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AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES
SCHOOLS ENRICHMENT CENTRE
TEACHER NETWORK

Title: I'm Eight (Grades 3 to 10)

I'M EIGHT

When I went into a classroom earlier this week a child rushed up to tell me she was 8 that day!
Well, Happy Birthday to everyone who has a birthday today!
Whatever age you are, can you find a variety of questions that give your age as the answer? This could be 8 or any particular number you choose, for example 6+2, 22−14, etc.

But you need to get examples that use all the different mathematical ideas that you know about.
1) So you could show some multiplications and some divisions.
2) If you know about fractions then you can add or subtract numbers involving fractions. You could also ask questions like "What is half of 16?" , "What is four-fifths of 10?" and so on.
3) If you've come across decimals then do a few of those also, perhaps using all the four rules [addition, subtraction, multiplication and division].
And so on.
Use whatever mathematics you know to find as many different ways of getting the answer 8.
You may find some patterns that would go on for ever and ever. If you do, just put down a few, and then see if you can describe how the pattern works.
So if you're 8 years old maybe you'll write something like this:
16÷2, 8÷1, 4+4, 2+6, 9−1, 12−4
1+1+1+1+1+1+1+1, 2+2+2+2
15−3−2−1−1, 5+3+6−3−3
and so on.
Whatever your age, and whatever you get caught up with, have a look at the ways that you can make new ones that have a similar pattern.
Your "What would happen if ...?" questions may be a little different from our usual ones.
The 8 year old might ask "I wonder what would happen if I tried to use multiplication and addition to make 8?"
But if you're much much older you may write something like:-
$4\sin(\pi/2) + \sqrt{(52 - 32)}$
Thanks to NRICH for this lesson activity.

Solution

Clearly there are very many solutions. Here is one submitted to the NRICH website by an 11 year old learner:

$(10 + 78) \div 8 = 11$	$(0.8 \times 10) + 3 = 11$	$0.11 \times 100 = 11$
$((11/12 \text{ of } 72) \div 11) + 5 = 11$	$50 - 39 = 11$	$(3 \times 12) - (100 \div 4) = 11$
$(132 \div 10) - 2.2 = 11$	$52 - 41 = 11$	$(77 \div 11) + 4 = 11$
$(11 \times 11) \div 11 = 11$	$249.15 \div 22.65 = 11$	$3^2 + 2 = 11$

And some patterns

$(4 \times 3) - 1 = 11$ $(5 \times 3) - 4 = 11$ $(6 \times 3) - 7 = 11$ $(7 \times 3) - 10 = 11$	With the comment: "Mmm, there is a space of 3 between how many you have to take away each time."	$4 \times 11) - (3 \times 11) = 11$ $(5 \times 11) - (4 \times 11) = 11$ $(6 \times 11) - (5 \times 11) = 11$ $(7 \times 11) - (6 \times 11) = 11$	With the comment: "The numbers on the left go 4, 5, 6, 7 and the numbers on the right go 3, 4, 5, 6."

Notes for teachers

Why do this activity?

This number activity is a good way to engage learners in in thoughtful work and for getting them to push forward their own understanding of number.

Possible approach

For very young learners start the lesson with some examples. Then encourage the learners to work out some of their own and then to share them with the class.

With older learners, give practice in reading and making sense of the question for themselves, either by writing it on the board or giving it to them on paper, or by showing the webpage. After 5 or 10 minutes you might encourage learners to share their ideas in pairs.

Later decide on the target number (8 or some other chosen number) and get the whole class to suggest answers but move their thinking on by suggesting operations or types of numbers that they have not already used. You could roughly group their suggestions into types of operation: addition, subtraction, multiplication, division, mixed operations or according to the types of numbers involved: whole numbers only, fractions, decimals. After a while ask if there are any more, but just write 'etc' to indicate that you don't need to stop there if they agree.

Talk about the fact they can use any mathematics that they understand as long as the answer is the target number and encourage the learners to find some more examples for themselves. This could be a homework exercise and answers could be shared in the next lesson.

For very young learners, if they use only two numbers or only one type of operation, you might point this out. So ask, could they use three or four numbers and get to 8? After more examples ask if they could start with a big number and then take some away and then have to take some more away in order to end up with only 8?

If and when slip-ups occur (suppose they have suggested 15 - 6 - 6), ask what has to happen to the answer so far, so that the answer can get to 8.

Key questions

(Don’t assume that you follow their recording - which may have to be a bit unorthodox - it's good to pose questions that help you to know how the learner was thinking.)
Tell me what you are doing here.
How have you got these?
Could you find any more like that?
Could you use (name another operation or another type of number not already used)?

Possible extension

1) You might find that, for example, a learner continues with lots and lots of subtractions raising the starting number by just one each time. You may want to allow this for a while but at some point encourage them to venture further. Maybe the learner just had to work at something they felt very confident with, or maybe they just liked the patterns that came from the work.
2) Sometimes when learners have written something very confidently you might for example ask them if they know anything about something different (for example, it might be halves or quarters) and if so they could use them also. Very often learners have done this when they have received no formal teaching of that subject yet.

For the exceptionally mathematically able

A learner in this category may well have many arithmetic and geometric skills and knowledge of more sophisticated processes. Then the learner can be challenged to obtain their target number using all their using their knowledge and experience of mathematics

Possible support

If a learner has eight objects then they can access this activity by just putting the eight into a number of groups and say "this, plus this, plus this, makes 8". In this way, the eight objects can be put together and set out into different groups.