

An tSraith Shóisearach do Mhúinteoirí

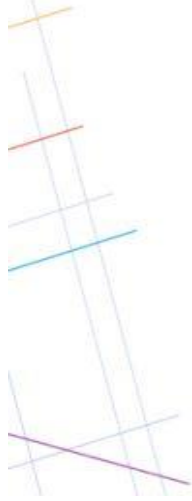
Junior **CYCLE**
for teachers

*Strategies for
Teaching and
Learning*

*Mathematics
Symposium*

2019





Question Stems

Why does...?

What would happen if...?

Why do you think...?

How does this relate to...?

Does anyone have a different way to explain...?

What facts support...?

Is...always true?

Does...when...?

How would/could you use...?

How could we find out if...?

What could the reason for...be?

What examples show...?

What would happen to the pattern if...?

What other way could you...?

What rule explains...?

Does it keep happening?

What needs to be changed so that...?

Explain your conclusion?

How can we be sure that...?

What do you think the problem is asking?

Tell me something that must be true if...

What can/must be [added/removed/altered] in order to [allow/ensure/contradict]...?

Classification



This strategy allows students to demonstrate an understanding of **relationships between things** and helps them **clarify concepts**.

Used collaboratively, students develop **communication skills** and can **deepen their understanding** of the topic in hand.

- Select a number of categories within a topic.
- Identify the features that distinguish one category from another e.g. Irish History: Hunter Gatherers and the First Farmers nomadic v settled, Temporary dwellings v Wattle and Daub houses, Wild nuts and berries vs Cultivated crops.
- Ask the students to draw a table in their copies.
- The number of columns, 2 or more, will depend on the number of categories within the topic.
- The number of rows will depend on the number of distinguishing features of each category.
- Students are then asked to classify the distinguishing features under the correct category heading.
- Students should be able to defend their choices, identify items that don't fit and explain their reasoning.
- This is a useful strategy to use at the beginning of a lesson to test prior knowledge or after learning about categories and classification or when a unit is completed to review concepts and terms.

Tips

- Classification is central to all the sciences. It is also relevant to aspects of history, geography, home-economics etc.
- Structuring this activity in groups provides a means of improved communication and organisation of information for students.
- Move around each group to ensure they are on task.
- To further develop students understanding once they have classified the items into groups ask them to identify the features that distinguish one category from another.



Further Information
Further reading and support on implementing this strategy is available on www.jct.ie



Key Skills

- ▶ Managing information and thinking
- ▶ Managing myself
- ▶ Communicating
- ▶ Being literate
- ▶ Being creative
- ▶ Working with others

Resources

Pre-prepared list of categories and distinguishing features for each category

Room Layout

Arrange students in **groups of 4** around a desk

Assessment

Observe student understanding of material and inform future lessons

Supporting Homework

By developing their ability to classify information students develop a greater understanding of the topic in hand thus enabling them to apply the information to higher order questions

Facts/Falsehoods



Gives all students an opportunity to **evaluate** a series of statements which the teacher and/or other students **devise** and **decide** on whether they are **true** or **false**.

- After a section of content has been taught the teacher can devise a series of questions to which the answer is true or false.
- In groups (optional), the students could also be asked to devise 3 questions on the content. The teacher could refine the questions to compile a list.
- The list of questions are given out to the class and completed on an individual or group basis.
- Statements are written with two columns at the end, one marked True, one marked False.
- As students go down through the questions they place a tick in the true or false column.
- At the end of the activity the students-peer assess their work.
- Time is allowed for individual students to receive clarification on answers.

Tips

- Be specific with your time.
- Move around each group to ensure they are on task.
- This activity could be used as a quick method to gauge student understanding of a topic; the teacher can then address any areas that need attention.



Further Information
Further reading and support on implementing this strategy is available on www.jct.ie



Key Skills

- ▶ Managing information and thinking
- ▶ Managing myself
- ▶ Communicating
- ▶ Being literate
- ▶ Working with others

Resources

- ▶ Fact/Falsehood question sheet

Room Layout

No specific room layout required unless it is decided to complete task in groups

Assessment

- ▶ Assess for understanding by listening to student responses
- ▶ Check the whole class response at the end of the activity

Supporting Homework

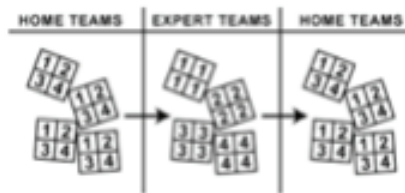
Based on the list of questions from the facts and falsehood the teacher can develop a higher order question for homework

Jigsaw



This is a **cooperative learning activity**. Students form a home team and are set a home team problem. They break up into 'expert groups' and gain expert knowledge that feeds into the overall problem. Just as in a **jigsaw puzzle**, each student's part is essential for the completion and full understanding of the home team problem.

The reason this activity is so effective is that each student's part of the puzzle is essential, empowering them as experts and challenging them to be accountable to the home team.



- Divide the class into groups of 4, 5 or 6 (depending on how many pieces you want in the jigsaw). This is the home team.
- Assign these roles: Recorder, Time Keeper, Reporter & Manager.
- Present the home team with an overall problem to be solved. This could be in the form of a question or a scenario that needs to be investigated.
- Break students up into 'expert groups', ideally at stations around the room if space allows.
- Students gain knowledge at their expert stations which feeds into the home team problem. This knowledge could be gained through reading of information and extracting key points or by solving a mini-problem.
- After students have gained expert knowledge, re-form the home team. Get students to share their expert knowledge. Finally, they use the expert knowledge to solve the overall problem.
- The recorder keeps notes for the group, the manager ensures the group stays on task and that everyone has an input, the reporter gives feedback to the class on the group's decisions.

Tips

- Float from group to group, observing the process. If any group is having trouble (e.g., a member is dominating or disruptive), make an appropriate intervention. Eventually, it's best for the manager to handle this task. Managers can be trained by whispering an instruction on how to intervene, until they get the hang of it.
- Be comfortable with letting the groups get on with the work. You may find that as students take on their expert roles, they will be highly motivated to complete their work individually.
- At the end of the session, give a quiz on the material so that students quickly come to realise that these sessions are not just fun and games but really count.
- Allow time for discussion with students.
- Remind Time Keepers to focus on more than just the end time.



Further Information

Further reading and support on implementing this strategy is available on www.jct.ie



Key Skills

- ▶ Managing information and thinking
- ▶ Managing myself
- ▶ Being literate
- ▶ Working with others

Resources

- ▶ Home team problem sheets
- ▶ Expert group sheets

Room Layout

Groups of 4, 5 or 6 students at each desk

Expert stations ideally distributed around the room

Assessment

Short quiz at the end to recap/summarise the learning

Observation of group activity

Questioning both individually and in groups throughout the activity

Supporting Homework

Home work can be informed by the thinking of the group.

Recorders can share the notes at the end of the group discussions.

Mindmap-Coggle



This strategy gives students a structure to summarise and represent visually what they have learned. It improves long-term memory of factual information.

After teaching a topic coggle could be used to summarise, organise and visualise the topic. It could also be used as a brainstorming exercise to summarise prior knowledge at the beginning of a topic.

- Before class, login to www.coggle.it and prepare a sample mind map to show as an example to the students.
- Show this to the whole class using a data projector and demonstrate its features. You could also show the following video <https://goo.gl/xf8n23> which demonstrates the features of coggle in 1 min.
- Bring students to the IT room.
- All students (or in groups of 2) login via web browser www.coggle.it
- Select a free plan.
- Click create (private diagram)
- Now you are in the coggle work space.
- Ask students to create a mind map on the chosen topic.
- Students select a number of headings and add notes under each heading to create their own mind map.

Tips

- Students can work on their own or in pairs to develop a mind map.
- Encourage all students to create an account and add to their mind maps as the progress through the year.
- Once the students have a coggle account it can be used in as many subjects as they wish.
- Teachers can view the mind maps to observe whether teaching needs to be adapted (students share their coggle with their teacher using the share feature).
- Students could present their mind maps to the rest of the class.
- A variety of devices can be used e.g. tablet, smart phone etc.
- Peer assessment can be used where students could give each other feedback on areas they may have left out or need to be improved in their mind maps.



Further Information
Further reading and support on implementing this strategy is available on www.jct.ie



Key Skills

- ▶ Managing information and thinking
- ▶ Managing myself
- ▶ Being literate
- ▶ Being creative
- ▶ Working with others

Resources

- ▶ Coggle.it (other mind-mapping tools are available online)
- ▶ Data projector
- ▶ IT Room/Smart Phone/Tablet

Room Layout

If using groups, arrange students in groups of 2

Assessment

Teachers can assess student understanding of a topic. Peer assessment and feedback can give students the opportunity to improve their mindmaps.

Supporting Homework

A mind map could be used as a home exercise throughout a topic

Peer Assessment Using Success Criteria



“... success criteria summarise the **key steps** or **ingredients** the student needs in order to fulfil the learning intention - the main things to do, include or focus on.”

Shirley Clarke 2010

- The teacher states 'This project will be complete when...'
- Students write phrases that explain their idea of completeness for the project in question.
- Students pair up and compare their ideas.
- Pairs join with another pair and agree on a list.
- Collect the lists from each group of 4.
- Refine the lists to a manageable number that the class agree upon.
- Students record the final list of success criteria.
- At the end of the project the students work in pairs and apply the agreed success criteria to their peer's project.
- Feedback can be given verbally or in writing depending on the success criteria.

Tips

- Have a class discussion to agree how peer feedback should be given.
- Success criteria are:
 - **linked** to learning intentions and activity specific.
 - **discussed and agreed** with students prior to undertaking the activity.
 - a focal point and provide a **scaffold** for students while engaged in the activity.
 - used as a basis for **feedback** and peer/self-assessment.



Further Information

Further reading and support on implementing this strategy is available on www.jct.ie

Key Skills

- ▶ Managing information and thinking
- ▶ Managing myself
- ▶ Communicating
- ▶ Being literate

Resources

- ▶ Whiteboard
- ▶ Past projects/assignments etc can be used as exemplars

Room Layout

No specific room layout required, however organising students in **groups of 4** would facilitate the activity.

Assessment

Peer assessment can be used to assess the project based on the success criteria. The success criteria can be used as framework for feedback from the teacher also.

Supporting Homework

Success criteria can be used as a check list for students to complete the project.

Peer Feedback



Provides students with an opportunity to **learn** from each other and **improve** their own work.

This strategy complements *Peer Assessment Using Success Criteria*.

- Decide on work that students will complete as homework.
- Clarify with the students the success criteria for the homework.
- Students complete the homework in groups of 4 students read each other's work. Allow enough time for all students to complete this.
- Students then discuss any differences between the pieces of homework.
- They collectively mark each piece of homework using the success criteria agreed upon.
- They then comment on one thing that the student did well and one thing that could be improved upon.

Tips

- Take the time in selecting groups to ensure students are adequately challenged.
- Assign timekeepers in each group and set time limits for each phase of the strategy.
- Move around each group to ensure they are on task in marking the homework.



Further Information
Further reading and support on implementing this strategy is available on www.jct.ie



Key Skills

- ▶ Managing information and thinking
- ▶ Managing myself
- ▶ Communicating
- ▶ Being literate

Resources

- ▶ Homework copies
- ▶ Success criteria

Room Layout

Arrange students in **groups of 4**

Assessment

Students are peer assessed using criteria. The teacher can observe how the students apply the success criteria to the homework, Observation of the students' comments gives further insight into the students understanding of the task and the application of success criteria.

Supporting Homework

Students work on an area that was highlighted by their peers to be improved upon.

Stop and Jot



This strategy gives students the opportunity to respond to questions in writing. Asking students to **think and write** about what they are learning promotes **retention and comprehension**.

These checks for understanding help students make sense of what they are learning before moving on in the lesson.

- Ask students to title a page in their copies "Stop Box".
- At least once during a lesson, stop and ask an important question for students to respond to in their "Stop Box".
- Ask students to share one or two responses with the class.
- These boxes can also serve as a study tool later, highlighting important information about the topic.

Tips

- Move around as students write to ensure they are on task.
- Observe their answers against what you are teaching.
- Stop and Jot can be used before introducing new material in order to activate prior knowledge, during the lesson to make sense of new material and as a check for understanding, after the lesson to provide closure, check and clarify understanding.



Further Information
Further reading and support on implementing this strategy is available on www.jct.ie



Key Skills

- ▶ Managing information and thinking
- ▶ Managing myself
- ▶ Communicating
- ▶ Being literate
- ▶ Being creative

Resources

- ▶ Pen
- ▶ Copy

Room Layout

No specific room layout required

Assessment

Check for understanding by reading the students' responses as you move around the room

Supporting Homework

Stop and Jot allows teachers to highlight important aspects of a topic that can be built upon in homework

Think. Pair. Share.



This strategy is designed to provide students **time and structure** for thinking on a given topic, enabling them to **develop** individual ideas and **share** these ideas with a peer.

- Inform the class that you will ask three students to give their answer to the next question aloud to the class.
- Before you identify which students will be asked, the class will use the Think-Pair-Share strategy.
- Think individually about the answer to a given question.
- Pair with a partner and discuss the individual answers.
- Share ideas with the rest of the class.

Tips

- When using this for the first time explain all three steps before asking the question.
- Ask a specific higher order question about the text or topic.
- Allow adequate time (up to three minutes) to think and answer individually.
- The time for pair discussion could be 2 - 5 minutes depending on the question.
- Allow the students to select who is going to share to the whole class.
- Feedback from the whole class could be collected and students could jot down this feedback as a summary to support homework.



Further Information
Further reading and support on implementing this strategy is available on www.jct.ie



Key Skills

- ▶ Managing information and thinking
- ▶ Managing myself
- ▶ Communicating
- ▶ Working with others
- ▶ Being literate
- ▶ Being creative

Resources

A pre-planned higher order question relevant to the topic in hand

Room Layout

Arrange students so that they can pair off easily

Assessment

Assess for understanding by listening to student responses

Supporting Homework

The pre-planned question can be used as a written exercise for homework

Think . Pair . Share .

Prompt or Question	What I think	What my partner thinks	What we will share

Ranking Ladder



Provides all students with an opportunity to engage in thinking at the *evaluation level* of Bloom's taxonomy.

A Ranking Ladder requires students to place items on rungs of a ladder in order from least to most important, as a group activity it allows students to be challenged as to why they rank one item above or below another.

- Hand out a sheet of paper, a marker and a list of items to be ranked to each group/individual.
- Ask each group/individual to draw a ladder on a full page, the number of rungs equal to the number of items to be ranked.
- Students should discuss the items to be ranked and explain the criteria and justification for the placing of each item.
- Place the item considered the least important on the bottom rung of the ladder.
- Continue placing items on the ladder until all items have been ranked and agreed upon by the group.
- The ranking ladders can then be displayed in the classroom and form the basis of a whole class discussion.

Tips

- Assign one person from each group as the recorder.
- Be clear on how you want the items to be ranked.
- Move around each group to ensure they are on task.
- Pre-prepared laminated ranking ladders could be a useful resource to be used in future classes.
- Blank rungs could be added to the ladder to encourage student initiative in adding additional items to the ladder.



Further Information
Further reading and support on implementing this strategy is available on www.jct.ie



Key Skills

- ▶ Managing information and thinking
- ▶ Managing myself
- ▶ Communicating
- ▶ Working with others
- ▶ Being literate
- ▶ Being creative

Resources

- ▶ A sheet of A4/A3 paper or Ranking Ladder template
- ▶ List of items to be ranked

Room Layout

Arrange students around tables in groups of 4

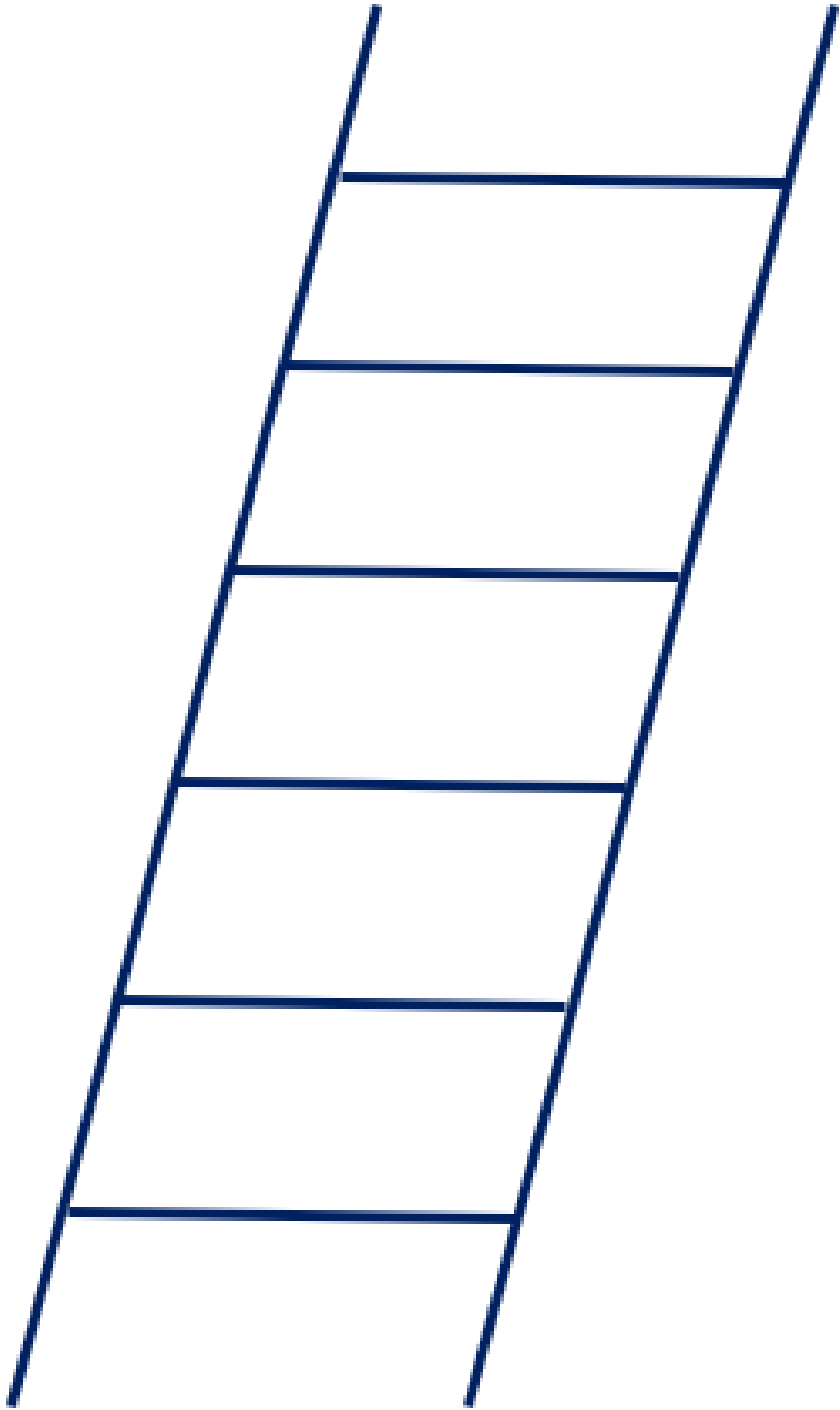
Assessment

Assess for higher order thinking skills by listening to student responses

Supporting Homework

Students could be invited to take a photo of the Ranking Ladder and the notes taken by the recorder to support homework and revision

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Placemat



This activity gives all students the opportunity to work individually, to share ideas and learn from each other in a **cooperative** small-group discussion



- Divide students into small groups of 4, around a sheet of A3.
- Students individually write down answers to a preplanned question in their own section on the paper (alternatively students could consider 4 different aspects of one question).
- Students then take turns to share ideas in discovering common elements which can be written in the centre of the chart.
- Students engage in a discussion with all group members to reach consensus on a group answer.
- A ranking ladder is a graphic organiser with 3 or 4 rungs. Students place the most important point agreed by the group on the top rung, the second on the next rung and so on.
- The group rank their answers in the centre of the placemat.
- Students should be encouraged to actively listen and take notes as each group's placemat is presented.
- For further sharing, the placemats could be hung on the classroom wall or students could take photos of them to support homework and revision.

Tips

- Divide a blank sheet of paper into sections equal to the number of students in the group. While 4 is ideal, 3 or 5 would also work.
- Assign group roles e.g. timekeeper, reporter, etc. Be specific with your time.
- Highlight that in the first part of a Placemat students work individually.
- Move around each group to ensure they are on task.



Further Information
Further reading and support on implementing this strategy is available on www.jct.ie



Key Skills

- ▶ Managing information and thinking
- ▶ Managing myself
- ▶ Communicating
- ▶ Working with others
- ▶ Being literate
- ▶ Being creative

Resources

- ▶ Placemat template
- ▶ Markers
- ▶ Blu tack

Room Layout

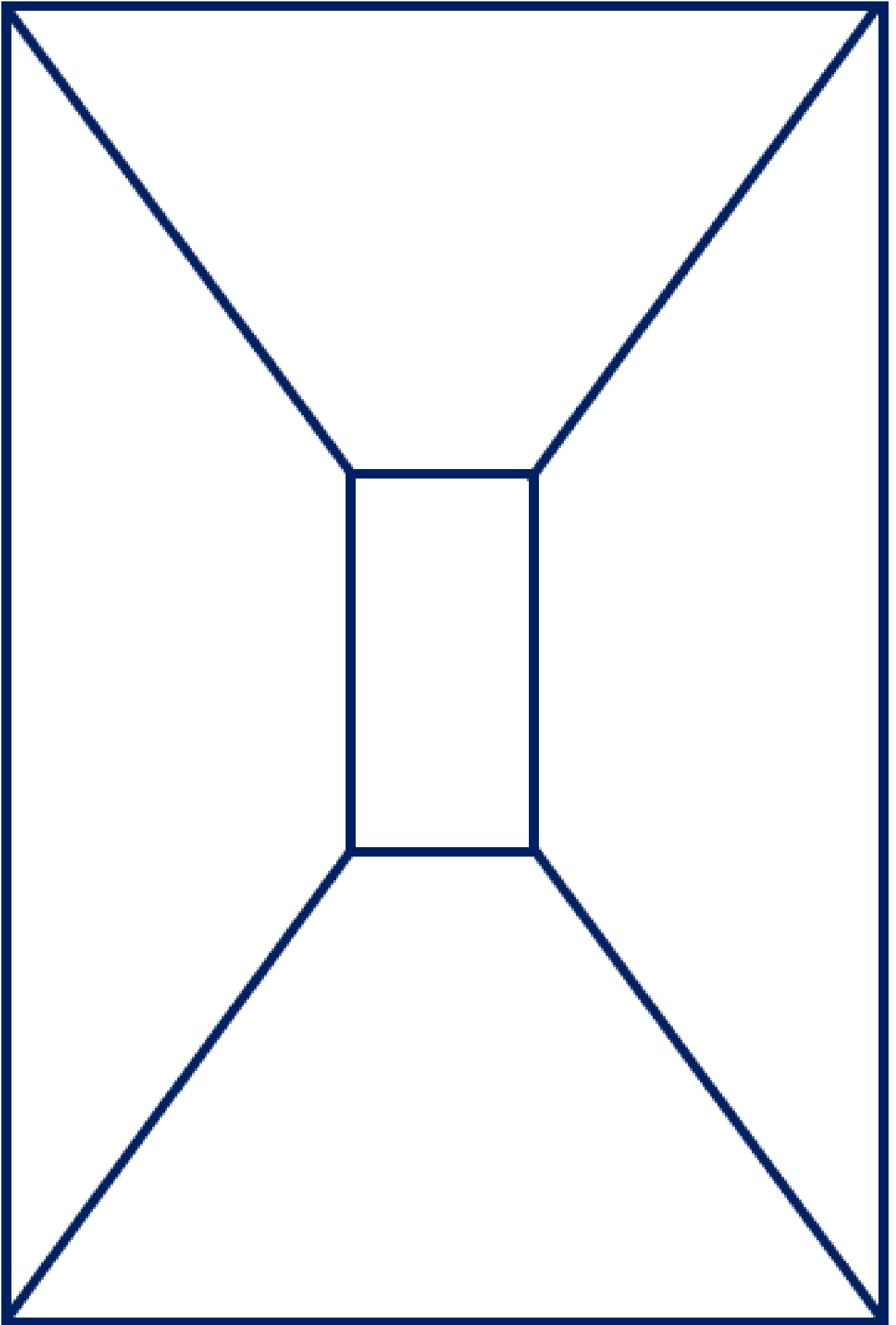
Arrange students in groups of 4

Assessment

Assess for understanding by listening to student responses

Supporting Homework

The group responses could be saved and posted on a digital platform to support homework



KWL



This strategy serves several purposes: it elicits prior knowledge of the text, it sets a purpose for reading and it helps students monitor their comprehension.

By being aware of students' interests and prior knowledge the teacher has the ability to create projects and assignments that are challenging and that the students will enjoy. A KWL chart is a tool that can be used to inform teaching as well as guide student learning.

- Choose a topic/text.
- Ask the students to brainstorm words, terms or phrases that they associate with the topic. The students record these in the K column of the KWL chart.
- Next, ask students what they want to learn about the topic. This is recorded in the W column. If the students respond with a statement turn them into questions before recording them in the W column.
- While engaging with the topic/text the students find the answers to the questions in their W column. Students can fill out their L columns either during or after completing the task/topic.
- Finally, discuss the information that students recorded in the L column.

Tips

- Come prepared with your own questions to add to the W column. You might want students to focus on ideas on which the students' questions are not likely to focus on.
- Encourage students to explain their words/associations especially vague ones and ask 'what made you think of that?'
- In addition to answering the W column questions, encourage students to write anything they found especially interesting in the L column, using a star to differentiate them from the things they have learned.
- There are many KWL charts online, KWL Creator is an example of KWL the student can complete online.



Further Information

Further reading and support on implementing this strategy is available on www.jct.ie



Key Skills

- ▶ Managing information and thinking
- ▶ Managing myself
- ▶ Being literate

Resources

- ▶ KWL template (this could be photocopied for each student or students can draw it into their copies)

Room Layout

No specific room layout required

Assessment

The KWL chart is a useful way to assess your instruction informally. Have students complete the **Know** and **Want to Know** sections of the chart prior to the lesson and the **Learned** section after the lesson is finished. Did the students successfully master the intentions of the lesson?

Supporting Homework

The K column could be given as a homework exercise and reviewed at the beginning of the next lesson.

K What I Know	W What I want to know	L What I have learned

Diamond 9



This is a **collaborative** strategy to help students prioritise key factors.



- Divide the class into groups of 4 (groups of 3 and 5 also work).
- Assign these roles: Recorder, Time Keeper, Reporter & Manager.
- The most important factors are placed towards the top of the 'diamond' and the least important factors towards the bottom.
- Factors of equal importance are placed on the same row.
- Students agree on factor placement and explain their reasoning.
- The recorder keeps notes for the group, the manager ensures the group stays on task and that everyone has an input, the reporter gives feedback to the class on the group's decisions.

Tips

- Students should be encouraged to compare diagrams. Groups should be able to justify the placing of a particular factor.
- All top factors could be tallied up, thus identifying the most important factor for the whole class (Being numerate).
- The most important step is to review the students' responses. The information gathered can be used to inform future lessons.
- Allow time for discussion with students.
- Remind Time Keepers to focus on more than just the end time.
- Blank templates could be A3 and laminated to be used in future lessons.
- An image of each final diamond could be taken using a phone or a tablet and emailed/uploaded for students' future use.
- By way of variation the students can be given more or less than 9 factors, or they can be given blank cards whereby they can introduce a factor of their own.



Further Information
Further reading and support on implementing this strategy is available on www.jct.ie



Key Skills

- ▶ Managing information and thinking
- ▶ Managing myself
- ▶ Communicating
- ▶ Being literate
- ▶ Being creative
- ▶ Working with others

Resources

- ▶ Diamond 9 Template
- ▶ List of factors

Room Layout

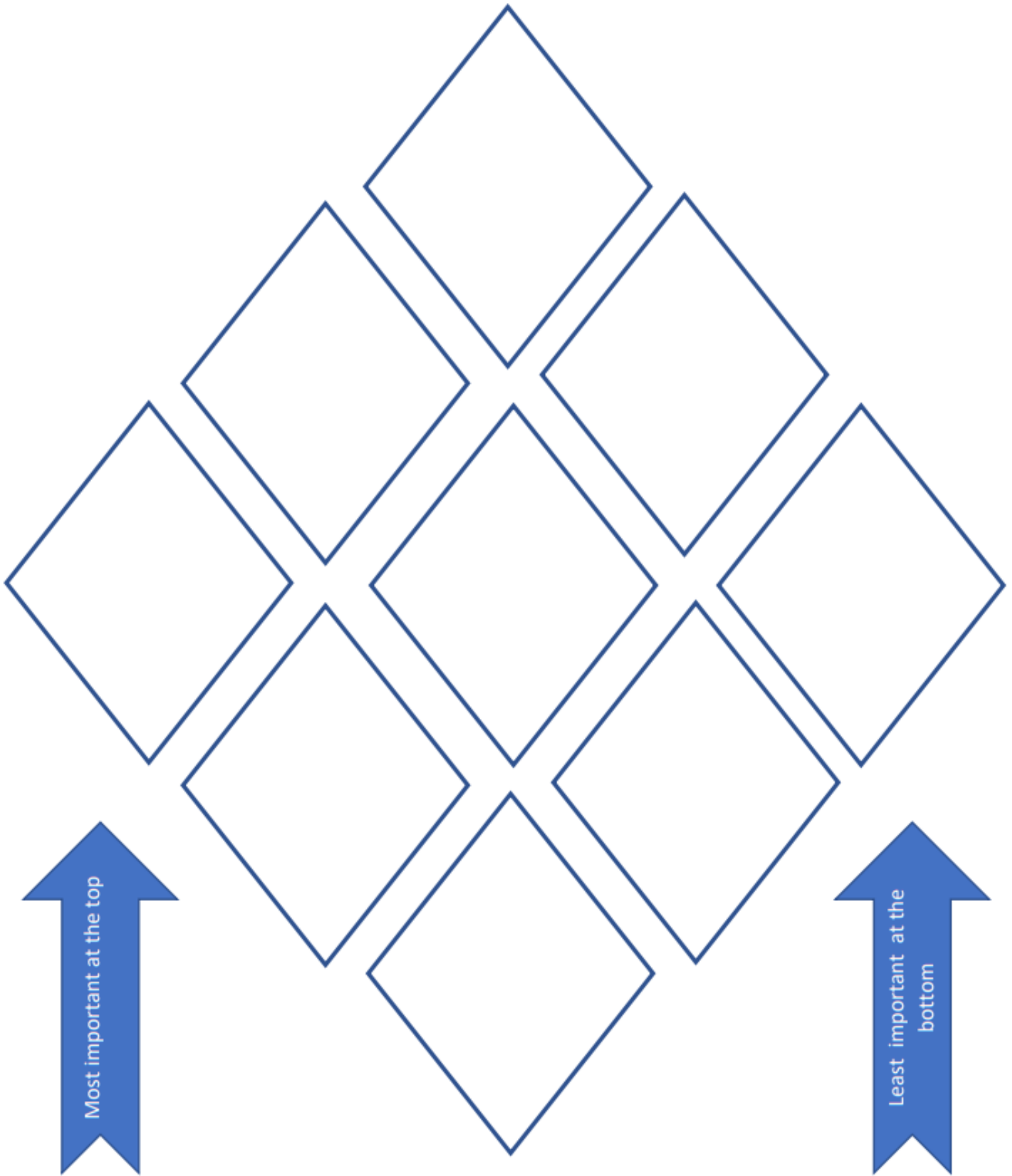
Arrange **groups of 4 (or 3 or 5)** at each desk

Assessment

Students explain their reasoning for the arrangement of factors on the diamond

Supporting Homework

Homework can be informed by the thinking of the group. Recorders can share the notes at the end of the group discussions.



Map of the Website



Key Documents



News/Events



CPD Workshops



Planning



Assessment



Resources



Framework
Maths Specification
Maths Info Leaflet
Assessment Guidelines

Latest News
Twitter Feed
Newsletter Issue 1

CPD Workshop Presentations
Resource Booklets
Learning Experiences
Elective Workshops – Webinars
Interactive Assessment Guidelines Resource

Linking Junior Cycle Mathematics with L2LPs
Quick Reference Guide – Links Between Primary and Post Primary
Primary Mathematics Curriculum
Professional Time in Mathematics
Mathematics Specification
Suggested Planning Templates – Units of Learning

Assessment in Junior Cycle Mathematics Video
Formative Assessment in Mathematics – Quick Reference Guide
Interactive Assessment Guidelines Resource

Learning Outcomes Poster
Editable Learning Outcomes document
Action Verbs Poster
Unifying Strand Poster
Introducing the Mathematics Specification Video
Assessment in Junior Cycle Mathematics Video
Formative Assessment in Mathematics – Quick Reference Guide