

Patterns!

FRAMEWORK
I. Scientific and Engineering Practices
II. Cross-Cutting Concepts
III. Physical Sciences

SKILLS/OBJECTIVES
<ul style="list-style-type: none">○ To teach students how to look for patterns; to look for similarities in objects that differ from each other.
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MATERIALS
<ol style="list-style-type: none">1. Findgerprinting pads2. Clear, (wide) tape3. Plain white sheets of paper4. A few (4?) black pens (not ballpoint), all DIFFERENT kinds5. Long, Inch-wide strips of paper towel6. Bowls/ containers filled with one inch of water or nail polish remover7. Strips of plastic mirror, about 8 inches long and wide enough that they just fit into a paper towel container in a triangle8. Paper towel tube or toilet paper tubes9. Translucent beads, confetti10. Adhesive tape11. Pieces of transparent plastic12. (ruler, knife to cut the mirror before hand)13. bags of objects from previous lesson plans (each one should contain 10 objects) <ul style="list-style-type: none">○

BACKGROUND

- How do we find patterns? These three activities are all different. Can you find patterns between them?

Activity #1	Making Patterns with Hands
Materials	Fingerprint pads, wide tape, white sheets of paper
Worksheet	N

- Does anyone know what a pattern is? We can find patterns by looking at similarities between different objects. Can you find any patterns in nature (day and night, the ocean tide, leaf patterns, your heartbeat)? Can you name other kinds of patterns?

Patterns with your hands: Finding fingerprints

1. Press your index finger into the ink pad
2. When the tip of your finger looks dark, put some of the clear tape against your finger.
3. Take the tape off and place it on the white paper.
4. This is your fingerprint! Fingerprints usually occur in one of three patterns (whorl, loop, or arch). Which one is yours?

Since everyone's fingerprint is slightly different, we use fingerprints to identify people.

Activity #2	Patterns in a bag
Materials	Worksheet
Worksheet	Y

1. Every student receives one bag of 10 random items
2. The student must separate his items into two categories that he decides on
3. sort the items into the two columns on the worksheet (the two categories do not need to have equal amounts of items)
4. the students may partner up and discuss the categories that they chose when they are done

Activity #3	Patterns with color: Paper and Pen Chromatography
Materials	Pens, paper towels, bowl of water
Worksheet	N

1. Draw a short, squiggly black line going across the shorter part of your paper towel somewhere in the middle
2. Place the bottom of one long end of the paper towel into the water, so the ink is NOT touching the water
3. Tape the paper towel to the bowl so the end is still sitting in the water
4. Watch the water creep upward until it passes the black ink and brings some color with it – look at the resulting pattern!
5. Like the fingerprints, you all end up with samples that are similar but still a little bit different! What can you learn from the differences in the color streaks that come from the pen ink? (that each ink is composed a little bit differently)
6. Keep your paper chromatography

Activity #4	Patterns with light: Kaleidoscope
Materials	Small mirrors, clear tape, adhesive tape, toilet paper tube, round cardboard piece
Worksheet	N

1. tape the pieces of mirror into a prism with the mirror sides facing inside and secure with the adhesive tape
2. cover one end of the mirror prism with the clear plastic or clear tape and put some beads/ confetti in over the plastic
3. insert the prism into the long toilet paper tube (the tube should be 1 cm longer than the prism at each end (tape more tubes together if they are not long enough)
4. put another piece of clear plastic/ tape over the beads and tape it to the paper towel tube
5. put a round piece of cardboard over the other end and poke a hole in it wide enough to look through
6. decorate the tube

7. point it toward a source of light, look through, and turn it slowly
8. How does the light play with your eyes? Which beads or pieces of glitter shine light through the best? Why does the pattern that you see change when you turn it?

Activity #4	Patterns with light: Kaleidoscope
Materials	Small mirrors, clear tape, adhesive tape, toilet paper tube, round cardboard piece
Worksheet	N

1. tape the pieces of mirror into a prism with the mirror sides facing inside and secure with the adhesive tape
2. cover one end of the mirror prism with the clear plastic or clear tape and put some beads/ confetti in over the plastic
3. insert the prism into the long toilet paper tube (the tube should be 1 cm longer than the prism at each end (tape more tubes together if they are not long enough)
4. put another piece of clear plastic/ tape over the beads and tape it to the paper towel tube
5. put a round piece of cardboard over the other end and poke a hole in it wide enough to look through
6. decorate the tube
7. point it toward a source of light, look through, and turn it slowly
8. How does the light play with your eyes? Which beads or pieces of glitter shine light through the best? Why does the pattern that you see change when you turn it?

CONCLUSIONS

Are there patterns between these activities?

You all completed three activities, and the outcomes of each one were different. How were all of your kaleidoscopes similar? Whose fingerprint did yours look like the most? Were all of the pens made from the same ink?

Worksheet:

How did you separate your items into two groups? _____

Group 1

Group 2

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