

## Montgomery College General Education Assessment Rubric: Scientific Reasoning

Montgomery College's Scientific and Quantitative Reasoning Rubric is based on the Scientific Method of Inquiry, [Advancing Assessment of Quantitative and Scientific Reasoning](#), *Numeracy*, 3 (2): Article 2 by Sundre, Donna L. and Amy D. Thelk. 2010, and adapted from the College of Marin Common Scientific and Quantitative Reasoning Rubric, and the Association of American Colleges and Universities' *Quantitative Literacy VALUE Rubric*.

**Scientific and Quantitative reasoning: the ability to locate, identify, collect, organize, analyze, and interpret data and the ability to use mathematics and the scientific method of inquiry to make decisions, when appropriate.**

<b>Standard 1 Problem Observation and Formulation of a Hypothesis</b>				
<b>Advanced (3)</b>	<b>Proficient (2)</b>	<b>Novice (1)</b>	<b>Not Evident (0)</b>	
<ul style="list-style-type: none"> <li><input type="checkbox"/> Identifies relevant properties of the system under study.</li> <li><input type="checkbox"/> Identifies the role of specific parts of relevant concepts and how they interact to create the outcome of the system.</li> <li><input type="checkbox"/> Formulates hypotheses on the basis of observations.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Identifies relevant properties of the system under study.</li> <li><input type="checkbox"/> Identifies minimally the role of specific parts of relevant concepts and how they interact to create the outcome of the system.</li> <li><input type="checkbox"/> Formulates weak hypotheses on the basis of observations.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Mostly identifies relevant properties of the system under study.</li> <li><input type="checkbox"/> Identifies minimally the role of specific parts of relevant concepts and how they interact to create the outcome of the system.</li> <li><input type="checkbox"/> Formulates weak hypotheses on the basis of observations.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Does not identify relevant properties of the system under study.</li> <li><input type="checkbox"/> Does not identify the role of specific parts of relevant concepts and how they interact to create the outcome of the system.</li> <li><input type="checkbox"/> Does not formulate hypotheses on the basis of observations.</li> </ul>	<p>All Scientific Reasoning Assessment instruments must score this measure</p>

<b>Standard 2 Experimentation and Collection of Data</b>				
<b>Advanced (3)</b>	<b>Proficient (2)</b>	<b>Novice (1)</b>	<b>Not Evident (0)</b>	
<ul style="list-style-type: none"> <li><input type="checkbox"/> Formulates and carries out test of hypotheses employing appropriate techniques.</li> <li><input type="checkbox"/> Method is documented completely and accurately, making experiment easy to reproduce.</li> <li><input type="checkbox"/> Variables are identified and classified as dependent and independent.</li> <li><input type="checkbox"/> Measurements are carried out using standard units of measurements and minimize sources of uncertainty.</li> <li><input type="checkbox"/> Data is thoroughly and accurately recorded using identified tools.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Formulates and carries out test of hypotheses employing appropriate techniques.</li> <li><input type="checkbox"/> Method is mostly well documented.</li> <li><input type="checkbox"/> Variables are mostly identified and classified as dependent and independent.</li> <li><input type="checkbox"/> Measurements are mostly expressed using standard units of measurements and sources of uncertainty are mostly minimized.</li> <li><input type="checkbox"/> Data is mostly thoroughly and accurately recorded using identified tools.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Formulates and carries out test of hypotheses employing mostly appropriate techniques.</li> <li><input type="checkbox"/> Method is not well documented making experiment difficult to reproduce.</li> <li><input type="checkbox"/> Variables are not identified and classified as dependent and independent.</li> <li><input type="checkbox"/> Measurements are not carried out using standard units of measurements and sources of uncertainty are not minimized.</li> <li><input type="checkbox"/> Data is not thoroughly and accurately recorded using identified tools.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Does not formulate and carry out test of hypotheses employing mostly appropriate techniques.</li> <li><input type="checkbox"/> Method is not documented making experiment difficult to reproduce.</li> <li><input type="checkbox"/> Variables are not identified and classified as dependent and independent.</li> <li><input type="checkbox"/> Measurements are not carried out using standard units of measurements and sources of uncertainty are not minimized.</li> <li><input type="checkbox"/> Data is not thoroughly and accurately recorded using identified tools.</li> </ul>	<p>All Scientific Reasoning Assessment instruments must score this measure</p>

<b>Standard 3 Data Interpretation and Evaluation</b>
--

Advanced (3)	Proficient (2)	Novice (1)	Not Evident (0)	All Scientific Reasoning Assessment instruments must score this measure
<ul style="list-style-type: none"> <li><input type="checkbox"/> Converts relevant information into an insightful mathematical portrayal in a way that contributes to a further and deeper understanding.</li> <li><input type="checkbox"/> Uses correct and complete quantitative analysis.</li> <li><input type="checkbox"/> Makes relevant and correct conclusions.</li> <li><input type="checkbox"/> Explicitly describes assumptions and provides rationale for why each assumption is appropriate.</li> <li><input type="checkbox"/> Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Mostly converts relevant information into an insightful mathematical portrayal in a way that contributes to a further and deeper understanding.</li> <li><input type="checkbox"/> Mostly uses correct and complete quantitative analysis.</li> <li><input type="checkbox"/> Mostly makes relevant and correct conclusions.</li> <li><input type="checkbox"/> Mostly describes assumptions and provides rationale for why each assumption is appropriate. Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Minimally converts relevant information into an insightful mathematical portrayal in a way that contributes to a further and deeper understanding.</li> <li><input type="checkbox"/> Uses incorrect and incomplete quantitative analysis.</li> <li><input type="checkbox"/> Makes irrelevant and incorrect conclusions.</li> <li><input type="checkbox"/> Minimally describes assumptions and provides rationale for why each assumption is appropriate.</li> <li><input type="checkbox"/> Partly shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Does not convert relevant information into an insightful mathematical portrayal in a way that contributes to a further and deeper understanding.</li> <li><input type="checkbox"/> Does not use correct and complete quantitative analysis.</li> <li><input type="checkbox"/> Does not make relevant and correct conclusions.</li> <li><input type="checkbox"/> Does not describe assumptions and provides rationale for why each assumption is appropriate.</li> <li><input type="checkbox"/> Does not show awareness that confidence in final conclusions is limited by the accuracy of the assumptions.</li> </ul>	

DRAFT