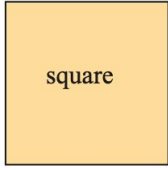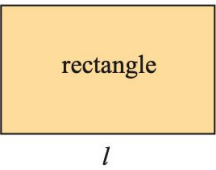**WALT** Investigate different types of perimeters using composite shapes
Success Criteria I know how to calculate the perimeter of different shapes
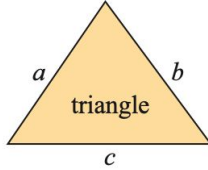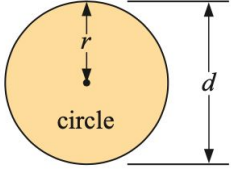
Perimeter formulae

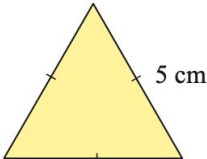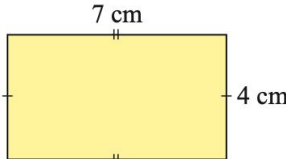|			
s square	rectangle w l	a triangle b c	r circle d
$P = 4s$	$P = 2(l + w)$	$P = a + b + c$	$C = \pi d$ or $C = 2\pi r$

[**Note:** The perimeter of a circle is its **circumference**.]

Do Now

a 5 cm
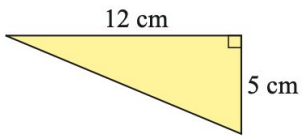
b 7 cm, 4 cm

c 12 cm, 5 cm

d 4 cm, 6 cm, 10 cm

e 6 m, 4 m, 3 m

f 7 mm, 5 mm, 3 mm, 8 mm

Find, correct to 1 decimal place, the perimeter of:

a ◄8 cm►

b ◄─ 40 m ─►
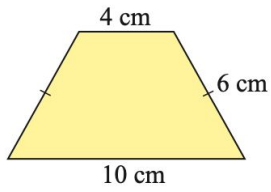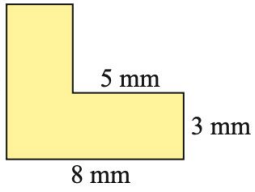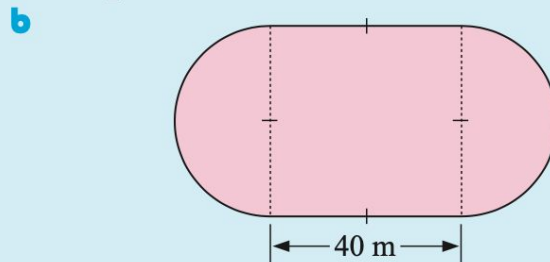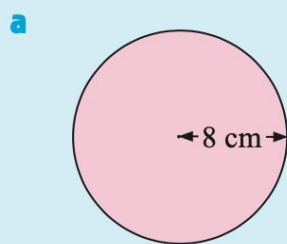
a Circumference
$= 2\pi r$
$= 2\pi \times 8$ cm
$= 16\pi$ cm
$\doteqdot 50.3$ cm

b Perimeter
$=$ circumference of circle
$\qquad + 2 \times$ (length of straight side)
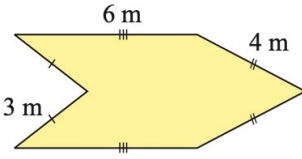$= (\pi \times 40) + (2 \times 40)$ m
$= 40\pi + 80$ m
$\doteqdot 205.7$ m

3 Find, correct to 1 decimal place, the perimeter of:

a

5 cm

b

3 m

c

4 cm

d

4 m

e

60 m

80 m

f

6 cm

g

4 cm

h

3 cm

i

18 cm

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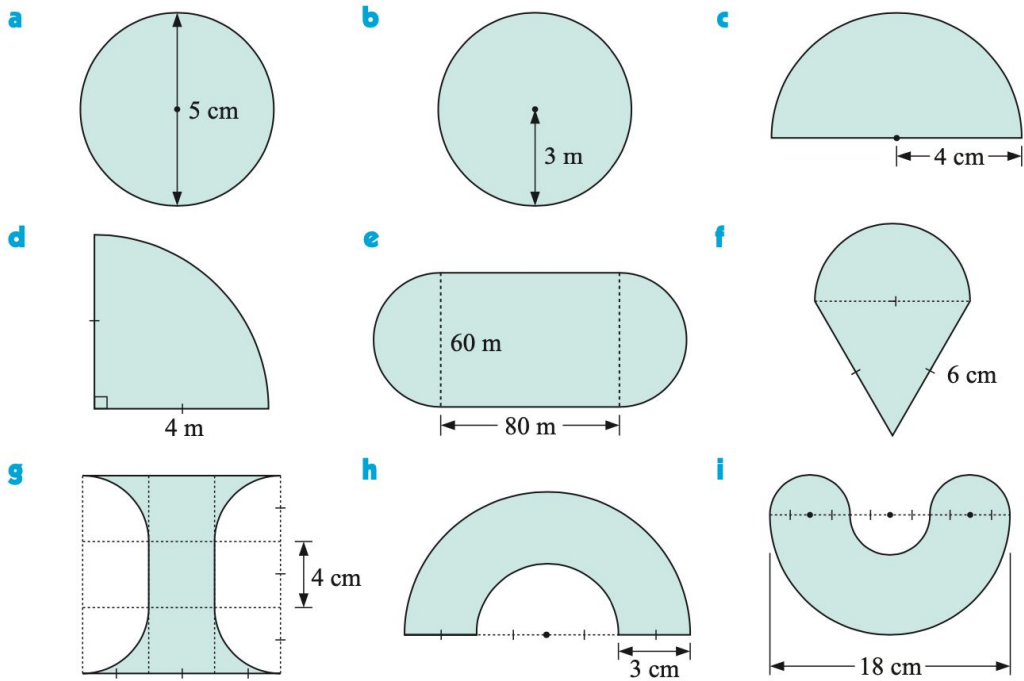
4 A farmer decides to fence a 400 m by 350 m paddock with a 4-strand wire fence. Find the total cost of the wire required given that single strand wire costs 12.4 cents per metre.
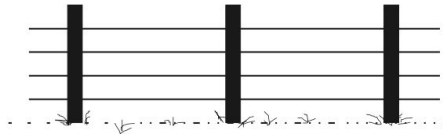
5 Find the total length of string used to tie a box as illustrated. 15 cm extra is required for the knot and bow.

10 cm

15 cm

20 cm
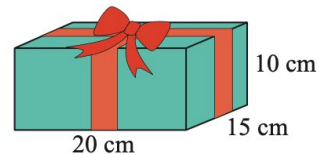
6 The framing of a toolshed consists of square, galvanised tubing which costs $7.25 a metre. Find the total cost of the tubing necessary to make the framing of the shed illustrated.

2 m

3 m   4 m
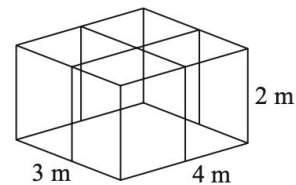
7 Which is the shorter path from A to B: along the 4 semi-circles or along the larger semi-circle?

A   B

8 m
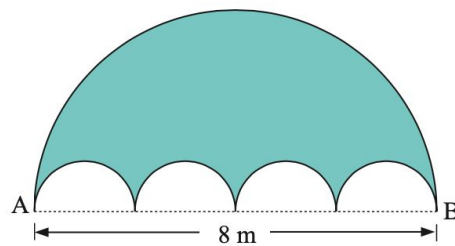
8 Wire mesh contains horizontal wires and vertical wires at 10 cm intervals. How much wire is required to make mesh which is 10 m long and 1 m high?

1 m
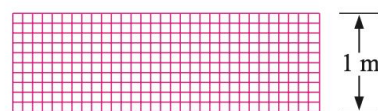
Example 4

Find, correct to 2 decimal places, the radius of a circular pond which has a circumference of 30.5 m.

Using $C = 2\pi r$

$\therefore \quad 30.5 = 2\pi r$

$\therefore \quad \dfrac{30.5}{2\pi} = r$

$\therefore \quad r \doteqdot 4.85 \qquad \{Calculator:\ 30.5 \;\boxed{\div}\;\boxed{(}\; 2 \;\boxed{\times}\;\boxed{\pi}\;\boxed{)}\;\boxed{=} \}$

So, the radius is 4.85 m.

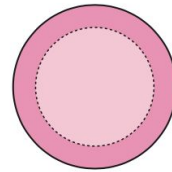**9** A machine makes circular paper plates of circumference 50 cm. Find the diameter of a plate correct to the nearest mm.

10 A bicycle wheel has diameter 0.6 m.
  a What is the circumference of the wheel to the nearest mm?
  b Through how many revolutions must the wheel turn during a 100 km trip?

11 A satellite has a circular orbit 800 km above the surface of the earth. The radius of the earth is 6 400 km and the satellite must complete exactly 2 orbits in one day.
  a What is the circumference of the satellite's orbit to the nearest km?
  b How fast must it be moving?

Example 5

Find a formula for the perimeter P, of:
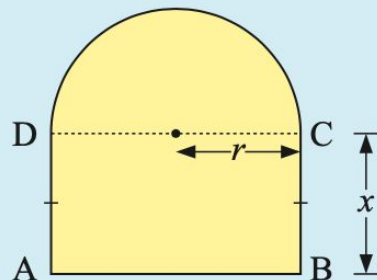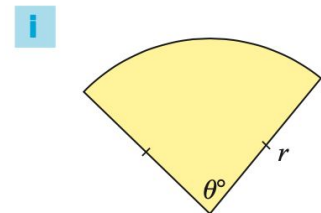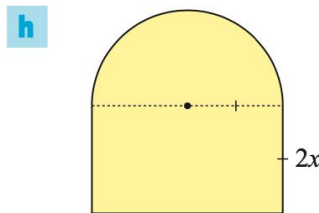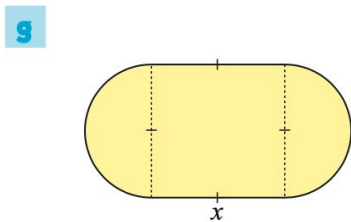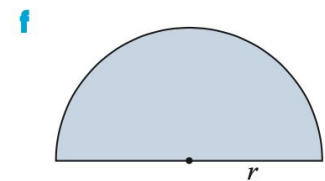
Now $\quad P = \text{AB} + 2(\text{BC}) + \text{semi-circle length}$

$\therefore \quad P = 2r + 2x + \tfrac{1}{2}(\text{full circumference})$

$\therefore \quad P = 2r + 2x + \tfrac{1}{2}(2\pi r)$

$\therefore \quad P \doteqdot 2r + 2x + \pi r$

12 Find a formula for the perimeter P, of the following:

a

x

y

b

a

c

b

c

$2a$

a

$3a$

d

$4x$

e

x cm

$(2x-3)$ cm

f

r

g

x

h

$2x$

i

r

$\theta°$
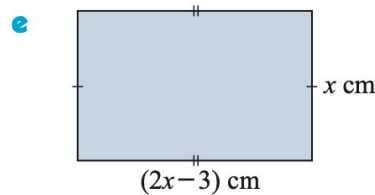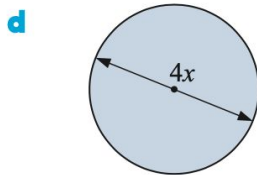
INVESTIGATION 1   THE SHADE HOUSE

You wish to build a shade-house against an existing brick wall. The structure is to be made from light square section galvanized steel tubing and is to be covered with dark green shade cloth.

The tubing costs $3.95 a metre and the shade cloth comes in 3 m wide strips which cost $6.50 a metre.

existing wall

4.5 m

roll-up door
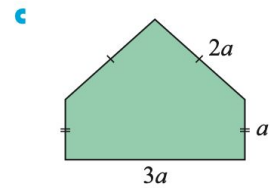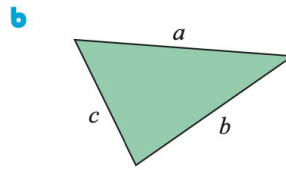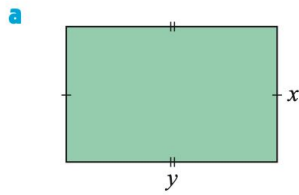
C

B

A

2.4 m

3 m
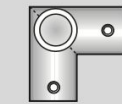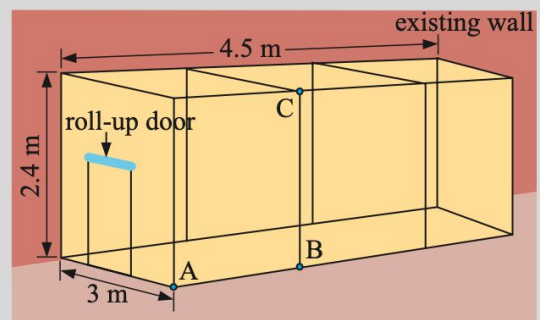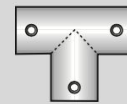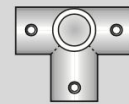
'corner'   'T'   '4-way'

What to do:

1 Determine the total length of tubing required and hence find its cost.

2 Find the length of the cloth required and hence its cost.

3 Find the total cost of all joiners if: "corner" joiners cost $5.00 each, "T" joiners cost $3.50 each and "4-way" joiners cost $6.50 each.

4 The floor of the shade house is to be covered with clay-brick pavers which can be purchased at $29.50 a square metre. Find the area of the floor and hence the total cost of the pavers required.

5 Find the total cost of making the shade-house.

The **"Wetter is Better"** sprinkler company makes the following sprinkler types for automatic systems:
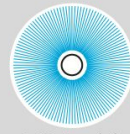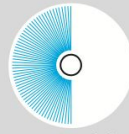
360° with 3 m radius   180° with 4 m radius   90° with 5 m radius   270° with $3\frac{1}{2}$ m radius
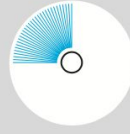
What to do:

1 If you have only four 90° sprinklers, four 180° sprinklers and three 360° sprinklers, design a sprinkler system to cover an 8 m by 22 m rectangular lawn. [An accurate scale diagram must be constructed using your compass.]

2 Using four 90° sprinklers, four 180° sprinklers and three 360° sprinklers, determine as accurately as you can the greatest length of lawn 8 m wide which can be watered. [Once again an accurate scale diagram, with compass constructions must be given.]

sprinkler head
T-piece
joining clamp   joiner
elbow with thread
elbow
PVC pipe   T-piece with thread   PVC pipe
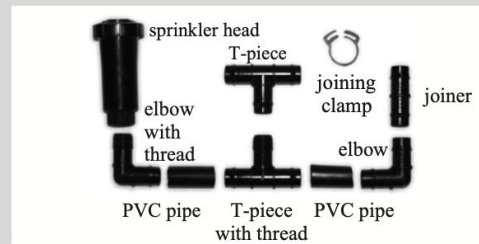
3 If you can have any combination of sprinklers, determine the minimum number that would be required to water a lawn shaped as in the plan given. An accurate scale diagram will be necessary.

10 m
8 m
6 m   8 m
12 m
16 m
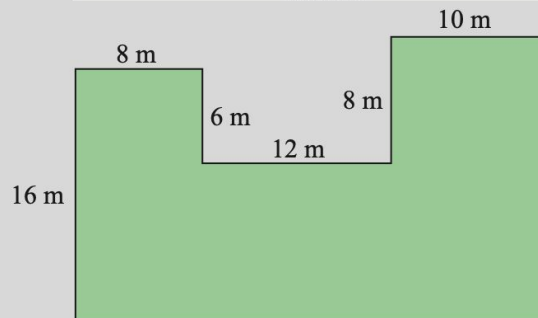
Some more invstigtion

Your PE teacher wants to convert the school gym to a gymnastics floor for a few weeks to teach gymnastics. The idea is to have a large "supersoft" in the middle of the gym and smaller rectangular gym mats placed around the remaining space (modern gym mats can be velcroed together!)

i.e.,

How many gym mats will be needed to cover the gym floor with the "supersoft" in the middle?

What to do:

1 Visit your school gym and have a look at the **area** of it, along with a large "supersoft" and a smaller gym mat. Make a **guess** of how many gym mats would be required to cover the gym floor if the "supersoft" is placed in the middle.

2 Now make an **estimate** of the dimensions of the gym, the "supersoft" and a gym mat by walking around each and counting paces. You will now need to **estimate** the **area** of each by multiplying the lengths by the widths (make sure you convert your paces to metres). How many gym mats do you **estimate**?

3 Now use a tape measure to find the **actual** dimensions you estimated in **2**. Recalculate the actual areas involved and hence state the number of gym mats required to cover the floor.

4 Could you use the mats as they are to cover the floor or would you need to cut some? Investigate this further.

5 Find out from your teacher the cost of a gym mat. How much would it cost to cover the gym floor with gym mats?

6 How close was your guess and estimation with the actual number of mats required?

Check your answers

2 **a** 15 cm **b** 22 cm **c** 30 cm **d** 26 cm
   e 26 m **f** 30 mm

3 **a** 15.7 cm **b** 18.8 m **c** 20.6 cm
   d 14.3 m **e** 348.5 m **f** 21.4 cm
   g 57.1 cm **h** 34.3 cm **i** 56.5 cm

4 $744 5 125 cm 6 $369.75

7 same length **8** 211 m **9** 159 mm

10 **a** 1885 mm **b** 53 051.6 revolutions

11 **a** 45 239 km **b** 3770 km/h

12 **a** $P = 2x + 2y$ **b** $P = a + b + c$ **c** $P = 9a$

    d $P = 4\pi x$ **e** $P = 6x - 6$

    f $P = \pi r + 2r$ **g** $P = \pi x + 2x$

    h $P = 2\pi x + 8x$ **i** $P = \dfrac{\pi \theta r}{180} + 2r$