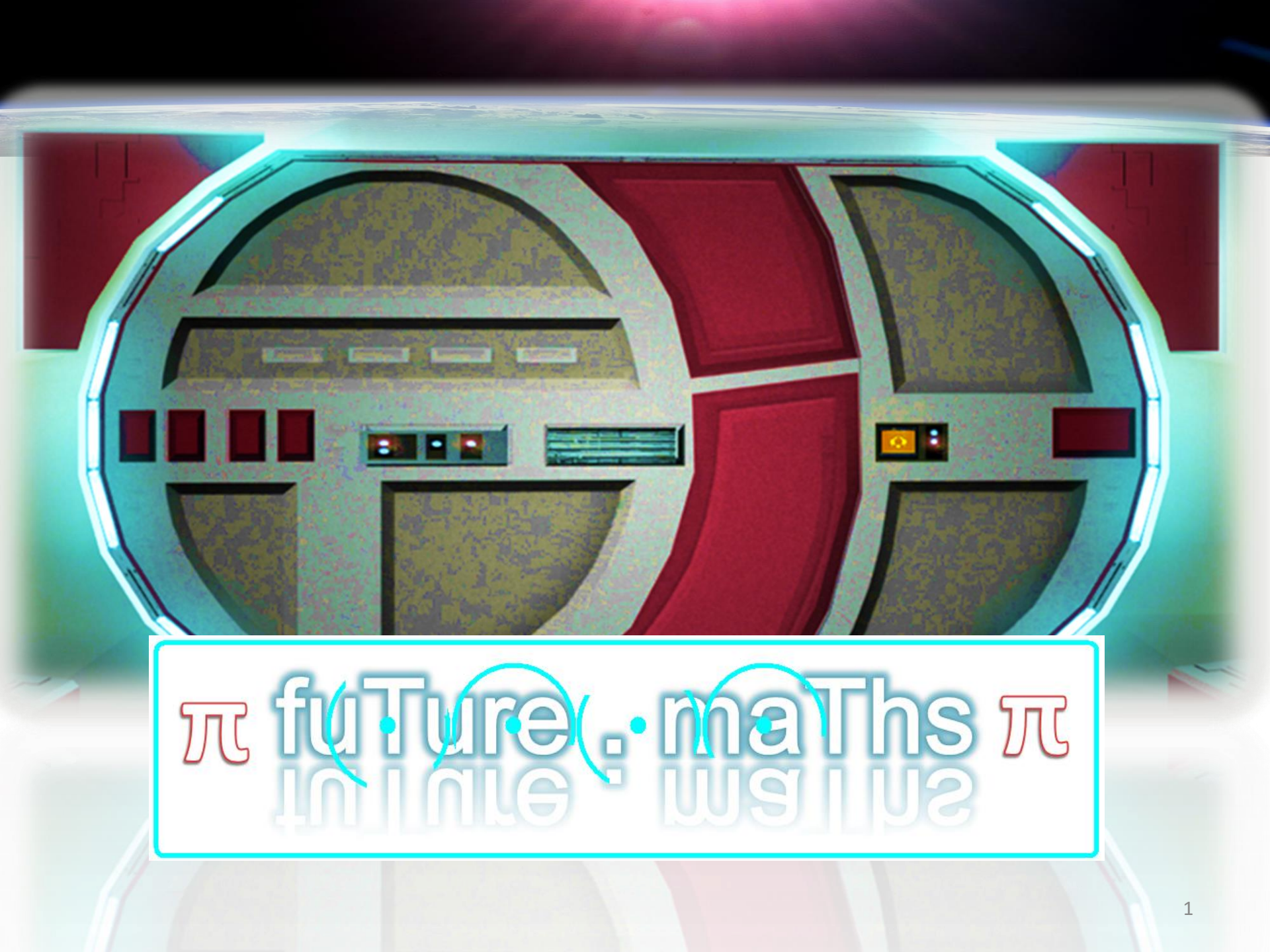

π fuTure . maThs π


futuremaths
maths E1 E2 E3
Whole Number and Fu
maths Level 1 & 2
x2
AREA

Course Content: Choose your topic …

MATHS L1 to L2

Whole Number and Functions

place value | negative numbers | add and subtract | multiply divide | round numbers | ratio scale

Parts of a whole

fraction | decimal numbers | percent | percent decimal fraction

Measure and Shape

metric measure | imperial measure | perimeter | area | volume | formulae bodmas

Handling Data

charts data | averages | prob-ability

Topic Introduction : A r e a

AREA

A 2D surface such as a garden, wall, plot of land or even mobile phone screen can be measured using squares. Area is the number of squares you can put inside a 2D shape. Whether you are dealing with sheets of metal in a factory or carpets in your house, the topic of area becomes important.

Area measures two directions at the same time and a new piece of maths is introduced in this topic. An 'Index' number that is written small and raised to the side of the measurement unit, tells you how many directions you have measured at the same time. If this index number is 2 then you are measuring area which is length and width directions.

Choose an icon to select where to start

Warm up Exercise 1

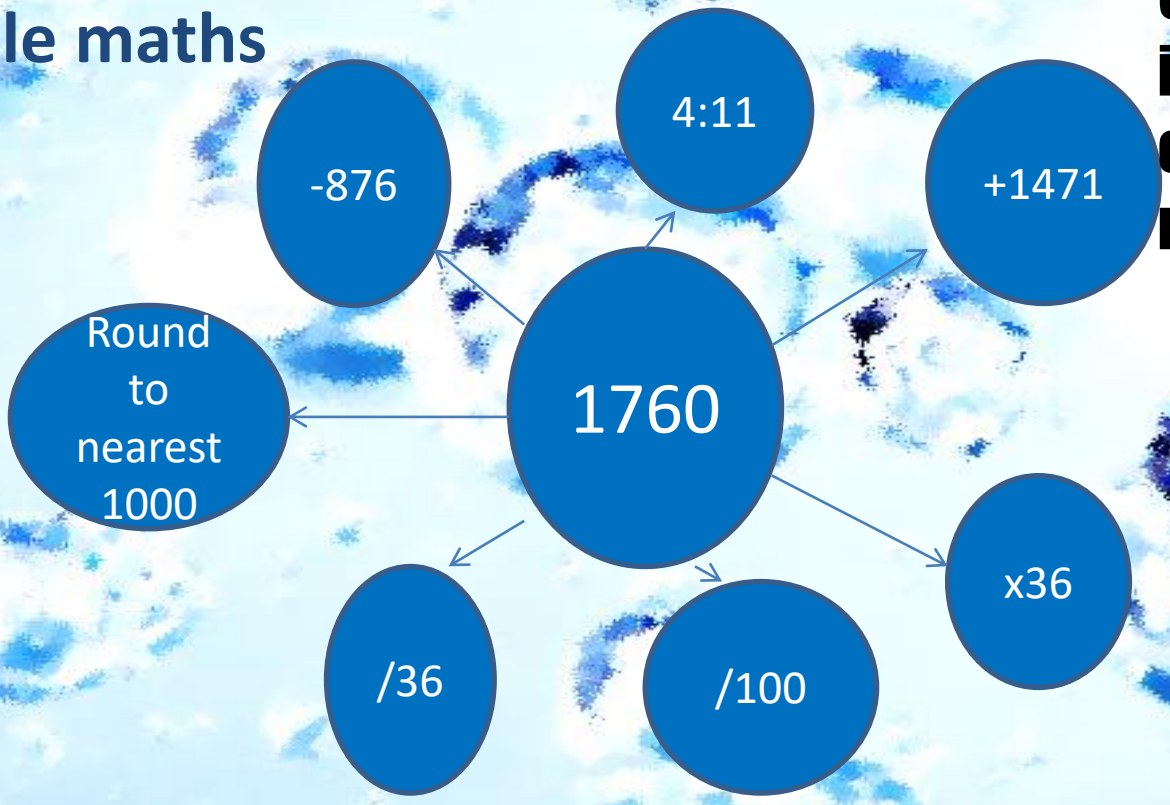
1 x 8 =	
2 x 8 =	
3 x 8 =	
4 x 8 =	
5 x 8 =	
6 x 8 =	
7 x 8 =	
8 x 8 =	
9 x 8 =	
10 x 8 =	

1	7	3	10	6	4	8	5	9	2
6									
10									
8									
7									
3									
9									
4									
2									
5									

Lets start today by revising ! Complete the above sums and multiplication grid

Warm up Exercise 2

Bubble maths



Calculate the instruction on the central number

Warm up Exercise 3

210mm=	.....cm
0.09m	.....cm
2.45m	.....mm
0.7km	.....m
78m	.....km
125cm	.....m
68mm	.....m
129mm	.....cm
56ml	cl
0.5l	cl

0.34l	.....ml
50cl	l
755ml	l
14ml	cl
0.39g	.....mg
7.2kg	.....g
25g	..... kg
99mg	.....g

AREA

Progress Checker 1

What do you already know about Areas ?

How would you rate your skills in finding areas of 2d shapes ?

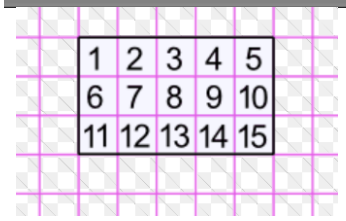
1) Excellent ability
2) Good ability, but working to improve
3) Ok, making a start but I know I have lots to still learn

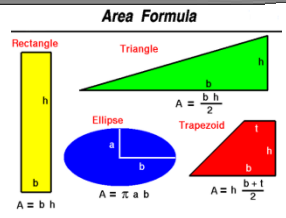
My aims for today Date: **are...**

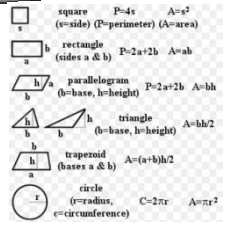
A Find the area of simple square and rectangular shapes

B Find the area of composite shapes and circles

C Use area formulae to solve practical problems involving areas







Introductory Video and Discussion

What are you counting when you find an AREA measurement ?
Can you find the area of any shape ?

What would you need to find the area of and why ?
What is land area and what unit/s is it measured in ?

What is an 'index' number and how is it used in units of area measurement ?
How do you convert sq ft to sq metres ?

Watch the introductory video and then discuss the above

Your thoughts..

Vocabulary and Jobs

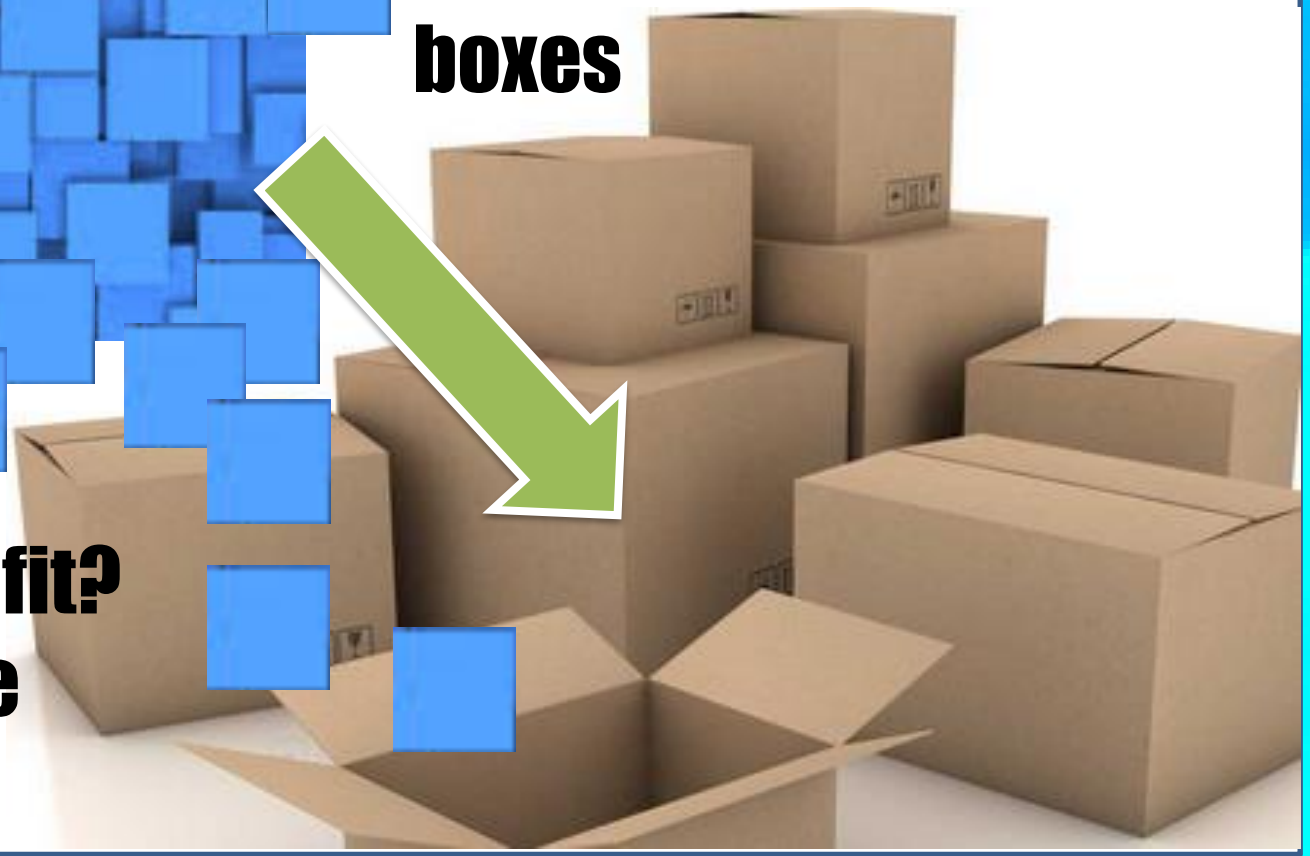
Area
Squared
Formula
Surface
2 Dimension (2D)
Plane
Length
Width
mm^2 cm^2 m^2 km^2
in^2 ft^2 yd^2 $mile^2$
Hectare
Acre
Compound

These are the words you will be using in this topic

Carpet Fitter
Tiler
Roofer/Slater
Road worker
Cloth/Fabric worker
Sheet Metal worker
Seating planner
Farming
Housing planner
…. Can you think of more?
……
……




Fit the squares into the bottom of the boxes

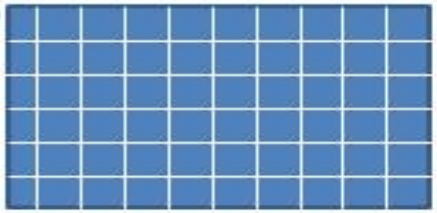


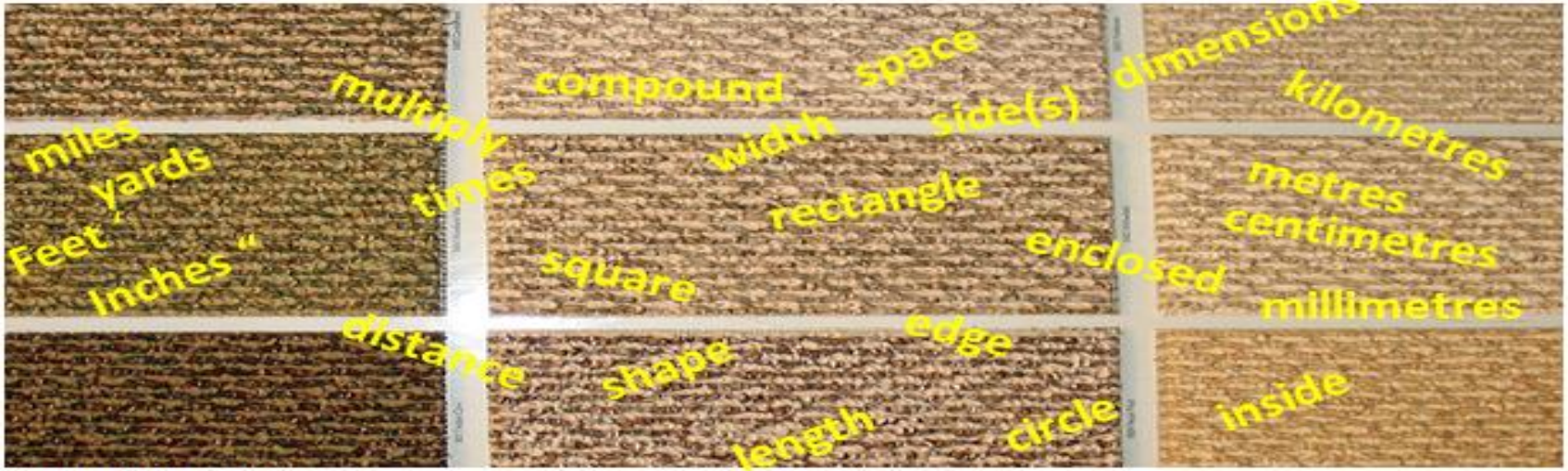
How many will fit?
What about the gaps?

What is Area?

Root Questions

- How much space is enclosed?
- How much ..... will I need?
- How many squares will I need to go inside?





Typical Questions-

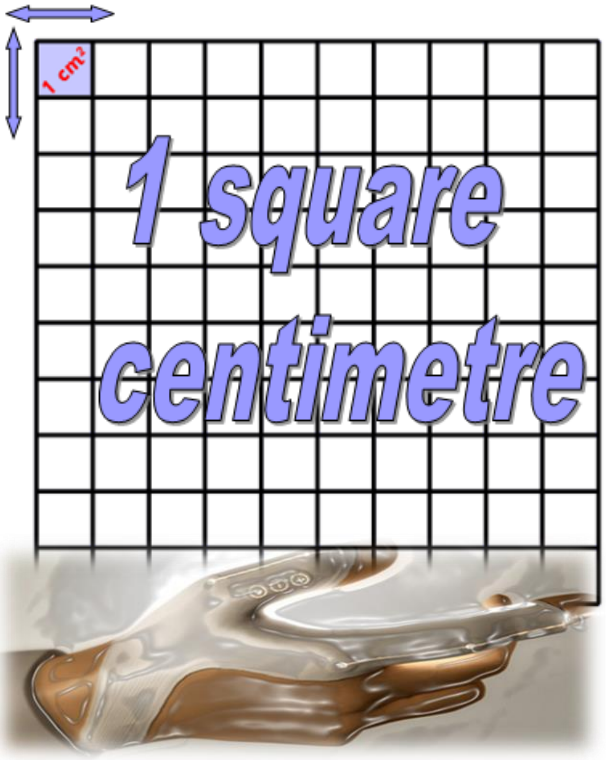
How much carpet will I need for this room?

How many tiles do I need for the bathroom?

How much grass seed do I need for the garden?

How much office space does this property have?

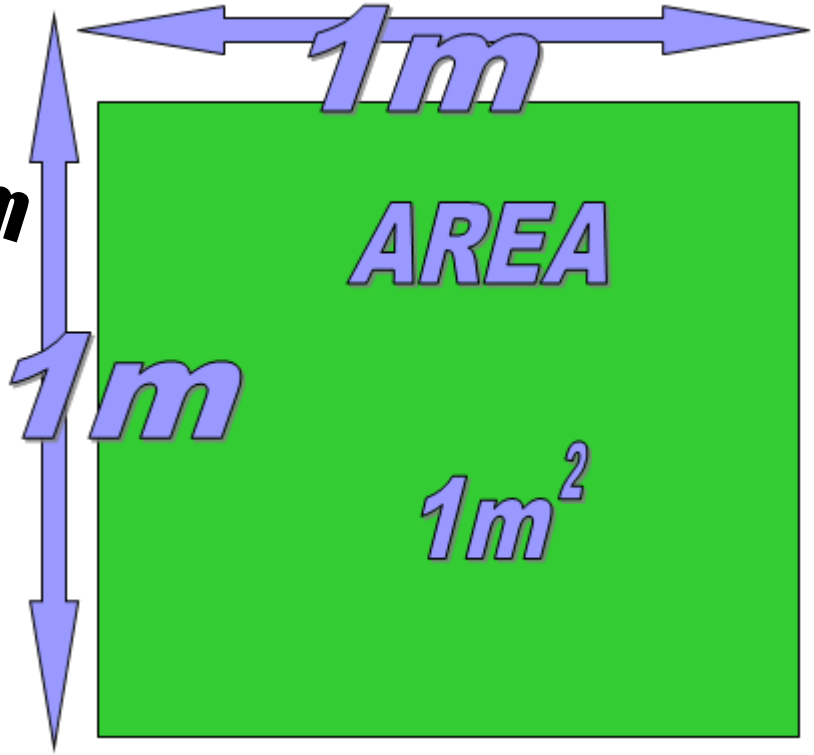
km^2 cm^2 mm^2 squared^2 m^2



A square centimetre is one centimetre in two directions and would fit on your fingertip

The square metre is one metre in two directions and is the size of a household rug

10,000 sqcm = 1 sqm

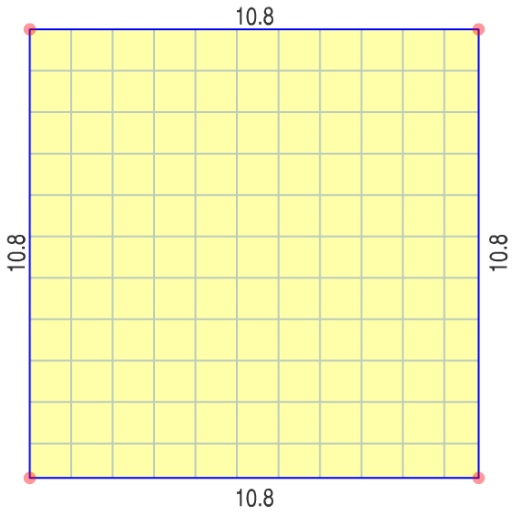


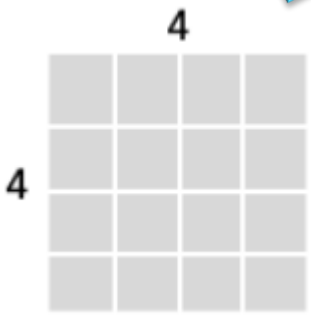
Lesson: Main Teach 3

Squared area occupies 2 directions at once, x and y

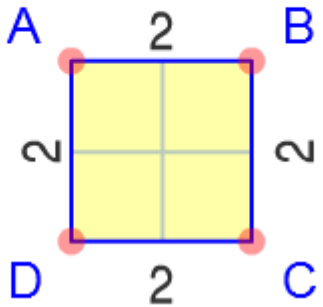
Like spreading paint along a wall and up or down at the same time!

$$Area = 10.8 \times 10.8 = 116.6$$





$$Area = 2.0 \times 2.0 = 4.0$$

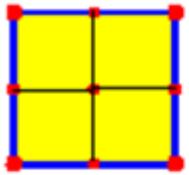


The AREA of a square....

1) Measure a side length
2) Multiply this number by itself
3) Add the correct squared unit

eg cm² or maybe m²

That's it..done !



2cm by 2cm square

What is its area?

rows x columns =

width x length =

length x length =

2 cm x 2 cm =

2 x 2 cm x cm =

4 cm^2

$A(squ) = L^2$

Finding Square shaped Areas..

You will need to learn the answers to some basic questions such as the 'Squared Numbers'

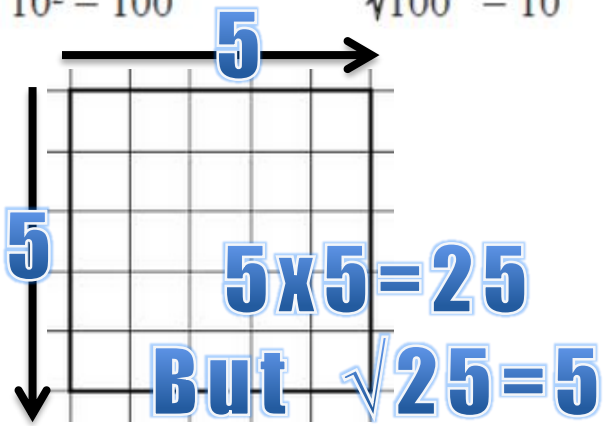
These are just numbers multiplied by themselves.

If you already have the answer ..ie.. the size of the Area ... then you may have to work backwards.

The square root of a number tells you what number multiplied by itself will give you the Area

1^2	1 x 1	1
2^2	2 x 2	4
3^2	3 x 3	9
4^2	4 x 4	16
5^2	5 x 5	25
6^2	6 x 6	36
7^2	7 x 7	49
8^2	8 x 8	64
9^2	9 x 9	81
10^2	10 x 10	100
11^2	11 x 11	121
12^2	12 x 12	144

Squares	Square Roots
$1^2 = 1$	$\sqrt{1} = 1$
$2^2 = 4$	$\sqrt{4} = 2$
$3^2 = 9$	$\sqrt{9} = 3$
$4^2 = 16$	$\sqrt{16} = 4$
$5^2 = 25$	$\sqrt{25} = 5$
$6^2 = 36$	$\sqrt{36} = 6$
$7^2 = 49$	$\sqrt{49} = 7$
$8^2 = 64$	$\sqrt{64} = 8$
$9^2 = 81$	$\sqrt{81} = 9$
$10^2 = 100$	$\sqrt{100} = 10$



Square Area examples:..

1) The length of a square rug is 2.5 metres long.
Find how many square metres of floor space the rug covers.

Answer..... Measure the rug.... This is already given as 2.5 m
Multiply the length by itself.... So .. 2.5 x 2.5 = 6.25
Add the unit.... Here it is metres x metres ..so m^2

answer is 6.25 m^2

2) A broken square window is replaced. 5000 sqcm is used.
What is the size of the window (length?).

Answer.... Here we have the area already and need to work backwards.
Take the square root of the area... $\sqrt{5000}$ =70.7cm

Rectangular Areas…

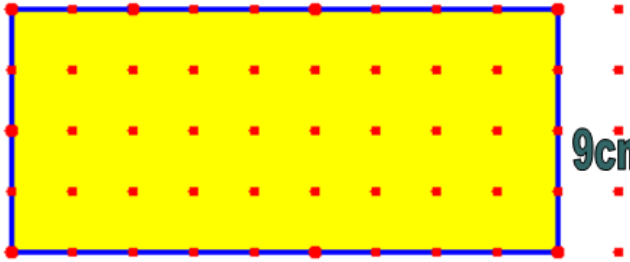
A rectangle is just a longer square!

It has squares inside it in rows and columns

You ‘could’ count all the squares inside…or you could multiply the number of rows of squares by the number of columns of squares

Therefore the Area of a rectangle is its Length x Width

$A = L \times W$ (length, area, width)



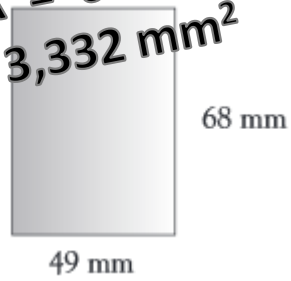
whats its area?

rows x columns =
width x length =
4cm x 9cm =
4x9 cm x cm =
36 cm^2

$A(rec) = WL$

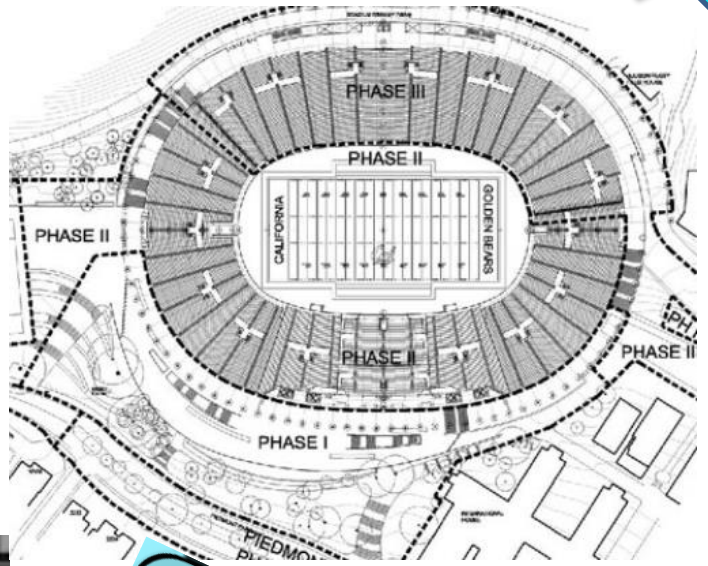
Area = 10 cm^2

$A = 68 \times 49$
$= 3{,}332\ mm^2$



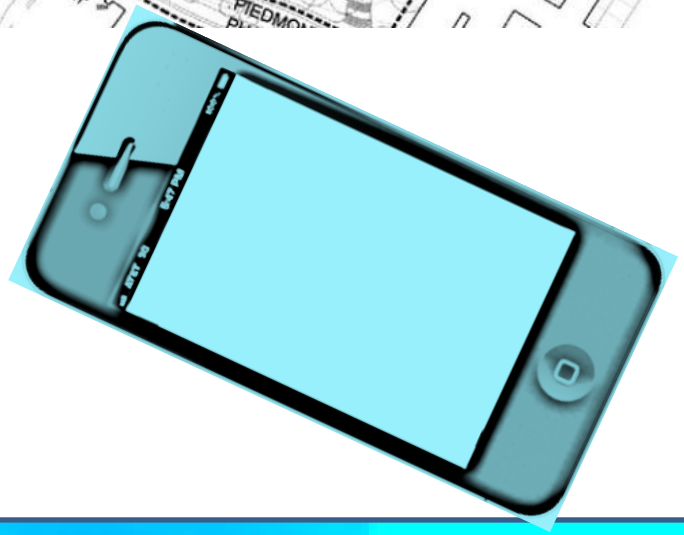
Rectangle Area examples:..

1) The plans for a rectangular sports stadium lay out a 400m by 200m size area of land. Find the number of sqm of land.



Answer... Area of a rectangle is L X W ... so 400m x 200m
this equals 80,000 m^2

2) The area of glass for a new mobile phone screen is 50sqcm. If the width of the screen is 5cm, how long is the screen?



Answer... Now we know the Area is 50 and that A=LxW
So... 50 = ?? x 5, well only 10 x 5 can make 50
so the answer is ....the length is 10cm

Areas of circles..

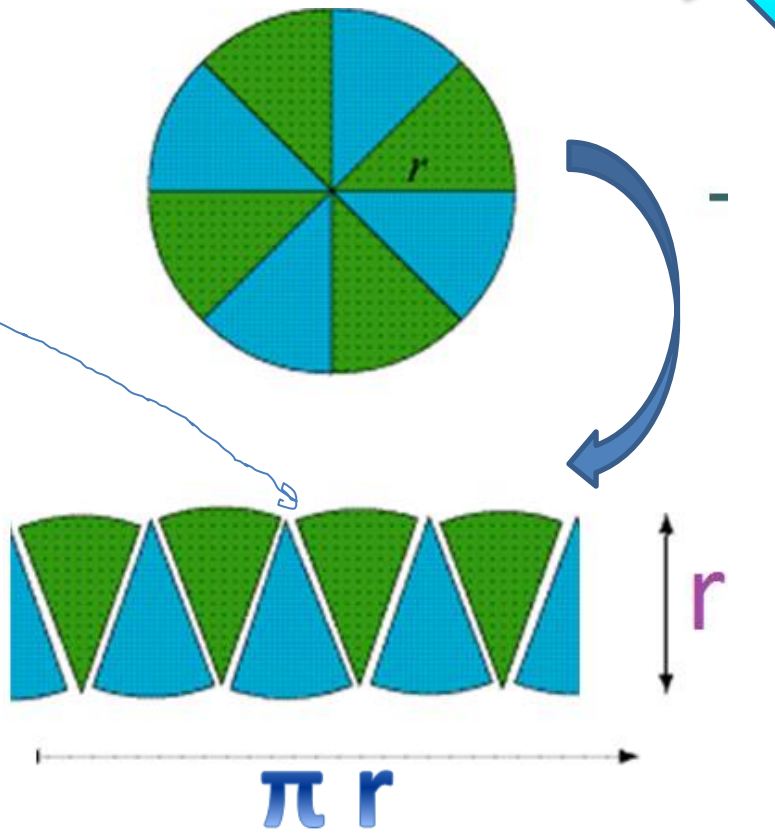
The area of a circle can be found by cutting the circle up into pieces and turning it into a rectangle shape.

The area of the rectangle formed is just L x W

However the width of the rectangle is the same as the radius of the circle.

Also the length of the rectangle is half of the circumference length (ie half of 2 π r , which is π r)

Therefore the area of the rectangle (and also the circle) is r x π r which can be written πr^2

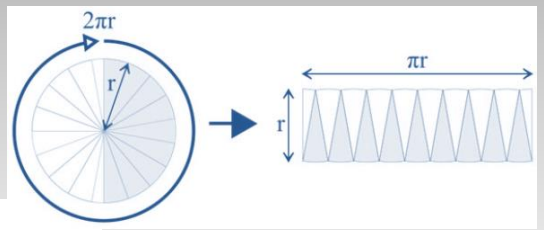


Don't forget that just like a rectangle area, you are counting squares. Therefore your answer must be in squared units such as cm^2 or m^2

$$\text{Area} = \pi r^2$$

Areas of circles..

Let's try some.....



$A = \pi r^2$

Area is 3 times radius times radius

A = 3 R R

- A = r = 4cm ⟸ **Radius is 4 cm .. So... 3.14 x 4 x 4 = 50.24 cm²**
- A = r = 10m ⟸ **Radius is 10 m .. So... 3.14 x 10 x 10 = 314 m²**
- A = r = 50ft ⟸ **Radius is 50 ft .. So... 3.14 x 50 x 50 = 7850 ft²**

- A = 60 km² r = ⟸ **Area is 60 km² ..so.. √(60 / 3.14) = 4.37 km**
- A = 12 m² r = ⟸ **Area is 12 m² ..so.. √(12 / 3.14) = 1.95 m**
- A = 0.5 ft² r = ⟸ **Area is 0.5ft² ..so.. √(0.5 / 3.14) = 0.4 ft**

Don't forget that square roots are what you need to reverse the squaring process !

Lesson: Try out

Block 1 : Watch tutor led demo (in class or on video)

(sqm = square metres, sqcm = square centimetres)

Try these, 1) Find the area of a square with side length 5m

2) A = 20cm x 20cm

3) Rectangle 4m by 9m = Area ?

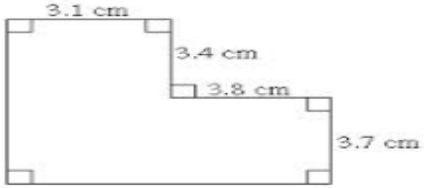
4) Area is 30 sqm, length is 5m, width = ?

Block 2 : Watch tutor led demo (in class or on video)

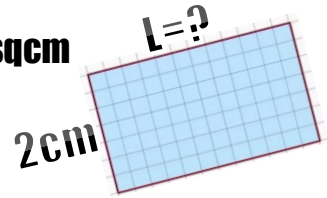
Try these, 5) 19.6cm x 8cm = ...

6) Area = 80 sqm , length = 35m, width = ?

7) Area = ?



8) Area = 17 sqcm



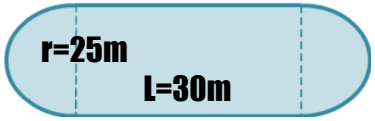
Block 3 : Watch tutor led demo (in class or on video)

Try these, 9) Circle Area is 40sqm, what is the Radius?

10) Circumference = 15cm, Area = ??

11) $\pi r^2 = 50$ miles, r = ??

12) What is the total area of the shape?



Lesson: Websites and links

An Area and Perimeter Geoboard	http://www.echalk.co.uk/maths/dfes_numeracy/Assets/area_flash.swf
Compare Area and Perimeter	http://www.shodor.org/interactivate/activities/ShapeExplorer/
Set of Area and Perimeter Card to match like dominoes	http://www.greatmathsteachingideas.com/wp-content/uploads/2012/02/44255740-Area-and-Perimeter-Follow-Me-Card-Sort-Rectangle-Square-Triangle.pdf
Excellent visual circle applet to explore Area of circle from its circumference	http://www.geogebratube.org/student/m279`
Explore simple squares, rectangles and Triangle Areas, visuals and examples	http://www.mymaths.co.uk/samples/sampleLessonAreaRectangle.swf
Website page with area shapes and their Formulae with examples	http://www.mathsisfun.com/area.html
Examples of finding areas of basic shapes with questions to try	http://www.mathgoodies.com/lessons/vol1/area_rectangle.html
Get visual with circles and see how diameters circumferences, radius and areas are connected	http://illuminations.nctm.org/Activity.aspx?id=3547

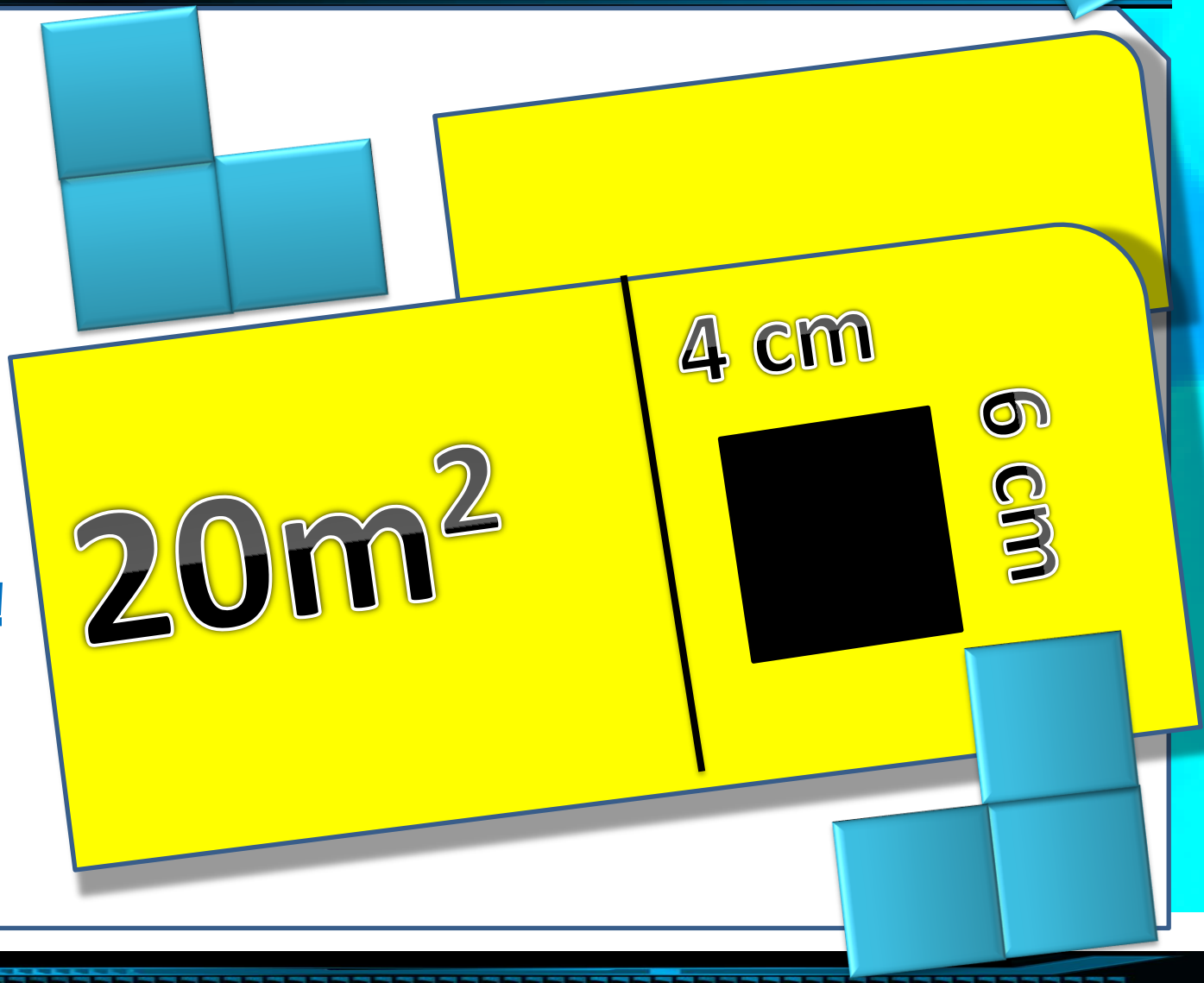
Lesson: Activity A

Area Link !!

Like a set of dominoes, find the answers to the Area problems

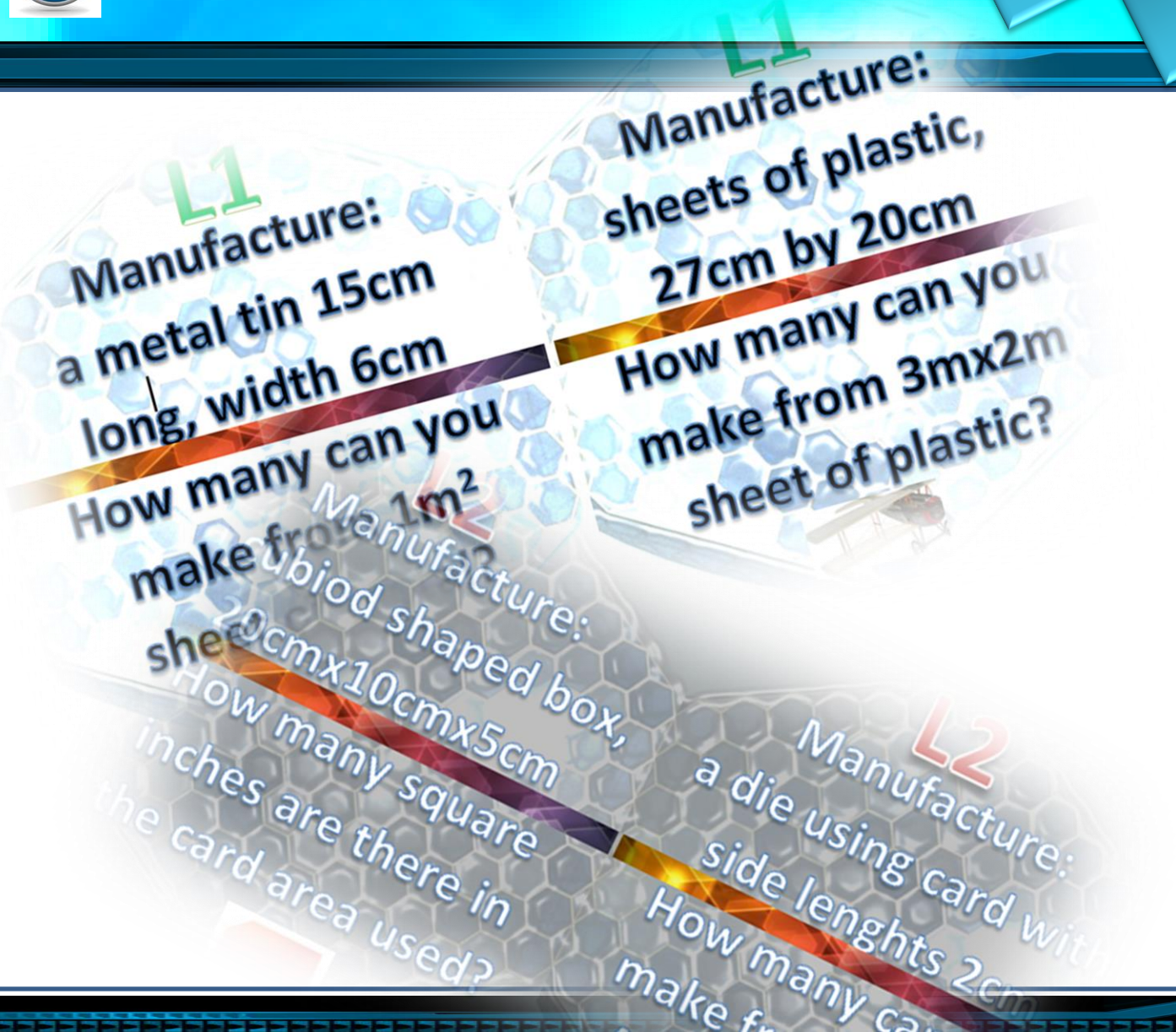
The answers will be on other cards !

Link them up to create a rectangle



Lesson: Activity B

Use the materials provided to make the shapes and designs as per the cards



Lesson: Activity C

Computer based activity -

Design your own wallpaper pattern using a tessellating shape (shapes that do not have gaps when fitted together)

Can you figure out how many shapes can fit onto a single 1m2 area of material ?

L2 extension:

Can you create a pattern of circles that minimises wastage on a single 1m2 area of material ? Can you figure out how much is used and how much is wasted in the gaps between the circles?

Lesson: Activity D

Complete the functional skills questions at L1 or L2

Lesson: Activity E

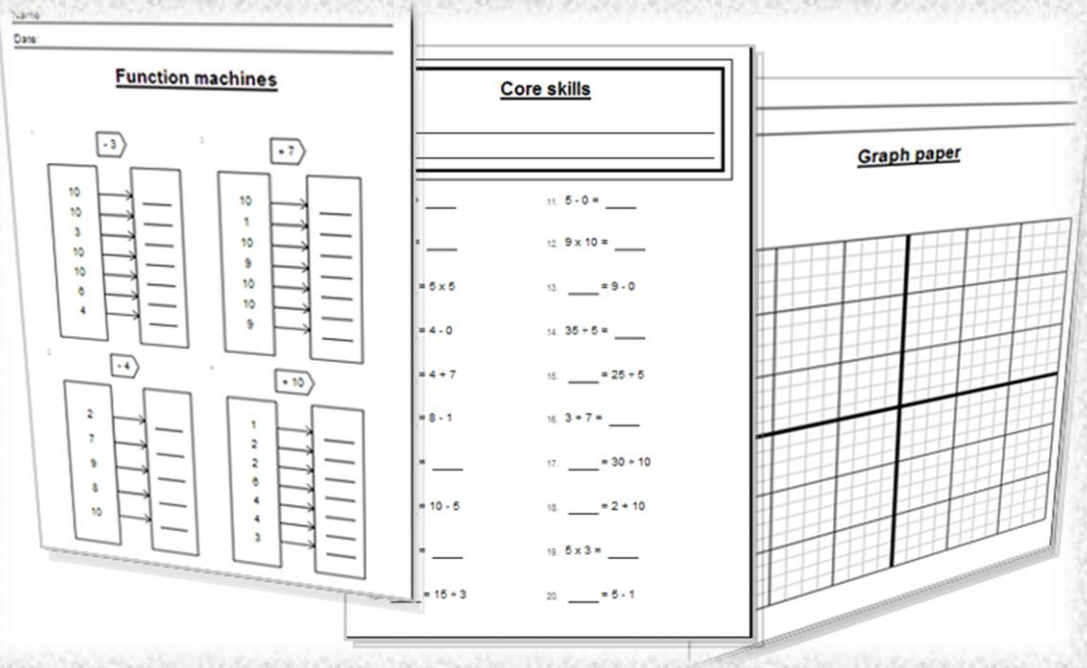
Try a variety of written practice

Worksheets

Workbooks

Practice Exam Papers

Maths Problems



Lesson: Practice – just the numbers

Find the areas of these rectangular shapes

1) L=2 W=7
2) L=5 W = 10
3) L=80m W=40m
4) L=15cm W=16cm
5) L=7.2 in W= 7.2 in

Find the lengths of the squares given their area

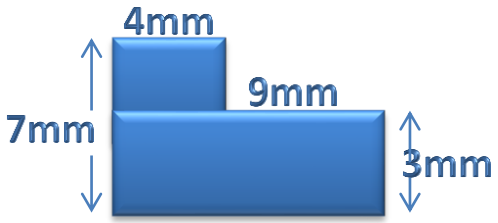
6) A= 16 cm^2
7) A= 81 m^2
8) A= 225 km^2
9) A= 4000 ft^2
10) A= 5m^2

Find the areas of the shapes

11)

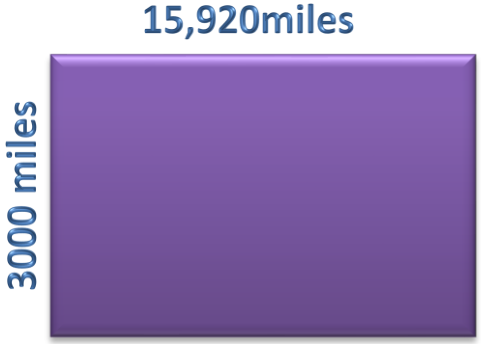
12)

13)



14)

15)



Find the areas of the circles given their diameters or radius

16) r = 5cm
17) d = 10ft
18) r = 0.2mm
19) d = 23.7miles
20) r = half the area value! (difficult !!)

Find the circle radius given the area

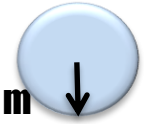
21) A=40 cm2
22) A=900 m2
23) A=19.7 km2

Find the circle areas

24)

r = 2.3 cm

25)



r = 31 m

Lesson: Practice – word problems

1) A roof is covered in rectangular tiles 30cm x 15cm in size. The roof is 5m x 14m on the left side and the same on the right. How many tiles are needed to cover both sides of the roof?

2) A radiation leak forces an evacuation of a 40 mile radius from a town. What land area is now uninhabitable due to the leak?

3) A yacht is fitted with a new white triangular sail that is 3m long and 6.3m tall. What area of material was used to make the sail?

4) A sonar beep spreads out a circular area under the water detecting any movement in a 1 sqkm area on the sea floor. What is the distance the beep travels? (clue..the beep is the radius of the circle area)

5) A field of crops has a width that is half the length and covers 2 sqkm of land area. How wide and long is the field? (clue.. L = 2W, so... A = 2W x W)

6) A large red carpet for a movie premier extends out from the cinema down the road of a town. The carpet is 4m wide and 1.7 km long. How many square metres of carpet was used for the red carpet?

7) A rectangular piece of icing is used on the top of a circular cake. The icing is 30cm by 35cm long. How big can the circular cake be? (only consider the top of the cake, not the sides!)

Lesson: Practice – Making it Functional 1

Basic Hard Wearing Lawn

Price £7.15 per bag (1kg)

Buy 5 bags 30% discount

Buy 10 bags 40% discount

Buy 15 bags 45% discount

Quantity	High Sowing Rate (recommended)	Coverage
	50 grams per sq. metre	
2kg	" "	40 sq. metres
5kg	" "	100sq. metres
10kg	" "	200sq. metres

Lesson: Practice – Making it Functional 2

Use the information on the previous page

- You have a garden and want most of it to have a lawn. You work out the area that you will cover with grass seed is 12 metres long x 9.5 metres wide.
- 1. a) Calculate the area requiring grass seed.
- b) Calculate the number of bags of lawn seed you will have to buy.
- c) Do you qualify for a discount? What %?
- d) Calculate the price you will pay in total.

2 The lawn seed is not very reliable and also gets attacked by the birds so you decide to order 25% extra.

2 a) How many extra bags will you order?

b) Will it be cheaper to order 10 bags to get the extra discount? Show your calculations.

c) What time of year would you put the lawn seed down? Give 2 reasons why.

End of Session Quiz to assess LEVEL 1

1 Level One

TOPIC QUIZ

Area

1) A house is to be built on a square shaped plot of land that measures 400 sqm. How long will the plot be?

2) A length of fabric is cut 20cm wide and 1.5m long. What area of fabric is used?

3) 16.2m x 0.7m = ... m^2

4) A film studio has a backstage area of 1800 sqm. It is 20m wide, how long is it?

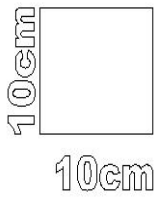
5) On an aircraft a single passenger occupies 70cm x 70cm of floor space. How much floor space do 200 people take up?

6) A tennis court has a length of 20m and a width of 10m. What is the area of the tennis court?

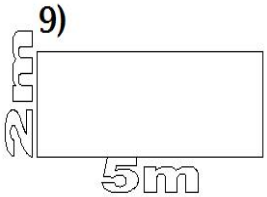
7) The area a swimming pool takes up is $300m^2$ and it has a length of 30m. What is the width of the pool?

Find the AREA of the following shapes

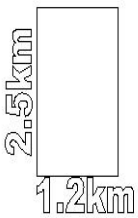
8)



9)



10)



How well did you do??

Score (out of ten)

End of Session Quiz to assess LEVEL 2

2 Level Two End of Session Quiz

AREA (circles Area = ? r^2)

1) Find the triangle area.. Base= 10.4cm Height=5 cm

2) Find the circle area r = 18cm

3) Find the radius of a circular drain cover with area of 2700cm2 area

4) What length circular ring road needs to be built around a town with diameter 12miles?

5) 30 bathroom tiles are used on a toilet wall. Each tile is 10cmx10cm. What area is covered in total by the 30 tiles?

6) How many circular CDs of diameter 10cm can be stamped out of an A4 sheet of metal?

7) How many square centimetres are in two square metre area?

8) A volcano has a 2mile radius. What land area does it occupy in square miles?

9) The land area of a particular meteor that hit the earth produces a crater 1000 times wider than the meteor itself. The meteor is assumed to be a sphere shape with diameter of 1m. What area of land is blasted away into a crater from the meteor impact?

10) Exactly how many ft^2 fit into one m^2 *(3.3ft = 1m)*

How well did you do?? Score (out of ten)

TOPIC ANSWERS 1

Block 1 answers

1) 25 sqm
2) 400 sqcm
3) 36 sqm
4) 6m

Block 2 answers

5) 156.8 sqcm
6) 2.3m
7) 36.07 sqcm
8) 8.5 cm

Block 3 answers

9) 3.6 m
10) 17.9 cm
11) 4 miles
12) 3463 sqm

Just the sums

1) 14
2) 50
3) 3200 sqcm
4) 240 sqcm
5) 51.84 sqin

6) 4 cm
7) 9 m
8) 15 km
9) 20 ft
10) 2.23 m

11) 6000 sqcm
12) 0.75 sqkm
13) 55 sqmm
14) 3.2 sqin
15) 47,760,000 sq miles

Just the sums cont.

16) 78.54 sqcm
17) 78.54 sqft
18) 0.126 sqmm
19) 441.15 sq miles
20) r=0.64, A=1.28

21) 3.57 cm
22) 16.93 m
23) 2.5 km

24) 16.62 sqcm
25) 3019.1 sqm

Word problem - answers

1) 3111 tiles
2) 5026.5 sq miles

Word prob. Cont.

3) 9.45 sqm
4) 564 m
5) W=1km L=2km
6) 6800 sqm
7) 706.9 sqcm (15cm long max!)

TOPIC ANSWERS 2

- 1 a) 12 x 9.5m = **114sqm**
- b) The bags come in 1kg sizes, using the information given, eg. 2kg =40sqm calculate 1 bag covers 20sqm. You will need grass seed to cover 120sqm, which will require **6 bags.**
- c) **Yes** over 5 bags gives a 30% discount.
- d) 6 bags x £7.15 = £42.90. 30% Discount £12.87. £42.90 - £12.87 = **£30.03**

- 2 a) You have 6 bags, so 25% extra would give you a total of **8.**
- b) **No it won't be cheaper**. 8 bags x £7.15 = £57.20 – 30% discount = £40.04. 10 bags x £7.15 = £71.50 -40% discount = £42.90.
- c) 2 logical reasons. Eg. Spring time, as the grass will grow more and there should be enough rain to help it grow. Winter so it has more time to grow, and people won't walk on it.

TOPIC ANSWERS 3

Quiz answers – Level One

1) 20m
2) 3000 sqcm
3) 11.34 sqm
4) 90 m
5) 980,000 sqcm or 98 sqm
6) 200 sqm
7) 10m
8) 100 sqcm
9) 10 sqm
10) 3 sqkm

Quiz answers – Level Two

1) 26 sqcm
2) 1018 sqcm
3) 29 cm
4) 37.7 miles
5) 3000 sqcm
6) 6
7) 20,000
8) 12.6 sqkm
9) 0.79 sqkm
10) 9 whole squares or 10.89 if you are able to

AREA

Progress Checker 2

What do you now know about Areas ? WHAT DID YOU LEARN. Write some examples…

How would you now rate your skills in finding areas of 2d shapes ?

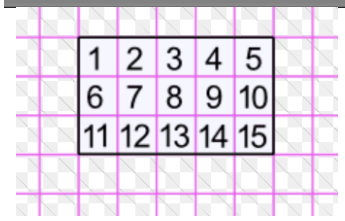
1) Excellent ability
2) Good ability, but working to improve
3) Ok, making a start but I know I have lots to still learn

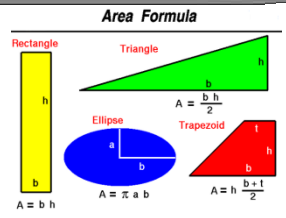
My aims for today Date: **were…**

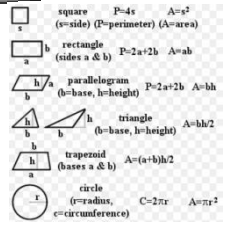
A Find the area of simple square and rectangular shapes

B Find the area of composite shapes and circles

C Use area formulae to solve practical problems involving areas







Continuing to Study and Learn

What else can you do to help yourself to learn and practice? Here are ten suggestions, record which you do each week and also record your progress.

Internet websites
Repeat the lesson, make notes, organise a folder, revise

Own maths workbook
Study together with a friend or family member

Finish activities in this book
Complete class handouts or tasks

Practice exams / past papers
Use maths skills learnt at home or at work in real situations

Play games
Experiment yourself, try new things ask yourself questions

Try making a graph of number of practice methods you use against your progress score in each topic. Are you showing more practice gives better results?