|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | 👍  Choose | ☺😐☹  Rate | 🕓  Time | ✍  Reason |
| **A1: Irrational Numbers and Calculator**  **✓** | 👍👍 | ☺☺ | 5mins.  5 minutes | Teachers need to have the realisation that part of their role in encouraging and developing the use of a calculator is to convey the fact that the calculator is a tool of mathematics and not in any way a means of formal proof.[Usefulness / Limitations]  Teachers need to be aware of the importance of formal definitions and mathematical language.  Importance of developing sound prior knowledge.  From early on, students should appreciate the power of a definition as in the definition of rational numbers and how to use a definition to make decisions. This also deals with the idea of necessary and sufficient conditions (not repeating as well as not ending required for irrational numbers). It also deals with understanding of the digital medium – had the student looked closely they would have seen the dot over the first decimal place. Use of counterexamples can be encouraged which helps the student to appreciate the idea of proof and generalisation.  The teacher questioning trains the student in self – questioning. |
| **A3: Multiplication of Real Numbers between 0 and 1**  **✓** | 👍👍👍 | ☺☺☹ | 10mins.  5 minutes  A class period at least | Teachers need to recognise student difficulties with fractions.  Teachers need to be aware of and be able to cope with many students misconceptions relating to mathematical operations  Could encourage and develop teacher use of visuals and manipulatives  Very important for students to see multiplication as scaling from an early stage and to move away from “ multiplication always makes bigger”. Also this provides opportunity for visualisation of multiplication of fractions and generalisation of multiplication of a /b by c/d, where a<b and c<d. These students would have to have a good understanding of the use of a variable to represent a quantity to be able to do this question. The understanding of fraction concept will be a pedagogical concern for all new teachers.  This is a really difficult concept and for that very reason it needs to be tackled. Multiplication of rational numbers particularly where ‘multiplication makes smaller’ is counterintuitive for young students |
| **A4: Place Value** | 👍 | ☹ | 20 minutes | I chose this because it is an area of real difficulty for students and it opens the door to discussing the structure of the polynomial in algebra in future lessons |
| **B1: Geometry Definitions**  **✓** | 👍 | 😐 | One period | It is an open ended task far deeper than a first cursory glance might lead one to believe. There are many shapes to be discussed and categorised. This can lead to a deep discussion as to the criteria that must be satisfied for a shape to be correctly categorise. | |
| **B2: Multiple Methods** | 👍👍 | ☹😐 | 15mins.  10 minutes | Alerts the pre service teacher to the concept of multiple approaches to problem solving. Encourages the evaluation of methodology used by student rather than just focusing on the solution. Encourages the pre service teacher to ask why one method rather than another is used - may indicate misconceptions or gaps in knowledge. Helps to make links between different elements of Strand 2. Indicates the importance of getting inside the student’s head to see the way they are thinking about their mathematics  Longer time given as teacher will need to analyse both methods.  Like it as it shows how an appreciation and understanding of geometry can allow students to solve problems more efficiently while at the same time the question shows connections to algebraic methods. Teachers can see use of multiple methods as a way to increase understanding and allow for discussion. | |
| **B3: Similar Triangles**  **✓** | 👍👍 | 😐☹ | 10 minutes One period+ | Allows teachers appreciate solving problems in unfamiliar situations and the importance of students being exposed to unfamiliar situations in order to deal with this type of problem. Links to B2 also.  Another open ended task that engages the student in hypothesising and demands that they defend their reasoning. It also represents a rich avenue to explore the underlying principles relating to the theorem. | |
| **B5: Symmetry** | 👍 | 😐 | 10mins. | Use of this question highlights for pre service teachers the difficulties Irish students have with spatial aspects of mathematics. The value and importance of analysing the how /why of students’ answers rather than the entire focus being on the solution to the actual question is highlighted by this question. To correct misconceptions we must evaluate the knowledge students and identify where thsat is different from the knowledge they think they have. | |
| **C1: Linear Pattern**  **✓** | 👍👍 | ☺☺ | 5mins.  20 minutes | The importance of patterns as a tool for understanding mathematics. Basic difficulties with number and algebra result in more serious issues as students’ progress through mathematics. Could alert pre service teacher to the value of a visual approach to algebra. Phraseology of question puts emphasis on student self correction and role of teacher as guide rather than leader.  A very nice task to introduce algebraic reasoning through the exploration of patterns. |
| **C2: Exponential Equation** | 👍 | 😐 | 10 minutes | Engaging context, using broadcast media, would lend to discussion in class, accessible to all students but capable of leading to generalisation, allows for multiple representation, linking number and algebra and function; The jump to 6400 euro happens quite quickly so students have to be attentive and analyse and communicate what is happening. |
| **C3: Simplifying Algebraic Fractions**  **✓** | 👍👍👍 | 😐😐😐 | 5mins.  10 minutes  A number of periods-as many as three | Makes the pre service teacher reflect on the understanding of the procedures of algebra, knowing the steps is not enough understanding the why of the steps is more important and the transmission of these reasons is essential for student comprehension of algebra and its use as a tool to deal with other mathematics.  Teacher must think about students’ understanding of the fraction concept, of the formation of equivalent fractions, of factors and divisors – plenty of use of correct mathematical language combined with understanding operations. This gives a reason to address use of the terms “cancel”, “get rid of” and also requiring students to verbalise procedures in number.  A task that all but the very best students misunderstand. It does however, provide a nice opportunity to explain at least one reason for factoring expressions in algebra and opens the door to reminding students about equivalent fractions in the Number Strand |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **D1: Reading Graphs**  **✓** | 👍👍 | 😐😐 | 5mins.  30 min | Alerts pre service teacher to the importance of interpretation of graphs not just on their construction. Shows students the importance of not looking at just one representation of data. Shows the importance of analysis of all forms of data a point pre service teachers need to get across to students.  A nice task to raise awareness of the misuse of data |
| **D2: Probability Concepts**  **✓** | 👍 | 😐 | 5 minutes | Core misconception addressed. Answer given seems so plausible until one generalises such a procedure. (What if Katie had got 2 heads out of 20 tosses on, and Lucy used her procedure to estimate the probability?) |
| **D3: Number Systems and Probability Concepts** | 👍👍👍 | 😐😐😐 | 10mins.  10 minutes At least one period | Alerts the pre service teacher to the interrelatedness of mathematics and connections between strands of the syllabus. Demonstrates the necessity of in depth study of numbers and properties of numbers. Allows pre service teachers an opportunity to see how questions can be set in a context and in a way that links strands  Addresses the importance of students having productive disposition towards Maths, so they will use some of their strategies for problem solving and investigate if a pattern exists. Only when students have become very used to looking for patterns will they approach this problem without anxiety.  A nice exercise to develop the students’ critical thinking skills and (re)introduces the perfect square in context-rich fashion |

Further Comments: In general I choose questions that would be based at Junior Cycle level as most newly qualified teaches in my experience work at Junior Cycle level for a short number of years before being timetabled into Senior Cycle classes; for that reason I feel that they particular difficulties experienced at that level should be prioritised.

The pre service teachers would be encouraged(in my opinion), to reflect on the issues that will help enable them to establish for their students a solid foundation based on understanding, making connections, looking at context and analysis of the data presented in any given situation.

The chosen questions in many cases also encourage the pre service teacher to consider the importance of multiple approaches to problem solving, multiple methods of explanation, a visual approach to mathematics and above all the notion that the destination (answer) is not the most importantaspect but ratherthe journey(exploration).

I loved all the questions and found it very hard to choose. In the end I went for questions involving the idea of proof, understanding of the fraction concept, linking many strands, analysing others’ solutions to problems, and looking for patterns but the questions I left out also encompassed these ideas!

C1 I thought was a really lovely example of where a student gives the right answer for the wrong reason which can happen a lot and how the teacher has to enable the student to think more deeply about the situation and in particular to constantly ask themselves “Will this always be true? Can I prove it? Can I think of a counterexample?