Question 1

Without using a calculator, determine

$$1 + 7 \times \left(3^5 \div 3^3 + 1\right) - 8 \div 2$$

Question 1 Solution

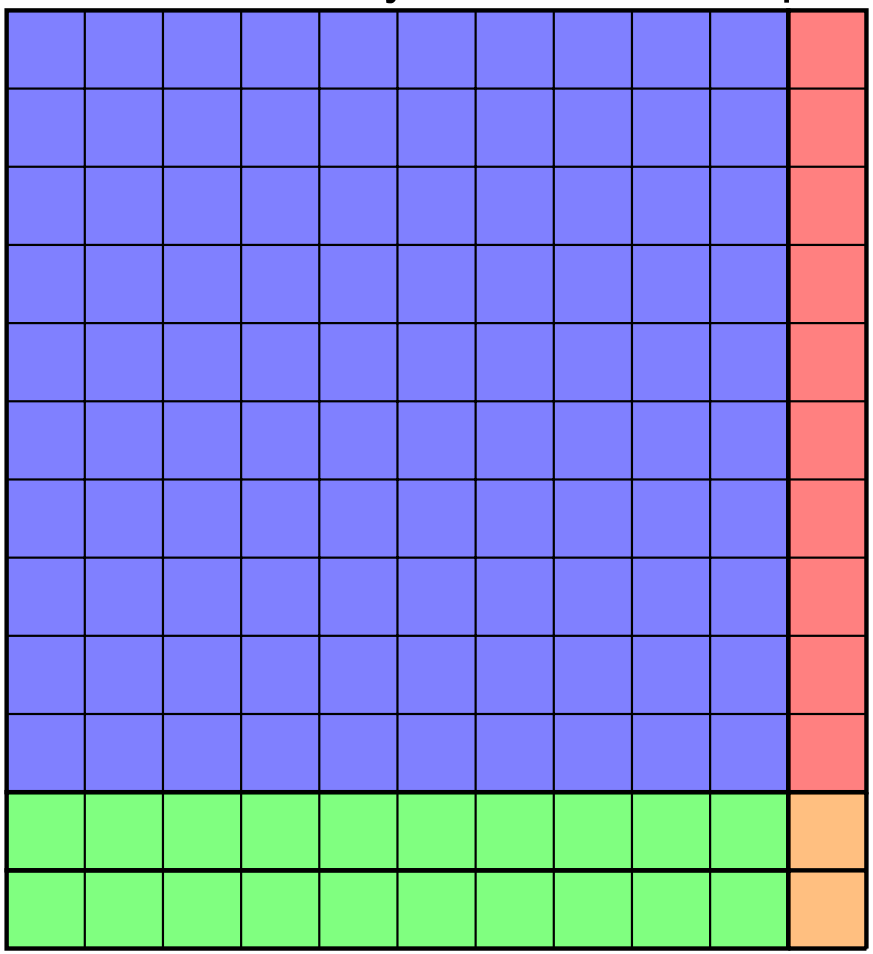
$$1 + 7 \times \left(3^5 \div 3^3 + 1\right) - 8 \div 2 = 67$$

Question 2

Sketch the multiplication 12×11 using base 10 pieces in the array model, then show the corresponding four-partial products and how they relate to your sketch.

Question 2 Solution

Given is the array with the four-partial products



10x10 = 100

10x1 = 10

2x10 = 20

2x1=2

12x11=100+10+20+2

Question 3

How many units are in 3201_{five}?

Question 3 Solution

There are 426 units in 3201_{five}

Since

$$\begin{aligned} 3201_{five} &= 3(5)^3 + 2(5)^2 + 0(5) + 1(1) \\ &= 426. \end{aligned}$$

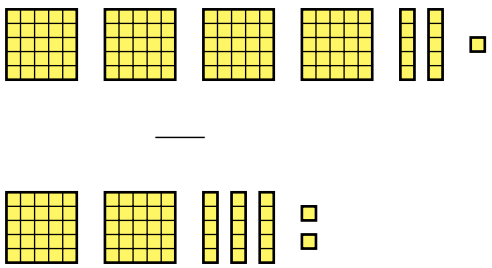
Question 4

Sketch the base five pieces corresponding to the problem $421_{five} - 232_{five}$. Show all regroupings. Write the answer as a base five numeral.

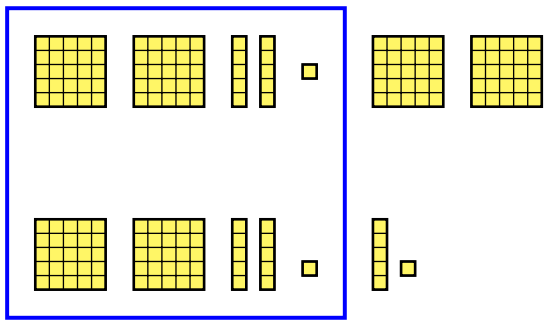
Question 4 Solution

This is using the comparison model. The pieces outside of the blue box in the fourth step represent our number. As a base five numeral the answer is 134_{five}.

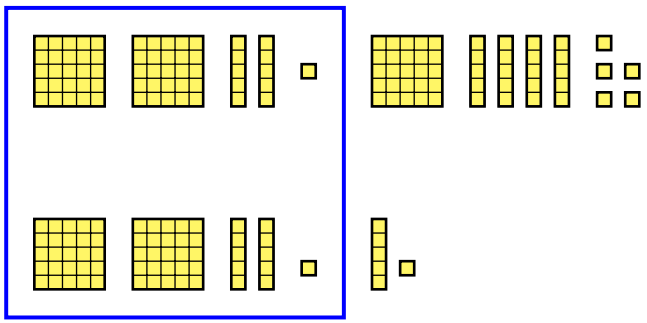
What We Start With



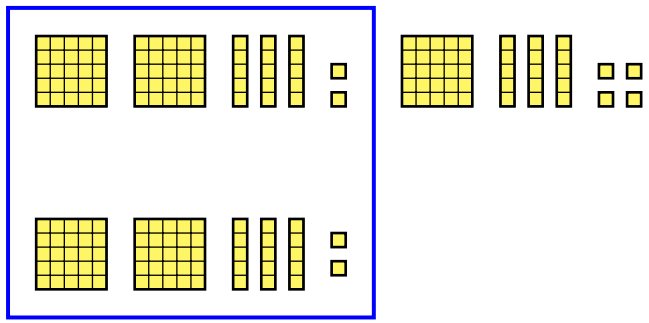
Step 2: Group together like pieces



Step 3: Replace one flat with 4 longs and 5 ones



Step 4: Put Remaining Like Pieces in the Box



Question 5

Write 2785 in base 9

Question 5 Solution

$2785 = 3734_{nine}$.
Since $2785 = 3(729) + 7(81) + 3(9) + 4(1)$

Question 6

What are the digits in base 9?

Question 6 Solution

0, 1, 2, 3, 4, 5, 6, 7, 8

Question 7

Are the whole numbers closed under subtraction? If not, give an example showing how this property fails.

Question 7 Solution

The whole numbers are not closed under subtraction if we try to subtract any two arbitrary whole numbers. For example $1 - 3 = -2$. -2 is not a whole number. Subtraction is closed if we require that we only subtract smaller numbers from larger numbers.

Question 8

Give an example of the commutative property for multiplication.

Question 8 Solution

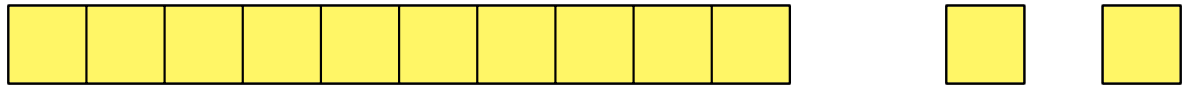
$(2)(3) = 6$
$(3)(2) = 6$
So, $(2)(3) = (3)(2)$.
Any example which illustrates that order doesn't matter works.

Question 9

Make a sketch of $12 \div 3$ showing the "sharing" model of division

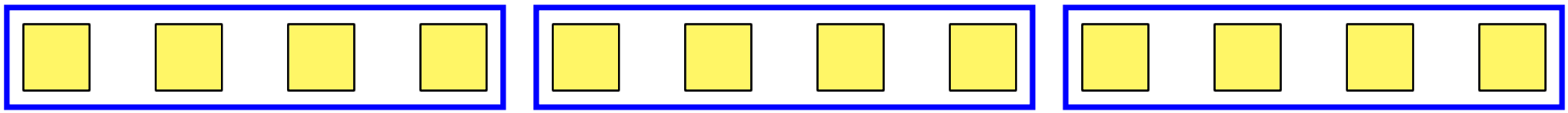
Question 9 Solution

Start with 12



Break up into Units

Put the Units into Three Equally Sized Groups



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Question 10

Make a word problem for $12 \div 3$ that demonstrates the "measurement" model of division.

Question 10 Solution

I have 12 pieces of candy I would like to give 3 pieces to as many people as possible. To how many people can I give 3 pieces of candy?

Question 11

Consider the question "I have 72 pencils. My brother has 65. How many more pencils do I have?" What operation is being performed? Which concept of that operation does this model?

Question 11 Solution

This is the comparison model of subtraction.

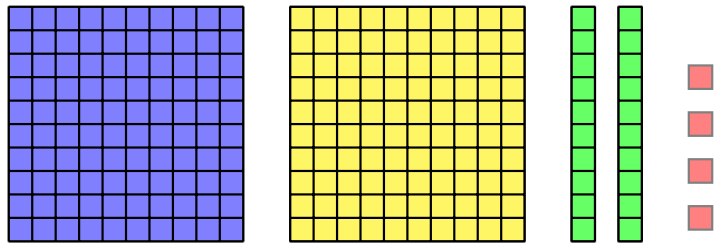
Question 12

Use the array model of division for $224 \div 16$ using your base 10 pieces.

Question 12 Solution

We get $224 \div 16 = 14$

We begin with 224.



Now we need to turn this into a rectangle with a height of 16. To do this we turn 1 flat in 10 longs and 2 longs into 20 ones.