

Connect Four Pattern Project

The objective of this project is to use algebra to describe and explain two shape patterns and to structure a report that communicates your findings clearly.

This project is an opportunity to develop [math curricular competencies](#), specifically those listed under *reasoning* and *communication*.

To **organize** your project - consider structuring your report with the pages outlined below.

To communicate well, write your report for an **intended audience**. Write at least one sentence at the start of each page to explain what each page is for. The reader should be able to understand your project without referring to these instructions.

To be **complete**, the following elements should be present:

Page 0 Cover page. Write the title, date, course & your name. Write one sentence describing the objective of the project (you can use the sentence at the top of these instructions). Perhaps include a relevant illustration.

Page 1 Draw the first five shapes in your pattern. At the top of the page, write a sentence to say what the page is for (eg, "Here are the first five shapes in my pattern..."). Use colour for clarity in referencing the pattern. Perhaps an additional sentence that begins 'I notice that ...'

Page 2 Draw a table of values that shows how many of each counter are in each shape in your sequence. Write a sentence or two at the top of the page to introduce the page. Perhaps include an additional sentence that begins 'I notice that ...'

Shape #	Red counters	Yellow counters	Total counters
1			
2			
3			
4			
5			

Page 3 Begin this page with a prediction of how many of each colour counter are required to make the tenth shape in your pattern. At this point it is ok if your prediction is not correct. Explain how you arrive at your prediction. Finally, draw the tenth shape and *verify* or *correct* your prediction.

Page 4 Analyse the pattern as follows:

- Define the letters you use for each variable: Use 'n' for the shape number, 't' for total, 'y', 'r' for yellow, red respectively or your own letters if you use different colours.
- Write a formula for each variable in terms of 'n' the shape number. Eg, $y = 3n + 4$ and test each formula out using numbers from your table on page 2.
- Write an explanation for your formulas. Use diagrams to explain why the structure of your shape pattern leads to your formula.
- A connect four game includes 22 red, and 22 yellow counters. Write an equation (or an inequality) to determine the biggest shape number in your sequence that can be constructed using the counters from a game of connect four. Solve your equation. Finally, count yourself 22 red, 22 yellow counters and check your answer.

Page 5 Use technology to draw three graphs - shape number (1st to 5th) on the horizontal axis, number of counters on the vertical axis. Draw one graph each for yellow, red and total counters. Title each graph and each axis. Write a sentence under each graph: "I notice that..."

Page 6 Finally, create your own shape pattern with the red and yellow counters. Draw the first five shapes, a table of results and determine the formulae required to relate the shape number to the number of yellow; red; total counters respectively. Explain, in the context of the problem, why at least one of your three formulae works.

Feedback

See <https://tentotwelvemath.com/fmp-10/algebra-prereq/projectconnect4counters/> for more details on grading.

Math communication. Emerging; Developing; Proficient; Extending
P: All components of the project are included. I have presented each component thinking of the reader. I have included sufficient commentary for the project to make sense without referring to the instructions. I have thoughtfully used a variety of diagrams, tables, technology, text, math vocabulary and notation to describe the number patterns that arise from the sequence of shapes.

Mathematical Reasoning. Emerging; Developing; Proficient; Extending
P: All components of the project are included. I have used deductive reasoning to correctly and effectively explain and generalize the shape and number patterns on pages 3, 4 and 6.