Division Prior Assessment Question 11

Objective: I use my knowledge of order of operations (BODMAS) to solve equations.

NC: NASDM 6 use their knowledge of the order of operations to carry out calculations involving the four operations.

Teacher Input Ideas:(may want to split this over 2 lessons)

You may also want to give the children a few questions as a starter to help assess the children's knowledge of brackets before introducing the principles of the order of operations.

2 x (2 + 5) + 12=

3 + 4 x (2 +3) =

5 x (7 – 2)

6 -5 x 7 =

20 – 6 ÷ 2 =

Place on the board 2 + (6 x 4). Ask the children to work out what the answer is. Discuss with the children why there are brackets in the sum. Could also compare to English. What do the brackets do? Could make this engaging by creating some larger brackets to use to show to the children. These could be placed around increased sized sums or children. Inform the children that the brackets keep part of the sum separate. For example, it can be confusing if there is more than one symbol in a sum 2 x 5 + 7 – 2=. There are 3 symbols. The order that we complete them in is important.

In some sums, there are brackets to help. Do not just tell the children that you work out what is in the brackets first, children need to understand why there is a need for brackets and linking this to a real-life example will help:

I'm going to get some treats for my family and my friends family who are visiting. There are 3 members in my family and 4 members in my friend's family, so I know that altogether that there are 7 people. So today I know that whatever I choose to buy I will have to x by 7 however, at the moment I'm unsure what to buy at the shop.

Write 7 x ? on the board.

Now show two amounts/objects with price tags. I decide to buy a book for each person which is £3 and a cake for each person which is £2.

So now I know that I want a book and a cake for each person so

I need to add a cake and a book together 3 + 2

Now display with the 7 x (3 + 2).

So, each person's treats will cost £5 and then I have 7 people to x by.

I placed these amounts in brackets as I needed to do this first.

If I wrote 7 x 3 + 2

This would = 23 (model). Discuss why the answer is different establishing that they have worked out 7 lots of books and just one cake.

Place a few examples of questions with and without brackets and see what answers the children get. Compare and discuss.

The purple activity provides the opportunity to secure understanding of the use of brackets.

Order of Operations

Refer to the questions in 11a and b and allow the children time to discuss why they may have got this wrong. Many children will be confused and not understand why they have got the question wrong. Inform the children that they are going to learn something new today about the order of operations.

Recap what the purpose of brackets are and how they are used. Now introduce that some mathematicians felt that it can often be confusing when there is more than one calculation symbol in a sum. For example: 20 – 5 x 2 =

So many years ago, a rule called the order of operation was created. Some people call this BODMAS or BIDMAS. If all people follow this rule then no one will get confused or a different answer.

Brackets

Orders

Division

Multiplication

Addition

Subtraction

So, you do anything inside brackets first (as we found yesterday)

Then you look for any other orders such as ^{2} or ^{3} or $\sqrt{}$ and calculate these.

Then you look for any ÷ or x. If there are both in the same sum then you perform whichever comes first (from left to right).

Then you look for and + or - if there are both in the same sum then you perform whichever comes first (from left to right).

Share some together

30 – 5 x 2

So, if you do not use the order of operation the answer would be 50.

30 – 5 = 25 25 x 2 = 50

if we use the order or operation then it is 20 5 x 2 = 10 30 – 10 = 20

Explore with other examples.

The green and yellow activities provide opportunities to secure understanding of the order of operations.

Practice Activities:

Purple Practice: Most suited for children who need to secure the use of brackets before learning about the order of operations.

This activity provides the opportunity for the children to solve sums containing brackets. The children should apply their knowledge of working out the sum inside the bracket first before completing any other operation in the sum.

Part 2 of the task requires the children to work out the sum with and without the brackets to help the children to understand that the use of brackets has an impact on the answer. Additionally, the children should be encouraged to use a range of mental methods to work out the answer.

Green Practice: Most suited for children who made errors in Q11 as they demonstrated little understanding of the order of operations.

This activity requires the children to work out the sum reading from left to right and then work out the sum using the order or operations. The children should be able to notice that often the answers are different and that is why the order of operations was created so that all can follow the same rule.

Yellow Practice **Most suited for children who answered Q11 correct and would benefit from further exploring the use of the order of operations rule.**

This activity requires the children to understand the use of ^{2} and ^{3} before being able to complete this. If the children have already learnt what these signs mean and can explain how they are used then the activity is appropriate for them. If you feel that teaching of these signs is needed then this activity could be used as a fluency activity during the teaching of area and volume.

Mastery:

This activity requires the children to explore the order of operations when the children are presented with both division and multiplication symbols in a sum. Encourage the children to explore working out the sums from left to right and from another point of view of using the Division symbol first. Encourage children to spot that in these examples there is no difference in the answer. Now provide opportunity for the children to explore if it does have an impact. The children may need to use other symbols in their sums too or may explore using brackets. Encourage the children to express their findings to others and provide examples to support their point of view.

Answers:

Purple

1a) 14 b) 46 c) 20 d) 4 e) 5

f) 32 g) 2 h) 60 i) 48

2a) 32 and 14 b) 11 and 3 c) 5 and 56

d) 10 and 3 e) 7 and 7 f) 20 and 20

Green

Sum	Reading from left to right	BODMAS
16 – 4 x 2 =	24	8
3 + 2 x 4 =	20	11
8 + 6 ÷ 2 =	7	11
15 – 4 x 2 =	22	7
30 – 3 + 10 =	37	37 (from left to right as – and + are equal)
7 x (3-1) =	20	14
2 + 4 x (2 x 4)	48	34
30 – 10 x 2 + 6	46	16 (from left to right as – and + are equal)
18 – 2 x 6 ÷3	32	14 (from left to right as x and ÷ are equal)

Challenge :

(10- 2) x (5 + 6) = 88

Yellow:

1) 0	2)82	3) 21
4) 28	5) 18	6) 82
7) 99	8) 78	9) 70
10) 26	11) 18	12) 81

Mastery:

The children should notice that in the examples given the answers are the same regardless the way they are performed. This is because a ÷ and a x sign have been used and no other signs. (For the answers to be whole numbers, the divisor had to be a factor of the multiple created in the x part of the sum.)

The children should then explore using other symbols such as + and – in their sums to see if it makes a difference in the order.

a) 8
b) 18
c) 16

BRICKWORK Mathematics

Purple Practice

Lo: I can solve sums that contain brackets.

1) Read each sum on the block. Can you work out the answer? Remember what to do when you see a set of brackets.

a) 16 – (4 ÷ 2) =

b) (20 + 3) x 2 =

c) 2 x (3 + 7) =

d) 16 ÷ (12 - 8) =

e) 30 ÷ (12 ÷ 2) =

f) (3 + 5) x (1 + 3) =

g) (4 x 5) ÷ (5 x 2) =

h) 4 x (3 + 7 + 5) =

i) 5+3+4 x (6-2) =

2) Work out the next questions by using the brackets. Then work out the question again removing the brackets. How do the brackets make a difference?

a) 4 x (2 + 6) =

b) 12 - (3 ÷ 3) =

c) 17 – (3 x 4) =

d) 20 ÷ (4 - 2) =

e) 7 x (7 ÷ 7) =

f) 5 x (12 ÷ 3) =

BRICKWORK Mathematics

Green Practice

Lo: I can use my knowledge of the order of operations to help me calculate sums.

Work out each question reading left to right. Then workout each question using BODMAS

Sum	Reading from left to right	BODMAS
16 – 4 x 2 =		
3 + 2 x 4 =		
8 + 6 ÷ 2 =		
15 – 4 x 2 =		
30 – 3 + 10 =		
7 x (3-1) =		
2 + 4 x (2 x 4) =		
30 – 10 x 2 + 6 =		
18 – 2 x 6 ÷3 =		

Challenge: Using your understanding of BODMAS, how can you make this sum have the highest possible answer:

10 – 2 x 5 + 6 =

BRICKWORK Mathematics

Yellow Practice

LO: I use the order of operations rule to help me to calculate the answer to sums.

Look at the sums on each block. Use your knowledge of the order of operations to help you calculate the answers.

1) $3 - 9 \div 3 =$

2) $67 + 3 \times 5 =$

3) $7 \times 4 - (5+2) =$

4) $6^2 - 2^3 =$

5) $27 - 3 \times 3 =$

6) $9^2 + 1^2 =$

7) $180 - 9^2 =$

8) $80 - 10 \div 5 =$

9) $6 + 4^3 =$

10) $10 + 4 \times 2^2 =$

11) $7 + (2 + 3)^2 =$

12) $(7+ 2) \times 3^2 =$

Challenge:

How are you going to remember the order of operations rule?

Can you create your own song, poem or poster to help you?

BRICKWORK Mathematics

Mastery

Applying and Reasoning

Charlie and Harry cannot agree how to use the BODMAS rule.
Harry says that you should read from left to right if you have a ÷ sign and a x sign in the same sum. Charlie thinks that you should always use the division sign first as D comes before M in BODMAS.

	Harry	Charlie
4 x 6 ÷3=		
6 x 6 ÷ 2 =		
8 x 10 ÷ 5 =		

Look at the sums above and find the answers to the sums using both points of view. For these sums, what do you notice?

Can you find 3 examples of your own sums where the answers are different if you use Charlie's idea and Harry's idea.

Hint:
You may need to include other operation symbols too.