Bearsden Academy

S3 – Block 1 & 2 Topics

- Removing brackets
- Completing the square
- Factorising
- Percentages
- Patterns
- The gradient
- Equation of a straight line
- Volume
- Surface Area

ALGEBRAIC EXPRESSIONS with BRACKETS

Multiply out the brackets and simplify in each question.

1. **(a)** $3(x + 7) + 2x$ **(b)** $16y - 5(2y + 3)$ **(c)** $7(s - 2) - 13$ **(3)**

2. **(a)** $x(x^3 + 2)$ **(b)** $3m(8 - m)$ **(c)** $2y^2(w - 5y)$ **(3)**

3. **(a)** $9(a + 5) + 7(2a + 7)$ **(b)** $7(y - 8) - 5(3y - 6)$ **(1, 2)**

4. **(a)** $(x + 4)(x + 7)$ **(b)** $(y - 9)(y - 3)$

(c) $(s + 12)(s - 2)$ **(d)** $(2a + 5)(a + 9)$

(e) $(3w - 8)(2w + 1)$ **(f)** $(4x - 3)^2$ **(1, 1, 1, 1, 1, 1)**

5. **(a)** $(x + 1)(x^2 + 1)$ **(2)**

(b) $(x - 2)(2x^2 - 3x - 2)$ **(3)**

20 marks

ALGEBRAIC EXPRESSIONS with BRACKETS

1. **(a)** $5x + 21$ **(b)** $6y - 15$ **(c)** $7s - 27$

2. **(a)** $x^4 + 2x$ **(b)** $24m - 3m^2$ **(c)** $2y^2w - 10y^3$

3. **(a)** $23a + 94$ **(b)** $-8y - 26$

4. **(a)** $x^2 + 11x + 28$ **(b)** $y^2 - 12y + 27$ **(c)** $s^2 + 10s - 24$

(d) $2a^2 + 23a + 45$ **(e)** $6w^2 - 13w - 8$ **(f)** $16x^2 - 24x + 9$

5. **(a)** $x^3 + x^2 + x + 1$ **(b)** $2x^3 - 7x^2 + 4x + 4$

COMPLETING the SQUARE

1. Write each of the following quadratic expressions in the form $a(x+b)^2 + c$:

(a) $x^2 + 6x - 3$ **(b)** $x^2 - 5x + 1$

(2, 2,

8 marks

National 5 Homework – Expressions and Formulae

2.3 COMPLETING the SQUARE

1. **(a)** $(x+3)^2-12$ **(b)** $(x-2\cdot5)^2-5\cdot25$

FACTORISING an ALGEBRAIC EXPRESSION

Factorise each expression in the following:

1. **(a)** $y^2 + 5y$ **(b)** $4x^2 - 49$ **(c)** $5s^2 - 20$ **(5)**

2. **(a)** $x^2 + 10x + 25$ **(b)** $x^2 - 10x - 24$ **(c)** $k^2 + 5k - 6$ **(6)**

3. **(a)** $12a^2 + 7a - 12$ **(b)** $7w^2 - 2w - 9$ **(c)** $4x^2 - 11x + 6$ **(6)**

4. **(a)** $12x^2 + 16x + 4$ **(b)** $3m^2 - 6m - 9$ **(c)** $3 - 3x - 36x^2$ **(6)**

5. **(a)** $x^5 - 81x$ **(b)** $a^2 + 3ab + 2b^2$ **(5)**

25 marks

FACTORISING an ALGEBRAIC EXPRESSION

1. **(a)** $y(y + 5)$ **(b)** $(2x - 7)(2x + 7)$ **(c)** $5(s - 2)(s + 2)$

2 **(a)** $(x + 5)(x + 5)$ **(b)** $(x - 12)(x + 2)$ **(c)** $(k + 6)(k - 1)$

3. **(a)** $(4a - 3)(3a + 4)$ **(b)** $(7w - 9)(w + 1)$ **(c)** $(4x - 3)(x - 2)$

4. **(a)** $4(3x + 1)(x + 1)$ **(b)** $3(m - 3)(m + 1)$ **(c)** $3(1 - 4x)(1 + 3x)$

5. **(a)** $x(x^2 + 9)(x - 3)(x + 3)$ **(b)** $(a + b)(a + 2b)$

WORKING with PERCENTAGES

1. John has just put £700 into a savings account where the rate of interest is 4% per annum.

   How much will his savings be worth after 3 years? **(3)**

2. Mary puts £1200 into an account where the annual rate of interest is 5·5%.

   How long will it be before she has at least £1400 in her account? **(5)**

3. My new car has just cost me £18,000. Its value will depreciate by 20% every year.

   How much will it be worth when I trade it in 3 years from now? **(3)**

4. The pressure in my car tyre should be 30psi, but a nail in it is causing it to lose pressure at the rate of 15% every mile that I drive.

   How far can I drive before the pressure falls below 20psi? **(5)**

5. Hassan has been told his hourly pay is to increase by 6% to £9.54.

   Calculate his hourly rate before the increase. **(3)**

6. Due to fire damage, the value of a painting has fallen by 34% and is now valued at £4158.

   What was its value before the damage? **(3)**

22 marks

WORKING with PERCENTAGES

1. £787.40
2. 3 years to reach at least £1400
3. £9216
4. 2 miles
5. £9
6. £6300

Exercise 1 Sequences & Patterns

1. Give a rule for each of these sequences :- (*begin with "start at ... and then ....."*).

   a 2, 5, 8, 11, 14, ... **b** 7, 13, 19, 25, ... **c** 25, 20, 15, 10, ...

   d 98, 81, 64, 47, ... **e** 3, 9, 27, 81, ... **f** 1, 6, 36, 216, ...

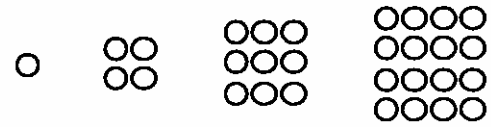
2. Write down the next two numbers in each sequence from question 1.

3. Find the next two numbers in each sequence :-

   a 7, 9, 11, 13, ... **b** 5, 9, 13, 17, ... **c** 24, 22, 20, ...

   d 70, 58, 46, 34, ... **e** 1, 3, 9, ... **f** 2, 4, 8, 16, ...

4. Shown is the pattern for **square numbers**.
   Write down the first 12 square numbers.



5. A pattern of numbers is defined as :- (2 x 3), (3 x 4), (4 x 5), (5 x 6) ....
   Write down the :- **a** 10th term **b** 1000th term **c** n^{th} term.

Exercise 2 Simple Linear Patterns

1. Each door has six window panes.

   a Copy and complete the table.

   b Copy and complete the formula :- P = ... x D

   c How many panes would there be in 11 doors ?

   d How many doors are there if there are 78 panes ?

No. of Doors (D)	1	2	3	4	5
No. of Panes (P)	6	12	?	?	?
rises by : →		6	6	?	?

2. For the tables below :- **(i)** complete each one **(ii)** construct a formula.

   a No. of toys and price

T	1	2	3	4	5	6
P	9	18	27	...	...	...

P = ... x T

   b No. of seconds and no. of minutes

M	1	2	3	4	5	6
S	60	120	180	...	...	...

S = ... x M

   c No. of pentagons and no. of vertices

P	1	2	3	4	5	6
V	5	10	15	...	...	...

   d No. of tables to legs

T	1	2	3	4	5	6
L	8	16	24	...	...	...

3. **Linear Graphs** – For each of the tables below :-

(i) complete each table **(ii)** construct a formula

(iii) take each pair of numbers as coordinates **(iv)** plot on a coordinate graph

(v) draw a line through the points and label the line with your formula.

a

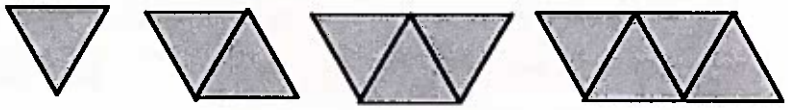
x	0	1	2	3	4	5
y	0	3	6	9	…	…

b

x	0	1	2	3	4	5
y	0	2	4	6	…	…

Exercise 3 Harder Linear Patterns

1. Look at the pattern shown.



1 triangle perimeter 3 | 2 triangle perimeter 4 | 3 triangle perimeter 5 | 4 triangle perimeter 6

a Copy and complete the table shown.

No. of triangles (T)	1	2	3	4	5	6
Perimeter (P)	3	4	5	…	…	…

1 1 1

b Copy and complete the formula for the above pattern :- P = … x T + ….

c Find the perimeter of the pattern with 21 triangles.

d Find the number of triangles if the perimeter is 27.

2. For each of the tables below :-

(i) complete each table **(ii)** construct a formula.

a

x	0	1	2	3	4	5
y	3	5	7	9	…	…

b

x	0	1	2	3	4	5
y	5	6	7	8	…	…

c

x	0	1	2	3	4	5
y	-2	1	4	7	…	…

d

x	0	1	2	3	4	5
y	-1	4	9	14	…	…

e

x	-2	-1	0	1	2	3
y	…	-4	-2	0	2	…

f

x	-2	-1	0	1	2	3
y	…	-11	-4	3	…	…

3. **Harder Linear Graphs** - For each of the tables below :-

(i) complete each table (ii) construct a formula

(iii) take each pair of numbers as coordinates (iv) plot on a coordinate graph

(v) draw a line through the points and label the line with your formula.

a

x	-2	-1	0	1	2	3
y	-1	2	5	…	…	…

b

x	-2	-1	0	1	2	3
y	…	…	-5	-3	-1	…

Revisit - Review - Revise 4

1. Write down the next **two** numbers in these sequences :-

a 80, 73, 66, 59, 52, ...

b 225, 196, 169, 144, 121, ...

c 2, 6, 12, 20, 30, ...

d 1, 2, 5, 10, 20, ...

2. If you add any 2 **consecutive triangular** numbers together, you get a **square** number.

For example :- (1 + 3 = 4), (3 + 6 = 9), (6 + 10 = 16), etc...

Which 2 consecutive triangular numbers add to give the square number 100 ?

3. This table shows the number of bags (B) with the number of sweets (S) in total.

B	1	2	3	4
S	7	14	21	28

a Write down the formula for the number of bags and the number of sweets.

S = ...

b How many sweets are there in 11 bags ?

4. Shown below are four tables showing the connection between pairs of values.

Write down a **formula** connecting the value of the 2nd letter to the 1st letter.

a

T	1	2	3	4
P	3	5	7	9

P = ... T + ...

b

F	1	2	3	4
G	7	11	15	19

G = ...

c

C	1	2	3	4
K	-5	-1	3	7

d

X	1	2	3	4
Y	-6	-5	-4	-3

Ch 3 Cumulative Ex 1 (Chapters 1-3)

1. a 81 mm² b 121 cm² c 2.25 m²
2. a 9 b 64 c 36
   d 144 e 10000 f 8
   g 81 h 100000 i 256
   j -1 k 8 l 10
   m 1 n 1000 o 10
   p 2 q 3
3. a small 20p per 50g, large 23p per 50g
   b small tin is cheaper per 50g
4. per 50 ml - small £1·10, medium 80p, large 91p
   cheapest is medium
5. a CM £54 is cheaper. (Mixer £60)
   b CM £88 is cheaper (Mixer £120)
6. a 28 b 30
   c 36 d 30
7. a 4 b 12
   c 7 d 1
8. a 23, 29 b 53, 59 c 101, 103, 107, 109
9. a 2 x 2 x 2 x 3
   b 2 x 2 x 3 x 3
   c 2 x 2 x 3 x 3 x 5
   d 2 x 2 x 2 x 2 x 2 x 3 x 5 x 5
10. a €562·5 b $2041·20 c 61538·46 Yen
11. £288
12. 9·6%

Chapter 4 : Patterns

Review 3 Percentages, Fractions & Decimals

1. a 0·25 $^1/_4$ b 0·45 $^9/_{20}$
   c 0·78 $^{39}/_{50}$ d 0·71 $^{71}/_{100}$
   e 0·75 $^3/_4$ f 0·125 $^1/_8$
   g 0·005 $^1/_{200}$ h 1·00 $^1/_1$ = 1
2. a 32% b 80% c 2%
   d 90% e 30% f 80%
   g 0·3% h 150%
3. a £90 b 300g c £32
   d 360 ml e $200 f 52 km
4. a £91 b £225 c £1260
   d £24·31 e £385 f £38·40
5. a 1530 mph b 378
6. Sunflower - 232 cm
   Gladiola - 225 cm
   Clematis - 224 cm

Ch 4 Ex 1 Sequences & Patterns

1. a start at 2 then add 3
   b start at 7 then add 6
   c start at 25 then subtract 5
   d start at 98 then subtract 17
   e start at 3 then times by 3
   f start at 1 then times by 6
2. a 17, 20 b 31, 37 c 5, 0
   d 30, 13 e 243, 729 f 1296, 7776
3. a 15, 17 b 21, 25 c 18, 16
   d 22, 10 e 27, 81 f 32, 64
4. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144
5. a 11 x 12 b 1001 x 1002 c $(n+1) \times (n+2)$

Ch 4 Ex 2 Simple Linear Patterns

1. a 1 2 3 4 5 6
   6 12 18 24 30 36
   b $P = 6D$ c 66 d 13
2. a 1 2 3 4 5 6
   9 18 27 36 45 54 $P = 9T$
   b 1 2 3 4 5 6
   60 120 180 240 300 360 $S = 60M$
   c 1 2 3 4 5 6
   5 10 15 20 25 30 $V = 5P$
   d 1 2 3 4 5 6
   8 16 24 32 40 48 $L = 8T$
3. a 0 1 2 3 4 5 6
   0 3 6 9 12 15 18 $y = 3x$
   check linear diagram
   b 0 1 2 3 4 5 6
   0 2 4 6 8 10 12 $y = 2x$
   check linear diagram

Ch 4 Ex 3 Harder Linear Patterns

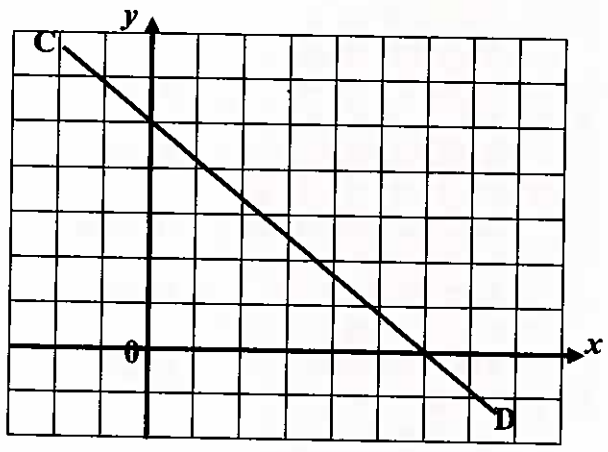
1. a 1 2 3 4 5 6
   3 4 5 6 7 8
   b $P = T + 2$ c 23 d 25
2. a 0 1 2 3 4 5
   3 5 7 9 11 13 $y = 2x + 3$
   b 0 1 2 3 4 5
   5 6 7 8 9 10 $y = x + 5$
   c 0 1 2 3 4 5
   -2 1 4 7 10 13 $y = 3x - 2$
   d 0 1 2 3 4 5
   -1 4 9 14 19 24 $y = 5x - 1$
   e -2 -1 0 1 2 3
   -6 -4 -2 0 2 4 $y = 2x - 2$
   f -2 -1 0 1 2 3
   -18 -11 -4 3 10 17 $y = 7x - 4$
3. a -2 -1 0 1 2 3
   -1 2 5 8 11 14 $y = 3x + 5$
   check graph
   b -2 -1 0 1 2 3
   -9 -7 -5 -3 -1 1 $y = 2x - 5$
   Check graph

Ch 4 Revisit - Review - Revise 4

1. a 45, 38 b 100, 81
   c 42, 56 d 50, 100 (coin values)
2. 45 + 55
3. a $S = 7B$ b 77
4. a $P = 2T + 1$ b $G = 4F + 3$
   c $K = 4C - 9$ d $Y = X - 7$

DETERMINING the GRADIENT of a STRAIGHT LINE given TWO POINTS

1. The line CD passes through the points (0, 5) and (6, 0)



Calculate the gradient of CD. **(1)**

2. A line passes through the points A(–2, –4) and B(8, 1).

Find the gradient of the line AB. **(2)**

3. Prove that the points A(0, –2), B(–4, 4) and C(6, –11) all lie on the same straight line. **(3)**

4. The points S(k, 3), T(10, 2) and U(–2, 5) are collinear. Find the value of k. **(4)**

5. Calculate the gradient of a line which is parallel to the line passing through F(3, –7) and G(–8, 2). **(2)**

6. The line which passes through (–4, 1) and (–7, –11) is parallel to the line through (2, y) and (–3, –3). Find the value of y. **(4)**

(3)

20 marks

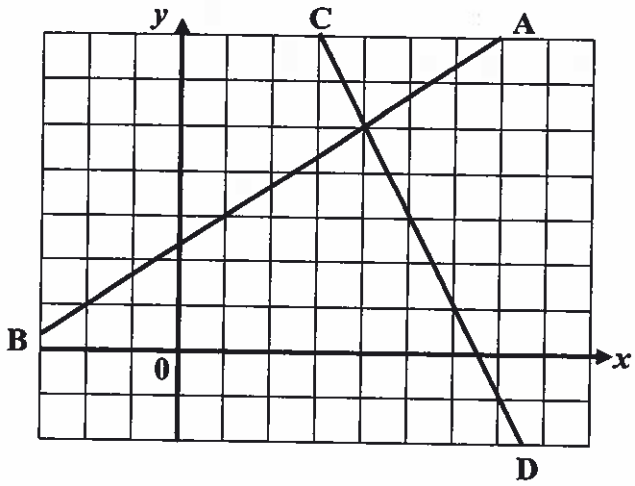
DETERMINING the GRADIENT of a STRAIGHT LINE given TWO POINTS

1. $-\frac{5}{6}$ **2.** $\frac{1}{2}$ **3.** Proof [gradients $-\frac{3}{2}$]

4. $k = 6$ **5.** $-\frac{9}{11}$ **6.** $y = 17$

DETERMINING the EQUATION of a STRAIGHT LINE

1. Calculate the gradients of the lines AB and CD shown below. **(2)**



2. A line passes through the points A(–2, –4) and B(8, 1).

(a) Find the gradient of the line AB. **(2)**

(b) Find the equation of the line AB. **(2)**

3. Find the equation of the line passing through P(4, 6) which is parallel to the line with equation $4x - 2y + 6 = 0$. **(4)**

4. A straight line has equation $3y - 2x = 6$.

Find the gradient and y-intercept of the line. **(3)**

5. Find the equation of the straight line joining the points P(–4, 1) and Q(2, –3). **(3)**

16 marks

DETERMINING the EQUATION of a STRAIGHT LINE

1. $m_{AB} = \frac{2}{3}$ $m_{CD} = -2$

2. **(a)** $m_{AB} = \frac{1}{2}$

(b) $2y - x = -6$

3. $y - 2x = -2$

4. $m = \frac{2}{3}$

y – intercept (0, 2)

5. $3y + 2x = -5$

Extension Exercise **Book 4G**

Surface Areas
This Exercise to go with Chapter 7 (following Exercise 2)

Chapter 7

The Surface Area of a Triangular Prism

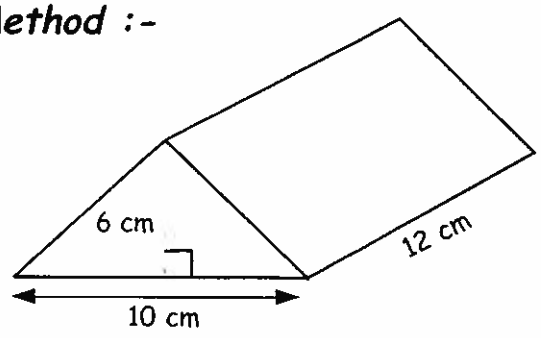
In Textbook 4G, you were shown how to find the surface area of a triangular prism. The following exercise gives you more examples on this topic.

Remember -

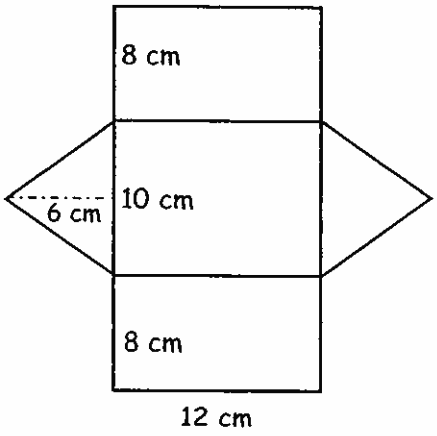
$\text{Area}_{\text{rect}} = L \times B$

$\text{Area}_{\text{triangle}} = \frac{1}{2}(L \times B)$

Method :-



Becomes —>



To calculate the TOTAL SURFACE AREA, you must follow these steps :-

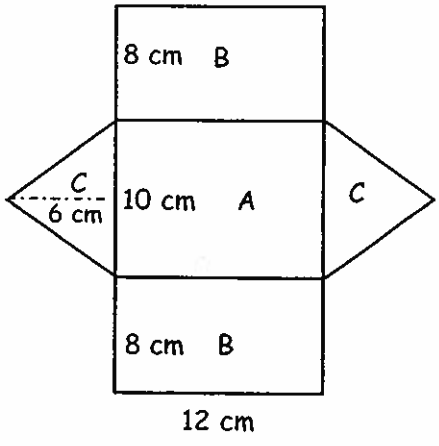
Step 1 find the area of each rectangle - 1 large and 2 smaller

Step 2 find the area of each triangle (both the same)

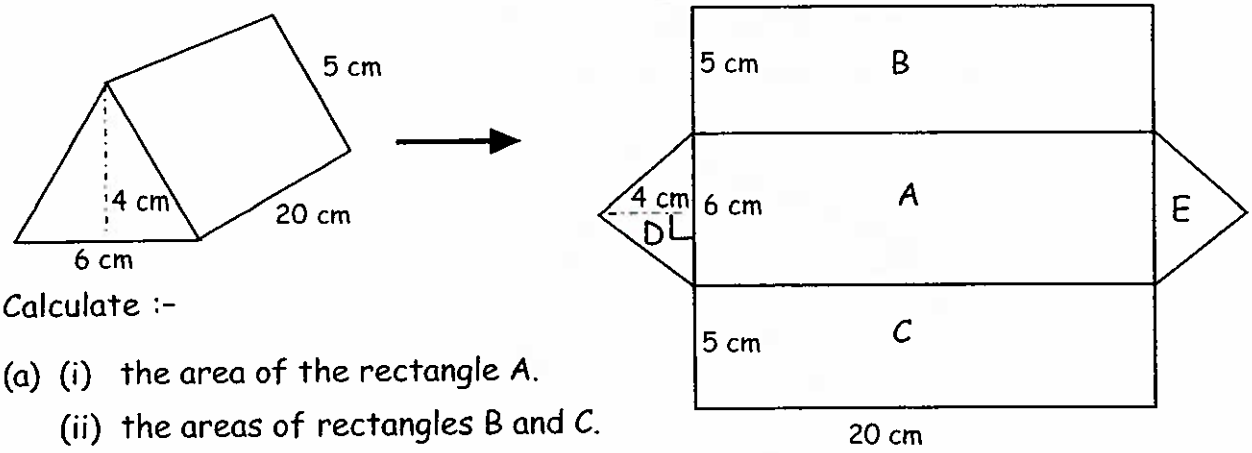
Step 3 add your answers to get total surface area (in cm^2)

Exercise 2E

1. For the triangular prism shown, calculate :-
   (a) (i) the area of the rectangle A.
   (ii) the areas of rectangles B.
   (b) the areas of triangles C.
   (c) the total surface area.



2.



Calculate :-

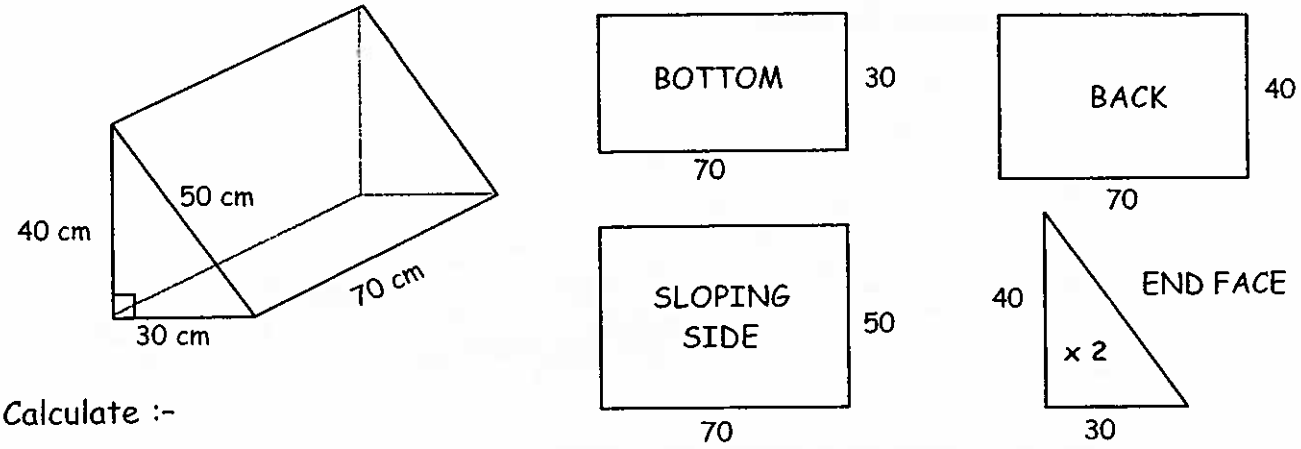
(a) (i) the area of the rectangle A.

(ii) the areas of rectangles B and C.

(b) the areas of triangles D and E (the same).

(c) the total surface area.

3. This triangular prism consists of 3 rectangles and 2 <u>right angled</u> triangles.



Calculate :-

(a) the area of the 3 rectangles.

(b) the area of the 2 right angled triangles.

(c) the total surface area.

4. Calculate :-

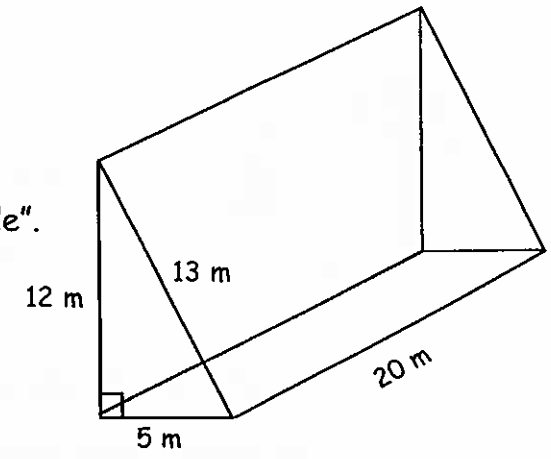
(a) (i) the area of the rectangular floor.

(ii) the area of the rectangular "back".

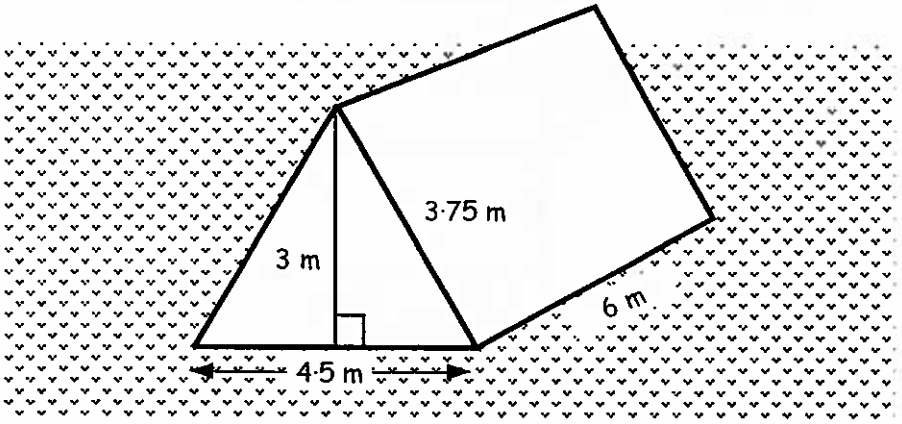
(iii) the area of the rectangular "sloping side".

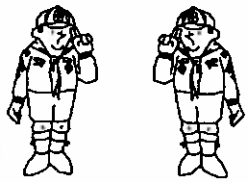
(b) the area of the 2 right angled triangles.

(c) the total surface area.

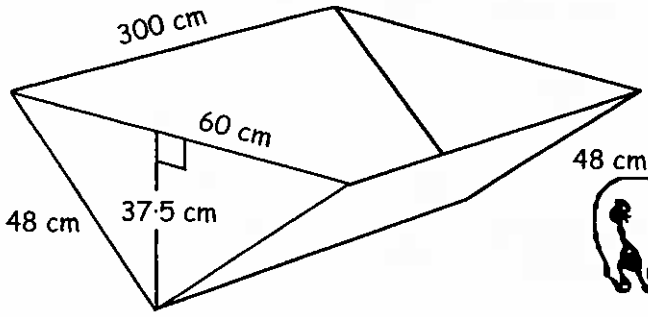


5. Calculate the total area of canvas required for the ground-sheet, the 2 sloping sides that make up the roof and the 2 triangular ends of this tent.



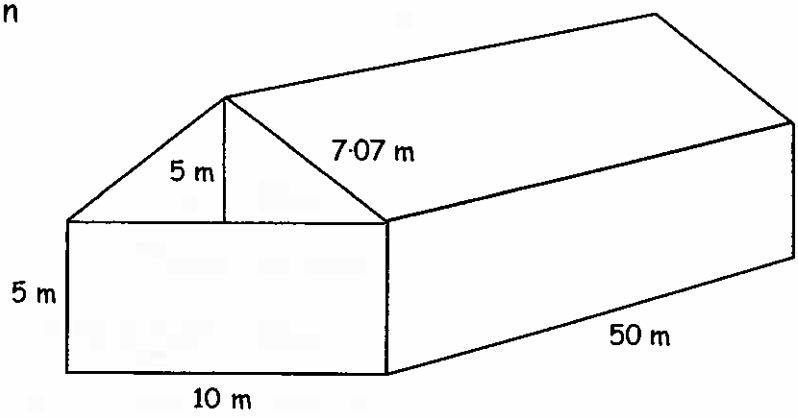


6. The farmer empties pig food into this open trough.
The end faces are isosceles triangles.



What area of metal is required to make this trough ?
(Remember - the top is open !!)

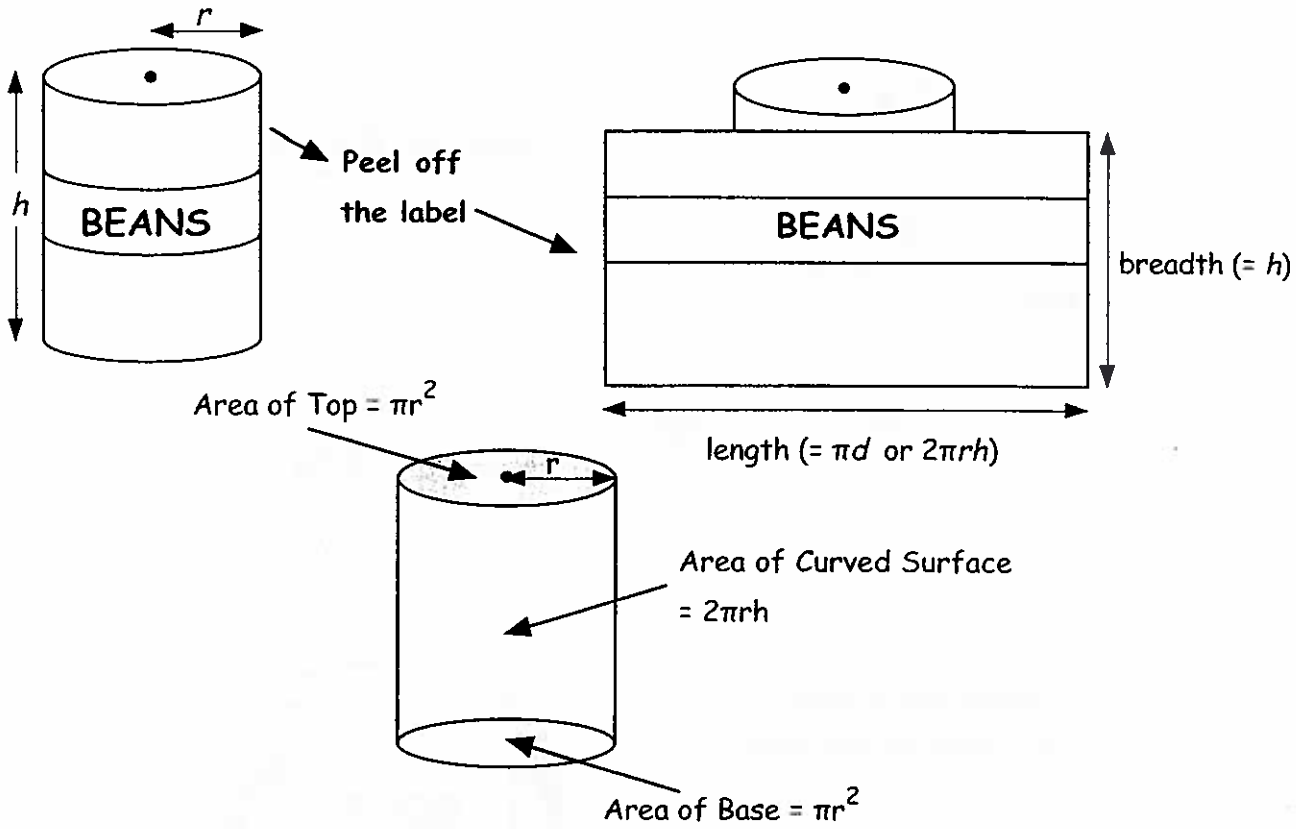
7. A wedding reception was held in a large marquee as shown.



(a) Calculate the area of each end of the marquee.

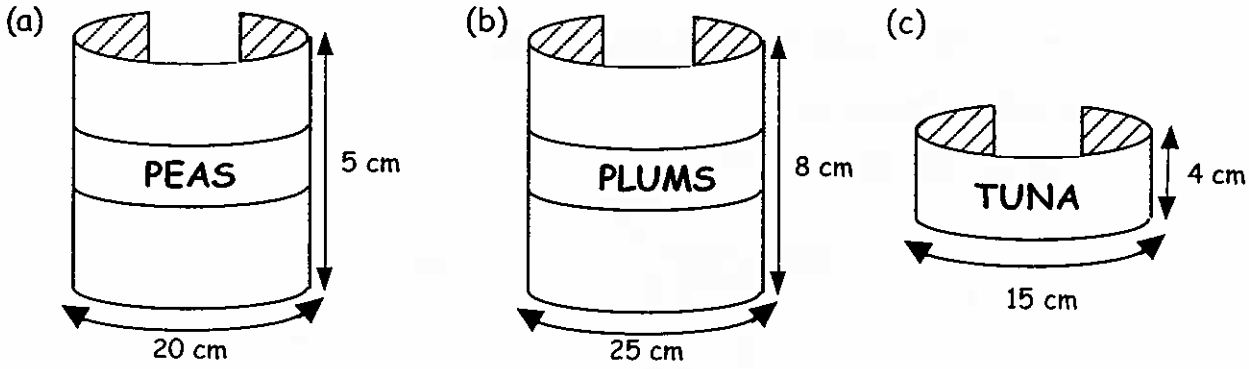
(b) Calculate the total surface area of the marquee including the canvas floor.

The Surface Area of a Cylinder



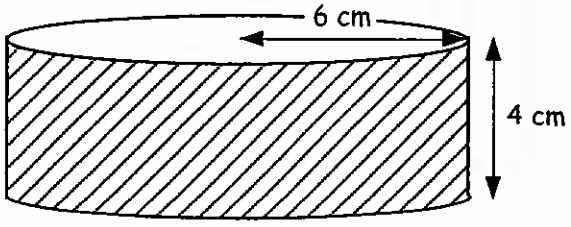
Exercise 3E

1. Calculate the area of each label removed from their cylindrical cans.
($A = L \times B$)



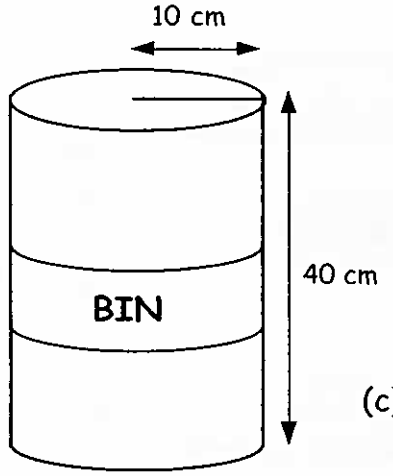
2. (a) Calculate the circumference of this circular top. ($C = \pi D$ or $C = 2\pi r$)

   (b) Calculate the <u>curved surface area</u> of this cylinder.

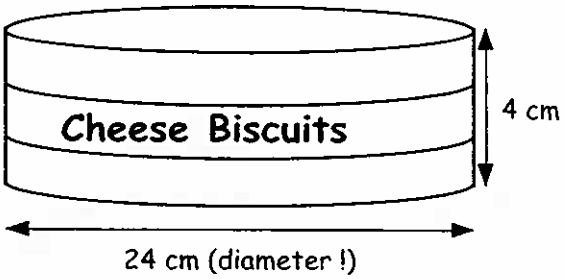


3. Calculate the curved surface area (C.S.A.) of these cylinders :-

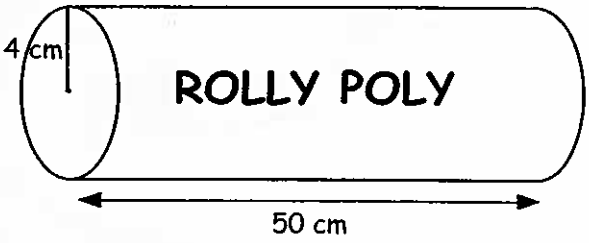
(a)



(b)

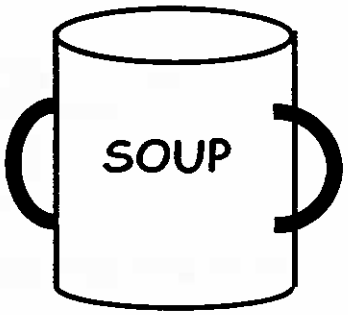


(c)



4. The height of a large pot of soup is 70 cm, and the radius of the base is 40 cm.

Calculate the pot's curved surface area.



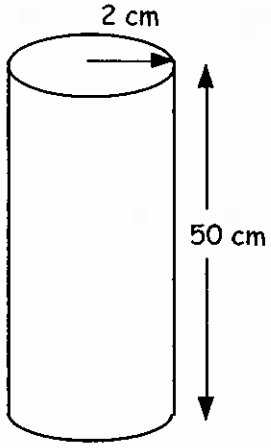
5. For each cylinder find :-

(i) the area of the circular ends. ($A = \pi r^2$ twice !)

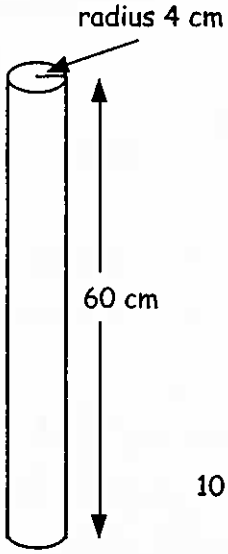
(ii) the curved surface area.

(iii) the total surface area.

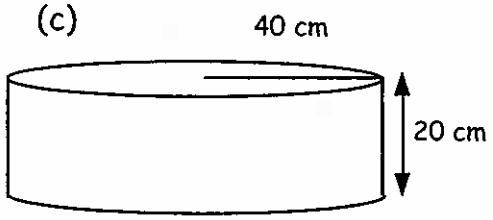
(a)



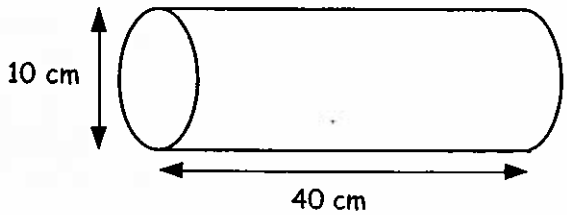
(b)



(c)



(d)



6. This can has been opened and the lid removed !

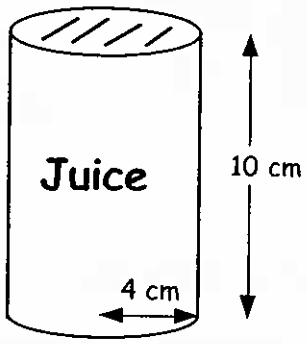
It has a base with radius 4 cm
and height 10 cm.

Calculate the area of :-

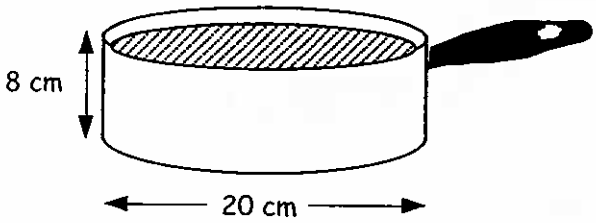
(a) its base.

(b) its curved surface area.

(c) its total surface area.



7.



For this cylindrical saucepan :-

Calculate the area of :-

(a) its base.

(b) its curved surface area.

(c) its total surface area.

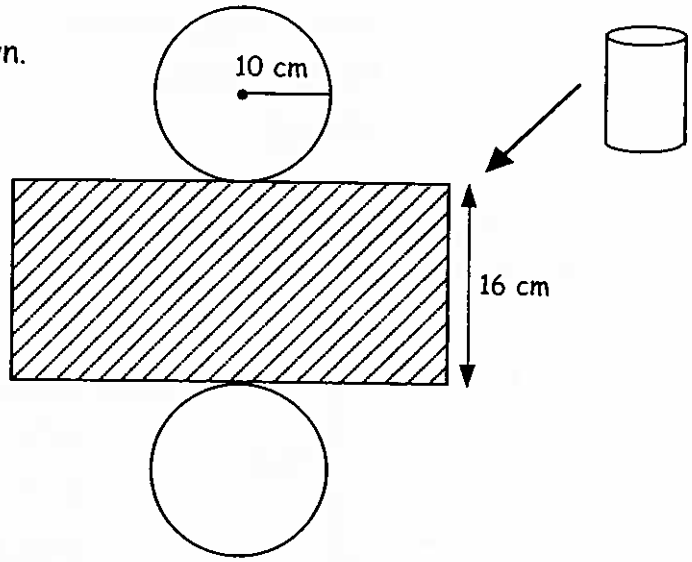
8. The NET of a closed cylinder is shown.

Calculate the area of :-

(a) its base.

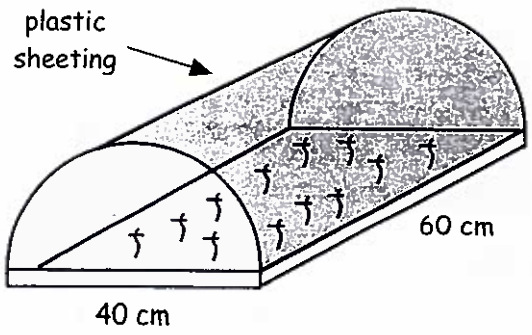
(b) its curved surface area.

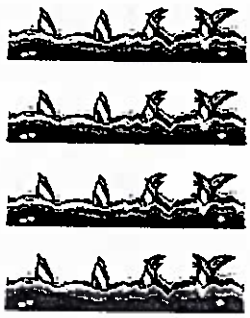
(c) its total surface area



9. PROBLEM !!

Shown is a box of flowering seeds covered by a curved piece of clear plastic.



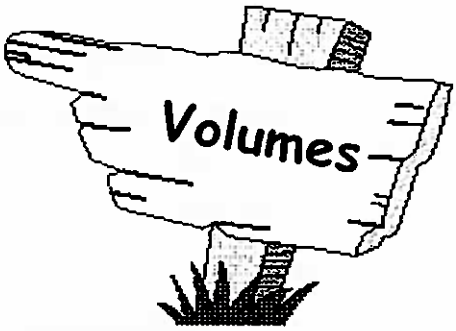


Calculate the area of curved clear plastic needed to cover the seed box.

Extension Exercise **Book 4G**

Chapter 8

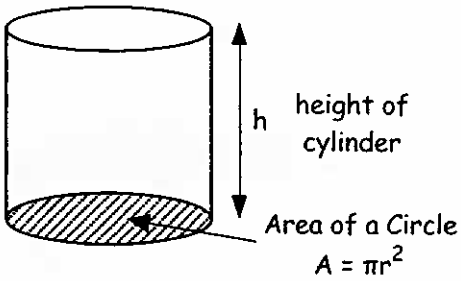
Volumes
This Exercise to go with Chapter 8 (following Exercise 3)



The Volume of a Cylinder

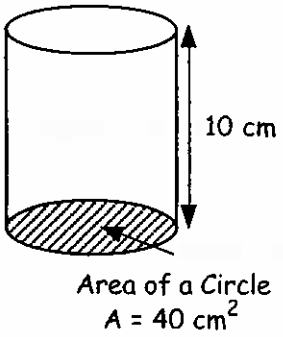
To find the **volume** of a cylinder, simply :-

"Find the Area of the Base (a circle) then multiply the answer by the Height of the Cylinder".



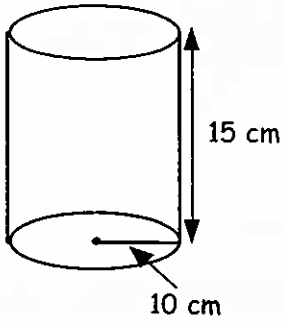
Three Cases :-

1. Finding the volume of a cylinder when the area of the base is already given.



V = Area of base × height
= $40\ cm^2 \times 10\ cm$
= $400\ cm^3$

2. Finding the volume of a cylinder given the radius of the circular base.

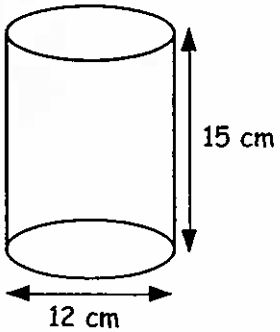


V = Area of base × height
$V = \pi r^2 h$
$= 3{\cdot}14 \times 10 \times 10 \times 15$
$= 4710\ cm^3$

3. Finding the volume of a cylinder given the diameter of the circular base.

Use :- $V = \pi r^2 h$

(this time, the radius has to be found first)



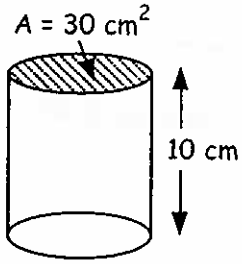
Answer :- diameter is 12 cm, so radius is 6 cm.

$V = \pi r^2 h$
$= 3{\cdot}14 \times 6 \times 6 \times 15$
$= 1696\ cm^3$

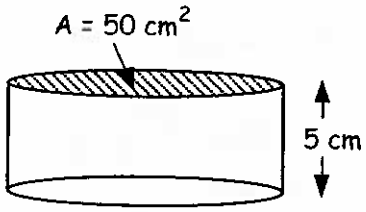
Exercise 3E

1. Find the volume of each of the following cylinders :-
(the areas of the circular bases are given)

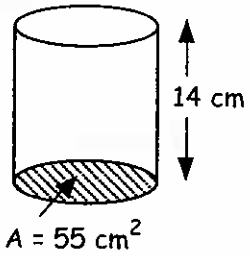
(a)



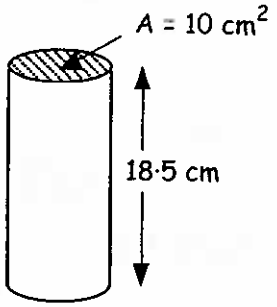
(b)



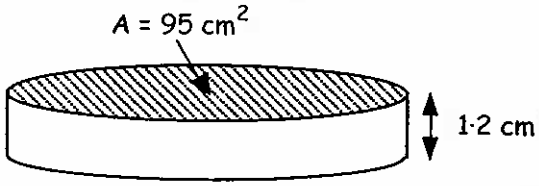
(c)



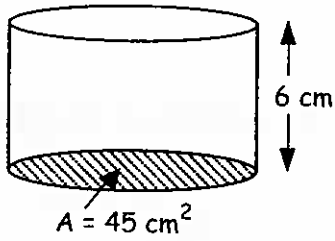
(d)



(e)

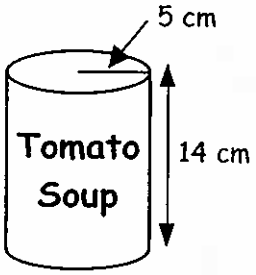


(f)

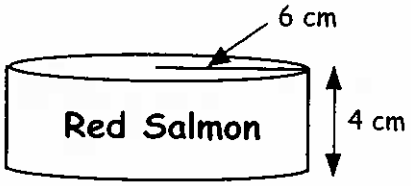


2. Use the formula $V = \pi r^2 h$ to find the volumes of the following cylinders, giving you answers to 2 decimal places :-
(in each case, the <u>radius</u> of the circular base is given)

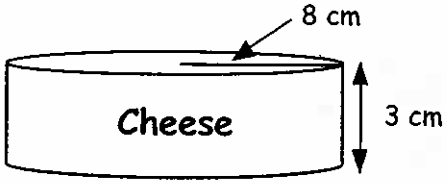
(a)



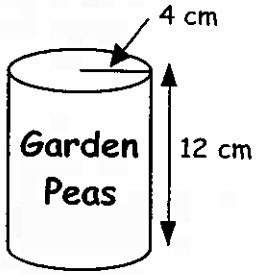
(b)



(c)

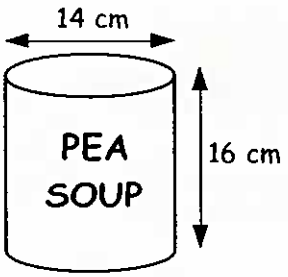


(d)

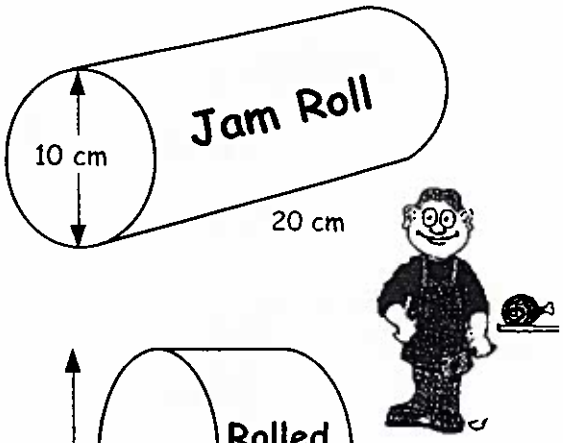


3. Write down the **radius** of each circular base.
Use the formula $V = \pi r^2 h$ to find the volume of each of the following cylinders :-
(*give your answers correct to the nearest whole* cm^3)

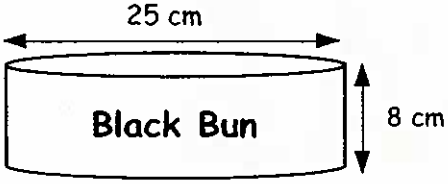
(a)



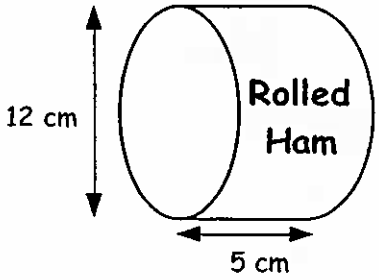
(b)



(c)

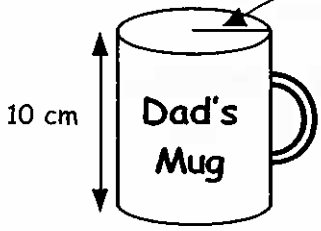


(d)

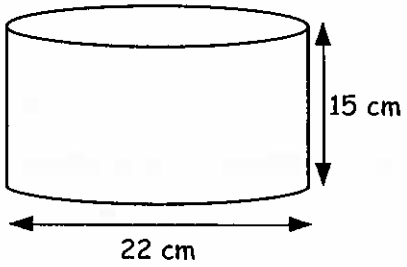


4. Calculate the volumes of the following cylinders :-

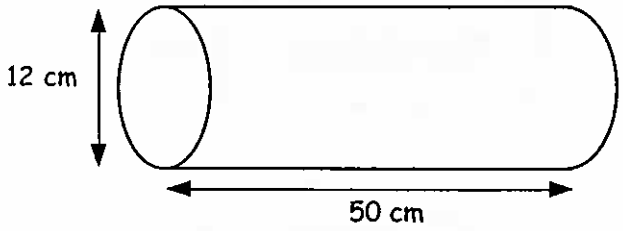
(a)



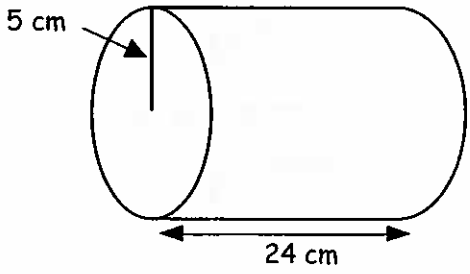
(b)



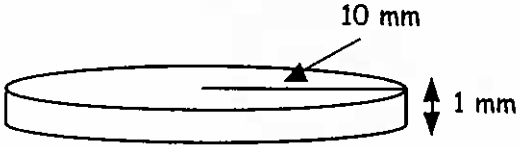
(c)



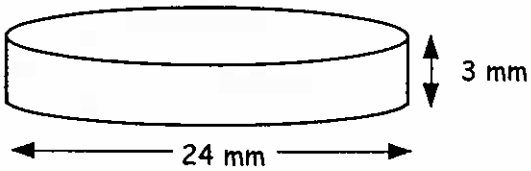
(d)



(e)



(f)

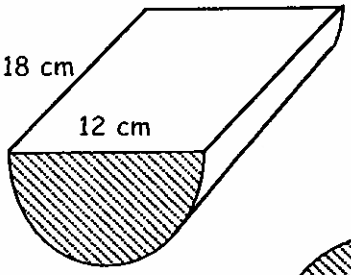


5. The wooden logs shown below have been sawn into fractional parts of a cylinder. (e.g. a half cylinder, a quarter cylinder, etc.)

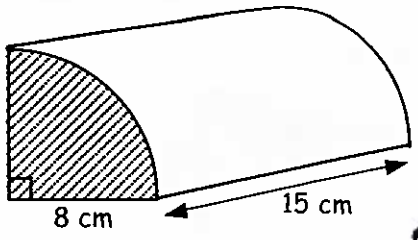
Calculate :- (i) the volume of the original **whole** cylinder each time.

(ii) the volume of the actual shape.

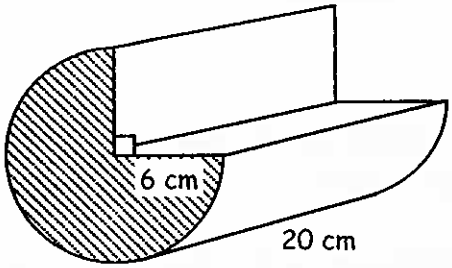
(a)



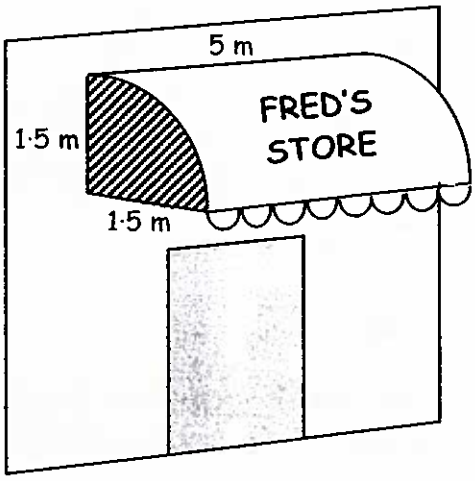
(b)



(c)



6. Each end of this sun canopy is in the shape of a quarter-circle.
The shape itself is a quarter-cylinder.



(a) (i) Calculate the area of one quarter-circle end.

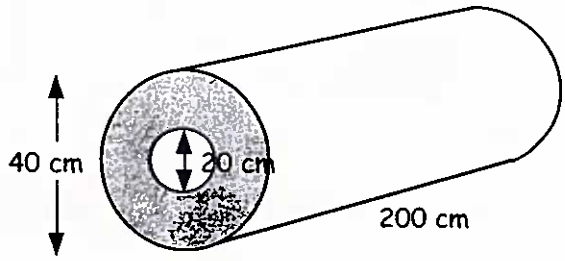
(ii) Use your answer to find the volume of the shape.

(b) (i) Use the formula $V = \pi r^2 h$ to find the volume of the whole cylinder.

(ii) Now find the volume of the quarter-cylinder.

(c) What do you notice about your answers to (a) (ii) and (b) (ii) ?

7. This picture shows a hollow plastic tube.
It is 200 cm long.
It has an outside diameter of 40 cm.
It has an inside diameter of 20 cm.



Calculate :-

(a) the area of the large circular end with a diameter of 40 cm.

(b) the area of the small circular end with a diameter of 20 cm.

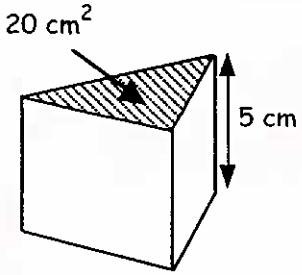
(c) the shaded area.

(d) the volume of the tube.

The Volume of a Triangular Prism

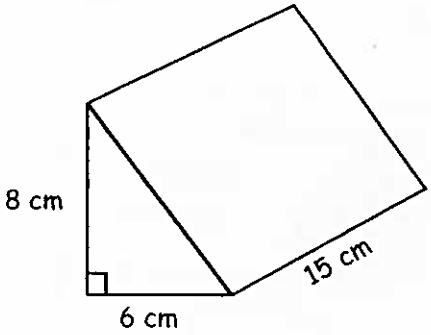
Two Cases :-

1. Finding the volume of a triangular prism when the area of the triangular base is already given.



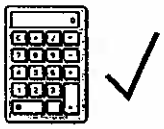
V = Area of base × height
= 20 × 5
= 100 cm³

2. Finding the volume of a triangular prism given the base and height of the end triangle.



$\text{Area}_{(\text{triangle})} = \frac{1}{2} \times B \times H$
$= \frac{1}{2} \times 6 \times 8$
$= 24 \text{ cm}^2$

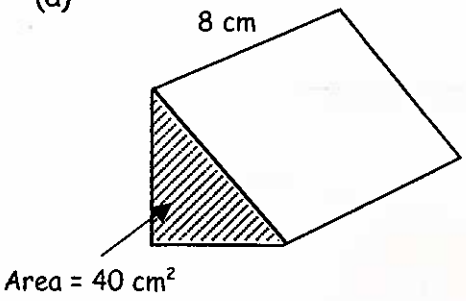
For Δ prism
V = $\text{Area}_{(\text{triangle})}$ × depth
= 24 × 15
= 360 cm³



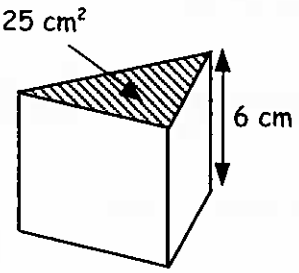
Exercise 4E

1. Find the volume of each of the following triangular prisms :-
(the areas of the circular bases are given)

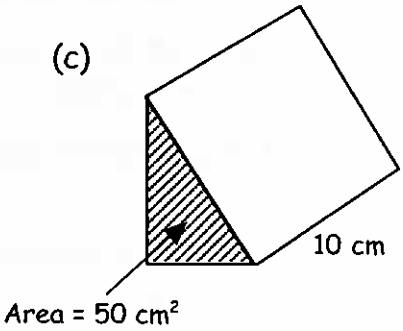
(a)



(b)

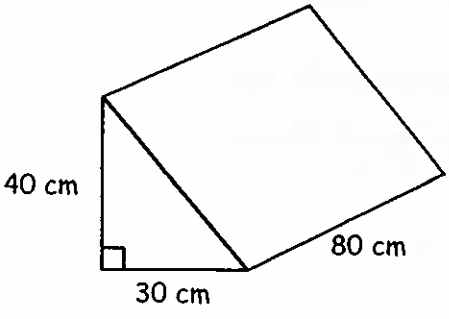


(c)

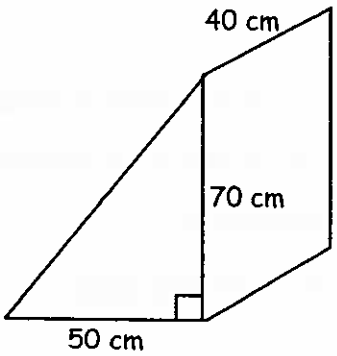


2. Calculate the volume of each of the following triangular prisms :-

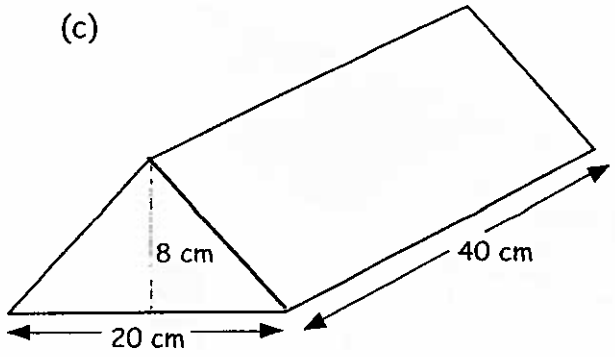
(a)



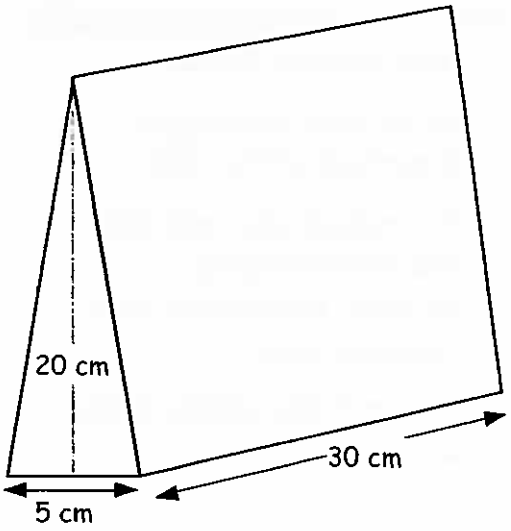
(b)



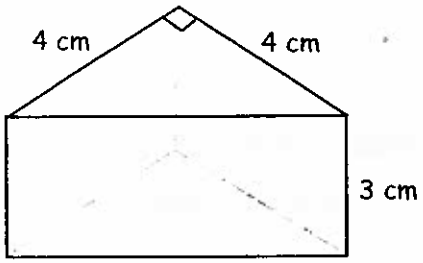
(c)



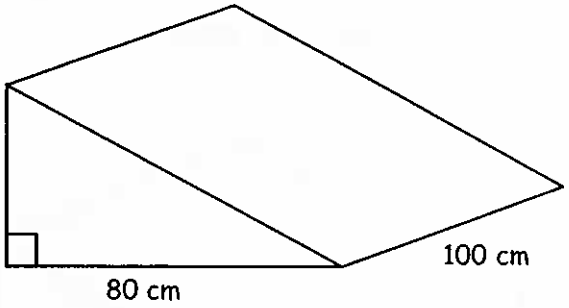
(d)



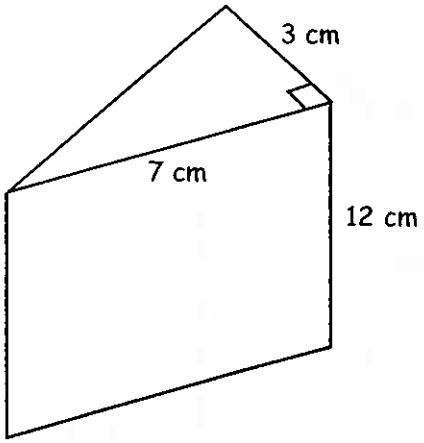
(e)



(f)



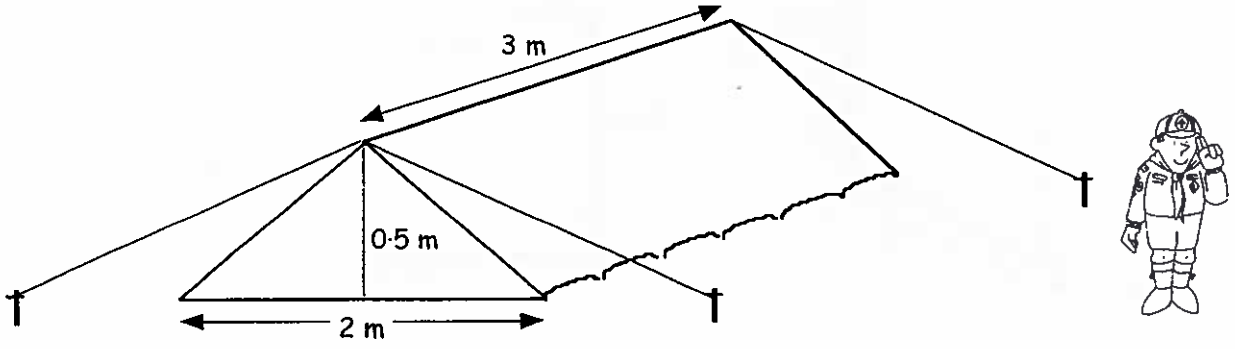
(g)



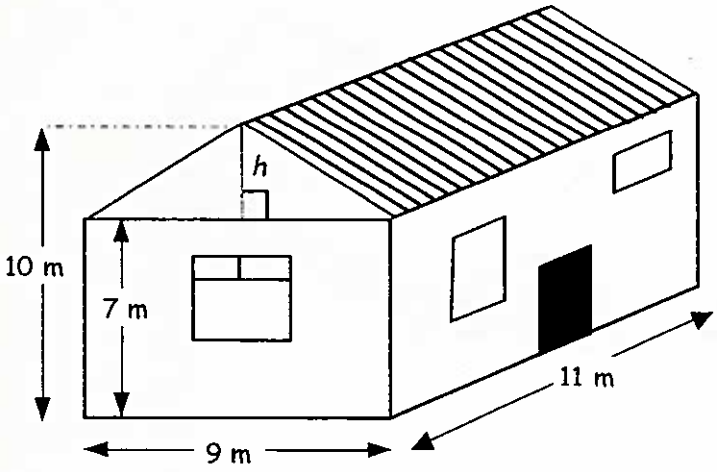
3. For the tent shown below, calculate :-

   (a) the area of the triangular front.

   (b) the volume of the tent.



4. Shown is a house on which repairs are being done to its roof.



(a) Write down the height (h metres) of the roof.

(b) The ends of the roof are isosceles triangles. Calculate the area of one triangular end.

(c) Work out the volume of the roof space.

5. For each of the following, find :-

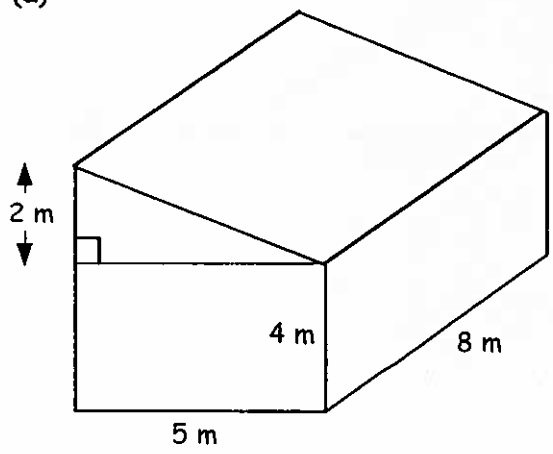
(i) the area of the "end" rectangle.

(ii) the area of the "end" triangle.

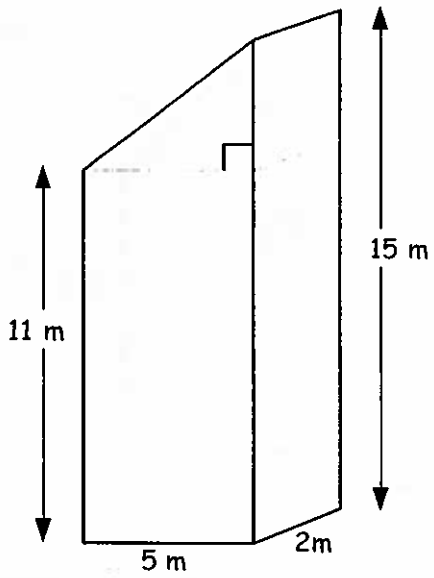
(iii) the total "end" area.

(iv) the volume of the shape.

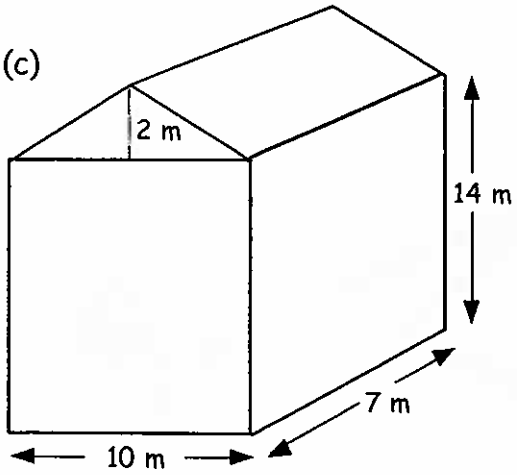
(a)



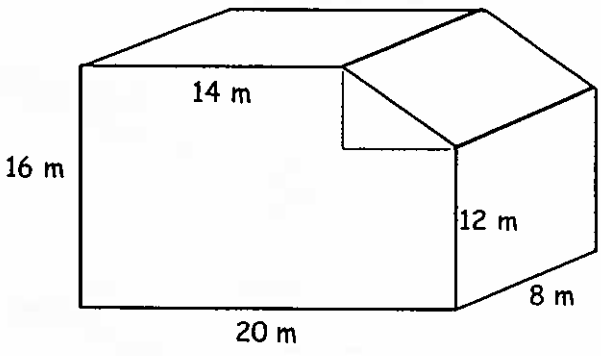
(b)



(c)



(d) **Hard !!**



5. a 0·026 b 0·00046 c 0·00573
   d 0·0000904 e 0·26381 f 0·006
   g 0·00009 h 0·0000001001
6. 0·028 kg = 28 g = less than 30 g
7. a 0·005 b 0·021 c 0·0006
   d 0·071 e 0·0000693 f 0·000001234
8. a (i) 0·025 (ii) 360 (iii) 0·004
   (iv) 700000 (v) 0·000298 (vi) 30710
   b (i) 7×10^{-2} (ii) $5{\cdot}3 \times 10^{1}$ (iii) $4{\cdot}5 \times 10^{-4}$
   (iv) $4{\cdot}67 \times 10^{2}$ (v) $1{\cdot}39 \times 10^{-3}$ (vi) $5{\cdot}8 \times 10^{5}$
   (vii) 9×10^{-7} (viii) $6{\cdot}3 \times 10^{7}$ (ix) 2×10^{-1}
9. n = 9
10. a 3400 km b 780000000 km
    c 0·0054 m d 0·00000335 sec
11. a $1{\cdot}74 \times 10^{6}$ m b 3×10^{-5} sec
    c $1{\cdot}494 \times 10^{5}$ d $6{\cdot}2 \times 10^{-6}$ mm
12. $7{\cdot}5 \times 10^{-10}$ kg

CHAPTER 6

Exercise 4E

1. B(6,3) C(2,4) D(0,3) E(2,0)
2. a x-axis b y-axis c origin
   d B e B and D
3. a/b see diagram c $\frac{2}{6} = \frac{1}{3}$
4. a/b see diagram c $\frac{6}{2} = 3$
5. a $\frac{1}{2}$ b 4 c $\frac{1}{6}$ d 0
6. Q(4,3) R(3,0) S(1,-3) T(-2,4)
   U(-3,0) V(-2,1) W(-3,-2) Z(-2,-3)
7. a/b see diagram c $\frac{3}{9} = \frac{1}{3}$
8. a 3 b $\frac{2}{5}$ c $\frac{1}{5}$ d 4

CHAPTER 7

Exercise 2E

1. a (i) 120 cm² (ii) 96 cm² each
   b 30 cm² each c 372 cm²
2. a (i) 120 cm² (ii) 100 cm² each
   b 12 cm² each c 344 cm²
3. a 2100 cm², 2800 cm², 3500 cm²
   b 600 cm² each c 9600 cm²
4. a (i) 100 m² (ii) 240 m² (iii) 260 m²
   b 30 m² each c 660 m²
5. 85·5 m²
6. 31050 cm²
7. a 75 m² each b 1857 m²

Exercise 3E

1. a 100 cm² b 200 cm² c 60 cm²
2. a 37·68 cm b 150·72 cm²
3. a 2512 cm² b 301·44 cm² c 1256 cm²
4. 17584 cm²
5. a (i) 25·12 cm² (ii) 628 cm² (iii) 653·12 cm²
   b (i) 100·48 cm² (ii) 1507·2 cm² (iii) 1607·68 cm²
   c (i) 10048 cm² (ii) 5024 cm² (iii) 15072 cm²
   d (i) 157 cm² (ii) 1256 cm² (iii) 1413 cm²
6. a 50·24 cm² b 251·2 cm² c 301·44 cm²
7. a 314 cm² b 502·4 cm² c 816·4 cm²
8. a 314 cm² b 1004·8 cm² c 1632·8 cm²
9. 3768 cm²

CHAPTER 8

Exercise 3E

1. a 300 cm³ b 250 cm³ c 770 cm³
   d 185 cm³ e 114 cm³ f 270 cm³
2. a 1099 cm³ b 452·16 cm³ c 602·88 cm³
   d 602·88 cm³
3. a 2462 cm³ b 1570 cm³ c 3925 cm³
   d 565 cm³
4. a 282·6 cm³ b 5699·1 cm³ c 5652 cm³
   d 1884 cm³ e 314 mm³ f 1356·48 mm³
5. a (i) 2034·72 cm³ (ii) 1017·36 cm³
   b (i) 3014·4 cm³ (ii) 753·6 cm³
   c (i) 2260·8 cm³ (ii) 1695·6 cm³
6. a (i) 1·76625 m² (ii) 8·83125 m³
   b (i) 35·325 m³ (ii) 8·83125 m³
   c same answer
7. a 1256 cm² b 314 cm² c 942 cm²
   d 188400 cm³

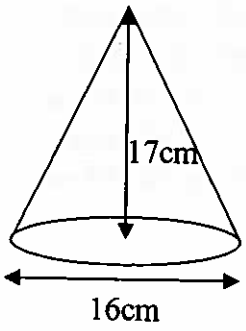
Exercise 4E

1. a 320 cm³ b 150 cm³ c 500 cm³
2. a 48000 cm³ b 70000 cm³ c 3200 cm³
   d 1500 cm³ e 24 cm³ f 200000 cm³
   g 126 cm³
3. a 0·5 m² b 1·5 m³
4. a 3 m b 13·5 m² c 148·5 m³
5. a (i) 20 m² (ii) 5 m²
   (iii) 25 m² (iv) 200 m³
   b (i) 55 m² (ii) 10 m²
   (iii) 65 m² (iv) 130 m³
   c (i) 140 m² (ii) 10 m²
   (iii) 150 m² (iv) 1050 m³
   d (i) area of end face = 308 m²
   (ii) vol = 308 m² × 8 m = 2464 m³

WORKING with the VOLUME of a SOLID SPHERE, CONE, PYRAMID

Give your answers correct to 3 significant figures where necessary.

1.



A cone has a base diameter of 16cm and a height of 17cm.

Calculate the volume of the cone, giving your answer correct to 3 sig figs.

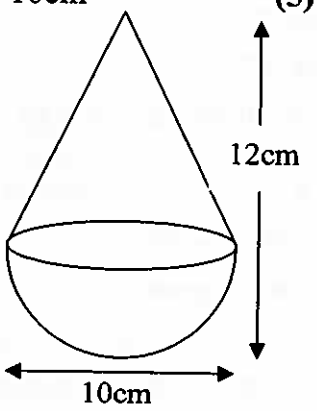
[Volume of cone = $\frac{1}{3}\pi r^2 h$] **(3)**

2. A lead sinker is in the shape of a cone with a hemispherical base.

The total height of the sinker is 12cm and the diameter of the base is 10cm **(5)**

Calculate the volume of lead required to make the sinker.

[Volume of sphere = $\frac{4}{3}\pi r^3$]



3. **(a)** Calculate the volume of the largest sphere which will fit inside a cube of side 15cm.

(b) Calculate the volume of wasted space between the two. [Answer to nearest cm^3]

(2, 3)

4. A pyramid has a square base of side 6cm and a vertical height of 9cm.

Calculate the volume of the pyramid correct to 2 significant figures. **(4)**

16 marks

WORKING with the VOLUME of a SOLID SPHERE, CONE, PYRAMID

1. $1140cm^3$ **2.** $445cm^3$ **3.** **(a)** $1770cm^3$ **(b)** $1610cm^3$

4. $110cm^3$