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Final checkpoint!

Scorecard!

Learning target:	P1	P2	L1	L2	L3	L4
Your confidence level before starting (0-5):						
Your confidence level after the quiz (0-5):						
The mark you earned on this attempt:	Success! Try again!	Success! Try again!	Success! Try again!	Success! Try again!	Success! Try again!	Success! Try again!
Learning target:	G1	G2	G3	G4		
Your confidence level before starting (0-5):						
Your confidence level after the quiz (0-5):						
The mark you earned on this attempt:	Success! Try again!	Success! Try again!	Success! Try again!	Success! Try again!		
Learning target:	C1	C2	C3	C4	Q1	Q3
Your confidence level before starting (0-5):						
Your confidence level after the quiz (0-5):						
The mark you earned on this attempt:	Success! Try again!	Success! Try again!	Success! Try again!	Success! Try again!	Success! Try again!	Success! Try again!

Have fun and do your best! I believe in u ♡

Learning target C1 and C3, version 1

Answer each of the counting questions on this page. Explain why your approach is correct.

(a) How many different bags of 20 Skittles are possible, assuming we care about how many of each of the 5 “flavors” are in the bag?

(b) How many stacks of 9 coins are possible, using pennies, nickels, dimes, and quarters?

(c) How many bit strings of length 12 have weight either 5 or 6?

(d) How many 5-letter words can you make from the letters $\{a,b,c,d,e,f,g\}$ without using any letter more than once?

(e) How many ways are there to divide 15 people into “red team,” “blue team,” and “green team,” so that each team has 5 people?

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Learning target C2, version 1

You are hosting a party for 50 people. As a conscientious host, you've asked all of your guests what they are allergic to: shellfish (S), peanuts (P), and/or broccoli (B). Here are the results:

Allergen	S	P	B	Both S and P	Both S and B	Both P and B	S, P, and B
Number	14	12	12	4	5	3	1

How many of your 50 guests are **not** allergic to anything?

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Learning target C4, version 1

Give a *combinatorial* proof of the fact that each row of Pascal's triangle adds up to a power of 2:

$$\binom{n}{0}+\binom{n}{1}+\ldots+\binom{n}{n}=2^n.$$

Remember, a combinatorial proof is one in which you ask a counting question, answer it in two different ways, and then conclude that the two answers must be the same. I have provided some structure hints.

Consider the counting question: ____________________

One way that we can answer this question is:

Therefore, one answer to this counting question is $\binom{n}{0}+\binom{n}{1}+\ldots+\binom{n}{n}$.

A second way that we can answer this question is:

Therefore, another answer to this same counting question is 2^n.

(Now write your conclusion here!)

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Learning target Q1 and Q3, version 1

The abandoned field behind your house is home to a large prairie dog colony. Each week the size of the colony triples, before 4 prairie dogs sadly die. Let $(a_n)_{n\geq 1}$ be the sequence giving the number of prairie dogs in the colony after the nth week (after the tripling followed by the death of 4). After the first week, there are 5 prairie dogs (so $a_1 = 5$).

(a) Write down a recurrence relation to describe a_n in terms of a_{n-1}.

Briefly explain why your formula is correct.

(b) Give a careful proof by mathematical induction that $a_n = 3^n + 2$.

Base case:

Inductive step:

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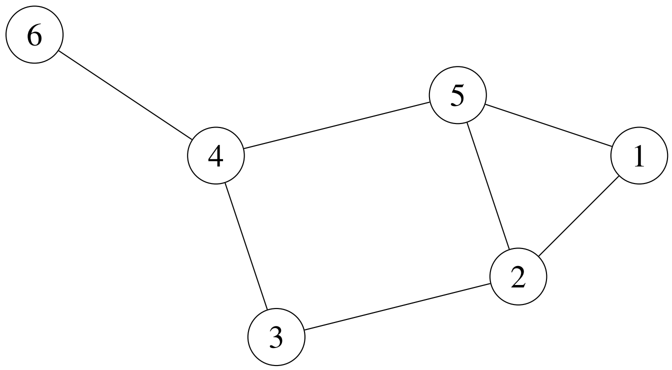
Learning target G3 and G4, version 2

Consider the graph below.



(G3) Is the graph a tree, complete, bipartite, planar, or have an Euler circuit? Explain.

(G4) What is the chromatic number of this graph? Illustrate by providing a proper coloring.

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Learning target Q3, version 2

The following is true for all integers $n \geq 1$. Prove it using mathematical induction.

$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + ... + \frac{1}{n(n+1)} = \frac{n}{n+1}$$

Base case:

Inductive step: