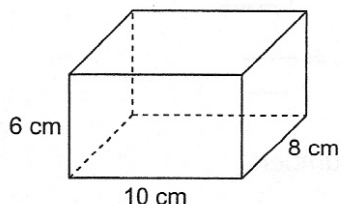# 1.3 Skill Builder

Surface Areas of Rectangular Prisms

The **surface area** of a rectangular prism is the sum of the areas of its 6 rectangular faces. Look for matching faces with the same areas.

The matching faces in each pair have the same area. We find the area of one face and multiply by 2.

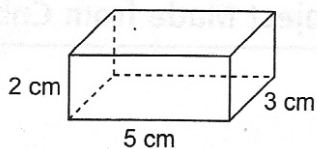For each rectangular face, area equals its length times its width.

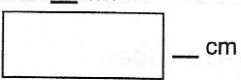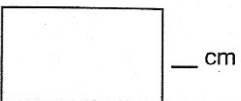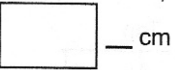| Matching Faces	Diagram	Corresponding Area (cm²)
		$2(10 \times 6) = 120$
		$2(10 \times 8) = 160$
		$2(8 \times 6) = 96$
Total		376

The surface area is 376 cm².

Check

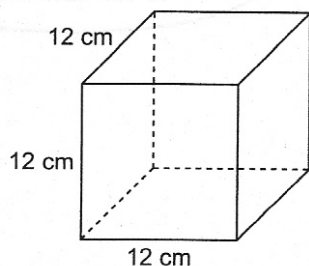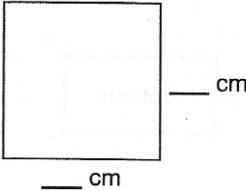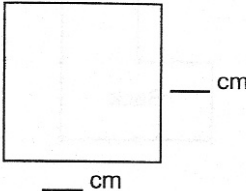**1.** Determine the surface area of each rectangular prism.

a)
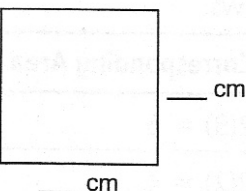
Matching Faces	Diagram	Corresponding Area (cm²)
Front Back	___ cm ___ cm	2(__ × __) = __
Top Bottom	___ cm ___ cm	2(__ × __) = __
Right Left	___ cm ___ cm	2(__ × __) = __
Total		___

The surface area is ___ cm².

b)

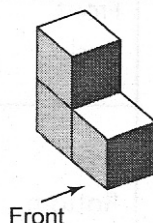| Matching Faces	Diagram	Corresponding Area (cm²)
Front Back	___ cm ___ cm	2(__ × __) = ___
Top Bottom	___ cm ___ cm	2(__ × __) = ___
Right Left	___ cm ___ cm	2(__ × __) = ___
Total		___

The surface area is ___ cm².

▶ 1.3 Surface Areas of Objects Made from Right Rectangular Prisms

Find the surface areas of objects made from rectangular prisms.

Example 1 | Finding the Surface Area of an Object Made from Cubes

Make this object with 1-cm cubes.
What is the surface area of the object?

Front

Solution

Think of tracing each face, or "opening" the object.

Top

Left side

Front

Right side
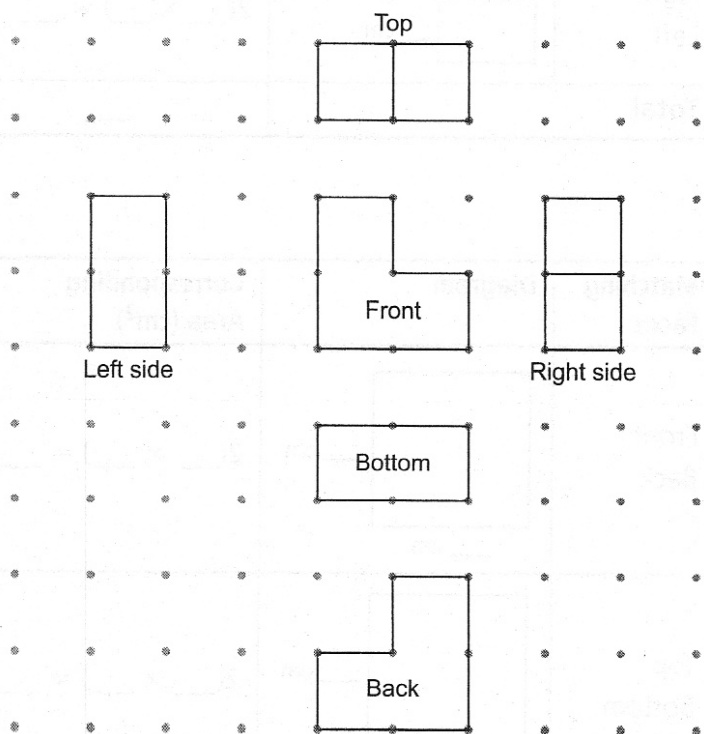
Bottom

Back

Turn the object to see each view.

Look for matching views.

Matching Views	Corresponding Area (cm²)
Front / Back	2(3) = 6
Top / Bottom	2(2) = 4
Right / Left	2(2) = 4
Total	14

The surface area is 14 cm².

Example 2 | Finding the Surface Area of a Composite Object

Find the surface area of this composite object.
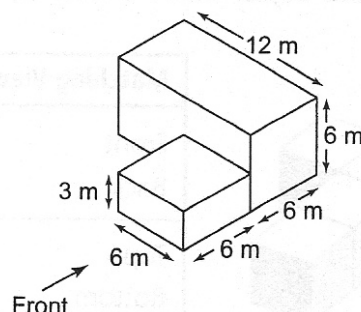
Solution

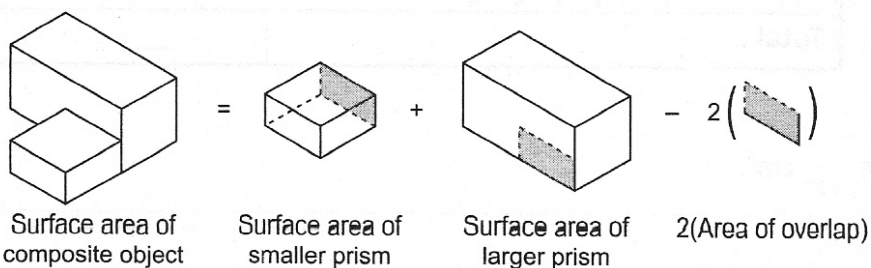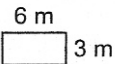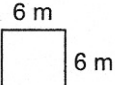
| Surface area of composite object | = | Surface area of smaller prism | + | Surface area of larger prism | − | 2(Area of overlap) |
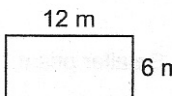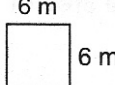
Surface area of smaller prism

Matching Faces	Diagram	Corresponding Area (m²)
Front Back Right Left	6 m, 3 m	$4(6 \times 3) = 72$
Top Bottom	6 m, 6 m	$2(6 \times 6) = 72$
Total		144
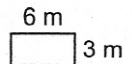
The surface area is 144 m².

Surface area of larger prism

Matching Faces	Diagram	Corresponding Area (m²)
Front Back Top Bottom	12 m, 6 m	$4(12 \times 6) = 288$
Right Left	6 m, 6 m	$2(6 \times 6) = 72$
Total		360

The surface area is 360 m².

Area of overlap

Diagram	Corresponding Area (m²)
6 m, 3 m	$6 \times 3 = 18$

The area of overlap is 18 m².

SA of composite object $= 144 + 360 - 2(18) = 468$
The surface area of the composite object is 468 m².

SA means surface area.

26

Check

1. Make this object with 1-cm cubes, then find its surface area.
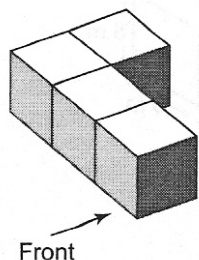
Matching Views	Diagram	Corresponding Area (cm²)
Front Back		2(___) = ___
Top Bottom		2(___) = ___
Right Left		2(___) = ___
Total		___

The surface area is ___ cm².

A **composite object** is made from 2 or more objects.

Composite object = Smaller prism + Larger prism
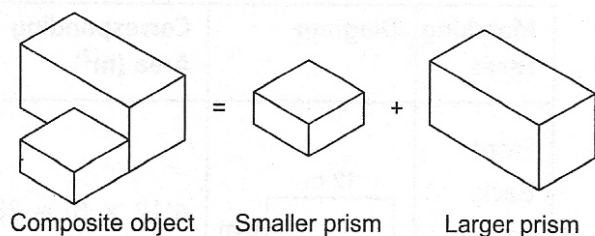
To find the surface area of a composite object, imagine dipping the object in paint. The surface area is the area of all the faces covered in paint.
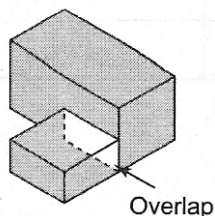
Overlap

Where objects overlap, there is a hidden surface. The paint doesn't reach the hidden surface.

The overlap is not painted, so it is not part of the surface area.

Check

1. The diagram shows the surface areas of the two prisms that make up a composite object.

SA = 40 cm²

SA = 70 cm²

3 cm

1 cm
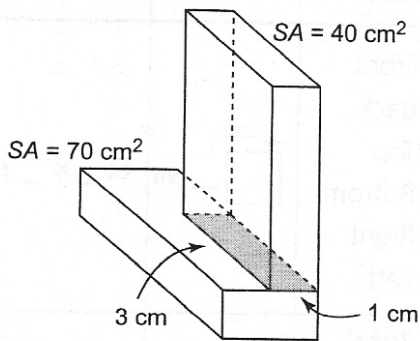
a) What is the area of the overlap?

The overlap is a _____-cm by _____-cm rectangle.

Area of overlap = _____ cm × _____ cm

= _____ cm²

b) What is the surface area of the composite object?
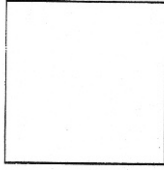
SA composite object = SA smaller prism + SA larger prism − 2(Area of overlap)

= _____ cm² + _____ cm² − 2(_____) cm²

= _____ cm²

2. Find the surface area of this composite object.

6 cm

6 cm

2 cm

2 cm

2 cm

6 cm
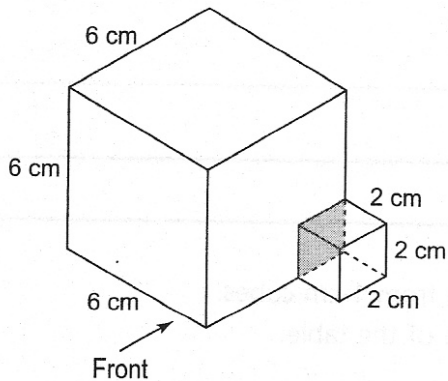
Front

A cube has _____ congruent faces.

Surface area of larger cube

Matching Faces	Diagram	Corresponding Area (cm²)
Front Back Top Bottom Right Left	__ cm __ cm	6(__ × __) = ____
Total		_____

The surface area is ____ cm².

Surface area of smaller cube

Matching Faces	Diagram	Corresponding Area (cm²)
Front Back Top Bottom Right Left	__ cm __ cm	6(__ × __) = ____
Total		_____

The surface area is ___ cm².

Area of overlap

| Diagram	Corresponding Area (cm²)
__ cm __ cm	__ × __ = __

The area of overlap is ___ cm².

SA composite object = SA larger cube + _____ − _____

= _____ + _____ − 2(__)

= _____ .

The surface area of the composite object is _____ cm².

Practice

1. The diagram shows the 6 views of an object made from 1-cm cubes.
Identify pairs of matching views in the first column of the table.
Then, find the surface area of the object.

Top   Front   Right   Left   Bottom   Back
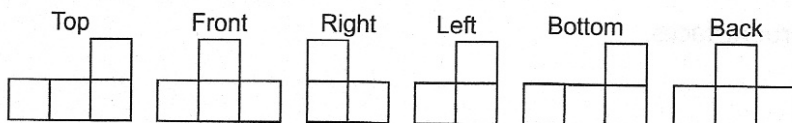
Matching Views	Corresponding Area (cm²)
Front / _____	_____
Top / _____	_____
Right / _____	_____
Total	_____

The surface area is ___ cm².

2. Each object is made with 1-cm cubes. Find the surface area of each object.

a)

Front

Matching Views	Diagram	Corresponding Area (cm²)
Front Back		2(__) = __
Top Bottom		2(__) = __
Right Left		2(__) = __
Total		__

The surface area is ___ cm².

b)

Front

Matching Views	Diagram	Corresponding Area (cm²)
Front Back		2(__) = __
Top Bottom		_____
Right Left		_____
Total		__

The surface area is ___ cm².

3. Find the surface area of this composite object.

10 m

10 m

5 m

5 m

20 m

15 m

Front

Surface area of larger prism

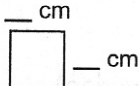| Matching Faces	Diagram	Corresponding Area (m²)
Front Back		2(___ × ___) = ___
Top Bottom		_____
Right Left		_____
Total		_____

The surface area is ____ m².

Surface area of smaller prism

Matching Faces	Diagram	Corresponding Area (m²)
Front Back		2(___ × ___) = ___
Top Bottom		_____
Right Left		_____
Total		_____

The surface area is ____ m².

Area of overlap

Diagram	Corresponding Area (m²)
	___ × ___ = ___

The area of overlap is ____ m².

Surface area of composite object

SA composite object = _____ + _____ − _____

= ___ + ___ − 2(___)

= ____

The surface area of the composite object is _____ m².

4. Find the surface area of this composite object.

30 cm   30 cm

30 cm

10 cm

20 cm   10 cm
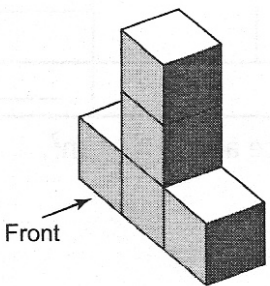
Front

Surface area of cube

Matching Faces	Diagram	Corresponding Area (cm²)
Front / Back Top / Bottom Right / Left	___ cm ___ cm	6(___ × ___) = _____
Total		_____

The surface area is _____ cm².

Surface area of rectangular prism

Matching Faces	Diagram	Corresponding Area (cm²)
Front / Back		2(___ × ___) = ___
Top / Bottom		_____
Right / Left		_____
Total		_____

The surface area is _____ cm².

Area of overlap

Diagram	Corresponding Area (cm²)
	___ × ___ = ___

The area of overlap is ____ cm².

Surface area of composite object

SA composite object = _____ + _____ − _____

= ____ + ____ − _____

= _____.

The surface area of the composite object is _____ cm².

3 ✓

5. A loading dock is attached to one wall of a warehouse. The exterior of the buildings is to be painted at a cost of $2.50/m². How much will it cost to paint the buildings?

Will the bottom of the warehouse and loading dock be painted? _____

30 m 20 m
Warehouse
20 m
Loading Dock
10 m
Front   30 m   20 m
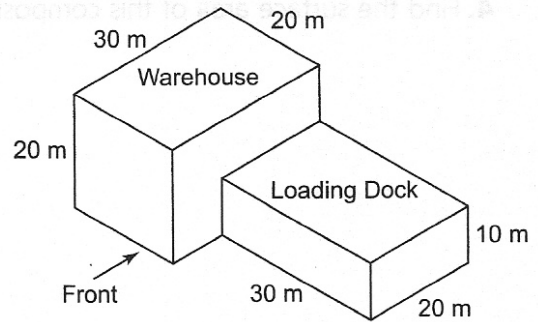
Surface area of warehouse to be painted

Matching Faces	Diagram	Corresponding Area (m²)
Front Back		2(___ × ___) = ___
Top Sides		3(___ × ___) = ___
Total		_____

The surface area of the warehouse to be painted is _____ m².

Area of overlap

Diagram	Corresponding Area (m²)
	___ × ___ = ___

The area of overlap is ____ m².

Surface area of composite object to be painted
____ + ____ − _____ = ____
The surface area of the composite object to be painted is _____ m².

So, the area to be painted is _____ m².
The cost per square metre is: $____
The cost to paint the buildings is: _____ × $____ = ____

Surface area of loading dock to be painted

Matching Faces	Diagram	Corresponding Area (m²)
Front Back		2(___ × ___) = ___
Top		___ × ___ = ___
Sides		2(___ × ___) = ___
Total		_____

The surface area of the loading dock to be painted is _____ m².