



Where on Earth are you?

Looking at the stars

time

60 minutes

learning outcomes

To:

- use units of measurement to express lengths and heights
- read measured values
- know what a sextant is and how to use one
- know what the Pole Star is

materials needed

- 24 protractors
- 24 drinking straws
- 24 nuts or washers
- 12 5-metre measuring tapes
- sticky tape
- ball of string
- globe
- book

end product

- a sextant for each child

Preparation

For the activity **Measuring** you will need to have a book on your desk.



Measuring 15 min.

Invite the children to sit in a circle with you. Ask how many centimetres long they think the book is. How high do they think the classroom door is? How tall are they? The children write their predictions in the space provided in [Task 1](#) on the worksheet and then work in pairs to measure using a measuring tape. Discuss the answers.

Explain that there is a special instrument we can use to measure the height of objects: a sextant. Apart from measuring the height of objects, a sextant can help you find your latitude on Earth. Explain that the Earth is divided into different latitudes. Sailors used to use a sextant to find out the latitude of their ship and the position of other ships. The children can probably imagine that it is very difficult to know where you are if you can only see the ocean all around you. Ask if anyone knows what the Pole Star is. Explain that the Pole Star is a prominent star that always appears in the same position above the North Pole in the night sky and around which all the other stars seem to rotate. By looking at this star you can tell which direction is North. The sailors used this knowledge to use their sextant.



The children make a sextant to measure the height of an object.



Make a sextant 20 min.

Together look at the sextant on the worksheet. Explain that the children are going to make their own sextant. Discuss the conditions the sextant needs to meet. Come to the conclusion that:

- the sextant needs to clearly show the angle at which you are looking (you need a protractor)
- the sextant needs to be sturdy
- you need to be able to look through the sextant easily (you need a straw)

Tip.

The children could make a protractor from stiff card. It is important that they copy the degrees accurately.

You can see from the drawing of the sextant on the worksheet what the finished sextant should look like. Hand out the materials for making the sextant. The children make the sextant following the instructions in [Task 2](#) of the worksheet. It is important that the string hangs vertically and remains vertical when the protractor turns. The string must be taped to the front of the protractor in the exact centre of the straight edge and hang unobstructed down the back of the protractor as shown on the worksheet.



How high? 15 min.

Take the children outside to the playground. Organise the children into pairs. Each pair is going to measure the height of a certain object, such as a tree or the height of the roof. The children complete [Task 3](#) on the worksheet. They need to measure a position 10 metres from their object. Help each pair to measure a height one metre from the ground at their position. One child in each pair must ensure that the measurement is taken from this height of one metre from the ground. The child holding the sextant looks through the straw from this height to the top of the object to be measured. It is important that the children remember the angle shown by the string on the protractor. Take the children back to the classroom.

Explain that they are going to use the angle they measured to calculate the height of their object. In [Task 3c](#) they use their protractor to draw the angle they measured, starting at the right-hand end of the bold horizontal line. They continue this line upwards until it dissects the bold vertical line. The children measure the vertical line to where it meets their diagonal line. Each centimetre represents one metre. Because they started measuring one metre from the ground, they need to add one metre. This gives the height of their object. Ask the children what answers they came to. Are their results realistic? Do their answers correspond to their predictions in [Task 3b](#)?



If the answers are obviously incorrect, the worksheet gives some tips as to what may be the reason for this. You may like to take the children outside to repeat their measurement.

The sextant and the Pole Star 10 min.

Point out the lines of latitude on the globe. Everywhere on the Equator is at 0 degrees. The North Pole is at 90 degrees North. The UK lies between 50 and 60 degrees North. Because you cannot see the Pole Star during the day, you are going to pretend you are at the North Pole. The children take their sextants and look at the Pole Star which is directly overhead. How many degrees does their sextant show? And how many degrees is it at the Equator? At the Equator the Pole Star appears nearly on the horizon.

Ask the children at what angle they would need to hold their sextant if they were to look at the Pole Star from a central position in the UK. Check if they are holding their sextant so that the string shows an angle of around 55 degrees. The children complete [Task 4](#) on the worksheet.



Where on Earth are you?

1 *Measuring*



Write in the spaces below how tall you think each object is in metres or centimetres and how many metres or centimetres you *measured*.

What do you think?

What did you measure?

write the numbers
HERE

book: _____ centimetres

door: _____ centimetres

you: _____ centimetres

book: _____ centimetres

door: _____ centimetres

you: _____ centimetres



You are going to make a sextant.

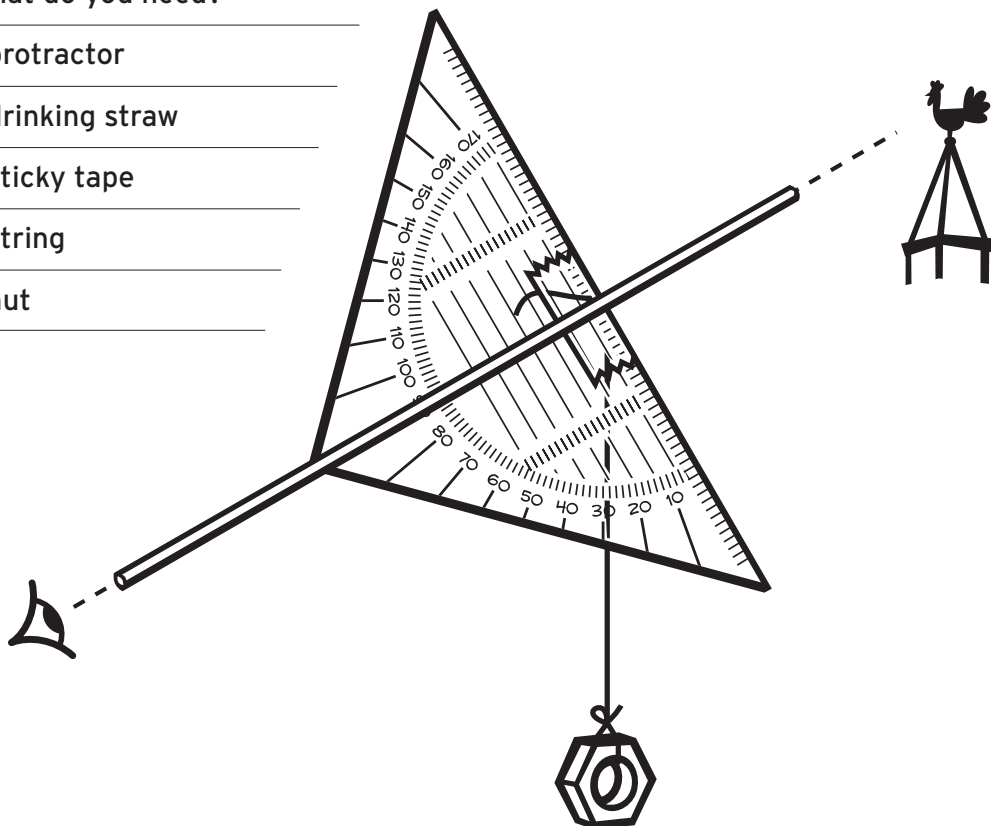
You can use a sextant to measure the height of an object.

2 *Make a sextant*



What do you need?

- protractor
- drinking straw
- sticky tape
- string
- nut



What do you need to do?

You are going to make a sextant. The drawing on the previous page shows how to use the various items you need for this.

1 Cut a piece of string of around 25 centimetres long.

Tie the nut to one end.

2 Tape the other end of the string to the protractor, precisely in the centre of the straight edge. Turn the protractor over and make sure the string hangs vertically along the back of the protractor.

3 Turn the protractor over and tape the straw in the centre along the 90 degree line. Make sure that an equal length of straw protrudes from both sides as shown in the drawing on the previous page.

4 Does your sextant look just like the one shown in the drawing on the previous page? **yes / no**

3 How high?

Now you are going to test your sextant.

a Which object would you like to know the height of?

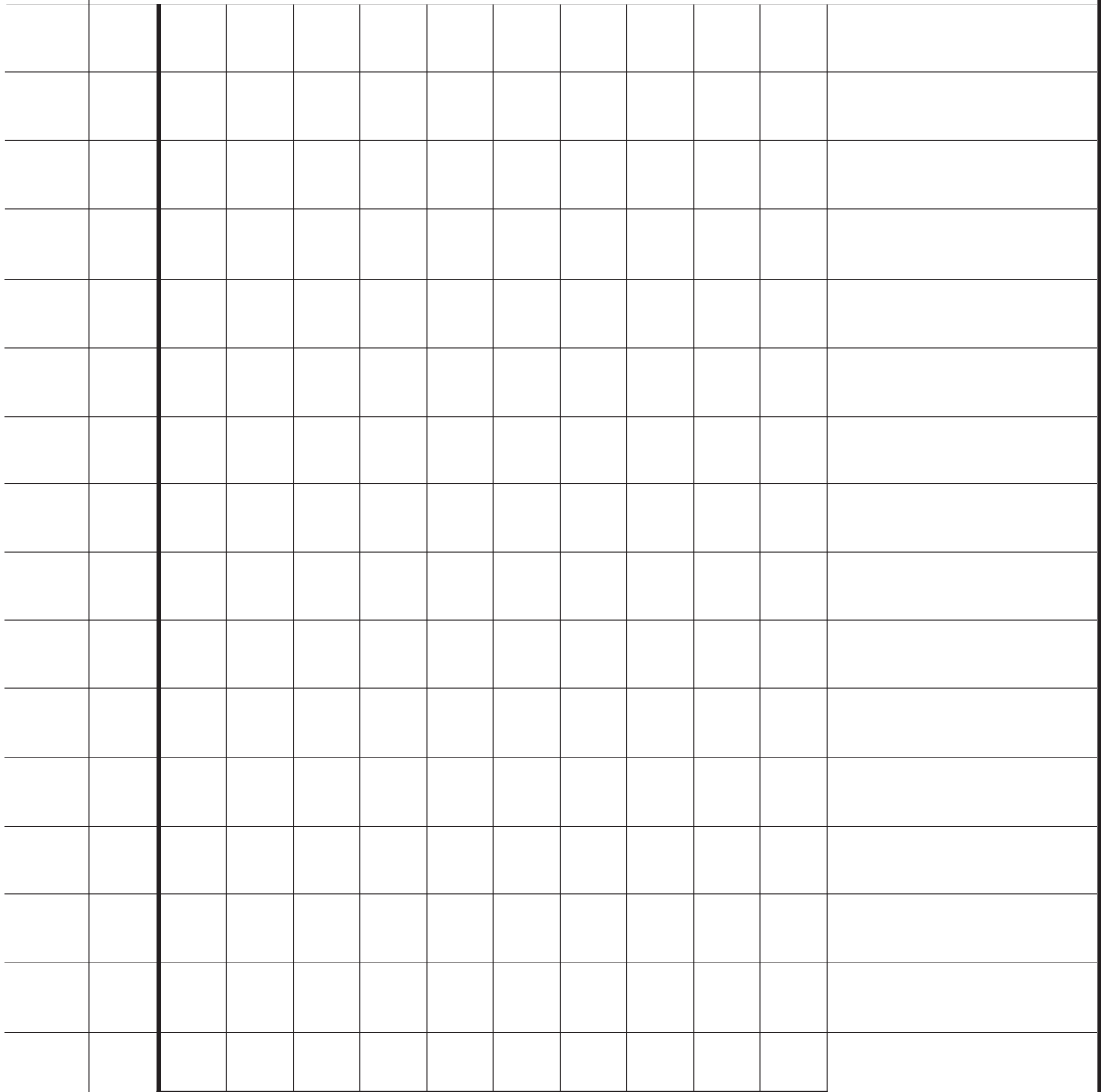
b How high do you think it is?

CIRCLE
the correct
answer

write your
answer
HERE

1 Stand 10 metres away from your object. Use the tape measure to measure the distance accurately. Hold your sextant exactly one metre above the ground and look through the straw at the top of the object. Ask your partner to read how many degrees the string shows on the protractor. Your partner should also make sure you are measuring from a height of one metre above the ground.

c Draw your line in this diagram. How high is your object?



d Check the following points:

- | | |
|---|-----------------|
| • Is the string hanging vertically with no obstructions? | yes / no |
| • Did you tape the string exactly in the centre of the straight line? | yes / no |
| • Did you look at the top of your object? | yes / no |
| • Is the reading of your angle less than 90 degrees? | yes / no |

CIRCLE
the correct
answer

2 If you answered no to any of these questions, correct this.

4 *The sextant and the Pole Star*

a At what latitude is the North Pole?

write your
answer
HERE

a At what latitude is the Equator?

write your
answer
HERE