# Curriculum Outcome

(N5) Determine the square root of positive rational numbers that are perfect squares.

(N6) Determine an approximate square root of positive rational numbers that are non-perfect squares.

(SS2) Determine the surface area of composite 3-D objects to solve problems

(N4) **Explain and apply the order of operations, including exponents, with and without technology.**

Class / Homework

- Review For Test

- Handout: Surface Area Worksheet

Questions: 1-6 2, 5, 6

answers were on the board

- Questions from Textbook:

page 45 - 46

#2(b, d, f, h)
#3(a,b,c,d,e)
#4(a,d)
#5 (a, c, e)
#6 (b,d)
# 7(ad)
# 12ac
#13ab
#15(bc)
#16(bc)
#19(a)

Page 31

# 10a Warehouse question

Test
Wednesday, Nov 28

Multiple choice: 14 pts
Square roots and perfect squares, and basic surface area

Short Answer: 36 pts
-estimating perfect squares
-Pythagorean theorem
-Surface area of composite shapes

# Area of square

The Area of a square is 124 $m^2$, what is the length of the side?

$A = b^2$

$\sqrt{124} = \sqrt{b^2}$

$11.1 = b$

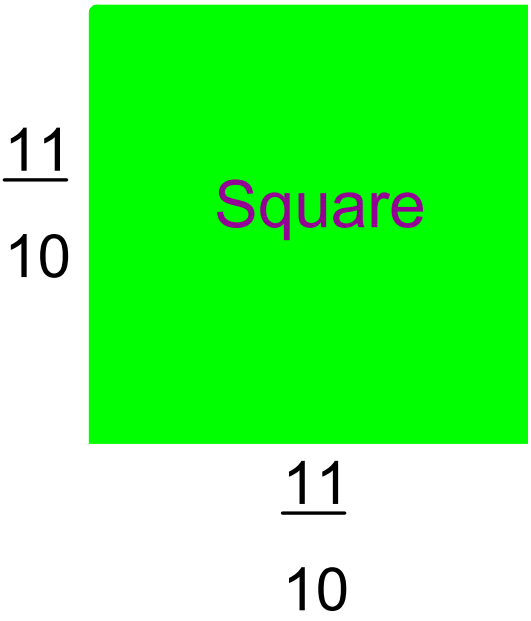
$P = 4(side)$

$= 4(11.1)$

$= 44.4$

What is the area of the following

# What is the area?




$A = b \times b$

$A = b^2$

$A = \left(\frac{11}{10}\right)^2$

$A = \frac{121}{100}$

What is the perimeter?

$P = 4(\text{side})$

$= \frac{4}{1}\left(\frac{11}{10}\right)$

$= \frac{44}{10}$

Area of square = $\frac{49}{81}$ $cm^2$

What is the length of the sides?

$x = \frac{7}{9}$

What it the perimeter of the square

$P = \frac{28}{9}$

# Warm Up Math 9

1) Find the perfect square whose square root is

a) 0.6

$\sqrt{x} = 0.6$

$x = 0.36$

b) $\frac{3}{5}$

$\sqrt{y} = \frac{3}{5}$

$y = \frac{9}{25}$

2) Is the following fractions or decimals perfect squares? Explain

a) 0.64

P.S

b) 62.5

N.P.S

c) $\frac{49}{144}$

P.S

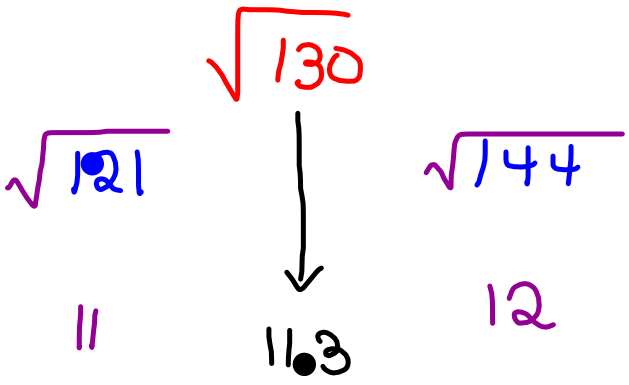
d) $\frac{13}{25}$

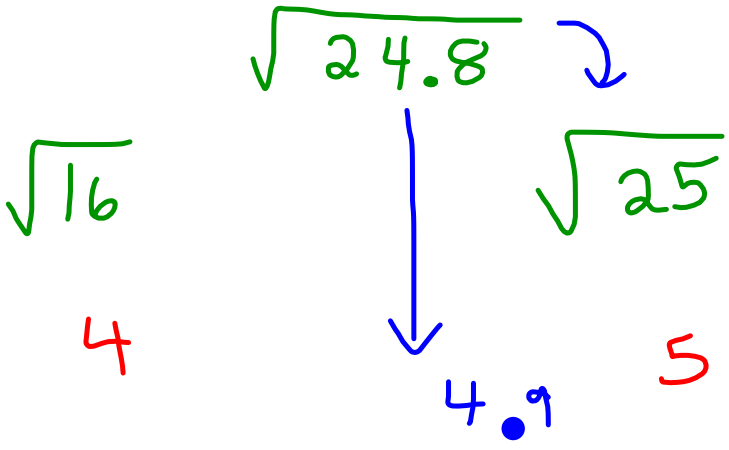
N.P.S

$\frac{72}{50} = \frac{36}{25}$

P.S

# Estimate the square root of 130



## To Determine if a Fraction is a Perfect Square

BOTH Numerator and Denominator MUST be Perfect Square Numbers

***Simplify fractions first ***

$$\sqrt{\frac{27\div 3}{45\div 3}} = \sqrt{\frac{9}{15}}$$

Is each fraction a perfect square? Explain

a) $\frac{18\div 2}{32\div 2} = \sqrt{\frac{9}{16}}$

b) $\frac{4}{3}$

c) $\frac{9}{25}$

## Identifying Decimals that are Perfect Squares

$1.44$

### Method 1

Write the decimal as a fraction

$$\frac{144}{100}$$

Simplify the fraction. Divide the numerator and denominator by 4.

$$1.44 = \frac{36}{25}$$

$$= \frac{6}{5} \text{ X } \frac{6}{5}$$

THUS 1.44 is a perfect square

### Method 2

Use a Calculator.

Use the square root button $\sqrt{\ }$

$$\sqrt{1.44} = 1.2$$

Since the sqaure root is a terminating decimal then 1.44 is a perfect square.

Without a calculator

# Determine if the decimal is a perfect square?

1.69

$\sqrt{\frac{169}{100}}$

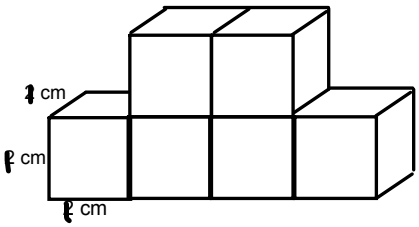
perfect square

0.016

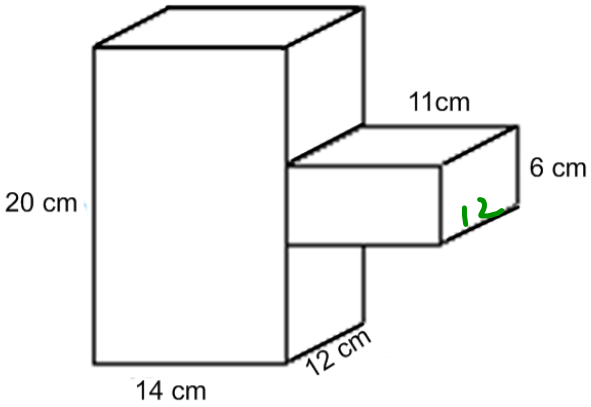
$\sqrt{\frac{16}{1000}}$

not perfect

Calculate the surface area of the following shape: (Show ALL WORK)



Calculate the total surface area of the following: (Show all work)

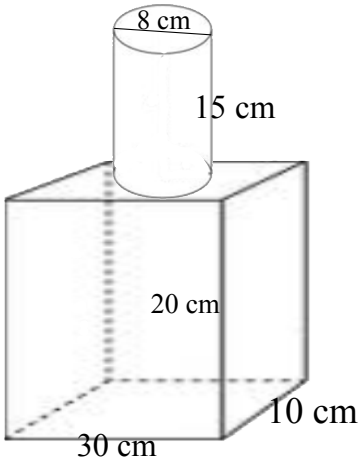



2 (20 x 14)

2 (14 x 12)

2 (12 x 20)

How much paint is needed to cover the following shape?




You try!!!

Overlap

$r = 4 \quad h = 15$

$SA = 2\pi r^2 + 2\pi r h$

**Cylinder**

Area of Cylinder = $2\pi r^2 + 2\pi rh$

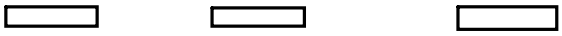
$= 2(3.14)(\_4\_)^2 + 2(3.14)(\_4\_)(\_15\_)$

$= 2(3.14)(\_16\_) + 2(3.14)(\_4\_)(15)$

$= 100.48 + 376.8$

$= 477.28$

**Rectangular Prism**



Top
A = 30 cm x 10 cm
= 300 $cm^2$
2A=600

A = 20 cm x 30 cm
= 600 $cm^2$
2 A=1200

A = 10 cm x 20 cm
= 200 $cm^2$
2A = 400

Total SA small = 2Top +2Side +2Front
= 600 $cm^2$ + 1200$cm^2$ + 400$cm^2$
= 2200$cm^2$

**Overlap Area** = $\pi r^2$

$= 3.14\ (4)^2$

$= 3.14\ (16)$

$= 50.24$ x2 = 100.48

Total Surface Area = cylinder + Prism - (Overlap area)

$= 477.28 + 2200\ cm^2 - 2(\ 50.24 cm^2\ )$

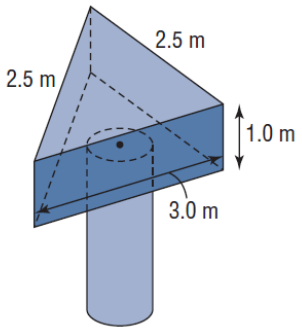
$= 477.28 + 2200\ cm^2 - 100.48\ cm^2$

$= 2677.28\ cm^2 - 100.48\ cm^2$

$= 2576.8\ cm^2$

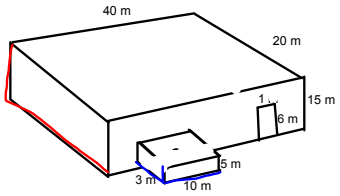
**5.** Determine the surface area of each composite object.

a) The cylinder is 2.5 m long with radius 0.5 m.



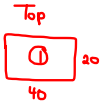
Find the area of the warehouse with the attached storage space.

(Think if you were going to paint this....How much paint is needed???)




Step 1) Calculate the sides of all of the larger prism, (40m x 20m x 15m)

Top




$A_1 = b \times h$

$A_1 = 40 \times 20$

$A_1 = 800\ m^2$

left / Right


$A_2 = b \times h$

$A_2 = 20 \times 15$

$A_2 = 300\ m^2$

$2A_2 = 600\ m^2$

Front / back


$A_3 = b \times h$

$A_3 = 40 \times 15$

$A_3 = 600\ m^2$

$2A_3 = 1200\ m^2$

So surface area of the storage space is:

$$SA_1 = A_1 + 2A_2 + 2A_3$$
$$= 800 + 600 + 1200$$
$$= 2600\ m^2$$

Step 2) Storage space consist of 3 walls and a roof (3m x 10m x 5m)

Top


$A_1 = B \times h$

$A_1 = 10 \times 3$

$A = 30\ m^2$

left/Right


$A_2 = b \times h$

$A_2 = 3 \times 5$

$A_2 = 15\ m^2$

$2A_2 = 30\ m^2$

Front/back


$A_3 = b \times h$

$A = 10 \times 5$

$A = 50\ m^2$

$2A_3 = 100\ m^2$

So surface area of the storage space is:

$$SA = A_1 + 2A_2 + 2A_3$$
$$= 30 + 30 + 100$$
$$= 160\ m^2$$

Overlap


$A = 50\ m^2$

$2A = 100\ m^2$

door


$A = 1m \times 6m$

$A = 6m^2$

$$TSA = SA_1 + SA_2 - overlap - door$$
$$= 2600 + 160 - 100 - 6$$
$$= 2654\ m^2$$

**MATH 9 SKILLS CHECKLIST** **NAME:**_____

***UNIT 3 – SQUARE ROOTS AND SURFACE AREA***

**GENERAL CURRICULUM OUTCOMES (GCOs):**

**(i) Number (N) – Develop number sense.**
**(ii) Shape and Space (SS) – Describe 3-D objects and 2-D shapes, and analyze the relationships.**

**SPECIFIC CURRICULUM OUTCOMES (SCOs): N4, N5, N6 and SS2**

_____ **1. (N4) Explain and apply the order of operations, including exponents, with and without technology.**

**ACHIEVEMENT INDICATORS:**

_____ **Solve a given problem by applying the order of operations without the use of technology.**

Ex.: Determine the square root of 6.25: $\sqrt{6.25}$

$= \sqrt{\frac{625}{100}}$

$= \sqrt{\frac{25}{4}}$

$= \frac{5}{2}$

_____ **Solve a given problem by applying the order of operations with the use of technology.**

(In other words, for square roots and surface area, know where YOUR square root and pi ($\pi$) buttons are on YOUR calculator so you can solve problems efficiently and accurately.)

_____ **Identify the error(s) in applying the order of operations in a given incorrect solution.**

Ex.: $\sqrt{0.0036}$

$=$ 0.006 [This means $\sqrt{\frac{36}{10000}}$ which is equal to $\frac{6}{100}$ or **0.06**.]

___ **2. (N5) Determine the square root of positive rational numbers that are perfect squares.**

**ACHIEVEMENT INDICATORS:**

_____ **Determine whether or not a given rational number is a square number and explain the reasoning.**

Ex.: If a dance floor has an area of $256m^2$, could the dance floor be a square?

$\sqrt{256}$

$= 16$ ; yes, the dance floor could be a square because 256 is the result of 16 x 16 making 256 a square number.

_____ **Determine the square root of a given positive rational number that is a perfect square.**

Ex.: $\sqrt{0.0036}$

$= \sqrt{\frac{36}{10000}}$

$= \frac{6}{100}$

$= 0.06$ ; 0.0036 is a perfect square because it is the result of 0.06 x 0.06.

_____ **Identify the error made in a given calculation of a square root.**

Ex.; $\sqrt{0.64}$

$= 0.08$ [This means $\sqrt{\frac{64}{100}}$ which is equal to $\frac{8}{10}$ or **0.8**, not 0.08.]

_____ **Determine a positive rational number given the square root of that positive rational number.**

Ex.: Calculate the number whose square root is 0.5.

$0.5(0.5)$

$= \frac{5}{10}\left(\frac{5}{10}\right)$

$= \frac{25}{100}$

$= 0.25$ So, $\sqrt{0.25} = 0.5$; therefore, the number whose square root is 0.5 is **0.25**.

_____ **3. (N6) Determine an approximate square root of positive rational numbers that are non-perfect squares.**

**ACHIEVEMENT INDICATORS:**

_____ **Estimate the square root of a given rational number that is not a perfect square using the roots of perfect squares as benchmarks.**

Ex.: Use benchmarks to estimate the square root of 7.5.

$\sqrt{4}$ $\sqrt{5}$ $\sqrt{6}$ $\downarrow$ $\sqrt{7}$ $\sqrt{7.5}$ $\sqrt{8}$ $\sqrt{9}$
$= 2$ $2.5$ $\doteq 2.7$ $= 3$

The closest perfect squares to 7.5 are 4 and 9. 7.5 is closer to 9 than to 4, so $\sqrt{7.5}$ is closer to 3 than to 2. An approximate value for $\sqrt{7.5}$ is **2.7**.

_____ **Determine an approximate square root of a given rational number that is not a perfect square using technology (e.g., calculator, computer).**

_____ **Explain why the square root of a given rational number as shown on a calculator may be an approximation.**

Ex.: Paul found the square root of 7.5 to be **exactly** 2.738612788. Is he correct?

**No**; $(2.738612788)^2 = 7.500000003$

_____ **Identify a number with a square root that is between two given numbers.**

Ex.: Find a number that has a square root between 3 and 4.

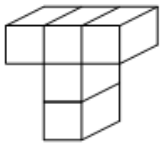
The number with a square root of 3 is 9.
The number with a square root of 4 is 16.
This means that any number between 9 and 16 has a square root between 3 and 4; therefore, $\sqrt{10}$, for example, is between 3 and 4. [$\sqrt{10} \doteq 3.2$ ]

_____ **4. (SS2) Determine the surface area of composite 3-D objects to solve problems.**

**ACHIEVEMENT INDICATORS:**

_____ **Determine the area of overlap in a given concrete, composite 3-D object, and explain its effect on determining the surface area (limited to right cylinders, right rectangular prisms and right triangular prisms).**

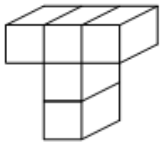
Ex.: This composite 3-D object is made using centimetre cubes. How many overlaps are there? How will they affect the total surface area of the object?



There are **4 overlaps** here. We **remove 2 sides per overlap from the total surface area** of the object. A total of **8 cm$^2$ must be subtracted from the total** surface area of this object.

_____ **Determine the surface area of a given concrete, composite 3-D object (limited to right cylinders, right rectangular prisms and right triangular prisms).**

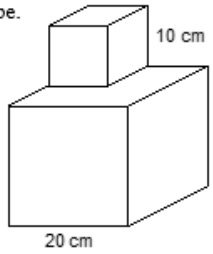
Ex.: This composite object is made using centimetre cubes. What is its total surface area?



S.A. = (5 cubes x 6 faces per cube) – (4 overlaps x 2 faces/overlap)
= 30 – 8
= 22 cm$^2$

_____ **Solve a given problem involving surface area.**

Ex.: This composite 3-D object is made of a 10-cm cube on top of a 20-cm cube. Determine its surface area.




S.A. = 4bh + 6bh
= 4(10)(10) + 6(20)(20)
= 400 + 2400
= 2800 cm$^2$

**VOCABULARY:**

| | | |
|---|---|---|
| _____ perfect square | _____ perimeter | _____ Pythagorean Theorem ($a^2 + b^2 = c^2$) |
| _____ non-perfect square | _____ right rectangular prism (bh) | _____ right cylinder ($2\pi r^2 + 2\pi rh$) |
| _____ square root | _____ cube (bh) | _____ composite object |
| _____ benchmarks | _____ right triangular prism $\left(\frac{bh}{2}\right)$ | _____ overlap |
| _____ surface area | | |

Cylinder:

Name: _____ Class: _____ Date: _____ ID: A

# Chapter 1 Test Review

**Multiple Choice**

*Identify the choice that best completes the statement or answers the question.*

1. Determine the value of $\sqrt{2.56}$.
   a. 0.64
   b. 1.6
   c. 0.16
   d. 0.8

2. Calculate the number whose square root is 8.1.
   a. 32.4
   b. 65.61
   c. 0.9
   d. 81

3. Which decimal has a square root between 15 and 16?
   i) 272.3
   ii) 196
   iii) 15.5
   iv) 233.5
   a. iv
   b. i
   c. ii
   d. iii

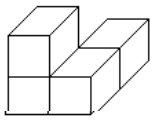
4. Which fraction has a square root between 3 and 4?
   i) $\frac{61}{7}$
   ii) $\frac{42}{5}$
   iii) $\frac{53}{5}$
   iv) $\frac{60}{7}$
   a. i
   b. iv
   c. ii
   d. iii

5. Estimate the value of $\sqrt{0.95}$, to the nearest tenth.
   a. 0.9
   b. 0.97
   c. 1.0
   d. 0.3

6. A square has an area of 27.8 $cm^2$.
   Determine the side length of the square, to the nearest millimetre.
   a. 5.27 cm
   b. 5 cm
   c. 5.2 cm
   d. 5.3 cm

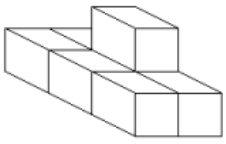
7. The lengths of the two legs of a right triangle are 6.5 cm and 3.2 cm.
   Determine the length of the hypotenuse to 1 decimal place.
   a. 3.1 cm
   b. 7.2 cm
   c. 5.7 cm
   d. 52.5 cm

8. This composite object is made using centimetre cubes. Determine its surface area.



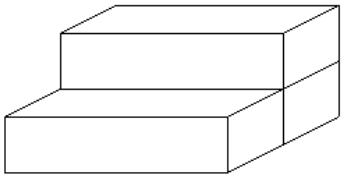
   a. 24 $cm^2$
   b. 20 $cm^2$
   c. 15 $cm^2$
   d. 18 $cm^2$

9. This object is made from 7 centimetre cubes. Determine its surface area.



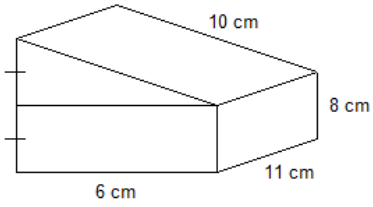
   a. 20 $cm^2$
   b. 28 $cm^2$
   c. 42 $cm^2$
   d. 26 $cm^2$

10. This object is made from 3 identical right rectangular prisms.
Each prism is 65 cm long and has square ends of side length 20 cm.
What is the surface area of the object?



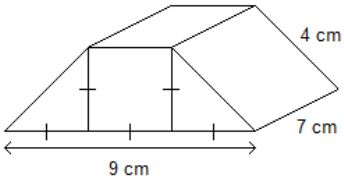
a. 10 200 $cm^2$
b. 18 000 $cm^2$
c. 12 800 $cm^2$
d. 11 600 $cm^2$

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



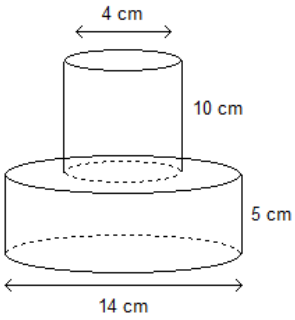

a. 342 $cm^2$
b. 584 $cm^2$
c. 728 $cm^2$
d. 518 $cm^2$

12. This object is composed of two right triangular prisms and a right rectangular prism.
Determine the surface area of the object.



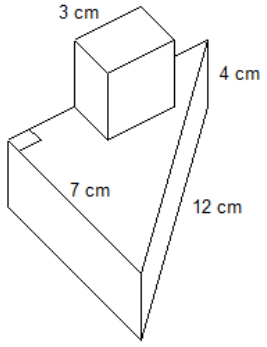

a. 176 $cm^2$
b. 113 $cm^2$
c. 158 $cm^2$
d. 212 $cm^2$

13. This object is composed of a cylinder of diameter 4 cm and height 10 cm on top of another cylinder of diameter 14 cm and height 5 cm.
Determine the surface area of the object, to the nearest square centimetre.




a. 500 $cm^2$
b. 657 $cm^2$
c. 661 $cm^2$
d. 653 $cm^2$

14. A 3-cm cube is attached to the top of a right triangular prism as shown.
Determine the surface area of the composite object, to the nearest square centimetre.




a. 219 $cm^2$
b. 185 $cm^2$
c. 228 $cm^2$
d. 210 $cm^2$

15. Determine the value of $\sqrt{0.25}$.
a. 0.05
b. 0.125
c. 0.5
d. 0.0625

16. Which numbers are perfect squares?
i) 42.25
ii) 32
iii) 28.9
iv) 3.24
a. i and ii
b. i and iv
c. ii and iii
d. i and iii

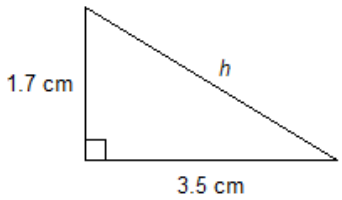
17. Determine the value of $\sqrt{\frac{50}{72}}$.
a. $\frac{5}{6}$
b. $\frac{5}{12}$
c. $\frac{25}{36}$
d. $\frac{10}{6}$

**Short Answer**

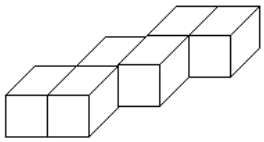
18. Determine the value of $\sqrt{2.89}$.

19. Determine the value of $\sqrt{\frac{289}{361}}$.

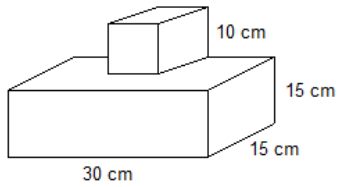
20. Determine the value of $\sqrt{0.27}$, to the nearest tenth.



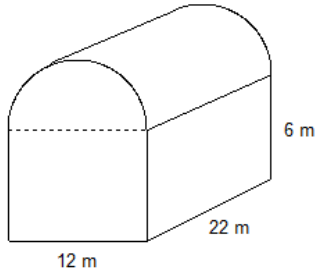

22. This composite object is made using centimetre cubes. Determine its surface area.



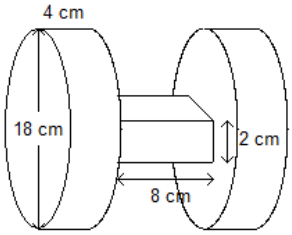
23. This object is composed of a cube on top of a right rectangular prism.
Determine the surface area of the object.




24. A barn is built in the shape of a right rectangular prism with a semi-circular roof.
Determine the surface area of the barn. Give your answer to the nearest whole number.




25. This object is composed of two identical cylinders connected by a right rectangular prism.
Each cylinder has diameter 18 cm and height 4 cm.
The rectangular prism has length 8 cm and square ends of side length 2 cm.
Determine the surface area of the object. Give your answer to the nearest whole number.




**Problem**

26. Determine the value of $\sqrt{\dfrac{\sqrt{81}+\sqrt{49}}{\sqrt{196}-\sqrt{100}}}$.