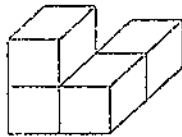Name: _____   Class: _____   Date: _____

# SURFACE AREA OF COMPOSITE SHAPES
UNIT TEST

Multiple Choice
Identify the choice that best completes the statement or answers the question.

**d** 1. This composite object is made using centimetre cubes. Determine its surface area.

a. 24 cm²   b. 20 cm²   c. ‹15 cm²   (d.) 18 cm²

d 2. This object is composed of two identical cubes joined by a right rectangular prism.
The edge length of each cube is 8 cm.
The rectangular prism is 9 cm long and has square ends of side length 3 cm.
Determine the surface area of the object.

8 cm

9 cm
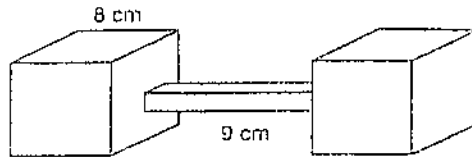
a. 660 cm²   b. 894 cm²   c. 876 cm²   (d.) 858 cm²

a 3. This object is made from 9 centimetre cubes. Determine its surface area.
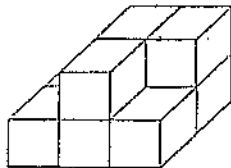
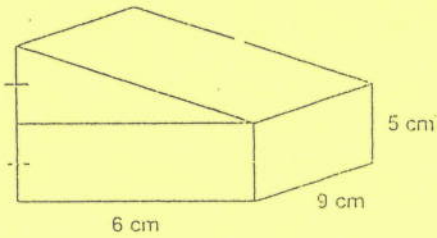(a.) 30 cm²   b. 28 cm²   c. 34 cm²   d. 54 cm²

4. The following 3-D object is composed of identical cubes. The volume of the 3-D object is 56 cm³.
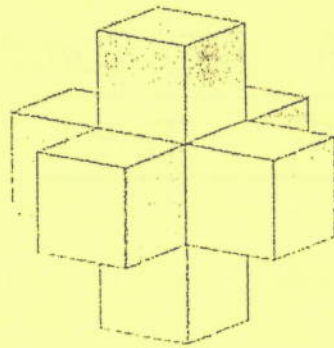
The surface area of the 3-D object above is

A.   30 cm²
B.   60 cm²
C.   120 cm²
D.   144 cm²

5. This object is composed of a right triangular prism on top of a right rectangular prism. Determine the surface area of the object.

5 cm

9 cm

6 cm

a.   351 cm²   b.   297 cm²   c.   207 cm²   d.   441 cm²
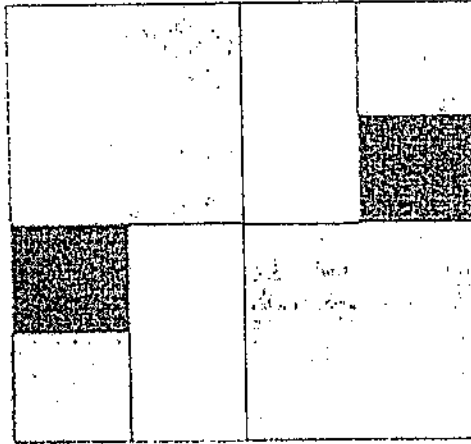
✱ Answer is 349 cm²

6. This object is composed of a cylinder of diameter 4 cm and height 14 cm on top of another cylinder of diameter 12 cm and height 4 cm.
Determine the surface area of the object, to the nearest square centimetre.

4 cm

14 cm

4 cm

12 cm
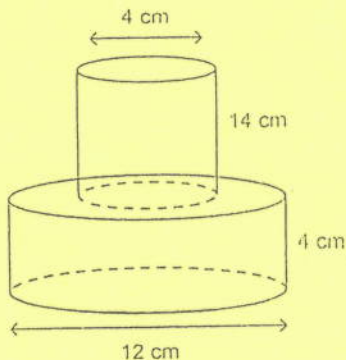
a.   440 cm²   b.   557 cm²   c.   561 cm²   d.   553 cm²

7.

The diagram shown below is a square and has a perimeter of 8 cm.

What is the total area of the white rectangles and the black squares?

Answer: __1.5__ cm²

8. Each layer of a two-layer cake is a right rectangular prism.
The bottom layer has a square base of side length 26 cm and height 8 cm.
The top layer has a square base of side length 18 cm and height 6 cm.
The surface of the cake is frosted. What area of the cake is frosted?

Answer: 1940cm²

* if didn't subtract bottom area
SA= 2616 cm²

9. A desk top is a rectangular prism with dimensions 106 cm by 50 cm by 2 cm. Each of 4 legs of the desk is a rectangular prism with dimensions 75 cm by 3 cm by 3 cm.
   a) Sketch the desk.
   b) Determine the surface area of the desk.

Answer: 14,824 cm²

10. Nick makes a doughnut with a flat top and a flat bottom. He plans to cover all surfaces of the doughnut with a sugar glaze. What is the surface area Nick must cover?

5 cm

10 cm

2 cm
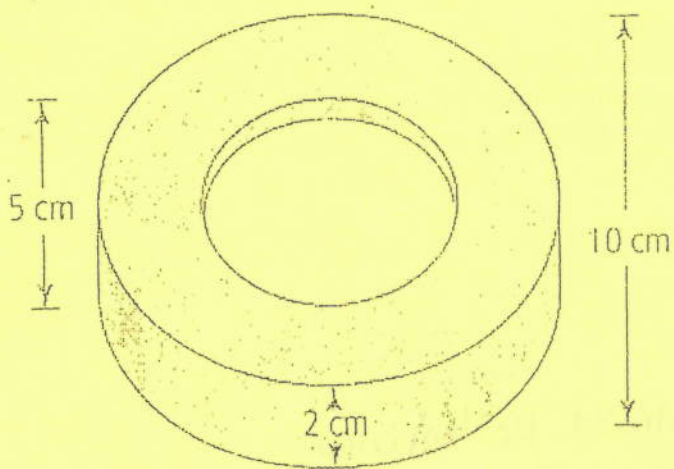
Answer: 211.95 cm²

SURFACE AREA UNIT TEST - SOLUTIONS.

1. Surface Area of 1 block $\rightarrow$ $1 \times 1 = 1 \times 6$ faces $= 6 cm^2$

There are 4 blocks $\rightarrow$ $6 cm^2 \times 4 = \underline{24 cm^2}$

Overlap: 3 spots $\times 2 = 6$ each with area of $1 \times 1 = 1 cm^2$
Total Overlap $= 6 \times 1 cm^2 = \underline{6 cm^2}$

Actual Surface Area $= 24 cm^2 - 6 cm^2 = \underline{\underline{18 cm^2}}$

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2. 3 shapes: 2 cubes (identical), 1 rectangular prism

Surface Area of 1 cube: $8 \times 8 = 64 \times 6$ faces $= \underline{384 cm^2}$
Surface Area of 2 cubes: $384 \times 2 = \underline{768 cm^2}$

Surface Area of Rectangular Prism $= 2(L \times W + L \times H + W \times H)$
$= 2(9 \times 3 + 9 \times 3 + 3 \times 3)$
$= 2(63)$
$= \underline{126 cm^2}$

Total SA $= \underline{894 cm^2}$

Overlap: 2 spots $\times 2 = 4$, each with area of $3 \times 3 = 9 cm^2$
Total Overlap $= 4 \times 9 cm^2 = \underline{36 cm^2}$

Actual Surface Area $= 894 cm^2 - 36 cm^2 = \underline{\underline{858 cm^2}}$

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3. Similar to question #1.   9 cubes, each with SA of $6 cm^2 = \underline{54 cm^2}$

Overlap: 12 spots $\times 2 = 24$, each area of $1 \times 1 = 1 cm^2$
Total Overlap $= 24 \times 1 cm^2 = \underline{24 cm^2}$

Actual SA $= 54 cm^2 - 24 cm^2 = \underline{\underline{30 cm^2}}$

$\boxed{4}$ Volume $= 56\,cm^3$ $\overset{7}{\cancel{\blacksquare}}$ cubes $\to$ $8\,cm^3$ each

$\ast$ Remember $V = S \times S \times S$

$8 = S \times S \times S \quad \to \quad S = 2\,cm$

because $2 \times 2 \times 2 = 8$

Therefore each cube is $2\,cm \times 2\,cm \times 2\,cm$.

Surface Area of 1 cube $= 2 \times 2 = 4\,cm^2 \times 6$ faces $= \underline{24\,cm^2}$

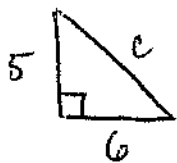$\cancel{\blacksquare}$ 7 cubes $\to$ $24 \times 7 = \underline{168\,cm^2}$

Overlap: 6 spots $\times 2 = 12$ each with area $2 \times 2 = \underline{4_{cm^2}}$

Total Overlap: $12 \times 4 = \underline{48\,cm^2}$

Actual SA $= 168\,cm^2 - 48\,cm^2 = \underline{\underline{120\,cm^2}}$

$\boxed{5}$ 2 shapes : Triangular Prism $\&$ Rectangular Prism

SA of Triangular Prism $=$ Area of all 5 faces

First, solve for missing side using Pythagorean Theorem.

$5^2 + 6^2 = 25 + 36 = 61 = c^2$

$c = \sqrt{61}$ or 7.81

SA of TP $=$ Tri 1 $\quad = 15\,cm^2$

Tri 2 $\quad = 15\,cm^2$

Rectangle 1 $= 54\,cm^2$

2 $= 45\,cm^2$

3 $= \underline{70.29\,cm^2}$

$199.29\,cm^2$

SA of RP

$= 2(5 \times 6 + 5 \times 9 + 6 \times 9)$

$= 2(129)$

$= \underline{258\,cm^2}$

Total $= \underline{457.29}$

Overlap: $6 \times 9 = 54$

$\underline{\quad \times 2}$

$108\,cm^2$

Actual SA $= 457.29 - 108$

$= \underline{\underline{349.29\,cm^2}}$

6 | 2 cylinders → 1 small, 1 large

$$SA_{small} = 2\pi r^2 + \pi d h$$
$$= 2(3.14)(2\times2) + (3.14)(4)(14)$$
$$= 25.12 \qquad + 175.84$$
$$= \underline{200.96 \text{ cm}^2}$$

$$SA_{large} = 2\pi r^2 + \pi d h$$
$$= 2(3.14)(6\times6) + (3.14)(12)(14)$$
$$= 226.08 \qquad + 150.72$$
$$= \underline{376.8 \text{ cm}^2}$$

Total: $200.96 + 376.8 = \underline{577.76 \text{ cm}^2}$

Overlap: The small circle
$$A = \pi r^2 = 3.14 \times 2\times2 = 12.56$$
$$\times 2$$
$$\overline{\underline{25.12 \text{ cm}^2}}$$

Actual $SA = 577.76 - 25.12$
$$= \underline{552.64 \text{ cm}^2}$$

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7 |
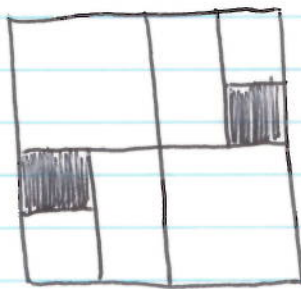
Perimeter = 8cm ⚡distance around

Therefore each side is:
8cm ÷ 4 sides = $\underline{2\text{cm}}$

If the side is 2cm
then half way is 1cm
and half of that is 0.5cm

Therefore [box] 0.5 / 1 & [shaded box] 0.5 / 0.5

$A = 2\times 0.5 = 1.0$
$2\times 0.25 = 0.5$

$\overline{\underline{1.5 \text{ cm}^2}}$

$A = 0.5 \times 1$
$= 0.5 \text{ cm}^2$

$A = 0.5 \times 0.5$
$= 0.25 \text{ cm}^2$

8 2 rectangular prisms

y small $SA = 2(18 \times 18 + 18 \times 6 + 18 \times 6)$
$= 2(324 + 108 + 108)$
$= 2(540)$
$= \underline{1080 \text{ cm}^2}$

2/Large   SA
$SA = 2(26 \times 26 + 26 \times 8 + 26 \times 8)$
$= 2(676 + 208 + 208)$
$= 2(1092)$
$= \underline{2184 \text{ cm}^2}$

Total: $1080 + 2184 = \underline{3264 \text{ cm}^2}$

Overlap: $18 \times 18 = 324$
$\underline{\times 2}$
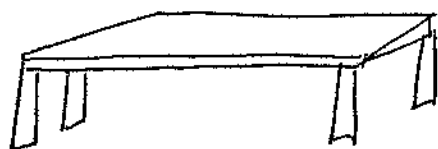$\underline{648 \text{ cm}^2}$

Actual $SA = 3264 - 648 = \underline{2616 \text{ cm}^2}$

$*$ Also correct if you subtracted the bottom, since you wouldn't frost it.

$*$ $2616 - (26 \times 26)$
$2616 - 676 = \underline{1940 \text{ cm}^2}$

9

1 Big Rectangular Prism
4 Rectangular Prism legs

SA of Table top $= 2(106 \times 50 + (106 \times 2 + 50 \times 2))$
$= 2(3612)$
$= \underline{11,224 \ cm^2}$

SA of 1 leg $= 2(75 \times 3 + 75 \times 3 + 3 \times 3)$
$= 2(459)$
$= 918$
$\underline{\times 4 \ legs}$
$\underline{3672 \ cm^2}$

Total: $11,224 + 3672 = \underline{14,896 \ cm^2}$

Overlap: Square → top of legs : $3 \times 3 = 9 \times 2 = 18$
$\underline{\times 4 \ legs}$
$\underline{72 \ cm^2}$

Actual SA $= 14,896 - 72$
$= \underline{\underline{14,824 \ cm^2}}$

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10 Surface Area of the donut is equal to the surface area of the entire cylinder shape, subtract the top circle and bottom circle, then add the inner ring around.

SA of donut $= 2\pi r^2 + \pi d h = 2(3.14)(5 \times 5) + (3.14)(10)($
$= 157 + 62.8$
$= \underline{219.8 \ cm^2}$

Area of top + bottom circles $= \pi r^2 = (3.14)(2.5 \times 2.5)$
$= 19.625 \times 2 \ circles$
$= \underline{39.25 \ cm^2}$

Area of inner ring $= \pi d h = 3.14 \times 2.5 \times 2 = \underline{31.4 \ cm^2}$

Actual SA $= 219.8 - 39.25 + 31.4 = \underline{\underline{211.95 \ cm^2}}$