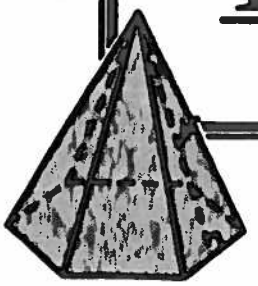
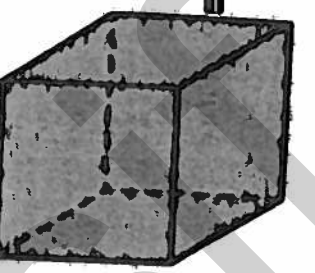
NAME: Solution Key DATE: _____

TOTAL SURFACE AREA





LATERAL AREA OF A SOLID:

the area around a solid, excluding BASES.

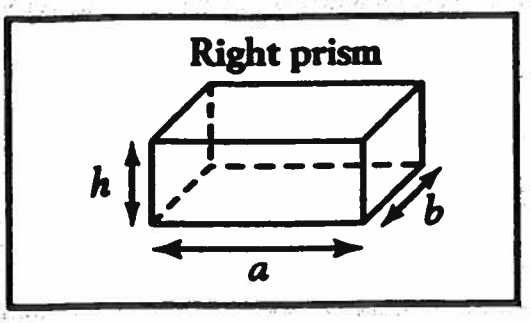
SURFACE AREA OF A SOLID:

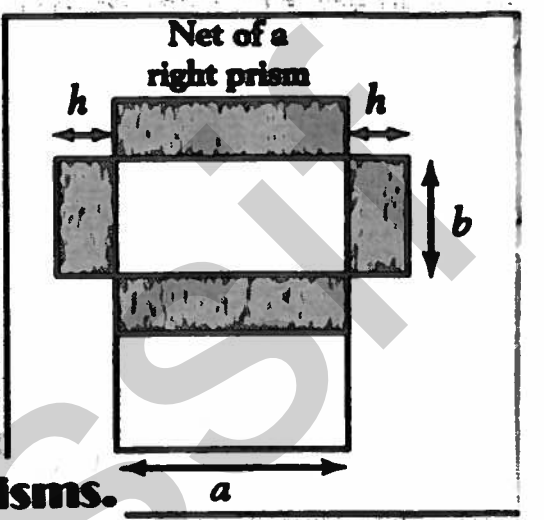
the area of all surfaces including BASES.

Area of Regular Shapes

- CUBES
- PRISMS
- CYLINDERS
- PYRAMIDS
- CONES
- SPHERES

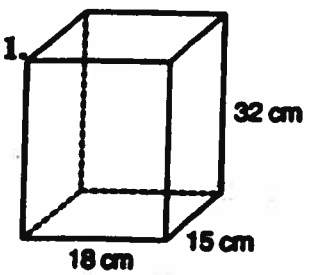
Surface Area of Prisms





Calculate the area of the following prisms.

1.

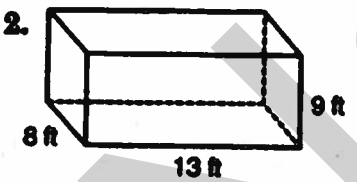


$A_T = 2A_B + A_L$

$2(270) + 66(32)$

$2652\ cm^2$

2.

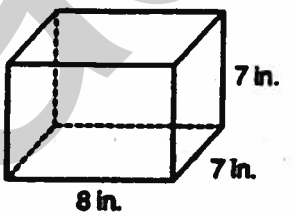


$A_T = 2(L \times W) + P_B \times h$

$= 2(13 \times 8) + 42(9)$

$586\ ft^2$

3.

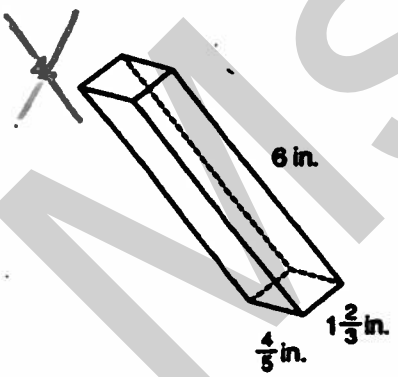


$A_T = 2(L \times W) + P_B \times h$

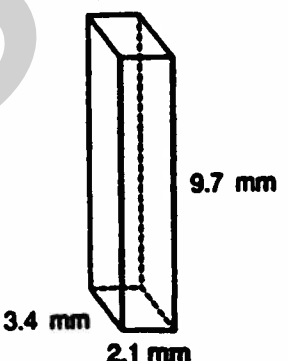
$2(8 \times 7) + 30 \times 7$

$322\ in^2$

4.



5.

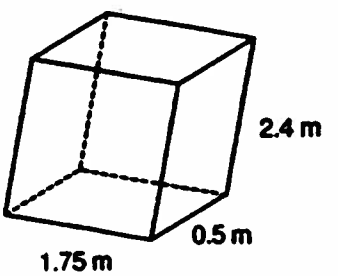


$A_T = 2(L \times W) + P_B \times h$

$= 2(3.4 \times 2.1) + 11(9.7)$

$120.98\ mm^2$

6.

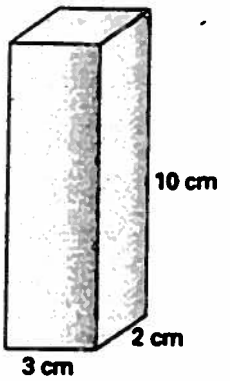


$A_T = 2(L \times W) + P_B \times h$

$= 2(1.75 \times 0.5) + 4.5(2.4)$

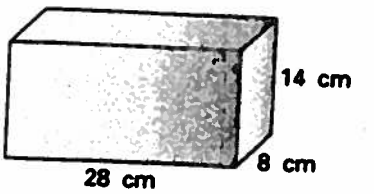
$12.55\ m^2$

7 Determine the surface area of each of the following right prisms.



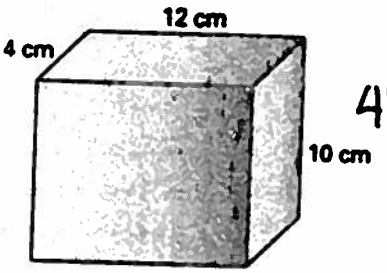
112 cm²

8



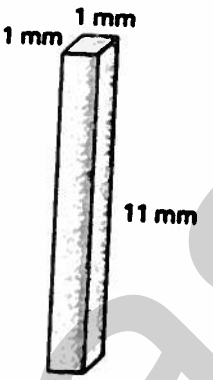
1456 cm²

9



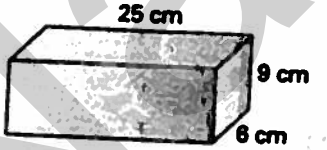
416 cm²

10



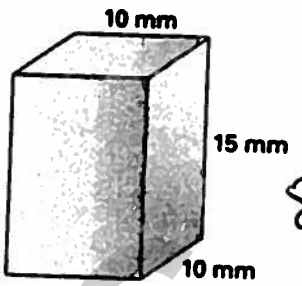
46 mm²

12.



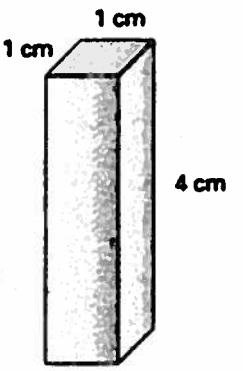
858 cm²

11.



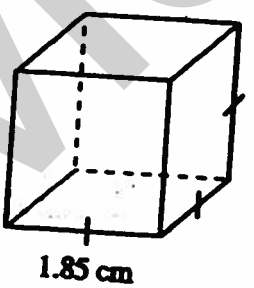
800 mm²

13.



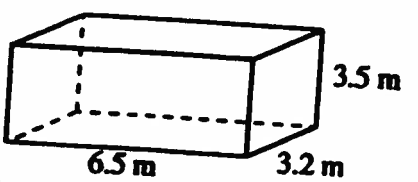
18 cm²

14



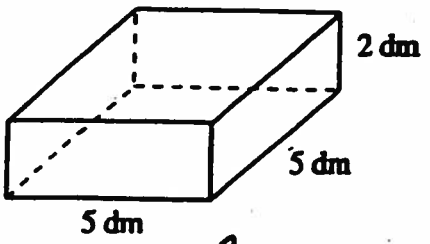
20.52 cm²

15.



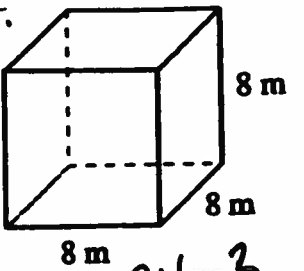
109.5 m²

16.



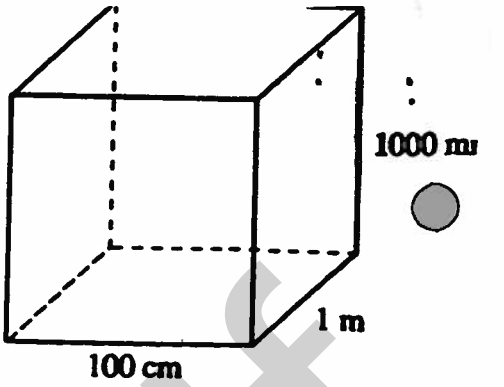
90 dm^2

17.

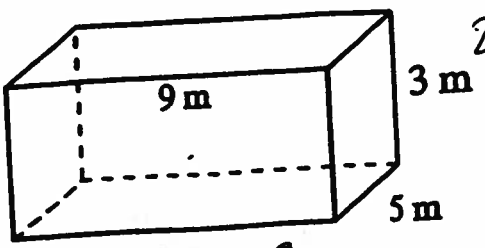


384 m^2

18.

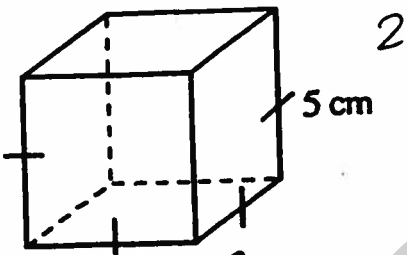


19.



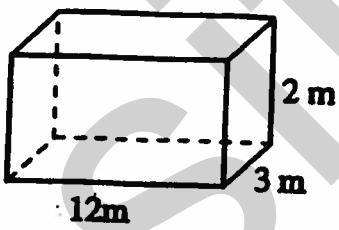
174 m^2

20.



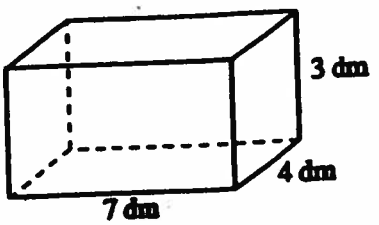
150 cm^2

21.



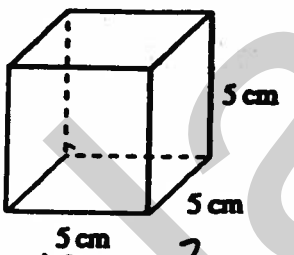
132 m^2

22.



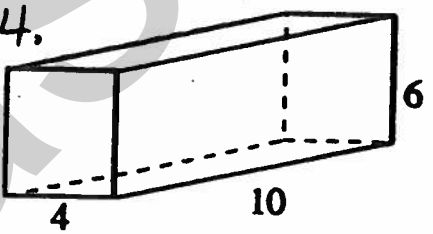
122 dm^2

23.



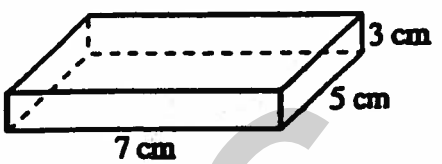
150 cm^2

24.



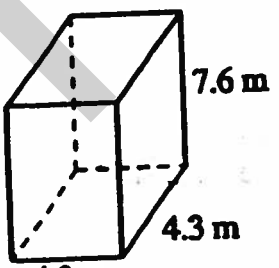
248 u^2

25.



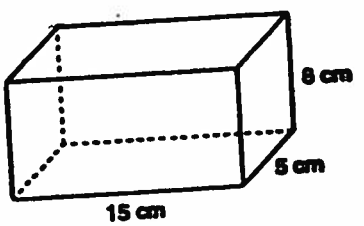
142 cm^2

26.



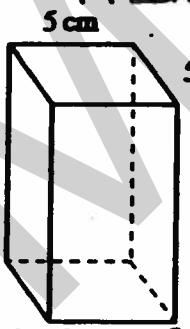
165.32 m^2

27.



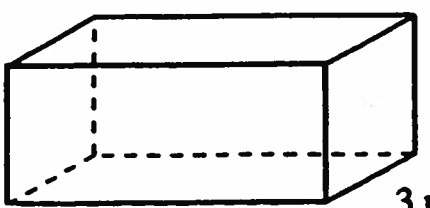
470 cm^2

28.



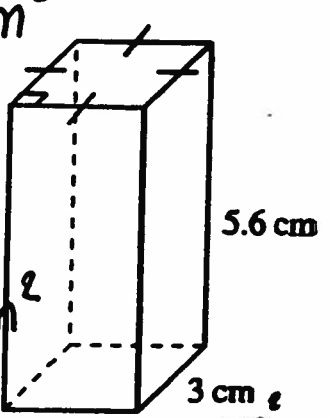
290 cm^2

29.



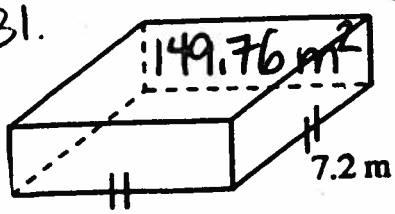
158 m^2

30.

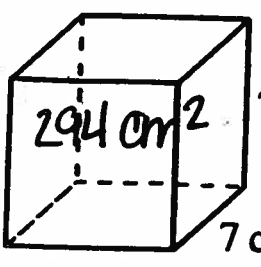


85.2 cm^2

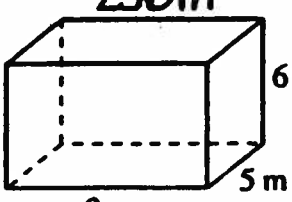
31.



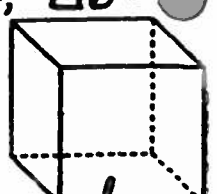
32.



33. 236 m^2



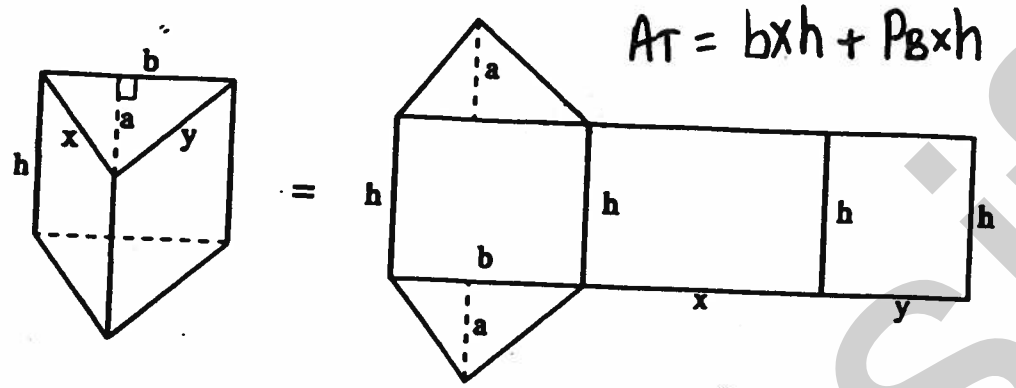
34. 216 cm^2

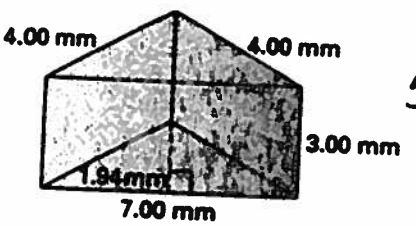


SURFACE AREA OF TRIANGULAR PRISMS.

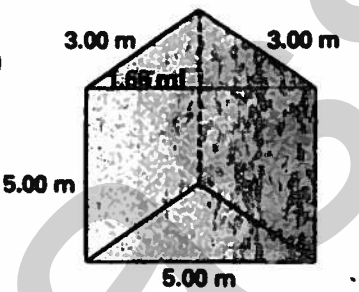
Find the surface area of the following figures.

$A_T = b \times h + P_B \times h$

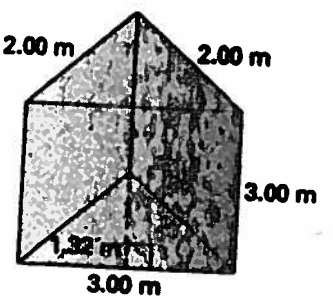


1) 

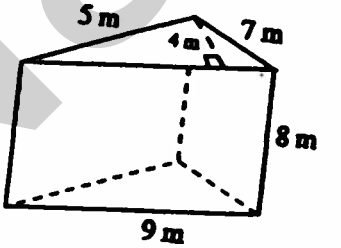
$58.58\ mm^2$

2) 

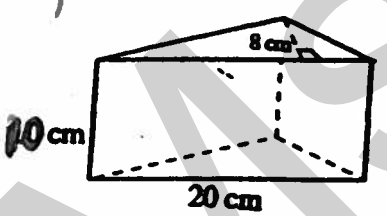
$63.3m^2$

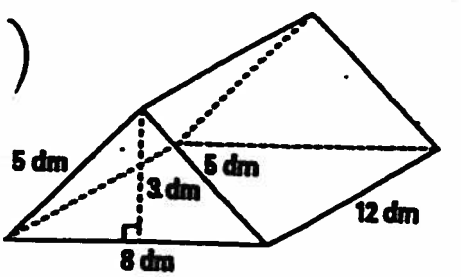
3) 

$24.96cm^2$

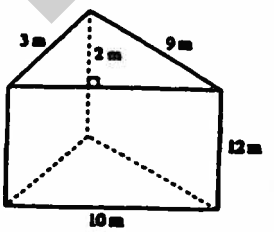
4) 

$204m^2$

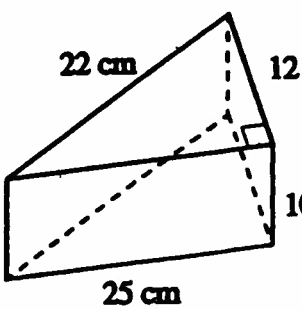
5) 

6) 

$240\ dm^2$

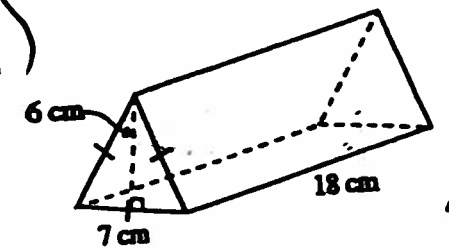
7) 

$284\ m^2$

8) 

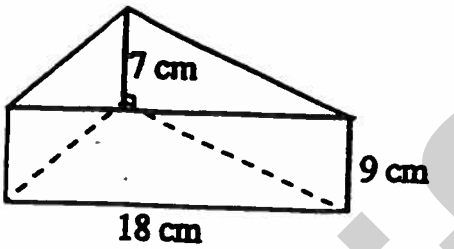
$890\ cm^2$

9)

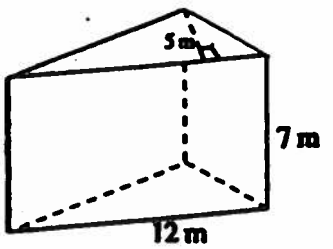


420cm²

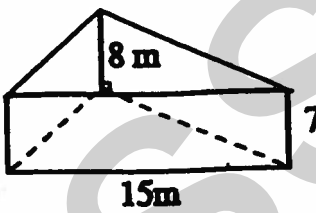
10)



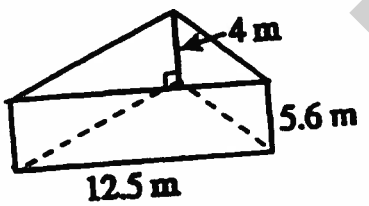
11)



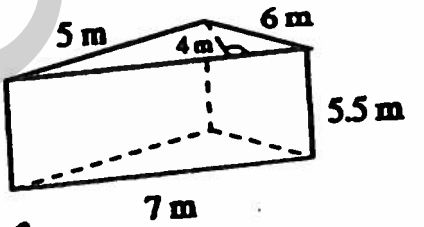
12)



13)

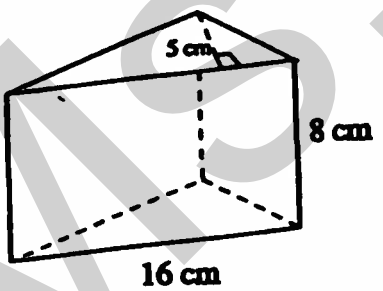


14)

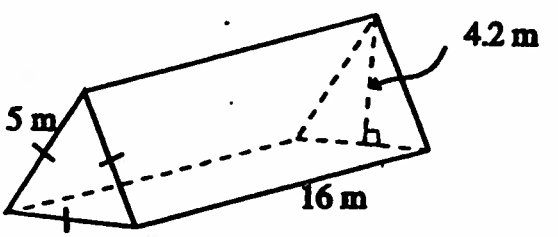


127 m²

15)

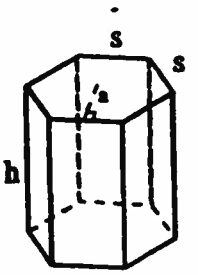


16)



261 m²

Surface Area of Hexagonal Prism



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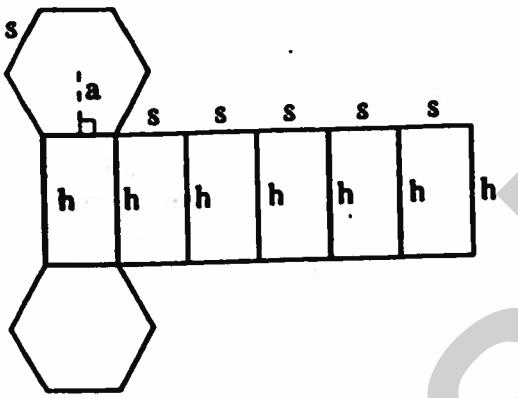
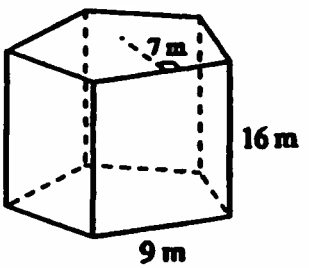
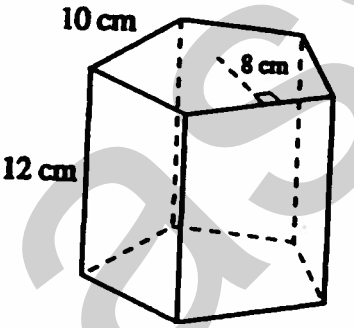


1)



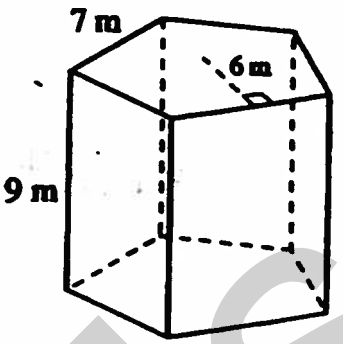
$1035\ m^2$

2)



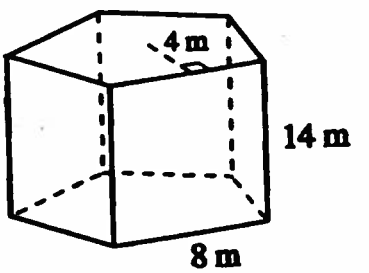
$1000\ cm^2$

3)



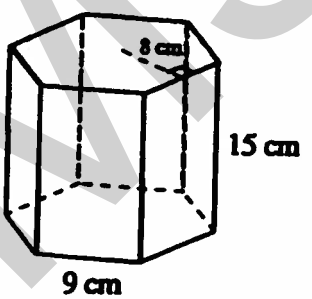
$525\ m^2$

4)



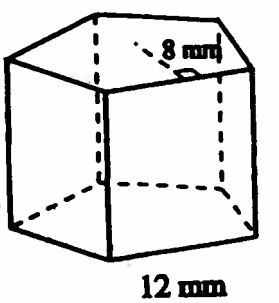
$720\ m^2$

5)



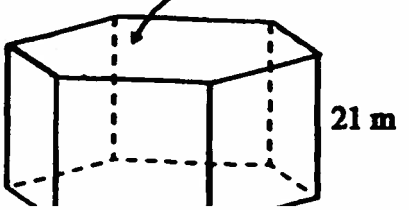
$1242\ cm^2$

6)

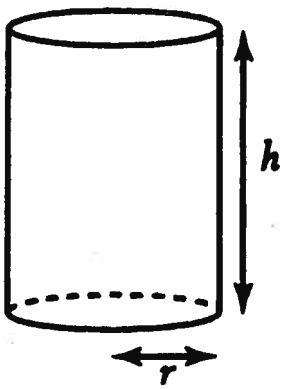


$1440\ mm^2$

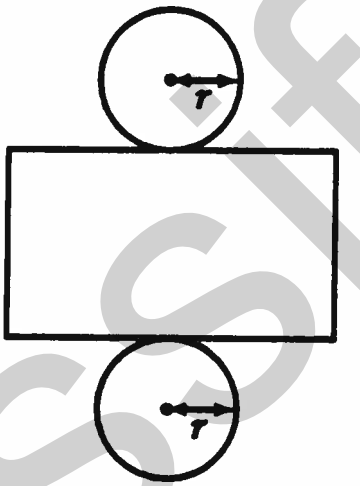
~~7)~~



Surface Area of Cylinders

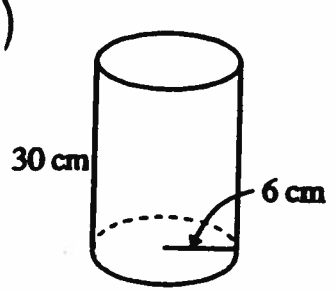


$A_T = 2\pi r^2 + 2\pi rh$



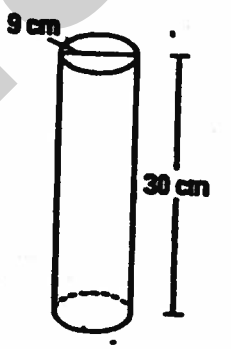
Calculate the area of the following cylinders.

1)



1356.48 cm²

2)

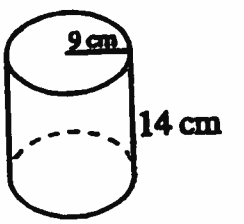


974.97 cm²

3)

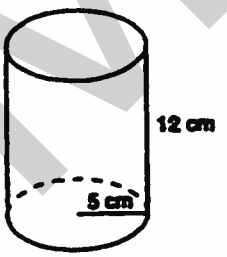
406.63 m²

4)



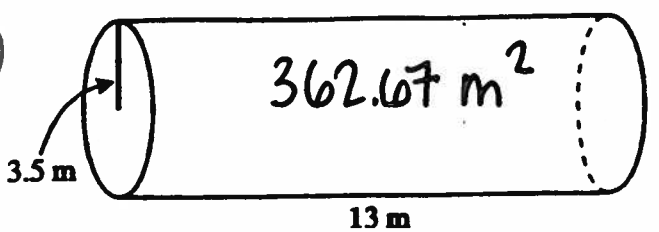
1299.96 cm²

5)

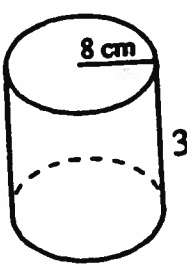


533.8 cm²

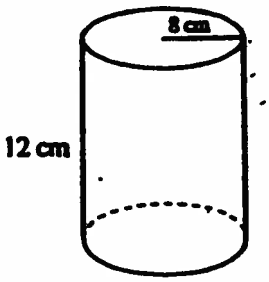
6)



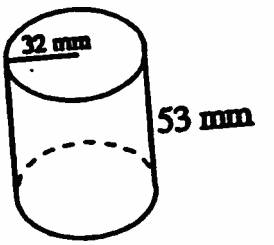
7)



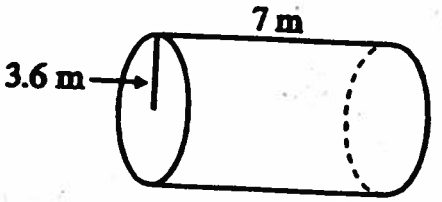
1909.12 cm²

8) 

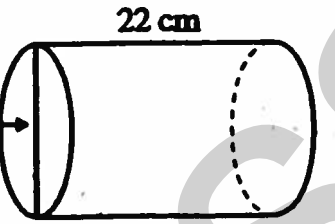
1004.8 cm^2

9) 

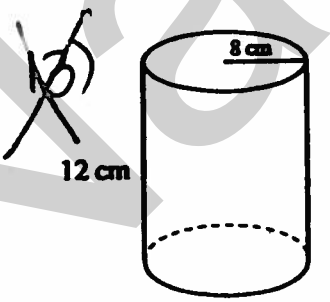
17081.6 mm^2

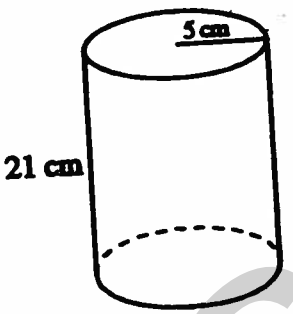
10) 

239.64 m^2

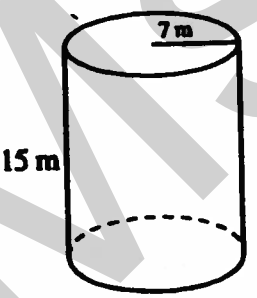
11) 

560.49 cm^2

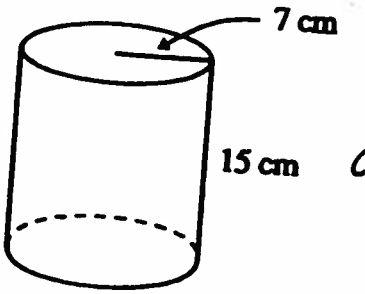
13) 

12) 

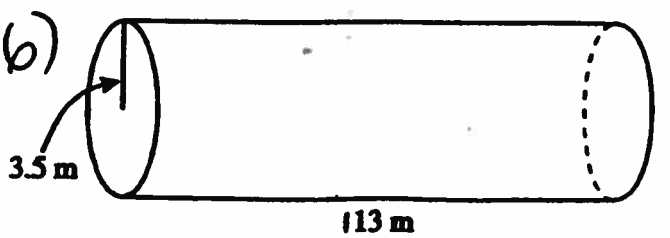
816.4 cm^2

14) 

967.12 m^2

15) 

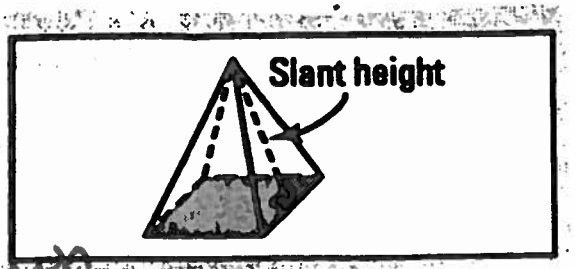
967.12 cm^2

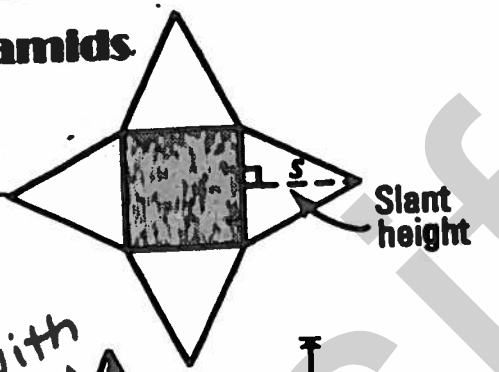
16) 

2560.67 m^2

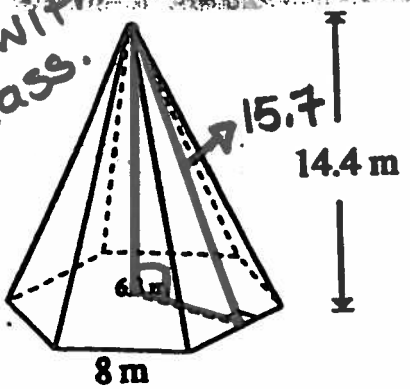
Surface Area of Pyramids

Calculate the area of the following pyramids.



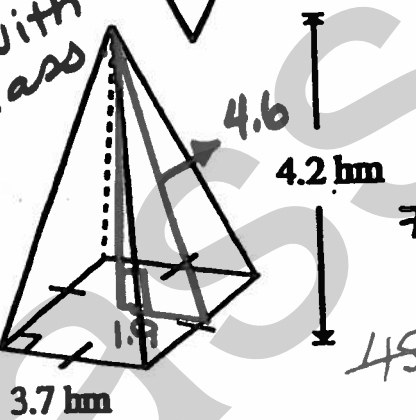


3. Do with Class.



$525.48\ m^2$

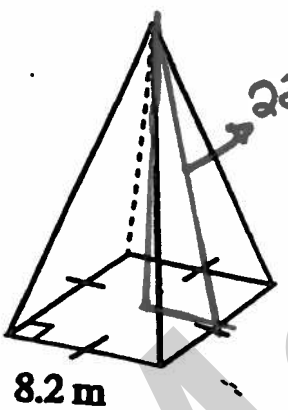
4. Do with Class



$75.3\ hm^2$

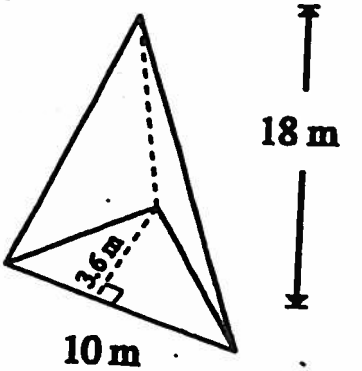
45.47.73

5.

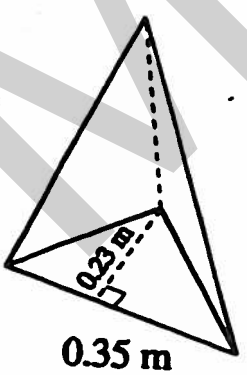


$434.25\ m^2$

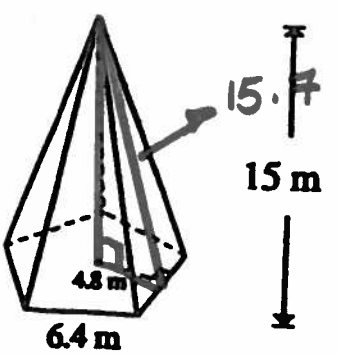
6.



7.

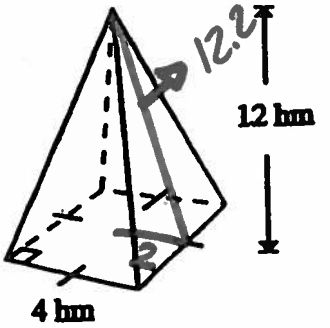


8.



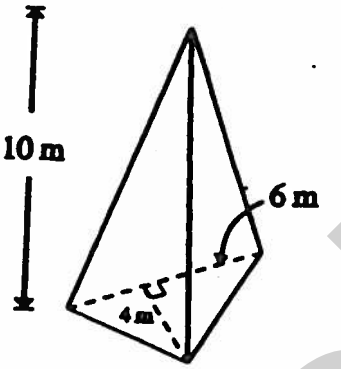
$328.8\ m^2$

9)

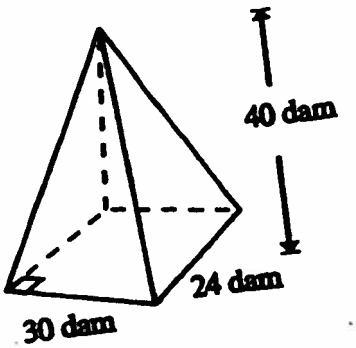


113.32 hm^2

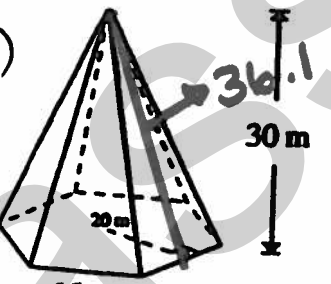
~~10)~~



~~11)~~

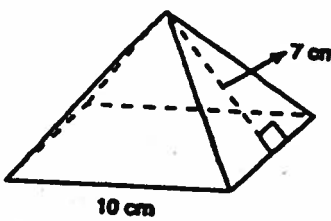


12)



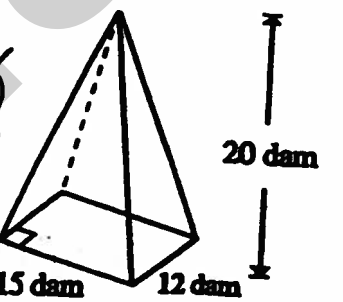
2524.5 m^2

13)

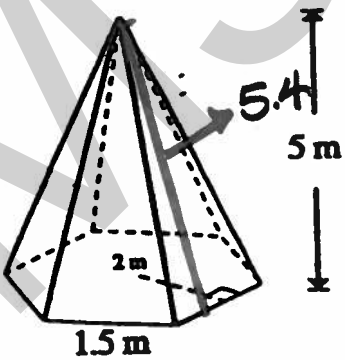


240

~~14)~~

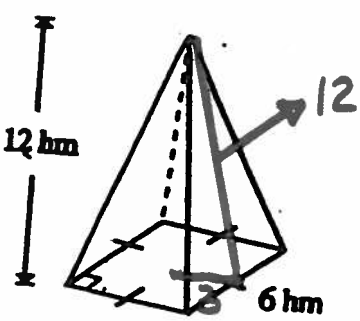


15)



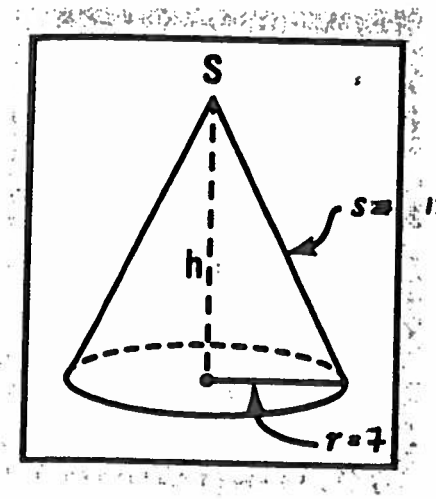
33.3 m^2

16)

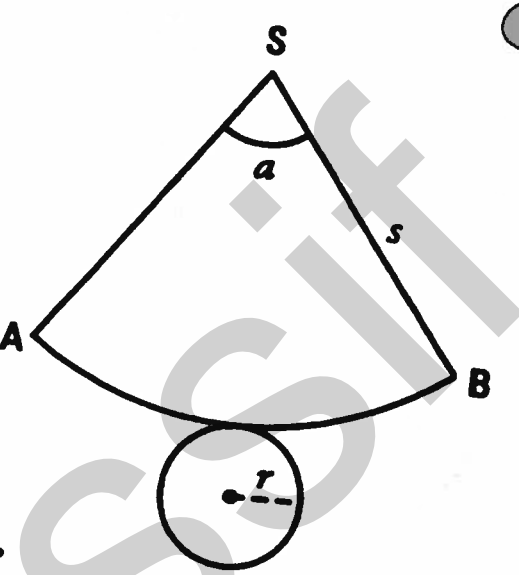


184.44 hm^2

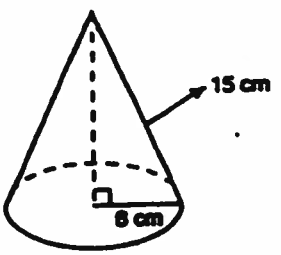
Surface Area of Cones



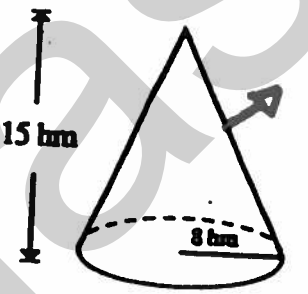
$A_T = \pi r^2 + \pi r s$



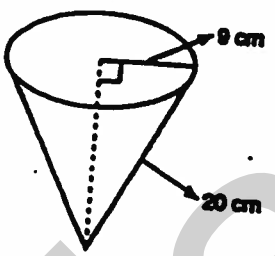
Calculate the area of the following cones.

1) 

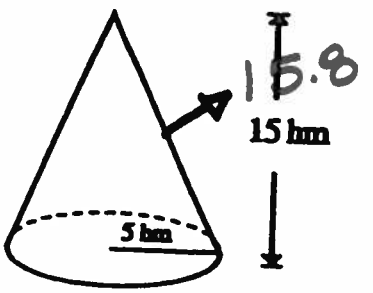
395.64 cm²

2) 

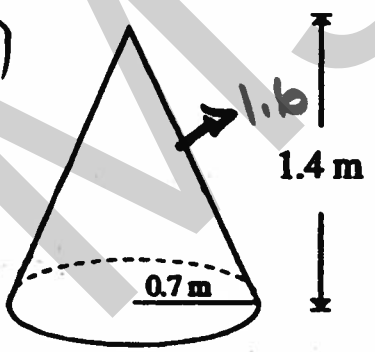
628cm²

3) 

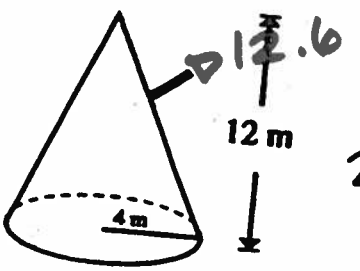
819.54 cm²

4) 

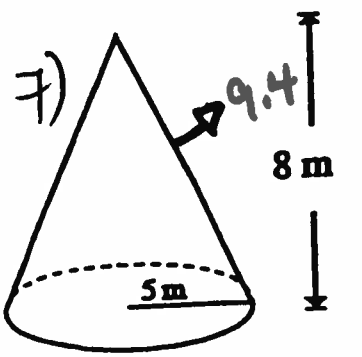
326.56hm²

5) 

5 cm²

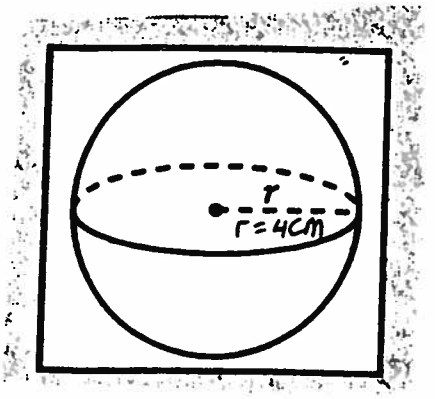
6) 

209.12m²

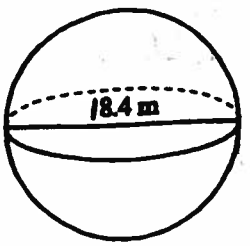
7) 

226.55 cm²

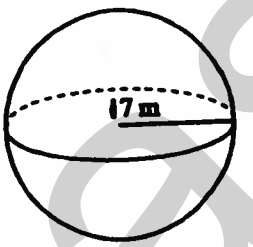
Surface Area of Spheres



$A_T = 4\pi r^2$

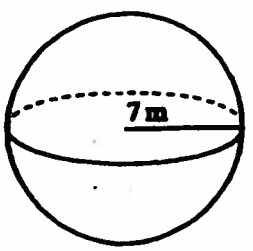
A) 

$1063.08\ m^2$

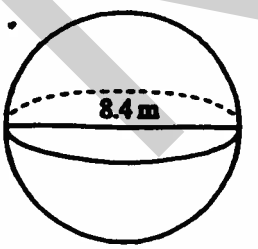
B) 

$3629.84 m^2$

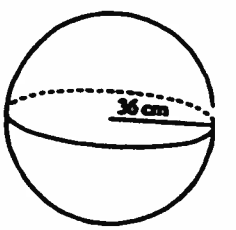
Find the surface area of the spheres below.

1. 

$615.44 m^2$

2. 

$221.56\ cm^2$

3. 

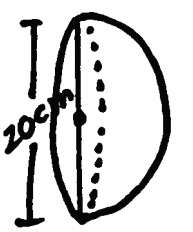
$16277.76\ cm^2$

4. 

$602.88\ cm^2$

5. 

$235.5\ cm^2$

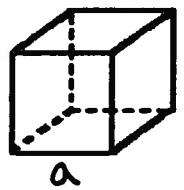
6. 

$942 cm^2$

Surface Area of Solids

Find the surface area of each solid to the nearest tenth. (use $\pi = 3.14$)

1)

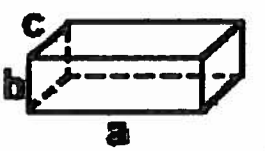


a = 2 cm

$A_T = 6s^2$

$24 cm^2$

2)

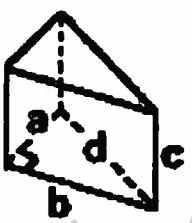


a = 6 m
b = 2 m
c = 3 m

$A_T = P_B \times h + 2(L \times W)$

$72 cm^2$

3)

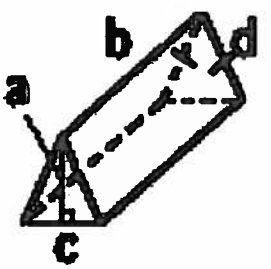


a = 3 km
b = 5 km
c = 3.5 km
d = 4 km

$A_T = B \times H + P_B \times h$

$57 km^2$

4)



a = 3 mm
b = 9 mm
c = 4 mm
d = 3.6 mm
(isosceles)

$A_T = b \times h + P_B \times h$

$45.6 cm^2$

Notes & Formulas for Volume & Area of Solids

Solid Shape	Volume	Lateral Area	*Total Area	Rules
Sphere	$\frac{4\pi r^3}{3}$	$4\pi r^2$	$4\pi r^2$	None
Pyramid or Cone	$\frac{A_b \cdot h}{3}$	$\frac{P_b \cdot h_s}{2}$	$\frac{P_b \cdot h_s}{2} + A_b$	For right & **regular only
Prism or Cylinder	$A_b \cdot h$	$P_b \cdot h$	$P_b \cdot h + 2A_b$	For right only

* also known as surface area

** equal length base edges

a = apothem
A_b = Area of the base
b = base
B = biggest base
d = shortest diagonal
D = longest diagonal
h = height
h_s = slant height
l = length
P_b = perimeter of base
r = radius
s = side
w = width
π = Pi (approximately 3.14)

Shape	P_b	A_b
Circle	$2\pi r$ or πd	πr^2
Triangle	$s_1 + s_2 + s_3$	$\frac{b \cdot h}{2}$
Square	4s	s^2
Rectangle	2(l + w)	$l \cdot w$
Parallelogram	2(b + s)	$b \cdot h$
Rhombus	4s	$\frac{D \cdot d}{2}$
Trapezoid	B + b + 2s	$\frac{(B + b) \cdot h}{2}$
??agon	s(# of sides)	$\frac{Pb \cdot a}{2}$

Circumference (perimeter) of a circle:

$2\pi r$ or πd where d = diameter

Finding lateral and total area of irregular pyramids.

- Find the slant height of each triangle that makes up the sides of the pyramid. The slant height can then be used as the height of each triangle for calculating the area. This may involve the use of the *Pythagorean Theory* ($a^2 + b^2 = c^2$ where a & b represent the shorter sides (legs) of a right triangle and c the hypotenuse or longest side of a right triangle (the side across from the right angle)).

- Lateral area in this case would be the sum of the areas of all the triangles involved, and total area would be the lateral area plus the area of the base.

Notes & Formulas for Volume & Area of Solids

Conversions

King Harry died and mother didn't care much!

km hm dam m dm cm mm

These are linear measurements. Converting is one jump per unit to the left or right (multiplying or dividing by 10). For example, 10 m = 1 dam = 100 dm

km^2 hm^2 dam^2 m^2 dm^2 cm^2 mm^2

These are measurements of area. Converting is two jumps per unit to the left or right (multiplying or dividing by 100). For example, 10 m^2 = 0.1 dam^2 = 1 000 dm^2

km^3 hm^3 dam^3 m^3 dm^3 cm^3 mm^3

These are measurements of volume. Converting is three jumps per unit to the left or right (multiplying or dividing by 1000). For example, 10 m^3 = 0.01 dam^3 = 10 000 dm^3

1 Litre (1 L) = 1 dm^3

Jumping from one table to another:

km^3 hm^3 dam^3 m^3 dm^3 cm^3 mm^3

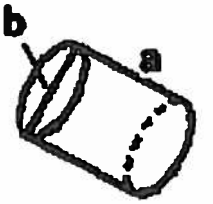
kL hL daL L dL cL mL

5)

a = 5 cm
b = 10 cm

$A_T = 2\pi r^2 + 2\pi rh$
$= 471 cm^2$

6)



a = 10 dm
b = 8 dm
(diameter)

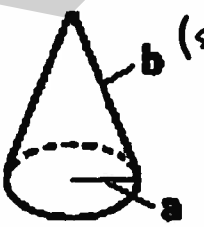
$A_T = 2\pi r^2 + 2\pi rh$
$= 351.68 dm^2$

7)

(slant height)
a = 6 m
b = 4 m

$A_T = \frac{P_B \times S_h}{2} + L \times W$
$= 64 m^2$

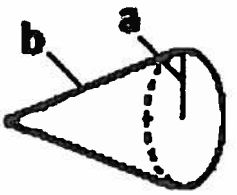
8)



(slant height)
a = 2 cm
b = 6 cm

$A_T = \pi rs + \pi r^2$
$= 50.24 cm^2$

9)

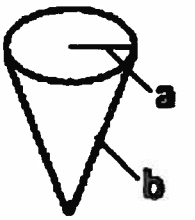


a = 3 km
b = 7 km

$A_T = \pi rs + \pi r^2$

$94.2 cm^2$

10)

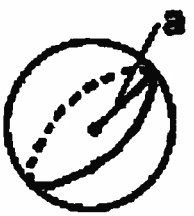


a = 4 mm
b = 10 mm

$A_T = \pi r^2 + \pi rs$

$175.84 cm^2$

11)

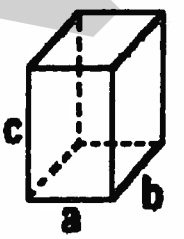


a = 3 m

$A_T = 4\pi r^2$

$113.04 cm^3$

12)

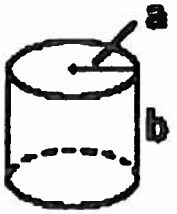


a = 3 cm
b = 4 cm
c = 5 cm

$A_T = Pb \times h + 2(L \times W)$

$94 cm^2$

13)

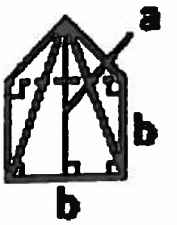


a = 3.5 dm
b = 4.2 dm

$A = 2\pi r^2 + 2\pi rh$

$= 169.24\ dm^2$

14)

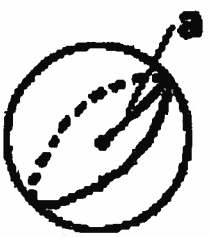


a = 3.8 km
b = 2.6 km

$A_T = L \times W + \frac{P_B \times S}{2}$

$= 27.66\ cm^2$

15)

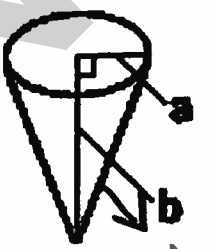


a = 2.2 cm

$A_T = 4\pi r^2$

$= 60.79 cm^2$

16)



a = 1.5 dm
b = 3.5 dm

b (height h, NOT slant height S)

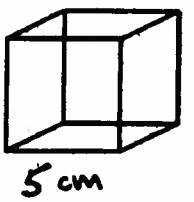
3.81

$A_T = \pi rS + \pi r^2$

$= 25.01\ cm^2$

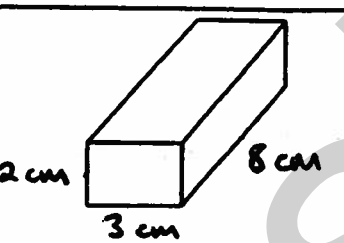
Surface Area of Solids

For each of the following solids, find the area of the bases, the lateral area, and the total surface area. Round your answers to the nearest tenth. Use $\pi = 3.14$.



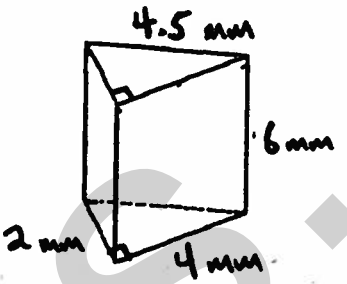
$A = 6s^2$

$= 150 cm^2$



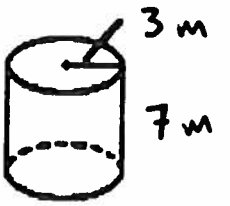
$A_T = 2(l \times w) + P_b \times h$

$92 cm^2$



$A = bxh + P_B xh$

$71 mm^2$

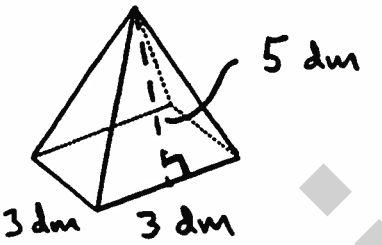


$A_T = 2\pi r^2 + 2\pi rh$

$= 188.4 m^2$

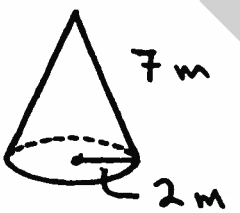
$A_T = 2\pi r^2 + 2\pi rh$

$= 401.92\ cm^2$



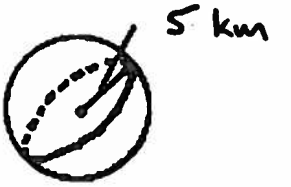
$A_T = 6^2 + \frac{P_B \times S_{tl}}{2}$

$= 39\ dm^2$



$A_T = \pi r^2 + \pi rs$

$= 56.52\ m^2$

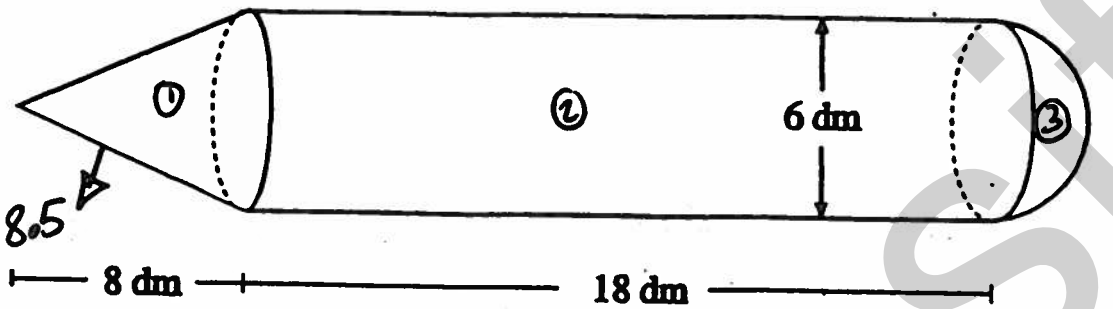


$A_T = 4\pi r^2$

$= 314\ km^2$

Area of Decomposable Solids

(1) What is the surface area of the shape below?



① $A_{cone\ lat} = \pi r s$
$= \pi(3)(8.5)$
$= 80.07\ dm^2$

② $A_{cyl\ lat} = 2\pi r h$
$= 2 \times \pi \times 3 \times 18$
$= 339.12\ dm^2$

③ $A_{hem\ lat} = 2\pi r^2$
$= 56.52\ dm^2$

④ $A_{total} = 475.71\ dm^2$

(2) A milk bar has a sign in the shape of a huge ice cream cone.
The sign is made up of a cone and a hemisphere, as shown in the diagram below.
The owners of the milk bar want to change the colour of the entire sign.

One litre of paint covers 6 square metres and costs $12.

How much will it cost to paint the sign?

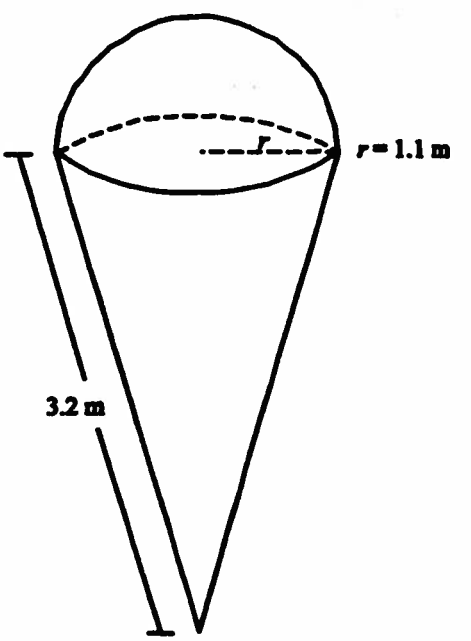
① $A_{hem} = 2\pi r^2 = 7.6 m^2$

② $A_{cone} = \pi r s = 11.05 m^2$

③ $A_{total} = 18.65\ m^2$

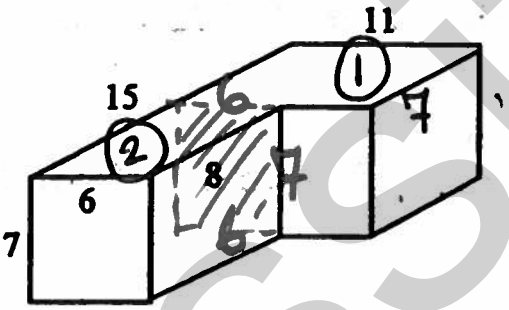
④ $18.65 \div 6 = 3.10 \rightarrow 4L$

⑤ $Cost = 4 \times 12 = 48\$$



Area of Decomposable Solids

1) A group of students is to cover all the surfaces of the box below with cloth.
What is the total area of the surface to be covered? (All measurements are given in cm)



① $A_{rect} = 2A_B + P_B \times h$
$= 2(7 \times 11) + 36 \times 7$
$= 406\ cm^2$

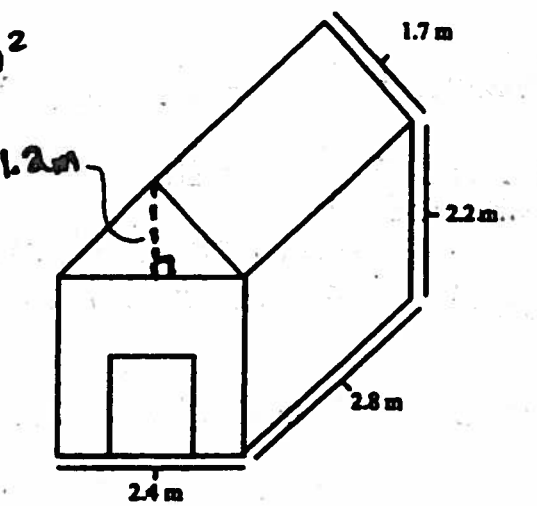
Remove rectangle 6 by 7
$406 - 42 = 364\ cm^2$

② $A_{rect} = 2A_B + P_B \times h$
$= 2(6 \times 8) + 28 \times 7$
$= 292\ cm^2$

Remove rectangle 6 by 7
$292 - 42 = 250\ cm^2$

③ $A_T = 364 + 250 = 614\ cm^2$

2) Eric wants to paint the exterior of his gardening shed (everything except the bottom).
If 1 litre of paint covers 10 m^2 of wood, how many litres of paint does he need?



$A_{L\ Rect.\ PRISM} = P_B \times h = 10.4 \times 2.2$
$= 22.88\ cm^2$

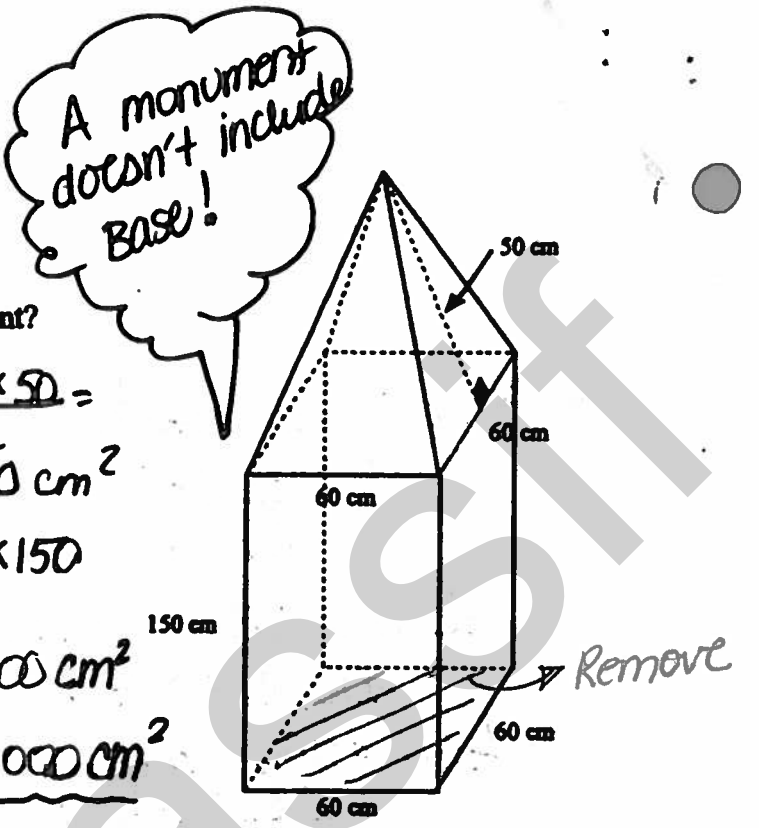
$A_{L\ tri\ PRISM} = P_B \times h + b \times h$
$= 5.8 \times 2.8 + 2.4 \times 1.2$
$= 19.12\ cm^2$

Remove rectangle 2.4 by 2.8
$19.12 - 6.72 = 12.4\ cm^2$

$A_{TOTAL} = 22.88 + 12.4 = 35.28$

3) The monument to the right has the shape of a square-based pyramid on top of a right prism with a square base.

What is the total surface area of the monument?



$A_{L\ pyramid} = \frac{P_B \times S_{LL}}{2} = \frac{240 \times 50}{2} =$

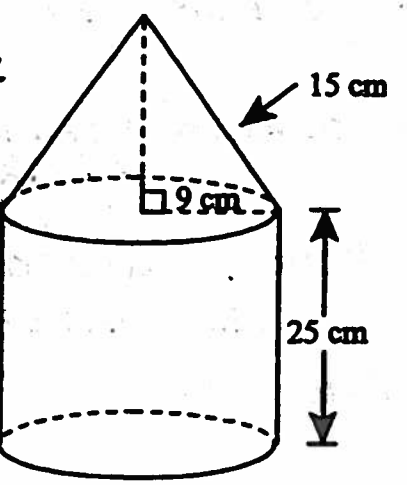
$= 6000\ cm^2$

$A_{L\ rect\ prism} = P_B \times h = 240 \times 150$

$= 36000\ cm^2$

$A_{TOTAL} = 6000 + 36000 = 42000\ cm^2$

4) What is the total surface area of the following solid?



$A_{L\ cone} = \pi rs = \pi(9)(15) = 423.9\ cm^2$

$A_{CYL} = \pi r^2 + 2\pi rh$

with 1 BASE

$= \pi(9)^2 + 2\pi(9)(25)$

1 BASE

$= 1667.34\ cm^2$

$A_{TOTAL} = 423.9 + 1667.34$

$= 2091.24\ cm^2$

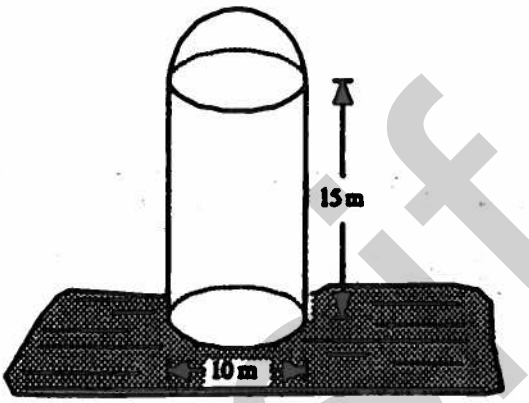
5) You have to paint the outer surface of a silo shaped like a cylinder topped with a hemisphere.

The bottom of the silo will not be painted.

The measurements of the silo are given in the diagram on the right.

One litre of paint covers 20 square metres and costs $15.

How much will it cost to paint the silo?



$A_{L\ CYLIN} = 2\pi rh = 2\pi(5)(15)$
$= 471\ cm^2$

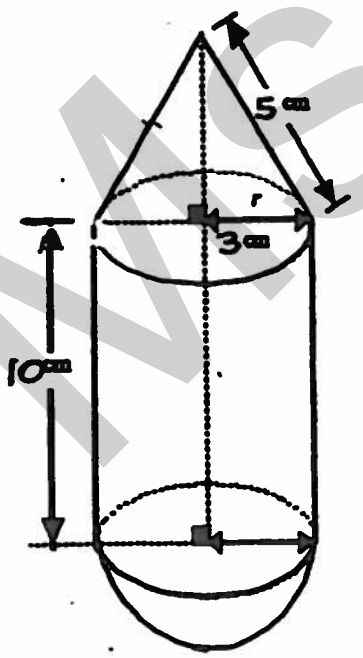
$A_{L\ Hem} = 2\pi r^2 = 2\pi(5)^2 = 157\ cm^2$

$A_{TOTAL} = 628\ cm^2$

$628 \div 20 = 31.4 \rightarrow 32L$

$32 \times 15\$ = 480\$$

6) A military engineer wants to construct a model of the following high-calibre bullet out of a thin sheet of copper. What area of copper sheeting is needed?



$A_{Lat\ cone} = \pi rs = 47.1\ cm^2$

$A_{Lat\ CYL} = 2\pi rh = 188.4\ cm^2$

$A_{Hem} = 2\pi r^2 = 2\pi(3)^2 = 56.52\ cm^2$

$A_{Tot} = 292.02\ cm^2$

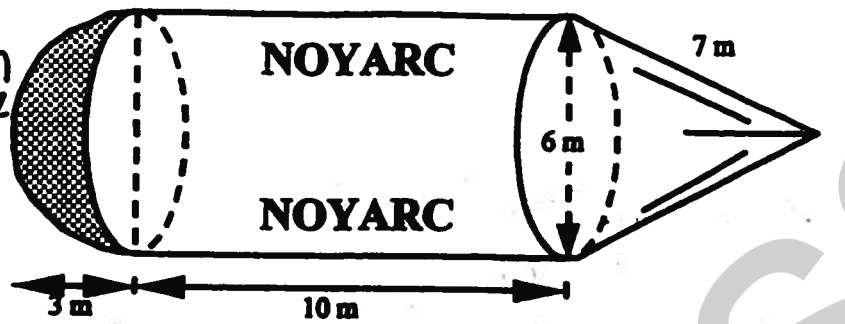
7) To advertise its "Noyarc" pencils, the company that makes them ordered a blimp. This blimp is formed from a hemisphere, a right cylinder and a right cone.

The dimensions of the blimp are shown below.

What is the total surface area of the blimb?

$A_{L\ cone} = \pi rs = 65.94\ cm^2$

$A_{L\ CYL} = 2\pi rh = 188.4\ cm^2$



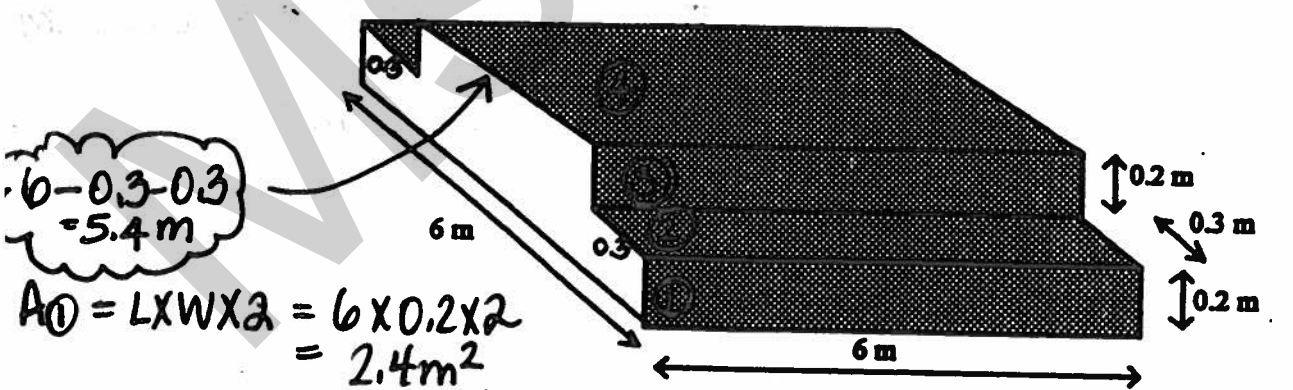
$A_{hem} = 2\pi r^2 = 2\pi(3)^2 = 56.52\ cm^2$

$A_{tot} = 310.86\ cm^2$

8) Final preparations are under way for a school's annual drama presentation.

Robert's team has to install a green carpet on the symmetrical podium where the play will be staged. The surface to be carpeted is shaded in the diagram below. There is no carpet under the podium or on the sides.

What area of carpeting will be required to cover the podium?



$6 - 0.3 - 0.3 = 5.4\ m$

$A_① = L \times W \times 2 = 6 \times 0.2 \times 2 = 2.4\ m^2$

$A_② = 6 \times 0.3 \times 2 = 3.6\ m^2$

$A_③ = 6 \times 0.2 \times 2 = 2.4\ m^2$

$A_④ = 6 \times 5.4 = 32.4\ m^2$

$A_{tot} = 40.8\ m^2$

Solution Key

AREA AND VOLUME GOING BACKWARDS

1. The volume of a rectangular prism is 60 cm^3. The height is 5 cm, the width is 3 cm. Find the length. 4

2. The volume of a rectangular prism is 386 cm^3. If the area of the base is 50.24 cm^2. Find the height. 7.7

3. The volume of a cylinder is 351.68 cm^3. If the area of the base is 50.24 cm^2, find the height. 7

4. The volume of a cylinder is 452.16 cm^3. The area of the base is 28.26 cm^2. Find the height. 16

5. The volume of a cylinder is 6154.4 cm^3. The height is 10 cm. Find the area of the base and then find the radius. 615.44 14

6. The volume of a cylinder is 1356.48 cm^3. The height is 12 cm. Find the area of the base and then find the radius. 9.42 113.04 1.73 6

7. The volume of a cylinder is 5024 cm^3. The height is 13 cm. Find the radius. 11.1

8. The volume of a cylinder is 2034.72 cm^3. The height is 9 cm. Find the radius. 8.5

9. The volume of a pyramid is 24 cm^3. The height is 4 cm and the width is 3 cm. Find the length. 6

10. The volume of a square based pyramid is 720 cm^3. The length and width are 12 cm. Find the height. 15

11. The volume of a pyramid is 1998 cm^3. The length is 37cm, and the width is 9 cm. Find the height. 18

12. The volume of a pyramid is 336 cm^3. The length is 14 cm and the width is 8 cm. Find the height. 9

13. The volume of a cone is 25.12 cm^3. If the area of the base is 12.56 cm^2, find the height. 6

14. The volume of a cone is 1017.3 cm^3. If the area of the base is 254.34 cm^2, find the height. 12

15. The volume of cone is 78.5 cm^3. If the height is 3 cm, find radius. 5

16. The volume of a cone is 226. 08 cm^3. If the height is 6 cm, find the radius. 6

17. The volume of a cone is 923.16 cm^3. If the height is 18 cm, find the radius. 7

18. The volume of a cone is 200.96 cm^3. If the height is 12 cm, find the radius. 4

19. The volume of a square-based pyramid is 2160 cm^3. The height is 15 cm. Find the length of one side of the base. 20.8

20. The volume of a square-based pyramid is 480 cm^3. If the height is 10 cm, find the length of one side of the base. 12

21. A prism with square base has a volume of 648 cm^3 and a height of 8 cm. Find the length of one side of the base. 9

22. Calculate the height of a cylindrical oil tank if the area of the base is 40 dm^2 and the volume is 500 dm^3. 12.5

23. What is the area of the base of a square-based pyramid with height of 12 cm whose volume is 48 cm^3? 12

24. The volume of a cone is 314 cm^3. The height of the cone measures 12 cm. What is the measure of the diameter? 10

25. The volume of a cone is 628 cm^3. The height of the cone measures 24 cm. What is the measure of the diameter? 10

26. If the lateral area of a prism with a triangular base is 72 cm^2. What is the height?

$A_l = P_b \times h$

$72 = P_b \times h$