

APPENDIX A

Evidence of child challenging herself and demonstrating how to apply the order of operations in the correct order on class board.



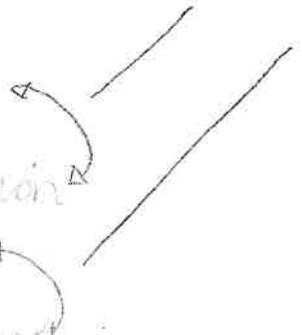
L1: I am learning the rules for the order of operations in number calculations.

Self-Assessment/ Evaluation

SC 1: I can **state** what the order of operations are in number calculations.

- ① Brackets
- ② Order
- ③ Division
- ④ Multiplication
- ⑤ Addition
- ⑥ Subtractions

★ always go left to right



SC 2: I can **explain** why we must do calculations in a particular order.

There has to be an order because there can't be two different answers.



SC 3: I can **use** BODMAS to choose the correct operation (e.g. addition, subtraction, division and multiplication).

1) $6 \times 4 - 16$
 $= 24 - 16$
 $= 8$

2) $7 + 5 \times 2$
 $= 5 \times 2 + 7$
 $= 10 + 7$
 $= 17$

3) $8 - 3 \times 2$
 $= 8 - 6$
 $= 2$

4) $32 + 20 \div 5 - 3$
 $= 32 + 4 - 3$
 $= 33$



B Brackets ()

O rders ² ✓

D ivision —

M ultiplication X

A ddition +

S ubtraction -

left to right

left to right

ORDER OF OPERATIONS

APPENDIX C

Q1: I am learning to apply reverse the order of operations to "what's in the brackets" first.

SE:

- I can use DMAS to check if my operations are in the correct order using PEMDAS.

Board Questions

$$\begin{aligned} \text{m)} & (3 + 6) \times (8 - 5) \\ &= 9 \times (8 - 5) \\ &= 9 \times 3 \\ &= 27 \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{n)} & 7 + 8 \times 9 - 4 \\ &= 7 + 72 - 4 \\ &= 75 \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{o)} & 8 \times (6 + 3) + 5 \\ &= 8 \times 9 + 5 \\ &= 72 + 5 \\ &= 77 \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{p)} & (19 - 7) + 8^2 + 9 \\ &= 12 + 8^2 + 9 \\ &= 12 + 64 + 9 \\ &= 85 \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{q)} & 9 \times (5 + 6) + 4 \\ &= 9 \times 11 + 4 \\ &= 103 \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{r)} & 8 \div (7 - 5) \times 6 \\ &= 8 \div 2 \times 6 \\ &= 4 \times 6 \\ &= 24 \quad \checkmark \end{aligned}$$

$$\begin{aligned}
 5) \quad & 9 \times 3 \div 9 \times 4 \\
 & = 27 \div 9 \times 4 \\
 & = 3 \times 4 \\
 & = 12 \quad \checkmark
 \end{aligned}$$

$$\begin{aligned}
 6) \quad & (124 \div 2) \times 2 \\
 & = 62 \times 2 \\
 & = 124 \quad \checkmark
 \end{aligned}$$

Challenge cards

$$\begin{aligned}
 2) \quad & 4 \times (2 + 6) - 3 \\
 & = 4 \times 8 - 3 \\
 & = 32 - 3 \\
 & = 29 \quad \checkmark
 \end{aligned}$$

$$\begin{aligned}
 3) \quad & 64 \div 8 + 12 \times (4 + 3) - 2 \\
 & = 64 \div 8 + 12 \times 7 - 2 \\
 & = 8 + 12 \times 7 - 2 \\
 & = 20 \times 7 - 2 \\
 & = 140 - 2 \\
 & = 138 \quad \checkmark
 \end{aligned}$$

$$\begin{aligned}
 4) \quad & 92 - 15 \times 2 + 16 - 5 + (11 + 3) \times 2 \\
 & = 92 - 15 \times 2 + 16 - 5 + 14 \times 2 \\
 & = 92 - 30 + 16 - 5 + 14 \times 2 \\
 & = 92 - 30 + 16 - 5 + 28 \\
 & = 62 + 16 - 5 + 28 \quad \text{+ and -} \\
 & = 78 - 5 + 28 \quad \text{left to right} \\
 & = 73 + 28 \\
 & = 101
 \end{aligned}$$

$$\begin{aligned}
 5) \quad & 25 \times 2 - 14 - 7 + 4 \\
 & = 50 - 14 - 7 + 4 \\
 & = 36 - 7 + 4 \\
 & = 29 + 4 \\
 & = 33
 \end{aligned}$$

+ and -
left to right

APPENDIX D

SE

1. 🟡 I gave myself a green because I remembered to underline the sum I was starting with

2. 🟠 I gave myself orange because I forgot to go left & right but I able to correct this. I will remember to do this next time

APPENDIX E-

Child A was observed by the teacher sharing her approach to solving problems and solutions. She adopted a lead role and acted as the teacher, helping others to complete given problems.



APPENDIX F

Order of Operations Bletcher Station Record

Remember to show your working as well as the answer!

$ \begin{aligned} 1. & 82 + (50 \times 2) - 9 \\ & = 82 + 100 - 9 \\ & = 182 - 9 \\ & = 173 \quad \checkmark \end{aligned} $	$ \begin{aligned} 2. & (6-3) + (6 \times 3) \div 9 \\ & = 3 + (6 \times 3) \div 9 \\ & = 3 + 18 \div 9 \\ & = 3 + 2 \\ & = 5 \quad \checkmark \end{aligned} $
$ \begin{aligned} 3. & 1001 - (75 + 19) - 100 \\ & = 1001 - 94 - 100 \\ & = 907 - 100 \\ & = 807 \quad \checkmark \end{aligned} $	$ \begin{aligned} 4. & ((7 \times 7) + 15 + 21) \div 5 \\ & = (49 + 15 + 21) \div 5 \\ & = 85 \div 5 \\ & = 17 \quad \checkmark \end{aligned} $
$ \begin{aligned} 5. & 5^2 + 199 + (12 \times 3) \\ & = 5^2 + 199 + 36 \\ & = 25 + 199 + 36 \\ & = 124 + 36 \quad \times \\ & = 160 \end{aligned} $	$ \begin{aligned} 6. & 507 + 81 \div 9 \\ & = 507 + 9 \\ & = 516 \quad \checkmark \end{aligned} $
$ \begin{aligned} 7. & 100 \div 20 + (11 \times 9) + 86 \\ & = 100 \div 20 + 99 + 86 \\ & = 5 + 99 + 86 \\ & = 104 + 86 \quad \checkmark \\ & = 190 \end{aligned} $	<p>8.</p>
<p>9.</p>	$ \begin{aligned} 10. & 28 + 6^2 - (96 \div 3) \\ & = 28 + 6^2 - 32 \\ & = 28 + 36 - 32 \\ & = 64 - 32 \\ & = 32 \quad \checkmark \end{aligned} $
$ \begin{aligned} 11. & (42 - 12) \times (36 \div 9) \\ & = 30 \times (36 \div 9) \\ & = 30 \times 4 \\ & = 120 \quad \checkmark \end{aligned} $	$ \begin{aligned} 12. & 110 - (72 \div 12) + 560 \\ & = 110 - 6 + 560 \\ & = 104 + 560 \\ & = 664 \quad \checkmark \end{aligned} $

APPENDIX G

1. 🟡 I gave myself green because my group and I solved our questions correctly using the correct order.
2. 🟡 I gave myself a green because I showed my group how to complete these sums.
3. 🟡 I gave myself a green because I explained my answer to my group.

Regional Improvement Collaborative: West Partnership Practitioner Moderation Template (PMT)

Prior to the moderation exercise, please complete the following information and submit it to your facilitator with assessment evidence from one learner that you judge to have successfully attained the Es and Os.

Evidence Code	R44
Curriculum Area(s)	Numeracy
Level	Second
Stage(s)	Primary 7

Planning	<p>Experiences and Outcomes (highlight the relevant aspects of each E and O):</p> <ul style="list-style-type: none"> • MNU 2-03a Having determined which calculations are needed, I can solve problems involving whole numbers using a range of methods, sharing my approaches and solutions with others. • MNU 2-03c Having explored the need for rules for the order of operations in number calculations, I can apply them correctly when solving simple problems.
	<p>Learning Intentions:</p> <ul style="list-style-type: none"> • LI 1: I am learning the rules for the order of operations in number calculations. • LI 2: I am learning to apply the rules for the order of operations when solving simple problems. • LI 3: I am learning to share my approaches and solutions to simple problems with others.

Assessment	<p>Benchmarks:</p> <ul style="list-style-type: none"> • Applies the correct order of operations in number calculations when solving multi-step problems.
	<p>Success Criteria: <i>Please list SC and give brief detail on how learners were involved in their creation.</i></p> <p>LI 1:</p> <ol style="list-style-type: none"> 1. I can state what the order of operations are in number calculations. 2. I can explain why we must do calculations in a particular order. 3. I can use BODMAS to choose the correct operations (e.g. addition, subtraction, division and multiplication). <p>LI 2:</p> <ol style="list-style-type: none"> 4. I can use BODMAS to choose the correct operation. 5. I can apply operations in the correct order using BODMAS. <p>LI 3:</p> <ol style="list-style-type: none"> 6. I can solve simple problems using the correct order of operations. 7. I can explain my approach to solving simple problems to others. 8. I can explain my solution to simple problems to others.

Briefly outline the context and range of quality **learning experiences** that have been planned making reference to the chosen **design principles**. Make specific reference to **breadth, challenge & application**.

Context: Pupils are learning to apply the order of operations in the correct order using BODMAS.

Lesson 1: I initially discussed the LI and SC with my class and asked children to share their prior learning. I then asked children to complete '2+5x4' on an individual white board; some children had answered 28 and others answered 22 – this led us on to a class discussion about why we need to have 'rules' for the order of operations. I then showed children a short video clip explaining BODMAS. Children then used this knowledge to identify what operation they would carry out first in board examples (challenge – children could complete the board questions if they felt confident enough).

Lesson 2: We discussed the LI and SC and children were given time to share their learning from lesson 1. I asked for volunteers to demonstrate how to use BODMAS to complete a calculation on the teaching board, explaining what they were doing and why if they felt comfortable (challenge) ([appendix A](#)). Children were then presented with board questions which were coloured green, amber and red – green being quite simple and amber and red getting progressively harder- they could choose which set of questions they completed in their jotter (personal challenge and choice). An extension task or 'challenge cards' were then made available for children who completed their work or felt that they required further challenge – these included questions with more steps, opportunities to create own questions and create posters explaining the process etc.

Lesson 3: Lesson 3 gave children the opportunity to apply their understanding of BODMAS to word problems (application). Children were organised into mixed ability groups where they were presented with problem solving cards and asked to 'blether' about how to solve each question. Children were encouraged to help each other and to explain both their chosen approach and solutions to each other. Some children took a lead role and acted as the 'teacher' helping others to understand the processes.

Record the planned assessment that will be gathered to meet the success criteria considering **breadth, challenge and application**.

Lesson 1: Children were given a sheet with **SC 1, 2 and 3** on it and space to record evidence showing that they had achieved and understood each one. They were also encouraged to use traffic lights to show their understanding. As an extension task child A also chose to make a poster stating the correct order of operations to be added to our class display to help others. ([APPENDIX B](#)).

Lesson 2: **SC 4 and 5** – Pupils completed sums in their jotter using BODMAS. They underlined the operation they were focusing on and took a new line for each step of the calculation, this showed clearly that they could use BODMAS to choose the correct operation (**SC 4**). The jotter was corrected by the teacher, correct answers showed that they could apply the operations in the correct order (**SC 5**) (See [APPENDIX C](#) for written jotter task), verbal feedback was also given. Child A also volunteered to demonstrate her ability to complete these types of questions on the classroom board to help others in the class ([APPENDIX A](#)). On completion of all tasks children were asked to give the success criteria (**SC 4 and 5**) a traffic light and explained their choice of colour ([APPENDIX D](#)).

Lesson 3:

SC 6 -Children recorded their working and answers to each problem on a given worksheet (APPENDIX F). Children were encouraged to self and peer assess their working and answers throughout the group task.

SC 7 and 8 – Children were observed by the teacher, watching for children sharing/ explaining their approach and solutions to simple problems (APPENDIX E).

At the end of the lesson children were asked to traffic light the success criteria and explain their choice of colour (APPENDIX G).

Briefly outline the oral/written **feedback** given to the pupil on progress and **next steps**, referring to the learning intention and success criteria.

LI 1:

1. I can state what the order of operations are in number calculations.
2. I can explain why we must do calculations in a particular order.
3. I can use BODMAS to choose the correct operations (e.g. addition, subtraction, division and multiplication).

You showed me clearly that you have achieved each of your success criteria. You even had a go at completing some calculations. Your next step is to apply BODMAS to trickier calculations.

LI 2:

1. I can use BODMAS to choose the correct operation.
2. I can apply operations in the correct order using BODMAS.

Well done, you showed me that you can use BODMAS. Remember when multiplication and subtraction both appear in a calculation you work from left to right. I am impressed that you chose to challenge yourself!

LI 3:

3. I can solve simple problems using the correct order of operations.
4. I can explain my approach to solving simple problems to others.
5. I can explain my solution to simple problems to others.

Excellent! You led your group in completing simple problems. I spotted you helping others to understand your approach and solution – you were a great teacher! Your next step is to apply this learning to trickier multi-step problems and to create your own questions.

Pupil Voice:

What have you learned? How did you learn? What skills have you developed?

Lesson 1, SC 1, 2 and 3: appendix B

Lesson 2, SC 4 and 5: appendix D

Lesson 3, SC 6, 7 and 8: appendix G

Did the learner successfully attain the outcomes?

YES/NO

L1: I am learning the rules for the order of operations in number calculations.

SC 1: I can **state** what the order of operations are in number calculations.

① Brackets

② Order

③ Division

④ Multiplication

⑤ Addition

⑥ Subtraction

☆ always go left to right



SC 2: I can **explain** why we must do calculations in a particular order.

There has to be an order because there can't be two different answers.

SC 3: I can **use** BODMAS to choose the correct operation (e.g. addition, subtraction, division and multiplication).

$$\begin{aligned} 1) & 6 \times 4 - 16 \\ & = 6 \times 4 = 24 \\ & = 24 - 16 \\ & = 8 \end{aligned}$$

$$\begin{aligned} 2) & 7 + 5 \times 2 \\ & = 5 \times 2 = 25 \\ & = 25 + 7 = 50 \\ & = 50 + 7 \\ & = 57 \end{aligned}$$

$$\begin{aligned} 3) & 8 - 3 \times 2 \\ & = 8 - 3 = 5 \\ & = 5 \times 2 \\ & = 10 \end{aligned}$$

$$\begin{aligned} 4) & 32 + 20 \div 5 - 3 \\ & = 32 + 20 \div 5 - 3 \\ & = \end{aligned}$$