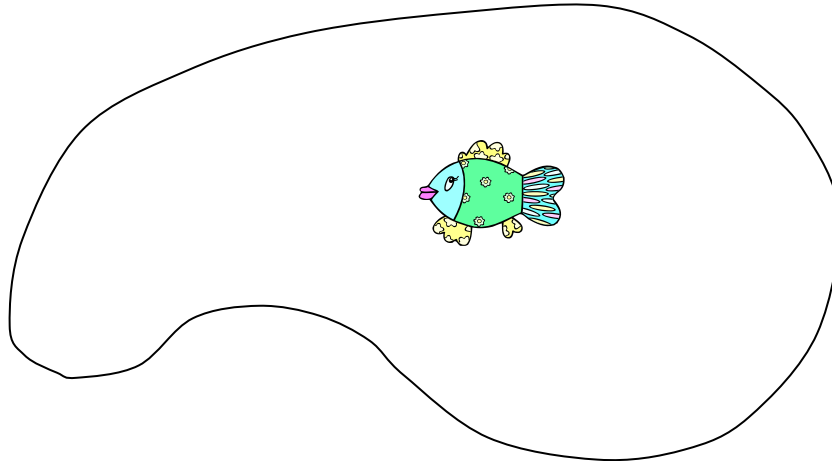
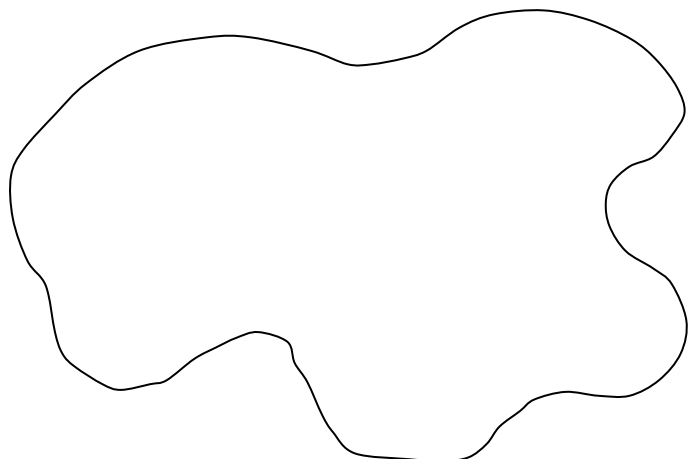




Fishie is a wee fish. She lives in a wee pond. Here is the **top view** of the pond.



1. You want to know the volume of water in the pond. To find this, you need to know the surface area of the pond. You can estimate this, as follows:
 - a. Draw a rectangle that just fits around the pond.
 - b. Measure the length and width of the rectangle.
 - c. Calculate the area of the rectangle, in cm^2 .
 - d. Estimate what fraction (or percent) of the rectangle is covered by the pond.
 - e. Use your answer to (d) to **estimate** the area of the pond.
 - f. If the water is 5 cm deep, **estimate** the volume of water in the pond.
 - g. Why is it important to know the surface area of a fish pond?
 - h. Alongside is a sketch of a patch of weeds. Estimate the area of the patch of weeds. Show your working.
 - i. Why might someone want to know the area of the weed patch?



2. We can use a similar method to estimate the area of a circle.

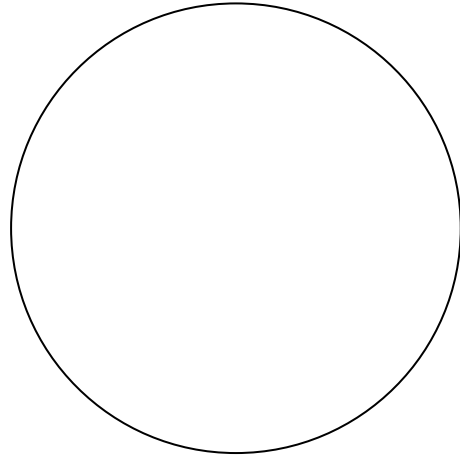
a. Draw a rectangle around the circle.
What special rectangle is it? How do you know?

b. Measure the length and width of the rectangle.

c. Calculate the area of the rectangle in cm^2 .

d. Estimate what fraction or percent of the rectangle is covered by the circle.

e. Use your answer to (d) to estimate the area of the circle.



Deriving the formula for the area of a circle.

3. We can use the above method to find a formula for the area of a circle.

a. Draw a rectangle around the circle.

b. Write the **length** of the rectangle in terms of the radius.

c. Write the **width** of the rectangle in terms of the radius.

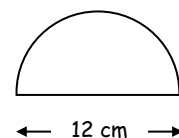
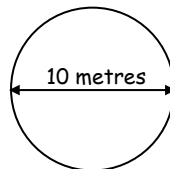
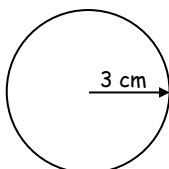
d. Write the **area** of the rectangle in terms of the radius.

e. The circle covers about $\frac{3}{4}$ of the square.

Use algebra to show that the approximate area of the circle is given by the formula

$$\text{Area} = 3 \times \text{radius} \times \text{radius}$$

f. Find the approximate area of these shapes.



Fishie – Solutions to some parts

1a. {rectangle drawn}

1b. Length - from 10 cm to 11 cm; Width - 6 cm

1c. $\text{Area} = B \times PH$
 $= 10.5 \times 6$
 $= 63 \text{ cm}^2$ (any answer from 60 cm^2 to 66 cm^2 is acceptable)

1d. About 70%

1e. $\text{Area} \approx 70\% \times B \times PH$
 $\approx 0.7 \times 10.5 \times 6$
 $\approx 45 \text{ cm}^2$ (any estimate from 40 cm^2 to 53 cm^2 is acceptable)

1f. $\text{Volume} = \text{Area of Base} \times \text{Depth}$
 $= 45 \text{ cm}^2 \times 5$
 $= 225 \text{ cm}^3$ (any reasonable estimate is acceptable)

2a. {rectangle drawn}. It is a square. Since the base = height.

2b. Length = Width = 5.5 cm

2c. $\text{Area} = 5.5 \times 5.5 \approx 30 \text{ cm}^2$ {answer may vary from 25 cm^2 to 36 cm^2 }

2d. About 75% {from 70% to 80% is acceptable}

2e. $\text{Area} \approx \frac{3}{4}$ of 30 cm^2
 $\approx 23 \text{ cm}^2$ {from 20 cm^2 to 28 cm^2 is acceptable}