

Stimulus question 95

Every Angle

Teaching notes

Key question / task

Learners are presented with three diagrams involving parallel lines where they are invited to see if they can deduce every angle on each diagram, given one angle only.

If not, they are asked what may be the minimum number of angles they need to be given.

Supplementary questions / discussion

- What geometric rules could you use in this situation?
- Can you identify any angles that you know are the same? Can you explain why?
- Can you identify angles that are linked, for example, by summing to 360° , or 180° or 90° ?
- Can you find any lines that are equal on length? Can you explain why?
- Are there any similar shapes in the diagram? Can you explain why?
- What does similar mean? Is similar the same as congruent?

Resources for learners:

- Pencils / paper / rulers
- Individual whiteboards / pens (for classroom discussion)
- Learning Resource sheet: Every Angle, (optional – the PowerPoint contains all the questions.)

Resources for teachers:

- PowerPoint slides.

Reasoning questions / extensions

- What is the range of geometric rules we could use in these situations?
- How can we select which of the rules to use?
- Can you design a similar question of your own for others to try?
- When you construct your own question, what properties of shapes, lines and angles do you use?

Commentary / notes:

These questions intend to develop geometric reasoning using parallel lines, similar triangles and properties of angles at a point, and on a line. They should not be answered through measurement (there is no guarantee that the diagrams are completely accurate). They are suitable questions for Foundation and Intermediate tiers.

Solutions

Solutions and possible strategies are given on the PowerPoint slides. These are only suggestions - it is essential that there is a classroom dialogue to discuss the range of methods and ideas that could be used to find the missing angles.

GCSE Subject Content		
Foundation	Intermediate	Higher
<p>The geometrical terms: point, line, plane, parallel, right angle, vertical, acute, obtuse and reflex angles.</p> <p>Vocabulary of triangles, quadrilaterals and circles: isosceles, equilateral, scalene, exterior/interior angle, diagonal, square, rectangle, parallelogram, rhombus, kite, trapezium</p> <p>Angles at a point. Angles at a point on a straight line.</p> <p>Opposite angles at a vertex.</p> <p>Parallel lines.</p> <p>Corresponding, alternate and interior angles.</p> <p>Angle properties of triangles.</p> <p>Using the fact that the angle sum of a triangle is 180°.</p> <p>Using angle properties of equilateral, isosceles and right-angled triangles</p>		
	Essential properties of special types of quadrilateral, including square, rectangle, parallelogram, trapezium	

Learner Outcomes and Assessment	
Reasoning strand - Learners are able to:	Assessment Guidance: Can learners:
<ul style="list-style-type: none"> ▪ Select, trial and evaluate a variety of possible approaches and break complex problems into a series of tasks ▪ Prioritise and organise the relevant steps needed to complete the task or reach a solution ▪ Identify, measure or obtain required information to complete the task ▪ Identify what further information might be required and select what information is most appropriate ▪ Select appropriate mathematics and techniques to use ▪ Explain results and procedures precisely using appropriate mathematical language ▪ Select and apply appropriate checking strategies 	<ul style="list-style-type: none"> • Find a starting point – e.g. try out a few examples of angles in different positions, to see if they can identify all the angles from it? • Identify the geometric rules they need to use to solve the problem? • Identify any lines that are equal as part of the process of finding the angles (question 3 especially)? • Explain their methods using appropriate geometrical vocabulary and reasoning – e.g. corresponding, alternate, interior, isosceles. • Check work appropriately – e.g. using inverses to check the sum to 180°?