Reasoning and Problem Solving
Perimeter, Area and Volume – Year 6

About This Resource

This resource is aimed at Year 6 Secure and has been designed to give children the opportunity to consolidate the skills they have learned in Spring Block 5 – Measurement: Perimeter, Area and Volume.

The questions are based on a selection of the same 'small steps' that are addressed in the block, but are presented in a different way so children can work through the pack independently and demonstrate their understanding and skills.

Small Steps

Shapes – same area
Area and perimeter
Area of a triangle
Area of a parallelogram
Volume of a cuboid

National Curriculum Objectives

Mathematics Year 6: (6M7a) Recognise that shapes with the same areas can have different perimeters and vice versa.
Mathematics Year 6: (6M7b) Calculate the area of parallelograms and triangles.
Mathematics Year 6: (6M7c) Recognise when it is possible to use formulae for area of shapes.
Mathematics Year 6: (6M8a) Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm3) and cubic metres (m3), and extending to other units [for example, mm3 and km3]

Did you like this resource? Don't forget to review it on our website.

classroomsecrets.com

Adventures in Wonderland

You have the unique opportunity to be a key player in the creation of the country's largest theme park ever built.
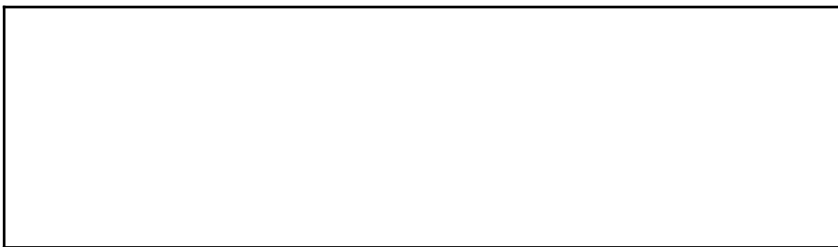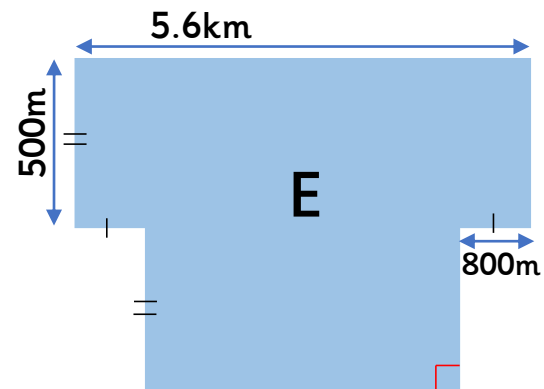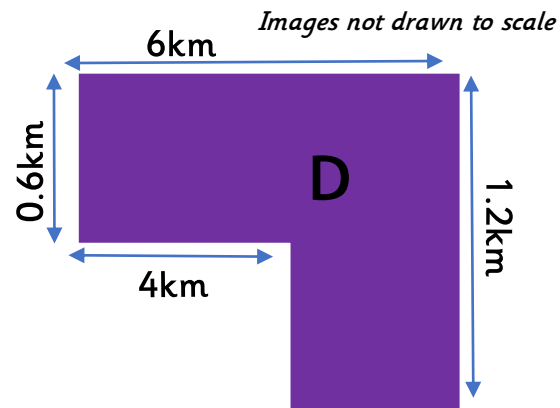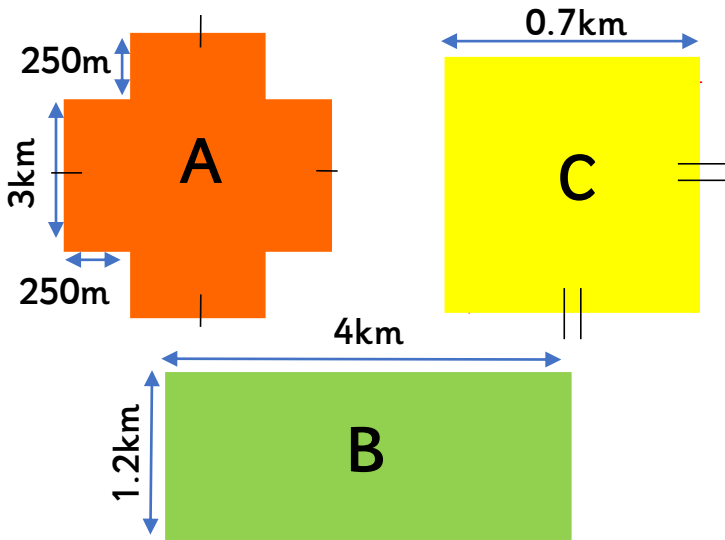
We are looking for people with skills in architecture, design and events organisation to take us to the next level of theme park adventures!

Our creativity and the combination of traditional and bang-up-to-date attractions makes us stand out from the crowd. Join us to help families make amazing memories for years to come.

The park has building consent for 4.8km^2 of wasteland to build upon. The wasteland sits in a larger area of old industrial land so we have a number of options:

1. Calculate the area of each plan. Which options meet our planning requirements?

Images not drawn to scale

250m

3km

250m

A

0.7km

C

6km

0.6km

4km

D

1.2km

4km

1.2km

B

5.6km

500m

E

800m

We need four distinct areas for our theme park; Water Adventures, High Flyers, Coaster Mania and Back in Time. Each should have almost equal space and it should be possible for a family to walk around the park in one day.

2. With this in mind which plan would you advise the team select? Give reasons, discussing area and perimeter of your chosen plan.

classroomsecrets.com
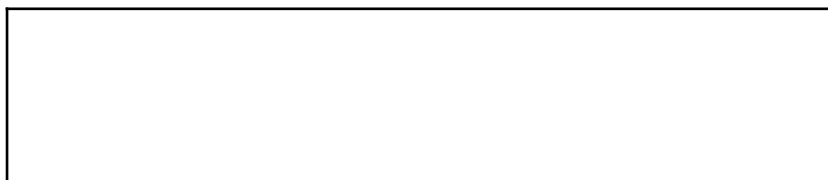
3. Draw your chosen shape on the grid below, include the boundaries and labels for all four themes of the park. Give the area of each theme in km².
Each square represents 1km².

Each area of the park will have its own colour theme. The fences all around the outer edge of the area will show the boundary and keep the colour theme vibrant.

4. Using your choice of shape, how many metres of each colour fence will be needed?

| Water Adventures	metres	Coaster Mania	metres
High Flyers	metres	Back in Time	metres

When creating the foundations for building, due to the height and power of our planned rides, we will need to dig trenches of 25m depth and fill with 12.5m deep gravel (for drainage), then 12.5m top soil.

5. For the shape of your whole theme park, calculate the volume of the trench. Give your answer in m³.

classroomsecrets.com

The park is landscaped and building work is ready to begin. There is going to be an indoor waterpark with 7 slides, a wave machine, Olympic standard diving pool and water cannons.

The toddler slide has been identified as potentially hazardous due to the space beneath the slide being open. We plan to block the space using boarding, the boarding costs £9m^2.
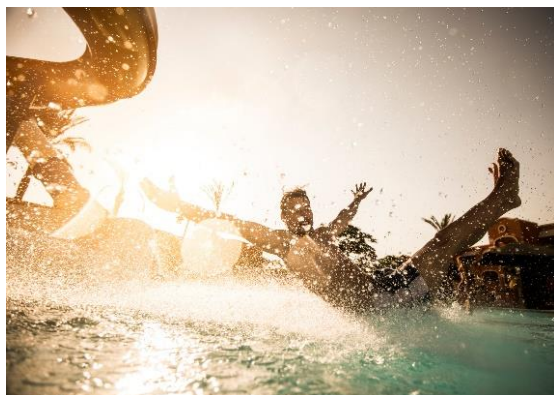
6. Calculate how much boarding we will need and the cost of the total order for our 4 slides below. Each slide is positioned against a wall so only one side will require board, in the shapes shown below.

Images not drawn to scale

The Flurry — 2.4m / 5m

Launcher — 4m / 7.9m

Peak — 12.8m / 6m

Double Trouble — 13m / 13m / 15m / 40m
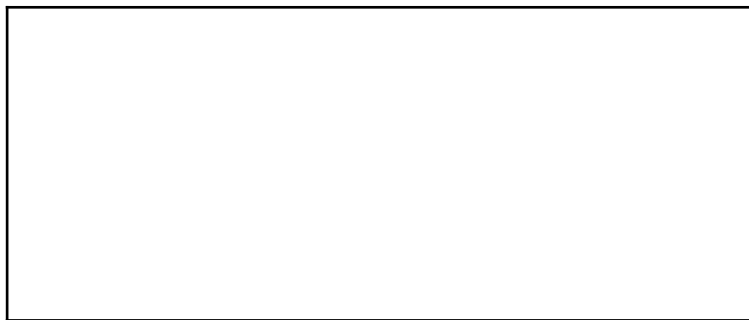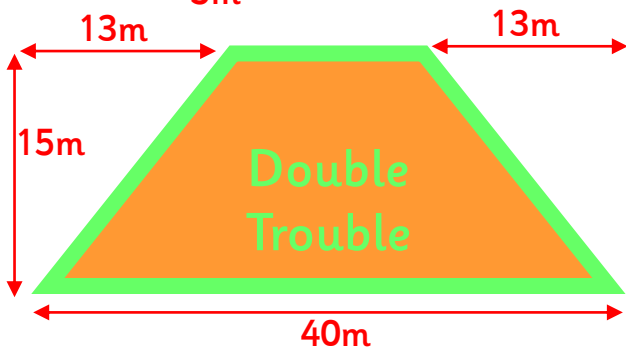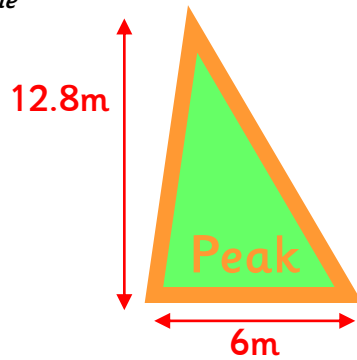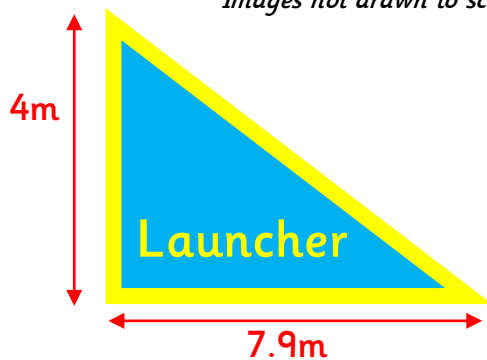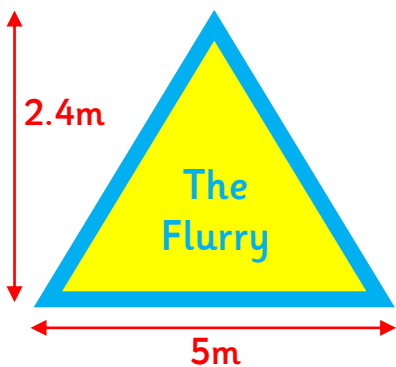
Our plan is to have a large infant pool where children can all safely explore and enjoy time with their parents, and a wave pool for the more adventurous swimmers. The pool will be a square shape as outlined below and is 60cm deep. The wave pool is a rectangle, as below, which is 2.5m deep.

7. The chlorine needs to be added at a rate of 7ml per 5m^3. How much chlorine will need to be added to both pools?

Ariel views are not drawn to scale

6.5m / 6.5m

18m / 6.5m

classroomsecrets.com
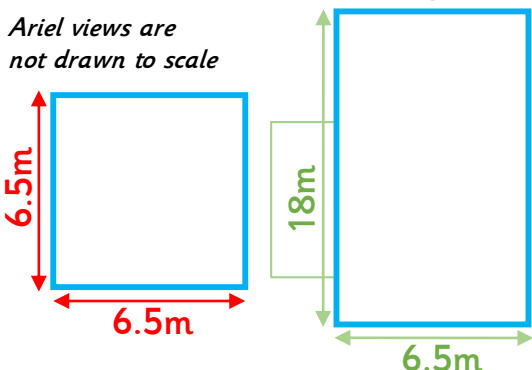
As part of the 'Back in Time' area there will be traditional fayre rides and family fun. The first attraction to be arranged is the hedge maze. We have procured enough full height hedging for the outer edge of the maze to cover a distance of 0.75 km.

8. How would you recommend the hedging is used to give us the largest maze as possible?

Show your calculation and provide the area you have created with the hedge in km² to the nearest thousandth.

The maze must be either a square or rectangular shape due to the design already provided.

'Back in Time' will also involve a bumper car ride that we need to order specialist covering for the bumper cars to create a smooth ride.

9. Look at the plan below and complete the order form for the rubberized surface.
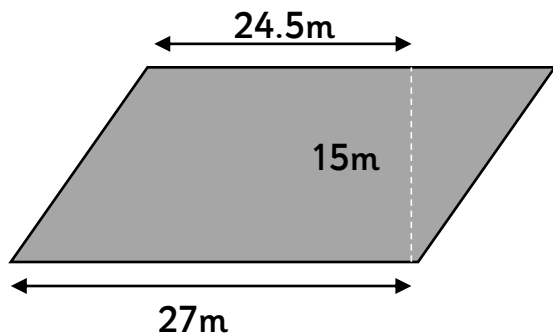
24.5m

15m

27m

Rubber Dubber Specialised Surfaces for the Entertainment Industry		
	m²	£
Bumper car surfacing @ £12 per m²		

Disaster has struck!

The giant inflatable test run did NOT go well, a leak has been found in the slide and it won't re-inflate. There's only a matter of hours before the big launch. The replacement must be ordered and delivered within 12 hours so we need to let the company know as soon as we can.

The slide measures 5m wide and 23m long.
Tick which size slide is the correct replacement?

110m²	£1,876	
115m²	£2,409	
105m²	£985	

classroomsecrets.com

It's launch party time! The professional fireworks display is booked and we need to create an exclusion zone of 25m around the fireworks. The display team will work within an area of 15m x 10m and there will be a fall zone before the exclusion zone which is 10m around the working area.

11. Taking all this information into account, create a drawing for the firework site below.

1 square = 5 m
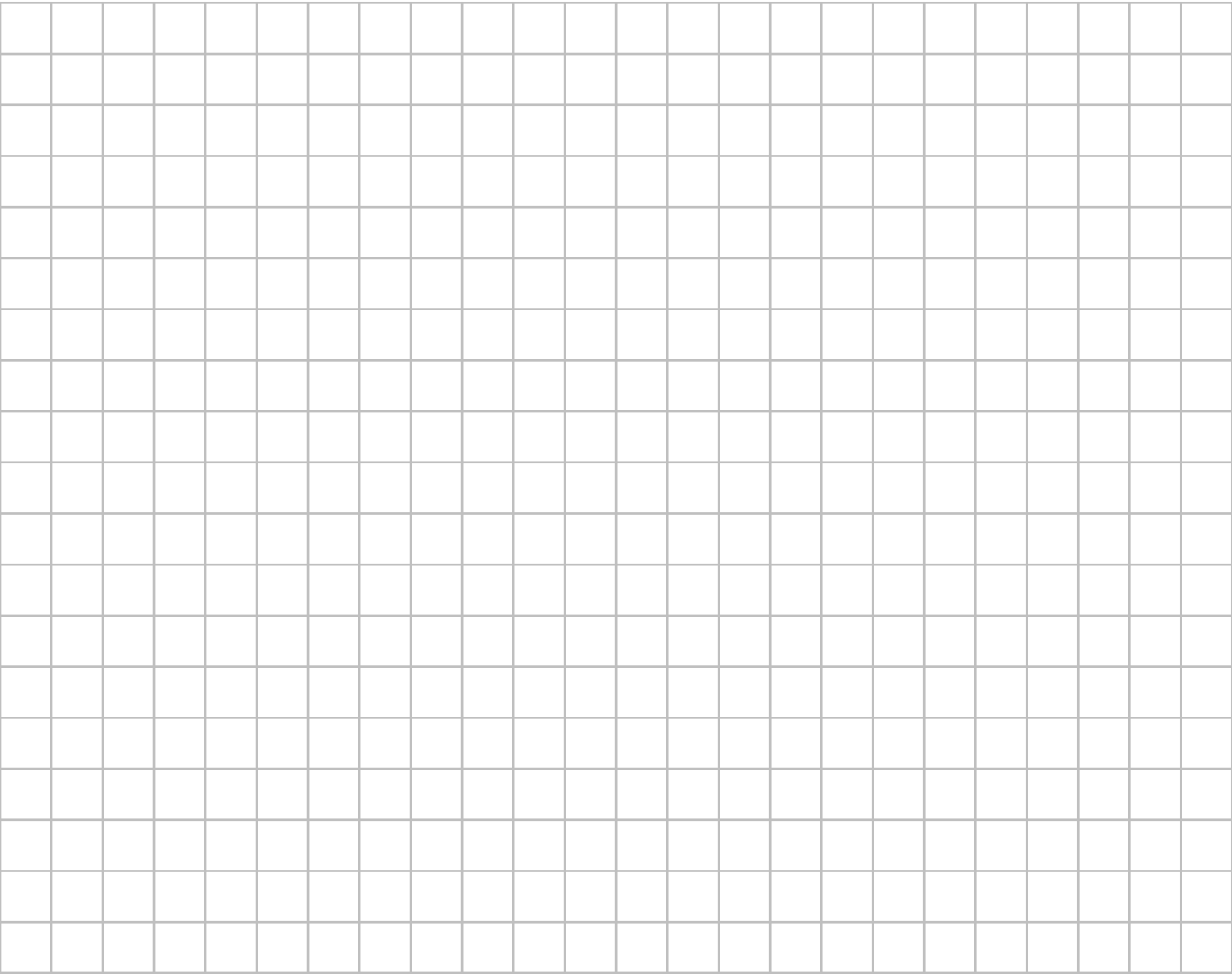
The fireworks are ready to be lit, the rides are ready to go and you are on our team!

Welcome to the best rides, the best times, the best memories! Join in the fun! The gates open tomorrow! Are YOU ready?

classroomsecrets.com

1. Shape A   12km²   4 x (3 x 0.25 = 0.75km²) + (3 x 3 = 9 km²)

   Shape B   4.8km²   4 x 1.2 = 4.8km²

   Shape C   0.49km²   0.7 x 0.7 = 0.49km²

   Shape D   4.8km²   (1.2 x 2 = 2.4) + (0.6 x 4 = 2.4) = 4.8km² or (6 x 0.6 = 3.6) + (0.6 x 2 = 1.2) = 4.8km²

   Shape E   4.8km²   (5.6 x 0.5 = 2.8) + (0.5 x 4 = 2) = 4.8km² or 2 x (0.8 x 0.5 = 0.4) + (4 x 1 = 4) = 4.8km²

   Areas B, D and E meet the planning requirements.

2. Children's choice may vary; any of B, D or E would be suitable providing justification is given, discussing area and perimeter. See below for example answers.

   B   The area could be split into equal parts of 1.2km². The perimeter of each would be 4.4km.

   D   The area could be split into 4 areas of 1.2km². The perimeter of each would be 5.2km.

   E   It would be difficult to make 4 areas of almost equal size. The area could be split into 2 areas of 0.4km² and 2 areas of 2km². The perimeter would be 2.6km for the smaller areas and 9km for the larger areas.

3. Children's answers will vary dependant on their choice in question 2, and where they place each themed area.
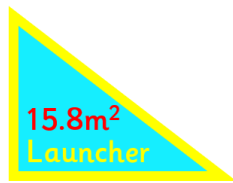
   B

   | 1.2km² | 1.2km² | 1.2km² | 1.2km² |

   D

   | 1.2km² | 1.2km² | 1.2km² |
   | | | 1.2km² |

   E

   | 0.4 km² | 2 km² | 0.4 km² |
   | | 2 km² | |
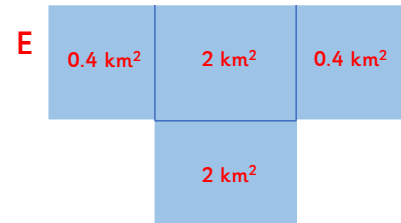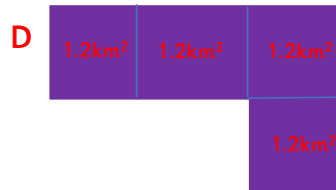
4. Children's answers will vary dependent on their choice of positioning for each area, see maps above for area labels.

Shape	Water Adventures	High Flyers	Coaster Mania	Back in Time
B	4,400m	4,400m	4,400m	4,400m
D	5,200m	5,200m	5,200m	5,200m
E	2,600m	9,000m	2,600m	9,000m

5. As children have area of 4.8 km² for all shapes, they are able to calculate 4.8 x 2.5 = 12km³. Some children may wish to use the formula w x h x d for all their rectilinear shape part.

classroomsecrets.com

6.

6m² The Flurry

15.8m² Launcher

Peak 38.4m²

405m² Double Trouble

Total area of boarding needed is 465.2m²

So the cost will be 9 x 465.2 = £4,186.80

.

7. **Infant pool**
volume = 6.5 x 6.5 x 0.6 = 25.35m³

Wave pool
volume = 18 x 18 x 2.5 = 810m³

Total volume = 25.35 + 810 = 835.35

Amount of chlorine   835.35 ÷ 5 = 167.07   167.07 x 7ml = 1,169.49ml

8. 187.5m x 187.5m gives the largest area of 35.16km².

187.5m

187.5m

187.5m

187.5m

Area = 35.16km²

9.

Rubber Dubber Specialised Surfaces for the Entertainment Industry		
Bumper car surfacing @ £12 per m²	m²	£
	27 x 15 = 405	12 x 405 = £4,860

10. 115 m²

11.

Reasoning and Problem Solving – Year 6 – Consolidation Pack – Expected ANSWERS