

Unit 6 Probability and Data Management: Sorting and Graphing

Introduction

In this unit, students will learn to sort objects into one or more groups, to compare data, and to display data in simple charts and tables, such as pictographs.

Meeting Your Curriculum

Alberta—All lessons in this unit are required.

British Columbia—All lessons in this unit are required.

Manitoba—All lessons in this unit are required.

Ontario—All lessons in this unit are required.

Prior knowledge required. Students need to be familiar with patterns (Unit 3) and simple geometric shapes and attributes (Unit 5) to complete this unit.

Materials

We recommend that you reproduce **BLM Attribute Blocks** (pp M-8–10) onto paper in different colours, laminate the sheets, and cut the shapes out. This BLM includes many different shapes with various geometric and non-geometric attributes (e.g., dots and stripes, big and small, curved and straight sides, symmetrical and non-symmetrical). The shapes can be sorted in endless ways and are used throughout the unit; they are referred to as “attribute blocks.” You can also paste the shapes onto thicker materials, such as cardboard or foam, to allow sorting by thickness.

For sorting activities with the whole class, you can attach shapes to the blackboard using magnets or sticky putty. Alternatively, you can pin shapes to a large bulletin board; cut shapes out of felt and use a felt board; or lay the shapes on a large, flat surface, such as the floor.

Use yarn circles (pieces of yarn 80 to 100 cm long tied into loops) to create sorting circles. You can create larger sorting circles on a table or on the floor using masking tape, yarn, string, or hula hoops.

In addition to the BLMs provided at the end of this unit, the following Generic BLMs, found in section M, are used in Unit 6:

BLM 2 cm Grid Paper (p M-1)

BLM Attribute Blocks (pp M-8–10)

Assessment. The assessment checklist for this unit can be found in section N. The following table indicates the lessons covered by a test, which can be found in section O.

| | |
|------|---------------------|
| Test | Lessons PDM2-1 to 7 |
|------|---------------------|

PDM2-1 Sorting into Groups

Pages 85–87

CURRICULUM REQUIREMENT

AB: required
BC: required
MB: required
ON: required

VOCABULARY

circle
data
group
information
oval
rectangle
sorting circle
square
triangle

AT HOME



Students can help sort groceries (edible or not, refrigerated or not) or laundry (light/dark, white/coloured, children's clothes/adult's clothes). See Letter to Parents (p G-45).

Goals

Students will sort objects according to different attributes, using sorting circles.

PRIOR KNOWLEDGE REQUIRED

Can identify sides and vertices in shapes
Can identify circles, ovals, squares, rectangles, and triangles

MATERIALS

masking tape or string
BLM Animals to Sort (p G-34)
sorting boxes
cards with letters and numbers
attribute blocks from **BLM Attribute Blocks (1)** (p M-8)

Sort objects using one sorting circle. Create a large circle on the floor using masking tape or string. Put a card labelled “has pets” inside the circle, and ask all the students who have a pet to stand inside the circle. ASK: Who is left outside the circle? (students who have no pets) Repeat with a different label, such as “wearing a sweater” or “brown eyes.”

Now sort pictures of animals from **BLM Animals to Sort**. Start with four pictures. Draw a sorting circle on the board and label it “wild animals.” Have volunteers come to the board and place a picture inside or outside the circle. Repeat with other labels as you increase the number of pictures. **EXAMPLES:** 4 legs, hunts for food, pets, reptiles, animals native to Canada. Leave the last group of animals in the sorting circle on the board.

ACTIVITY 1 (Essential)

1. Give each student a sorting box and several cards with capital letters, lower case letters, one-digit numbers, and two-digit numbers (one item per card). Ask students to place all the cards of a certain type in the box (**EXAMPLES:** all letters, all numbers, all two-digit numbers). Repeat several times.

Bonus: Place all the vowels in the box.

Introduce vocabulary: sort, group, data. Point to the last group of animals in the sorting circle on the board. ASK: How are all these objects the same? Explain that students have been sorting: putting objects into groups according to different labels or rules. SAY: The objects you sort are called data. Write the words “sort,” “group,” and “data” on the board. Point out that all of the objects in a group are similar in some way. For example, all the animals in the first circle were wild animals.

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NOTE: Students in BC might recognize the piece of bread as an ovoid and the moon as a U-shape. ➡

NOTE: Students in Ontario might recognize them as quadrilaterals. ➡

Sort geometric shapes by one attribute. Draw various shapes on the board (EXAMPLES: circle, square, triangle, rectangle, trapezoid, pentagon, and octagon). Review the names of the shapes with students. Also review the names of various geometric terms and properties, such as sides, vertices, and curved and straight sides. Give each student a sorting box or a yarn circle and the shapes from **BLM Attribute Blocks (1)**. Ask students to place all the rectangles and squares in their box or yarn circle. Point out that the shapes left outside the box can be described as “not rectangles and not squares.” Repeat with triangles. Then have students place all the shapes that have at least some straight sides in the box. ASK: What is left outside? (the button (circle), the moon shape, and the piece of bread (oval)) Why? (they do not have straight sides) What kind of sides do they have? (curved)

Refine the sorting. When students can comfortably sort by one attribute, ask them to look at a group they sorted, say shapes with four sides, and to refine the sorting by leaving only the shapes with four straight sides in the group. Have them trace the shapes with four straight sides on a sheet of paper. Now have students mix all their shapes up, find all the shapes with straight sides, and then leave only the shapes with four straight sides inside the group. Have students use the tracings to compare the results of each way of sorting. ASK: Did you end up with the same shapes? (yes)

Sort using two attributes. Have students complete the exercises below to find the shapes with four straight sides in one step.

Exercises: Sort the shapes. Place the shapes described in the circle. Place all other shapes outside the circle.

- a) light rectangles or squares
- b) dotted shapes with only straight sides
- c) shapes that have both straight and curved sides

Bonus: shapes with 4 vertices and dots

Answers: a) white square and dotted rectangle inside; b) dotted rectangle, dotted triangle, and dotted pentagon inside; c) piece of pizza, dotted four-sided shape with two curved and two straight sides, shape with three straight sides and one curved side; Bonus: dotted rectangle, dotted four-sided shape with two curved and two straight sides inside

ACTIVITY 2 (Essential)

2. Give pairs of students two lists of properties that apply to their attribute blocks, one geometric and the other non-geometric. EXAMPLES for list 1: dotted, striped, starred, dark, light, red, blue, green, thick, thin, large, small. EXAMPLES for list 2: 4 sides, curved sides only, straight sides only, polygons, rectangles, 3 vertices. Player 1 chooses one property from each list and

Player 2 sorts the shapes so that the shapes inside the sorting circle have both properties. Player 1 checks the sorting and then players exchange roles. Warn students that sometimes the circle will stay empty. For example, if you chose “striped” and “rectangles,” the circle will be empty, because students do not have striped rectangles.

Extensions

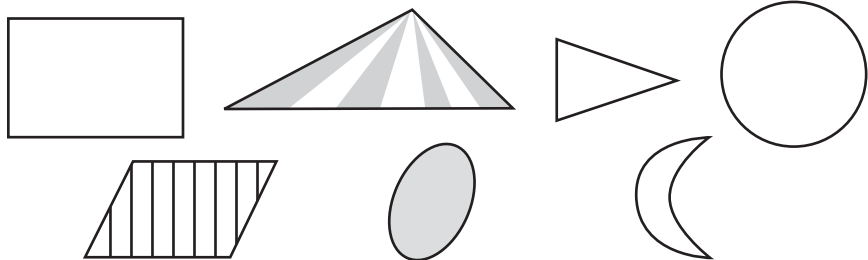
1. Ask students to choose a property from each list in Activity 2 so that there are no shapes in the circle. Have them draw a shape that could be placed into the circle. For example, students can choose “striped” and “rectangles” and draw a striped rectangle.

CONNECTION



Geometry

2. Sort the shapes below using a sorting circle labelled “shapes with a line of symmetry.”



3. Kate sorted the words below.

cat, tab, beet, team, seal, toad, mat, dog, bat

Correct her mistakes.

a)

| |
|--|
| cat, tab, beet, team, seal, toad, mat |
| 3-letter animals cat, dog, bat |

b)

| |
|--|
| tab, beet, team, seal, mat, dog |
| animals that end with “t” cat, toad, bat |

c)

| |
|---|
| cat, tab, dog, seal, toad, bat |
| 4-letter words that are not animals beet, team, mat |

d)

| |
|--|
| tab, beet, mat |
| 4-letter words or animals cat, toad, bat, seal, dog, team |

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Answers

a) cat, tab, beet, team,
seal, toad, mat

3-letter animals
cat, dog, bat

b) tab, beet, team, seal,
mat, dog, *toad*

**animals that
end with “t”**
cat, ~~toad~~, bat

c) cat, tab, dog, seal,
toad, bat, *mat*

**4-letter words
that are not animals**
beet, team, ~~mat~~

d) tab, ~~beet~~, mat

**4-letter words
or animals**
cat, toad, bat, seal,
dog, team, *beet*

PDM2-2 Sorting into Many Groups

Pages 88–89

CURRICULUM REQUIREMENT

AB: required
BC: required
MB: required
ON: required

VOCABULARY

attribute
circle
data
group
oval
rectangle
square
sort
sorting circle
triangle

NOTE: In addition to the shapes listed above, students in Ontario must be able to identify and work with quadrilaterals, pentagons, hexagons, heptagons, and octagons.

EXTRA PRACTICE

BLM Sorting Polygons
(Ontario only)

Goals

Students will sort objects into groups according to different attributes.

PRIOR KNOWLEDGE REQUIRED

Can identify sides and vertices in shapes
Can identify a circle, oval, square, and rectangle

MATERIALS

attribute blocks from **BLM Attribute Blocks (1) and (2)** (pp M-8–9)
3 pencil crayons (red, blue, and green)
4 markers (red, blue, green, and yellow)
BLM What Changes? (pp G-35–36)
BLM Sorting Polygons (p G-37)
pattern-making materials
objects to compare and sort
sorting boxes
yarn circles

Review attributes, introduce the term. SAY: We can sort objects into groups because they are similar in certain ways. Draw on the board, in random order, several triangles and rectangles of various colours, sizes, and patterns. ASK: How can I group these objects? What makes some of the objects similar? (they are all shapes; some are rectangles, some are triangles; some are large, some are small; some have 4 sides, some have 3 sides) Explain that these characteristics are called attributes. Write the word “attribute” on the board. Draw polygons of various shapes, sizes, colours, and patterns. Have a volunteer draw a circle around the shapes they think have a certain attribute (e.g., white or large) while the rest of the class guesses what attribute the volunteer is thinking of. Repeat with other volunteers. Hold up the dark, starred rectangle from **BLM Attribute Blocks (1)**. ASK: What attribute does this shape have? (only straight sides, 4 sides, 4 vertices, 4 square corners, rectangle, polygon, dark, starred)

Exercises: Complete **BLM What Changes?**

Answers: (1) colour, shape, size, colour, shape; (2) size and colour, size and shape, thickness and direction, shape and colour, thickness and shape

Sort into many groups. Show students three markers (red, blue, and green) and three pencil crayons (red, blue, and green). ASK: How could we sort these objects? (SAMPLE ANSWERS: by colour: red, blue, and green; by object: markers and pencil crayons; by how they write: thick and thin) Model using sorting circles, labelling each circle with a group name. While referring to the sorting circles labelled with the colour attributes, show students a yellow marker. ASK: Which group does the yellow marker

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belong to? (none) Remind students that objects that don't fit into any group are placed outside the circle. While referring to the sorting circles labelled "markers" and "pencil crayons," show the yellow marker again. ASK: Which group does the yellow marker belong to? (markers) Explain that the group name is important when deciding whether an object belongs.

Give students the shapes from **BLM Attribute Blocks (2)** and keep a set for yourself. Since there are multiple sorting groups in this lesson, instead of using yarn circles have students place the shapes in each group in piles, one shape on top of the other.

Exercises

- Sort the shapes into shapes with 3 sides and shapes with 4 sides.
- Sort the shapes into plain shapes, shapes with dots, and other shapes.

Review sorting and refining. Ask students to take their plain-shapes group from part b) of the exercises above and sort that group into shapes with 3 vertices and shapes with 4 vertices (or into triangles and quadrilaterals, if students are familiar with the terms). Have students repeat the process with the dotted shapes group and the other shapes group.

Hold up one of the plain triangles. ASK: How can you describe these shapes? (plain triangles) Repeat with dotted shapes with 4 vertices. SAY: You sorted by pattern, then you sorted the shapes in the pattern groups by the number of vertices. Suppose you did the work the other way around and you sorted by the number of vertices first, then by pattern. ASK: Would you get the same groups? (yes) Have students mix the shapes then sort them again, first by the number of vertices, then by pattern. Explain that the results are the same because you are producing groups with the same names, such as "plain triangles" and "dotted shapes with 4 vertices." The shapes in each small group have the same attributes after sorting. The order in which the attributes were sorted does not matter.

Sort into many groups using two attributes simultaneously. ASK: What other ways could we sort these shapes? (by size: large or small; by colour: white, grey, or black; by pattern: pattern or no pattern) Point out that when sorting by colour, you think of the colour of the background, not the dots or the thin stripes. Have several volunteers demonstrate the sorting. When the answer is unclear, call a vote.

SAY: We can sort blocks using two attributes at the same time, such as size and colour, but we have to decide how many groups there will be. Write on the board:

Size: large small

ASK: Can a block be both large and white? (yes) Can another block be small and white at the same time? (yes) SAY: The colour of the block does not depend on its size. We can have large and small blocks in the same colour, so we have to write each colour both with the large and the small blocks.

Draw on the board:

| Size Colour | Large | Small |
|----------------|-------|-------|
| White | | |
| Grey | | |
| Black | | |

Fill in the table as a class. (large and white, small and white, large and grey, small and grey, large and black, small and black) Explain that this table gives you all the names for the six sorting groups. Have students copy the names of the groups and sort the shapes. Repeat with size and the number of sides.

ACTIVITIES 1–2 (Essential)

1. Give each pair of students some pattern-making materials, such as beans, pasta in different colours, pattern blocks, or connecting cubes. Different pairs of students can have different materials. Have students discuss the attributes of the objects and sort the materials using one attribute, and then two attributes. Another pair should guess what the sorting rule is. Pairs can challenge each other to find other attributes by which to sort the materials and then guess what each new rule is.
2. Create stations with groups of objects for students to sort in two different ways. Have students rotate through the stations in groups of three. Include three sorting boxes at each station, and write the rules or labels for each sorting on cards (one rule per card). Students each fill a box according to one rule, and then empty the box and sort again according to another rule. In the first sorting, all objects should fit into one of the groups; in the second sorting, some objects should be left outside the groups.

EXAMPLES:

Sort writing tools: markers, crayons, and pencil crayons of different colours.

1. By type: markers, crayons, pencil crayons
2. By colour: green, red, and blue (other colours stay outside)

Bonus

“makes thick lines” and
“makes thin lines”

Sorting using categories that include “more” and “fewer.” Give students a circle and a pentagon from BLM Attribute Blocks (1), in addition to the shapes they have from BLM Attribute Blocks (2). Have students sort the blocks into “shapes with 3 vertices” and “shapes with 4 vertices.” Students should place shapes that don’t belong in either pile into a third pile. Show the answers on the board using two sorting circles. ASK: Where do the new shapes I just gave you go? (outside both circles) Re-sort the same shapes into “triangles and circles” and “shapes with 4 vertices.” ASK: Which shapes that were outside the groups in the previous sorting now go inside one of the groups? (circles)

Mix up your shapes and have students do the same with their set. Draw a new sorting circle on the board and label it “more than 3 vertices.” Show a rectangle and ASK: How many vertices does this shape have? (4) Is 4 more

than 3? (yes) Where does this shape go? (inside the circle) Repeat with a pentagon and a circle. Then show students a triangle and ASK: How many vertices does this shape have? (3) Is 3 more than 3? (no) Where does this shape go? (outside the circle) Remove the shapes from the board and draw a second circle, labelled “triangles and circles.” Sort the same four shapes into the two circles. ASK: Can you think of any shapes that go outside the groups? (ovals, hearts, eyes, leaves)

Now sort the four shapes into “fewer than 3 sides” and “4 sides.” ASK: Where do triangles go? (outside both circles) Finally, sort into three groups: “fewer than 3 sides,” “3 sides,” and “4 sides.” ASK: Where does a shape with six sides go? (outside all circles) A heart? (in “fewer than 3 sides”) Add a fourth circle labelled “more than 4 sides” and place the relevant shapes into it. ASK: Are there any shapes that stay outside the circles? (no)

Have students use the shapes from BLM Attribute Blocks (2), together with the pentagon and the circle from BLM Attribute Blocks (1), in the exercises below.

Exercises

a) Copy the table.

| | Fewer than 4 vertices | 4 or more vertices |
|-------|---|--------------------------------------|
| Large | Large shapes with fewer than 4 vertices | Large shapes with 4 or more vertices |
| Small | Small shapes with fewer than 4 vertices | Small shapes with 4 or more vertices |

b) Use each box inside the thick rectangle as a group. Sort the shapes.

Extensions

1. Distribute grocery store flyers. Have students cut out and sort the pictures into “fruits and vegetables,” “dairy products,” “meats,” and “grain products.” Tell students the types of products that fall under “dairy products” and “grain products.” Discuss what to do with products that can fall into more than one group. For example, an apple pie contains fruit as well as grain products (suggestions might include placing such food outside all groups, creating mixed groups, or cutting the picture and placing parts of the picture in each group).
2. Use the shapes from BLM Attribute Blocks (2).
 - a) Sort the shapes into shapes that have some sides of the same length and shapes that have no sides of the same length.

CONNECTION



Health

b) Fill in the table to make group labels.

| | Some sides are the same length | No sides are the same length |
|----------------|--------------------------------|------------------------------|
| Plain | | |
| Dotted | | |
| Other patterns | | |

c) Sort the shapes using the groups made in the table.



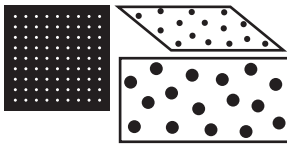
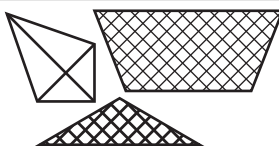

d) One box in the table in part c) is empty. Draw a shape that fits there.

Selected answers

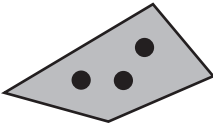
b)

| | Some sides are the same length | No sides are the same length |
|----------------|---|---|
| Plain | Plain shapes with some sides the same length | Plain shapes with all sides of different lengths |
| Dotted | Dotted shapes with some sides the same length | Dotted shapes with all sides of different lengths |
| Other patterns | Shapes with other patterns and some sides the same length | Shapes with other patterns and all sides of different lengths |

c)

| | Some sides are the same length | No sides are the same length |
|----------------|--|---|
| Plain |  |  |
| Dotted |  | |
| Other patterns |  |  |

d) Sample answer



CONNECTION



Science

3. **Sort in two ways without mixing.** Draw a chart on the board with the labels “North American animals” and “African animals.” As a class, sort the pictures from **BLM Animals to Sort**. (The beaver, moose, hamster, and rattlesnake can be found in North America; the zebra and lion are found in Africa; the kangaroo, tiger, and spectacled cobra belong to neither group.) Now change the labels to “Animals with hooves” and “Animals with claws,” but leave the animals where they are—some, if not all, will be incorrectly placed. Explain the difference between a hoof (hard foot, covers an animal’s toes) and a claw (sharp nail, is right at the end of the toe). Point out an animal that is now misplaced. ASK: Is this animal in the right place? Invite volunteers to move this and all other misplaced animals to the right places. Repeat with different labels (EXAMPLES: animals with 4 legs, animals with no legs). Then sort attribute blocks at least twice the same way (without mixing the blocks up before re-sorting), and use a geometric attribute for one round of sorting.

PDM2-3 Sorting Rules

Pages 90–91

CURRICULUM REQUIREMENT

AB: required
BC: required
MB: required
ON: required

VOCABULARY

colour
data
direction
group
pattern
shape
size
sort
sorting circle
thickness

Goals

Students will describe and deduce how different groups were sorted.
Students will identify attributes of data and sort shapes according to self-created rules.

PRIOR KNOWLEDGE REQUIRED

Can identify sides and vertices in shapes
Can identify triangles, rectangles, squares, circles, and ovals
Knows the attributes of geometric shapes
Can use sorting circles to sort

MATERIALS

two different shirts (e.g., long-sleeved baby shirt, adult T-shirt)
BLM Find 3 Differences (pp G-38–39)
different colours of chalk
BLM Attribute Spinner (p G-40) and a paper clip
short red pencil, long blue pencil, blue marker
objects to compare and sort
attribute blocks from **BLM Attribute Blocks** (pp M-8–10)
yarn circles



(size)



(shape, or number of sides/vertices)



(direction)

Review how patterns change. Write on the board words that describe how patterns can change: colour, size, shape, thickness, direction, and pattern (dots, stripes, etc.). Make sure students understand the meaning of each word. Use pictures to illustrate (e.g., use thick and thin lines to show thickness). Draw the pattern of squares in the margin and ASK: What changes in the pattern? (colour) Repeat with more patterns (see examples in margin).

Exercises: What changes in the pattern?



Answers: a) pattern; b) direction; c) direction, colour; d) size, pattern;
Bonus: shape, size, thickness

Describe differences and build an attribute chart. Show students two shirts and ask them to describe how the shirts are different. For every pair of differences (for example, large and small) identify the corresponding attribute (for example, size). Create a chart to record attributes and

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examples for each one. Compare more objects and add attributes and examples to the chart (EXAMPLES: pictures of two different animals; a large, thick book and a small notebook; pairs of different shapes).

Exercises: Complete **BLM Find 3 Differences (1)**.

Selected sample answer: shape: square, circle; colour: light, dark; number of holes: 2, 4

Continue comparing objects and adding to the attribute chart, but now focus on geometric attributes. Draw a small red rectangle and a large blue square on the board. ASK: What does the rectangle have that the square does not and that makes it a rectangle? (2 longer sides and 2 shorter sides) What does the square have that the rectangle does not and that makes it a square? (4 equal sides) Add stripes to one of the shapes. ASK: What attribute was added? (a pattern) Repeat with several more pairs of geometric shapes, including a triangle and a rectangle (number of sides and vertices) and a shape with four curved sides and a square (straight and curved sides).

Exercises: Complete **BLM Find 3 Differences (2)**.

Selected sample answer: shape: triangle, hexagon; size: small, large; pattern: no pattern, dots

ACTIVITY 1 (Optional)

1. Give each pair of students **BLM Attribute Spinner** and a paper clip. Player 1 draws a shape. Player 2 spins the spinner on the BLM and draws a shape that differs from Player 1's shape only by the attribute spun. Player 1 now spins and draws a shape that differs from Player 2's shape only by the attribute spun. Players continue spinning and drawing until they arrive back at the shape they started with. *Variation:* Each player spins and draws a shape that shares only the spun attribute with the first shape; the other three attributes must differ.

Describe what data have in common. Show students a short red pencil and a long blue pencil. ASK: What word describes both objects? (pencil) Replace the red pencil with a blue marker and repeat the question. (blue, writing tools) Repeat with more pairs and then small groups of objects. Encourage students to give multiple answers. **EXAMPLE:** a thick book and a notebook are both rectangles, made of paper, and have pages with a cover.

ACTIVITIES 2–3 (Essential)

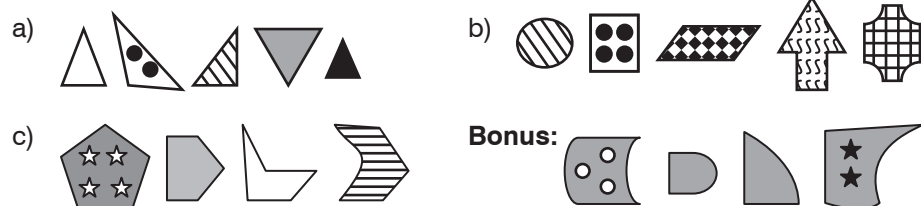
Pairs of students will need a collection of objects that have some attributes in common. **EXAMPLES:** red straw, plastic knife, long pencil, red tens block, JUMP Math AP Books, blank sheet of paper, pattern block, connecting cube the same colour as the pattern block.

2. Players choose pairs of objects from the collection and list all the common attributes they can think of. Players can create their lists independently and then compare them.
3. Player 1 chooses two objects that have something in common, and Player 2 has to guess what they have in common. Player 1 confirms or adjusts the guess by picking another object with the same attribute from the collection. Play continues until Player 2 guesses the correct attribute or until all the objects in the collection are gone.

Describe how objects are sorted (one circle). Draw a sorting circle on the board with a small red isosceles triangle (two sides of the same length) and a large red square inside it. ASK: How are these shapes the same? Pick one answer as the name of the sorting group and have volunteers add a shape inside the circle and a shape outside it. (Students can draw shapes or use attribute blocks from **BLM Attribute Blocks**.)

Erase all the shapes from the board. Draw a small red square and a large red rectangle inside the circle. ASK: What could we call this group? (red, no pattern, 4 sides, 4 vertices, straight sides) Accept and record all possible correct answers. ASK: How can we figure out which of these names is the one I was thinking of using? Explain that you will add more shapes to the circle until students get the name you have in mind. Add a blue square inside the circle. ASK: Can “red” be the name of the group? (no) Why not? (because the new square is not red) Remove “red” from the list. Continue adding shapes and eliminating possible names from the list. (EXAMPLE: add a patterned rectangle and remove “no pattern”) When the only properties left are “4 vertices” and “4 sides,” ASK: Can you think of a shape that has 4 sides but does not have 4 vertices? (no) Does the name “4 sides” fit the group? (yes) Does “4 vertices” fit too? (yes) Ask students to add a shape outside the newly named circle.

Exercises: What could be the name of the group of shapes?

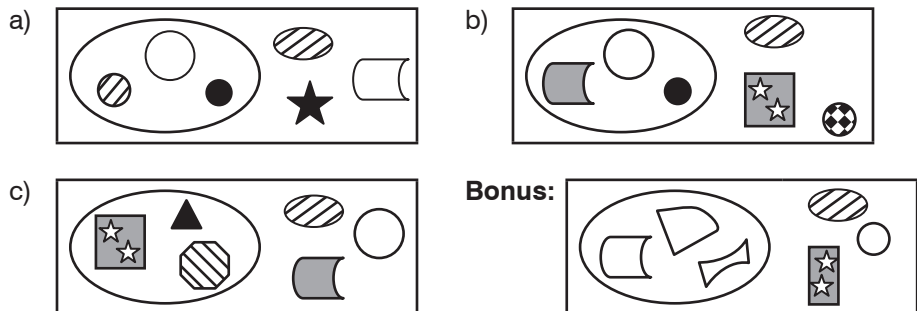


Sample answers: a) triangles, b) patterned shapes, c) 5 sides, Bonus: grey shapes with curved and straight sides

Use a shape outside the circle to determine the sorting rule. Repeat the discussion you had with students in “Describe how objects are sorted (one circle),” but start with a small blue heart and a small blue circle. Possible common attributes: small, blue, no pattern, curved sides. Eliminate answers by adding shapes inside the circle until you have two possibilities left: no

pattern and curved sides. Add a patterned heart outside the circle and ASK: What happens if I remove “no pattern” from the list? (Cover it with your hand.) What would the group name be? (curved sides) Does the patterned heart have curved sides? (yes) Where should this shape be if the group is called “curved sides”? (inside the circle) Where is it? (outside the circle) Can the right answer be “curved sides”? (no) Which property should I erase? (curved sides) Ask students to describe the sorting rule in the form of a sentence. EXAMPLE: “I put all shapes with no pattern inside the circle.”

Exercises: What could be the name of the shapes inside the oval?

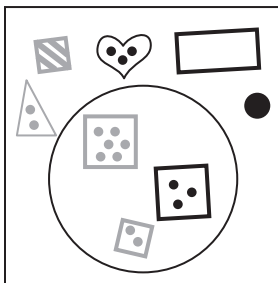


Sample answers: a) circles, b) shapes without a pattern, c) shapes with only straight sides, Bonus: white shapes with curved and straight sides

Use differences to determine the sorting rule. Draw a small dark square and a large dotted rectangle inside a sorting circle. Explain that you have started sorting shapes, but students have to guess the rule. ASK: Which words describe these two shapes? What do the shapes have in common? Draw a triangle with the same pattern as the rectangle outside the circle.

ASK: How is the triangle different from the rectangle? For each attribute that students name, ask if it applies to the square. Continue until students find the answer. (4 sides) Repeat with different shapes and sorting rules. (EXAMPLES: has dots, curved sides, more than 3 sides) Encourage students to explain the difference between the shapes in the circle and the shape(s) outside the circle each time.

Determine the sorting rule—two attributes. Tell students that this time you will use two attributes together when sorting. Draw the picture in the margin for grey and blue for black. Ask students to look at the shapes inside the circle and to say what all these shapes have in common. (EXAMPLES: 4 sides, 4 vertices, squares, dotted, straight sides) Write the answers on the board. Circle two properties, such as “straight sides” and “dotted,” and ask students to look at the shapes outside. ASK: Are there any shapes that are dotted? (yes: triangle and heart) Are there shapes that have straight sides? (yes: rectangle, triangle, and square) Between these shapes, are there any that are both dotted and have straight sides? (yes: the dotted triangle) If the group was named “dotted shapes with straight sides,” would the triangle be inside or outside the sorting circle? (inside) Could these two properties together be the name of the group? (no) Repeat with other pairs of properties that students suggest,



until they arrive at a pair that no shape outside the group has. (dotted squares) Explain that this could be the sorting rule for the group.

ACTIVITY 4 (Essential)

4. Give pairs of students 6–7 attribute blocks and a sorting circle. Player 1 thinks of a sorting rule and places two shapes inside the circle according to that rule. Player 2 guesses the rule and adds a third shape inside or outside the circle. Player 1 confirms the guess or places the shape correctly without saying what the rule is. The game continues until all shapes are sorted or Player 2 guesses the rule. Players then switch roles.

Extensions

CONNECTION



Patterns

1. Create different patterns where more than one attribute changes and have students identify the core, the number of terms in the core, and the attributes that change. EXAMPLES:



(direction and colour)



(direction, colour, size)

CONNECTION



Patterns

2. Have students create a pattern where one or more attributes change. Ask them to repeat the core two times.

PDM2-4 Sorting Rules—Many Groups

Pages 92–95

CURRICULUM REQUIREMENT

AB: required
BC: required
MB: required
ON: required

VOCABULARY

curved
data
geometric
group
sort
sorting circle
stripes
vertices

Goals

Students will describe and deduce how different groups are sorted.

PRIOR KNOWLEDGE REQUIRED

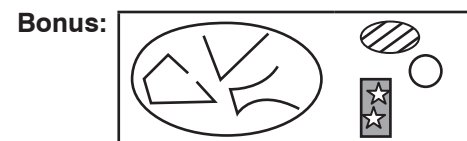
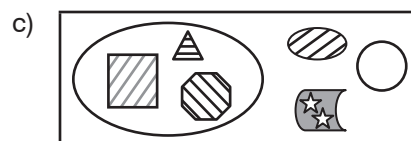
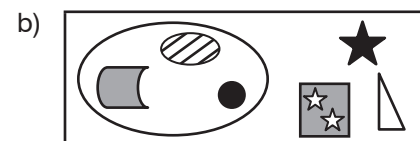
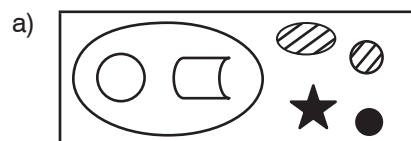
Can identify sides and vertices in shapes
Can identify triangles, rectangles, squares, pentagons, circles, and ovals
Knows the attributes of geometric shapes
Can use sorting circles to sort

MATERIALS

attribute blocks from **BLM Attribute Blocks** (pp M-8–10)
the game Set™ or **BLM Find a Triple** (pp G-41–43)

Review the previous lesson. Display several attribute blocks from **BLM Attribute Blocks** and draw a sorting circle on the board. Think of a rule that involves a non-geometric property, such as “shapes with dots,” and place two dotted shapes inside the sorting circle. SAY: We are going to play a guessing game. Instead of calling out the rule, choose another shape that you think will go inside the sorting circle or outside the sorting circle according to the rule. Have a volunteer add a shape to the circle, then ask the rest of the class if they agree. If the shape is placed in the correct place (dotted shapes are inside; everything else is outside), confirm the guess and have other volunteers sort the remaining shapes. Then ask students to identify the sorting rule. If a shape is placed incorrectly, explain that this is not the rule you were thinking of and move the shape to the correct place. Mix the shapes up and repeat, choosing another attribute that involves a geometric property, such as “shapes with six sides.” Mix the shapes up again and repeat using two properties, one geometric and one non-geometric. Tell students that the rule will have two properties together, such as “dotted triangles.”

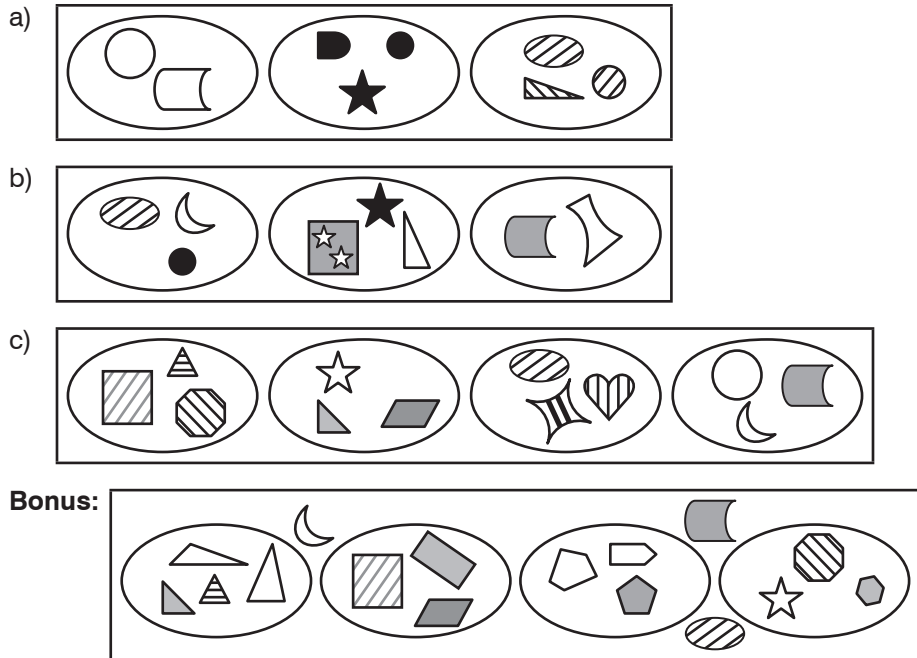
Exercises: How are the shapes sorted? Name the group.



Sample answers: a) white shapes, b) shapes that have some curved sides, c) striped shapes with straight sides only, Bonus: open lines

Naming multiple sorting groups. Guide students to deduce sorting rules, as above, for objects sorted into two groups. Begin with simple, non-geometric attributes (such as colour, size, patterns, type of object). Proceed to geometric attributes (such as number of sides, curved and straight sides), then use sorting rules that combine the two, such as “dotted triangles” and “striped circles” (all the rest go outside the sorting circles).

Exercises: How are the shapes sorted? Name the groups.

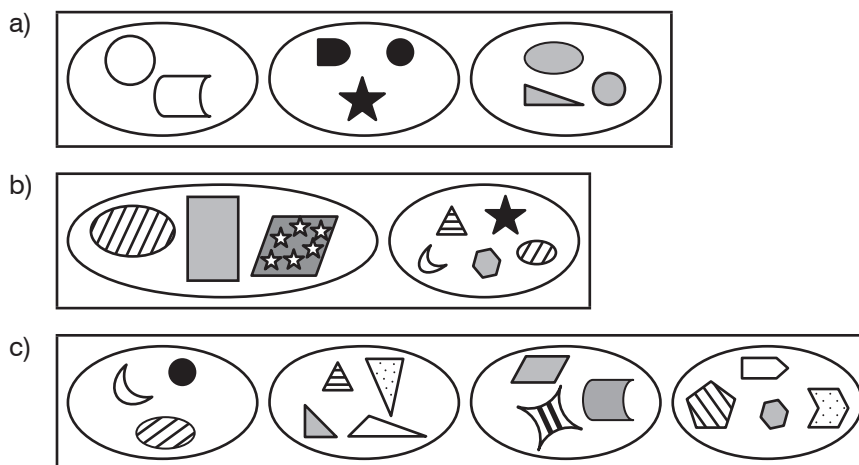


Sample answers: a) white shapes, black shapes, striped shapes; b) all sides curved, all sides straight, some sides straight and some sides curved; c) striped shapes with straight sides only, plain shapes with straight sides only, striped shapes with some curved sides, plain shapes with some curved sides; Bonus: 3 straight sides, 4 straight sides, 5 straight sides, more than 5 straight sides

Describing sorting. Write on the board: red, yellow, green. ASK: What word describes all three words together? (colour) Write “colours” on the board as a title for the three words. Draw three sorting circles and label them “red,” “yellow,” and “green.” Gather objects from around the classroom that are different colours and different sizes. Ask a volunteer to sort several objects into these circles. SAY: These objects are sorted by colour. Now write on the board: large, small. ASK: What word describes these two words together? (size) Write “size” as a title for the two words. Draw two more sorting circles and label them “large” and “small.” Again, ask a volunteer to sort several objects into these circles. SAY: These shapes are sorted by size. Repeat with: has dots, stripes, no pattern. (patterns) Then move to geometric attributes (EXAMPLES: shape, curved sides, number of vertices). Gradually increase the number of groups you use.

NOTE: If you do not have a commercial version of the game, use cards from **BLM Find a Triple**. The cards on the BLM differ by shape, number, and shading only.

Exercises: How are the shapes sorted?



Answers: a) by colour, b) by size, c) by the number of sides/vertices

Geometric and non-geometric properties. Explain that in geometry, when geometric shapes are sorted, we say the shapes are being sorted by their “geometric properties.” Ask students to give examples of properties they have learned about in geometry and make a list under the title “Geometric Properties.” (number of corners, number of sides, curved or straight sides, triangle, square, etc.) If students mention a property that is not geometric, such as size, explain that though size is a mathematical property, it is not geometric—a triangle is a triangle whether it is small or large. Make a second list under the title “Not Geometric Properties.” (colour, size, patterns, thick or thin, texture, etc.) Then present several properties (include tricky ones, such as “has 5 dots”) and ask students to say where they should be listed. (not geometric properties) Have students look at the ways shapes have been sorted during the lesson and, later, in the AP Book, and have them say whether the sorting was geometric or not.

ACTIVITIES 1-2 (Optional)

1. Show students cards from the game Set™. Ask students to say what categories can be used to sort the cards (e.g., shape, colour, number, shading) and then sort the shapes using those categories. Have groups of students play Set™ co-operatively. Students take turns trying to find sets and place their sets in a single pile to total at the end. You could tell students when to start and stop, giving them the same amount of time each round. **ASK:** Do your scores improve each time? Include only the solid shapes (no stripes or blanks) until students can very comfortably find sets.

- In pairs, students guess shapes based on clues. Player 1 mentally chooses a shape from a collection of attribute blocks displayed on the desk. Player 2 asks Player 1 questions about the shape. Player 1 is only permitted to answer “yes” or “no.” However, questions like “Is it a square?” are forbidden. (A player could ask “Is it a shape with 4 sides?” instead.) Player 2 tries to guess what the shape is. How many questions did students need to ask to identify the secret shape? Students should aim to ask the smallest number of questions as a pair.

Extensions

- Select three volunteers based on a particular attribute (EXAMPLES: hair colour, type or colour of clothing, footwear) and have them stand before the rest of the class. Invite other students to guess what the volunteers have in common. The student who guesses correctly selects a new group of volunteers according to a secret attribute, which the rest of the class then has to guess. Repeat several times.

CONNECTION



Geometry

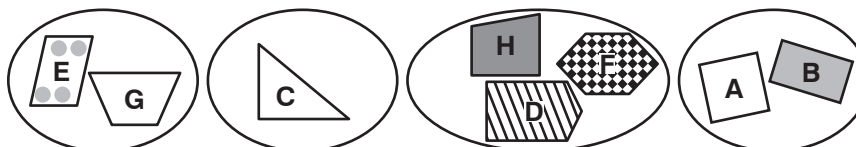
- Remind students that corners, such as corners of a square, are called “square corners.” Give them several attribute blocks.
 - Sort the shapes below into shapes with square corners and shapes without square corners.



Write the letter for each shape in the correct row of the table.

| | |
|--|--|
| Shapes with some square corners | |
| Shapes without square corners | |

- How are these shapes sorted? Name the groups.



Answers

| | | |
|----|--|------------------|
| a) | Shapes with some square corners | A, B, C, D, F, H |
| | Shapes without square corners | E, G |

- by the number of square corners: 0 square corners, 1 square corner, 2 square corners, 4 square corners

PDM2-5 Sort and Graph

Page 96

CURRICULUM REQUIREMENT

AB: required
BC: required
MB: required
ON: required

VOCABULARY

data
graph
list
symbols

Goals

Students will sort data and present it as a concrete graph.

PRIOR KNOWLEDGE REQUIRED

Can sort according to one attribute
Can tell how many more or how many less
Understands the comparatives largest, smallest, longest, shortest, most, least
Can identify and sort triangles, circles, squares, rectangles

MATERIALS

connecting cubes of different sizes and colours
2 cm grid paper or **BLM 2 cm Grid Paper** (p M-1)
cards labelled “spring,” “summer,” “fall,” and “winter”
attribute blocks from **BLM Attribute Blocks** (pp M-8–10)

Sort by colour. Give each student or small group of students about 20 large connecting cubes of three different colours. Ask them to sort the cubes by colour.

CONNECTION



Measurement

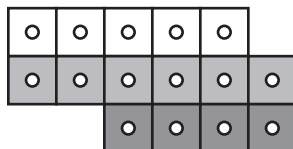
Create a concrete graph. SAY: I want to see which colour you have the most of. ASK: How can you show me that quickly? Have students link the cubes into chains of the same colour so that they can easily compare their lengths. Have students place the chains side by side, so that the difference is easy to see. SAY: You have created a graph. A graph is a way of ordering data. The data is easy to see and compare. Some graphs are drawn on paper, but a concrete graph is made with real objects. Write “graph” on the board.

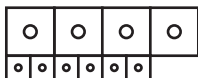
The need for a common starting line. Show three chains side by side without a common starting line, as shown in the margin.

ASK: Is it easy to see that there are more light grey cubes than white cubes? (yes) What about dark grey cubes and white cubes—can you compare them easily? (no, they are not lined up properly) How should the chains be arranged so that we see clearly the differences between all three colours? (the ends of the chains should line up on one side, usually the left side) Invite a volunteer to rearrange your cube chains accordingly. Then have them rearrange their own cube chains if necessary.

When all students have created their concrete graphs, prompt them to “read” their graphs. ASK: Which colour do you have the most of? How many more red cubes do you have than green cubes? How do you know?

The need for one-to-one correspondence. Have students break apart their cube chains and replace some of their large connecting cubes with





small connecting cubes. Ask them to sort their cubes by size and create two new chains. Hold up two cube chains side by side, one made of 4 large cubes and the other made of 6 small cubes, and SAY: I think I have more large cubes than small cubes because this chain is longer. ASK: Am I right? Have students identify your mistake. ASK: How could we draw these two chains on grid paper so that we can see which one has more cubes? PROMPTS: Think of reading buddies. The older students are larger. How do we know if there are the same number of older students and younger students? Buddies work in pairs. Can cubes go in pairs, too? How could you order the cubes on grid paper so that we see the pairs? Ask students to place their cubes on 2 cm grid paper (or **BLM 2 cm Grid Paper**) so that there is one large cube in a row for every small cube in the other row. ASK: Is it easy now to see which size we have more of?

Title. Invite a volunteer to draw the graph for his or her chains on the board. ASK: How did you sort the cubes? (large and small) What do the words “large” and “small” describe? What did you sort the cubes by? (size) PROMPT: Sorting into red and blue is sorting by colour. Sorting into big and small is sorting by what? Show students how to label the rows (small, large) and title their concrete graphs (Sizes of Cubes). Explain that all graphs need a title so that everyone knows what the graph represents.

Horizontal or vertical. Graphs can be created by arranging data in rows or columns. Have students rearrange their concrete graphs on grid paper so that there is one large cube in a column for every small cube in the other column. SAY: The columns need to line up at the bottom just as the rows did.

JOURNAL



ACTIVITIES 1–2 (Essential)

1. Have students sort six attribute blocks according to a rule of their choice, create a concrete graph, and trace it into their journals.
2. Have students sort other materials of their choice and create concrete graphs to represent their sorting. This can be done at stations. Remind students to add a title to their graphs.

Compare concrete graphs. Display three different concrete graphs created during the lesson activities (e.g., graphs created at stations). Have students compare the graphs. ASK: How are they the same? (they all have data ordered in rows or columns, the rows start at a common line, they all have titles and labels, they are all made with real objects)

Graphs can be used to display survey results. Explain what a survey is and discuss what people use surveys for. SAY: Results of a survey are also called “data.” Ask a survey question. EXAMPLE: What is your favourite season? Ahead of time, prepare cards with possible answers (spring, summer, fall, winter). Affix the cards to the board, write “Favourite Season” as the title, and invite students to stand in a line under their favourite season.

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SAY: It is a little hard to see which column is the longest, because you all are standing in rows. Draw the table shown below on the board and have students write their names in the column for their chosen season before returning to their desks. Emphasize that only one name goes in each box, so that the data is well-organized and easy to see.

Favourite Seasons

| Winter | Spring | Summer | Fall |
|--------|--------|--------|------|
| | | | |
| | | | |
| | | | |
| | | | |

ASK: Which season is liked by the largest number of people? Which season is liked by the smallest number of people? How do you know? How does our concrete graph make this easy to see? How many people like summer? How many people prefer spring? How many more people chose summer than spring?

Extensions

1. a) Write the names of 10 of your friends.
- b) Count the letters in each name.
- c) Sort the names into the table. Add more rows if you need to.

Number of Letters in Friends' Names

| 3 letters or fewer | 4 letters | 5 letters | 6 letters or more |
|--------------------|-----------|-----------|-------------------|
| | | | |
| | | | |

d) Answer the questions.

How many names have 3 letters or fewer?

How many names have 4 letters?

Do you have more friends with names that have 4 letters or more friends with names that have 5 letters? How many more?

How many letters are in the longest name? How many letters are in the shortest name?

2. Give students a handful of play coins, have them organize the coins into a concrete graph, and then answer the following questions.
 - a) Which coins do you have the most of?
 - b) Which coins do you have the least of?
 - c) Do you have more dimes or more nickels? How many more?
 - d) Do you have fewer dollar coins or quarters? How many fewer?
 - e) How many coins do you have in total? Write an addition sentence using your concrete graph.

CONNECTION
Measurement



3. Have students list the names of the months in the year, using a calendar of their choice (regular, traditional, or a calendar connected to their family culture). Have students sort the months by the number of days in the month or by the number of letters in the name of the month. Students then make a concrete graph using the names of the months. Have students ask and answer three questions about their concrete graphs.

PDM2-6 Pictographs

Pages 97–99



CURRICULUM REQUIREMENT

AB: required
BC: required
MB: required
ON: required

VOCABULARY

column
data
graph
label
pictograph
picture graph
row
symbol
title

EXAMPLES:

Money: 
Fruit: 

Goals

Students will read and analyze picture graphs and pictographs.

PRIOR KNOWLEDGE REQUIRED

Can sort according to one attribute
Can compare and order numbers
Can tell how many more or how many less
Can create concrete graphs

MATERIALS

small items to sort
BLM Graph Template (p G-44)

Picture graphs are more convenient than concrete graphs. ASK: How did we make graphs before? Give students 8–10 items to sort, and then have them create a concrete graph. For example, students can sort counters, cubes, or beads by colour, beads or pieces of pasta by shape, coins by picture on them, etc. SAY: Suppose you want to take this graph home. ASK: Will it be convenient? What could you do to show your work to your parents without taking the things you sorted home? (draw pictures of the items) Have students draw pictures in place of each item in the graph. Explain that they have created a picture graph. Write “picture graph” on the board.

Introduce pictographs. Tell students that there is an even simpler graph they can make to take home. Write “pictograph” on the board and have a volunteer compare it to “picture graph” by circling the parts of the words that are the same. Explain that a pictograph uses very simple pictures of objects. These simple pictures are called symbols and are very easy to draw. Write the word “symbol” on the board. Discuss which symbols could represent the items in students’ graphs. Ask students to think about what symbols they could use to represent people, flowers, desserts, books, and other items in a pictograph. Explain that sometimes people use the same symbol in all rows of the graph and sometimes they use different symbols.

Comparing pictographs. Have students look at the graphs on AP Book 2.1 p 97 (without answering the questions yet). SAY: There are four pictographs on this page. ASK: How are they different? (they use different symbols, they deal with different topics, they have different data, some have columns, others have rows, the pictograph in the grey box uses only one symbol, the other pictographs use different symbols, they have different numbers of columns) How are they all the same? (they all look like a table or chart, all the symbols in each column are the same) Make sure students notice the title and labels in each pictograph. Write “title” and “labels” on the board.

Exercises

1. What are the titles of the pictographs on page 97?

Answers: Lunch Time, Mitts or Gloves, Sally's Clothes, Marko's Flowers

2. What are the labels of the pictographs on page 97?

Answers: at home, at school; mitts, gloves; picture of a skirt, picture of shorts; tulips, roses, daisies

Have students use **BLM Graph Template** to translate their picture graphs to pictographs. Point out that some of the rows and boxes on the template may stay empty.

Creating a class pictograph. Draw the following table on the board (add more rows as necessary), and explain that you want to survey the class about their pets.

Favourite Pets

| Cat | Dog | Fish | Other | No Pet |
|-----|-----|------|-------|--------|
| | | | | |
| | | | | |

Explain the rules of the survey. SAY: Everyone has to choose one pet as a favourite pet, regardless of whether you own one or not. If you don't want any pets, you can choose "No Pet." If your favourite pet is not a cat, a dog, or a fish, you can choose "Other."

















Have students stand in rows according to the pets they chose. Then have each student draw a smiley face in the correct column of the pictograph. Remind them that the columns need to stay organized so that it is easy to compare them, so only one smiley face goes in each box. Make sure students do not leave empty boxes between smiley faces.

Answering questions by using data in a pictograph. ASK: Which has more smiley faces: cats or dogs? Can we tell how many more? (yes) How? (by counting and subtracting or by counting the extras) SAY: Let's count to see how many favourite pets are cats. Count the symbols in the cat column and write the total underneath the column. Prompt for the rest of the totals in the table. SAY: The numbers that we use to make the pictograph are called "data." SAY: Our data tell us that [number] people would like a dog as their pet. ASK: What does our data tell us about how many people like cats the most? (answers will vary)

Ask some "how many more" or "how many fewer" questions using the data in the pictograph. After each question, write the subtraction and the answer on the board. Ask some "put together" questions, such as "How many students chose cats or dogs?" After each question, write the addition and final answer on the board. Finally, ASK: How many people answered the survey? Write the addition and the answer on the board, then have a volunteer count the number of people in the class to check.

Ask some “take apart” questions, such as “How many people did not choose fish?” Guide students to do the question in two ways: subtract the number of students who chose fish from the total, or add the number of people who chose cat, dog, no pet, and other.

Using pictographs to answer comparison questions. Draw on the board:

| Favourite Colour | | | |
|---|---|---|---|
|  | | | |
|  | | | |
|  | |  |  |
|  | |  |  |
|  |  |  |  |
|  |  |  |  |
| Blue | Green | Red | Yellow |

SAY: A Grade 2 class voted for their favourite colour. The choices were blue, green, red, and yellow. The pictograph shows how many students voted for each colour. Each smiley face stands for one vote. ASK: How many people voted for blue? (6) SAY: There are six smiley faces in the column for blue, so six people voted for blue. Write “6” below blue. Repeat with each of the other colours. (2, 4, 4) Leave the pictograph on the board for use in the following exercises.

Exercises: Use the “Favourite Colour” pictograph to answer the question.

- How many students voted altogether?
- Which colours got the same number of votes?
- Which colour got the most votes?
- How many more students voted for blue than for green?
- How many fewer students voted for red than for blue?
- How many students did not vote for yellow?

Bonus: How many more students voted for blue or green than for red?




























Solutions: a) $6 + 2 + 4 + 4 = 16$; b) red and yellow; c) blue; d) $6 - 2 = 4$; e) $6 - 4 = 2$; f) $16 - 4 = 12$ or $6 + 2 + 4 = 12$; Bonus: $6 + 2 = 8$, $8 - 4 = 4$

Extensions

NOTE: Extensions 1 to 3 should be done in order.

1. The students in Mr. Miri's class made a pictograph of their favourite vegetables.

Our Favourite Vegetables

| | |
|----------|--|
| Broccoli |    |
| Carrots |       |
| Corn |           |
| Peas |         |

























Use the pictograph to answer the questions.

- a) How many students like each vegetable best?
- b) How many more students like corn or peas than broccoli or carrots?
- c) How many fewer students chose a green vegetable than an orange or a yellow vegetable?

Solutions: a) broccoli: 3, carrots: 6, corn: 10, peas: 8; b) $10 + 8 = 18$, $3 + 6 = 9$, $18 - 9 = 9$; c) $3 + 8 = 11$, $6 + 10 = 16$, $16 - 11 = 5$

2. Mr. Miri's class decided to ask all the students in the school about their favourite vegetable. The pictograph was too big to draw, so his students made a different pictograph where each smiley face stands for 10 students.

Our School's Favourite Vegetables

| | |
|----------|--|
| Broccoli |   |
| Carrots |      |
| Corn |           |
| Peas |          |

Each  stands for 10 students

Use the new pictograph to answer the questions.

- a) How many students in the school like each vegetable best?
- b) How many fewer students like broccoli or carrots than corn?
- c) How many students voted?

Solutions: a) broccoli: 20, carrots: 50, corn: 90, peas: 90; b) $20 + 50 = 70$, $90 - 70 = 20$; c) $20 + 50 + 90 + 90 = 250$

3. Use the pictographs from Extensions 1 and 2 to answer the question: How many more students voted in the school than in the class?

Solution: $250 - 27 = 223$

PDM2-7 Drawing Pictographs

Pages 100–101

CURRICULUM REQUIREMENT

AB: required
BC: required
MB: required
ON: required

VOCABULARY

column
data
graph
label
pictograph
picture graph
row
symbol
title

Goals

Students will create and analyze pictographs using one-to-one correspondence.




PRIOR KNOWLEDGE REQUIRED

Can sort according to one attribute
Can compare and order numbers
Can tell how many more or how many less/fewer
Can create concrete graphs
Can answer “compare,” “total,” and “take apart” questions using a pictograph

MATERIALS

BLM Graph Template (p G-44), two copies per student
transparency of **BLM Graph Template** (p G-44)
overhead projector
2 cm grid paper or **BLM 2 cm Grid Paper** (p M-1)

After-School Classes

| | |
|---------------|---|
| Art |  |
| Music |  |
| Soccer |  |

Review the need for one-to-one correspondence and a common starting point. Draw the graph in the margin on the board and explain that it shows how many times during the week students have various after-school classes. SAY: I think there are more art classes during the week than music classes or soccer classes. ASK: Is that correct? (no) Why not? SAY: I think there are more soccer classes than music classes. Discuss with students why you might be making mistakes. (the paint brushes are longer, the soccer balls aren't lined up with the other symbols) ASK: How could we redraw the pictograph to make it easier to read? (Sample ideas: Make the symbols the same size. Use different symbols that are all the same size. Use the same symbol in every row, such as stick people.) Invite a volunteer to redraw the pictograph as suggested. ASK: What activity has the largest number of classes in a week? (music)

There should be no “breaks” in the data. Draw the following chart on the board and explain that it shows the number of students in a class that were born in Canada and outside of Canada.

Our Birthplaces

| | | | | | | | | | | | | | |
|-------------------|---|---|--|---|---|---|---|---|--|---|---|---|---|
| Canada |  |  |  |  | |  | | | |  |  |  |  |
| Outside of Canada |  |  | |  |  |  |  |  | |  |  |  | |

SAY: I think more students were born in Canada than outside of Canada. The faces start at the same place, but the ones in the top row extend further than the ones in the bottom row. ASK: Is that correct? Have a volunteer explain your mistake and redraw the chart correctly. Remind students that the rows must line up at one end.

Explain that sometimes the first letter of a word is used as a symbol.
Complete AP Book 2.1 p 100 together as a class. ASK: What do S and H represent? (school and home) If students do not eat at home or school, what symbol could we use for other? (O) What symbol could we use for Ms. Lee’s students? (L) For Mr. King’s students? (K)

Making a picture graph from data. SAY: Now you will make your own pictograph. Tessa is packing for a trip. These are the clothes she is taking. Write on the board:

- 2 pairs of pants
- 1 pair of shorts
- 2 sweaters
- 4 T-shirts

Distribute **BLM Graph Template** and draw or project a copy on the board. SAY: We will make a pictograph for Tessa’s clothes. ASK: What title should we use? (Tessa’s Clothes) Write the title on the board, and tell students to write it in the space provided above the graph on the BLM.

SAY: The first column is for the labels. In this graph, the labels are the kinds of clothing Tessa is taking with her. We write each kind of clothing on a separate line. Model this on the board and have students copy the information on their graphs.

SAY: Now choose any symbol you like and fill in the pictograph. I will use triangles. Tessa is taking 2 pairs of pants on her trip. So I will draw two triangles in the row for pants. The pictograph should look like this:

Tessa’s Clothes

| | | | | | | | |
|----------|---|---|--|--|--|--|--|
| Pants | △ | △ | | | | | |
| Shorts | | | | | | | |
| Sweaters | | | | | | | |
| T-shirts | | | | | | | |

Have students complete the rest of the pictograph while you complete the one on the board. (see completed pictograph below)

Tessa’s Clothes

| | | | | | | | |
|----------|---|---|---|---|--|--|--|
| Pants | △ | △ | | | | | |
| Shorts | △ | | | | | | |
| Sweaters | △ | △ | | | | | |
| T-shirts | △ | △ | △ | △ | | | |

Keep the pictograph on the board for the rest of the lesson. Provide students with another copy of BLM Graph Template for use in the following exercise.

Exercises: Use the data to make a pictograph.

Eric wrote down the hair colour of all the students in his class. Here is his data:

Black: 7
Brown: 4
Blonde: 5
Red: 3

Make a pictograph to show the data.

Answer

Hair Colours in Eric's Class

| | | | | | | | |
|--------|---|---|---|---|---|---|---|
| Black | 😊 | 😊 | 😊 | 😊 | 😊 | 😊 | 😊 |
| Brown | 😊 | 😊 | 😊 | 😊 | | | |
| Blonde | 😊 | 😊 | 😊 | 😊 | 😊 | | |
| Red | 😊 | 😊 | 😊 | | | | |

Analyzing pictographs. Remind students that they can use addition or subtraction to answer questions related to the data. They can ask questions such as “How many more T-shirts than shorts is Tessa taking with her?” or “How many tops is Tessa taking with her?” Have volunteers come to the board and write the subtraction sentence for the first question ($4 - 1 = 3$) and the addition sentence for the second question ($4 + 2 = 6$). Have other volunteers think of more questions of this kind about Tessa’s clothes, and have the rest of the class answer them. Finally, ASK: How many clothing items does Tessa pack altogether? ($2 + 1 + 2 + 4 = 9$) Have a volunteer write the addition sentence on the board.

Exercises: Write 3 questions about the pictograph of hair colour in Eric’s class that you drew. Answer your questions.

Sample answer: How many more students have black hair than red hair? (4) How many students have blonde or red hair? (8) How many students are in Eric’s class altogether? (18)

Creating a table and a pictograph without using a template. Divide the class into two groups so that students do not have to deal with too much data. Show students how to start a table with two columns, as shown below:

The Hand We Write With

| Right hand | Left hand |
|------------|-----------|
| | |

In each group, ask students who write with their right hand to raise their hands. Have these students record their names in the correct column. Repeat with the left hand. Then have each student make a pictograph to show this data. Have students work on 2 cm grid paper or **BLM 2 cm Grid Paper**. Remind them to include a title and labels.

Compare the pictograph to the chart. Discuss with students how these presentations of data are different. ASK: Can we tell from the pictograph how many people write with their left hand? (yes) Can we tell from the chart with the names? (yes) Can we say from the pictograph which hand Eric writes with? (no) Can we say it from the chart with names? (yes) What is easier to make: a chart with names or a pictograph? What takes more time—to draw a smiley face or to write a long name?

Extensions

- Ms. Smith’s class chose their favourite drinks. There are 25 students in the class. Use the data to fill in the pictograph.

Apple juice was the most popular drink. 12 students chose it.

7 fewer students chose milk than apple juice.

2 more students chose orange juice than water. Hint: How many students chose orange juice or water?

Favourite Drinks

| | | | | | | | | | | | | | | |
|--------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Milk | | | | | | | | | | | | | | |
| Orange Juice | | | | | | | | | | | | | | |
| Apple Juice | | | | | | | | | | | | | | |
| Water | | | | | | | | | | | | | | |

Answer

Favourite Drinks

| | | | | | | | | | | | | | | |
|--------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Milk | ☺ | ☺ | ☺ | ☺ | ☺ | | | | | | | | | |
| Orange Juice | ☺ | ☺ | ☺ | ☺ | ☺ | | | | | | | | | |
| Apple Juice | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ | ☺ |
| Water | ☺ | ☺ | ☺ | | | | | | | | | | | |

2. Make a pictograph for the letters in the word “Mississauga.” Use each letter as its own symbol in the graph.

Answer

Mississauga

| | | | | | |
|---|---|---|---|---|---|
| M | I | S | A | U | G |
| m | i | s | a | u | g |
| | i | s | a | | |
| | | s | | | |
| | | s | | | |

CONNECTION
Social Studies

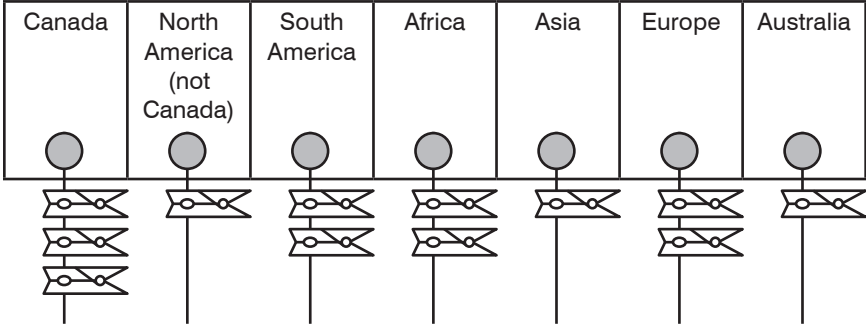


3. **Conducting a survey using clothespins.** Tell students you are going to take a survey to find out where they were born. Ahead of time, prepare a large piece of cardboard with strings attached and the labels and title shown in the picture below.



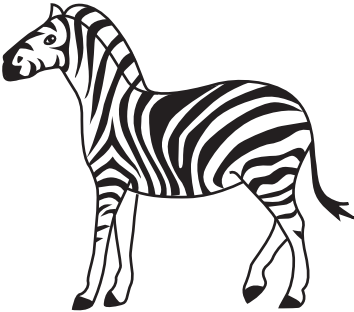
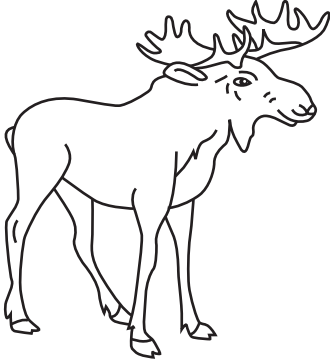
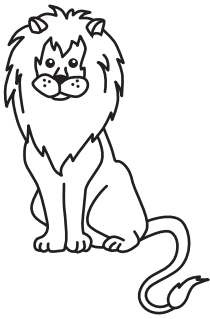
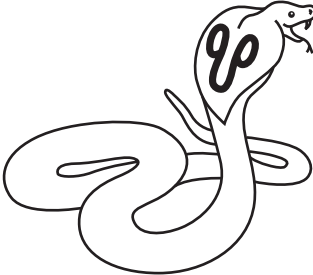
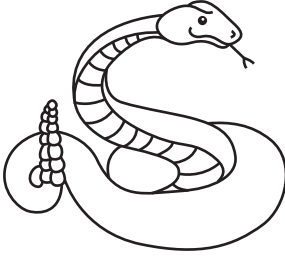
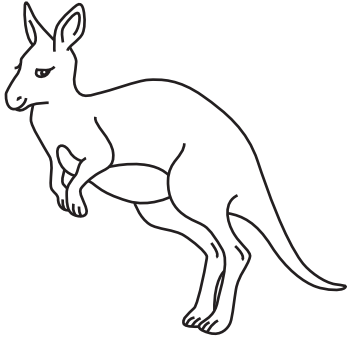

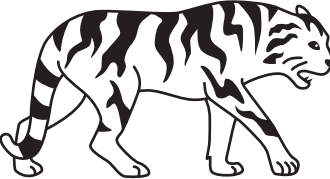
Display a map of the world, point to each continent and name it, and show where Canada is. Have each student come to the “graph” and attach a clothes pin to the string that belongs to the place they were born. Help students that know the country of their birth but are not sure which continent it is on. Ask if the clothes pins need to be rearranged to make the chart easier to read (for example, spaced evenly).

ASK: Where were the largest number of people in our class born? Where were the smallest number of people in our class born? How do you know? How many people were born in Canada? How many people were born in Asia? How many more people were born in Canada than in Asia? How does the chart make this easy to see? (see sample completed graph below)

Our Birthplaces



Animals to Sort

| | | |
|---|---|---|
|   <p>Beaver</p> |  <p>Zebra</p> |  <p>Moose</p> |
|  <p>Lion</p> |  <p>Cobra</p> |  <p>Rattlesnake</p> |
|  <p>Kangaroo</p> |  <p>Hamster</p> |  <p>Tiger</p> |

What Changes? (I)

What changes?

size

shape

colour

size

shape

colour

size

shape

colour

size

shape

colour

size

shape

colour

size

shape

colour

What Changes? (2)

What 2 things change?

size shape colour direction

size shape colour direction

size shape colour direction

size thickness colour direction

size shape colour direction

thickness shape colour direction

Sorting Polygons

☐ Sort the shapes. Draw lines.

pentagon

octagon

quadrilateral



hexagon


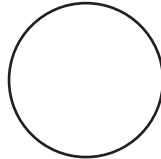
heptagon

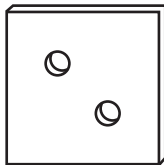

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Find 3 Differences (I)

☐ Find 3 differences.


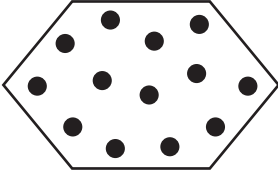
| | | |
|---------|---|---|
| |  |  |
| sleeves | <u>short</u> | <u>long</u> |
| buttons | <u>no</u> | <u>yes</u> |
| colour | <u>dark</u> | <u>light</u> |

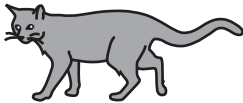
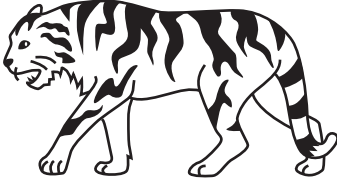
| | | |
|-----------------|--|---|
| |  |  |
| number of sides | _____ | _____ |
| straight sides | _____ | _____ |
| colour | _____ | _____ |



| | | |
|-------|---|---|
| |  |  |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

Find 3 Differences (2)

☐ Find 3 differences.

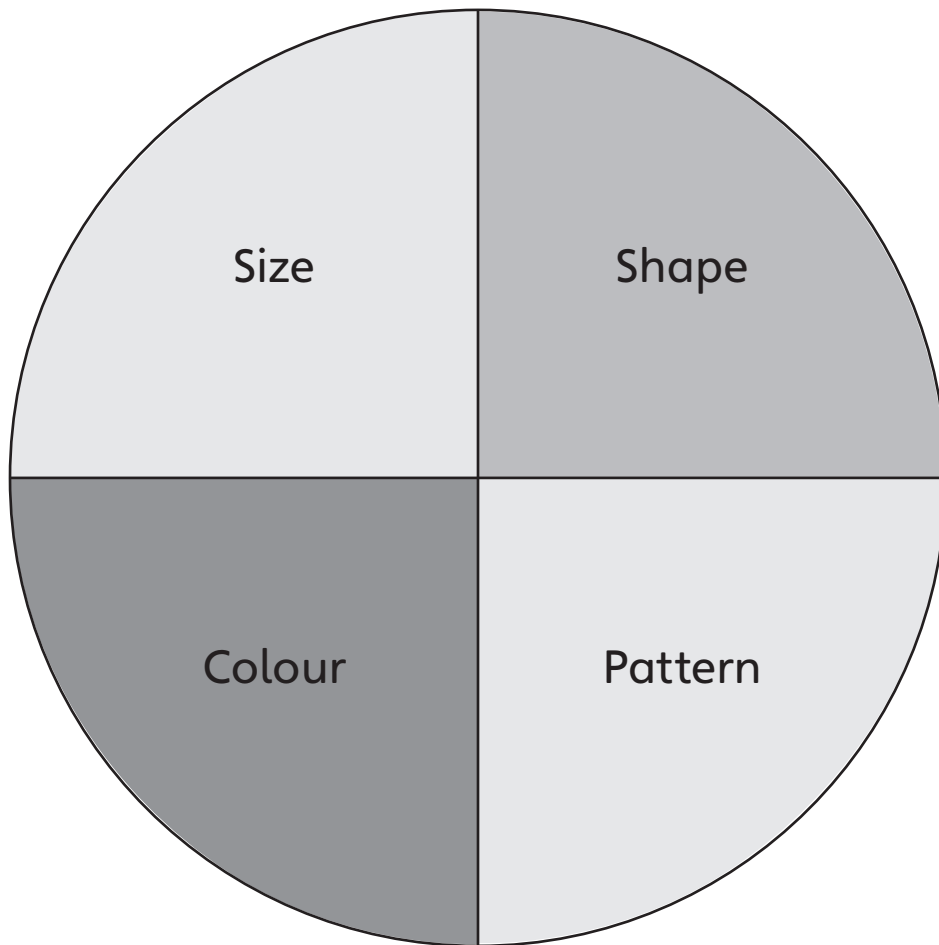
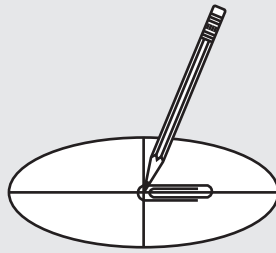



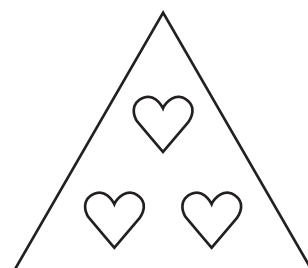
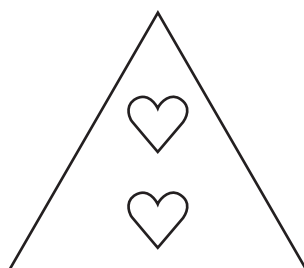
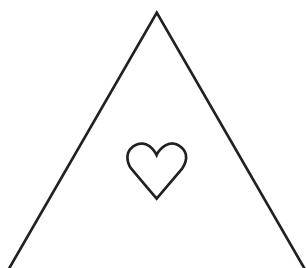
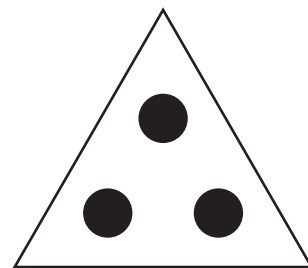
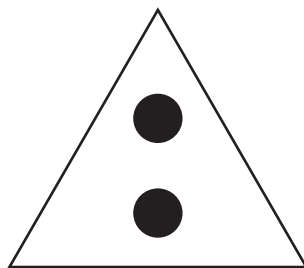
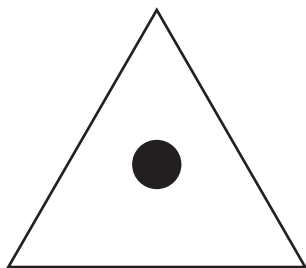
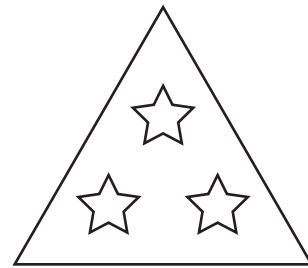
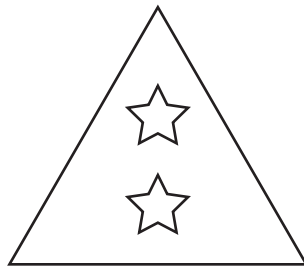
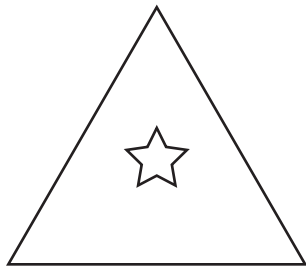



Attribute Spinner

- ☐ Use a pencil and a paper clip.
- ☐ Hold the pencil down in the centre.
- ☐ Hold the paper clip to the pencil tip.
- ☐ Spin the paper clip.






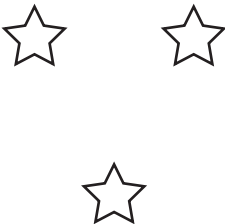


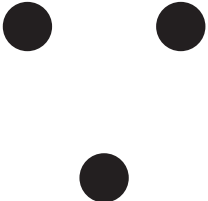


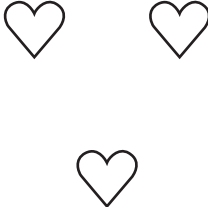
Find a Triple (I)



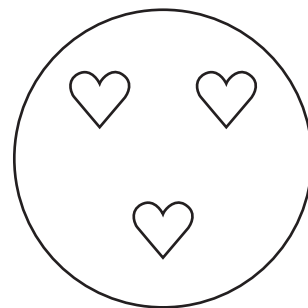
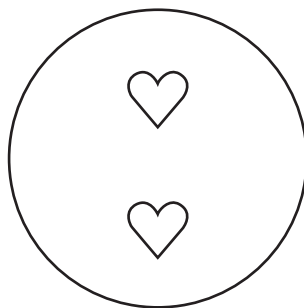
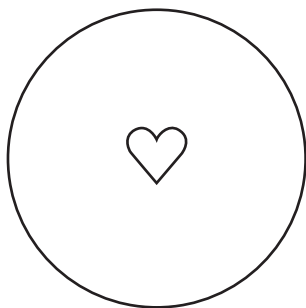
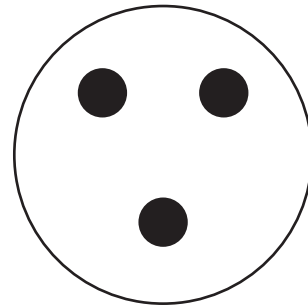
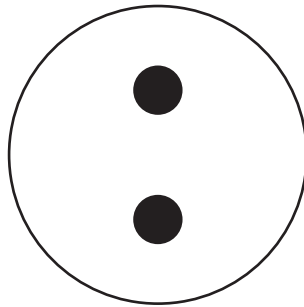
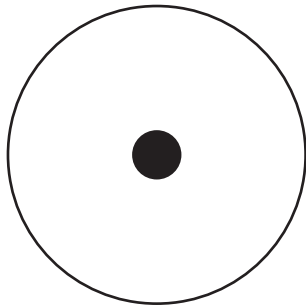
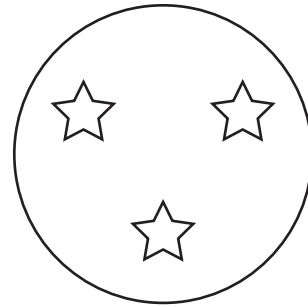
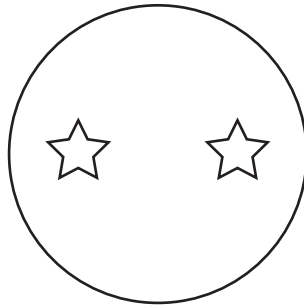
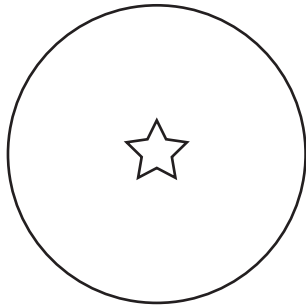
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Find a Triple (2)



| | | |
|---|---|---|
|  |  |  |
|  |  |  |
|  |  |  |

Find a Triple (3)



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Graph Template

| | | | |
|--|--|--|--|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Dear Parent/Guardian,

re: JUMP Math program
Grade 2 Probability and Data Management
Lesson PDM2-1

In mathematics, your child is learning how to sort things into groups. Here are some things you can do together to help your child practise sorting.

Sort laundry.

Ask your child to help you sort the laundry into different groups. For example:

- shirts, pants, socks
- dark clothes, light clothes
- your clothes, my clothes

Discuss with your child how all the items in a group are the same and how the groups differ. Can your child think of another way to sort the laundry?

Sort grocery items.

Ask your child to help you sort grocery items into groups. For example:

- dairy products, meat products, other
- things we store in the fridge, things we don't store in the fridge
- things we eat, things we don't eat (e.g., tissues, cat litter, soap)

You can also sort by shape or colour. Can your child think of another way to sort the items?

Sort cutlery.

Ask your child to sort cutlery before putting it away. What groups did your child create? Ask your child to explain why he/she sorted the items that way.

Sort toys, books, and games.

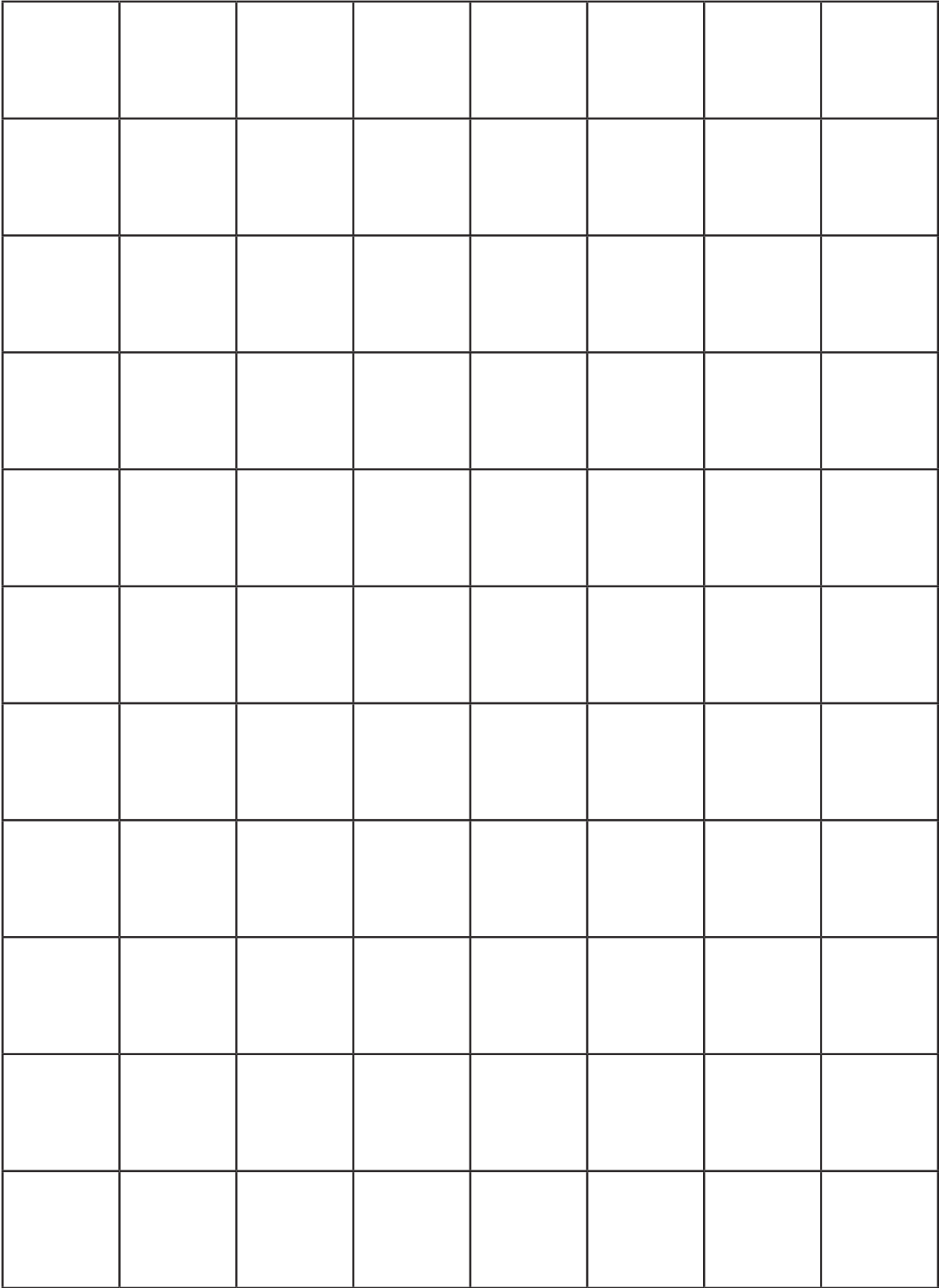
Ask your child to sort toys, books, and games before putting them away. If your child's toys are already sorted (e.g., books in a bookcase, games in a box), ask your child to describe how they are sorted. Which things are grouped together? How many groups are there?

How are they sorted?

Look for examples of sorting everywhere you go: at the grocery store, in the library, in stores and shops. Discuss how the items on a shelf or in an aisle are sorted and why they might be sorted that way. For example:

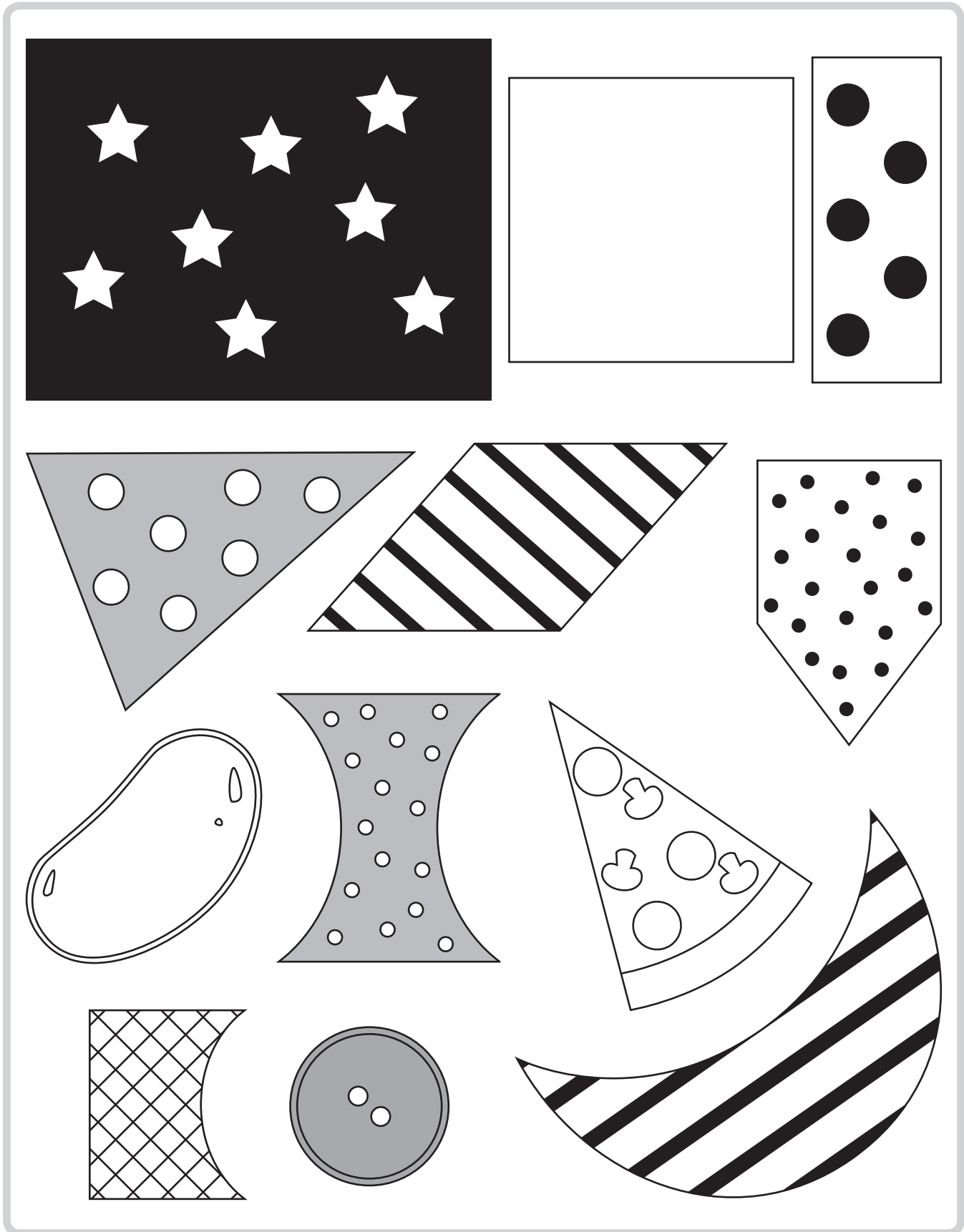
- Shoes in a shoe store are often sorted first by age and gender (men, women, children) and then by type (dress shoes, running shoes, boots, etc.).
- Flowers in a flower shop are sorted by type (carnations, lilies, roses) and then sometimes by colour.
- Books at the library or in a bookstore are sorted by subject and by age (fiction, cookbooks, children's books, etc.).

2 cm Grid Paper



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Attribute Blocks (I)

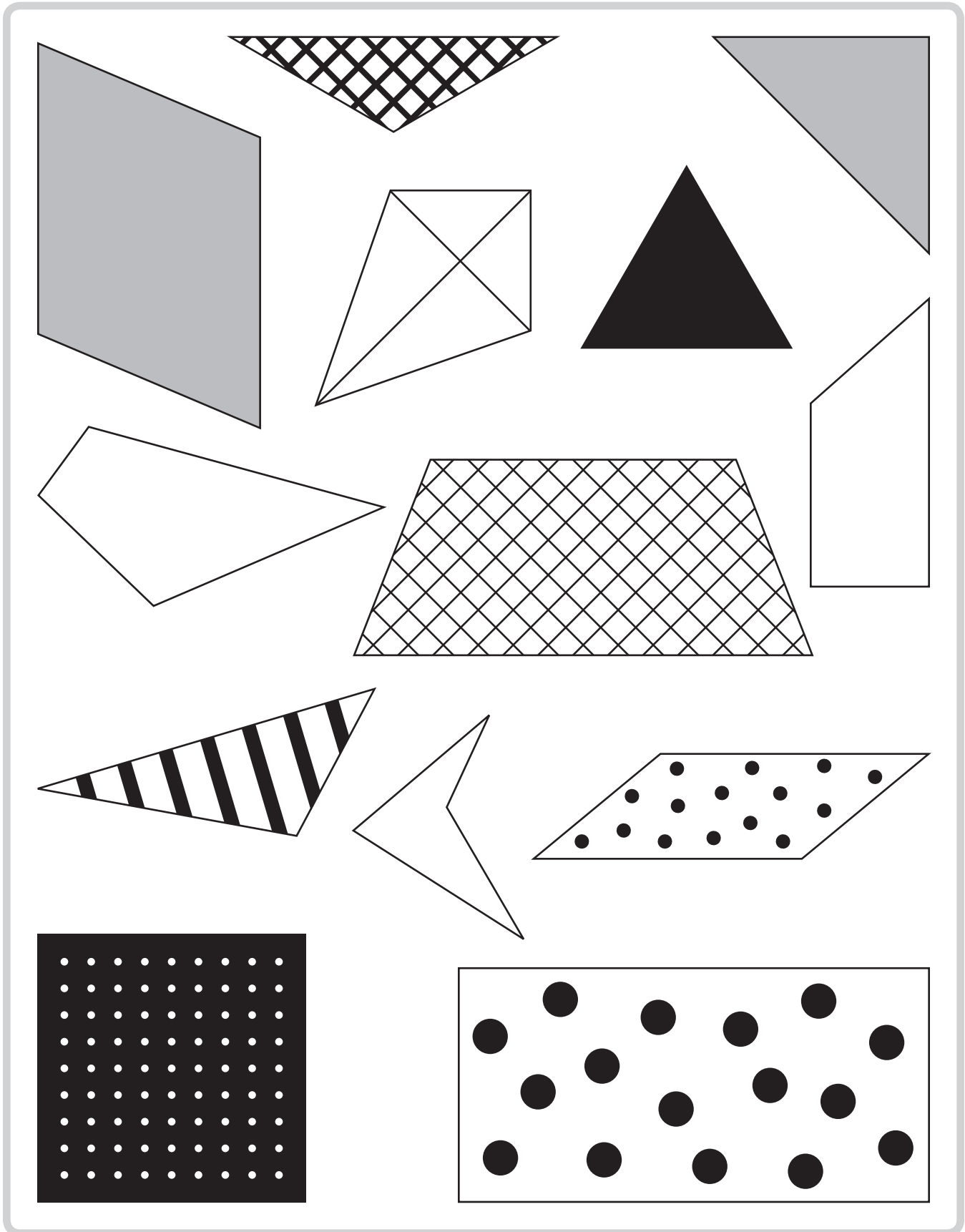


M-8

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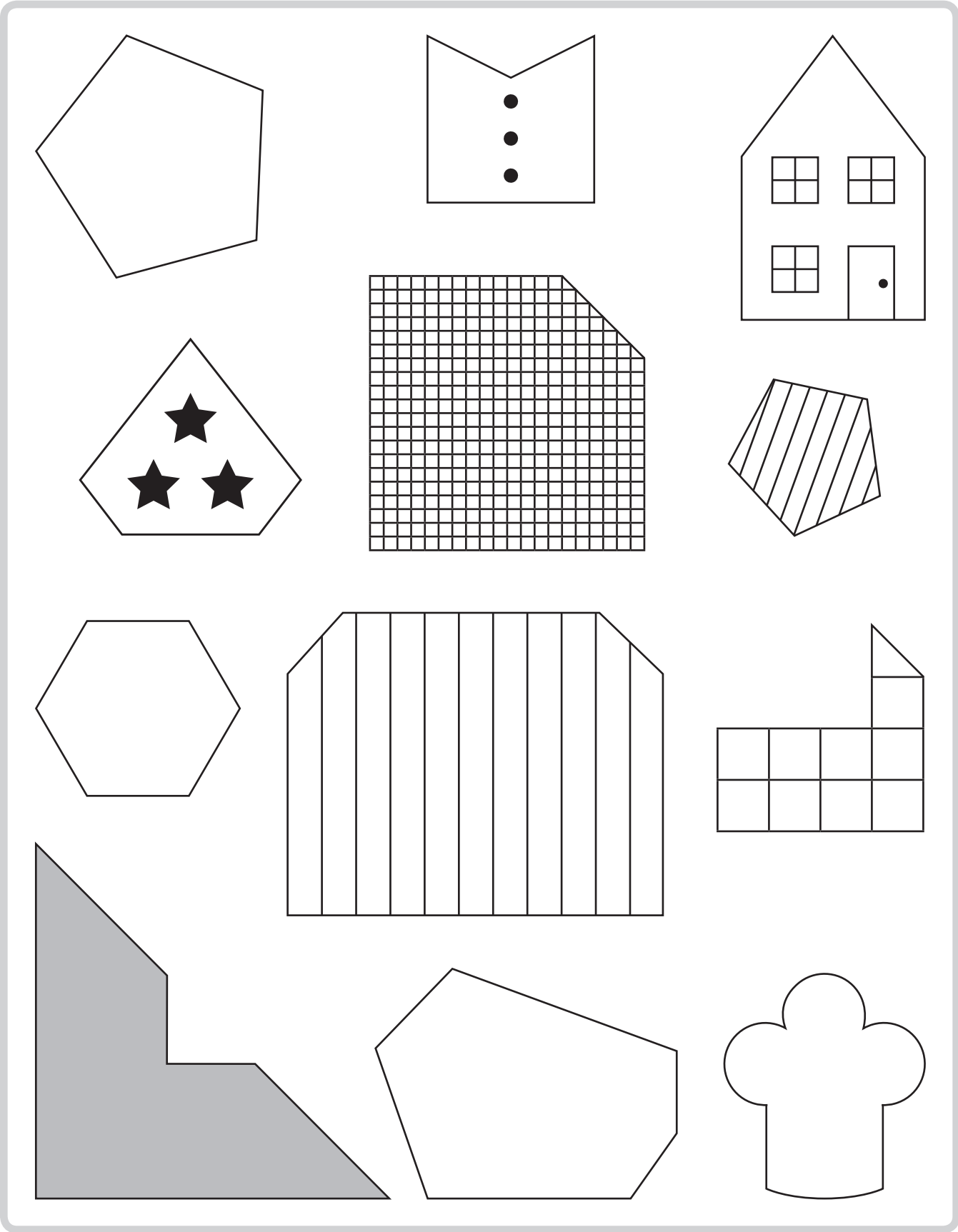
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Attribute Blocks (2)



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Attribute Blocks (3)



M-10

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