

# A2.1

## Order of operations and brackets

### objectives

- Know addition and subtraction facts to 20.
- Recall multiplication facts to  $10 \times 10$  and derive associated division facts.
- Know and use the order of operations, including brackets.
- Solve problems and investigate in number.

### starter

#### Vocabulary

operation  
addition  
subtraction  
multiplication  
division

#### Resources

OHTs A2.1a, A2.1b  
mini-whiteboards

Tell the class that mathematicians have decided an order for doing the operations of addition, subtraction, multiplication and division. Multiplication and division are always done before addition and subtraction.

Write on the board:

$$\begin{aligned} 4 \times 5 + 2 & \quad \text{Do the multiplication first.} \\ = 20 + 2 & \quad \text{Then the addition.} \\ = 22 & \quad \text{Answer: 22.} \end{aligned}$$

$$\begin{aligned} 8 - 12 \div 4 & \quad \text{Do the division first.} \\ = 8 - 3 & \quad \text{Then the subtraction.} \\ = 5 & \quad \text{Answer: 5.} \end{aligned}$$

Write three or four examples on the board, one by one. Ask pupils to copy them on their whiteboards and to underline the part they would do first. For example:

$$5 + 4 \times 10 \quad 16 \div 4 + 5 \quad 12 - 9 \div 3 \quad 4 \times 3 - 6$$

Show **OHT A2.1a**. Work with the class to find the five matching pairs: AH, BJ, CD, EF, GI.

Show **OHT A2.1b**, which gives an expression with missing operations. Say that the challenge is to find four different answers by replacing each circle with one of the four operations. For example,  $7 - 6 \div 2$  would give the answer 4.

Ask pupils to work in pairs on the problem. Take feedback on the solutions, which are  $7 + 6 - 2 = 11$ ,  $7 \times 6 - 2 = 40$ ,  $7 + 6 \times 2 = 19$ ,  $7 + 6 \div 2 = 10$ .

### main activity

#### Vocabulary

digit  
operation  
brackets

#### Resources

OHT A2.1c, including  
photocopies  
mini-whiteboards

Say that sometimes we want to do addition and subtraction first. We use brackets to show this. Write on the board:

$$\begin{aligned} 5 \times (4 + 3) & \quad \text{Do the brackets first.} \\ = 5 \times 7 & \quad \text{Then the multiplication.} \\ = 35 & \quad \text{Answer: 35.} \end{aligned}$$

$$\begin{aligned} (4 + 6) \div (5 - 3) & \quad \text{Do the brackets first.} \\ = 10 \div 2 & \quad \text{Then the division.} \\ = 5 & \quad \text{Answer: 5.} \end{aligned}$$

Write three or four examples on the board, one by one. For example:

$$(12 - 4) \times 3 \quad 15 \div (7 - 4) \quad (8 - 4) \times (1 + 3)$$

Ask pupils:

**Q What is the answer? Explain how you worked it out.**

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Write a problem on the board. Ask pupils to discuss in pairs what the answer is.

*Jack has 8 paperbacks. Rupee has 2 paperbacks.  
Each paperback cost £5.  
What was the total cost of the paperbacks?*

**Q The answer is £50. Did you get that? How did you work it out?**

Invite a pair to explain their method to the class.

**Q Did anyone do it a different way?**

Draw out that one method is to work out the cost of Jack's books (£5 × 8) and the cost of Rupee's books (£5 × 2), and then to add the two amounts. This calculation can be recorded as:

$$(5 \times 8) + (5 \times 2) = 40 + 10 = 50$$

A second method is first to add the number of Jack's books to the number of Rupee's books, and then to find the total cost of all the books at £5 per book. This calculation would be recorded as:

$$5 \times (8 + 2) = 5 \times 10 = 50$$

Explain that the brackets are needed to show that you must first work out what is inside the brackets. Stress that the brackets make a difference and demonstrate this by writing on the board and working out  $3 \times (4 + 5)$  and  $(3 \times 4) + 5$ . Repeat with another example:  $12 - (3 \div 3)$  and  $(12 - 3) \div 3$ .

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Write randomly on the board the four digits 1, 2, 3 and 4, and the four operation signs +, −, × and ÷.

Tell pupils that you want them to work in pairs. They are to use any of the four digits 1, 2, 3 and 4, with any of the four operations addition, subtraction, multiplication or division, to make numbers. Show them a couple of examples:

$$1 + 2 + 3 - 4 = 2 \quad 21 \div 4 = 25$$

Give pupils one or two minutes to get the idea, then draw the class together. Give pupils a worksheet photocopied from **OHT A2.1c**. Tell them that you now want them to make each of the numbers 1 to 20. Say that you are going to add some rules.

- All four digits must be used.
- A digit must not be repeated.
- The digits can be used in any order.
- Any operation can be used – pupils do not have to use all four operations.
- An operation can be repeated.
- Brackets should be used where they are needed.

Remind the class that digits can be combined to make two-digit numbers. Say that this is a joint effort from the whole class, and to start with everyone should try to make the number 9. Allow a minute or two for pairs to work on this. (If a pair finds a solution very quickly, suggest that they look for another one.) Then take feedback. Establish that there may be different ways to make the numbers: for example, 9 can be made as:

$$41 - 32 \qquad (4 + 3 + 2) \times 1 \qquad 14 - (3 + 2)$$

Stress the difference that the brackets make with the third example.

$$14 - (3 + 2) = 9, \text{ but } 14 - 3 + 2 = 13$$

Show **OHT A2.1c**, and write one of the pupils' solutions against the number 9. Say that when they have found a way to make a number, they should record it on their worksheet in a similar way.

Allow the pairs to work on making the numbers for about five minutes, then draw the class together. Ask:

**Q What numbers have you found so far?**

Check their suggestions and fill in as many numbers as possible. Ask them to use the remaining time to try to make the numbers that are still missing. While they are doing this, circulate and prompt by asking:

**Q If you put the brackets in a different place, would you get a different answer?**

## other tasks

**Springboard 7**  
Unit 15

### Unit 15 section 5: Brackets

1 Using brackets

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Star challenge 8: What's my sign?

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## plenary

### Resources

OHT A2.1d  
mini-whiteboards

Write these calculations on the board:

$$2 + 7 \times 3 = 27 \qquad 2 + 7 \times 3 = 23$$

Tell pupils that the answers are correct but that the brackets are missing. Ask them to work in pairs to put in the brackets. Discuss their solutions. Repeat with another example, such as:

$$8 \div 4 - 2 = 0 \qquad 8 \div 4 - 2 = 4$$

Finish by working through the test question on **OHT A2.1d**.

### Remember

- Always work out the calculation in the brackets first.
- If there are no brackets, multiply and divide before you add and subtract.