Chapter
11

3-D Geometry

GOAL

You will be able to

- draw and compare the top, front, and side views for a given 3-D object
- build a 3-D object given the top, front, and side views
- predict and draw the top, front, and side views when a 3-D object is rotated
- communicate about drawings of 3-D objects

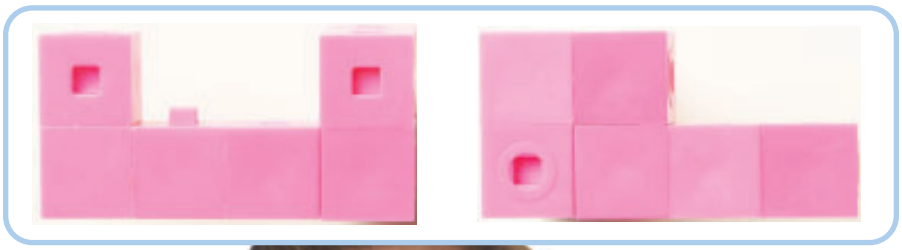
What 2-D shapes will you see when you look at the longhouse from different views?

Getting Started

YOU WILL NEED
- linking cubes
- grid paper

Identifying Cube Structures

Vanessa built a structure of linking cubes. These photos show the front and side views of her structure.



How many cubes might Vanessa have used to build her structure?

A. How do you know that Vanessa's structure is not a rectangular prism?

B. What extra information do you need to tell how many cubes she used?

C. What is the least number of cubes in her structure? Build the structure to show your answer.

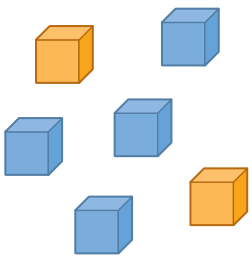
D. Can you build a different structure with the same views and the same number of cubes as in C?

E. What is the greatest number of cubes in her structure? Build the structure to show your answer.

F. What other number of cubes might be in her structure? Explain.

What Do You Think?

Decide whether you agree or disagree with each statement.
Be ready to explain your decision.



1. If you have a cube structure with two orange cubes and four blue ones, then you will see orange when you look at the front and side.

2. If you link four cubes together, you can see 18 faces when you look at all sides of the structure.

3. A 3-D structure will look the same whether you look at it from the right or the left.

4. You can tell how many cubes are in a structure by looking at a photo of it.

11.1 Drawing Views of Cube Structures

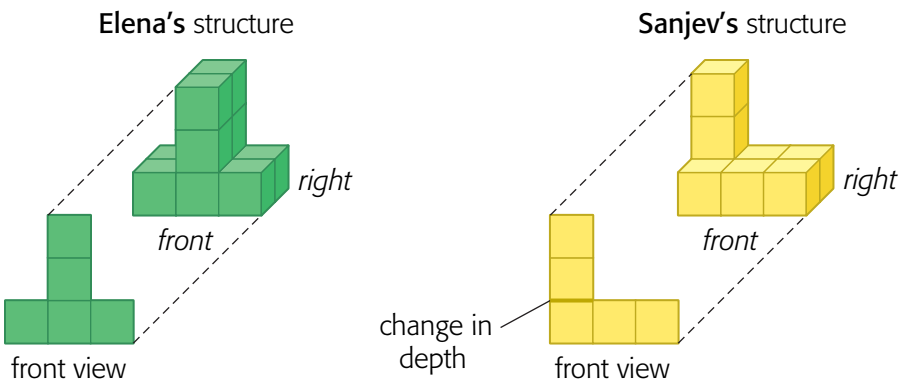
YOU WILL NEED
- linking cubes
- grid paper

GOAL

Use grid paper to draw top, front, and side views of a cube structure.

LEARN ABOUT the Math

Elena and Sanjev each used linking cubes to represent a building in their community. They want to draw different views of their models.



How can you make top, front, and side views of a cube structure?

A. How do you know that the drawing of each front view is correct?

B. Draw what you would see if you looked at the top view of each structure. Explain how you did it.

C. Draw what you would see if you looked at the right view of each structure. Explain how you did it.

Reflecting

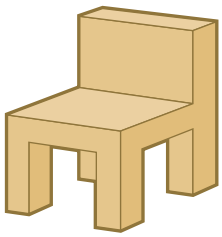
D. Why do the different views of a cube structure not always show the same number of cubes?

E. Can two cube structures have the same front view but different side views? Build models to help you explain.

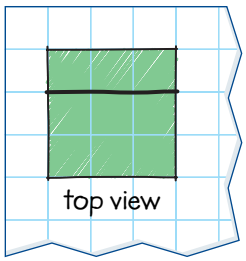
WORK WITH the Math

Example 1 | Drawing views of a cube structure

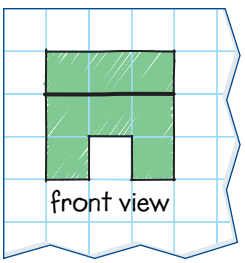
Nolan made a model of a chair using linking cubes. How can he represent the top, front, and right views of his structure?



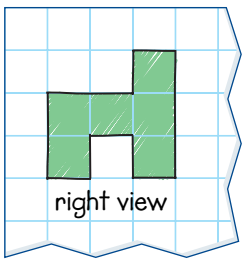
Nolan's Solution



To draw the top view, I looked down at the structure from directly above. To represent what I saw, I drew a 3-by-3 square. The top is not really a square, though. I drew a darker line to show where the surface changes in depth.



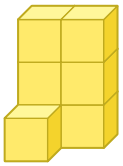
I repeated this for the front view. I represented what I saw when I looked straight at the front of the structure. Then I drew a darker line to show the change in depth.



For the right view, I turned the chair so that I was looking straight at the right side. This view had no change in depth.

A Checking

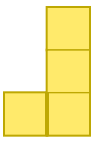
1. This structure is built with 7 linking cubes. Visualize what it will look like from the top, front, and right side. Identify each view below as top, front, or right side.

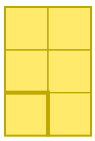


right

front

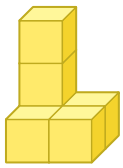
a) 

b) 

c) 

B Practising

2. **a)** Build this structure with linking cubes.
b) Rotate your structure so you can see the top, front, and right views.
c) Draw each view, using a thick line to indicate a change in depth.

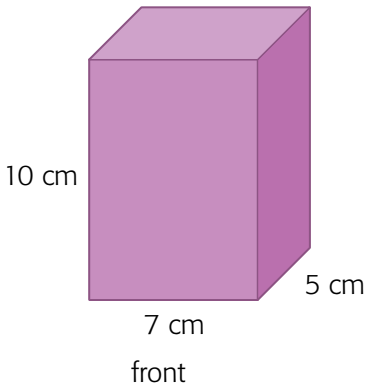


right

front

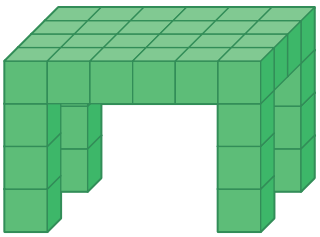
3. Make a rectangular prism out of linking cubes. Draw the top, front, and side views.

4. What would the top, front, and side views of this prism look like? Explain how you know.



5. **a)** Use up to 20 linking cubes to make an airplane that looks different from the top, front, and sides.
b) Draw the top, front, and right views of the airplane.

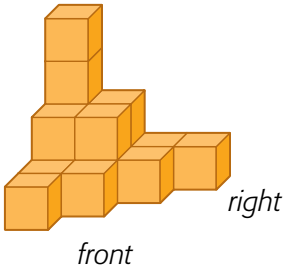
6. Draw and label three different views of the table.



7. **a)** Build this structure with linking cubes.

b) Rotate your structure so you can see the top, front, and right views.

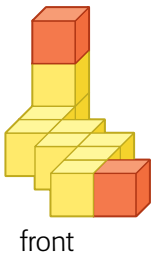
c) Draw each view, using a thick line to indicate a change in depth.



8. **a)** Build this structure with linking cubes.

b) Draw the top, front, right, and left views of the structure.

c) If you take away the red cubes, which views would look different? How would they be different?



9. Look at the structure in question 8.

a) How could you add a cube so only the top view does not change?

b) How could you add a cube so the number of depth lines is the same in both the left and right views?

10. How are the top, front, and side views of a rectangular prism alike?

11. Can you always tell how many cubes are used in a structure if you know the top, front, and right views? Explain.

11.2 Building Cube Structures from Views

YOU WILL NEED
- linking cubes
- grid paper

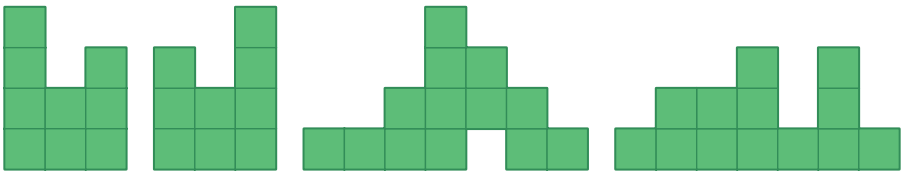
GOAL

Make cube structures, given their top, front, and side views.

EXPLORE the Math

Habitat 67 is a unique housing development made of stacked modules in the shape of rectangular prisms. It was built for the 1967 Montreal World Exposition and was featured in the movie *Blades of Glory*.

Last week Vanessa used cubes to make a model like Habitat 67. She drew these views of her structure but forgot to include the change of depth lines. She wants to build the model again.



? How many different models with these top, front, and side views can Vanessa build?

11.3 Creating Isometric Drawings

YOU WILL NEED

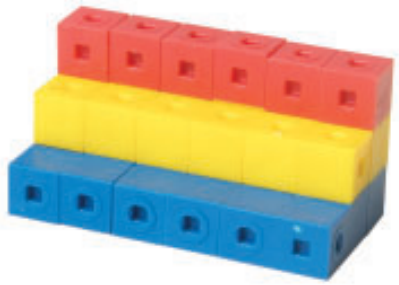
- Isometric Dot Paper
- a ruler
- linking cubes

GOAL

Create isometric drawings of cube structures.

LEARN ABOUT the Math

Sanjev used cubes to make a model of a platform for the choir. He wants to fax an **isometric drawing** of it to the choir director.

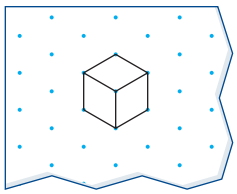


? How can Sanjev make an isometric drawing of the model?

isometric drawing

a 3-D view of an object in which

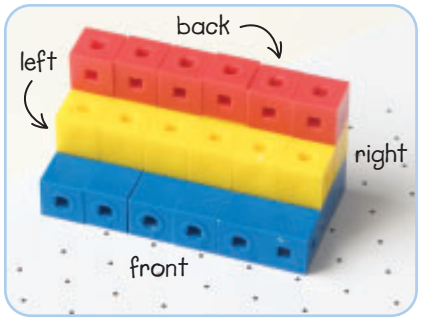
- vertical edges are drawn vertically
- width and depth are drawn diagonally
- equal lengths on the object are equal on the drawing



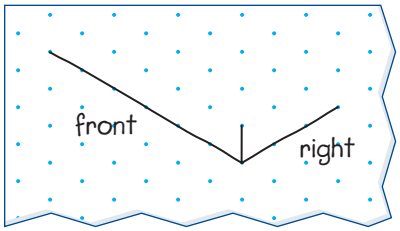
Example 1 | Making an isometric drawing

I used isometric dot paper to draw a model of the platform for the choir.

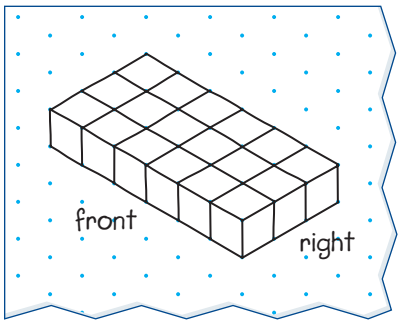
Sanjev's Solution



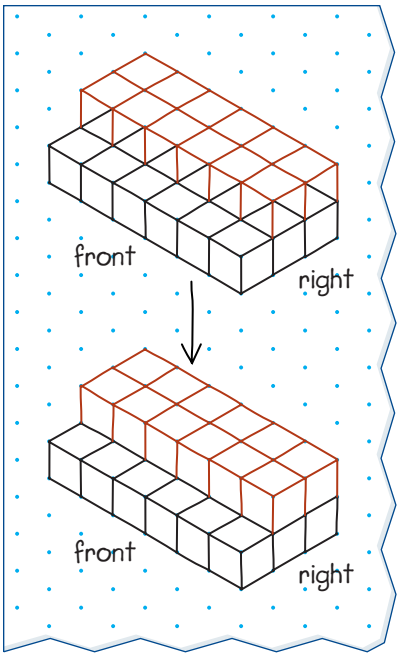
I placed the bottom layer of the structure on paper. I decided which sides of the structure were front, right, left, and back to help me keep track of the views. Then I turned the paper so that the view corresponded to the isometric dot paper.



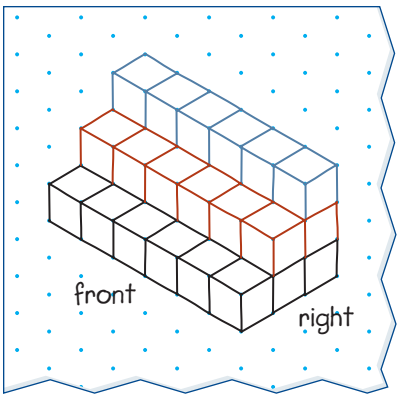
I could see three faces of the front right cube, so I started with that one. I drew the vertical part, then I added the bottoms of the front and right. I used one space for the height, six for the width, and three for the depth. I labelled the front and right faces.



I completed the bottom layer.
I used one space to represent the height, width, and depth of each cube.



I added the next layer to the structure. I used a different colour to add that layer to my drawing. When the second layer was finished, I erased lines from the first layer that should be hidden.



I repeated this for the top layer.

Reflecting

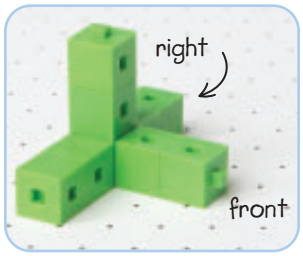
A. Did Sanjev have to draw the whole bottom layer first? Explain.

B. Would you rather use an isometric sketch or views drawn on grid paper to build a cube structure? Explain.

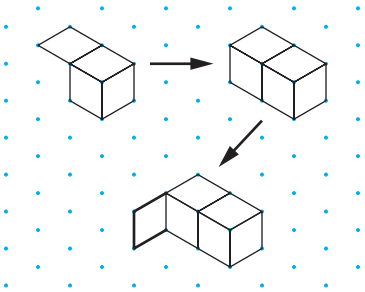
Example 2 | Drawing a cube structure

Make an isometric drawing of this cube structure.
Shade your drawing to make it look 3-D.

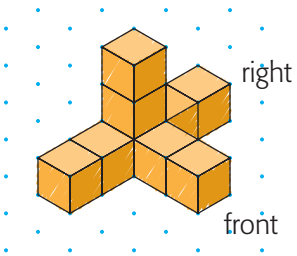
Solution



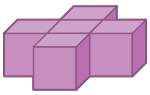
Line up the vertices of the cubes in the structure with the dots of the isometric dot paper. Start by drawing a cube that has three faces visible.



Extend the lines to draw a face that is next to it. Continue extending lines to add other faces.



When the drawing matches the cube structure, use three shades of the same colour to fill it in—one for the top faces, one for the front faces, and one for the side faces.

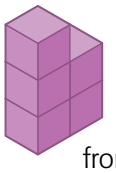


A Checking

1. Build this cube structure. Make an isometric drawing to represent your cube structure.

B Practising

2. **a)** Build this cube structure.
b) Make an isometric drawing of the structure.
c) Turn the structure to a different view and make another isometric drawing of it.

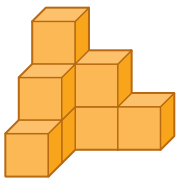

front

3. **a)** Build this cube structure.
b) Make two different isometric drawings of the structure.

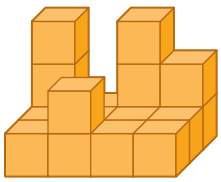

front

4. Build the following cube structures. Make an isometric drawing of each.

a)

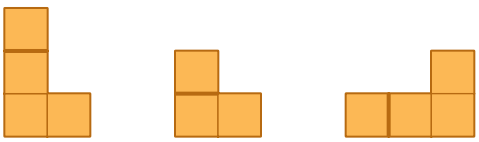

front

b)


front

5. **a)** Build three different letters of the alphabet with linking cubes.
b) Draw each letter on isometric dot paper.
c) Draw the top, front, and right views for each letter.

6. Build this cube structure. Make an isometric drawing of the structure.


top front right

7. **a)** Build two different cube structures that can be represented by the same isometric drawing.
b) Draw enough face views of each structure to show how they are different.

8. Why might an architect use an isometric drawing instead of face views to show a structure?

Reading Strategy

Visualizing

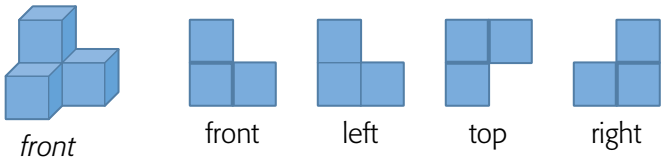
Make a picture in your mind to visually represent the information in question 8.

Mid-Chapter Review

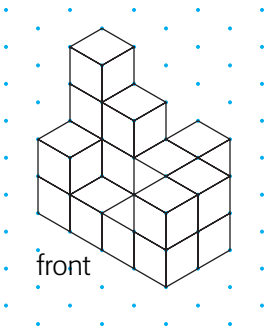
Frequently Asked Questions

Q. **How do you draw the different views of a cube structure?**

A. Draw what you see when you look at the structure straight on. Then look at the structure from a slightly different angle to see changes in depth. Mark the changes in depth with a heavier line. The top, front, left, and right views of a cube structure are shown below.



Q. **How do you make an isometric drawing of a cube structure?**



A. There are different ways to do this. You can line up the vertices of the cubes with the dots of the triangular dot paper. Then start drawing a cube with three faces. Extend the lines to draw the cubes around it. Continue drawing the cubes until the isometric drawing matches the cube structure.

Another method is to draw the structure layer by layer, erasing hidden lines as you go.

Q: **How does an isometric drawing compare with top, front, and side views?**

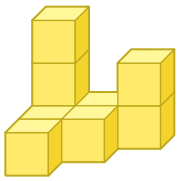
A: An isometric drawing is a single representation of a 3-D object. The drawing is 2-D but it appears to be 3-D. Top, front, and side views are separate drawings of a 3-D object. Each view is 2-D, and it appears to be 2-D.

Practice

Lesson 11.1

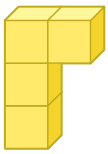
1. Draw the top, front, right, and left views of each structure.

a)



front

b)

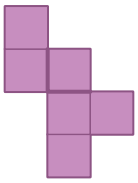


front

Lesson 11.2

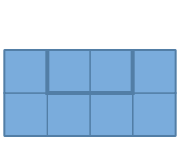
2. **a)** Make two cube structures that have this top view.

b) Draw three other views of your two structures.

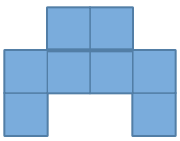


top view

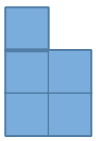
3. Use these views to build a linking-cube structure.



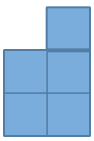
top view



front view



left view



right view

4. The front, left, and right views of a structure all look like this.

Build the structure and draw the top view.

Lesson 11.3

5. **a)** Build a cube structure using 15 linking cubes.

b) Make isometric drawings from two different views.

6. **a)** Trade your isometric drawings from question 5 with a partner.

b) Use your partner's isometric drawing to build a cube structure.

c) Did your cube structure match your partner's original structure? Why or why not?

11.4 Creating Cube Structures from Isometric Drawings

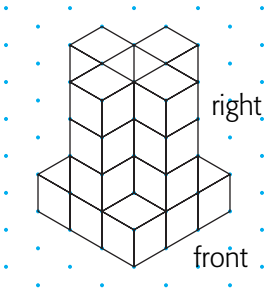
YOU WILL NEED

- Isometric Dot Paper
- a ruler
- linking cubes

GOAL

Create cube structures based on isometric drawings.

LEARN ABOUT the Math



Joseph and Mark are using Elena's isometric drawing to build a cube structure. Joseph thinks the structure has 20 cubes but Mark thinks it has only 19.

How can Elena make sure that they will build the structure correctly?

A. How many cubes are visible?

B. Build a cube structure with 19 cubes that matches Elena's drawing.

C. Build a cube structure with 20 cubes that matches Elena's drawing.

D. Elena says that the structure is made of 22 cubes. Make a cube structure with 22 cubes that matches Elena's drawing.

E. Make a second structure with 22 cubes that matches her drawing.

F. What additional instructions should Elena give to be sure that other people build the structure the way she intended?

Reflecting

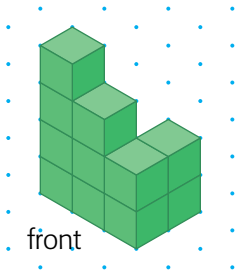
G. How can both Joseph's and Mark's models match Elena's sketch when they are made of different numbers of cubes?

H. What clues in the drawing did you use to help build Elena's cube structure?

WORK WITH the Math

Example 1 | Building based on an isometric drawing

Build two different cube structures that match this isometric drawing.



Kaitlyn's Solution

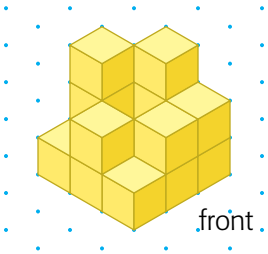
I started with the 11 cubes that I can see in the isometric drawing.

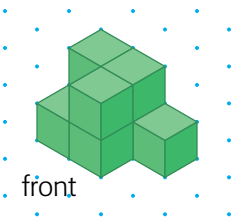
To make other structures that match the drawing I would have to add cubes that were hidden, so I turned my structure around.

I could see where to add a cube.

I turned my new structure back to the original position to check that the cube I added was hidden.

Both structures could be represented with the isometric drawing.





A Checking

1. **a)** How many cubes are visible in this isometric drawing?

b) Build a cube structure that matches the drawing. How many cubes did you use?

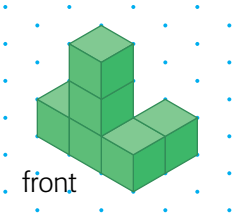
c) Build a different cube structure that also matches the drawing. How are your cube structures different?

B Practising

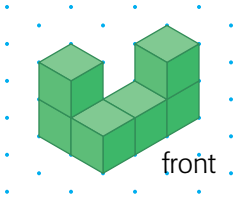
2. Build a cube structure to match this isometric drawing. Sketch your cube structure so that someone else would build it exactly as you did.

3. Each of these cube structures is made with six cubes. Which structures are the same?

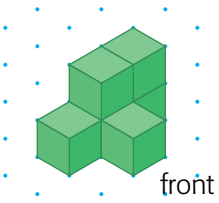
A.



C.



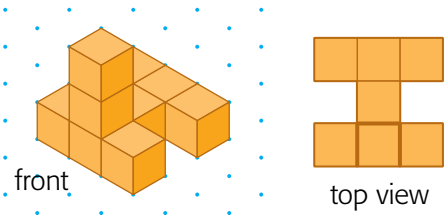
B.



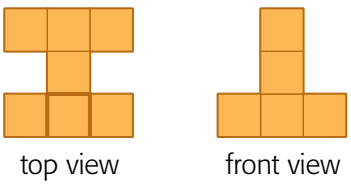
D.

4. Each set of drawings can be used to build the same structure. Which set would you choose to build the structure? Explain.

A.



B.



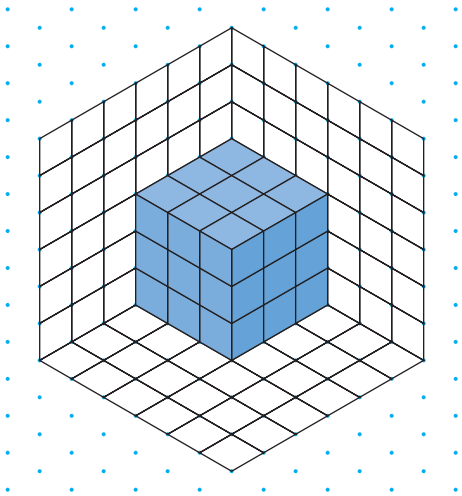
Optical Illusions

YOU WILL NEED
- Isometric Dot Paper
- pencil crayons (three colours)

Isometric drawings can be used to make optical illusions.

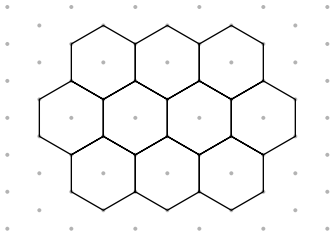
Look carefully at this isometric drawing.

Do you see three white walls with a blue cube sitting in the back corner, or do you see a large white cube with a portion taken out?

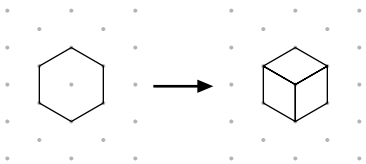


Follow these steps to make your own optical illusion.

1. Cover a portion of isometric dot paper with hexagons.



2. Make each hexagon represent a cube by dividing it into three rhombuses, as shown.



3. Choose a colour scheme for the different types of rhombuses, then use it to colour your drawing.

4. Are you looking down on cubes that come out of the page, or up at them?

Rhombus	Colour
	
	
	

11.5 Rotating Cube Structures

YOU WILL NEED

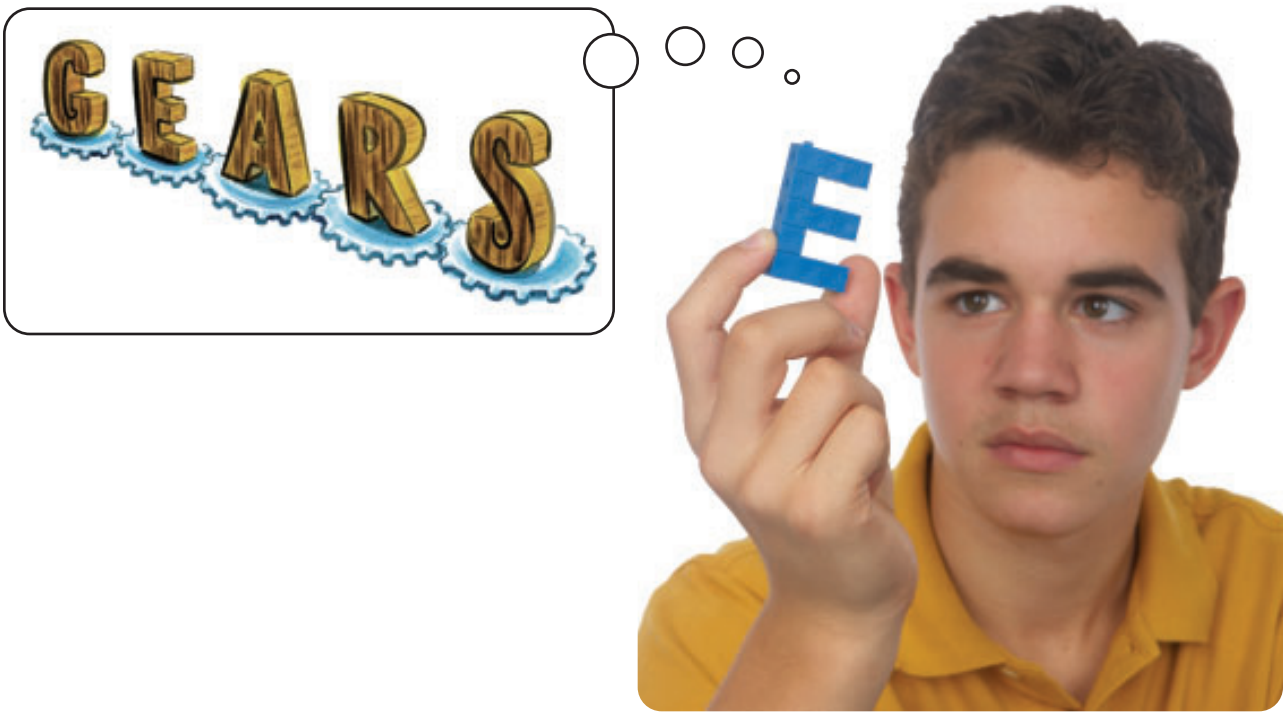
- Isometric Dot Paper
- linking cubes
- grid paper

GOAL

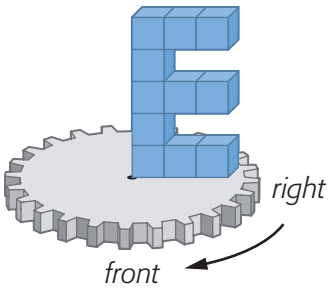
Make and verify predictions about the views that result from rotating cube structures.

LEARN ABOUT the Math

Mark's science fair project topic is pulleys and gears. For part of the display, he plans to attach the letters in the word GEARS to five gears in a train. He wondered what the letters would look like as they turned, so he built an E out of linking cubes to see.



? What views will Mark see when the E is rotated?



A. Draw the top, front, and side views of this letter E.

B. Predict and draw the top, front, and side views after the letter is rotated 90° in the direction shown.

C. Predict and draw the top, front, and side views after the letter is rotated 180° from its original position in the direction shown.

D. Predict and draw the top, front, and side views after the letter is rotated 270° from its original position in the direction shown.

E. Check your predictions by building the letter E with linking cubes and rotating it as described in parts B, C, and D.

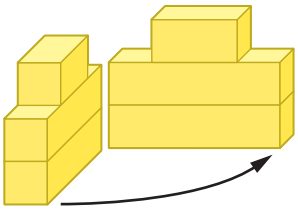
Reflecting

F. What strategies did you use to predict the views of the rotated letter?

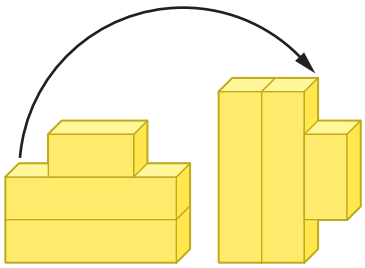
G. What happened to the views as the E was rotated?

Communication | *Tip*

Horizontally rotating a structure means making it rotate like a merry-go-round.



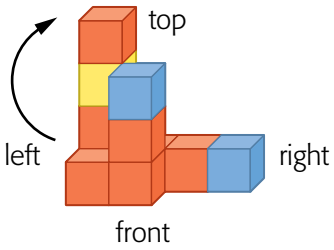
Vertically rotating the structure means making it rotate like a Ferris wheel.



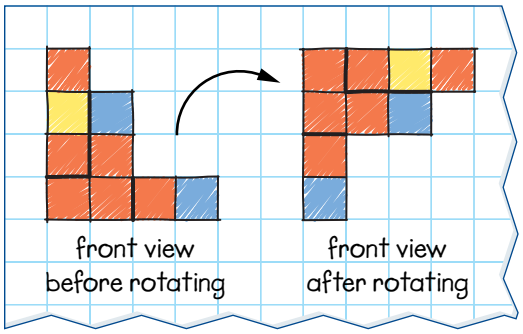
WORK WITH the Math

Example 1 | Representing views of a rotated structure

Vanessa made a cube structure and wants to predict the front, top, and right views after vertically rotating the structure 90° clockwise (cw).

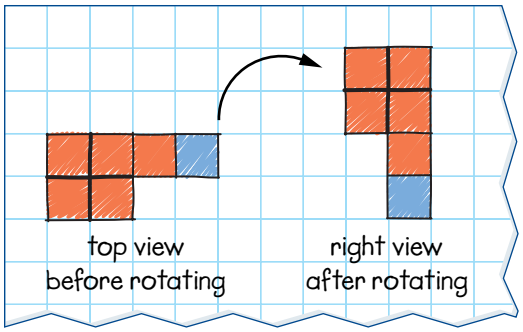


Vanessa's Solution

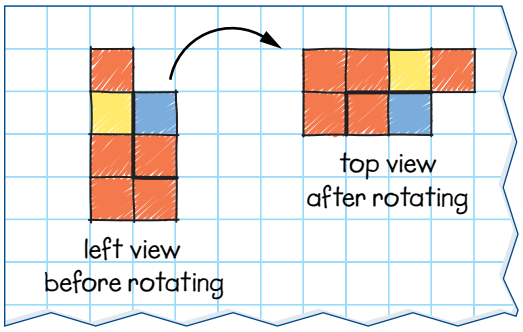


When I vertically rotate the structure 90° cw, the front face remains the front face, the left face becomes the top face, and the top face becomes the right face.

First I drew the front view of my structure. Then I rotated it 90° cw to show what the new front view will be.



When the structure is rotated, the left and right of the top view will become top and bottom of the right face. The top view will be rotated 90° cw to become the new right view.

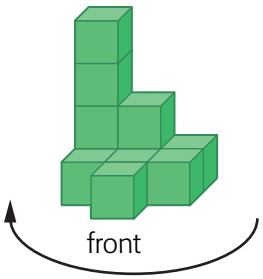


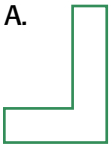
When the structure is rotated, the bottom and top of the left face will become the left and right of the top face. The left view will be rotated 90° cw to become the new top view.

When the structure is vertically rotated 90° cw, the new face views will be old face views that have been rotated 90° cw.

Example 2 | Identifying outlines of a rotated structure

Below are outlines of the front view of this structure in its original position and after it has been horizontally rotated 90° and 180° cw.



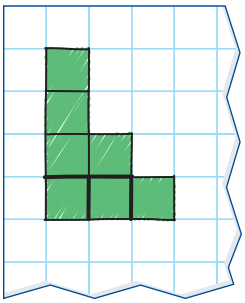
A. 

B. 

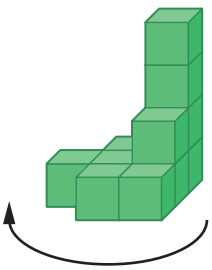
C. 

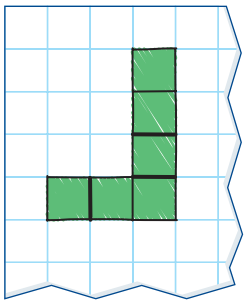
Match each outline to the correct rotation.

Guy's Solution

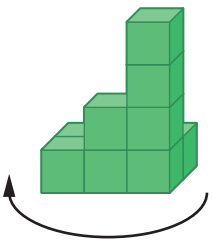


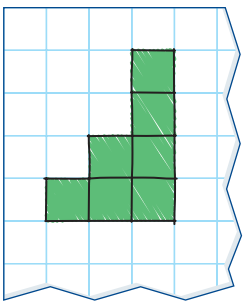
First I built the structure with linking cubes. Outline B matches the front view of the structure in its original position.





I rotated the structure 90° cw. The new front view matched outline A.



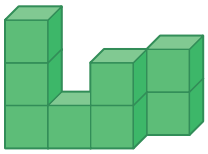


I rotated the structure 90° more so that it was rotated 180° from its original position. The new front view matched outline C.

Example 3 | Rotating a structure to show hidden cubes

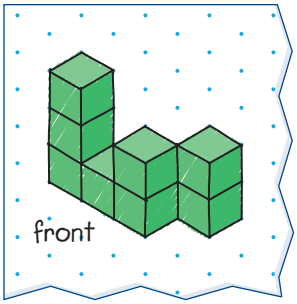
Build a structure using at least nine cubes. Make two isometric drawings that together show all of the cubes in your structure.

Kaitlyn's Solution

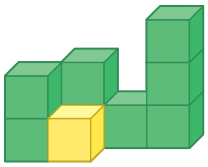


front

First, I built my structure using exactly nine cubes.

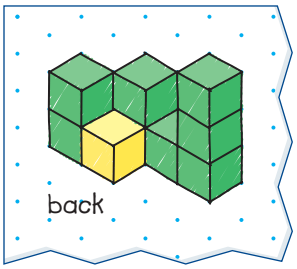


I made an isometric drawing from this view. It shows only eight cubes.



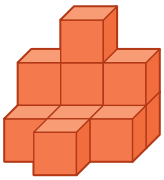
back

I horizontally rotated the structure 180° cw. This view shows a cube that I could not see before the structure was rotated.



I made my second isometric drawing.

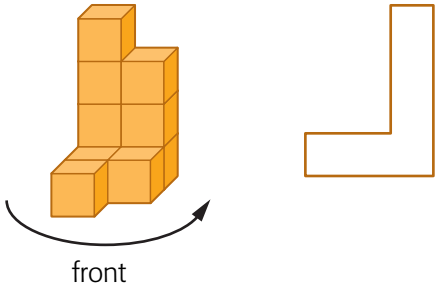
Each view shows only eight of the nine cubes, but together they show all of the cubes.


front

A Checking

1. **a)** Predict and draw the front, top, and right views of this structure.
   b) Predict and draw the front, top, and right views of this structure when it is horizontally rotated 180° cw.
   c) Build the structure and check your predictions.

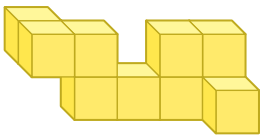
2. Rotate this structure horizontally until the outline matches the front view. How was the structure rotated?



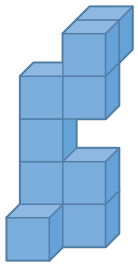
B Practising

3. Ruiz and Naghma each built a structure. Naghma thinks the structures are the same. Determine if she is correct and explain your answer.

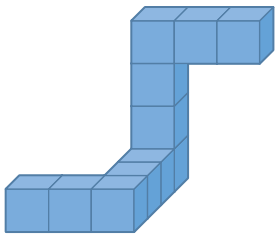
Naghma's structure

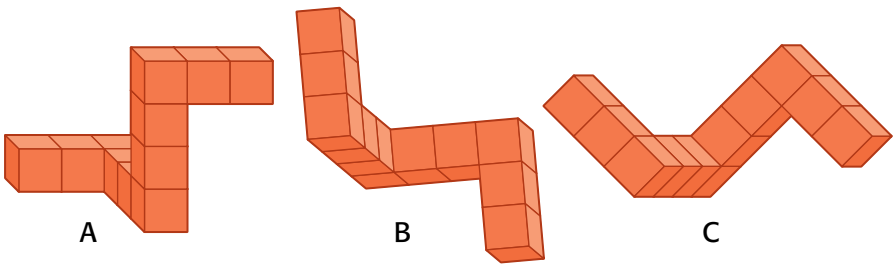


Ruiz's structure



4. Select two red objects that match the blue object on the left.

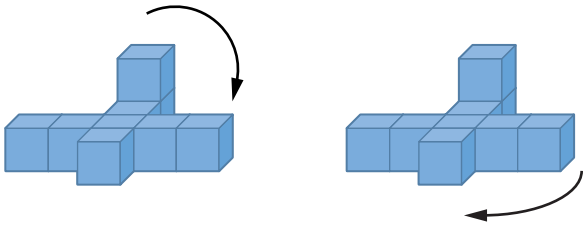


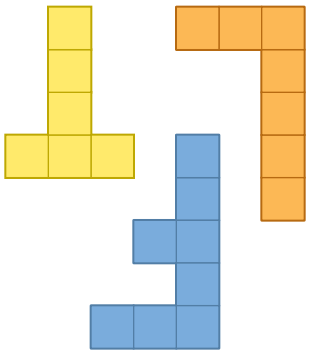


5. **a)** Draw the front, top, and right views of this model airplane after it has been vertically rotated 90° cw.

b) What would the front, top, and right views be if the model were horizontally rotated 90° cw?

c) Which of these two rotations is a real plane likely to do? Explain.





6. Joey constructed letters with linking cubes. These are the front views after the letters have been vertically rotated 180° cw.

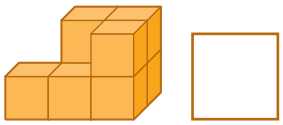
a) Which letters did he make?

b) What made it easy to identify the letters?

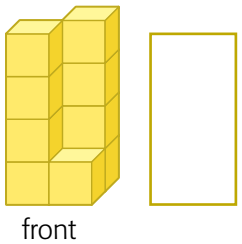
c) Would it be as easy to identify the letters if they were horizontally rotated 90° cw? Explain.

7. Rotate each of these structures until it matches the outline. Describe how each was rotated.

a)



b)



8. Make a structure with 10 linking cubes. Draw the front, top, and right views before and after it has been horizontally rotated 180° cw.

9. What information is provided by looking at different views of a rotated structure?

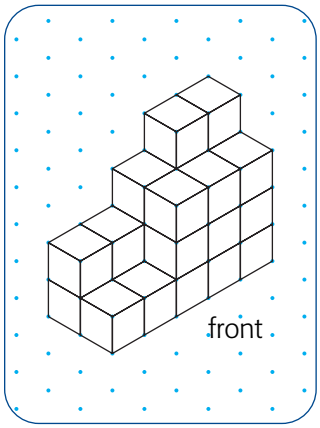
Math **GAME**

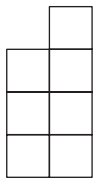
Real Estate Tycoon

YOU WILL NEED
- building cards
- view cards

In this game, you own a building once you have collected its top, front, and right views. The goal is to own the greatest number of buildings.

Number of players: 2 to 4





How to Play

1. Deal out the building cards. Place your building cards face up in front of you.
2. Spread all the view cards face down in an array so that everyone has access to them.
3. On your turn, flip over a view card. If possible, place it face up beside any of your buildings that it matches. Otherwise, flip it face down again. Your turn is over.
4. An opponent may challenge a match you have made. All players discuss it. If the match is incorrect, the challenger keeps your building card and the view card is turned face down again. If it is a correct match, you get another turn.
5. When you own all of your buildings, you may call the game. The player owning the greatest number of buildings wins. You may also let the play continue in the hope of gaining more buildings through challenges.
6. When all buildings are owned, the player owning the greatest number of buildings wins.

11.6 Communicate about Views

YOU WILL NEED

- Isometric Dot Paper
- linking cubes
- grid paper

GOAL

Describe the views necessary to build a 3-D structure.

LEARN ABOUT the Math

Guy wrote to his cousin Robert to tell him about his school project.

Hi, Robert!

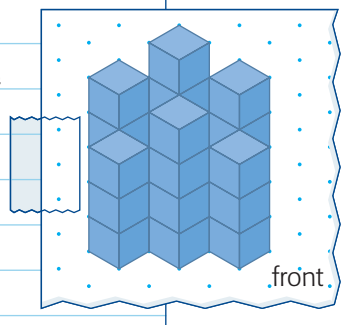
These are drawings of the model of Trim Castle Keep that I made for my Social Studies project. It was built in Ireland by the de Lacys in the 12th century and was featured in the movie Braveheart.

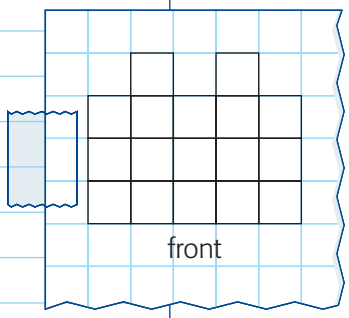
1. For the first drawing, I used isometric dot paper.
2. The second drawing shows what the model looks like from the front. I drew it on grid paper.

See if you can build the model, too.

Talk to you soon,

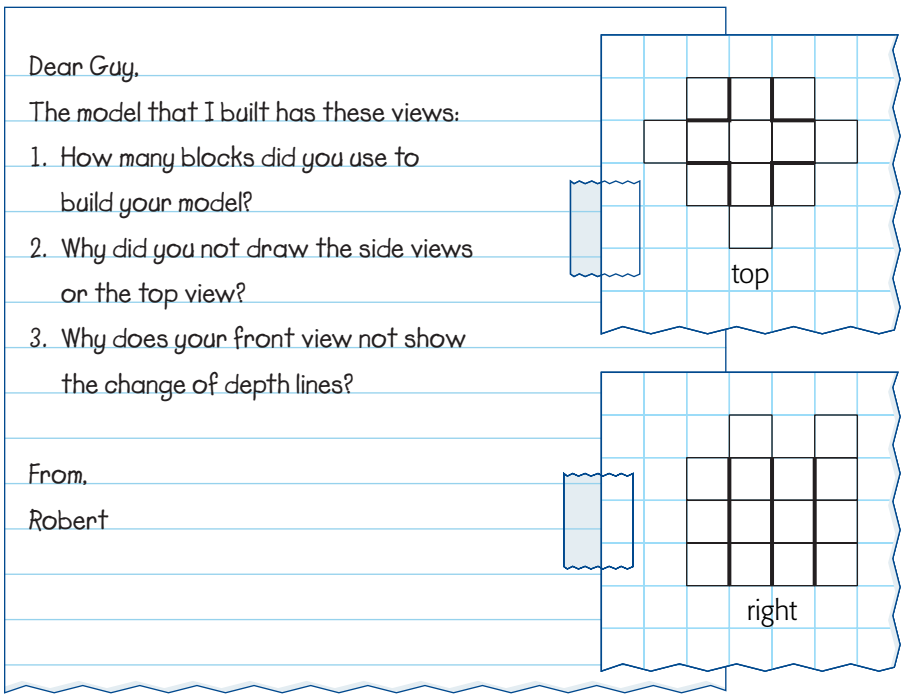
Guy.





? How can Guy improve his description?

Robert sent back a letter with the following drawings and some questions.



Communication *Checklist*

- ✔ Did you provide enough information for someone else to complete each step correctly?
- ✔ Did you use drawings effectively?
- ✔ Did you use appropriate math language?

A. Use the Communication Checklist to explain why Robert's questions could help Guy improve his description.

B. The top view of Trim Castle Keep is symmetric. Improve Robert's drawings of the views to represent the structure accurately.

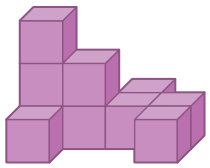
C. Rewrite Guy's description using Robert's ideas and your own.

Reflecting

D. Explain how the changes improve Guy's description.

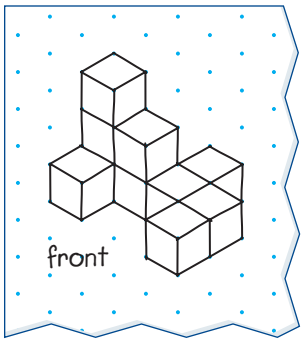
Example 1 | Describing a structure

Joseph wrote a description of the structure that he built.
Make suggestions to help Joseph improve his communication.

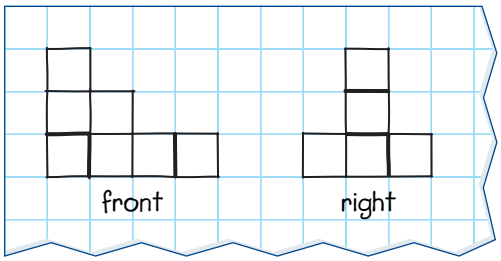


front

Joseph's Description



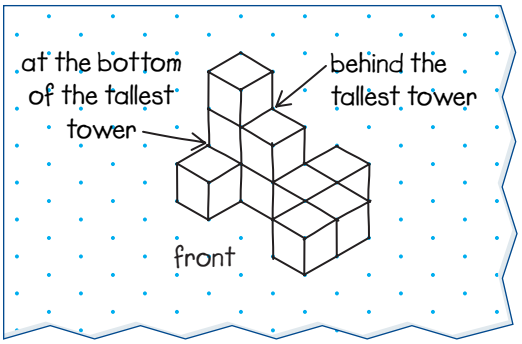
I built my structure with linking cubes.
I drew the structure on isometric dot paper.
I also drew the front and right views to give more information about the structure.



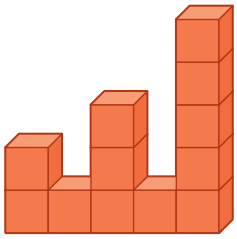
Elena's Suggestions

I think your drawings are accurate, but they do not tell me enough to build the structure. I can see the front and right views in the isometric drawing, so including those face views did not tell me any new information.

I can see 9 cubes in your drawing and there are two places where a cube might be hidden:



I think there must be a cube at the bottom of the tallest tower so that all the cubes are linked. The top view, left view, back view, or an isometric drawing from another view would show if the other cube is there or not. You could also say how many cubes you used.



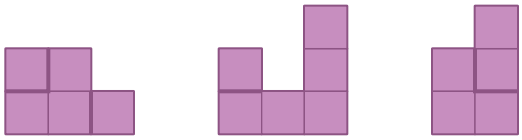
front

A Checking

1. Rosanna is building a 3-D object to display at the math fair. She is creating a plan for building the object. Using the Communication Checklist, write a description of the structure.

B Practising

2. **a)** Describe how to use these top, front, and left views to build a structure.



top front left

b) Use the Communication Checklist to help you decide what is good about your description and what you can improve.

c) Trade descriptions with a partner. Have your partner use your description to build the structure. If your partner was not able to use your description to build the structure, make changes to make the description clearer.

3. **a)** Build a structure using up to 12 linking cubes.

b) Make a plan for building the structure.

- Draw the views of your structure.
- Make isometric drawings of your structure.
- Add any other information that needs to be included in your plan to allow someone else to build your structure.

4. **a)** Choose an object in your classroom or at home. Use the Communication Checklist to help you describe the object so that someone could build a model using linking cubes.

b) Trade descriptions with a partner and follow the steps.

5. If you were building a desk from parts, what should the instructions include to help you build it? Explain.

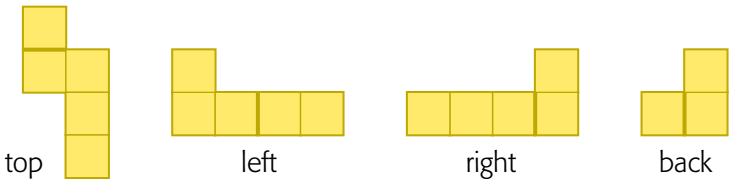
Reading Strategy

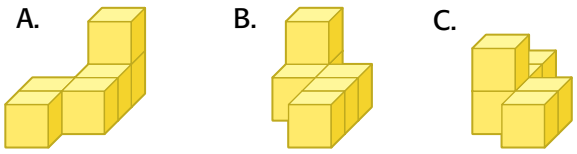
Evaluating

Share your answer with a partner. Does your partner agree or disagree?

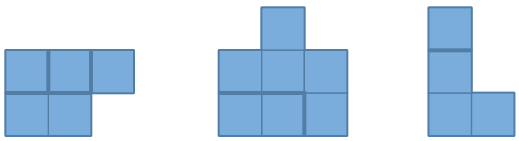
Chapter Self-Test

1. Which structure matches this set of top, left, right, and back views?





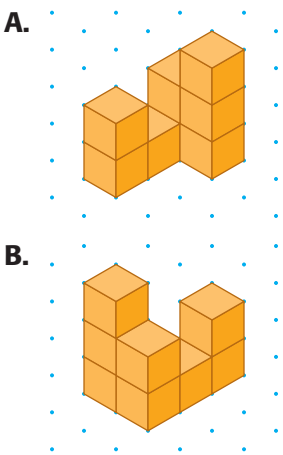
2. **a)** Use the top, front, and left views to build a cube structure.



b) Draw the right view of the structure in part a).

3. **a)** Build a structure using 10 linking cubes.
b) Draw the front, top, and side views of your structure.
c) Rotate your structure vertically 90° cw. Then make an isometric drawing of it that shows the front face.
d) Ask a classmate to build your structure using your drawings.

4. Both isometric drawings in the margin represent a structure made with eight cubes. Do they represent the same structure? How do you know?



What Do You Think Now?

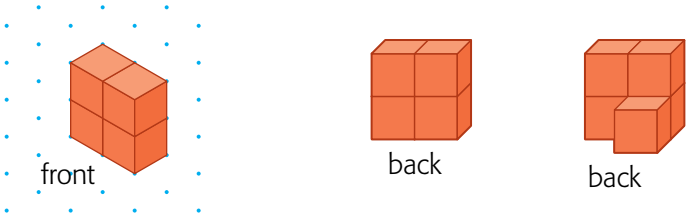
Revisit What Do You Think? on page 447. Have your answers and explanations changed?

Chapter Review

Frequently Asked Questions

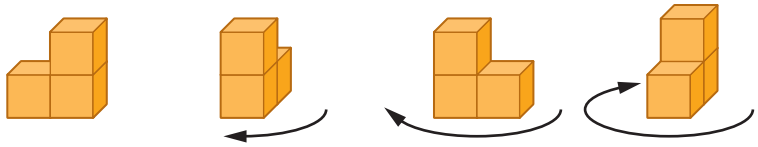
Q: How can different structures be represented by the same isometric drawing?

A: An isometric drawing shows only one view of a structure. There could be cubes hidden in that view. For example, both of these structures, shown from the back, correspond to the isometric drawing shown.

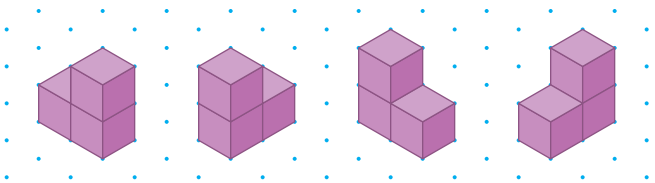


Q: How is it possible to have different isometric drawings of the same cube structure?

A. Different views of the same structure can lead to different isometric drawings. For example, these drawings show the same cube structure, first in its original position and then after being horizontally rotated clockwise.



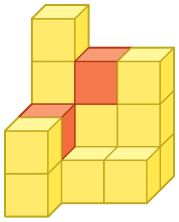
These are the corresponding isometric drawings:



Practice

Lesson 11.1

1. **a)** Build this structure with linking cubes.
b) Draw the top, front, right, and left views of your structure.
c) If you take away the red cubes, which views would look different and how would they be different?


front

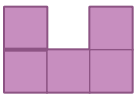
Lesson 11.2

2. Allanah built a structure with linking cubes and drew these views. Build Allanah's structure, then draw the back view.


right


left


top

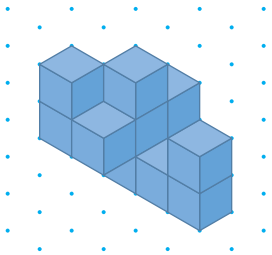

front

Lesson 11.3

3. **a)** Use 20 linking cubes to build a structure.
b) Make an isometric drawing of your structure.
c) Make an isometric drawing from a different view.

Lesson 11.4

4. Jared built a model using 11 linking cubes. He made an isometric drawing of his model. Build Jared's model using linking cubes.



Lesson 11.5

5. Leyla built a model of an inukshuk using linking cubes. She is sending her cousin in Montreal drawings of her model and an explanation of how inukshuks are built.
a) Build a model of an inukshuk with linking cubes.
b) Make isometric drawings to show your model horizontally rotated 0°, 90°, 180°, and 270° cw.

Lesson 11.6

6. Write a letter to Leyla's cousin, describing the model in question 5.

Chapter Task

Task | *Checklist*

- ✔ Did you build an accurate model of the building you chose?
- ✔ Did you provide enough information for someone else to complete each step correctly?
- ✔ Did you use drawings effectively?
- ✔ Did you use appropriate math language?

3-D Archaeology

Archaeologists must fully describe their dig sites in reports. They use 3-D models and 2-D drawings to record their findings.

How can you provide enough information so that an accurate model can be built of a structure?

A. Use linking blocks to build a model of an ancient building.

B. Provide enough information on paper to make it easy to visualize your model and to build it.

C. Exchange plans with a partner and try to build each other's structures.

D. Check to see if your partner could build your structure. Did you provide enough information for your partner? What other information would help?

Cumulative Review

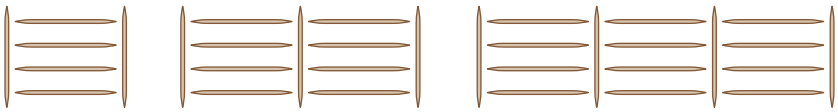
1. Students in a gym class were practising the standing long jump. Their best distances are recorded in centimetres:

185 205 221 186 185 212 222 215 198 200 205
207 193 186 172 208 225 170 206 215 228 230

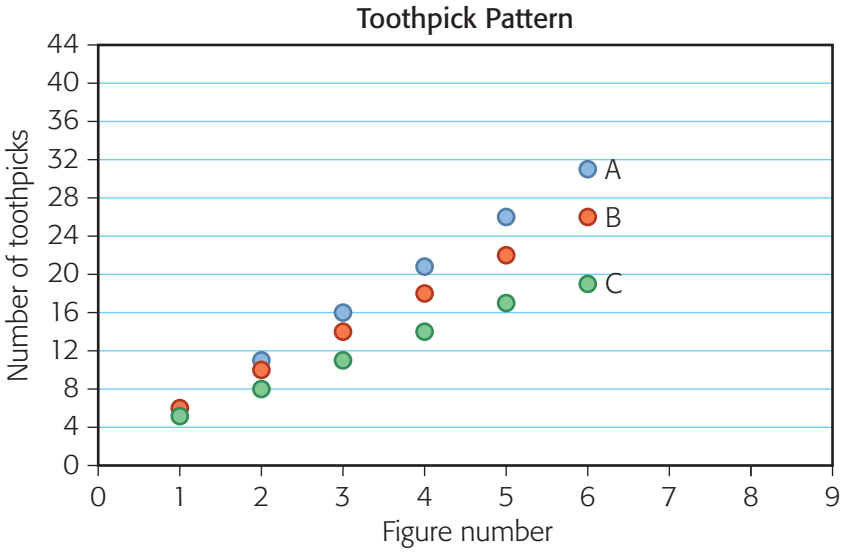
Which type of graph would best show the percentage of the class that jumped a distance of at least 190 m?

A. a bar graph
B. a line graph
C. a circle graph
D. any of the above are equally good.

2. Chad made the first three figures in a pattern using toothpicks.



The pattern rule he used was $n = 5f + 1$ where n represented the number of toothpicks he needed and f was the figure number. Which graph best represents the relation between the number of toothpicks and the figure number?



A. A
B. B
C. C
D. none of these

g	f
0	▲
1	−12
■	0

3. Determine the values for ■ and ▲ in the table of values for the relation $f = 3(g - 5)$.

A. ■ = 5, ▲ = 15 **C.** ■ = 5, ▲ = 0

B. ■ = 5, ▲ = −15 **D.** ■ = 0, ▲ = 0

4. A cart has a mass of 40 kg. Bags of flour are placed on the cart. Each bag has a mass of 5 kg. The total mass of the flour and the cart is 240 kg.

Which of the following equations could you solve to determine the number of bags of flour on the cart?

i) $240 = 5b + 40$ **ii)** $5b + 40 = 240$ **iii)** $5b = 240 - 40$

A. only equation i)

B. only equation ii)

C. only equation iii)

D. any of the equations

5. Which solution is correct?

A.

$15 = -5(a - 6)$

$15 = -5a - 30$

$45 = -5a$

$-9 = a$

C.

$15 = -5(a - 6)$

$3 = a - 6$

$9 = a$

B.

$15 = -5(a - 6)$

$15 = -5a + 30$

$-15 = -5a$

$3 = a$

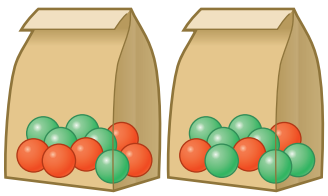
D.

$15 = -5(a - 6)$

$-3 = -a - 6$

$3 = -a$

$-3 = a$

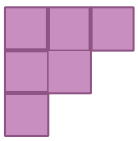


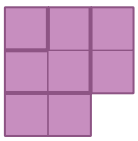
6. A paper bag contains 5 red balls and 5 green balls. Another bag contains 3 red balls and 7 green balls.

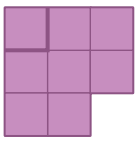
If you draw one ball from each bag, what is the probability that both will be red?

A. 15% **B.** 20% **C.** 40% **D.** 75%

7. Which is the top view of the cube structure?

A. 

B. 

C. 

D.