

**Look for and express**

**regularity in repeated**

**reasoning**.

\*Notice if calculations are repeated. Look both for general methods and for shortcuts. Noticing the regularity in the way terms cancel when expanding (x-1)(x+1), (x-1)(x2+x+1), and (x-1)(x3+x2+x+1) might lead them to the general formula for the sum of a geometric series.

\*Derive formulas or make generalizations.

\*Maintain oversight of the process, while attending to the details.

\*Continually evaluate the reasonableness of their intermediate results.

**Use appropriate tools**

**strategically.**

\*Consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software.

\*Be familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations.

\*Analyze graphs of functions and solutions generated using a graphing calculator.

\*Detect possible errors by strategically using estimation and other mathematical knowledge.

\*Make mathematical models, knowing that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data.

\*Identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems

\*Use technological tools to explore and deepen

their understanding of concepts.

**Reason abstractly and quantitatively.**

\*Seek to make sense of quantities and their relationships in problem situations.

\*Abstract a given situation and represent it symbolically, manipulate the representing symbols, and pause as needed during the manipulation process in order to probe into the referents for the symbols involved.

\*Use quantitative reasoning to create coherent representations of the problem at hand; consider the units involved; attend to the meaning of quantities, not just how to compute them; and know and flexibly use different properties of operations

and objects.

**Construct viable arguments**

**and**

**critique the reasoning of others.**

 \*Understand and use stated assumptions, definitions, and

 previously established results in constructing arguments.

\*Make conjectures and build a logical progression of statements to explore the truth of their conjectures.

\*Analyze situations by breaking them into cases, and can recognize and use counterexamples.

\*Justify their conclusions, communicate them to others, and respond to the arguments of others.

\*Reason inductively about data, making plausible arguments that take into account the context from which the data arose.

\*Compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and-if there is a flaw in an argument- explain what it is.

\*Determine domains, to which an argument applies, listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Attend to precision.**

\*Communicate precisely to others by using clear definitions in discussion with others and in their own reasoning.

\*State the meaning of the symbols they choose, specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem.

\*Calculate accurately and efficiently, and express numerical answers with a degree of precision appropriate for the problem context.

\*Examine claims and make explicit use of definitions.

**High School**

**Grade Level Emphasis**

**PA Core Standards**

**Standards for Mathematical Practice**

***Tool Developed by***

**Central Intermediate Unit # 10**

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**Look for and make use of structure.**

\*Look closely to discern a pattern or structure. In the expression x2 + 9x + 14, older students can see the 14 as 2 x 7 and 9 as 2 + 7.

\*Recognize the significance of an existing line in a geometric figure and use the strategy of drawing an auxiliary line for solving problems.

\*Step back for an overview and shift perspective.

\*See complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5-3(x-y)2 as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

\*Use these patterns to create equivalent expressions, factor and solve equations, compose functions, and transform figures.

**Model with Mathematics.**

\*Apply the mathematics they know to solve problems arising in everyday life, society, and the workplace.

\*Use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another.

\*Make assumptions and approximations to simplify a complicated situation, realizing that these may need revision later.

\*Identify important quantities in a practical situation and map their relationships using such tools as diagrams, two way tables, graphs, flowcharts and formulas.

\*Analyze relationships mathematically to draw conclusions.

\*Routinely interpret their mathematical results in the context of

 the situation and reflect on whether the results make sense,

 possibly improving the model if it has not served its purpose.

**Make sense of problems**

**and persevere in solving them.**

 \*Examine problems by explaining to themselves the

 meaning of a problem and looking for entry points to its solution.

\*Analyze givens, constraints, relationships, and goals.

\*Make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt.

\*Consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution.

\*Monitor and evaluate their progress and change course if necessary.

\*Depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need.

\*Explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends.

 \*Check their answers to problems using different

 methods and continually ask themselves, “Does this

 make sense?”

 \*Understand the approaches of others to solving

 complex problems and identify

 correspondences between different

 approaches.

**MP 2**

**MP 8**

**MP 3**

**MP 1**

**MP 7**

**MP 5**

**MP 6**

**MP 4**