How the problem might be focused: *Isosceles Triangles*

Focus	What learners might do	What teachers might do
Representing	• Break the problem down into different aspects that need further information and clarification, for example, discovering that triangles have to have bases of even length for the third vertex to be on a grid point. • Discuss the constraints imposed on the problem by the grid. • Devise means of recording their findings.	Encourage experimentation with the interactivity to discover the constraints of the environment. Discuss approaches to solving the problem. Ask: • How would you know you had all the solutions? Discuss, and share, possible ways of recording findings and checking results, either using the interactivity or on paper.
Analysing – use mathematical reasoning	• Utilise a range of content knowledge in order to tackle the problem. Draw together ideas and make connections. • Work in a way that 'guarantees' all solutions are found. • Listen to one another's ideas about how to keep track of results.	Share knowledge that might be useful in tackling the problem. Ask: • What things do you know that might be helpful? Encourage sharing of learners' ideas, for example that the base of a triangle has to be even for the third vertex to be on a point on the grid. Share learners' different ideas for working systematically.
Analysing – use appropriate mathematical procedures	• Use symmetry properties to check their working.	Draw attention to the use of symmetry when it occurs, as a means either of finding possibilities or checking that all possibilities have been found.
Interpreting and evaluating	• Identify gaps in other people's approaches, for example, 'You have not included triangles that…' • Identify where patterns and relationships (such as symmetry properties) have been used to generate results more quickly. • Evaluate the elegance and efficiency of different approaches.	As a systematic and organised approach is at the heart of the mathematics, make opportunities for learners to share effective methods as they work, getting feedback from others and jointly refining approaches and recording methods. • How do you know you have not missed anything out? • What have you done to ensure you have not missed anything? • What is 'good' about this approach? If learners have found only some solutions, identify a lack of systematisation that has left out possibilities, rather than point out what has been missed.
Communicating and reflecting	• Share ideas about being systematic and using symmetry properties. • Think about other triangles and how easy it would be to extend the argument to other cases. • Make connections with other work. For example, other situations where they have used symmetry properties of isosceles triangles.	If a group has found all possibilities encourage them to develop an argument that would convince the rest of the class, producing diagrams and other materials that would support their 'proof'. Ask questions such as: • How would you go about solving the same problem with a triangle of area 24? • Are there areas that will not work? Work together to produce a class list of all the mathematics they have used when tackling the problem.