

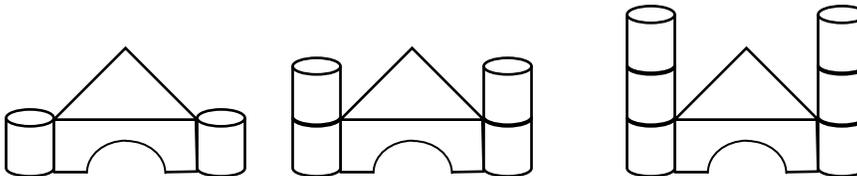
Introduction to T-tables

Goal: The students will be able to create a T-table for growing block patterns and to identify rules of number patterns using T-tables.

Prior Knowledge Required: Addition
Skip counting
Subtraction. Number patterns.

Vocabulary: T-table, growing pattern, chart, core, term

Draw the following sequence of figures on the board and tell your students that the pictures show several stages in the construction of a castle made of blocks:



Ask your students to imagine that they want to keep track of the number of blocks used in each stage of the construction of the castle (perhaps because they will soon run out of blocks and will have to buy some more). A simple way to keep track of how many blocks are needed for each stage of the construction is to make a T-table (the central part of the chart resembles a T- hence the name). Draw the following table on the board and ask students to help you fill in the number of blocks used in each stage of construction.

Figure	Number of Blocks
1	4
2	6
3	8

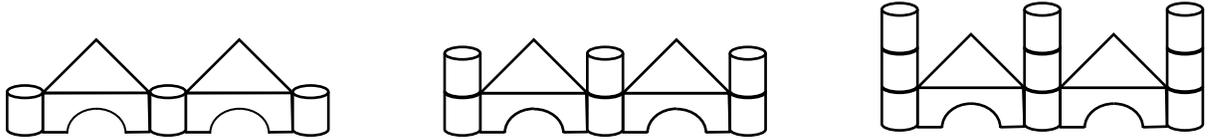
Ask students to describe how the numbers in the table change—they should notice that the number of blocks in each successive figure increases by 2, or that the difference between successive terms in the right hand column is 2. Write the number 2 (the “gap” between terms) in a circle between each pair of terms.

Figure	Number of Blocks
1	4
2	6
3	8

2
2

Ask students if they can state a rule for the pattern in the table (Start at 4 and add 2) and predict how many blocks will be used for the fifth figure. Students should see that they can continue the pattern in the chart (by adding the gap to each new term) to find the answer. Point out that the T-table allows them to calculate the number of blocks needed for a particular structure even before they have built it.

Draw the following sequence of figures on the board and ask students to help you make a T-table and to continue the table up to five terms.



Before you fill in any numbers, ask your students if they can predict the gap between terms in the T-table. They should see—even without subtracting terms in the table—that the gap between terms is 3 because the castle has three towers and you add one block to each tower at every stage of the construction.

Draw the following T-table on the board:

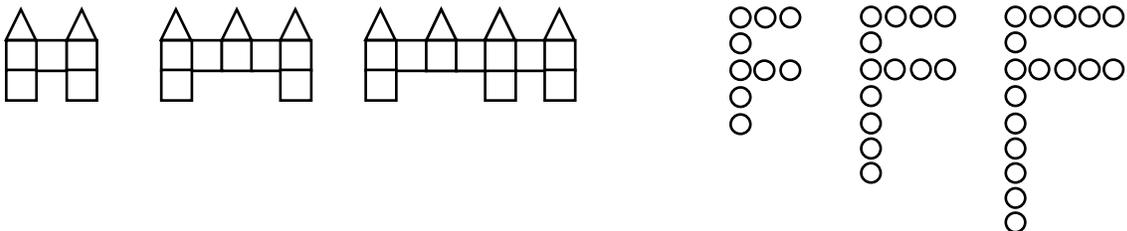
Figure	Number of Blocks
1	13
2	18
3	23

Tell students that the T-table gives the number of blocks used at each stage in the construction of a castle. The castle was built in the same way as the others (towers are separated by a gate with a triangular roof, and one block is added to each of the towers at each stage), but this particular castle has more towers. Ask students if they can guess, from the pattern in the number of blocks, how many towers the castle has. From the fact that the gap is 5, students should see that the castle must have five towers. Ask a student to come to the board to draw a picture of the first stage in the building of the castle. Then ask students to help you extend the T-table to five terms by adding the gap to successive terms.

After completing these exercises, give students a quiz with several questions like QUESTIONS 1 a) and 2 a) on the worksheet, or have them work through the actual questions on the worksheet.

Activities:

1. Ask your students to construct a sequence of shapes (for instance, castles or letters of the alphabet) that grow in a fixed way. You might also use pattern blocks for this activity.



Ask students to describe how their pattern grows and to predict how many blocks they would need to make the 6th figure. (If students have trouble finding the answer in a systematic way, suggest that they use a T-table to organize their calculation.) This activity is also good for assessment.

- Give each student a set of blocks and ask them to build a sequence of figures that grows in a regular way (according to some pattern rule) and that could be a model for a given T-table. Here are some sample T-tables you can use for this exercise.

Figure	Number of Blocks
1	4
2	6
3	8

Figure	Number of Blocks
1	3
2	7
3	11

Figure	Number of Blocks
1	1
2	5
3	9

Extensions:

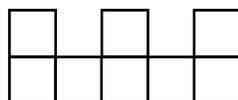
- A castle was made by adding one block at a time to each of four towers. Towers are separated by a gate with a triangular roof. Altogether 22 blocks were used. How high are the towers? How many blocks are not in the towers?
- Claude used one kind of block to build a structure. He added the same number of blocks to his structure at each stage of its construction. He made a mistake though in copying down the number of blocks at each stage. Can you find his error and correct it?

Figure	Number of Blocks
1	5
2	7
3	11
4	14

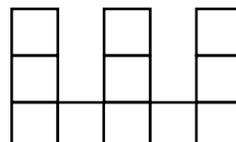
- You want to construct a block castle following the steps shown below. You would like each tower to be 5 blocks high. Each block costs five cents and you have 80 cents altogether. Do you have enough money to buy all the blocks you need? (HINT: Make a T-table with three columns: Figure, Number of Blocks and Cost).



STEP 1



STEP 2



STEP 3

T-tables

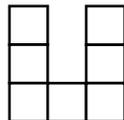
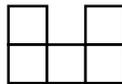
Goal: Students will extend patterns using T-tables.

Prior Knowledge Required: Addition. Subtraction. Skip counting. Number patterns.
Ordinal numbers.

Vocabulary: T-table, chart, term

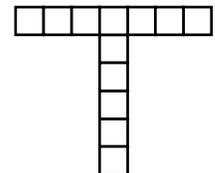
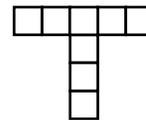
Draw several figure patterns on the board (or build them using one type of pattern block for each pattern). Ask your students to predict how many blocks you will need for the next figure in each pattern. Ask them how they made their prediction.

Invite volunteers to draw T-tables for the patterns you built. Use more volunteers to extend the tables and to check the results by building the next figure in the pattern. For one of the simpler figures you might say that each block costs two cents and ask the students to find the cost of each figure in the pattern. Ask students to make a new table for the cost of the figures. For the figures in the picture, you may also ask: Each block costs 3 cents. I have 40 cents; will that be enough to build the sixth figure?



Assessment:

Shade the blocks added to each figure to make the next one. How many blocks will the 6th figure in the pattern have?



Extension: In many sequences that students will encounter in life—for instance in a recipe—two quantities will vary in a regular way.

If a recipe for muffins calls for 3 cups of flour for every 2 cups of blueberries, you can keep track of how many cups of each ingredient you need by making a double chart. Give students several questions about recipes that they can solve with a double chart.

Number of Muffins Trays	Number of Cups of Flour	Number of Cups of Blueberries
1	3	2
2	6	4
3	9	6

Place Value – Ones, Tens and Hundreds

Goals: Students will identify the place value of digits in 2- and 3-digit numbers.

Prior Knowledge Required: Number Words — one, ten, hundred— and their corresponding numerals

Vocabulary: the numbers from 1–10, both the sounds and the numerals

Photocopy the **BLM** “*Place Value Cards*” and cut out the three cards. Write the number 321 on the board, leaving extra space between all the digits, and hold the “ones” card under the 3.

ASK: Did I put the card in the right place? Is 3 the ones digit? Have a volunteer put the card below the correct digit. Invite volunteers to position the other cards correctly. Cards can be affixed to the board temporarily using tape or sticky tack.

Now erase the 3 and take away the hundreds card. ASK: Are these cards still in the right place? Write the 3 back in, put the hundreds card back beneath the 3, erase the 1, and remove the ones card. ASK: Are these cards still in the right place? Have a volunteer reposition the cards correctly. Repeat this process with 3 1 (erase the 2).

Write 989 on the board and ask students to identify the place value of the underlined digit. (**NOTE:** If you give each student a copy of the **BLM** “*Place Value Cards*,” individuals can hold up their answers. Have students cut out the cards before you begin.) Repeat with several 2- and 3-digit numbers that have an underlined digit.

Vary the question slightly by asking students to find the place value of a particular digit without underlining it. (EXAMPLE: Find the place value of the digit 4 in the numbers: 401, 124, 847.) Continue until students can identify place value correctly and confidently. Include examples where you ask for the place value of the digit 0.

Then introduce the place value chart and have students write the digits from the number 231 in the correct column:

	Hundreds	Tens	Ones
a) 231	2	3	1

Do more examples together. Include numbers with 1, 2, and 3 digits and have volunteers come to the board to write the numbers in the correct columns.

Extensions:

1. Teach students the Egyptian system for writing numerals, to help them appreciate the utility of place value.

1 = | (stroke)

10 = ∩ (arch)

100 = ☉ (coiled rope)