Surface area and volume

UNIT 1: Surface area of different solids

QUESTION 1   Find the surface area of the following rectangular prisms.

a

A③
A① A② 9 cm
12 cm   10 cm

$A① = 12 \times 9 \times \cancel{4} = 432$
$A② = 10 \times 9 \times 2 = 180$ $+ 12 \times 10 \times 2$
$SA = 6 + 2 \, cm^2$
636

b

6.3 cm
6.3 cm   6.3 cm

$SA = 6.3 \times 6.3 \times 6$
$= 238.14 \, cm^2$

c

A⑧
A①   A② 10.2 cm
36.8 cm   12.5 cm
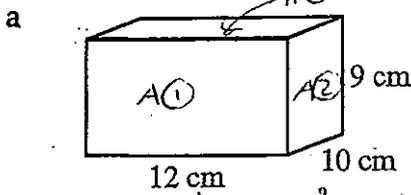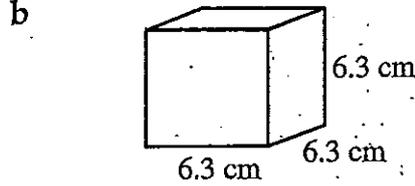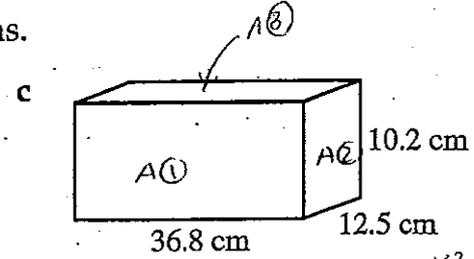
$A① = 36.8 \times 10.2 \times 4$ ×2
$= 1501.44$
$A② = 10.2 \times 12.5 \times 2$
$= 255$
$SA = 1756.44 \, cm^2$

**QUESTION 2**   Find the surface area of the following triangular prisms.

a

10 cm   10.8 cm
A②   A①   A②
8 cm   15 cm
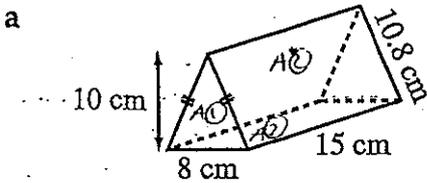
$2 \times \frac{1}{2} \times 8 \times 10 + 10.8 \times 15 \times 2$
$+ 8 \times 15 = 524 \, cm^2$

b

11.4 cm
9 cm
14 cm   20 cm
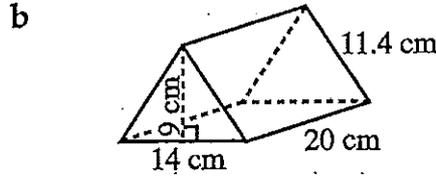
$2 \times \frac{1}{2} \times 14 \times 9 + 11.4 \times 20 \times 2$
$+ 14 \times 20 = 862 \, cm^2$

c

13 cm
12 cm
5 cm   18.9 cm
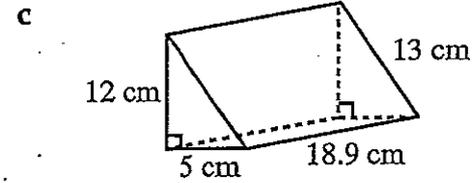
$2 \times \frac{1}{2} \times 12 \times 5 + 13 \times 18.9 +$
$12 \times 18.9 + 5 \times 18.9 =$
$627 cm^2$

**QUESTION 3**   Find the surface area of the following trapezoidal prisms.

a

8 m
5.6 m
5 m
18 m   12 m
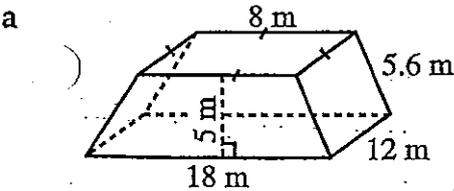
$\frac{1}{2}(8+18) \times 5 \times 2 + 5.6 \times 12 \times 2$
$+ 8 \times 8 + 18 \times 12 = 544.4 \, cm^2$

b

12 m
8 m   2 m
3 m
12.6 m

$\frac{1}{2}(2+3) \times 12 \times 2 + 5 \times 12 +$
$12.6 \times 8 + 8 \times 3 + 2 \times 8$
$= 296.8 \, cm^2$

c

16 m
10.2 m
7 m
23 m   18 m
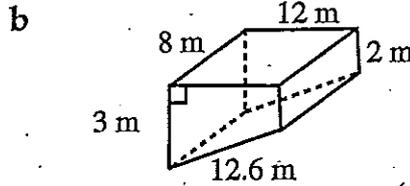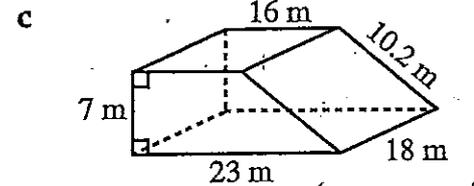
$\frac{1}{2}(23+16) \times 7 \times 2 + 10.2 \times$
$+ 7 \times 18 + 16 \times 18 + 23 \times 18$
$= 1284.6 \, cm^2$

QUESTION 4.   Find the surface area of the following cylinders. $2\pi r^2 + 2\pi r h$

a

7 cm
20 cm

$2 \times \pi \times 7^2 + \pi \times 7 \times 2$
$\times 20 = 1187.5 \, cm^2$

b

18 cm
8 cm

$2 \times \pi \times 9^2 + \pi \times 9 \times 2 \times 8$
$= 961.3 \, cm^2$

c

12 cm
24.6 cm
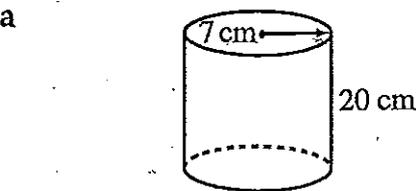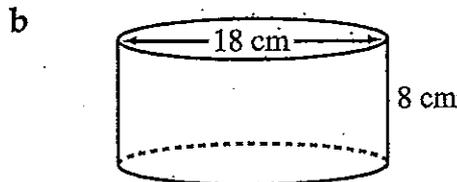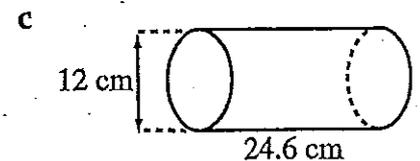
$2 \times \pi \times 6^2 + 2 \times \pi \times 6 \times$
$24.6 = 1153.6 \, cm^2$

urface area and volume

UNIT 2: Surface area of pyramids

UESTION **1**   Calculate the surface area of the following square pyramids.

b
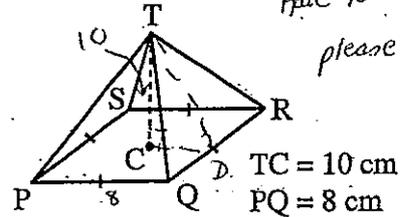
Have to find TD first,
please ask me!

TC = 10 cm
PQ = 8 cm

$\frac{1}{2} \times 12 \times 15 \times 4 + 12 \times 12 = 504 \text{cm}^2$

$\frac{1}{2} \times 8 \times 10 \times 4 + 8^2 = 224 \text{cm}^2$

(base area)

UESTION **2**   Calculate the surface area of the following rectangular pyramids.

b

TC = 9 cm
PQ = 16 cm
QR = 10 cm

Find TD

$\frac{1}{2} \times 24 \times 13 \times 2 = 312$ ✓

$\frac{1}{2} \times 18 \times 12 \times 2 = 216$ ✓

$24 \times 18 = 432$ ✓

$SA = 960 \text{cm}^2$ ✓

$\frac{1}{2} \times 16 \times 9 \times 2 = 144$

$\frac{1}{2} \times 10 \times 9 \times 2 = 90$

$16 \times 10 = 160$

$SA = 394 \text{cm}^2$

UESTION **3**   Calculate the surface area of the following pyramids.

b
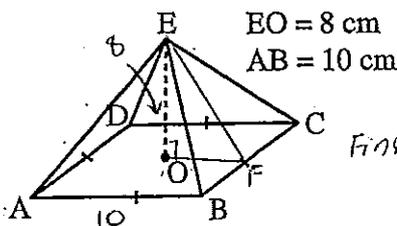
EO = 8 cm
AB = 10 cm

Find EF first
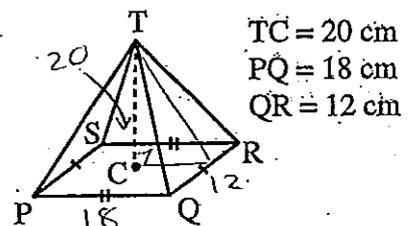
TC = 20 cm
PQ = 18 cm
QR = 12 cm

$\frac{1}{2} \times 10 \times 8 \times 4 + 10^2 = 260 \text{cm}^2$

$\frac{1}{2} \times 18 \times 20 \times 2 = 360$

$\frac{1}{2} \times 12 \times 20 \times 2 = 240$

$18 \times 12 = 216$

$SA = 816 \text{cm}^2$

Surface area and volume

UNIT 3: Surface area of a cone

$\pi r l + \pi r^2$

QUESTION 1 Find the *curved* surface area of the following cones correct to two decimal places.

a

12 cm

8 cm

b

15 cm   16.55

7 cm
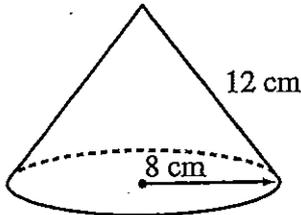
$\pi \times 8 \times 12 = 301.59 cm^2$
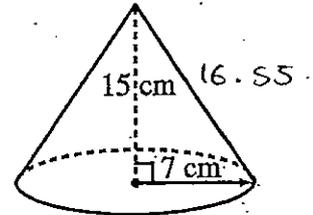
$\pi \times 7 \times 16.55 = 364.02 cm^2$

QUESTION 2 Find the *curved* surface area of the following cones correct to one decimal place.

a

18 cm

12 cm

b

34 cm   36.77

28 cm
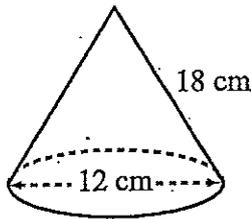
$\pi \times 6 \times 18 = 339.3 cm^2$
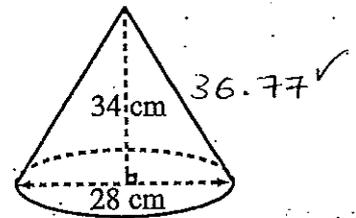
$\pi \times 14 \times 36.77 = 1617.2 cm^2$

QUESTION 3 Find the surface area (including base) of the following cones. Give answers in terms of π.

a Radius 12 cm and slant height 10 cm. $264 \pi cm^2$
b Radius 16 cm and height 12 cm. $576 \pi cm^2$
c Diameter 56 cm and height 30 cm. $2833.02 \pi . cm^2$
   Find slant height. $86 149 \pi$ 81 $\pi r l ① - \pi r l ②$
                                                   $+ \pi r^2 ① + \pi r^2 ②$

QUESTION 4 Find the surface area of the following solids.

a

8 cm 10
6 cm   7 cm

$\pi r l + \pi r^2$ b
$+ 2 \pi r h$

T
√80
S R
P M Q

TL = 8 cm
LM = 10 cm
LR = 4 cm
MQ = 9 cm

(32)
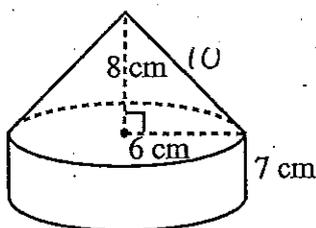
$\pi \times 6 \times 10 + \pi \times 6^2 + \pi \times 6 \times 7 \times 2$
$= 180 \pi cm^2$
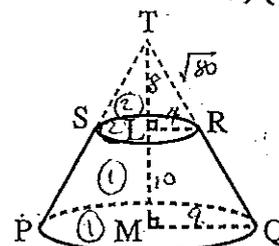
$81 \pi + 16 \pi = 97 \pi$
$\pi (9 \times \sqrt{405} - 4 \times \sqrt{80})$
$= 761.3 cm^2$

Surface area and volume

UNIT 4: Surface area of a sphere

$$SA = 4\pi r^2$$

QUESTION 1 Find the surface area of the following spheres with:

a radius = 7 cm
$$4 \times \pi \times 7^2$$
$$= 196\pi \, cm^2$$

b diameter = 18 cm
$$4 \times \pi \times 9^2$$
$$= 324\pi \, cm^2$$

c radius = 28 cm
$$4 \times \pi \times 28^2$$
$$= 3136\pi \, cm^2$$

d diameter = 42 cm
$$4 \times \pi \times 21^2$$
$$= 1764\pi \, cm^2$$

e radius = 8.3 cm
$$4 \times \pi \times 8.3^2$$
$$= 865.7 \, cm^2$$

f diameter = 23.9 cm
$$4 \times \pi \times 11.95^2$$
$$= 1794.51 \, cm^2$$

QUESTION 2 Calculate the surface area of the following spheres. Leave your answer in terms of π.

a
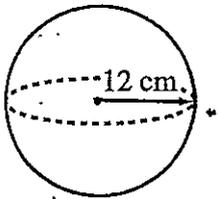
12 cm
$$SA = 4 \times \pi \times r^2$$
$$= 4 \times \pi \times 12^2$$
$$= 576\pi \, cm^2$$

b
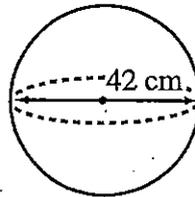
42 cm
$$SA = 4 \times \pi \times r^2$$
$$= 4 \times \pi \times 21^2$$
$$= 1764\pi \, cm^2$$

QUESTION 3 Calculate the surface area of the following hemispheres correct to two decimal places.

a
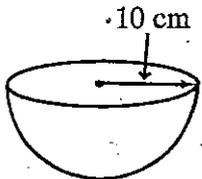
10 cm
$$SA = 2 \times \pi \times r^2$$
$$= 2 \times \pi \times 10^2$$
$$628.318\ldots + \pi r^2$$
$$= 942.48 \, cm^2$$

b
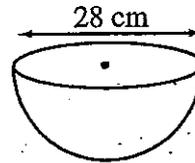
28 cm
$$SA = 2 \times \pi \times r^2$$
$$= 2 \times \pi \times 14^2$$
$$1231.50\ldots + \pi r^2$$
$$= 1847.26 \, cm^2$$

QUESTION 4 Find the surface area of the following solids correct to three significant figures.

a
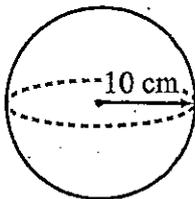
10 cm
$$SA = 4\pi r^2$$
$$SA = 4 \times \pi \times r^2$$
$$= 4 \times \pi \times 10^2$$
$$= 1260 \, cm^2$$

b
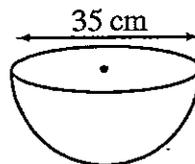
35 cm
$$SA = 2 \times \pi \times r^2$$
$$= 2 \times \pi \times 17.5^2$$
$$= 1920 \, cm^2 + \pi r^2$$
$$= 2890 \, cm^2$$

c
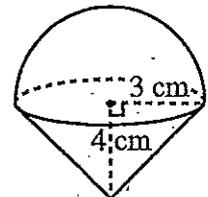
3 cm, 4 cm
$$2 \times \pi \times 3^2 + \pi \times 3 \times 5$$
$$= 103.67\ldots$$
$$= 104 \, cm^2$$

QUESTION 5 A sphere has a surface area of 360 cm². Find its radius correct to two decimal places.

$$\frac{360}{4\pi} = \frac{4\pi r^2}{4\pi} \qquad r^2 = \frac{360}{4\pi} = 28.64\ldots \qquad r = 5.35 \, cm$$

Surface area and volume

UNIT 5: Volume of different solids

QUESTION 1   Find the volume of the following rectangular prisms (give answer correct to one decimal place).

a

8.5 cm
8.5 cm   8.5 cm

$8.5^3 = 614.1 cm^3$

b

5.9 cm
10.3 cm   7.6 cm

$10.3 \times 7.6 \times 5.9$
$= 461.9 cm^3$

c

5.6 cm
18.8 cm   6.3 cm
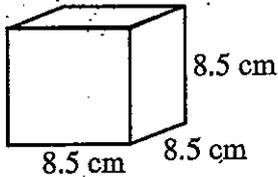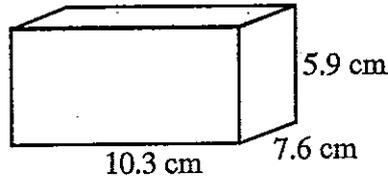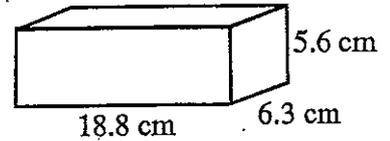
$18.8 \times 6.3 \times 5.6$
$= 663.3 cm^3$

QUESTION 2   Find the volume of the following triangular prisms (give answer correct to four significant figures).

$V = Ah$

a

14 cm
12 cm   25.8 cm

$V = (½ \times 12 \times 14) \times 25.8$
$= 2167.2 cm^3$

b

10 cm
6 cm   15.7 cm

$V = (½ \times 6 \times 10) \times 15.7$
$= 471 cm^3$

c

12 cm
18.6 cm   30 cm
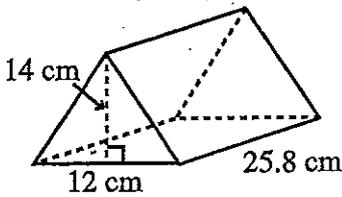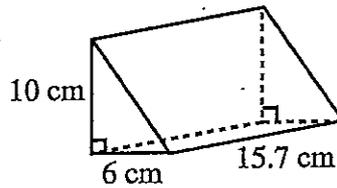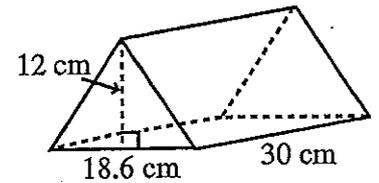
$V = (½ \times 18.6 \times 12) \times 30$
$= 3348 cm^3$

QUESTION 3   Find the volume of the following trapezoidal prisms (give answer correct to two decimal places).

a

21.1 cm
10.5 cm   16.4 cm
30.9 cm
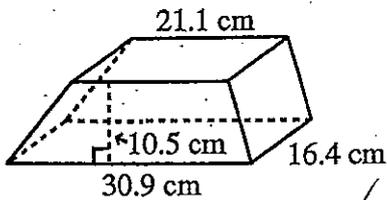
$½ \times 10.5 (21.1 + 30.9) \times 16.4$
$= 4477.20 cm^3$

b
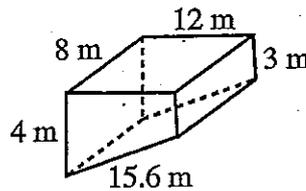
12 m
8 m   3 m
4 m
15.6 m
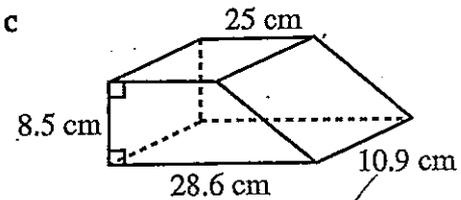
$½ \times 12 (3 + 4) \times 8$
$= 336 cm^3$

c

25 cm
8.5 cm
28.6 cm   10.9 cm

$½ \times 8.5 (25 + 28.6) \times 10.9$
$= 2483.92 cm^3$

QUESTION 4   Find the volume of the following solids.

a

3 m
5 m
12 m   15 m

$270 + 900 = 1170 m^3$

b

5 m
15 m   10 m
16 m   13 m

$1170 + 1300 = 2470 m^3$

c

42 cm
56 cm
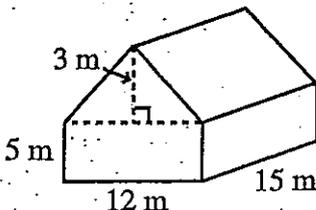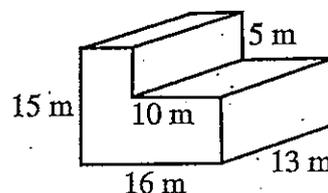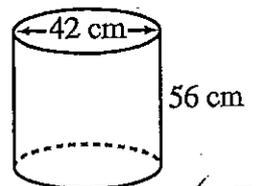
$2 46 96 7 \pi$

(34)

Surface area and volume

UNIT 6: Volume of pyramids

QUESTION 1 ·Calculate the volume of the following square pyramids correct to one decimal place.
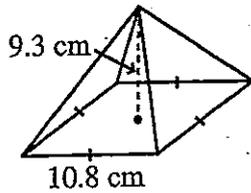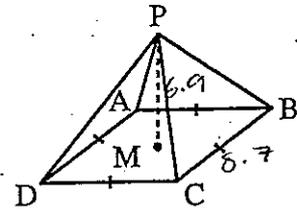
a

9.3 cm

10.8 cm

$$V = \frac{1}{3} \times 10.8^2 \times 9.3$$
$$= 361.6 \text{ cm}^3$$

b

P
A 6.9 B
M 8.7
D C

BC = 8.7 cm
DC = 8.7 cr
PM = 6.9 cr

$$V = \frac{1}{3} \times 8.7^2 \times 6.9$$
$$= 174.1 \text{ cm}^3$$

**QUESTION 2** Calculate the volume of the following rectangular pyramids.

a

6.8 cm

8.6 cm
15.7 cm
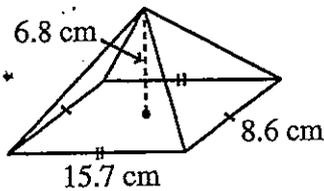
$$V = \frac{1}{3} \times (15.7 \times 8.6) \times 6.8$$
$$. = 306 \text{ cm}^3$$

b

1.6 m

1.9 m
2.3 m
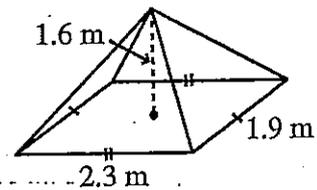
$$V = \frac{1}{3} \times (2.3 \times 1.9) \times 1.6$$
$$= 2.33 \text{ cm}^3$$

QUESTION 3 Calculate the volume of the following pyramids.

a

7.5 cm

9.3 cm
9.3 cm
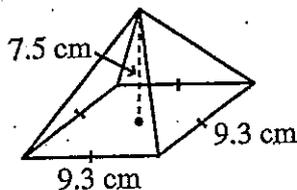
$$V = \frac{1}{3} \times 9.3^2 \times 7.5$$
$$= 216.2 \text{ cm}^3$$

b

10.2 cm

9.6 cm
23.8 cm
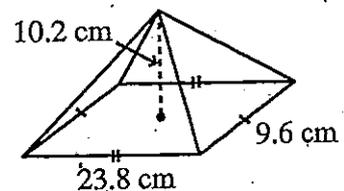
$$V = \frac{1}{3} \times (23.8 \times 9.6) \times 10.2$$
$$= 776.83 \text{ cm}^3$$

QUESTION 4 Calculate the volume of the following solids correct to one decimal place.

a

P
12.5 A 10.7
M
B D C
17.8
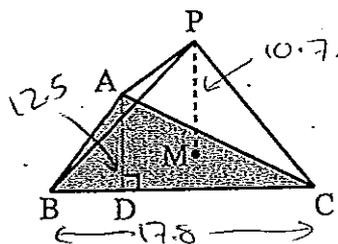
BC = 17.8 cm
AD = 12.5 cm
PM = 10.7 cm

$$V = \frac{1}{3} \times (\frac{1}{2} \times 17.8 \times 12.5) \times 10.7$$
$$= 396.8 \text{ cm}^3$$

b

5.1 m
2.3 m
6.8 m
10.5 m

$$V = \frac{1}{3} \times (10.5 \times 6.8) \times 5.1 + 10.5 \times 6.8 \times$$
$$2.3 = 285.6 \text{ m}^3$$

35
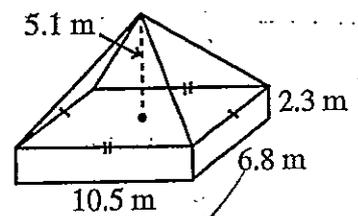
Surface area and volume

UNIT 7: Volume of a cone

$$V = \frac{1}{3} \times A \times h.$$

QUESTION **1**   Find the volume of the following cones correct to one decimal place.

a

6.9 cm

4.1 cm
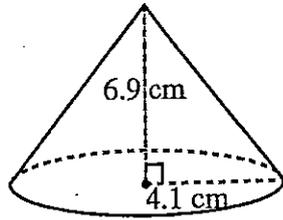
$$V = \frac{1}{3} \times (\pi \times 4.1^2) \times 6.9$$
$$= 121.5 cm^3$$

b

18.6 cm

20.3 cm
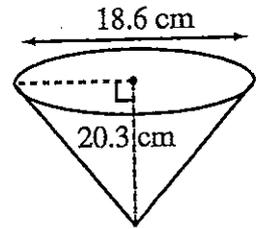
$$V = \frac{1}{3} \times (\pi \times 9.3^2) \times 20.3$$
$$= 1838.6 cm^3$$

QUESTION **2**   Find the volume of the following cones correct to two decimal places.

a

6.5 m

h
SA

3.6 m
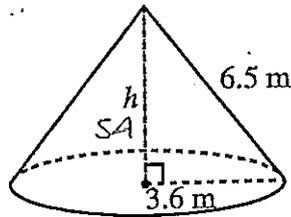
$$V = \frac{1}{3} \times (\pi \times 3.6^2) \times 5.4$$
$$= 73.45 cm^3$$

b

4.8 m

h 3.6

6 m

3.6
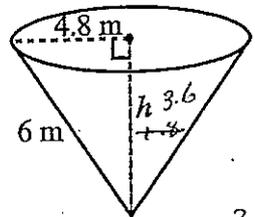
$$V = \frac{1}{3} \times (\pi \times 4.8^2) \times 4.8$$
$$= 42.76 cm^3$$
$$86.86 cm^3.$$

QUESTION **3**

a   A cone has a base radius of 8 cm and a height of 15 cm. Find its volume.
$$V = \frac{1}{3} \times (\pi \times 8^2) \times 15 = 1005/31 cm^3$$

b   Find the volume of a cone of height 7.9 cm and base diameter 5.2 cm.
$$V = \frac{1}{3} \times (\pi \times 2.6^2) \times 7.9 = 55.9/2 cm^3$$

c   Find the volume of a cone that has a slant height of 25 cm and base diameter of 30 cm.
$$V = \frac{1}{3} \times (\pi \times 15^2) \times 20 = 4712.3/cm^3$$

QUESTION **4**   Find the volume of the following solids.

a

18 cm

16 cm

20 cm
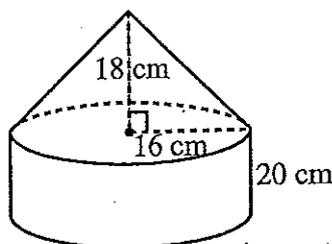
$$V = \frac{1}{3} \times (\pi \times 16^2) \times 18 + \pi \times 16^2 \times 20$$
$$= 20910.4 cm^3$$

b

T
S   R
P   M   Q
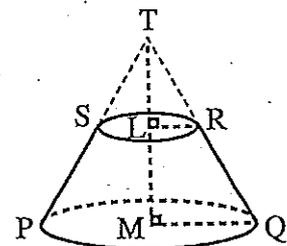
TL = 8 cm
LM = 10 cm
LR = 4 cm
MQ = 9 cm

$$\frac{1}{3} \times (\pi \times 9^2) \times 18 - \frac{1}{3} \times (\pi \times 9^2) \times 8$$
$$= 1392.8 cm^3$$

Surface area and volume

UNIT 8: Volume of a sphere

$\frac{4}{3}\pi r^3$

QUESTION 1   Find the volume of the following spheres (correct to one decimal place) with:

a   radius = 9 cm

$\frac{4}{3} \times \pi \times 9^3$

$= 3053.6 \, cm^3$

b   diameter = 20 cm

$\frac{4}{3} \times \pi \times 10^3$

$= 4188.8 \, cm^3$

c   radius = 30 cm

$\frac{4}{3} \times \pi \times 30^3$

$= 113097.3 \, cm^3$

d   diameter = 35 cm

$\frac{4}{3} \times \pi \times 17.5^3$

$= 22449.3 \, cm^3$

e   radius = 15.3 cm

$\frac{4}{3} \times \pi \times 15.3^3$

$= 15002.5 \, cm^3$

f   diameter = 56 cm

$\frac{4}{3} \times \pi \times 28^3$

$= 91952.3 \, cm^3$

**QUESTION 2**   Calculate the volume of the following spheres correct to one decimal place.

a

10 cm

$\frac{4}{3} \times \pi \times 10^3$

$= 4188.8 \, cm^3$

b

66 cm
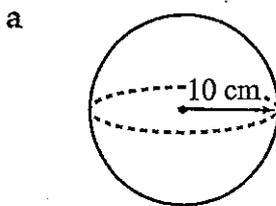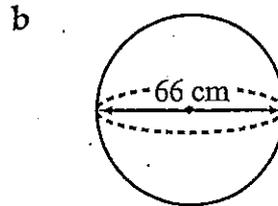
$\frac{4}{3} \times \pi \times 33^3$

$= 150532.6 \, cm^3$

QUESTION 3   Calculate the volume of the following hemispheres correct to one decimal place.
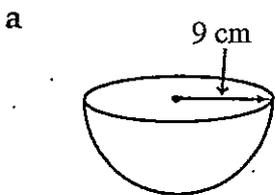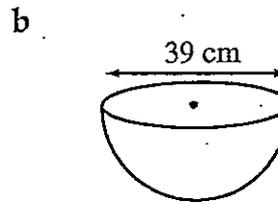
a

9 cm

$\frac{2}{3} \times \pi \times 9^3$

$= 1526.8 \, cm^3$

b

39 cm

$\frac{2}{3} \times \pi \times 19.5^3$

$= 5357713.9 \, cm$

$15529.7 \, cm^3$

QUESTION 4   Find the volume of the following solids correct to two decimal places.

a

27 cm

10 cm
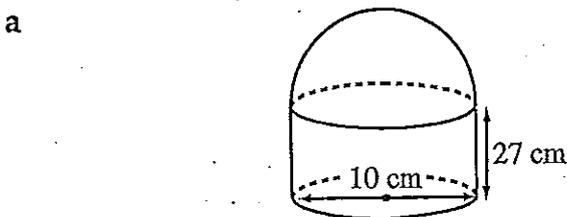
$\pi r^2 h + \frac{2}{3}\pi r^3$

$\pi \times 5^2 \times 27 + \frac{2}{3} \times \pi \times 5^3$

$= 2382.37 \, cm^3$
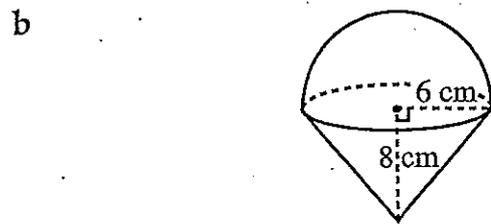
b

6 cm

8 cm

$\frac{1}{3} A h + \frac{2}{3}\pi r^3$

$\frac{1}{3} \times (\pi \times 6^2) \times 8 + \frac{2}{3}\pi \times 6$

$= 753.98 \, cm^3$

(37)

Surface area and volume

UNIT 9: Practical applications of surface area and volume

QUESTION 1   The radius of the Earth is approximately 6400 km. Calculate:

a   the surface area in square kilometres.

$$SA = 4 \pi r^2$$
$$= 4 \times \pi \times 6400^2$$
$$= 514718540.4 \, km^2$$

b   the volume correct to four significant figure

$$SA = 4 \pi r^2$$
$$= 4 \times \pi \times 6400^2$$
$$= 514718540.4 \, km^2$$
$$= 5.147 \times 10^8 \, km^2$$

QUESTION 2   A spherical balloon has a radius of 4.56 metres. Calculate:

)   its surface area correct to one decimal place.

$$SA = 4 \pi r^2$$
$$= 4 \times \pi \times 4.56^2$$
$$= 261.3 \, m^2$$

b   its volume correct to two decimal places.

$$V = \tfrac{4}{3} \pi r^3$$
$$= \tfrac{4}{3} \times \pi \times 4.56^3$$
$$= 397.18 \, m^3$$

QUESTION 3   A conical tent has a base diameter of 6.5 metres and a slant height of 6 metres. Find th area of canvas used for this tent. $SA = \pi r l$

$$\pi \times 3.25 \times 6$$
$$= 61.26 \, m^2$$

QUESTION 4   The diameter of the base of an oil can in the shape of a cone is 12 cm and its height is 10 cm. Find:

a   its volume in cubic centimetres.

$$V = \tfrac{1}{3} \times \pi r^2 \times 10$$
$$= \tfrac{1}{3} \times \pi \times 6^2 \times 10$$
$$= 376.99 \ldots$$
$$= 377 \, cm^3$$
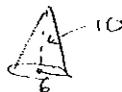
b   its capacity to the nearest millilitre.

$$377 mKL$$

QUESTION 5   A rectangular swimming pool with uniform depth is 25 metres long, 6 metres wide and 2.5 metres deep. It is to be tiled. Calculate:

a   the cost of tiling it at $46 per square metre.

$$6 \times 2.5 \times 2 = 30$$
$$25 \times 2.5 \times 2 = 125$$
$$25 \times 6 = 150$$
$$305 \times 46 = \$14030$$

b   its capacity to the nearest litre.

$$25 \times 6 \times 2.5 = 375$$

Surface area and volume

Instructions for SECTION 1
- You have 15 minutes to answer Section 1
- Each question is worth 2 marks
- Attempt ALL questions
- Calculators are NOT to be used
- Fill in only ONE CIRCLE for each question

1 Find the area of a square with side length 15 cm.

Ⓐ 450 cm²   Ⓑ 225 cm²   Ⓒ 60 cm²   ⬤ None of these

2 Calculate the volume of a cube with side length 7 cm.

Ⓐ 42 cm³   Ⓑ 243 cm³   ⬤ 343 cm³   Ⓓ None of these

3 A rectangular prism has sides of length 7 cm, 9 cm and 11 cm. Find its volume.

Ⓐ 27 cm³   Ⓑ 963 cm³   ⬤ 693 cm³   Ⓓ 396cm³

4 A cube has a volume of 3375 cm³. Find the length of each side of the cube.

Ⓐ 5 cm   ⬤ 15 cm   Ⓒ 25 cm   Ⓓ 35 cm

5 How many square centimetres are in a square metre?

Ⓐ 100   Ⓑ 1000   ⬤ 10 000   Ⓓ 100 000

6 A cone has a base diameter of 12 cm and a vertical height of 8 cm. Calculate its volume. $V = \frac{1}{3}\pi r^2 h$ $\frac{1}{3} \times \pi \times 6^2 \times 8 = 96\pi$

Ⓐ 8π cm³   Ⓑ 24π cm³   Ⓒ 72π cm³   ⬤ 96π cm³

7 The volume of a sphere of radius 5 cm is closest to $\frac{4}{3} \times \pi \times 5^3$

Ⓐ 515 cm³   ⬤ 524 cm³   Ⓒ 864 cm³   Ⓓ 1765 cm³

8 Approximately how many spherical balls of diameter 0.5 cm could be made from a melted down cube of side length 5 cm?

Ⓐ 19   Ⓑ 190   ⬤ 1900   Ⓓ 19 000

9 The volume of a cone with diameter 7 cm and height 8 cm is closest to $\frac{1}{3} \times \pi \times 3.5^2 \times 8$

Ⓐ 56 cm³   ⬤ 103 cm³   Ⓒ 392 cm³   Ⓓ 448 cm³

10 The volume of a cylinder with diameter 5 m and height 4 m is closest to $\pi r^2 h$ $\pi \times 2.5^2 \times 4$

Ⓐ 57 m³   Ⓑ 69 m³   ⬤ 79 m³   Ⓓ 89 m³

Total marks achieved for SECTION 1

39

Surface area and volume

Instructions for SECTION 2
- You have 20 minutes to answer ALL of Section 2
- Each question is worth 2 marks
- Attempt ALL questions
- Calculators may be used

Questions	Answers	Marks
Find the surface area and volume of the following. All measurements are in centimetres.		

Find the surface area and volume of the following.
All measurements are in centimetres.
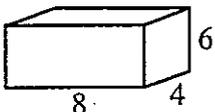
1 Surface area =

$\underset{208}{240cm^2}$ **2**

2 Volume = $192cm^3$ ✓ **2**

3 Surface area = $\frac{1}{2} \times 6 \times 4 =$ $\overset{2}{174}cm^2$ **2**

4 Volume = $120cm^3$ ✓ **2**

$2\pi r^2 + 2\pi vh$
5 Surface area = $2 \times \pi \times 14^2 + 2 \times \pi \times 14 \times 10$ $672\pi cm^2$ **2**

6 Volume = $\pi \times 14^2 \times 10$ $1960\pi cm^3$ ✓ **2**
$\pi r^2 h$

7 Surface area = $\frac{1}{2} \times 10 \times 12 \times 4 + 10^2$ $\overset{6}{340}cm^2$ **2**

8 Volume = $V = \frac{1}{3}Ah$ $400cm^3$ **2**
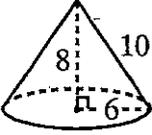
9 Surface area = $\pi r^2 + \pi r l$ $96\pi cm^2$ ✓ **2**

10 Volume = $\frac{1}{3}Ah$ $96\pi cm^3$ ✓ **2**
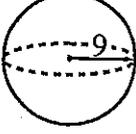
11 Surface area = $4\pi r^2$ $324\pi cm^2$ **2**

12 Volume = $\frac{4}{3}\pi r^3$ $\underset{972 \times}{927\pi cm^3}$ **2**
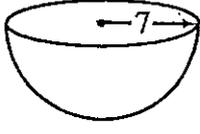
13 Surface area = $2\pi r^2 + \pi r^2$ $147\pi cm^2$ ✓ **2**

14 Volume = $\frac{2}{3}\pi r^3$ $\frac{686\pi}{3}/cm^3$ ✓ **2**

15 Find the surface area of a sphere with radius equal to 14 cm. $784\pi cm^2$ ✓ **2**
$4 \times \pi \times 14^2 \quad =$

Total marks achieved for SECTION 2 $\frac{26}{30}$

Answers

1 a

x	-4	-2	-1	-0.5	0	0.5	1	2	4
$y = \frac{1}{x}$	$-\frac{1}{4}$	$-\frac{1}{2}$	-1	-2	–	2	1	$\frac{1}{2}$	$\frac{1}{4}$

b

x	-4	-2	-1	-0.5	0	0.5	1	2	4
$y = \frac{4}{x}$	-1	-2	-4	-8	–	8	4	2	1

2 $y = -\frac{2}{x}$

3

PAGE 26 1 a

x	-2	-1	0	1	2	3
$y = 2^x$	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8

b

x	-3	-2	-1	0	1	2	3
$y = 2^{-x}$	8	4	2	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$

 2

3

x	-1	0	1	2	3
3^x	$\frac{1}{3}$	1	3	9	27
3^{-x}	3	1	$\frac{1}{3}$	$\frac{1}{9}$	$\frac{1}{27}$
$\frac{3^x + 3^{-x}}{2}$	1.7	1	1.7	4.6	13.5
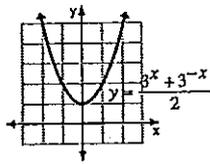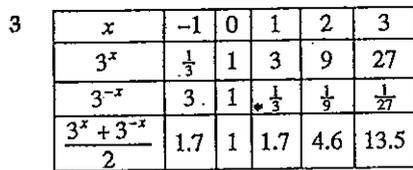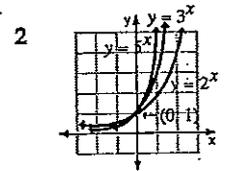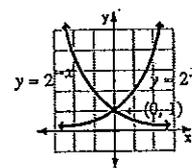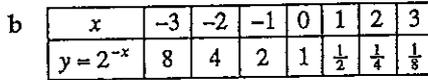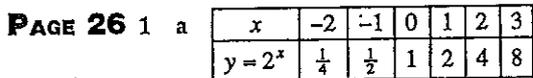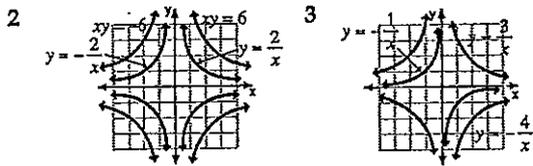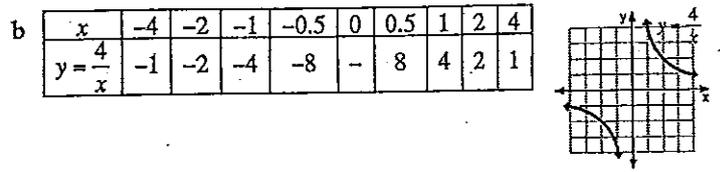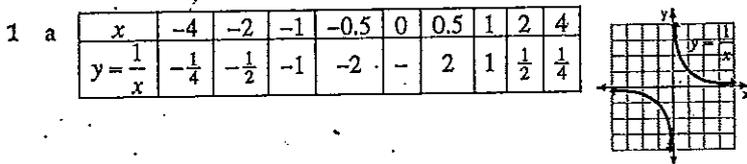
PAGE 27 1 a straight line **b** hyperbola **c** straight line **d** parabola **e** parabola **f** exponential **g** parabola **h** hyperbola **i** none of these **j** circle **k** exponential **l** circle **2 a** D **b** H **c** F **d** G **e** I **f** C **g** A **h** B **i** E **j** L **k** J **l** K

3 a **b** **c**
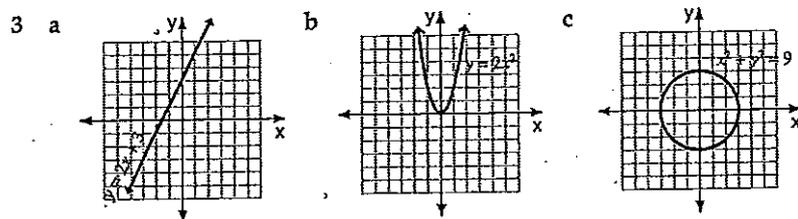
PAGE 28 1 A **2** A **3** C **4** A **5** A **6** D **7** C **8** C **9** B **10** C

PAGE 29 1 **2** **3** **4** **5** **6** **7** **8**

9 **10** $x^2 + y^2 = 81$ **11** $r = 1$ unit, centre $(0, 0)$ **12** x intercepts: $x = 1$ and 7, y intercept $= 7$ **13** $x = 4$ **14** $(4, -9)$ **15**
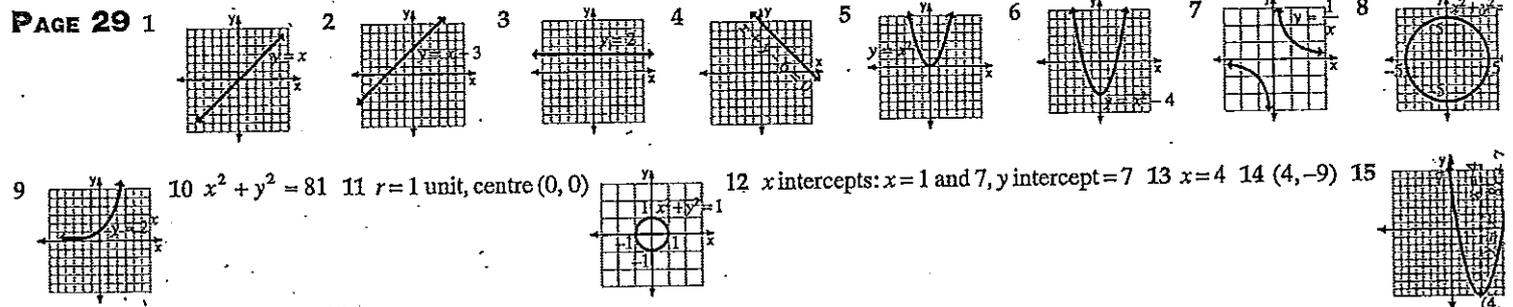
PAGE 30 1 a 636 cm² **b** 238.14 cm² **c** 1925.72 cm² **2 a** 524 cm² **b** 862 cm² **c** 627 cm² **3 a** 544.4 cm² **b** 296.8 cm² **c** 1238.6 cm² **4 a** 1187.5 cm² **b** 961.3 cm² **c** 1153.6 cm²

PAGE 31 1 a 504 cm² **b** 236.3 cm² **2 a** 960 cm² **b** 445.1 cm² **3 a** 288.7 cm² **b** 855.1 cm²

PAGE 32 1 a 301.6 cm² **b** 364 cm² **2 a** 339.3 cm² **b** 731.3 cm² **3 a** 264π cm² **b** 576π cm² **c** 1932π cm² **4 a** 180π cm² **b** 761.2 c

PAGE 33 1 a 196π cm² **b** 324π cm² **c** 3136π cm² **d** 1764π cm² **e** 865.7 cm² **f** 1794.5 cm² **2 a** 576π cm² **b** 1764π cm² **3 a** 461.81 c **b** 1847.26 cm² **4 a** 1260 cm² **b** 2890 cm² **c** 104 cm² **5** 5.35 cm

PAGE 34 1 a 614.1 cm³ **b** 461.9 cm³ **c** 663.3 cm³ **2 a** 2167 cm³ **b** 471.0 cm³ **c** 3348 cm³ **3 a** 4477.20 cm³ **b** 336.00 cm³ **c** 2483.02 c **4 a** 1170 m³ **b** 2470 m³ **c** $24\,696\pi$ cm³