Brombacher & Associates

NumberSense Companion Workbook Grade 6

Sample Pages (ENGLISH)

Working in the NumberSense Companion Workbook

The NumberSense Companion Workbooks address measurement, spatial reasoning (geometry) and data handling.There are 4 NumberSense Companion Workbooks. With the publication of the NumberSense Companion Workbooks we complete the mathematics curriculum coverage for Grades 4 to 7 (one Companion Workbook per grade). It is our hope that the NumberSense Companion Workbooks will provide children with the same challenges and enjoyment that they get from the NumberSense Workbooks helping them to experience mathematics as a meaningful, sense-making, problem solving activity.

Please note that these sample pages include references from the Companion Workbook Teacher Guide – the actual workbook will not include the Teacher Guide pages. Teachers will be able to download the Teacher Guides, at no charge, from the NumberSense website. You will, however, need to register on the website to access these resources.

To gain optimal benefit from the workbook series it is critical that children are encouraged to reflect on the tasks that they complete. Teachers (and parents) should ask questions such as:

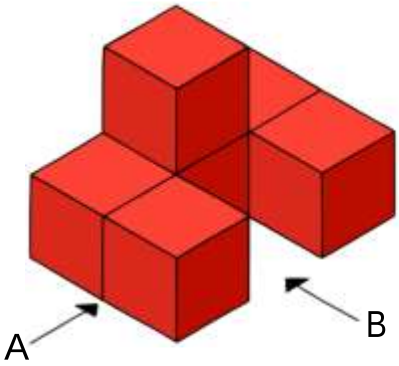
- Did you notice anything as you completed those activities?
- What helped you to answer the question?
- How is this activity similar to or different from activities that you have already completed?

Please mail info@numbersense.co.za for further assistance or information.

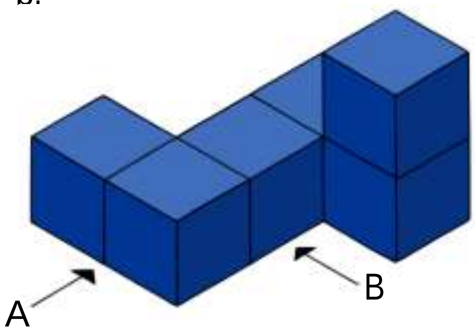
1. For each structure:

- Use cubes to make the structure, and write down how many cubes you used.
- Draw the view of the structure from position A. Use the grid to help you.
- Draw the view of the structure from position B. Use the grid to help you.
- Draw the top view of the structure. Use the grid to help you.

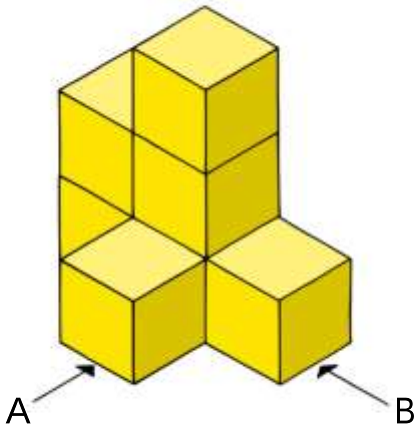
a.



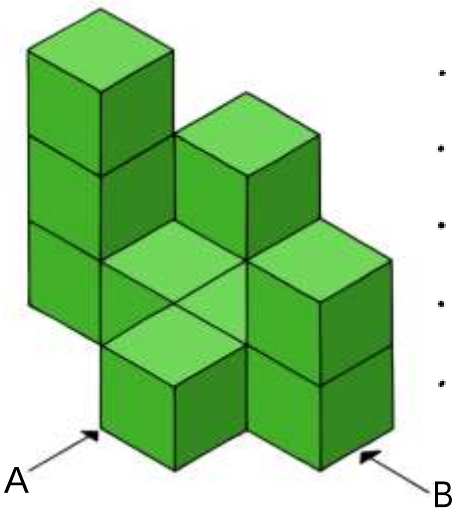
b.



c.



d.



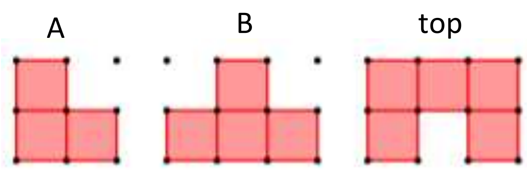
On this page, children describe and interpret sketches of objects seen from different positions.

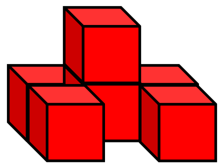
<u>Resources required:</u>

Foam cubes or connecting cubes

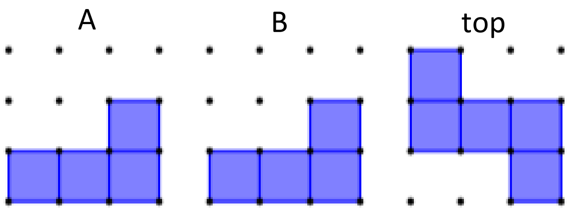
<u>Answers and discussion</u>

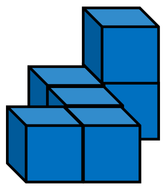
a. 6 cubes are used



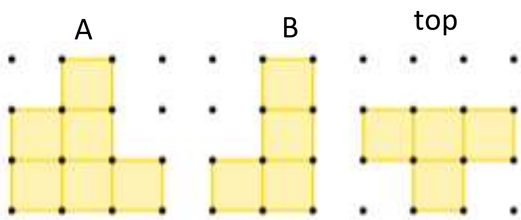


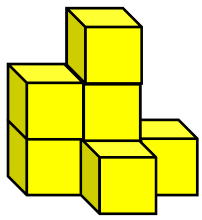
b. 6 cubes used



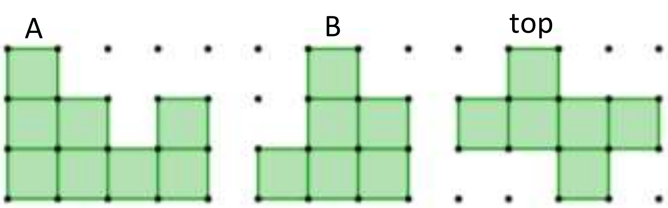


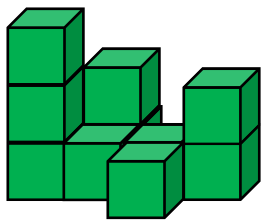
c. 7 cubes used





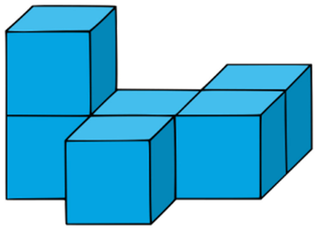
d. 10 cubes used





Surface area is the total area of all the faces of an object. Surface area is measured in square units.

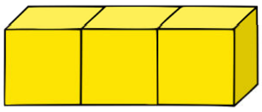
1. The object is made up of 1 cm by 1 cm by 1 cm cubes.

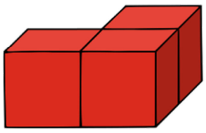


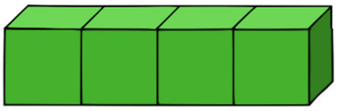
   a. Determine the volume of the object.

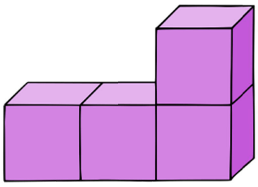
   b. Determine the surface area of the object.

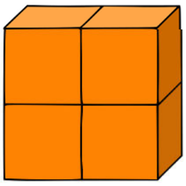
2. Determine the volume and the surface area of the objects and complete the table. There are no hidden cubes. Discuss with a friend.

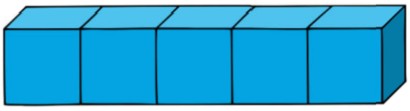
a. 

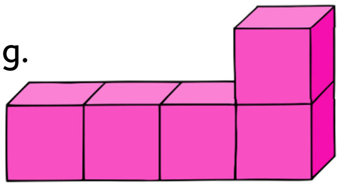
b. 

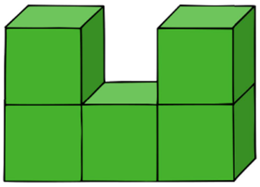
c. 

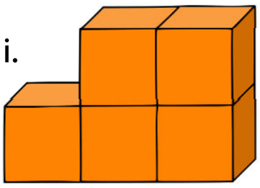
d. 

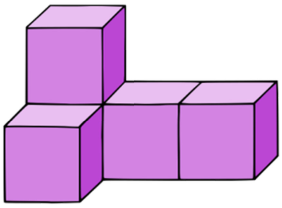
e. 

f. 

g. 

h. 

i. 

j. 

	Volume	Surface area
a.		
b.		
c.		
d.		
e.		
f.		
g.		
h.		
i.		
j.		

3. What do you notice about the volume and surface area of the objects? Discuss.

On this page, children investigate relationships between surface area, volume and the dimensions of rectangular prisms.

Suggested lesson activities

Children should use cubes to build objects and count the number of squares on the surface of the object. Allow opportunity for children to discuss their strategies. They may say for example, "On this face there are four squares so there will also be four squares on the opposite face." While children should be encouraged to count efficiently, teachers should not talk about formulae to determine surface area yet.

Children may argue that moving one cube from a straight row of cubes and positioning it above the row does not change the surface area because as you reveal one face you cover another. This is the type of discussion we would like children to start having.

At first children may think that objects with equal volumes will also have equal surface area. Object e. and i. provide counter-examples. Why? Children may notice that the tighter the cubes are packed the more faces are covered and the less the surface area.

Resources required:

Wooden or foam cubes or connecting blocks.

Answers and discussion

1. a. $6\ cm^3$

   b. $26\ cm^2$

2.

	Volume	Surface area
a.	$3\ cm^3$	$14\ cm^2$
b.	$3\ cm^3$	$14\ cm^2$
c.	$4\ cm^3$	$18\ cm^2$
d.	$4\ cm^3$	$18\ cm^2$
e.	$4\ cm^3$	$16\ cm^2$
f.	$5\ cm^3$	$22\ cm^2$
g.	$5\ cm^3$	$22\ cm^2$
h.	$5\ cm^3$	$22\ cm^2$
i.	$5\ cm^3$	$20\ cm^2$
j.	$5\ cm^3$	$22\ cm^2$

3. Objects with equal volumes do not necessarily have equal surface areas.
   The tighter cubes are packed, the more faces are covered and the less the surface area.

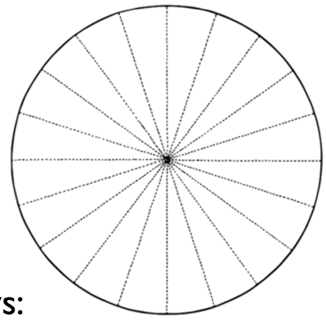
1. Research claims that left-handed people are better at playing computer games than right-handed people are. Dan and his friends played a computer game that ranked the players as Squire (okay), Knight (good) or King (excellent). They recorded their classification in a table. Study the results in the table.

	Squire	Knight	King
Right-handed	4	11	5
Left-handed	1	2	1

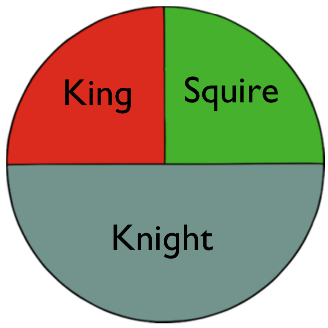
a. Were more of the Kings right-handed or left-handed? Does this support the claim that left-handed people are better at playing computer games than right-handed people are? Discuss.

b. What fraction of Dan's right-handed friends were Squires, Knights and Kings?

Right-handed players



Left-handed players

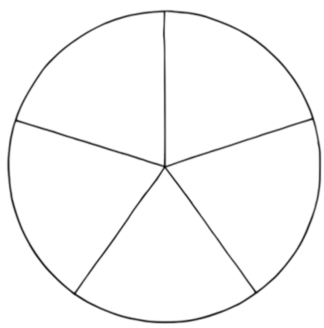


c. The circle is divided into twentieths. For the right-handed players colour the fraction of the segments that corresponds to the fraction of players in each category as follows: Squires = green; Knights = grey; and Kings = red. Label each set of segments appropriately.

2. Use the graphs to answer the question: Are Dan's right-handed friends or left-handed friends better at playing this computer game? Discuss.

We call what you have created a pie graph. Pie graphs display data as slices of a pie. Each slice represents a different data category. The size of each slice is in proportion to the amount of data in each category.

3. Redraw the pie chart for the left-handed players if one more left-handed King is included. What do you notice? Discuss.



On this page, children critically read and interpret data presented in pie graphs to draw conclusions and make predictions.

Suggested lesson activities

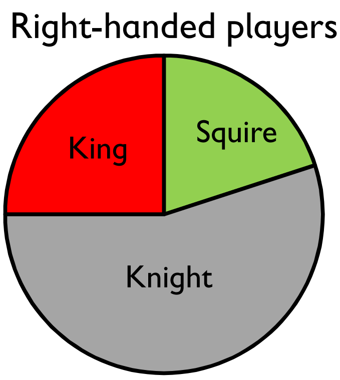
In this activity children start to compare data in terms of proportion and are introduced to pie graphs. It is important to bear in mind that we cannot draw conclusions from only 20 data points. The issue of whether or not left-handed people are better at computer games will be revisited in a future lesson.

Answers and discussion

1. a. More Kings were right-handed than left-handed. This does not mean that the claim is necessarily false for two reasons: (1) Dan collected data from 20 players – this is not enough to prove or disprove a claim and (2) even though the number of Kings that were right-handed exceeded the number of Kings that were left-handed, there were more right-handed players in the study. We need to consider the proportion of Kings out of the right-handed players and the proportion of Kings out of the left-handed players.

   b. Squires: $\frac{4}{20}$ or $\frac{1}{5}$; Knights: $\frac{11}{20}$ and Kings: $\frac{5}{20}$ or $\frac{1}{4}$

   c.



2. According to the graphs, the proportion of Kings is the same for Dan's right-handed and his left-handed friends. The proportion of Squires (which is the lowest rank) is higher in left-handed players which could indicate that amongst Dan's friends, the left-handed players are worse than the right-handed players. However, it is important to remember that there is not enough data to draw reliable conclusions.

3. Because the sample of left-handed players is so small, a single extra player in any category completely changes the shape of the graph and the conclusions that can be made.