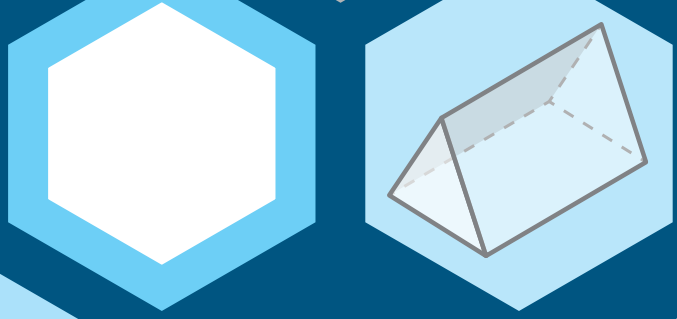
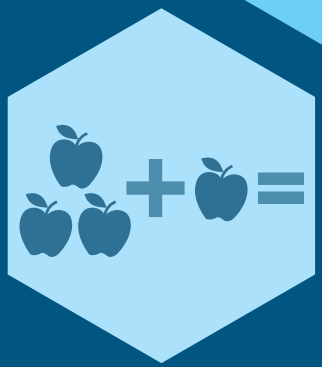
Grade 1

Forward With Math

A renewed approach to teaching and learning mathematics

LEARNING SITUATION





Work on Mrs. Zapata's Farm

AT A GLANCE

In this learning situation, the student helps Mrs. Zapata plan the construction of two buildings to house the animals on her farm, as well as a brand-new area for her vegetable garden. Students will be able to demonstrate their ability to construct a three-dimensional object and describe the two-dimensional shapes that compose up, their ability to construct a symmetrical three-dimensional object and a symmetrical two-dimensional shape, their ability to compare and order unit fractions, and their ability to estimate quantities of objects in collections.

During consolidation, students help create a map of their neighbourhood by building and assembling three-dimensional objects representing a building of their choice. Students then determine the number of coloured cards available to make a flag. Finally, students build a flag using a symmetrical two-dimensional shape of their choice and a toothpick to identify their name on the building they have constructed.

LIST OF ACRONYMS

PS Problem Solving

C Connecting

RP Reasoning and Proving

TS Selecting Tools and Strategies

CO Communicating

REP Representing

REF Reflecting

OVERALL AND SPECIFIC EXPECTATIONS

Number

B1 Demonstrate an understanding of numbers and make connections to the way numbers are used in everyday life.

B1.4 Estimate the number of objects in collections of up to 50, and verify their estimates by counting.

B1.8 Use drawings to compare and order unit fractions representing the individual portions that result when a whole is shared by different numbers of sharers, up to a maximum of 10.

Spatial Sense

E1 Describe and represent shape, location, and movement by applying geometric properties and spatial relationships in order to navigate the world around them.

E1.2 Construct three-dimensional objects, and identify two-dimensional shapes contained within structures and objects.

E1.3 Construct and describe two-dimensional shapes and three-dimensional objects that have matching halves.

LEARNING GOALS

At the end of this learning situation, the student will be able to:

- construct a three-dimensional object and describe the two-dimensional shapes that compose it;
- construct a symmetrical three-dimensional object;
- construct a symmetrical two-dimensional shape;
- demonstrate understanding of the concept of estimation;
- check estimations using counting strategies;
- compare and order unit fractions up to tenths;
- use the vocabulary studied.

POSSIBLE SUCCESS CRITERIA

During this learning situation, the student develops the evaluation criteria.
Here are examples:

- I construct a three-dimensional object to represent the first farm animal building and describe the two-dimensional shapes that compose it;
- I construct a symmetrical three-dimensional object to represent the second farm animal building;
- I create a symmetrical two-dimensional shape, with parts that are congruent, to represent the vegetable garden;
- I estimate the quantity of seeds in a collection;
- I verify my estimation using counting strategies;

- I determine the number of vegetable plants in the vegetable garden based on the unit fractions offered to me;
- I use the vocabulary under study.

MATERIALS

- materials for constructing three-dimensional objects and two-dimensional shapes (for example, toothpicks, straws, stiff cardboard, interlocking cubes, modeling clay, building blocks, pattern blocks, wooden sticks);
- manipulatives (for example, two-coloured interlocking cubes, building blocks);
- craft items (for example, coloured pencils, scissors, ruler, grid paper);
- Mira.

TYPES OF REASONING (LINKED TO SUPPORT DOCUMENTS)

Spatial Reasoning

Targeted spatial skills:

- spatial visualization (check the congruence of 2 parts of a two-dimensional shape using reflection, translation or rotation, describe the two-dimensional shapes that compose a three-dimensional object, understand that the edges of the base are common to the lateral faces of the object);
- composing and decomposing (determine the two-dimensional shapes that compose a three-dimensional object, determine the number of sides of a twodimensional shape, construct a symmetrical two-dimensional shape that has congruent halves);
- composing and decomposing three-dimensional objects (determine the number of edges and vertices that make up a three-dimensional object, construct a symmetrical threedimensional object, decompose a three-dimensional object into two-dimensional shapes, check the congruence and symmetry of a three-dimensional object);
- understanding of three-dimensional equivalence through mental and physical rotation (building congruent parts of a three-dimensional object);
- imagining objects moving in space (using rotation, reflection and translation to check the congruence of two-dimensional shapes);
- using proportional reasoning (understanding the connection between divided parts in relation to the whole, understanding that sharing a whole between more people results in smaller parts and, conversely, sharing a whole between fewer people gives larger shares);
- using non-verbal reasoning (use manipulatives to construct two-dimensional shapes and three-dimensional objects, use manipulatives to recognize the relationship between grouping of objects and fraction, use manipulatives to verify estimation);
- creating or designing objects (construct a two-dimensional shape, construct a three-dimensional object);

Proportional Reasoning

Concepts related to proportional reasoning:

- comparing quantities and change (comparing and ordering fractions in ascending order);
- partitioning (decompose a three-dimensional object in two-dimensional shapes, determine the number of edges and vertices in a three-dimensional object);
- multiplicative reasoning (skip counting, repeated addition);
- scaling up and down (understand that sharing a whole among more people results in smaller shares and, conversely, sharing a whole among fewer people results in larger shares);
- spatial reasoning (constructing three-dimensional objects and two-dimensional shapes);
- understanding rational numbers (compare and order unit fractions up to tenths);
- understanding quantities and change (establishing a link between a given fraction and the quantity represented in a whole);
- understanding the part-whole relationship (comparing and ordering unit fractions up to tenths);
- understanding the part-part relationship (recognizing that the whole is divided into equivalent parts and that the number of parts determines the name of the fraction);
- understanding the area model (comparing and ordering unit fractions up to tenths to determine the quantity of vegetable plants in the vegetable garden);
- understanding the set model (comparing and ordering unit fractions up to tenths in order to determine the quantity of vegetable plants in the vegetable garden);
- understanding the whole (recognizing that to compare fractions as numbers, we assume that they relate to a whole of the same size);
- understanding unit fractions (representing a unit fraction up to tenths to determine the number of vegetable plants in the vegetable garden);
- equivalence and comparison of fractions (compare and order unit fractions up to tenths).

Algebraic Reasoning

Concepts related to algebraic reasoning:

- exploring relationships (skip counting);
- establishing links between concrete and semi-concrete representations (determining the number of vegetable plants in the vegetable garden using manipulatives);
- understanding relationships and variations between quantities (recognizing that when comparing fractions as numbers, we assume that they relate to a whole of the same size);
- understanding the part-whole relationship (understanding the relationship between the unit fraction and the whole).

Strands	Mini Lessons	Mathematical Concepts
Number	• Reading, representing, composing and decomposing numbers up to 50 • Estimating objects in collections of up to 50* • Comparing and ordering unit fractions up to tenths	• Representating whole numbers • Estimating objects in collections • Comparing unit fractions
Spatial Sense	• Constructing and describing two-dimensional shapes and three-dimensional objects*	• Describing and constructing two-dimensional shapes and three-dimensional objects

* Mini Lessons marked with an asterisk present the key concepts covered in this learning situation. It is important to ensure that each student has a good understanding of these concepts.

WORK ON MRS. ZAPATA'S FARM

What do you notice?

TEACHING SEQUENCE – PART A

Before Learning (Warm-Up)

OBSERVING

Course of Action

- Group students together. Show them the illustration representing the learning situation **Work on Mrs. Zapata's Farm** then ask them the following question: What do you notice?
- Using the Think-Pair-Share strategy, invite students to reflect on their observations individually. Ask them to discuss it with their partner.
- Lead a discussion with students and record their observations using drawings.

Possible Observations

- The student does not understand the context of the illustration shown.
- The student notes one or two observations only.
- The student is limited to listing the farm animals observed.
- The students establish connections between the title of the situation and the geometric shapes that they observe.
- The student does not establish a connection between the title of the situation and the elements that make up the scene.
- The students recognize and names the geometric shapes that they observe.
- The student establishes connections between the character's thoughts and the title of the situation.
- The students list everything that they observe in the illustration and demonstrates a good understanding of the situation presented.
- The student establishes a connection between geometric shapes and mathematical concepts.

Possible Interventions

- What do you see? (PS)
- What does this make you think of? (C)
- What do you understand? (CO)

Possible Answers

- I see farm animals such as cows, chickens and ducks.
- I can see wooden planks stacked on top of each other.
- I see a lady who appears to be holding an electronic device.
- I notice that the lady is thinking and that she is thinking of a square-based pyramid, a cube, a rectangle-based prism, a triangle-based prism.
- I see a vegetable garden.

- I see a red building which must be used to shelter animals.
- I see two big piles of hay.
- I notice a windmill.
- I notice the scene seems to take place in summer because the leaves on the trees are green and there are vegetables growing in the vegetable garden.
- I notice that the title announces that there will be work on Mrs. Zapata's farm.
- I notice that the square-based pyramid, the cube, the rectangle-based prism, and the triangle-based prism are all three-dimensional objects.

TARGETING A QUESTION

Course of Action

- Ask the teams to formulate one or two questions that the class could answer following their observations.
- Lead a discussion to allow students to discuss the questions formulated.
- Present the target question (problem to be solved) to the students.

Possible Observations

- The team formulates questions related to geometric shapes.
- The team asks questions related to the title of the situation.
- The team asks questions related to the construction materials and geometric shapes presented.
- The team formulates questions about the lady's thoughts.
- The team cannot properly formulate a question.
- The team's question is too simple.
- The team formulates a question that does not take into account the context of the illustration.

Possible Interventions

- What are you looking for? (PS)
- What do you want to know? (REF)
- What does this make you think of? (CO)

Possible Answers

- Why is the lady thinking about geometric shapes?
- Is the lady planning work on the farm?
- Why are there piles of wooden planks? Will the wooden planks be used to construct new buildings?
- Is the lady thinking of constructing a new building in the shape of a three-dimensional object?
- Do all the animals in the illustration have shelter to protect them from bad weather?

TARGET QUESTION

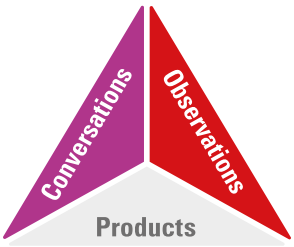
Mrs. Zapata would like to undertake new work on the farm. She would like to build 2 new buildings to accommodate more animals and create a new area for a vegetable garden.

Propose to Mrs. Zapata 2 models of buildings to shelter the animals that she will welcome on the farm. Build 2 three-dimensional objects. To help Mrs. Zapata arrange her garden, create a symmetrical two-dimensional shape. Estimate the number of seeds that will be planted in Mrs. Zapata's garden. Organize the different vegetable plants based on the fractions that will be offered to you.

ESTIMATING OR PREDICTING

Course of Action

- Ask students to predict the three-dimensional objects that could be used to shelter different farm animals.
- Ask students to predict the two-dimensional shapes that could be used to create the new area of Mrs. Zapata's vegetable garden.
- Ask students to estimate the number of vegetable plants that will be planted in Mrs. Zapata's new vegetable garden.
- Ask students to identify and record the missing data, as they imagine their three-dimensional objects and garden.



Triangulation of Assessment

Possible Observations

- The student formulates hypotheses about the three-dimensional objects that would be most appropriate to use for the construction of new buildings.
- The student has difficulty naming and recognizing three-dimensional objects.
- The student names three-dimensional objects that can hardly be used for the construction of new buildings (for example, a sphere).
- The student formulates relevant hypotheses on the two-dimensional shapes that would be most appropriate for the vegetable garden area.
- The student has difficulty recognizing what a two-dimensional shape is.
- The student estimates too many vegetable plants.
- The student formulates relevant hypotheses about the quantity of vegetable plants that can be grown in the new vegetable garden.

Possible Interventions

- What do you know? (PS)
- What do you want to know? (REF)
- What is important information to consider before even starting to find a solution? (REF)

Possible Answers

- I believe that several three-dimensional objects could be used for the construction of new buildings to shelter farm animals, for example rectangle-based prisms, cubes, pyramids or even cylinders.
- I believe that three-dimensional objects that offer less interior space, such as pyramids, could be used to shelter smaller animals like chickens, ducks or rabbits.
- I believe that three-dimensional objects that offer more space inside, such as rectangle-based prisms, could be used to shelter larger animals like cows, pigs or horses.
- I believe it is possible to combine 2 different three-dimensional objects to construct a building. For example, a square-based pyramid could serve as the roof and a cube could serve as the base of the building.
- I think that the rectangle would be the most appropriate two-dimensional shape for the vegetable garden, as there's no loss of space and vegetables can be planted in rows.

- I don't think the circle would be very appropriate for creating the vegetable garden because it's difficult to plant vegetables in a circular fashion.
- I think the square could be used to create the vegetable garden, as vegetables can be planted in rows and it would be easy to move around.
- I estimate that there will be around twenty vegetable plants in the new vegetable garden.
- I estimate that the number of vegetable plants will be determined based on the size of the vegetable plants. For example, a pumpkin plant takes up a lot of space in a vegetable garden while a carrot plant takes up very little space

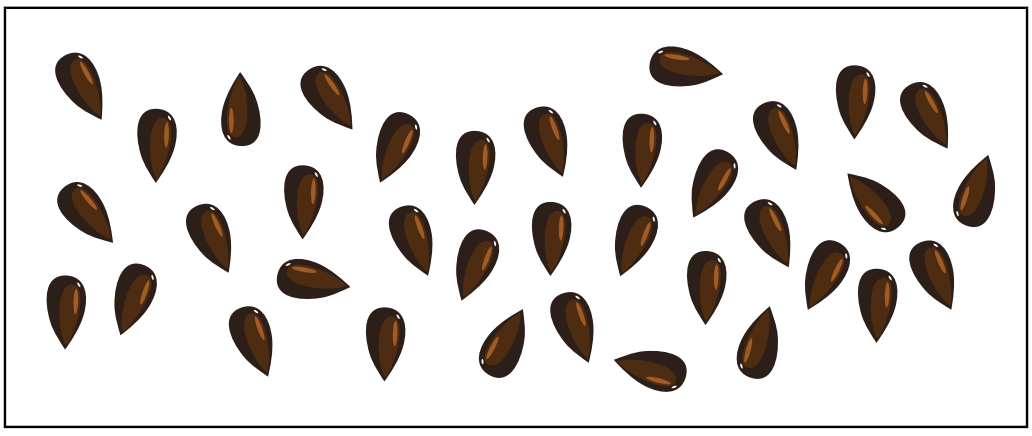
IDENTIFYING MISSING DATA

Course of Action

- Ask students the following question: What information is needed to solve the problem in the **Target Question**?
- Tell students that there are several ways to solve the problem. Invite them to identify missing data by conducting research or provide them with the following information:

  Mrs. Zapata is planning to build 2 buildings to accommodate new animals on the farm, as well as a new vegetable garden area. Mrs. Zapata needs your help to plan the work:

  - Suggest 2 different building models to Mrs. Zapata. Construct a first three-dimensional object and describe the two-dimensional shapes that compose it. Build a second symmetrical three-dimensional object. Use the materials provided (for example, toothpicks, straws, connectors, modeling clay, cardboard, building blocks, interlocking cubes, etc.).
  - Construct a symmetrical two-dimensional shape to create the new vegetable garden.
  - Mrs. Zapata would like to grow at least 30 different vegetable plants in her new vegetable garden. Does she have enough seeds in her container? Estimate the number of seeds in the container and then verify your estimation.



- Choose 3 vegetables to grow in Mrs. Zapata's garden.
- Determine the number of plants for each vegetable category using the following three unit fractions: the first category of vegetables will occupy half the garden, the second category of vegetables will occupy one-sixth of the garden and the third category of vegetables will occupy one-third of the garden.
- Illustrate the vegetables you've chosen in the two-dimensional shape you've created to represent your vegetable garden.

Possible Observations

- The student knows how to build 2 three-dimensional objects but doesn't know what materials are available.
- The student knows that 2 three-dimensional objects must be constructed but does not know whether to construct 2 different ones.
- The students know that it is necessary to construct 2 three-dimensional objects but do not know whether to construct the three-dimensional objects of their choice.
- The student knows that a two-dimensional shape must be constructed but does not know what materials are available.
- The students know that a two-dimensional shape must be constructed but do not know whether to create the shape of their choice.
- The student knows that it is necessary to estimate the number of seeds but does not know how the seeds are arranged in a collection.
- The student knows that the vegetable plants must be organized in the vegetable garden but does not know the quantity of vegetables that will be grown.
- The student knows that vegetable plants need to be organized in the vegetable garden but doesn't know whether to choose the vegetables to be grown by Mrs. Zapata.
- The student knows that vegetable plants must be organized in the vegetable garden but does not know the fractions to use to determine the number of vegetable plants.

Possible Interventions

- Can you tell me the problem in your own words? (C)
- How can you show your idea? (CO)
- What tools do you know that could help you solve this problem? (TS)

Possible Answers

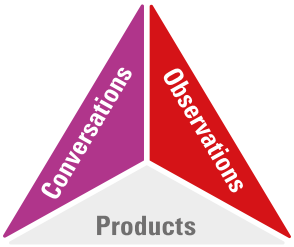
- What materials can I use to make the 2 three-dimensional objects?
- Do I have to make 2 different three-dimensional objects?
- How many vegetable plants are there in total?
- Which fractions should I use to determine the number of vegetables?
- Can I construct a two-dimensional shape of my choice?
- Do I have to choose which vegetables Mrs. Zapata will grow?

ACTIVE LEARNING (EXPLORATION)

SOLVING

Course of Action

- Allow students the time required to work, think and determine how to solve the problem by carrying out various experiments.
- Observe teams as they work and identify those who are experiencing difficulties. At the appropriate time, introduce them to the following mini lessons: **Comparing and Ordering Unit Fractions Up to Tenths, Estimating Objects in Collections Up to 50 and Constructing and Describing Two-Dimensional Shapes and Three-Dimensional Objects.** Mini lessons will allow students to address, revise, clarify or deepen the concepts necessary to solve the problem.
- Allow these students to continue their work.



Triangulation of Assessment

Possible Observations

- The student constructs a three-dimensional object using materials of their choice and describes the two-dimensional shapes that compose it.
- The student builds a second three-dimensional object identical to the first and fails to verify its symmetry and congruence.
- The student constructs a three-dimensional object and verifies whether its parts are congruent.
- The student constructs a three-dimensional object and verifies whether it is symmetrical using a Mira.
- The student constructs a two-dimensional shape whose halves are congruent and symmetrical.
- The students construct a symmetrical two-dimensional shape whose parts are not congruent.
- The students represent the number of plants chosen in the two-dimensional shape they have created.
- The students estimate the number of seeds there are in total and verify their estimation using an effective counting strategy.

- The student estimates the number of seeds there are in total but does not verify the estimation.
- The student determines the number of vegetable plants based on the given unit fractions.
- The student has difficulty representing fractions using a model.
- The student uses effective strategies to relate fractions to the total number of plants.

Possible Interventions

- What are you going to start with? (PS)
- How do you know your strategy is effective? (RP)
- What tools can help you? (TS)

Possible Answers

- Many answers are possible depending on the data used.
- Computational strategies may vary.

COMPARING, EXCHANGING AND IMPROVING

Course of Action

- Ask the teams to compare their results with those of another team.
- Follow the steps of the mathematical exchange strategy to allow students to compare, exchange and improve their solution. The teams present their 2 three-dimensional objects as well as the plan of the vegetable garden. The teacher leads a class discussion to bring out effective strategies for representing the different solutions. Students then have the opportunity to assess their learning and revise their work by adding missing elements.
- Get students thinking by asking them the following questions: Are you convinced of your construction? If yes, explain the reason. Otherwise, modify your construction.

Possible Observations

- The students listen to the constructive comments of others in order to revise their work.
- The students can compare their results with others and identify missing elements.
- The students make constructive comments regarding the work of other teams.
- The students listen attentively to their classmates' explanations and observes that there are several strategies that can lead to the same result.

Possible Interventions

- Did you use the best strategy to determine the quantity of vegetable plants to grow in the new vegetable garden? (TS)
- Is there another way to demonstrate that your three-dimensional object is symmetrical? (REP)
- How did you go about constructing your 2 three-dimensional objects and choosing the appropriate materials? How did you determine whether your two-dimensional shape was symmetrical? (REP)

Possible Answers

- I notice that one team has built 2 three-dimensional objects different from mine.
- I see that another team has chosen to build the same three-dimensional object as me but has chosen different building materials.
- I see that another team has not planted the same quantity of plants as me in their vegetable garden.
- I notice that another team did not consider the number of vegetable plants to grow as well as the given unit fractions.
- I notice that another team built a three-dimensional object that was not symmetrical.

CONSOLIDATION OF LEARNING

PRESENTING SOLUTIONS

Course of Action

- In order to lead a mathematical exchange, choose 2 solutions containing specific elements linked to the pedagogical intention. Ask the teams involved to present their solution and reasoning to the class.
- Target the important elements of the approaches presented by the teams in order to help students progress in their learning. To guide the discussion, it is possible to frame the targeted elements using masking tape or a paper frame.
- If necessary, suggest another possible solution to the class, making sure to make connections with the students' approaches.

Possible Observations

- The solutions presented by one team contain errors. For example, their second three-dimensional object and their two-dimensional shape are not symmetrical.
- The solution presented by one team does not take into account the given unit fractions.
- The solution presented by a team is well organized and offers relevant and effective strategies.
- The solution presented by the team is generally good, but has missing elements (for example, the team did not describe the two-dimensional shapes that compose the three-dimensional object).

Possible Interventions

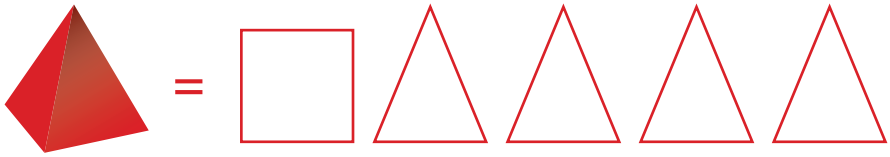
- Are you satisfied with your work? (PS)
- If you had a similar problem, would you choose the same materials and the same model? (TS)
- Do you think you have represented the problem correctly? (REF)

POSSIBLE SOLUTIONS

Several solutions are possible.

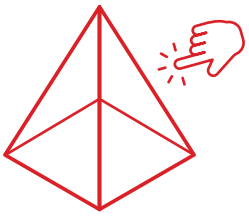
STRATEGY 1

To help me plan the construction of my first building, I decided to take inspiration from a pyramid model I found in my class. I looked at the model and noticed that the pyramid was made up of 4 identical triangles as well as 1 square. I also observed that the triangles had to be congruent to correctly form a pyramid.

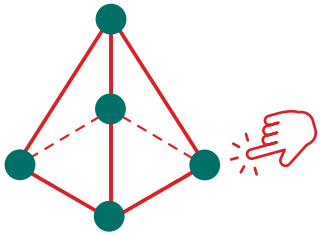


I then ran my finger over the edges and counted them. The pyramid has 8 edges. So I determined that I needed 8 toothpicks to make up my edges. Then I counted 5 vertices. To create my vertices, I need 5 pieces of modeling clay.

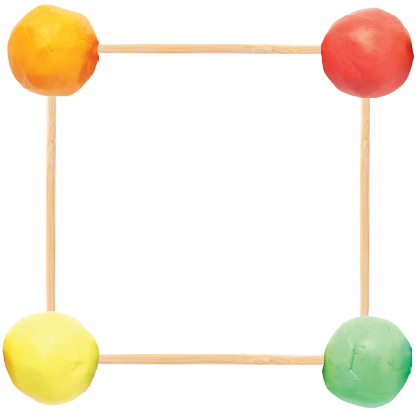
I count 8 edges



I count 5 vertices

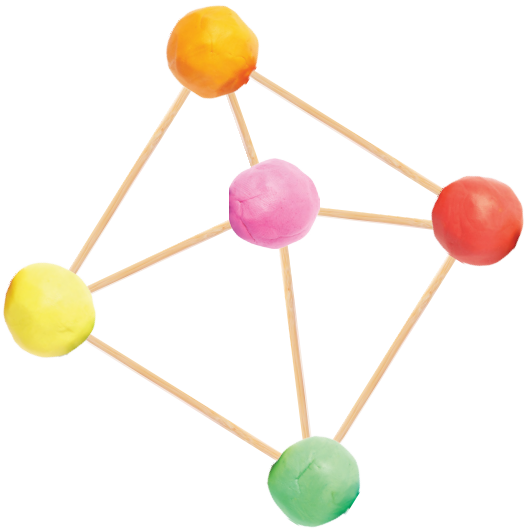


I assembled the base of the pyramid using 4 toothpicks and 4 pieces of modeling clay.

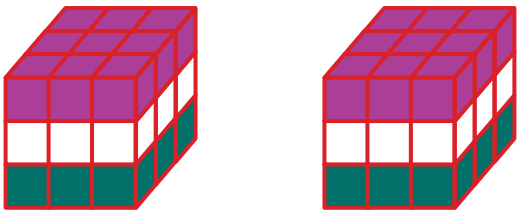


I constructed the faces of the three-dimensional object using 4 toothpicks and a piece of modeling clay to obtain 4 congruent triangles. I noticed that the vertices of the pyramid are the same as those of the triangles that compose it.

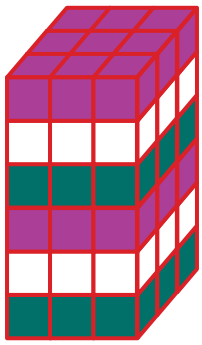
Here is my first building model for Mrs. Zapata's farm:



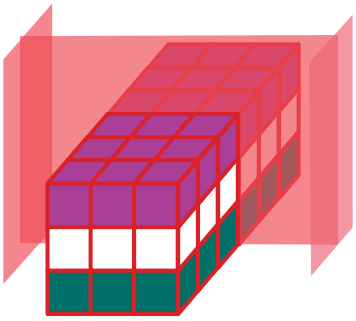
To create the second building, I decided to reproduce the model of a tissue box. I assembled 27 interlocking cubes to construct a first prism. I created a first row using 9 green cubes. I then added a row of 9 white cubes and a final row of 9 purple cubes. I made a second prism identical to the first using 27 cubes. I thus constructed the 2 parts of my prism.



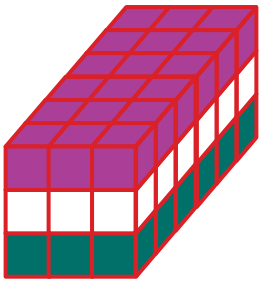
To check if the parts of the three-dimensional object are congruent, I superimposed them. I was thus able to notice that the halves overlapped perfectly.



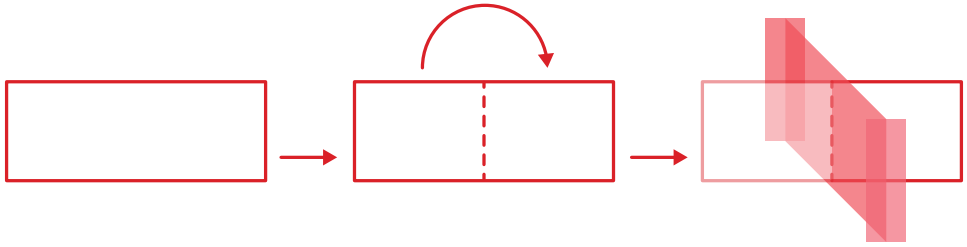
I glued the 2 parts together to form my building. I used a Mira to make sure my three-dimensional object is symmetrical. The reflection of half of my prism corresponds to the other half. My prism is therefore symmetrical.



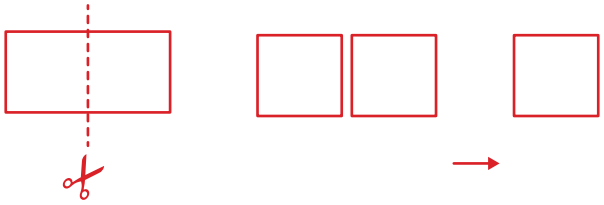
Here is the second building model I created for Mrs. Zapata:



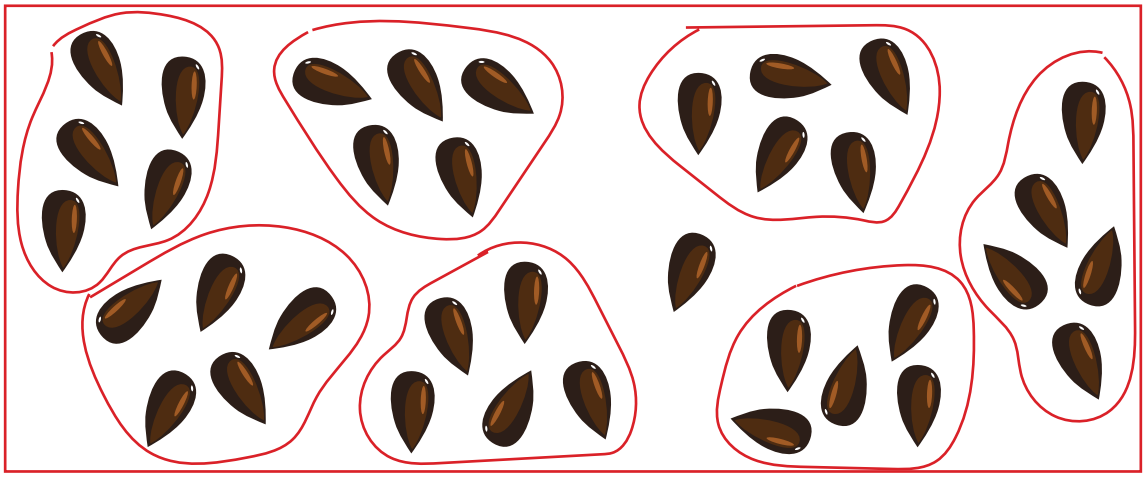
To construct the vegetable garden area, I chose to use the tissue box model again. I traced the outline of the box on a sheet of paper. I then cut out the two-dimensional shape. I folded it into 2 equal parts. The 2 parts overlap perfectly. My two-dimensional shape is therefore symmetrical. I also placed a Mira on the fold line to check if the two-dimensional shape is symmetrical. The reflection of one half corresponds to the other half. The two-dimensional shape is therefore symmetrical.



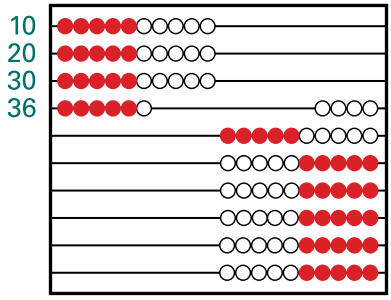
To check if the 2 halves of the two-dimensional shape are congruent, I cut the rectangle into 2 equal parts based on the fold line. I slipped the first half of the rectangle onto the second half. I noticed that the 2 halves are congruent because they overlap perfectly.



I estimated the number of seeds on the table. I grouped 5 seeds together in my head. I used this imaginary group to count the groups of seeds on the table. I estimated that there are 7 groups of 5, so there are about 35 seeds on the table.

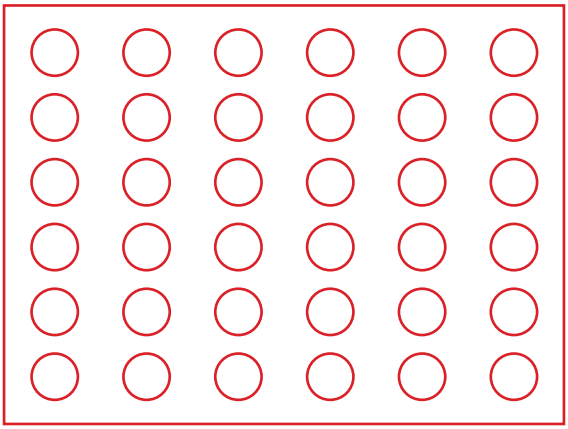


To verify my estimation, I grouped the seeds into groups of 5. I see that there are 7 groups of 5 and that 1 seed remains. Using the Rekenrek, I moved 7 groups of 5. I skip counted by 5s, that is 5, 10, 15, 20, 25, 30, 35 and added 1.

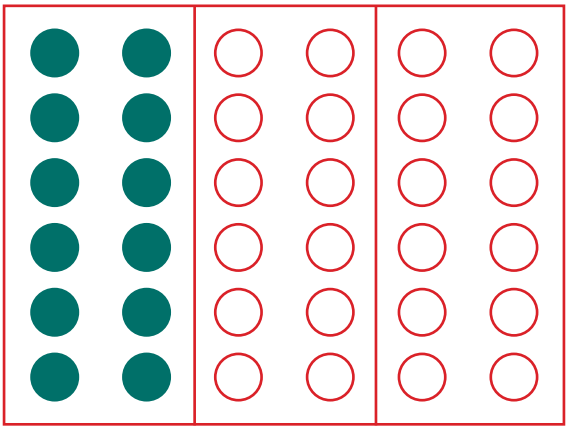


There are 36 seeds on the table. I made a good estimation. Mrs. Zapata will be able to grow more than 30 vegetable plants in her vegetable garden.

There are 36 vegetable plants. I chose to grow beans, cabbages and cherry tomatoes. On my rectangle, I drew 36 circles that represent the vegetable plants.

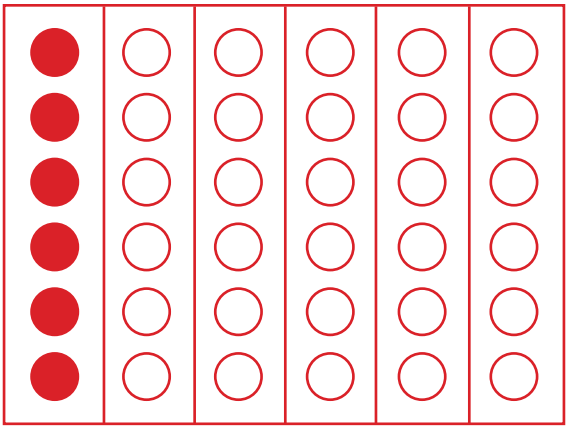


I chose to plant beans in one-third of the vegetable garden. To determine the number of plants, I used 36 two-coloured tokens. I divided the 36 plants into 3 equal groups to represent one-third of the plants in the vegetable garden. In each group, there are 12 plants. So there are 12 bean plants in Mrs. Zapata's vegetable garden. I coloured them green.



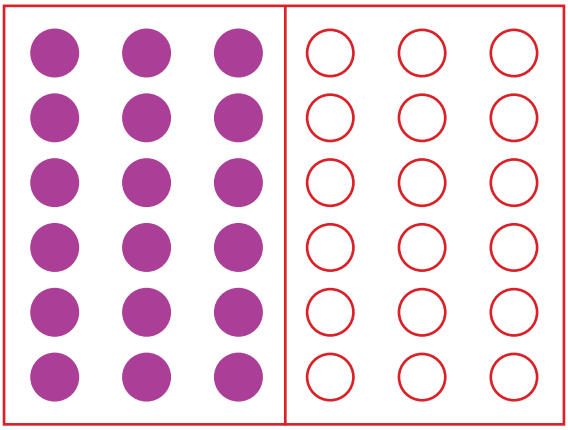
one-third

I chose to plant cabbages in one-sixth of the vegetable garden. I divided the 36 plants into 6 equal groups to represent one-sixth of the plants using two-coloured tokens. In each group, there are 6 plants. So there are 6 cabbages in Mrs. Zapata's vegetable garden. I coloured them red.



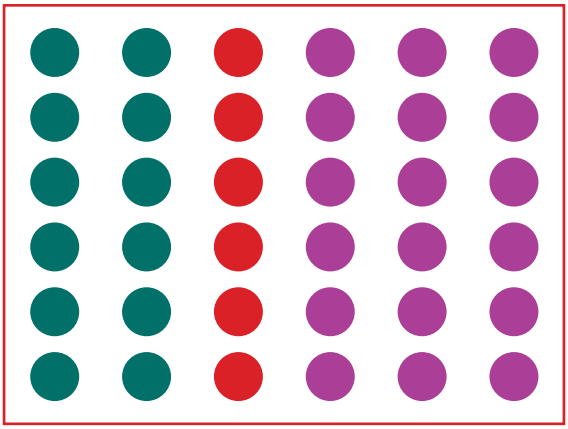
one-sixth

I chose to plant cherry tomatoes in half of the garden. I divided the 36 plants into 2 equal groups to represent one half of the plants using two-coloured tokens. In each group, there are 18 plants. So there are 18 cherry tomato plants in Mrs. Zapata's vegetable garden. I coloured them purple.



half

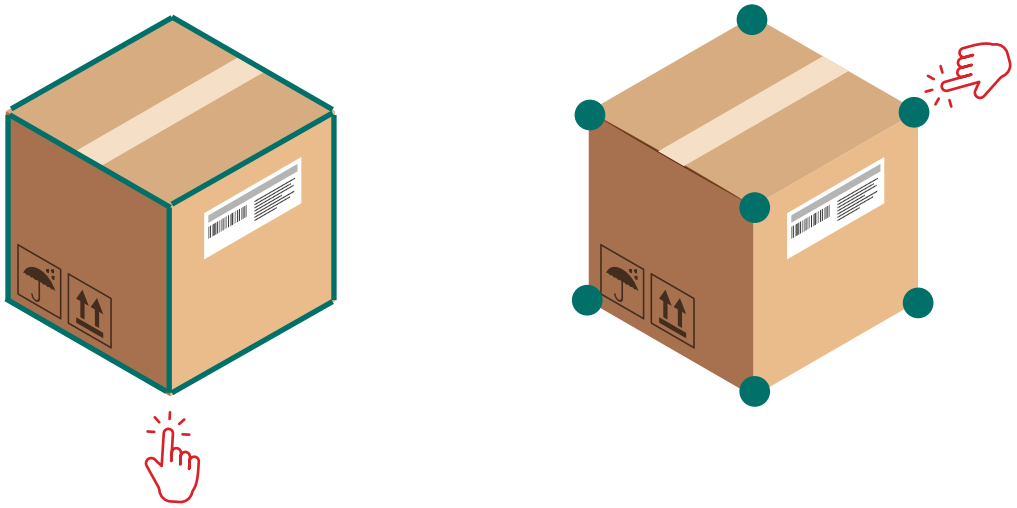
In Mrs. Zapata's vegetable garden, there are 12 bean plants, 6 cabbages and 18 tomato plants. There are therefore 36 vegetable plants, because 12 + 6 + 18 = 36.



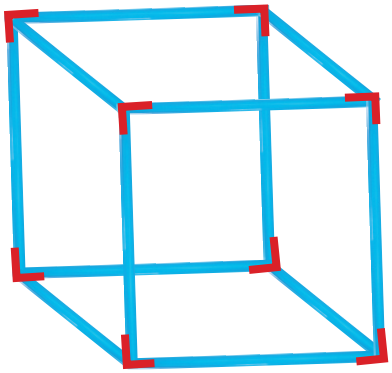
STRATEGY 2

To construct my second three-dimensional object, I decided to take inspiration from a cardboard box that I found in the hallway of my school. I looked at the box. It is made up of 6 identical two-dimensional shapes, that is 6 congruent squares.

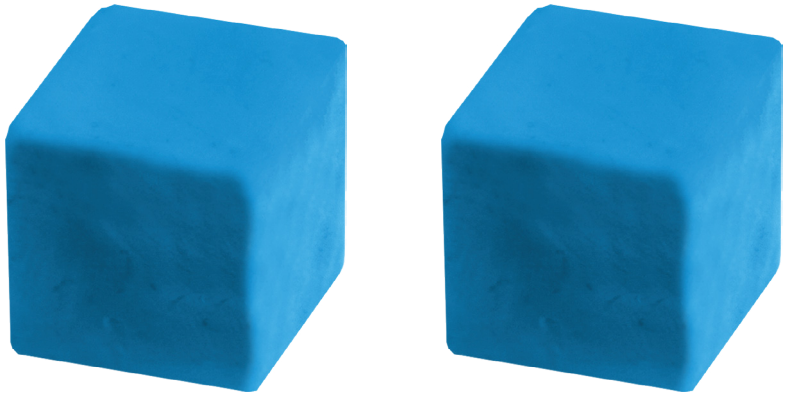
Next, I counted the number of edges and the number of vertices to determine how many straws and connectors I will need to construct my three-dimensional object. I was able to determine that I need 12 straws of the same length and 8 connectors.



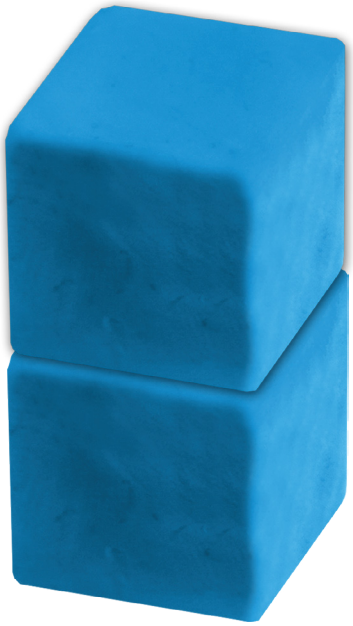
I assembled the straws using connectors to construct my first building.



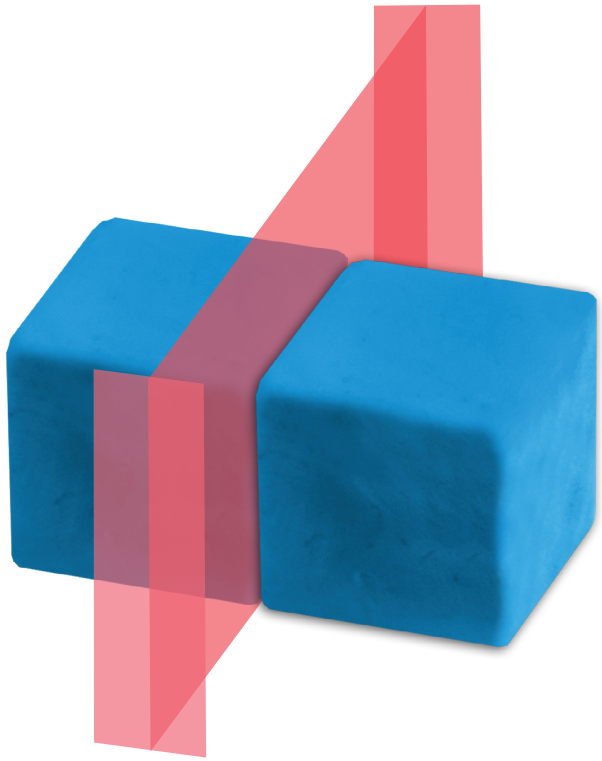
For my second three-dimensional object, I decided to construct a prism by assembling 2 cubes. Using modeling clay, I first made 2 cubes of the same size.



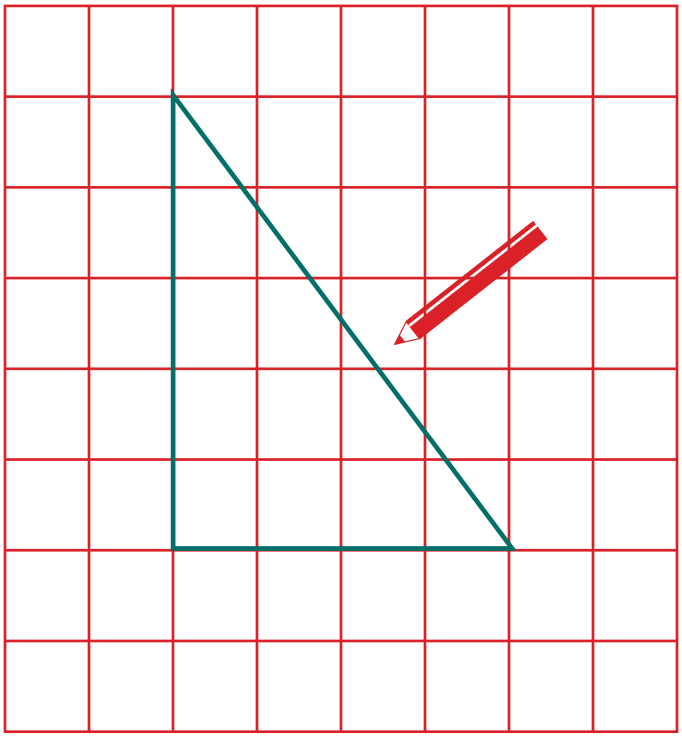
I then checked the congruence of the 2 halves by superimposing them on top of each other. The 2 halves overlap perfectly.



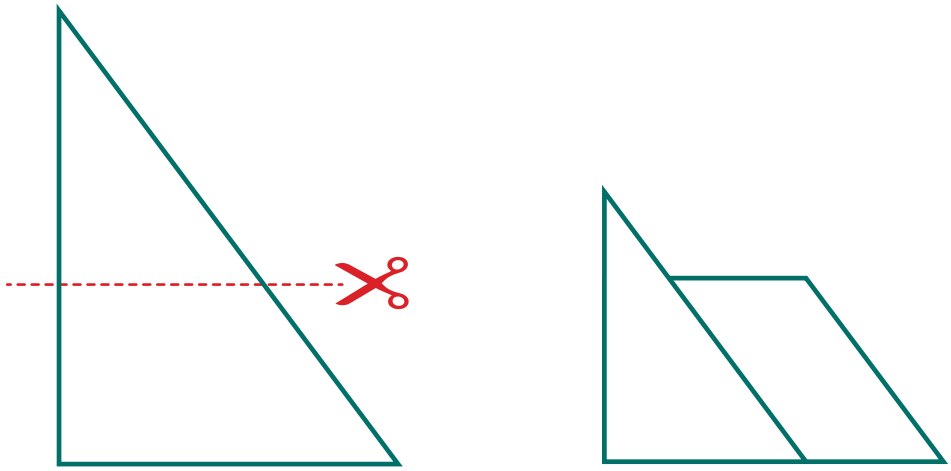
I glued the 2 parts together to form a single three-dimensional object. Finally, I used a Mira to make sure my three-dimensional object is symmetrical. The reflection of half of my prism corresponds to the other half. My prism is therefore symmetrical.



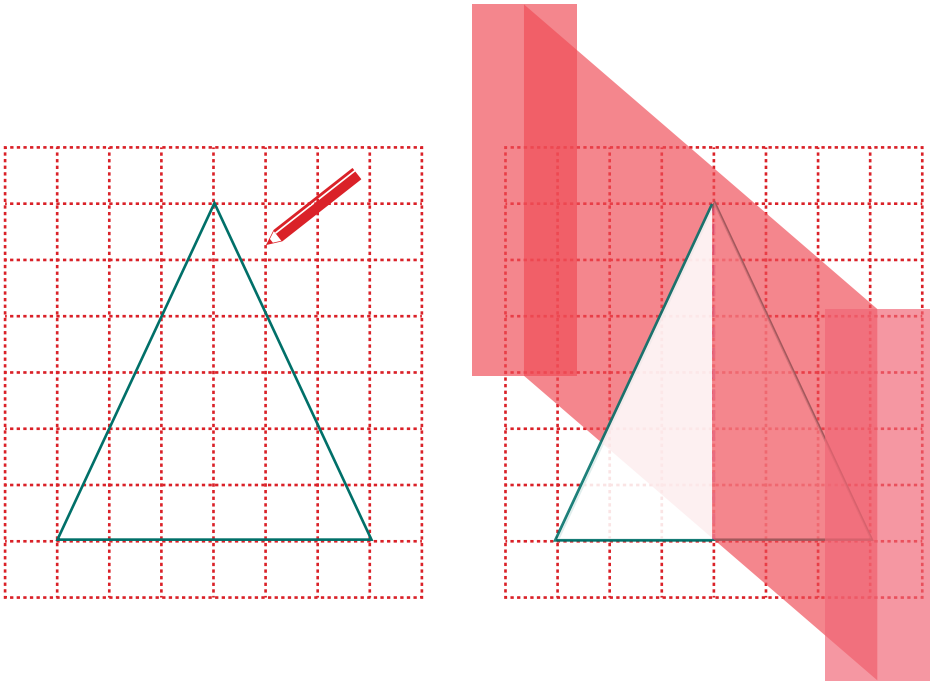
To design Mrs. Zapata's vegetable garden, I traced the outline of a pattern block on a sheet of paper and cut out the two-dimensional shape.v



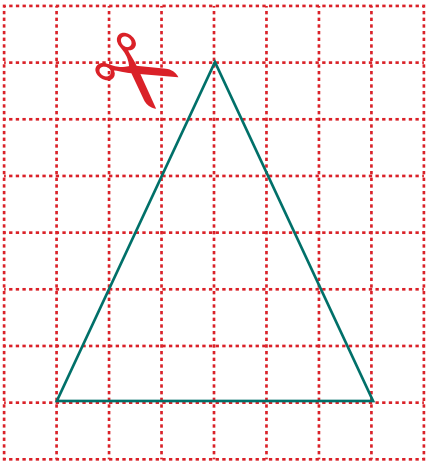
I then cut the triangle in half. I superimposed the 2 parts to check if the parts are congruent. I noticed they weren't. If the parts are not congruent, I know that my two-dimensional shape is not symmetrical. So, I decided to construct another two-dimensional shape.



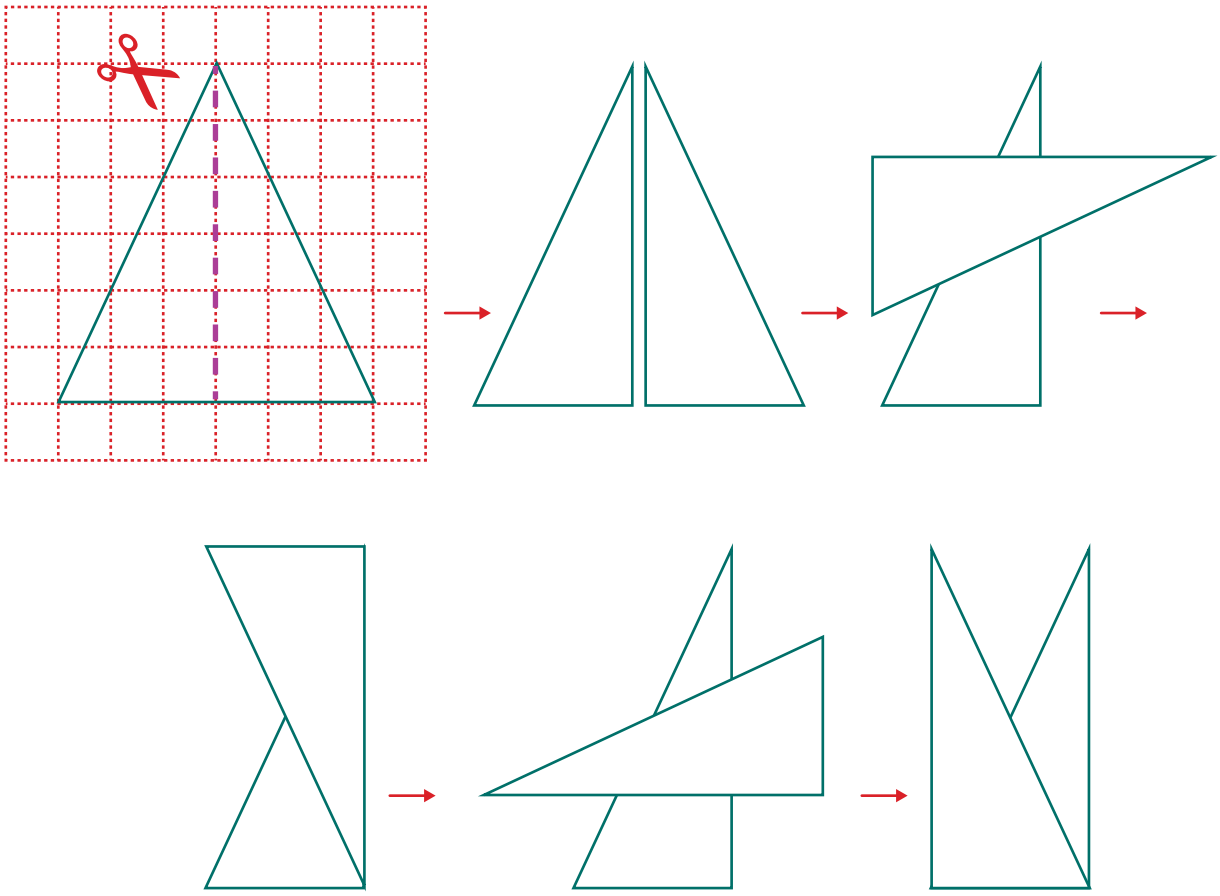
I traced the outline of another pattern block to create a two-dimensional shape. Then I drew a line in the center of the triangle and placed a Mira in the center of the triangle to check if my two-dimensional shape is symmetrical. The reflection of one half corresponded to the other half. The two-dimensional shape is therefore symmetrical.



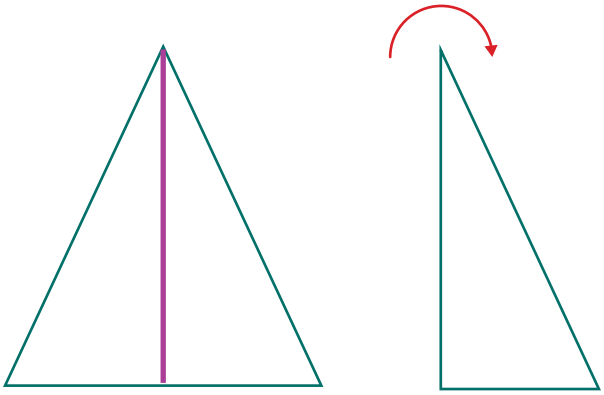
To check if the parts of my two-dimensional shape are congruent, I cut the triangle into 2 parts.



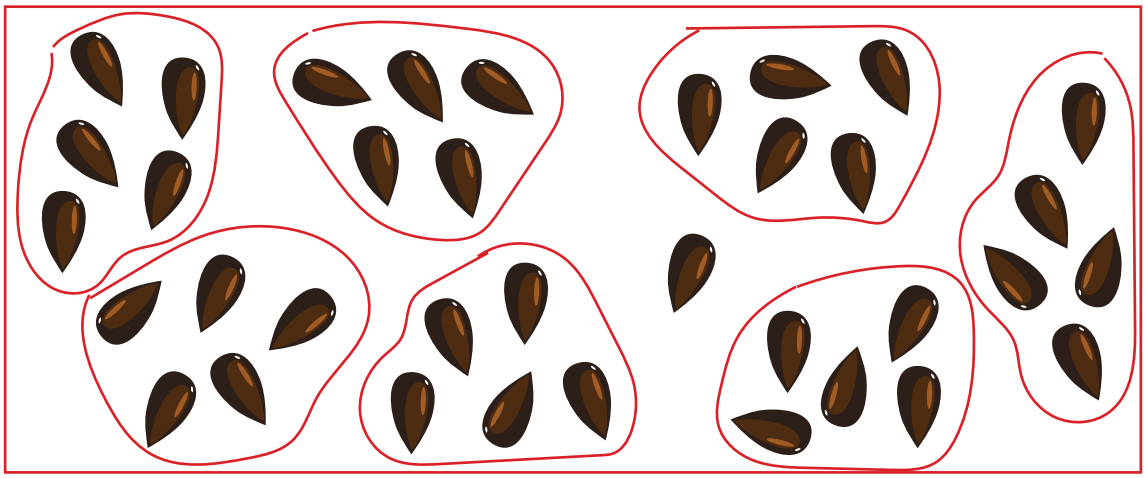
I superimposed the first half of the two-dimensional shape on the second half, rotating it. I observed that when rotating, the halves of the two-dimensional shape are not congruent.



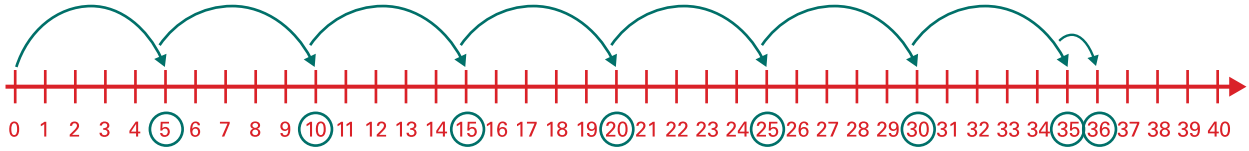
On the other hand, I've observed that if I fold the two-dimensional shape from the vertex onto the second part, the 2 parts overlap perfectly. The 2 halves of the triangle are therefore congruent.



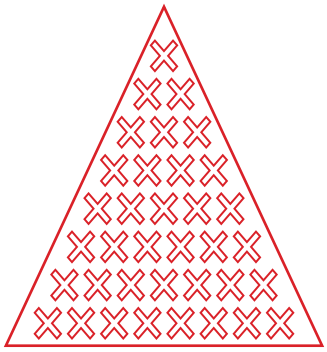
I estimated the number of seeds by making groups of 5. I visualized that there would be about 7 groups of 5 seeds. My estimation is about 35 seeds.



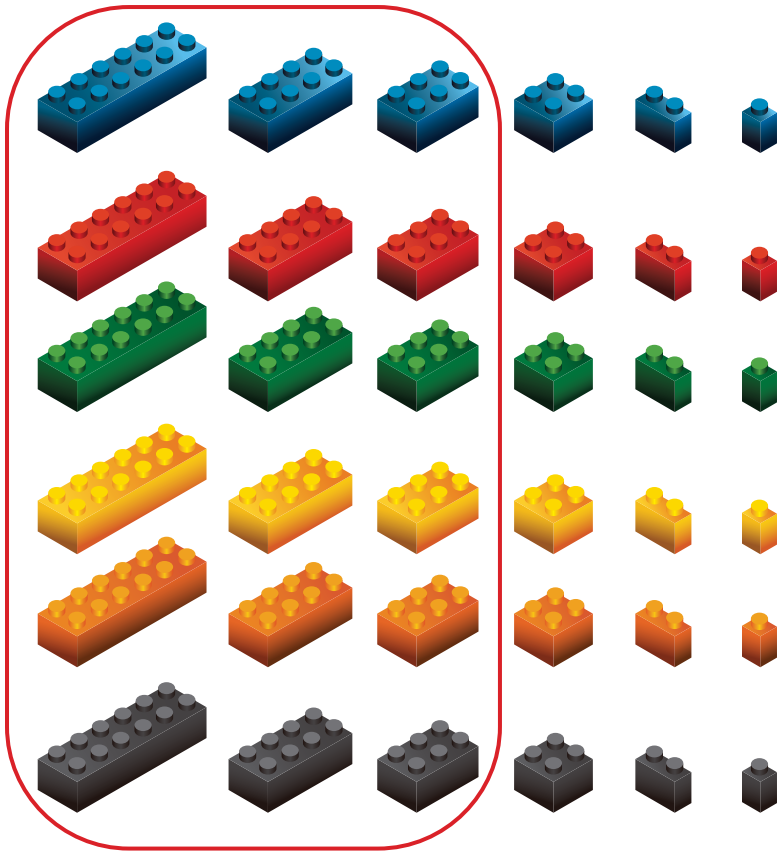
I verified my estimation using a number line. I organized the seeds into groups of 5. I counted 7 groups of 5 seeds. I indicate 7 leaps of 5 on the number line. I counted 5, 10, 15, 20, 25, 30, 35. I have 1 seed left. I made 1 jump of 1 to the right. So, there are 36 seeds on the table. I'm close to my estimation of 35.



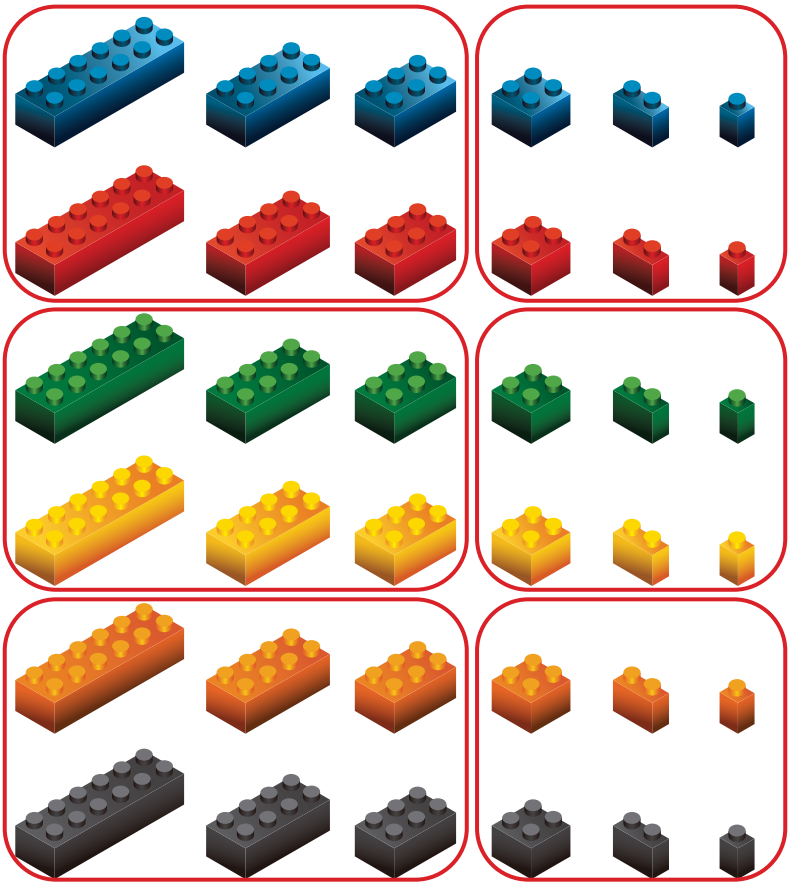
There are 36 vegetable plants in total. I chose to plant carrots, broccoli and pumpkins. In my triangle, I drew 36 symbols to represent my vegetable plants.



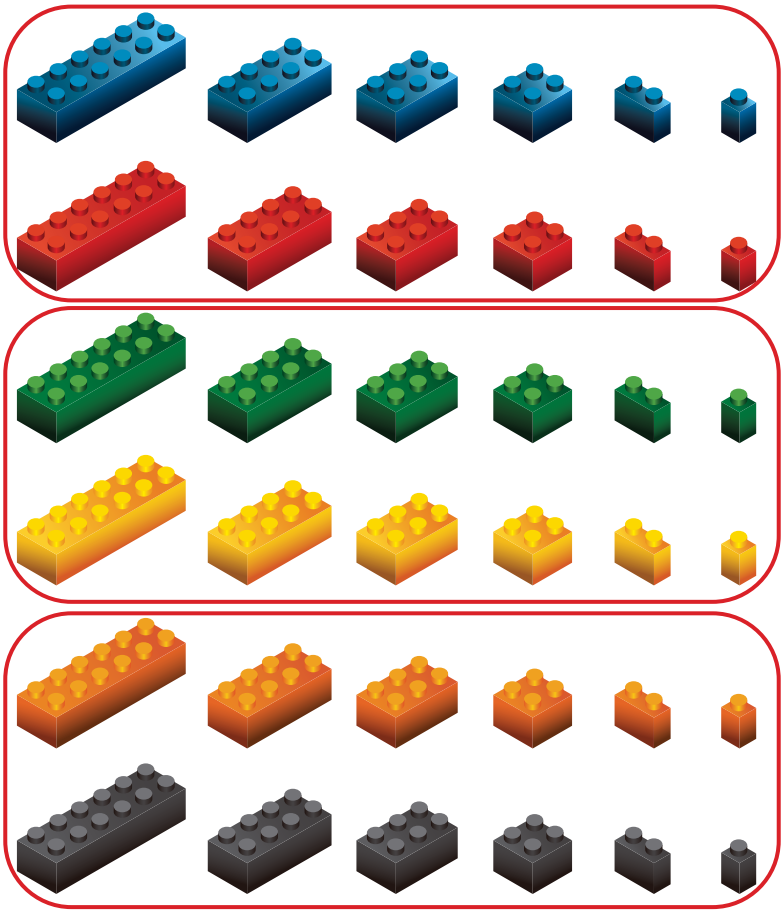
To create Mrs. Zapata's vegetable garden, I chose to plant carrots in half the garden. To help me find the number of plants for each category of vegetable, I used a sheet of paper and building blocks. I divided the 36 plants into 2 equal groups to represent half the plants in the garden. In each group, there are 18 plants. So there are 18 carrot plants in Mrs. Zapata's garden. I've coloured the 18 carrot plants in the garden red.



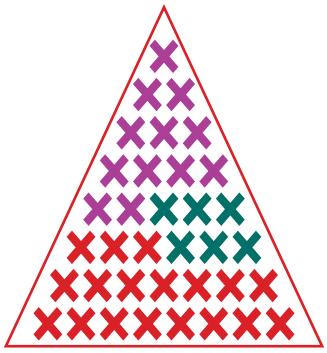
I chose to plant broccoli in one-sixth of the vegetable garden. So I divided the 36 plants into 6 equal groups to represent one-sixth of the plants, using building blocks. There are 6 plants in each group. So there are 6 broccoli plants in Mrs. Zapata's garden. I've coloured the 6 broccoli plants in my garden green.



I chose to plant pumpkins in one-third of the garden. So I divided the 36 plants into 3 equal groups to represent one-third of the plants, using building blocks. There are 12 plants in each group. So there are 12 pumpkin plants in Mrs. Zapata's garden. I've coloured the 12 pumpkin plants in my garden purple.



So, in Mrs Zapata's vegetable garden, there are 18 carrot plants, 6 broccoli plants and 12 pumpkin plants. So there are 36 vegetable plants in all, because 18 + 6 + 12 = 36.



CONSOLIDATION OF LEARNING

Course of Action

- Lead a discussion with students to determine important learnings by asking them the following questions: Was your estimation relatively correct? What mistakes did you make, or challenges did you face, when resolving the problem? What have you learned from these mistakes or challenges?
- Give students the opportunity to note important elements related to the types of reasoning and mathematical concepts targeted in this learning situation.
- Develop with the students the success criteria linked to the following learning goals: "At the end of this learning situation, the student will be able to construct a symmetrical three-dimensional object using manipulatives, describe the two-dimensional shapes that compose it, construct a symmetrical two-dimensional shape and congruent halves, compare and order unit fractions, and use the geometry and algebra vocabulary being studied."
- Ask students to solve the following problem:

Your teacher invites you to help create a map of your school's neighbourhood.

Construct a building of your choice in your neighbourhood by assembling 2 three-dimensional objects of your choice (for example, library, community center, school, house, restaurant, etc.).

Your building must be composed of 2 different three-dimensional objects.

Describe the two-dimensional shapes that compose your first three-dimensional object.

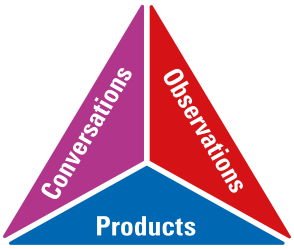
Your second three-dimensional object must be symmetrical.

Your teacher has provided 24 different coloured cards for students to use to identify their names on their buildings. Determine the number of cards of each colour if one-fourth of the cards are green, one-sixth are yellow, one-third are blue and one-fourth are red.

Your teacher would like you to construct a flag using cardboard of the colour of your choice and a toothpick. However, your teacher doesn't know if there are enough toothpicks for everyone in your class. Estimate the number of toothpicks in the container and verify your estimation. Are there enough toothpicks for everyone?

Note: As you work through this problem, it may be necessary to review some concepts with students by presenting the following mini lessons: **Constructing and Describing Two-Dimensional Shapes and Three-Dimensional Objects** and **Comparing and Ordering Unit Fractions Up to Tenths.**

Note: Gather evidence of student learning, analyze and interpret it to identify strengths and target next steps to help students improve.



Triangulation of Assessment

Possible Observations

- The student builds 2 different three-dimensional objects and assembles them to represent a building in the neighbourhood.
- The student constructs a three-dimensional object and describes the two-dimensional shapes of which it is composed, but has difficulty constructing a symmetrical three-dimensional object.
- The student describes the two-dimensional shapes that compose their first three-dimensional object.

- The student constructs a symmetrical three-dimensional object.
- The students construct a flag using a symmetrical two-dimensional shape of their choice.
- The student constructs a two-dimensional shape, but does not check the congruence of its parts.
- The student estimates the number of toothpicks and verifies the estimation.
- The student estimates the number of toothpicks, but does not verify the estimation.
- The student determines the number of cards of each colour according to the given unit fractions.

Possible Interventions

- What would you do differently next time? (PS)
- Is there another strategy you could have used? (TS)
- Do you think you have represented the problem correctly? (REF)

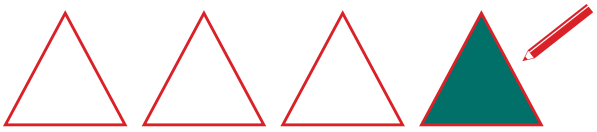
POSSIBLE ANSWERS

Several solutions are possible.

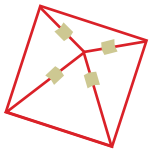
I chose to represent my house.

To represent the roof of my house, I decided to build a square-based pyramid. I know that my pyramid must be made up of 4 congruent triangles and 1 square. I also know that the base of the triangles that make up the pyramid are the same length as the sides of a square.

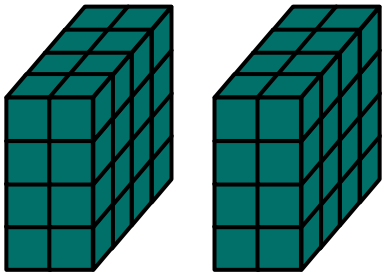
I used a triangular pattern block to trace my 4 two-dimensional shapes on cardboard. I cut out the 4 triangles.



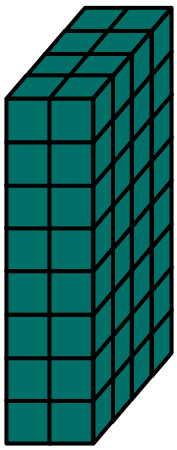
Finally, I created the base of my pyramid by tracing and cutting out a square. The sides of my square are the same length as the base of my triangles. I assembled the pieces of my pyramid using adhesive tape.



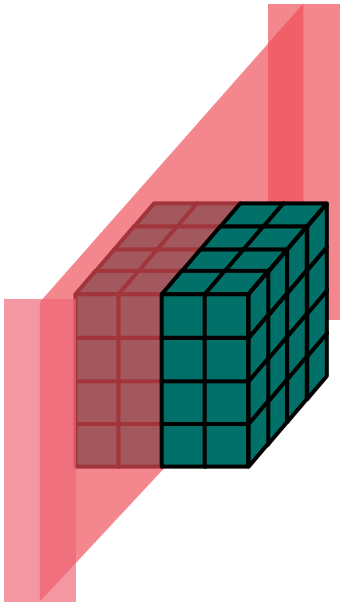
To represent the base of my building, I decided to build a cube using interlocking cubes. To ensure I created a symmetrical three-dimensional object, I made 2 identical parts using 32 cubes.



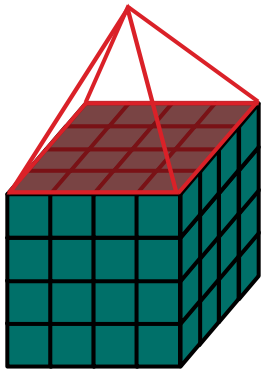
To verify if the 2 parts are congruent, I superimposed them. I was able to observe that the parts were congruent since they overlapped perfectly.



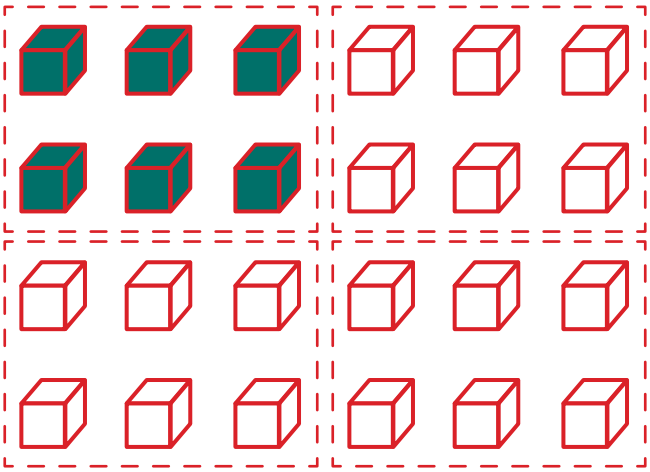
I glued the 2 parts to form my cube. To check if my cube is symmetrical, I used a Mira. The reflection of one half corresponds to the other half, so the three-dimensional object is symmetrical.



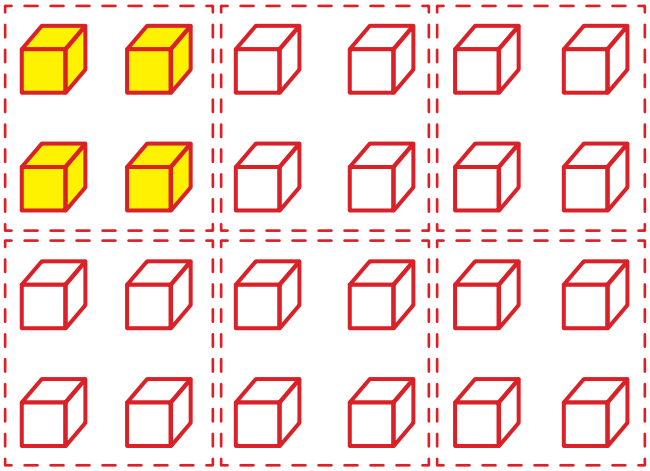
I assembled my 2 three-dimensional objects to create my building.



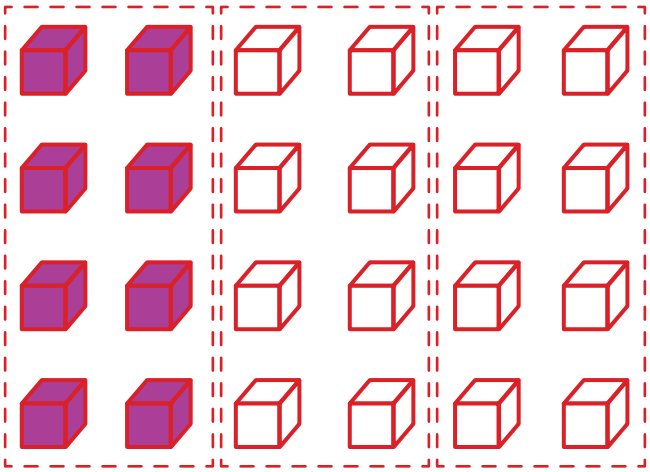
I know that there are 24 coloured cards available to us to construct our flag. I also know that one-fourth of the cards are green, one-sixth are yellow, one-third are blue and one-fourth are red. To find the number of cards of each colour, I used 24 cubes and formed 4 equal groups since the whole is divided into fourths. Each part is one-fourth of the whole. The 6 green cards represent one-fourth.



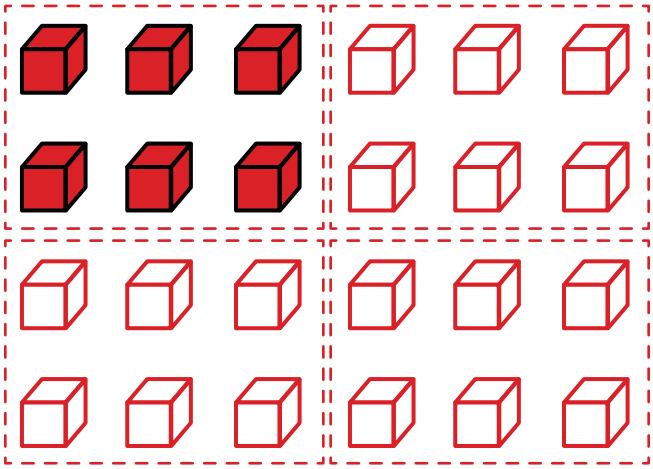
I reused the 24 cubes and formed 6 equal groups since the whole is divided into sixths. Each part is one-sixth of the whole. The 4 yellow cards represent one-sixth.



I reused the 24 cubes and formed 3 equal groups since the whole is divided into thirds. Each part is one-third. The 8 blue cards represent one-third.

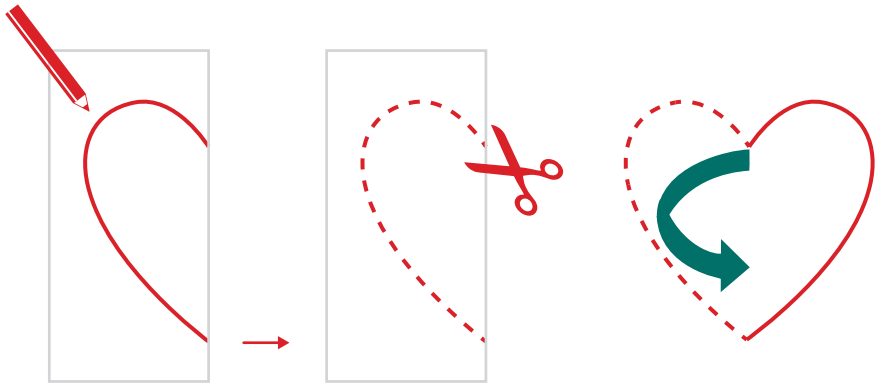


Using the 24 cubes, I formed 4 equal groups since the whole is divided into fourths. Each part is one-fourth. The 6 red cards represent one-fourth.

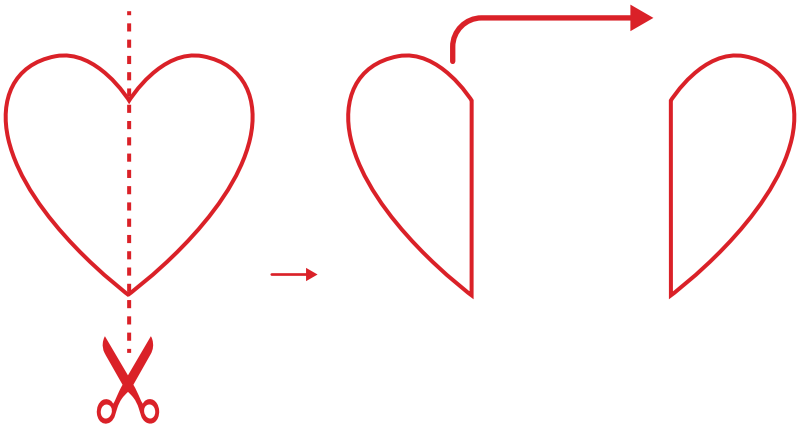


So I was able to determine that there are 6 green cards, 4 yellow cards, 8 blue cards and 6 red cards.

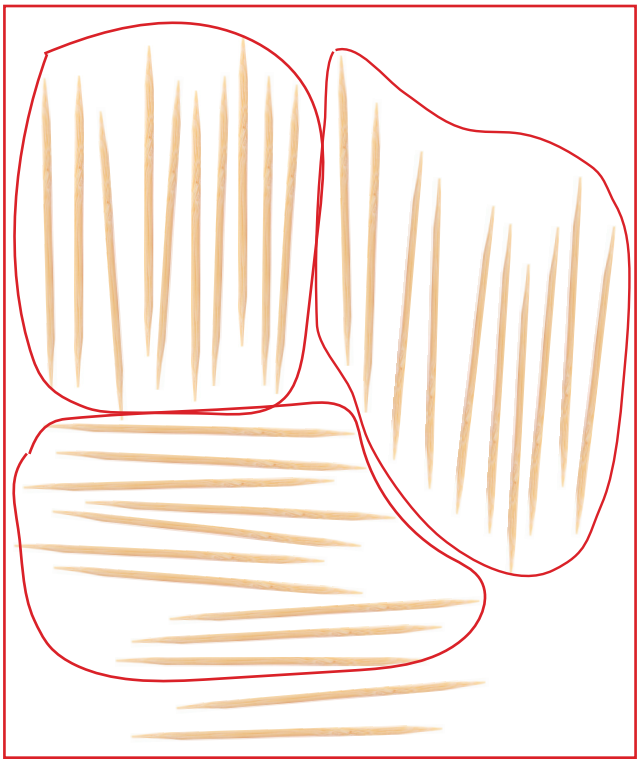
To construct my flag, I traced half of a heart on red cardboard folded in half. I cut out the two-dimensional shape and unfolded it. To check if the two-dimensional shape is symmetrical, I simply folded the heart in half. The 2 halves overlap perfectly. So my heart is symmetrical.



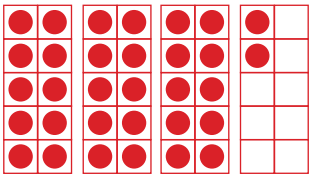
To verify if the halves of my two-dimensional shape are congruent, I cut the shape in half based on the fold line. I superimposed the first half of the two-dimensional shape on the second half, giving it a reflection. I was thus able to notice that the halves of the heart are congruent.



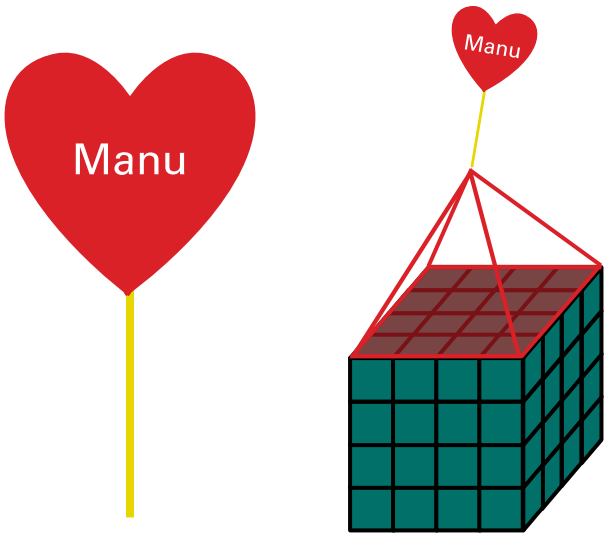
I estimated the number of toothpicks using a benchmark number. I counted groups of about 10 toothpicks. I used an imaginary circle to find the number of toothpicks. I visualized roughly 3 groups of 10 toothpicks. So, I estimated that there are about 30 toothpicks.



To verify my estimation, I used ten frames. I placed 1 token for each toothpick counted on the frames. There are 3 filled frames and 1 frame with 2 tokens, that is 10 + 10 + 10 + 2 = 32. There are 32 toothpicks in total. My estimation was right. There are enough toothpicks for all the students in my class, since there are 24 students in my class.



I attached my heart to a toothpick to finish constructing my flag. Finally, I hung my flag on top of my house.



POSSIBLE EXTENSIONS

1. Your teacher would like you to determine how many craft items she or he owns. First estimate the total number of straws in a container and verify your estimation. Next, determine how many craft items from each category are in the drawer. There are 40 items in total. One-fourth of the items are wooden sticks, one-tenth are toothpicks, one-fifth are pieces of modeling clay, one-fourth are wooden sticks and one-fifth are threads. Using the craft items, construct a symmetrical three-dimensional object, describe the two-dimensional shapes that compose it and construct a symmetrical two-dimensional shape of your choice.

2 You own several small cars. You have green ones, yellow ones, red ones and blue ones. Estimate the number of small cars you own and verify your estimation. For your friend's birthday, you give him one-fifth of your green cars, one-fourth of your yellow cars and one-tenth of your blue cars. Determine the number of cars you give to your friend. Using the manipulatives of your choice, make a symmetrical three-dimensional object in which you will place the small cars. Then describe the two-dimensional shapes that compose your object. To accompany your present, prepare a greeting card using a symmetrical two-dimensional shape.