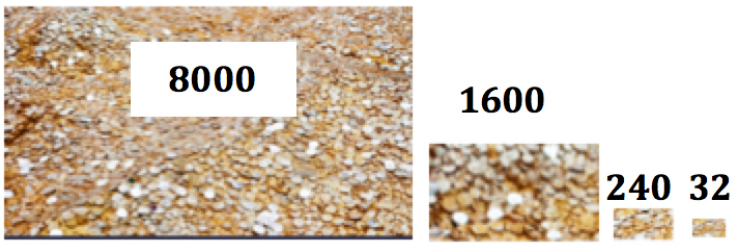
MAGIC NUMBERS

$9 - 1 =$
$98 - 2 =$
$987 - 3 =$
$9876 - 4 =$
$98765 - 5 =$
$987654 - 6 =$
$9876543 - 7 =$
$98765432 - 8 =$
$987654321 - 9 =$

Work out these subtractions.
Then divide each answer by 8.
What patterns do you see?

Suppose you share 9872 gold coins between 8 people.
You split them into 4 piles, as shown in the picture, chosen so that each pile is a multiple of 8.
Then you share each of the piles between the 8 people.
You give each person 1000 + 200 + 30 + 4 coins.



Use the coin sharing story to explain the division sum:

$9872 \div 8 = 1000 + 200 + 30 + 4 = 1234$

The brackets in these calculations tell you that you must do the calculation inside the brackets **first**.

Using the subtraction calculations that you have already done can you complete all of these calculations without using a calculator?

What patterns do you notice?

Why do you think that the ancient Egyptians called these numbers *magic numbers*?

$(9 - 1) \div 8 =$
$(98 - 2) \div 8 =$
$(987 - 3) \div 8 =$
$(9876 - 4) \div 8 =$
$(98765 - 5) \div 8 =$
$(987654 - 6) \div 8 =$
$(9876543 - 7) \div 8 =$
$(98765432 - 8) \div 8 =$
$(987654321 - 9) \div 8 =$

HELP

Start with this simpler activity:

Fill in the boxes:

136 ÷ 8 = 17 because 136 = 80 + ☐

280 ÷ 8 = 35 because 272 = ☐ + 40

456 ÷ 8 = 57 because 456 = ☐ + ☐

To do the division 2760 ÷ 8 by chunking

split up 2760 giving ☐ + 320 + 40.

Think how many 8's in the piles of hundreds, tens and units

8 × ☐ + 8 × ☐ + 8 × ☐

Explain how you filled in the boxes

Then try the challenge above again. You can do it!! Say to yourself YES I CAN.

NEXT MORE MAGIC NUMBERS

This challenge is an extension to MAGIC NUMBERS
https://aiminghigh.aimssec.ac.za/grades-4-to-7-magic-numbers/

Find the numbers to put in the boxes to make the calculations in LIST 1 correct.

LIST 1

$\square \times 8 + 1 = 9$
$\square \times 8 + 2 = 98$
$\square \times 8 + 3 = 987$
$\square \times 8 + 4 = 9876$
$\square \times 8 + 5 = 98765$
$\square \times 8 + 6 = 987654$
$\square \times 8 + 7 = 9876543$
$\square \times 8 + 8 = 98\,765432$
$\square \times 8 + 9 = 987654321$

LIST 2

$(9 - 1) \div 8 =$
$(98 - 2) \div 8 =$
$(987 - 3) \div 8 =$
$(9876 - 4) \div 8 =$
$(98765 - 5) \div 8 =$
$(987654 - 6) \div 8 =$
$(9876543 - 7) \div 8 =$
$(98765432 - 8) \div 8 =$
$(987654321 - 9) \div 8 =$

Complete the calculations in LIST 2.

What do you notice about the connections between the equations:

$\square \times 8 + 1 = 9$ etc.

and the calculations:

$(9 - 1) \div 8 =$? etc. ?

What do **inverse operations** have to do with the connections between LIST 1 and LIST 2?

You have been doing algebra!

The equations $\square \times 8 + 1 = 9$ etc. can be written in the form

$8x + 1 = 9$ etc.

where the letter x represents an unknown number and $8x$ means x multiplied by 8.

When you do algebra you are asked to solve equations. That means to find the number that the letter represents.

How would you use inverse operations to solve equations like $8x + 1 = 9$
$8x + 2 = 98$ etc. ?