21
<input type="text"/> x 2 = 16	8 x <input type="text"/> = 16	<input type="text"/> x 3 = 24	8 x <input type="text"/> = 24
<input type="text"/> x 2 = 18	9 x <input type="text"/> = 18	<input type="text"/> x 3 = 27	9 x <input type="text"/> = 27
<input type="text"/> x 2 = 20	10 x <input type="text"/> = 20	<input type="text"/> x 3 = 30	10 x <input type="text"/> = 30

100 Square 2

Name \_\_\_\_\_ Date \_\_\_\_/\_\_\_\_/\_\_\_\_

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

20 Multiplying Expressions for 2, 3, 5 and 10 Times Tables

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

Can you investigate in which times tables you find these products?

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Investigate how many different ways he could arrange his lettuces.

