Triangle Card Sort Task

This task can be used with students at the beginning, during or at the end of their initial study of triangles. If the task is used at the beginning or during a unit of learning the task is formative as it provides an opportunity for the class teacher to assess the level of knowledge of their students regarding the identification, sorting, organising and categorisation of various triangles, and adapt the focus of learning.

The Primary Curriculum identifies the following areas that incoming first years will have engaged with:

- Make informal deductions about 2-D shapes and their properties
- Use angle and line properties to describe and classify triangles
- Plot simple coordinates and apply where appropriate
- Use 2-D shapes and their properties to solve problems
- Explore the sum of the angles in a triangle

The task allows for the reinforcement of students' knowledge and understanding from primary school, while simultaneously providing an opportunity for extension and enrichment for students who may have fully grasped the concepts before commencing first year in post-primary. To promote students' mathematical thinking and discussion, and to generate rich classroom dialogue it is recommended that the task be undertaken by students in groups of between 2 and 4 students.

Suggested instructions for using this task:

- Each group should be given a set of Triangle Card Sort cards (A4) and a classification grid (A3)
- In turn, students in the group should select a card. The student identifies where they believe the card should be placed on the grid
- The card can only be placed on the grid once the group has reached a consensus
- The group can postpone the placement of a card only twice during the task and only after a discussion has taken place about its placement. [This task condition is to ensure students engage with some of the more challenging cards. The class teacher is best placed to decide whether this task condition is appropriate]
- The teacher should move around the room informally gathering information (evidence) about student's knowledge and learning. Appropriate questioning often provides greater insight
- Once the task has been completed, a plenary discussion is recommended. This should be informed by information (evidence) gathering process and where appropriate questioning has the potential to enrich the class discussion and student learning.

The task is linked to the following contextual strand learning outcomes from the Junior Cycle Mathematics specification:

- GT2 investigate 2-D shapes
- GT3 investigate the concept of proof through their engagement with geometry
    - Theorem 1
    - Theorem 2
    - Theorem 4
    - Theorem 8
    - Theorem 14
- GT5 investigate properties of points, lines and line segments in the co-ordinate plane

The task is also linked to the following Unifying strand learning outcomes from the Junior Cycle Mathematics specification:

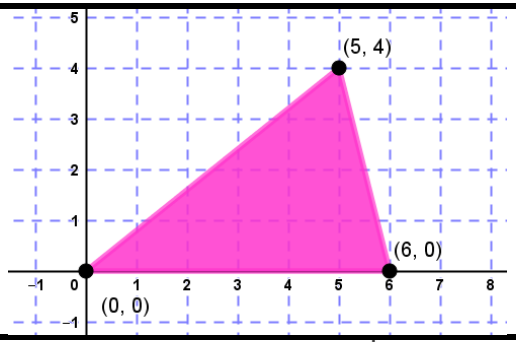
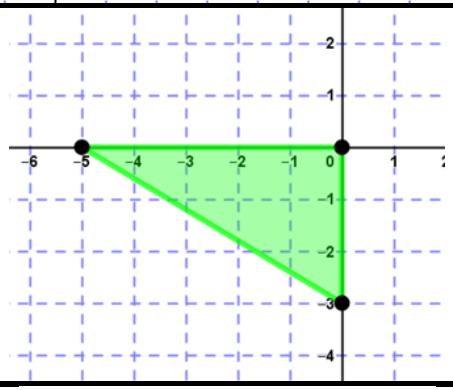
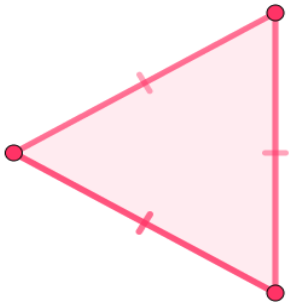
- U1 recall and demonstrate understanding of the fundamental concepts and procedures that underpin each strand
- U5 make connections within and between strands
- U13 communicate mathematics effectively: justify their reasoning, interpret their results, explain their conclusions, and use the language and notation of mathematics to express mathematical ideas precisely

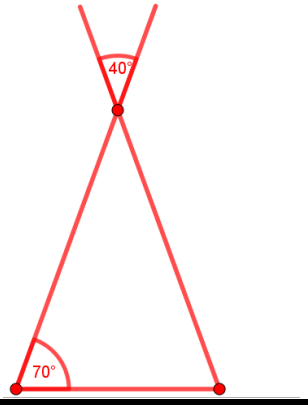
The task develops students' understanding of connections within the Geometry and Trigonometry strand and can be used to strengthen students' understanding of the connections between synthetic and co-ordinate geometry. It is suggested that this should be a focus of the plenary. It may be necessary to reduce the difficulty level of the task by selectively removing some of the cards. It is recommended, however, that scaffolding be kept to a minimum to allow students to apply their knowledge in unfamiliar situations and create a need for the construction of new knowledge. If the task is scaffolded students may engage with it multiple times over the three years of Junior Cycle.

Students should be encouraged to explain and justify their reasoning in relation to where they have placed their cards. Reasoning is often done verbally, and accurate use of mathematical language should be developed. Students should also be encouraged to use geometrical tools (compass etc.) to justify their placement where appropriate. Where appropriate, students should be alerted to the difference between justification and formal proof.

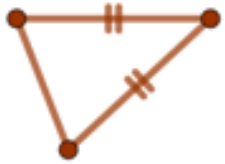
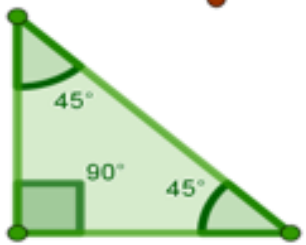
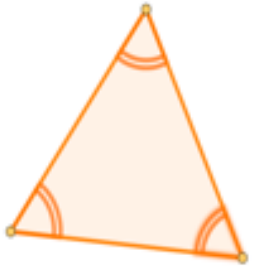
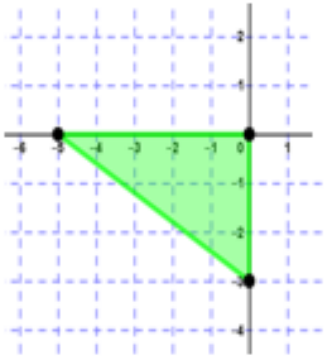
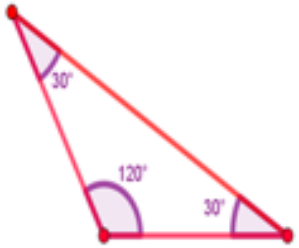
Teachers can encourage student talk using effective questioning and active listening. Below are some examples of questions that reinforce a student's prior knowledge and/or challenge their misconceptions. These questions may also provide an opportunity for extension and enrichment for students who may have fully grasped the concepts in primary school.

Sample Questions (This is not an exhaustive list)

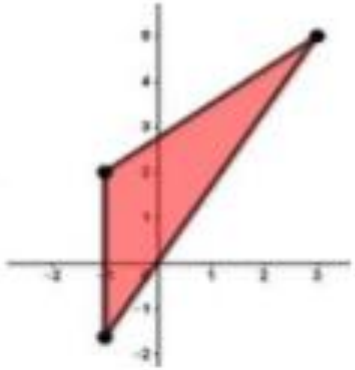
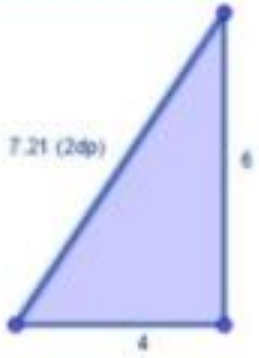
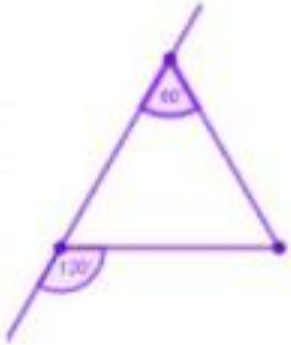
	Change the position of one of the vertices to create a different triangle, but the area of the new triangle must stay the same as the original.
	What is the co-ordinate of this vertex? [Referring to (-5,0)] What is the length of this side of the triangle? Discuss.
	Construct an equilateral triangle of any size. Explain the process and outline why the triangle is equilateral as a result.

	vertices **(1,3), (6,3), (-4,3)**	Change any of the co-ordinates to make a triangle? Change one of the co-ordinates to make an isosceles triangle. Generalise this change to express it for all possible isosceles triangles given these co-ordinates?
	vertices **(0,0) (5,0) (0,5)**	Confirm/prove, in as many ways as possible, that this triangle is right angled?
		Create a new question. The angles can be changed, but the triangle must remain isosceles.

Solutions

Scalene triangle	Right angled triangle	Isosceles triangle	Equilateral triangle	Not a triangle
side lengths 3, 4, 6	angle measure 90°, 37.36°, 52.64°	side lengths 3, 3, 4	side lengths 1, 1, 1	side lengths 1, 2, 4
	side lengths 3, 4, 5		angle measure 60°, 60°, 60°	angle measure 90°, 90°, 45°
Vertices (0,0), (6,0), (5,4)	Vertices (0,0), (5,0), (0,10)			side lengths 3, 3, 8
angle measure 91°, 62°, 27°				
	side lengths 19, 180, 181			angle measure 90°, 60°, 60°

Solutions

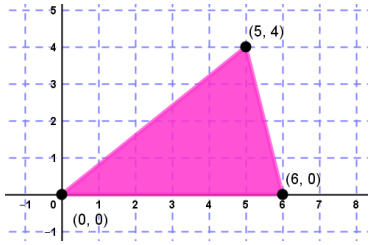
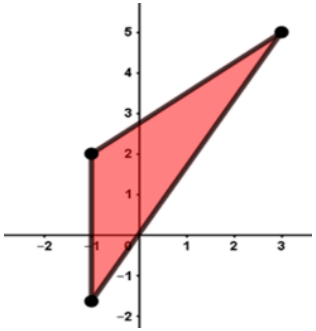
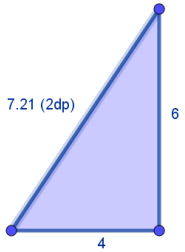
Scalene triangle	Right angled triangle	Isosceles triangle	Equilateral triangle	Not a triangle
	Vertices (0,0), (5,0), (0,5) side lengths 5, 12, 13 side lengths 1, 1, $\sqrt{2}$ angle measure 60°, 30°, 90°  side lengths 7, 24, 25	side lengths 32.6, 32.6, 60  	  side lengths 3, 3, 3	angle measure 70°, 70° 70° side lengths 11, 12, 25 Vertices (1,2), (1,6), (1,8) angle measure 30°, 40° 50° Vertices (1,3), (6,3), (-4,3)

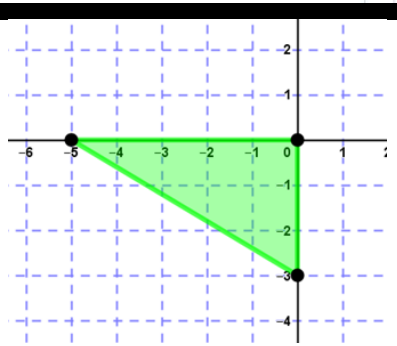
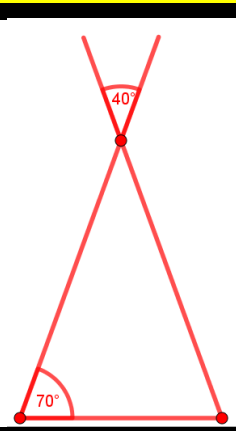
An tSraith Shóisearach do Mhúinteoirí
Junior CYCLE for teachers

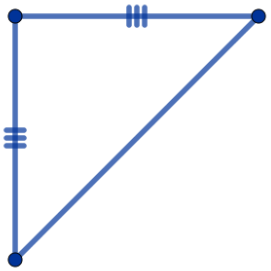
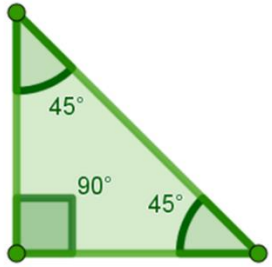
Task Instructions

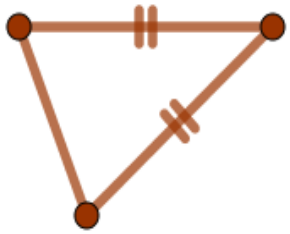
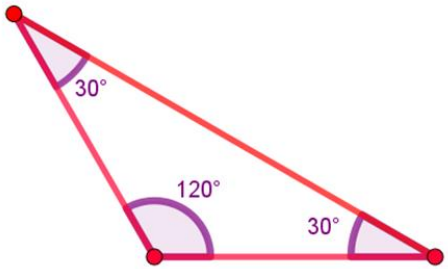
Place each card under the heading
that best describes the information given on the card

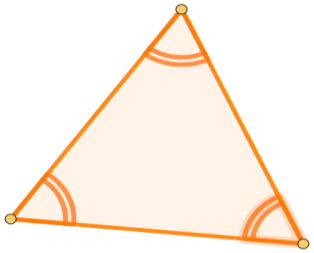
Scalene Triangle	Right-angled Triangle	Isosceles Triangle	Equilateral Triangle	Not a Triangle

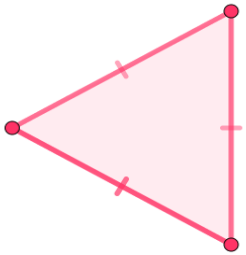
vertices **(0,0) (6,0) (5,4)**	**side lengths** **3, 4, 6**	**angle measure** $91°, 62°, 27°$
		
angle measure $90°\ 37.36°, 52.64°$	**side lengths** **3, 4, 5**	**angle measure** $60°, 30°, 90°$

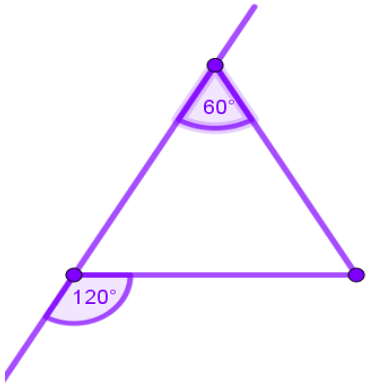
vertices **(0,0) (5,0) (0,10)**	**side lengths** **1, 1, $\sqrt{2}$**	
vertices **(0,0) (5,0) (0,5)**	**side lengths** **3, 3, 4**	**side lengths** **32.6, 32.6, 60**
	**side lengths** **5, 12, 13**	**side lengths** **7, 24, 25**

side lengths **1, 2, 4**	**side lengths** **11, 12, 25**	**side lengths** **3, 3, 8**
angle measure $90°, 60°, 60°$	**angle measure** $70°, 70°, 70°$	**angle measure** $90°, 90°, 45°$
		

vertices **(1,2) (1,6) (1,8)**	**vertices** **(1,3), (6,3), (-4,3)**	**angle measure** **$30°, 40°, 50°$**
side lengths **1, 1, 1**	**angle measure** **$60°\ 60°\ 60°$**	**side lengths** **3, 3, 3**
		**side lengths** **19, 180, 181**






60°
120°