

Growing and Shrinking Patterns

Expectations:

- identify and describe, through investigation, growing patterns and shrinking patterns generated by the repeated addition or subtraction of 1's, 2's, 5's, 10's, and 25's on a number line and on a hundreds chart
- identify, describe, and create, through investigation, growing patterns and shrinking patterns involving addition and subtraction, with and without the use of calculators
 - identify repeating, growing, and shrinking patterns found in real-life contexts
 - represent a given growing or shrinking pattern in a variety of way
 - create growing or shrinking patterns

Growing and shrinking patterns are also made by repeating something.

First, you need to know that:

Growing patterns
are patterns that get
bigger each step.

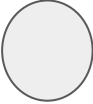
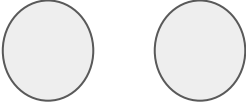
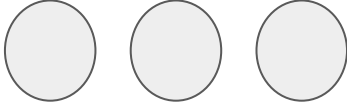


Shrinking patterns
are patterns that get
smaller each step.



Growing Patterns

A simple growing pattern begins with one element in the first term and increases by one element in each subsequent term.

Term 1	Term 2	Term 3
		

Other Ways To Demonstrate A Pattern

Using a different mode (e.g., actions, colours, sounds, letters). Translating a pattern into another mode focuses students' attention on the number of elements in each new term.

jump – jump

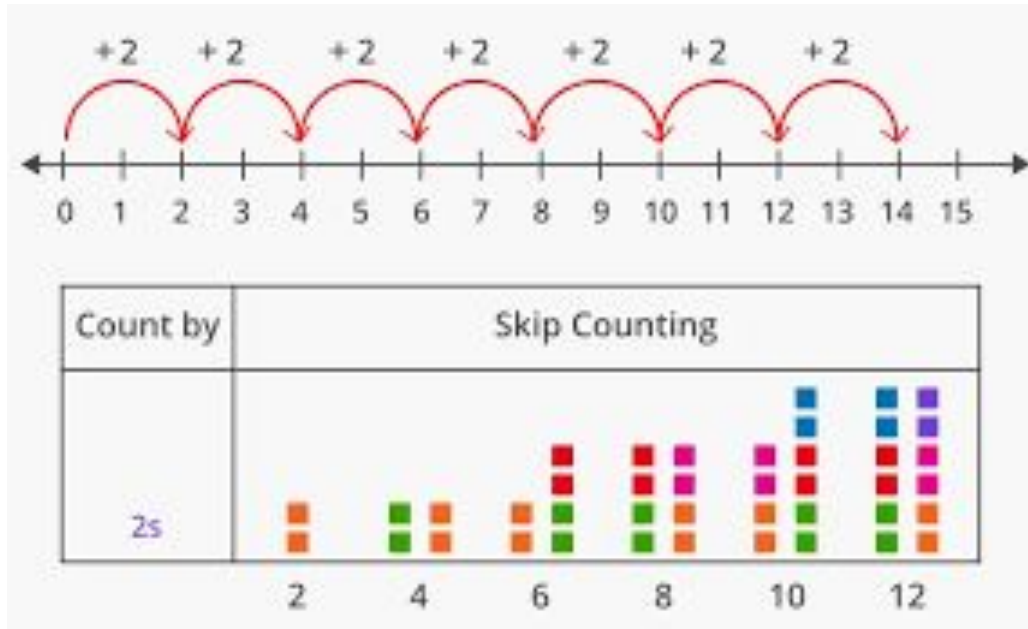
jump – jump – jump – jump

jump – jump – jump – jump – jump – jump

jump – jump – jump – jump – jump – jump – jump – jump

Using Number Lines and Bar Graphs

A number line illustrates the rate of increase (or decrease) in a pattern.



Using a Number Sequence

You can relate patterns that involve addition and subtraction to skip-counting sequences.

Add 2 each time: 2, 4, 6, 8





Add 5 each time: 15, 20, 25, 30


Subtract 10 each time: 100, 90, 80, 70

Subtract 1 each time: 56, 55, 54, 53

Using A Table

Information about the pattern can be recorded in a table. The arithmetic relationship between terms (e.g., + 2) can be indicated at the side of the table.

Term	Diagram	Number of Counters
1		2
2		4
3		6
4		8



+2
+2
+2

Patterns In A Hundreds Chart

Work with a hundreds chart allows students to recognize many numeric patterns. For example, a hundreds chart reveals the repetitive pattern of the digits of 1 to 9 in each decade, and of these digits in the tens place (e.g., 10, 20, 30, 40, . . .). Representing growing and shrinking patterns also results in visual patterns in a hundreds chart.

Take a look at this video.

<https://www.khanacademy.org/math/cc-third-grade-math/arithmetric-patterns-and-problem-solving/imp-patterns-in-arithmetic/v/patterns-in-hundreds-chart>

Patterns In Addition and Subtraction

Students learn to recognize patterns in basic addition and subtraction facts, for example, patterns in facts for 7. Knowing this pattern, will help when moving into larger numbers as well.

$0+7=7$

$7-7=0$

$1+6=7$

$7-6=1$

$2+5=7$

$7-5=2$

$3+4=7$

$7-4=3$

$4+3=7$

$7-3=4$

$5+2=7$

$7-2=5$

$6+1=7$

$7-1=6$

$7+0=7$

$7-0=7$

Activity #1 - Growing T's Activity - Getting Started

“Tina and her T-ball team were given a set of water bottles. The water bottles were identical, and during a game, players often got confused about which water bottle was their own. Tina had an idea: ‘Why don’t we each create a pattern on our own water bottle. We could arrange beads on a string in a pattern, and then tie the strings to the bottles. That way, we can tell which water bottle is our own by looking at the bead pattern.’”

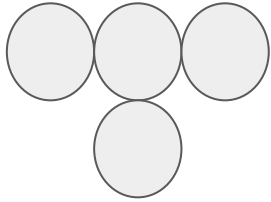
On a piece of paper, draw a line to represent a string. Draw coloured beads in a repeating pattern (e.g., blue, red, yellow, blue, red, yellow, blue, red, yellow). After drawing a few beads, identify the pattern and to suggest the next few beads in the pattern sequence.

Growing T's Activity - Working On It

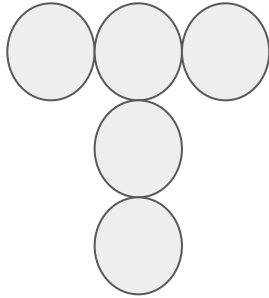
Continue to explain the situation about Tina and her teammates:

“Tina and her teammates created the bead patterns and attached the strings of beads to their water bottles. However, at the next game, players continued to mix up their water bottles, because so many of the patterns looked the same. Tina had another idea. “Why don’t we use beads to create a different kind of pattern? Because we are a T-ball team, we could follow a pattern to create T’s of different sizes. Then we will each have a different-sized T for our water bottles.”

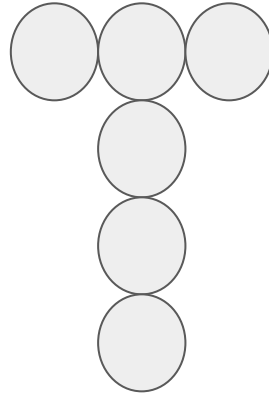
On a piece of paper, illustrate a growing pattern. Explain how the beads, represented by circles, might be arranged to create different-sized T's for four players.



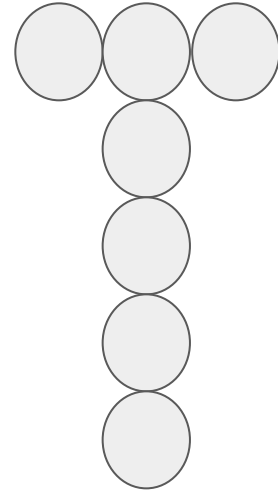
Player 1



Player 2



Player 3



Player 4

Discuss the growing pattern by asking the following questions:

- “What part of the T stays the same?”
- “What part of the T grows?”
- “What is the pattern?”

Use coloured counters (any object) to create the T's for the first four players. You can arrange the colours of the beads (counters) in any order. After you have created four T's, answer: “What would the T for player 5 look like? How do you know?” Have your child create the T for player 5.

Extend the growing pattern, using counters/any objects, and then draw a picture.

Record the number of beads that are needed to create each of the first six T's in the pattern.

After the first six T's have been completed, find the number of beads that are needed for both the seventh and the eighth T. Explain how they found the number of beads.

As you work on the activity, think about the following questions:

- “What is the pattern?”
- “Why is this pattern a growing pattern?”
- “How many beads do you think will be needed for the seventh T? Why do you think that?”
- “How many beads do you think will be needed for the eighth T? Why do you think that?”

Activity #2 - Can You Create My Pattern?

Materials: barrier (e.g., book, binder) and a variety of manipulatives (e.g., counters, colour tiles, interlocking cubes)

Instructions:

- Sit facing each other and set up a barrier between you and the other player in order to block work from each other's view. To begin, create a growing pattern, using any objects you have.
- After creating 3 or 4 terms of the pattern, one player provides oral instructions to his or her partner on how to create an identical pattern without looking at the original pattern. You might give instructions such as the following: "For the first term, place two red tiles beside each other.", "For the second term, place two red tiles beside each other, and place a blue tile on top of them.", "For the third term, place two red tiles beside each other, and add 2 blue tiles on top of them."
- After all instructions have been given, remove the barrier and compare your patterns. If the patterns are not identical, encourage your child to discuss how the instructions might have been more precise.

Activity #3 - Predicting Numbers

Materials:

- Hundreds Chart (Just google “hundreds chart” and there will be many to choose from)
- counters of any kind (several per pair)
- sheets of paper (1 per person)
- pencils (1 per person)

Predicting Numbers - Instructions

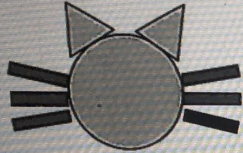
Play the game in pairs. One person chooses a number between 1 and 10 and places a counter on the number.

Next, both players count aloud by 2's/5's/10's (whatever you wish) beginning at the number chosen by the first player, and they place a counter on each number in the count. Count as far as the number closest to 50, but no further than 50.

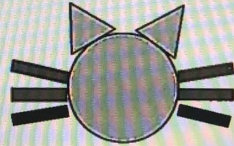
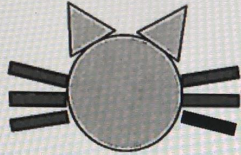
Each player predicts four numbers that will be covered by counters when the count continues beyond 50. Each records his or her four numbers on a piece of paper, without telling or showing the numbers to the partner.

Players continue to count by 2's, 5's or 10's from the last covered number on the hundreds chart, placing counters on the numbers in the count. You receive a point for every number that they predicted correctly. The game continues until one or both players score 20 points.

Cat Whiskers



One cat has
six whiskers.

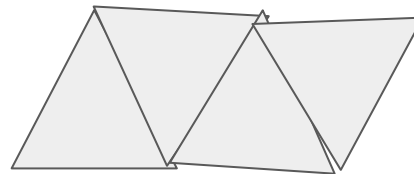
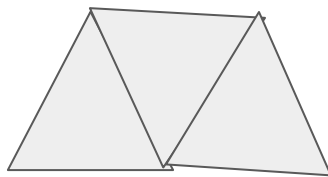
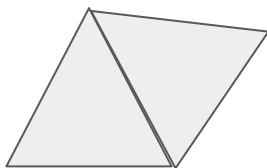
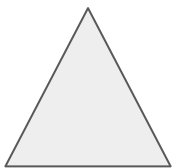


Two cats have
_____ whiskers.



Three cats have
_____ whiskers.

Think: How many whiskers do eight cats have?



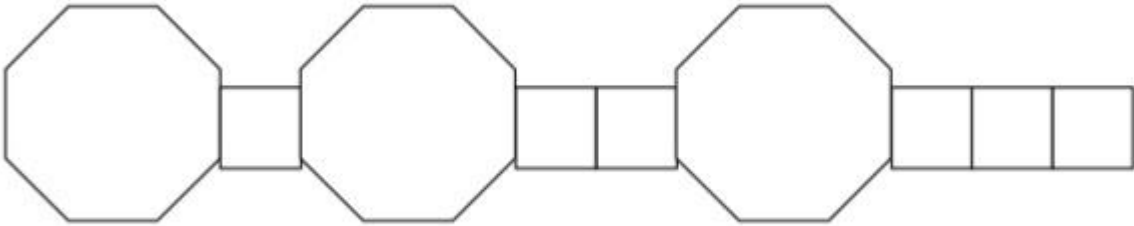
Draw the next three terms of this picture pattern.

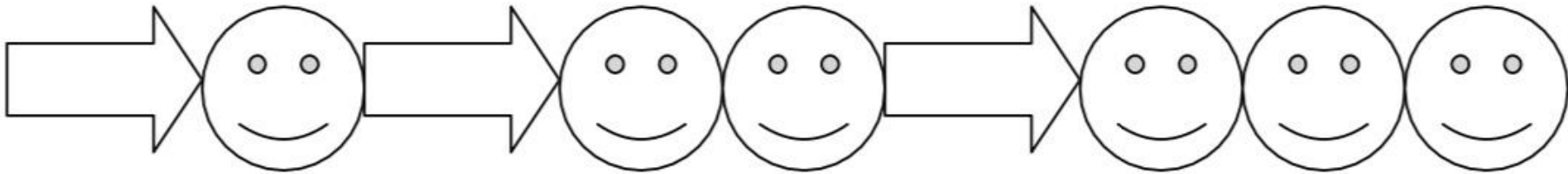
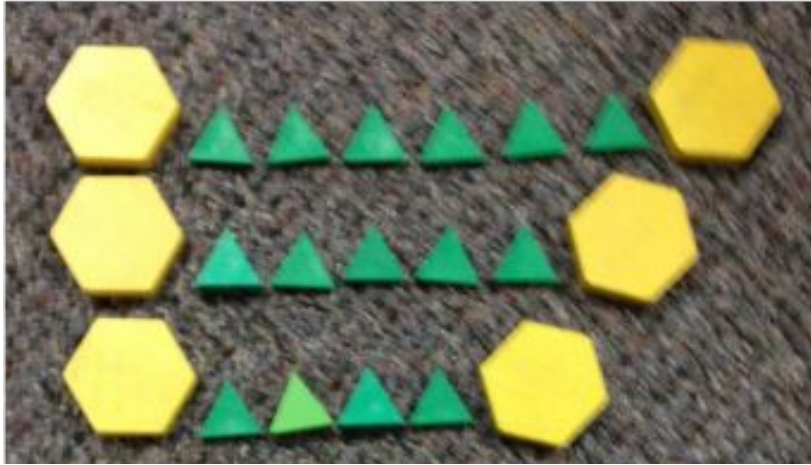


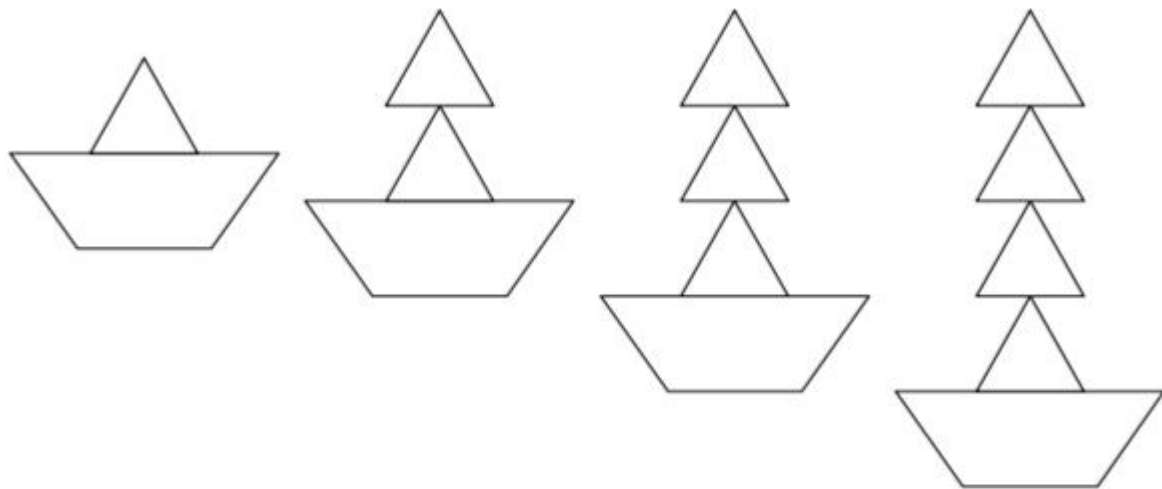
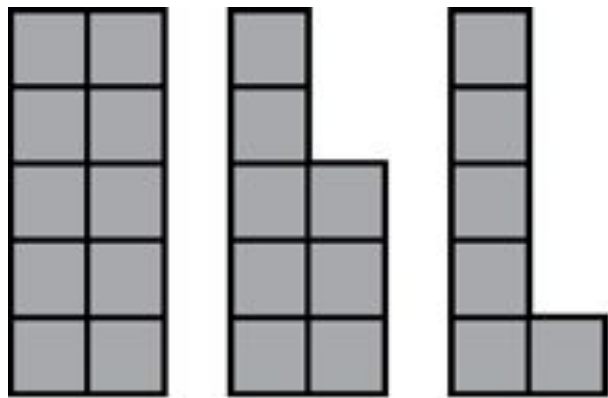
What is the number pattern that goes with the picture pattern.

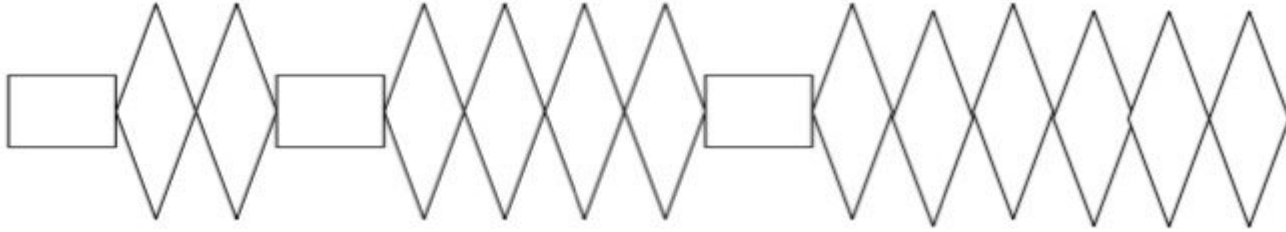


Continue the next 3 terms of each pattern. Identify if it is a growing or shrinking pattern.









Now, create some growing and shrinking patterns of your own!

Choose the best answer for each multiple choice question.

1. What type of pattern is this: **11, 9, 7, 5, 3** ?

- repeating
- growing
- shrinking

2. Choose the answer that shows the next 3 terms in this pattern:

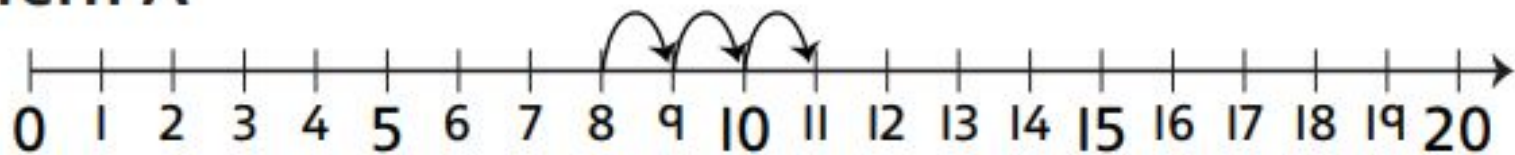
30, 40, 50, 60, _____, _____, _____.

- 65, 70, 75
- 50, 40, 30
- 70, 80, 90

3. Here is the pattern: **15, 20, 25, 30**. What is the pattern rule?

- Start at 15. Subtract 5 each time.
- Start at 15. Add 5 each time.
- Start at 15. Add 10 each time.

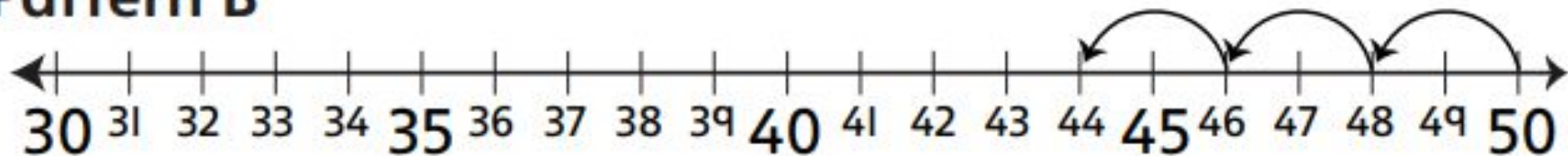
Pattern A



First 4 numbers

Next 3 numbers

Pattern B



First 4 numbers

Next 3 numbers

Complete the following patterns. Identify how many it is growing/shrinking by.

a) 10 12 14 _____ .

This pattern grows by _____.

b) 10 20 30 _____ .

This pattern grows by _____.

c) 25 20 15 _____ .

This pattern shrinks by _____.

d) 30 27 24 21 18 _____ .

This pattern shrinks by _____.