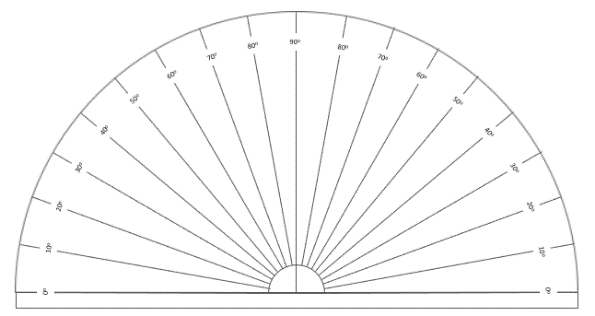
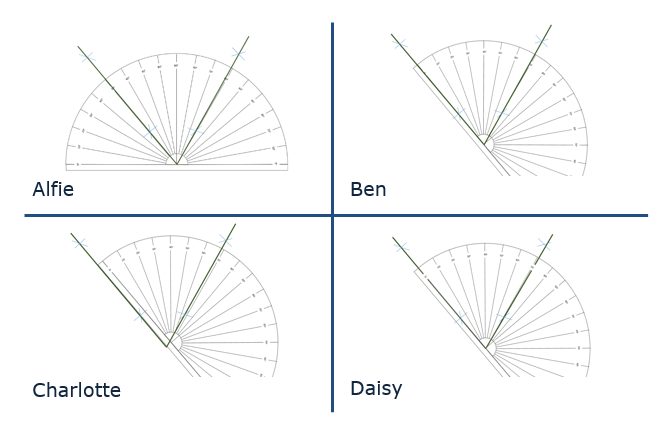
**Measuring angles**

Getting a measurement right needs care.

A protractor is used to measure an angle.



Who is measuring the angle correctly?



What would you say to the other students to help them?

*Physics > Big idea PSL: Sound, light and waves > Topic PSL1: Sound and light > Key concept PSL1.2: Characteristics of light*

|  |
| --- |
| **Diagnostic question** |
| **Measuring angles** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Light is reflected from all surfaces, and off a flat mirror it is reflected in a single direction. |
| Observable learning outcome: | Accurately measure angles of incidence and angles of reflection. |
| Question type: | Simple multiple choice |
| Key words: | Reflect, angle of reflection, normal |

**What does the research say?**

Students following the national curriculum of England are likely to learn how to draw given angles, and measure them in degrees (o) when they are aged nine or ten (DFE, 2013).

Anecdotally students do not always use a protractor to measure angles accurately, and this question checks whether students recognise some of the more common errors.

**Ways to use this question**

Students should complete the question individually. This could be a pencil and paper exercise, or you could use an electronic ‘voting system’ or mini white boards and the PowerPoint presentation.

The answers to the question will show you whether students understood the concept sufficiently well to apply it correctly.

If there is a range of answers, you may choose to respond through structured class discussion. Ask one student to explain why they gave the answer they did; ask another student to explain why they agree with them; ask another to explain why they disagree, and so on. This sort of discussion gives students the opportunity to explore their thinking and for you to really understand their learning needs.

The follow-up question gives students the opportunity to think more carefully about why the correct procedure gives more accurate measurements.

*Differentiation*

You may choose to read the questions to the class, so that everyone can focus on the science. In some situations it may be more appropriate for a teaching assistant to read for one or two students.

**Expected answer**

Ben

**How to respond - what next?**

Alfie is not wrong, but two readings and a calculation will be needed to find the angle.

Charlotte has made a common error and has not lined the *base line* of the protractor up correctly.

Daisy has used the protractor correctly, but has not drawn her second line accurately through the centre of the crosses.

If students do not recognise the errors made when measuring the angles, it can be useful for them to practise measuring a range of different angles.

The following BEST ‘response activity’ could be used in follow-up to this diagnostic question:

* Response activity: Reflecting angles

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG).

Images: UYSEG

**Reference**

DFE (2013). Mathematics programmes of study: key stages 1 and 2 National curriculum in England. Department for Education.