

Area and Perimeter Of 2D Shapes Questions By Topic:

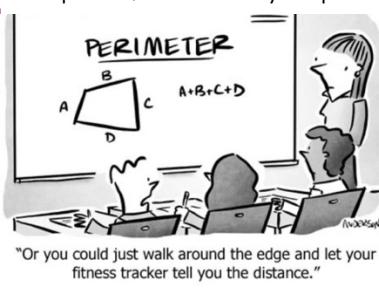


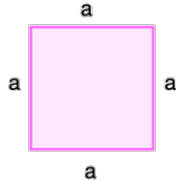
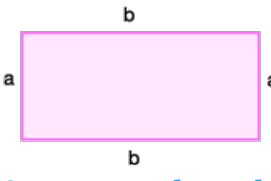
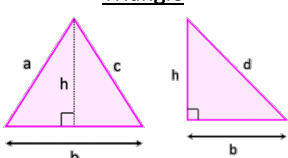
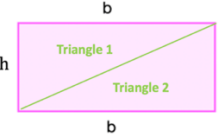
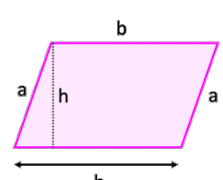
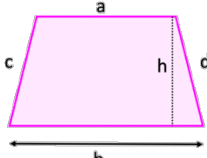
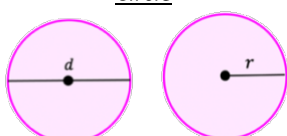
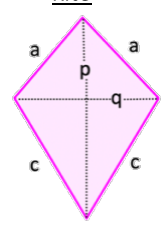
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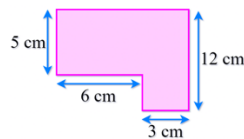
all diagrams in this worksheet are not drawn to scale



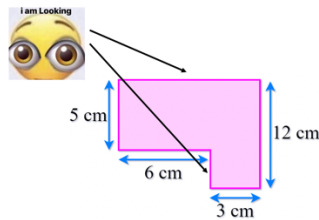
Summary Of Formulae For Regular Shapes

<p style="text-align: center;"><u>Square</u></p>  <p style="text-align: center;">$Area = a \times a = a^2$</p> <p style="text-align: center;">$a = \text{length}$</p>	<p style="text-align: center;"><u>Rectangle</u></p>  <p style="text-align: center;">$Area = a \times b = ab$</p> <p style="text-align: center;">$b = \text{length}$ $a = \text{width/height}$</p>			
<p style="text-align: center;"><u>Triangle</u></p>  <p style="text-align: center;">$Area = \frac{1}{2} \times b \times h$</p> <p style="text-align: center;">$= \frac{\text{base} \times \text{height}}{2}$</p>  <p>Note: A triangle is just half of a rectangle or square which is $\text{base} \times \text{height}$. This is the reason we divide by 2.</p>	<p style="text-align: center;"><u>Parallelogram</u></p>  <p style="text-align: center;">$Area = b \times h$ $= bh$ $= \text{base} \times \text{height}$</p> <p>Do not use the slant length a</p> <p>To help remember the formula: Sing the following tune "Mary Had A Little Lamb": "Area is base times height Base times height Base times height Area is base times height"</p>	<p style="text-align: center;"><u>Trapezium</u></p>  <p style="text-align: center;">$Area = \frac{1}{2} \times (a + b) \times h$ $= \frac{(a+b)h}{2}$</p> <p>$a, b = \text{lengths of parallel sides}$ $h = \text{height}$</p> <p>To help remember the formula: Sing the following tune "Pop Goes The Weasel": "Half the sum of the parallel sides Times the distance between them. That's the way to calculate The area of a trapezium"</p>	<p style="text-align: center;"><u>Circle</u></p>  <p style="text-align: center;">$Circumference = 2\pi r$ $= \pi d$</p> <p>To help remember the formula: "Cherry Pie's Delicious"</p> <p style="text-align: center;">$Area = \pi r^2$</p> <p>To help remember the formula: "Apple Pies Are Too" (Apple Pies R 2)</p> <p>Note: The diameter d is double the length of the radius</p>	<p style="text-align: center;"><u>Kite</u></p>  <p style="text-align: center;">$Area = \frac{1}{2} \times p \times q$ $= \frac{1}{2} pq$</p> <p>$p, q = \text{length of diagonals}$</p> <p>Note: This is just the area of 2 triangles added together. This formula is helpful since we aren't always given the heights of each of the triangles</p>

AREA of irregular shapes:

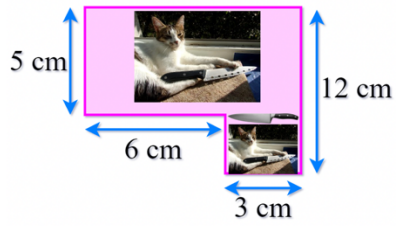


Step 1: Fill in any missing lengths by using the fact that opposite sides are the same length (using symmetry).

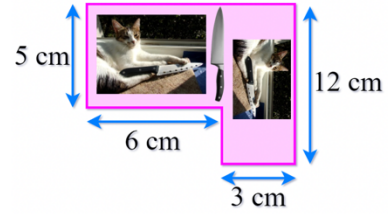


Step 2: Cut the shape up into nice rectangles (or squares). Think of trapping your pets in different square or rectangular rooms.





or



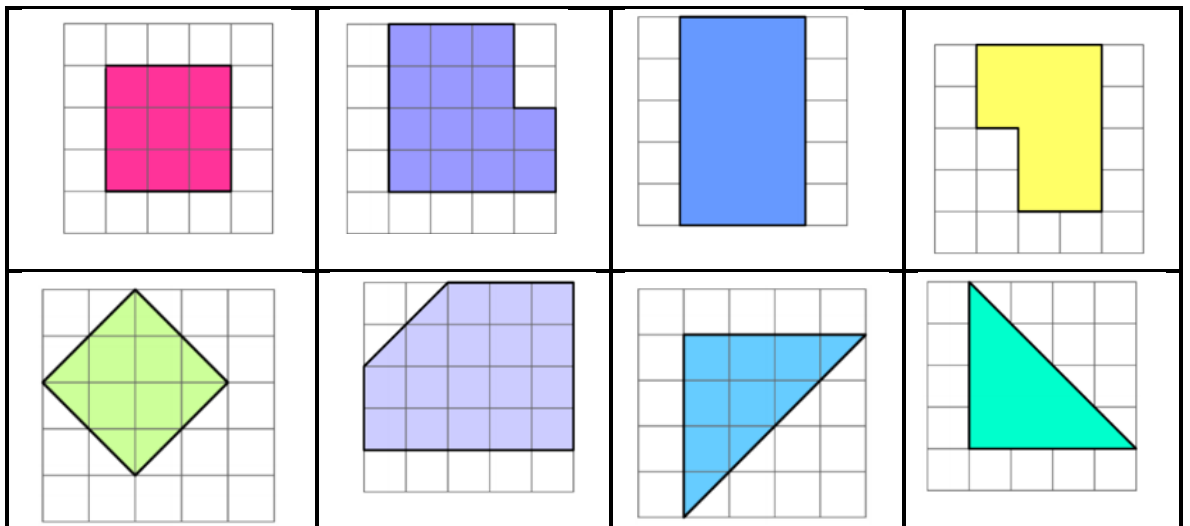
Step 3: Find the area of each shape and add your answers together

1 Bronze

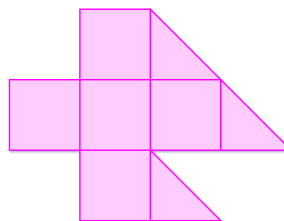


1.1 Counting Areas

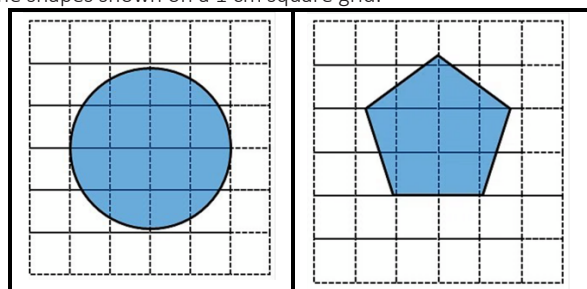
1) Calculate the exact area of the shapes shown on a 1 cm square grid.



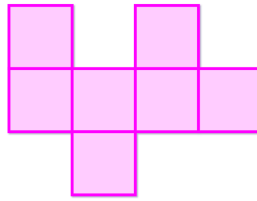
2) Each of the small squares in the shape below has an area of 1 cm^2 . What is the total area of the shape?



3) Calculate the area of the shapes shown on a 1 cm square grid.

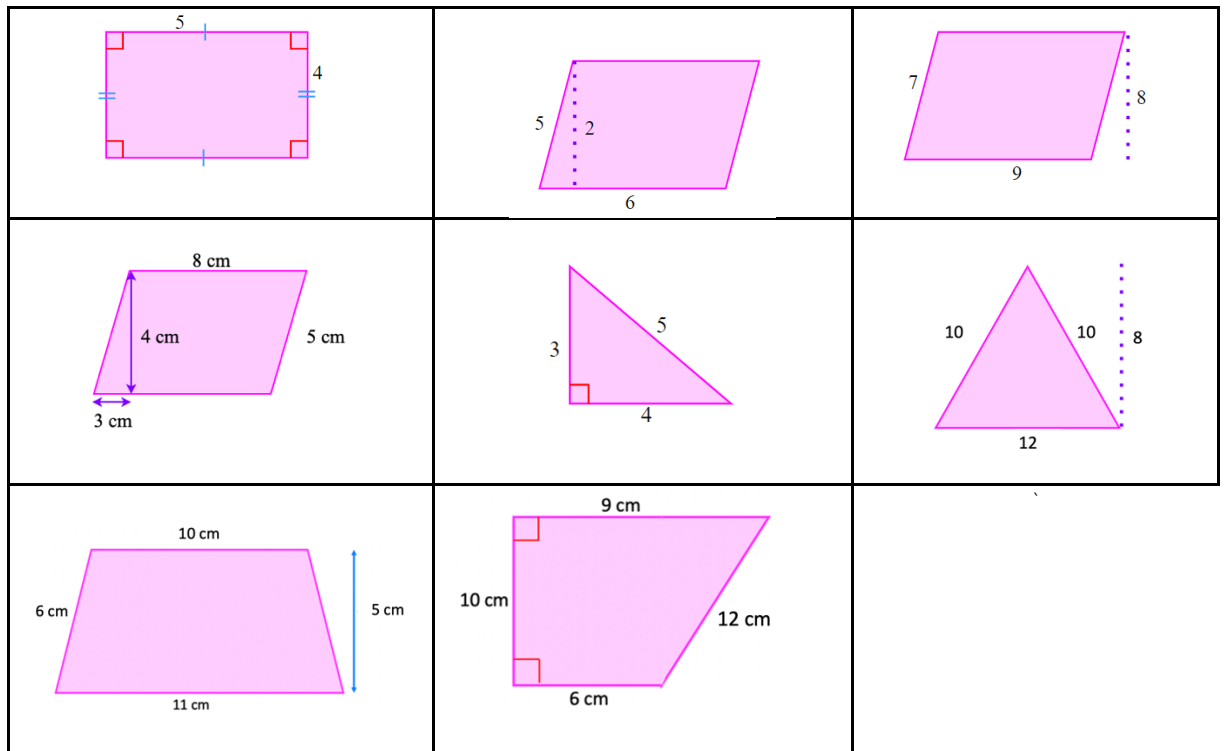


- 4) This shape has an area of 63 cm^2 . It is made from square tiles. Find the perimeter of the shape



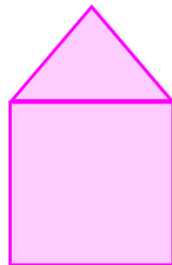
1.2 Simple Shapes

- 5) Find the area and perimeter of the shapes below

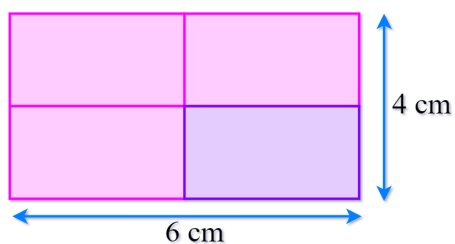


1.3 Compound Shapes

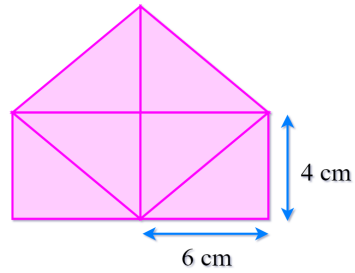
- 6) The diagram shows a square and an equilateral triangle. The square has a width of 6 cm and the square and triangle has a height combined of 10 cm. What is the total area of the diagram?



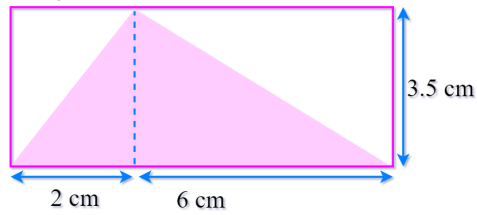
- 7) The diagram shows a rectangular flag. It is split into four equal rectangles. What is the area of the shaded rectangle?



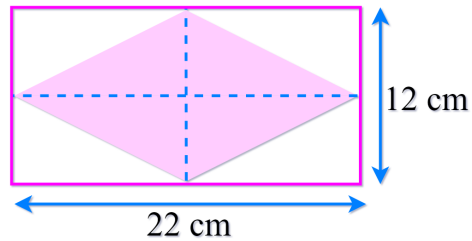
- 8) The playground at a local park is made up of six identical right-angled triangles. What is the area of the playground?



- 9) What is the area of the shaded triangle?



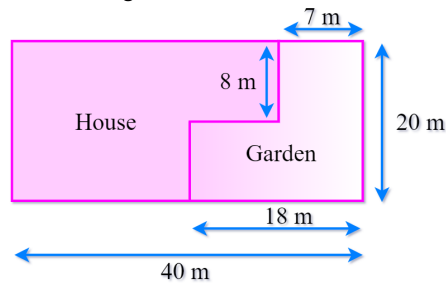
- 10) What is the area of the shaded diamond?



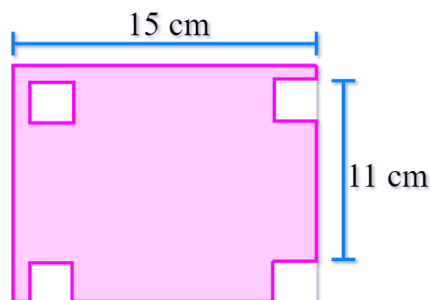
- 11) Find the area and perimeter of the shapes below
Note: All angles are right angles

	<p>Find the perimeter only</p>
<p>Equal squares are cut from the corners of a rectangular piece of card</p>	

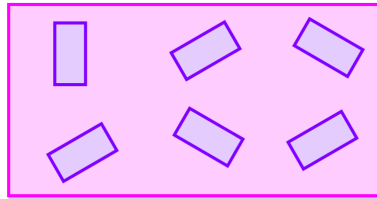
12) Find the area of the house and the area of the garden



13) A shape is made by cutting 2.5 cm squares from the corners of a rectangular piece of card. Find the area of the remaining card



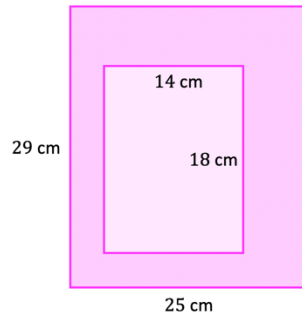
- 14) A rectangular piece of card measuring 37 cm by 18 cm, has 6 identical holes cut out of it. Each hole is a rectangle measuring 2 cm by 3.5 cm. Find the area of the remaining card



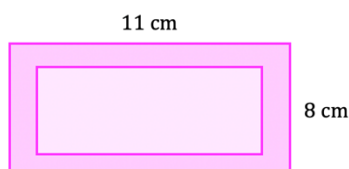
- 15) A photograph which measures 12 centimetres by 15 centimetres is mounted on a piece of red card so that there is a border of 3 centimetres all the way round the photograph. What area of red card is showing?



- 16) What is the area of the darker pink region?

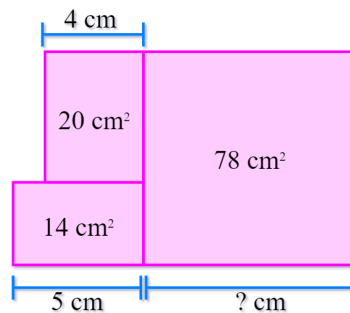


- 17) A path of width 1.5 m is built around the outside of a pond. The dimensions of the path are shown. What is the area of the pond. Make sure you state the units.

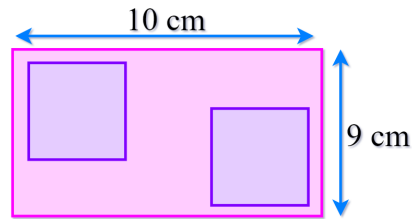


1.4 Working Backwards

- 18) Work out the missing length

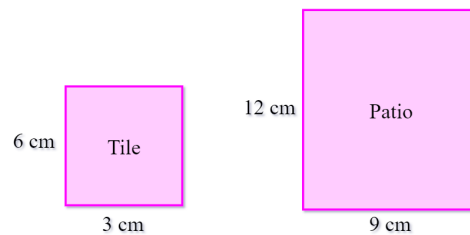


- 19) Two identical square holes are cut from a rectangular sheet leaving an area of 58 square centimetres. How long are the sides of the square?



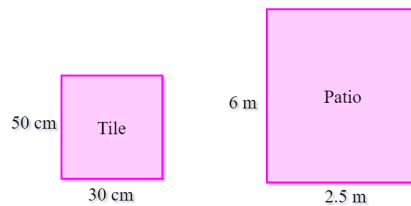
1.5 Fitting

- 20) How many tiles can fit in this patio?



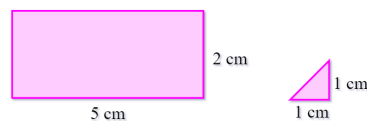
- 21) On my wall I want to put some stickers of my favourite pop star Singing Steve. The space I have available is 55cm by 60cm and the stickers are each 15cm by 5cm. What is the maximum number of stickers I can fit on the wall?

- 22) How many tiles can fit in this patio?
Careful: the measurements are not the same. Either convert all to cm or all to m



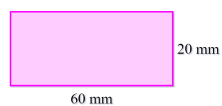
- 23) Mrs Derby wants to buy tiles to cover a 5 m × 4 m floor. Each tile measures 50 cm × 50 cm. How many tiles will Mrs Derby need to cover the floor?

- 24)

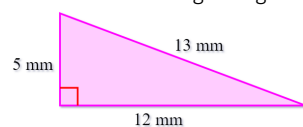


How many triangles of the size shown will fit into the rectangle?

- 25) Find the area of the rectangle

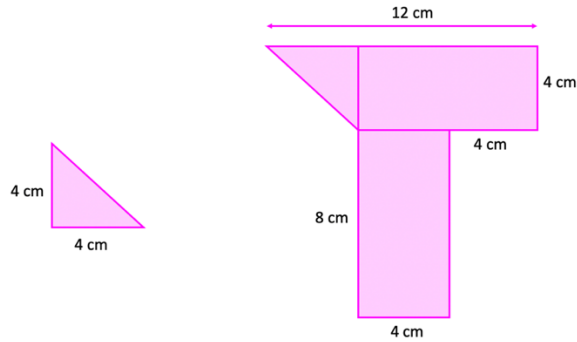


George cuts the rectangle up into an exact number of right-angled triangles, each with sides as shown

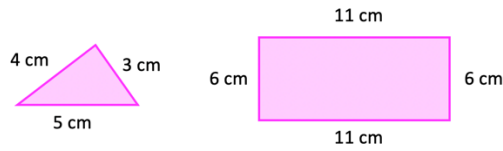


- Calculate the number of triangles that he cuts from the rectangle
- Find the combined perimeter of all the triangles that have been cut from the rectangle
- Convert this distance from millimetres into metres

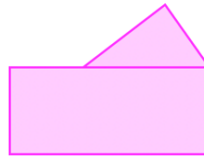
- 26) 1 m by 4 m rolls of turf cost £80.00. Mr Taylor's yard is 5 m long and 8 m wide. How much will it cost him to turf half of his yard?
- 27) The diagram on the left below shows a right-angled tile. How many of the tiles can I fit into the shape on the right?



- 28) The dimensions of the rectangle and triangle are given. The diagrams are not drawn accurately.

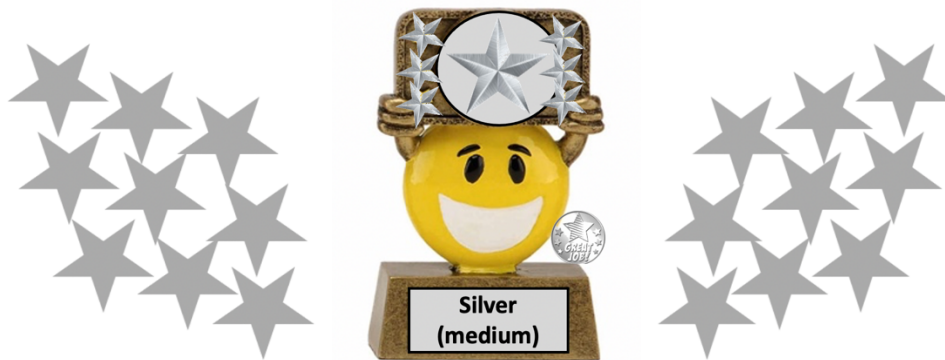


They are joined together to make a new shape.



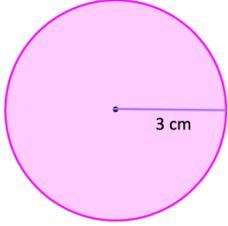
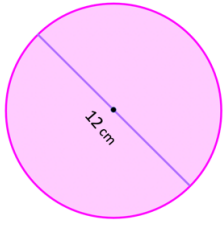
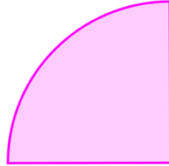
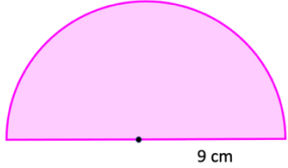
What is the perimeter of this new shape?

2 Silver



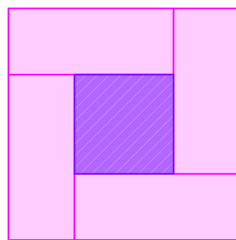
2.1 Simple Shapes

29) Find the area and perimeter of the shapes below

<p>Find the area and circumference of the circle below</p> 	<p>Find the area and circumference of the circle below</p> 	<p>Find the area and perimeter of the quarter-circle below</p> 	<p>Find the area and perimeter of the semi-circle below</p> 
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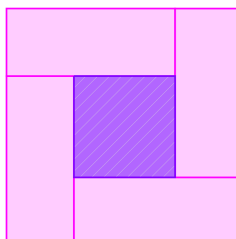
2.2 Compound Shapes

30) Four rectangles each of length 27 cm and width 13 cm are arranged to form the square shown below (not drawn to scale)



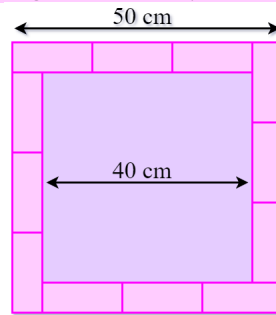
- i. Find the perimeter of the outer square shape
- ii. Find the area of the shaded inner square

31) Four rectangles each of length 14 cm and width 6 cm are arranged to form the square shown below (the diagram is not drawn to scale)

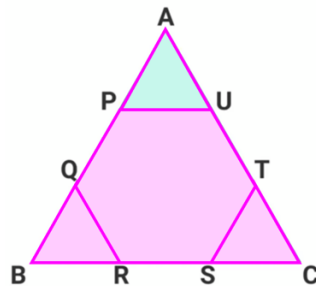


Find the perimeter of the outer square shape

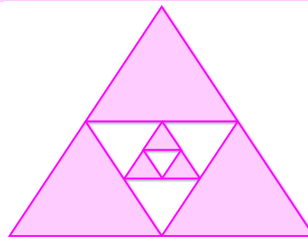
- 32) Twelve rectangles, all the same size are arranged to make a square. Calculate the area of one of the rectangles.



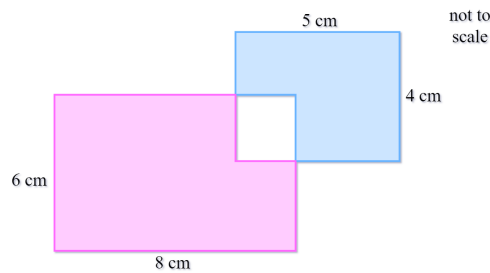
- 33) The diagram shows a regular hexagon PQRSTU and the area of triangle ABC is 90. What is the area of the shaded triangle APU?



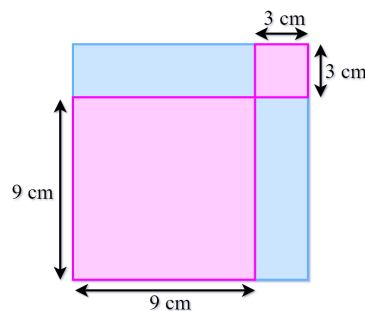
- 34) Below is an equilateral triangle with a total area of 128 cm^2 . Find the total shaded area.



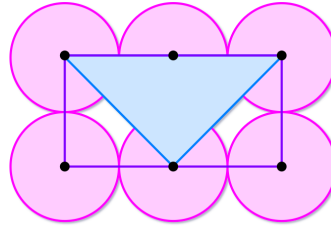
- 35) The shape below is made from two overlapping rectangles. One rectangle measures 5 cm by 4 cm. The other measures 8 cm by 6 cm. Given that the area of the shaded blue section is 15 cm^2 , work out the area of the section shaded pink.



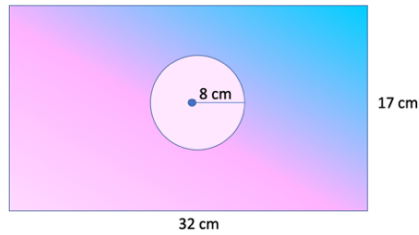
- 36) Two parts of this square design are shaded black. Two parts are shaded blue. Show that the ratio of pink to blue is 5:3



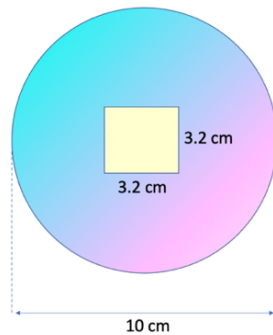
- 37) Six touching circles of radius 5 cm are shown. Find the area of the purple rectangle.



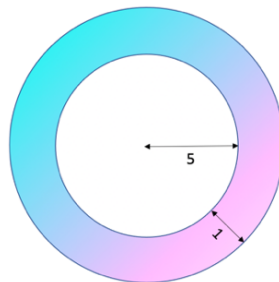
- 38) The diagram shows a circle inside a rectangle. Work out the area of the light pink shaded region.



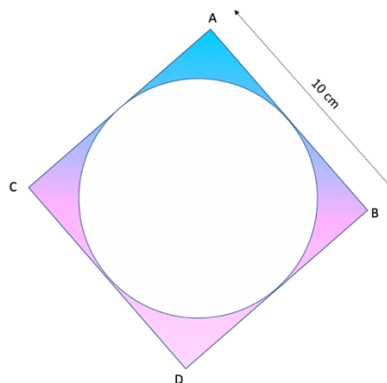
- 39) A square hole is cut from a circular piece of card. The square has sides of length 3.2 cm. The diameter of the circular piece of card is 10 cm. Work out the area of the multi-coloured shaded region.



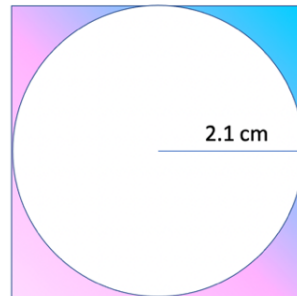
- 40) The diagram shows a circular pond with a path around it. The pond has a radius of 5 m. The path has a width of 1 m. Work out the area of the path. Give your answer to 3 significant figures.



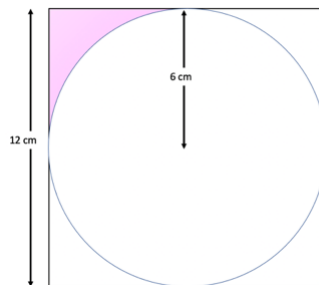
- 41) The diagram shows a circle inside a square. ABCD is a square of side 10 cm. Each side of the square is tangent to the circle. Work out the total area of the shaded regions in terms of π .



- 42) The diagram shows a circle with radius 2.1 cm inside a square. The circle touches the side of the square. Work out the shaded area

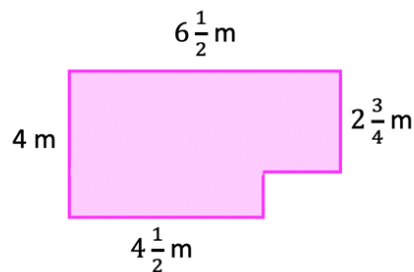


- 43) A diagram shows a circle drawn inside a square. The circle has a radius of length 6 cm. The square has a side of length 12 cm. Work out the shaded area. Give your answer in terms of π



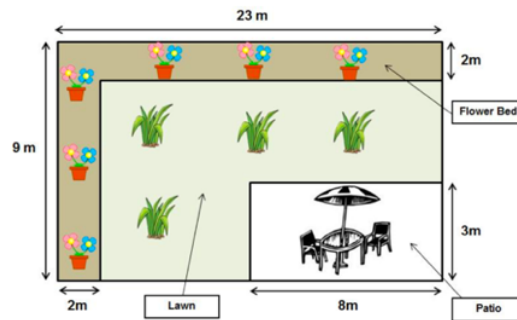
2.3 Area Fitting

- 44) This is a plan of Katie's bedroom. She wants to buy covering to line all around the edges of the ceiling.



- i. What length of the covering does she need?
- She also wants to tile the floor. The tiles are 50 cm by 50 cm.
- ii. How many tiles will she need to cover the floor.
- 45) Mrs Suzie needs to cover a floor measuring 3 m by 2 m. There are three possible options:
- Acorn tiles:** 50 cm x 50 cm cost £4 each
- Beeching tiles:** 60 cm x 40 cm. Cost £3 each.
- Carpet:** £14 per square metre. Fitting cost £30.
- Which option is the cheapest? Show all your workings and explain clearly.

- 46) Mr Green's garden is a mixture of lawn, patio and flower beds. A plant of the garden is shown below.



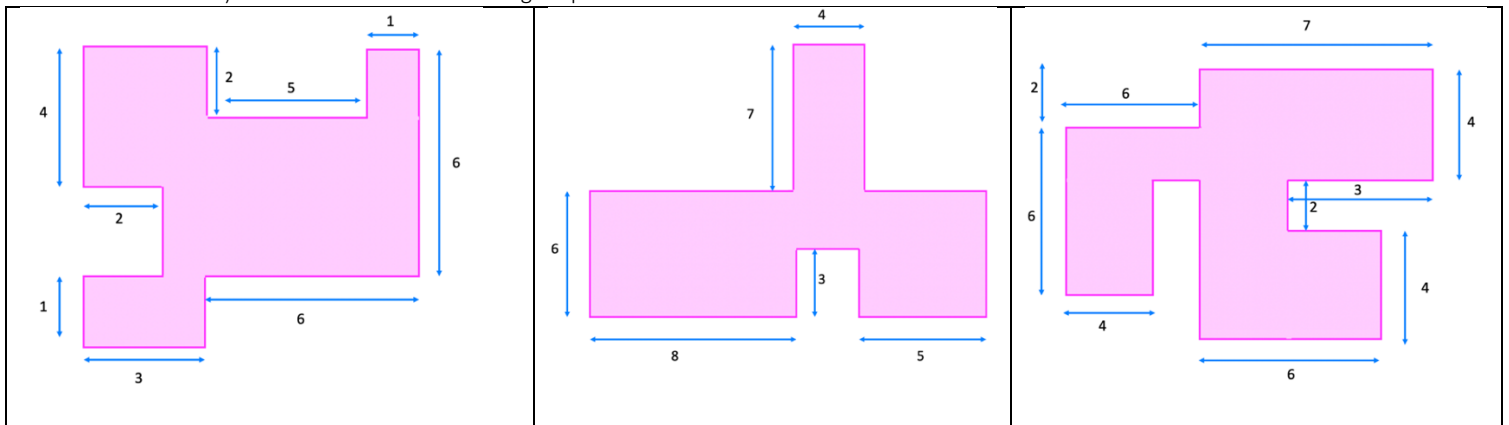
- i. What is the area covered by My Green's lawn
- ii. Mr Green has 6 flower pots. Flower pots cost £4.00 each. Mr green has a voucher for 15% off. How much does Mr Green spend on flower pots if he uses the voucher.
- iii. Mr Green wants to pay paving stones on his patio. The stones are rectangles measuring 50 cm by 20 cm. How many paving stones are needed to pave the patio.
- iv. The area of the flower bed is 60m .
One sack of fertilizer is needed for every 4 m^2 of flower bed. Sacks cost £10 each, but are on offer: "buy four sacks and get a fifth sack free"
How much does it cost to fertilize the flower bed?

3 Gold

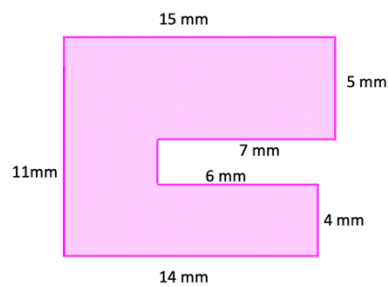


3.1 Compound Shapes

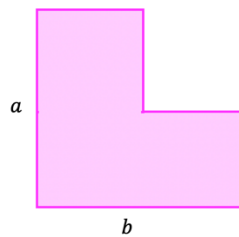
47) Find the area of the following shapes.



48) Find the perimeter and area of the following shape

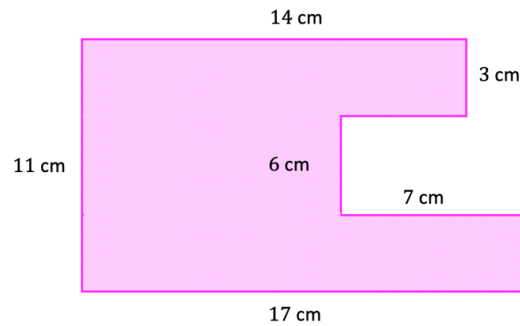


49) What is the perimeter of the shape below? Circle the correct answer

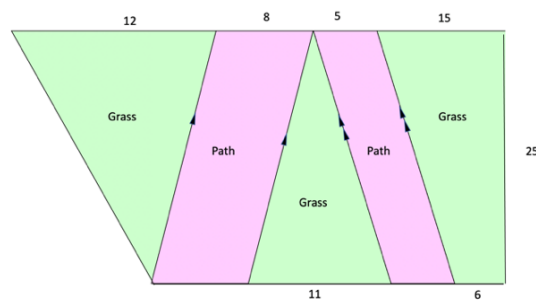


- i. $2a + 2b$
- ii. $a + b$
- iii. $a \times b$
- iv. $2a \times 2b$
- v. $2a + b - ab$

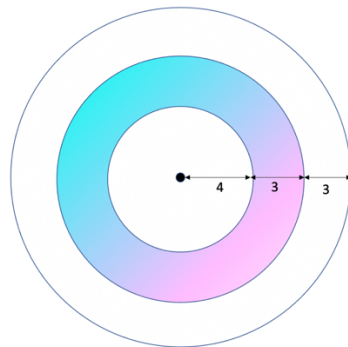
- 50) Work out the perimeter of the shape
 Note: all angles are right angles, but the diagram has not been drawn to scale.



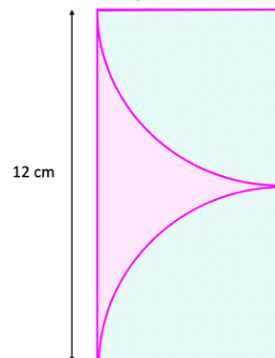
- 51) David is planning his garden. There will be two paths in the garden. The rest of the garden will be grass. The diagram shows David's plan for his garden. All measurements on the diagram are given in feet. Work out the total area of the grass.



- 52) The diagram shows a logo made from three circles. Each circle has centre O. Daisy says that exactly $\frac{1}{3}$ of the logo is shaded. Is Daisy correct?



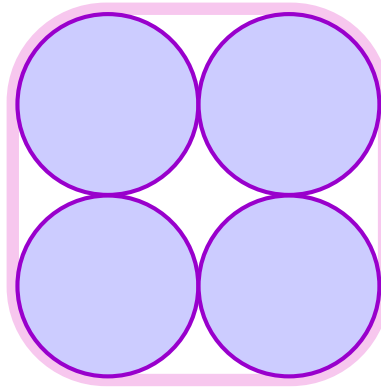
- 53) Two identical quarter circles are cut from a rectangle as shown. Work out the shaded pink area.



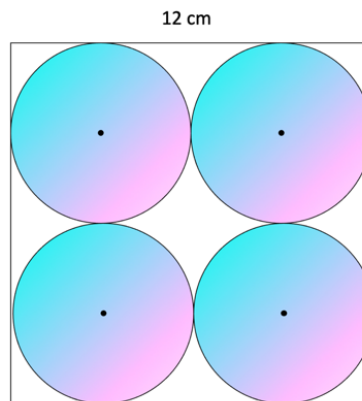
- 54) The diagram shows the path of an athlete on a running track. The path consists of two straight lengths and a semicircle at each end. Each straight length is 85 metres. Each semicircle has a radius of 36.6 metres. Calculate the area enclosed by the path to 2 significant figures.



- 55) Four pencils are held together with a band. The figure below shows the bottom end of the pencils and the band. Each of the pencils has a diameter of 9mm. Find the length of the band in this position.



- 56) Four identical circles just fit inside a square as shown. Work out the area of the unshaded region. Give your answer in terms of π .

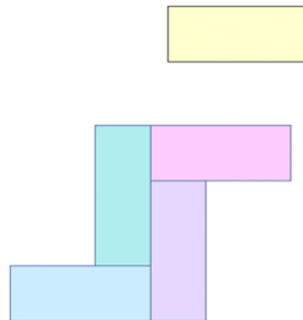


4 Diamond

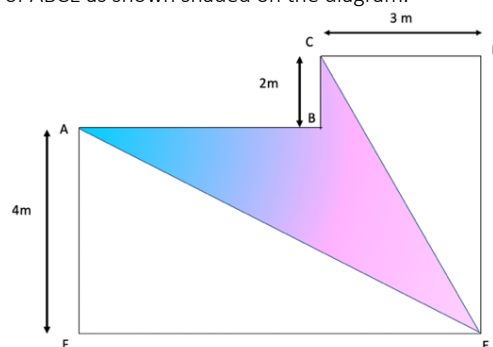


4.1 Compound Shapes

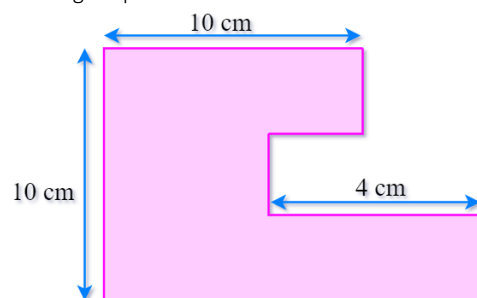
- 57) Here is a rectangle. The length of the rectangle is 7 cm longer than the width of the rectangle. 4 of these rectangles are used to make this 8-sided shape. The perimeter of the 8-sided shape is 70 cm. Work out the area of the 8-sided shape.



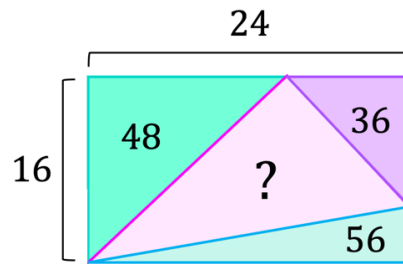
- 58) The diagram shows a shape ABCDEF. All the corners of the shape are right angles. The perimeter of the shape is 28 m. Work out the area of ABCE as shown shaded on the diagram.



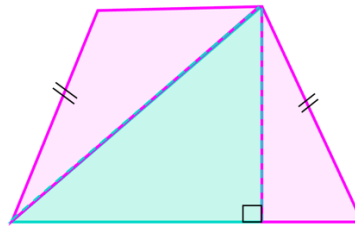
- 59) Find the perimeter of the following shape.



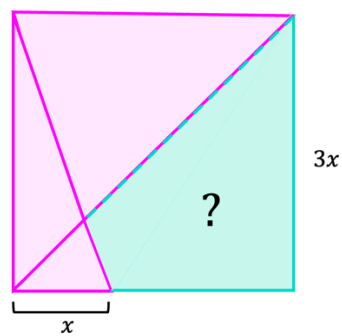
- 60) The 16×24 rectangle is cut into 4 triangles, 3 of which have perimeters 48, 36 and 56. What is the perimeter of the remaining orange triangle?



- 61) In this trapezoid, is the yellow or red area larger, or are they the same?



- 62) If the square has an area of 12, what is the area of the yellow quadrilateral?

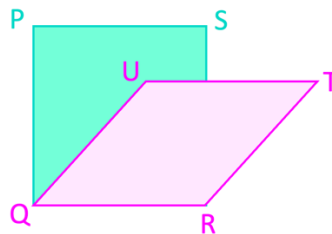


5 Challenges

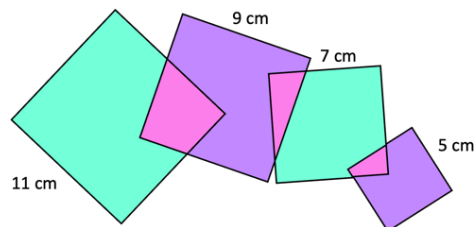


Questions like this will not come up for the 11+ , but are here for talented maths students who would like a challenge and some extension work.

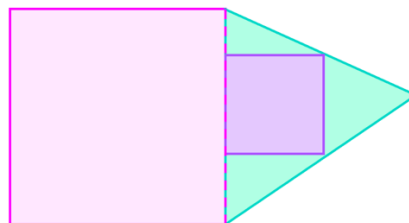
- 63) The diagram shows the square PQRS, which has area 25 cm^2 , and the rhombus, which has area 20 cm^2 . What is the area of the shaded region?



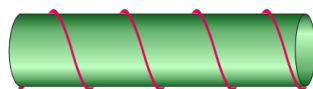
- 64) The diagram shows four overlapping squares that have sides of lengths 5 cm, 7 cm, 9 cm and 11 cm. What is the difference between the total area shaded green area and the total purple area?



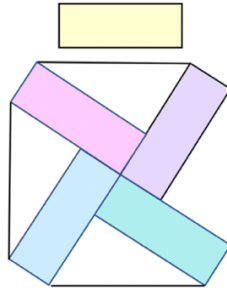
- 65) The diagram below includes two squares. One has sides of length 20 and the other has sides of length 10. What is the area of the shaded green region?



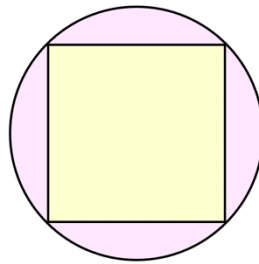
- 66) A string is wound symmetrically around a circular rod. The string goes exactly 4 times around the rod. The circumference of the rod is 4cm and it's length is 12cm. Find the length of the string.



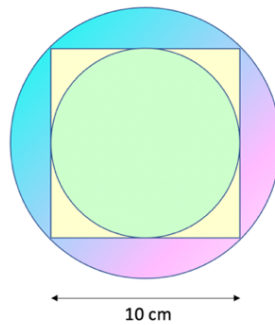
- 67) The 8-sided shape below is made from 4 of these rectangles and 4 congruent right-angled triangles. Work out the perimeter of the 8-sided shape.



- 68) A square, with sides of length x cm, is inside a circle. Each vertex of the square is on the circumference of the circle. The area of the circle is 49 cm^2 . Work out the value of x .

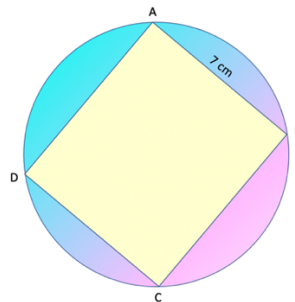


- 69) The diagram shows a square and two circles. The inner circle is the largest one that can be drawn inside the square. The outer circle is the smallest one that can be drawn with the square inside it.

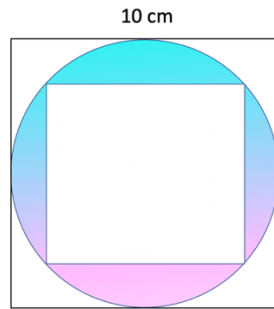


Prove that the shaded area between the two circles (the yellow and multicoloured pink and blue shaded area) is the same as the green shaded area enclosed by the inner circle.

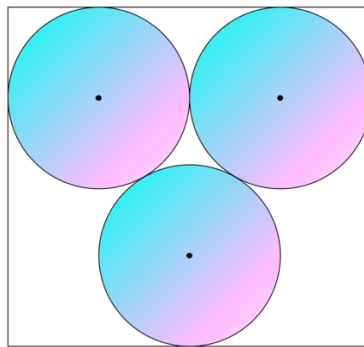
- 70) A, B, C and D are points on a circle. ABCD is a square of side 7 cm . Work out the total area of the multicoloured shaded (blue and pink) regions



- 71) Timur has drawn 2 squares and a circle. He has challenged Kamilla his sister to find the area of the shaded region. Can you do this?

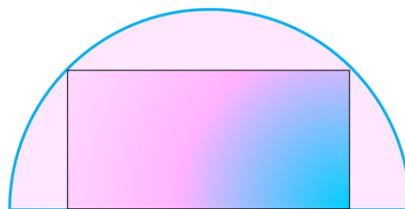


- 72) The diagram shows 3 identical circles inside a rectangle. Each circle touches the other two circles and the sides of the rectangle, as shown in the diagram.



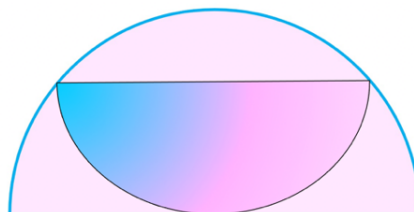
The radius of each circle is 24 mm. Work out the area of the rectangle to 3 significant figures.

- 73) The diagram shows a rectangle inside a semicircle. The rectangle has dimensions 16 cm by 6 cm.



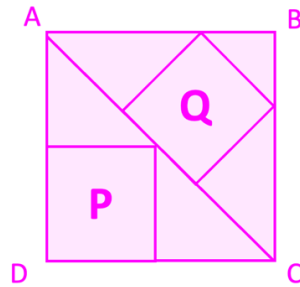
Work out the light pink shaded area. Give your answer in terms of π

- 74) I cut a semicircle from some patterned paper but realise I have cut it upside down – so cut the largest semicircle that will fit upside down inside the original as pictured.

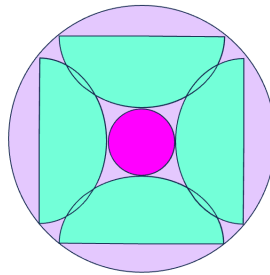


What is the ratio of the area of the small semicircle to the area of the large semicircle?

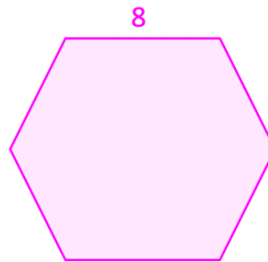
- 75) ABCD is a square. P and Q are squares drawn in the triangles. ADC and ABC, as shown. What is the ratio of the area of the square P to the area of square Q?



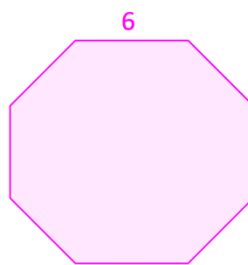
- 76) The diagram shows four semicircles placed symmetrically between two circles. The inner circle has area 4 and each semicircle has area 18. What is the area of the outer circle?



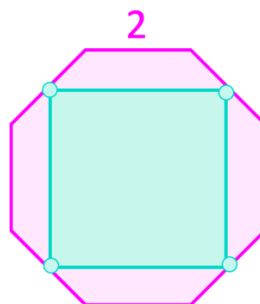
- 77) What is the area of the following hexagon?



- 78) What is the area of the following octagon?



- 79) What is the pink area?



- 80) A regular octagon is placed inside a square, as shown. The shaded square connects the midpoints of four sides of the octagon. What fraction of the outer square is shaded purple.

