

Reasoning and Problem Solving

Properties of Shape – Year 6

About This Resource

This resource is aimed at Year 6 Expected and has been designed to give children the opportunity to consolidate the skills they have learned in Summer Block 1: Properties of Shape.

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

Measure with a protractor
Introduce angles
Calculate angles
Vertically opposite angles
Angles in a triangle
Angles in a triangle – Special cases
Angles in a triangle – Missing angles
Angles in a quadrilateral
Angles in regular polygons
Draw shapes accurately
Nets of 3D shapes

National Curriculum Objectives

Mathematics Year 6: (6G2a) [Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons](#)

Mathematics Year 6:(6G4b) [Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles](#)

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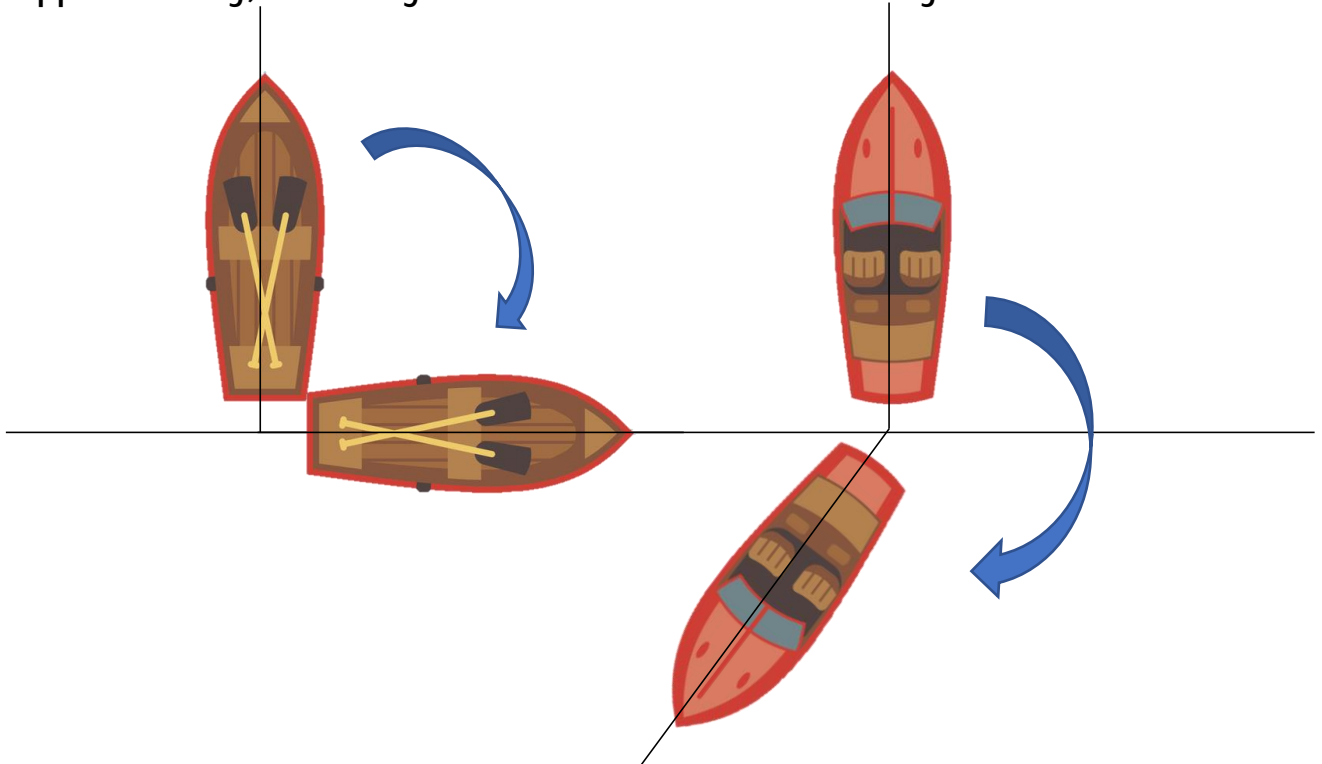
The Year 6 class from Forest Primary School are having a day out at South Sea Sailing Club.

They are learning all about the adventures you can have whilst sailing from Steve and Ali who own the sailing club.

The sailing boats are all moored up ready for when they will be next used.

When the wind blows it makes the boats change the direction that they are facing.

1. Approximately, what angle has each boat been moved by the wind?



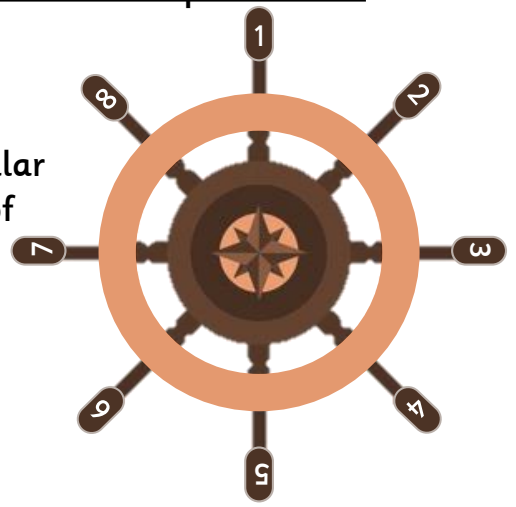
Steve is giving the children a guided tour inside the workshop. He is showing them some of the navigational instruments that they use when they take the boats out on voyages. A compass is used to navigate a vessel in the correct direction. It displays north, east, south and west.



2a. If a boat is travelling North, what angle does it turn if it wants to travel West. Is there more than one answer? Explain why.

2b. Draw an angle anywhere on the compass to represent an angle of 45° .

Ali takes the children onto the biggest ship in the workshop. It doesn't get to go out to sea anymore and the children are blown away with how spectacular it is to be standing at the back of the ship in front of the magnificent helm (ships wheel).



There are 8 handles used to turn the wheel, the wheel can be turned a full 360° .

3a. What angle is between each handle?

3b. Simon turns handle 1 clockwise and it finishes at position 8. How many degrees did the handle move through?

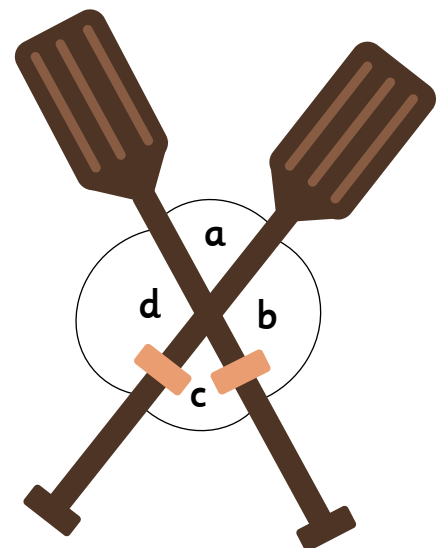
3c. If Simon turns handle one 135° . What position could it finish at?

Viktor is looking at some of the vintage pieces of sailing equipment and he sees a pair of oars that were once used to assist a sailor to sail independently across the English Channel.

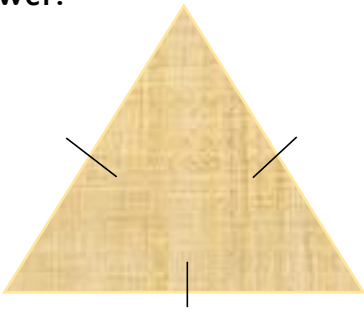
4a. He knows that angle a is 47° .

Is it possible for him to calculate the other 3 angles?

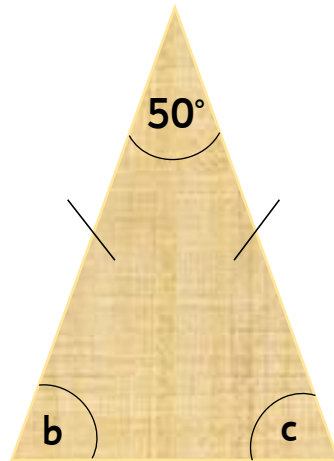
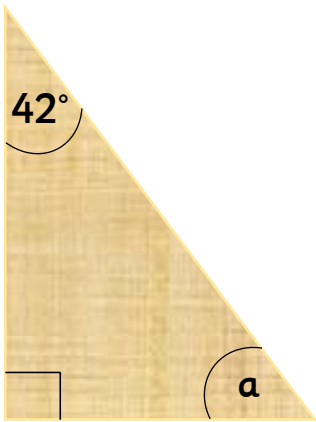
Prove it.



5a. Steve has asked the children to calculate the angles in this sail. No angles have been marked on this sail, is it possible to calculate the missing angles? Explain your answer.



5b. What are the missing angles in these sails?

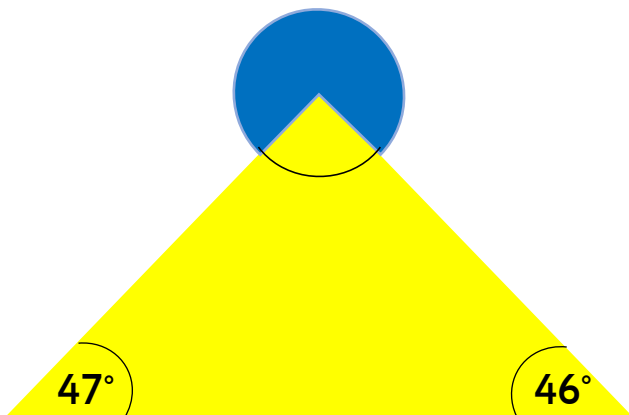


Angle a	
Angle b	
Angle c	

Ali is telling the children all about lighthouses and what they are used for. A lighthouse emits light which enables boats to stay clear of dangerous cliffs/rocks when entering a harbour.



5c. This is a birds eye view showing where the light from the lighthouse is currently shining. What is the size of the angle that is not covered by the lighthouse.

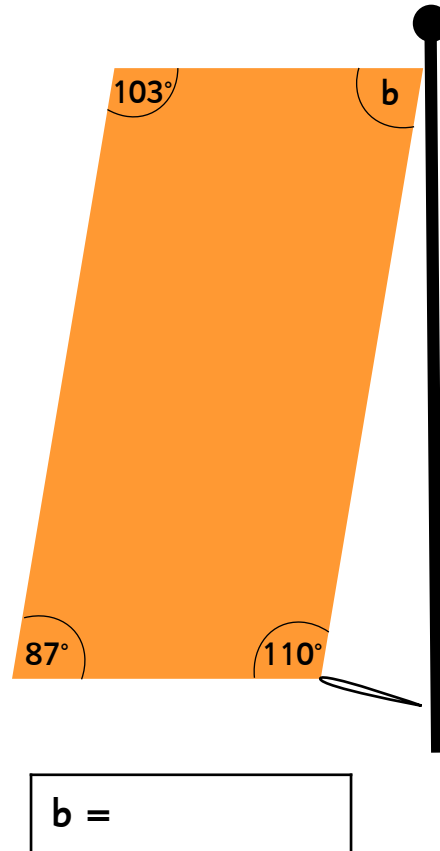
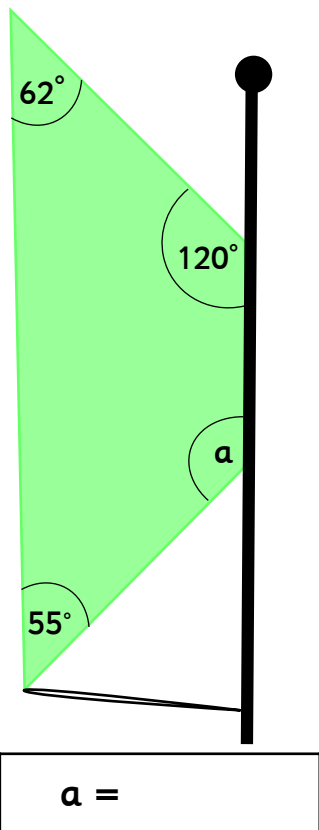


During the summer months the sailing club also offers the opportunity to do windsurfing. Windsurfing is a surface water sport that combines surfing and sailing using a surf board and a sail.

The shape of the sail differs but can sometimes be a quadrilateral.

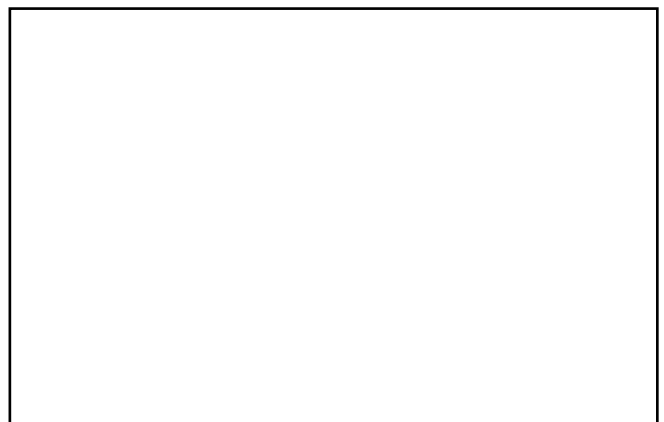
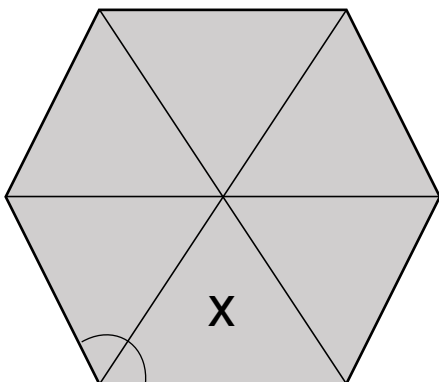
Here are two examples of wind surfing sails.

6. Work out the missing angle in each sail.



6 equilateral triangular sails have been placed down on the floor with the point of the sails connected at the top. They have made a hexagon shape.

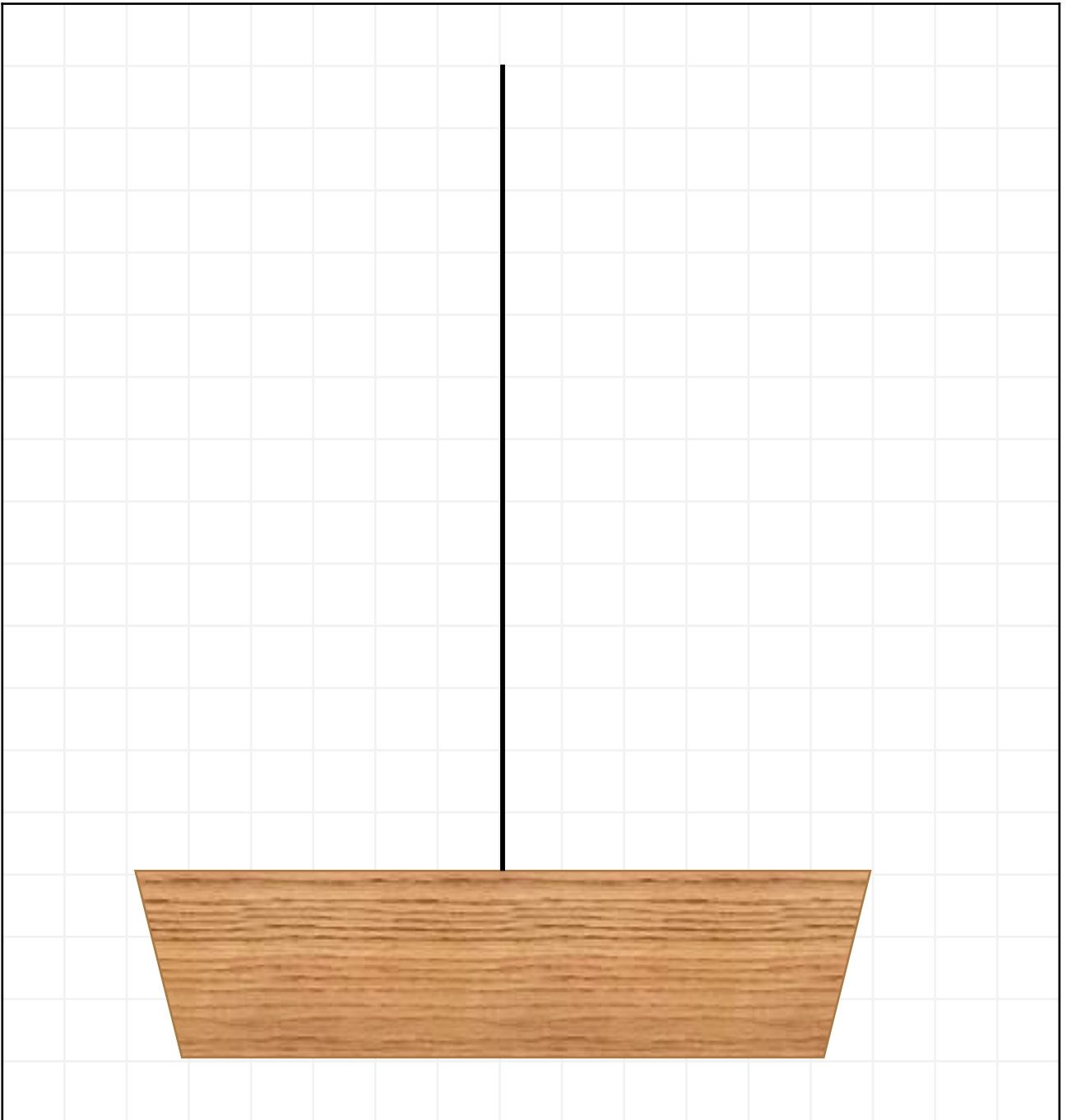
7. Using the angles of sail X, calculate the total of all the internal angles.



- 8a. Ali has set the children a task. Draw a sail for a boat following the instructions.
The sail has 3 sides.
The horizontal side is 6cm
Angle 1 is a right angle
Angle 2 is 50°

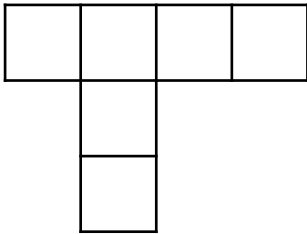
8b. What is the length of the vertical side?

8c. What is angle 3?

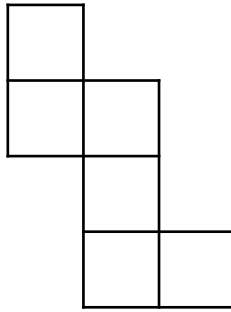


Steve is explaining all about safety whilst onboard a sailing boat. A first aid kit is an essential piece of equipment that every sail boat must have. Usually, only a few necessities are required as there is not much room on a sailing boat, so packing light is essential.

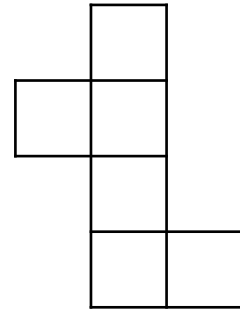
9a. Steve thinks that all of these nets will fold up to make a cube, is he correct? Explain why.



A



B



C

The children have had a great visit to the sailing club and can't wait to get back to school to tell the rest of the children all bout it.



1. 90° and 225°
- 2a. 90° anti-clockwise or 270° clockwise
- 2b. An angle which represent 45° for example North to North East or North East to East.
- 3a. 45°
- 3b. 315°
- 3c. 4 – clockwise or 6 – anti clockwise
4. Angle $a = 47^\circ$ so angle c will also be 47° as opposite angles are equal. Angles d and b together equals $360^\circ - 47^\circ - 47^\circ = 266^\circ$. $266^\circ \div 2 = 133^\circ$.
- 5a. It is an equilateral triangle therefore all the angles are equal. $180^\circ \div 3 = 60^\circ$.
- 5b. $a = 48^\circ$ ($180 - 42 - 90 = 48$) $b = 65^\circ$ $c = 65^\circ$ ($180 - 50 = 130 \div 2 = 65$)
- 5c. 273° ($180 - 47 - 46 = 87$; $360 - 87 = 273$)
6. $a = 123^\circ$ $b = 60^\circ$
7. $120^\circ \times 6 = 720^\circ$
- 8a. An accurate drawing of a triangle. Ensuring that the horizontal line is 6cm and the angles are 90° and 50° . Allow for slight discrepancies.
- 8b. 7cm
- 8c. 40°
9. C is the only net that will make a cube.