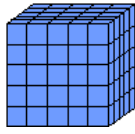
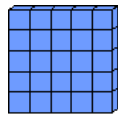


### Models for Xmanian Numbers with Xmanian Base Pieces

The base pieces used below will help Xmanian children learn their new number system.



Cube



Flat

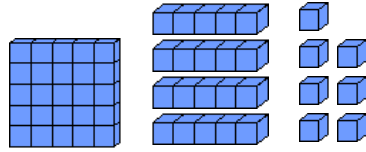


Long



Unit

1. You ask Xmanian children to use a collection of these blocks to represent the number of playing cards in a standard deck. One child, named Zam, creates the following collection of **A** flats, **D** longs, and **G** units:



Zam might say there are **G** units (instead of 7 units), but he has been told that **G** is archaic now and forbidden from public speech. Since a "**HAND**" represents an entire long (or 5 units on Earth), he could say he has "**HAND**" plus **B** units.

- a. Use your blocks to make Zam's collection shown above. Now trade in "**HAND**" units (which on Earth is "5" units) for 1 long, and "**HAND**" longs (again, on Earth we say "5" longs) for 1 flat. Draw your collection of base pieces in the box to the right:



We can say to Zam, "This new collection contains only \_\_\_ pieces total. We have \_\_\_ flats and \_\_\_ units. It is called the *minimal collection*." (Complete the above blanks with **A**, **B**, **C**, **D**, or **O**.)

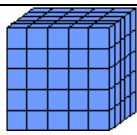
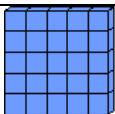


Record the number of cubes, flats, longs, and units with Xmanian numerals in the table below for the number of playing cards in **A** deck of cards.

Use your Xmanian base pieces to form a collection which represents the following. If necessary, make exchanges until you have an equivalent collection with the least number of base pieces. Then record your result in the table below.

- b. "The number playing cards in **B** decks."

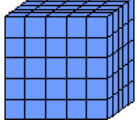
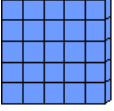


- c. "The number in **C** decks."

- d. "... in **D** decks."

The number of playing cards in...	Earth numeral	 Cubes	 Flats	 Longs	 Units
a. ... <b>A</b> deck of cards					
b. ... <b>B</b> decks of cards					
c. ... <b>C</b> decks of cards					
d. ... <b>D</b> decks of cards					

Complete this table with **A**, **B**, **C**, **D**, or **O**.

2. Explain why you never have to write a numeral greater than **D** in the table for a minimal collection (other than **O**). You can kiss **E, F, G, H, ... Z** good-bye!
3. Using your base pieces to help you, record the missing numbers in the table for minimal collections. For part **d**, note that, just like us, Xmanians have **B** feet, but they have a total of **C** hands!

	Earth numeral	 <b>Cubes</b>	 <b>Flats</b>	 <b>Longs</b>	 <b>Units</b>
<b>a.</b> Age, in Earth years, of Zam's mother.	<b>139</b>				
<b>b.</b> Age, in Earth years, of the Xmanian mathematician who died in her sleep.	<b>250</b>				
<b>c.</b> Total number of fingers and toes of any typical Earthling.					
<b>d.</b> Total number of fingers and toes of any typical Xmanian.					
<b>e.</b> Total number of fingers and toes of all the people in Zam's family. (Alas, one had a birth defect.)		<b>D</b>	<b>D</b>	<b>D</b>	<b>D</b>
<b>f.</b> Number of teachers in Zam's school.		<b>O</b>	<b>A</b>	<b>B</b>	<b>C</b>

4. Using the above table, propose a way to write numerals **in Xmania** which only contain the symbols **A, B, C, D** and **O** and fill in the blanks below with your proposed Xmanian numerals.
- The age of Zam's mother is \_\_\_\_\_.
  - The age of the Xmanian mathematician who died in her sleep was \_\_\_\_\_.
  - The total number of fingers and toes of any typical Earthling is \_\_\_\_\_.
  - The total number of fingers and toes of any typical Xmanian is \_\_\_\_\_.
  - How many family members does Zam have? \_\_\_\_\_
  - How many teachers are at Zam's school? \_\_\_\_\_
  - How many people were in our classroom, if on Earth it is named thirty five? \_\_\_\_\_