

Main Criteria: Forward Education
Secondary Criteria: Arizona's College and Career Ready Standards
Subjects: Mathematics, Science, Technology Education
Grades: 11, 12, Key Stage 4

Forward Education

Autonomous Electric Vehicles of the Future

Arizona's College and Career Ready Standards
Mathematics
Grade 11 - Adopted: 2018

STRAND		Standards for Mathematical Practice
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CONCEPT / STANDARD	MP.1	Make sense of problems and persevere in solving them.
CONCEPT / STANDARD	MP.2	Reason abstractly and quantitatively.
CONCEPT / STANDARD	MP.3	Construct viable arguments and critique the reasoning of others.
CONCEPT / STANDARD	MP.4	Model with mathematics.
CONCEPT / STANDARD	MP.8	Look for and express regularity in repeated reasoning.

STRAND		Algebra 1
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CONCEPT / STANDARD	A1.A-CED	Algebra – Creating Equations (A-CED)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	A1.A-CED.A	Create equations that describe numbers or relationships.

OBJECTIVE / GRADE LEVEL EXPECTATION	A1.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
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STRAND		Algebra 1
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CONCEPT / STANDARD	A1.A-REI	Algebra – Reasoning with Equations and Inequalities (A-REI)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	A1.A-REI.A	Understand solving equations as a process of reasoning and explain the reasoning.

OBJECTIVE / GRADE LEVEL EXPECTATION	A1.A-REI.A.1	Explain each step in solving linear and quadratic equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
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STRAND		Algebra 1
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CONCEPT / STANDARD	A1.F-IF	Functions – Interpreting Functions (F-IF)
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PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	A1.F-IF.C	Analyze functions using different representations.
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OBJECTIVE / GRADE LEVEL EXPECTATION A1.F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, exponential, quadratic, and piecewise-defined functions (limited to the aforementioned functions).

STRAND		Algebra 1
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CONCEPT / STANDARD	A1.F-LE	Functions – Linear, Quadratic, and Exponential Models (F-LE)
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PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	A1.F-LE.A	Construct and compare linear, quadratic, and exponential models and solve problems.
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OBJECTIVE / GRADE LEVEL EXPECTATION	A1.F-LE.A.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.
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GRADE LEVEL EXPECTATION A1.F-LE.A.1.a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

STRAND		Algebra 2
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CONCEPT / STANDARD	A2.A-REI	Algebra – Reasoning with Equations and Inequalities (A-REI)
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PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	A2.A-REI.A	Understand solving equations as a process of reasoning and explain the reasoning.
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OBJECTIVE / GRADE LEVEL EXPECTATION A2.A-REI.A.1 Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. Extend from quadratic equations to rational and radical equations.

STRAND		Algebra 2
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CONCEPT / STANDARD	A2.F-IF	Functions – Interpreting Functions (F-IF)
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PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	A2.F-IF.C	Analyze functions using different representations.
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OBJECTIVE / GRADE LEVEL EXPECTATION A2.F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Extend from linear, quadratic and exponential functions to include square root, cube root, polynomial, exponential, logarithmic, sine, cosine, tangent and piecewise-defined functions.

STRAND		Geometry
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CONCEPT / STANDARD	G.G-GPE	Geometry – Expressing Geometric Properties with Equations (G-GPE)
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PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	G.G-GPE.B	Use coordinates to prove geometric theorems algebraically.
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OBJECTIVE / GRADE LEVEL EXPECTATION G.G-GPE.B.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems, including finding the equation of a line parallel or perpendicular to a given line that passes through a given point.

STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.1	Make sense of problems and persevere in solving them.

OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. While engaging in productive struggle to solve a problem, they continually ask themselves, "Does this make sense?" to monitor and evaluate their progress and change course if necessary. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. Mathematically proficient students check their solutions to problems using different methods, approaches, or representations. They also compare and understand different representations of problems and different solution pathways, both their own and those of others.

STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.2	Reason abstractly and quantitatively.

OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students make sense of quantities and their relationships in problem situations. Students can contextualize and decontextualize problems involving quantitative relationships. They contextualize quantities, operations, and expressions by describing a corresponding situation. They decontextualize a situation by representing it symbolically. As they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects and when appropriate they interpret their solution in terms of the context.

STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.3	Construct viable arguments and critique the reasoning of others.

OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students construct mathematical arguments (explain the reasoning underlying a strategy, solution, or conjecture) using concrete, pictorial, or symbolic referents. Arguments may also rely on definitions, assumptions, previously established results, properties, or structures. Mathematically proficient students make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). Students critique others by affirming or questioning the reasoning of others. They can listen to or read the reasoning of others, decide whether it makes sense, ask questions to clarify or improve the reasoning, and validate or build on it. Mathematically proficient students can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.

STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.4	Model with mathematics.

OBJECTIVE / GRADE LEVEL EXPECTATION		Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. When given a problem in a contextual situation, they identify the mathematical elements of a situation and create a mathematical model that represents those mathematical elements and the relationships among them. Mathematically proficient students use their model to analyze the relationships and draw conclusions. They 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.
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STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.8	Look for and express regularity in repeated reasoning.

OBJECTIVE / GRADE LEVEL EXPECTATION		Mathematically proficient students look for and describe regularities as they solve multiple related problems. They formulate conjectures about what they notice and communicate observations with precision. While solving problems, students maintain oversight of the process and continually evaluate the reasonableness of their results. This informs and strengthens their understanding of the structure of mathematics which leads to fluency.
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STRAND		Quantitative Reasoning
CONCEPT / STANDARD	QR.MP	Standards for Mathematical Practice (MP)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	QR.MP.1	Make sense of problems and persevere in solving them.

OBJECTIVE / GRADE LEVEL EXPECTATION		Mathematically proficient students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. While engaging in productive struggle to solve a problem, they continually ask themselves, "Does this make sense?" to monitor and evaluate their progress and change course if necessary. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. Mathematically proficient students check their solutions to problems using different methods, approaches, or representations. They also compare and understand different representations of problems and different solution pathways, both their own and those of others.
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STRAND		Quantitative Reasoning
CONCEPT / STANDARD	QR.MP	Standards for Mathematical Practice (MP)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	QR.MP.2	Reason abstractly and quantitatively.

OBJECTIVE / GRADE LEVEL EXPECTATION		Mathematically proficient students make sense of quantities and their relationships in problem situations. Students can contextualize and decontextualize problems involving quantitative relationships. They contextualize quantities, operations, and expressions by describing a corresponding situation. They decontextualize a situation by representing it symbolically. As they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects and when appropriate they interpret their solution in terms of the context.
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STRAND		Quantitative Reasoning
CONCEPT / STANDARD	QR.MP	Standards for Mathematical Practice (MP)

PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	QR.MP. 3	Construct viable arguments and critique the reasoning of others.
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OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students construct mathematical arguments (explain the reasoning underlying a strategy, solution, or conjecture) using concrete, pictorial, or symbolic referents. Arguments may also rely on definitions, assumptions, previously established results, properties, or structures. Mathematically proficient students make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). Students critique others by affirming or questioning the reasoning of others. They can listen to or read the reasoning of others, decide whether it makes sense, ask questions to clarify or improve the reasoning, and validate or build on it. Mathematically proficient students can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.

STRAND		Quantitative Reasoning
CONCEPT / STANDARD	QR.MP	Standards for Mathematical Practice (MP)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	QR.MP. 4	Model with mathematics.

OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. When given a problem in a contextual situation, they identify the mathematical elements of a situation and create a mathematical model that represents those mathematical elements and the relationships among them. Mathematically proficient students use their model to analyze the relationships and draw conclusions. They 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.

STRAND		Quantitative Reasoning
CONCEPT / STANDARD	QR.MP	Standards for Mathematical Practice (MP)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	QR.MP. 8	Look for and express regularity in repeated reasoning.

OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students look for and describe regularities as they solve multiple related problems. They formulate conjectures about what they notice and communicate observations with precision. While solving problems, students maintain oversight of the process and continually evaluate the reasonableness of their results. This informs and strengthens their understanding of the structure of mathematics which leads to fluency.

Arizona's College and Career Ready Standards

Mathematics

Grade 12 - Adopted: 2018

STRAND		Standards for Mathematical Practice
CONCEPT / STANDARD	MP.1	Make sense of problems and persevere in solving them.
CONCEPT / STANDARD	MP.2	Reason abstractly and quantitatively.
CONCEPT / STANDARD	MP.3	Construct viable arguments and critique the reasoning of others.

CONCEPT / STANDARD	MP.4	Model with mathematics.
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CONCEPT / STANDARD	MP.8	Look for and express regularity in repeated reasoning.
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STRAND		Algebra 1
CONCEPT / STANDARD	A1.A-CED	Algebra – Creating Equations (A-CED)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	A1.A-CED.A	Create equations that describe numbers or relationships.

OBJECTIVE / GRADE LEVEL EXPECTATION A1.A-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

STRAND		Algebra 1
CONCEPT / STANDARD	A1.A-REI	Algebra – Reasoning with Equations and Inequalities (A-REI)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	A1.A-REI.A	Understand solving equations as a process of reasoning and explain the reasoning.

OBJECTIVE / GRADE LEVEL EXPECTATION A1.A-REI.A.1 Explain each step in solving linear and quadratic equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

STRAND		Algebra 1
CONCEPT / STANDARD	A1.F-IF	Functions – Interpreting Functions (F-IF)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	A1.F-IF.C	Analyze functions using different representations.

OBJECTIVE / GRADE LEVEL EXPECTATION A1.F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, exponential, quadratic, and piecewise-defined functions (limited to the aforementioned functions).

STRAND		Algebra 1
CONCEPT / STANDARD	A1.F-LE	Functions – Linear, Quadratic, and Exponential Models (F-LE)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	A1.F-LE.A	Construct and compare linear, quadratic, and exponential models and solve problems.

OBJECTIVE / GRADE LEVEL EXPECTATION A1.F-LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.

GRADE LEVEL EXPECTATION A1.F-LE.A.1.a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

STRAND		Algebra 2
CONCEPT / STANDARD	A2.A-REI	Algebra – Reasoning with Equations and Inequalities (A-REI)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	A2.A-REI.A	Understand solving equations as a process of reasoning and explain the reasoning.

OBJECTIVE / GRADE LEVEL EXPECTATION A2.A-REI.A.1 Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. Extend from quadratic equations to rational and radical equations.

STRAND		Algebra 2
CONCEPT / STANDARD	A2.F-IF	Functions – Interpreting Functions (F-IF)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	A2.F-IF.C	Analyze functions using different representations.

OBJECTIVE / GRADE LEVEL EXPECTATION A2.F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Extend from linear, quadratic and exponential functions to include square root, cube root, polynomial, exponential, logarithmic, sine, cosine, tangent and piecewise-defined functions.

STRAND		Geometry
CONCEPT / STANDARD	G.G-GPE	Geometry – Expressing Geometric Properties with Equations (G-GPE)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	G.G-GPE.B	Use coordinates to prove geometric theorems algebraically.

OBJECTIVE / GRADE LEVEL EXPECTATION G.G-GPE.B.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems, including finding the equation of a line parallel or perpendicular to a given line that passes through a given point.

STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.1	Make sense of problems and persevere in solving them.

OBJECTIVE / GRADE LEVEL EXPECTATION Mathematically proficient students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. While engaging in productive struggle to solve a problem, they continually ask themselves, "Does this make sense?" to monitor and evaluate their progress and change course if necessary. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. Mathematically proficient students check their solutions to problems using different methods, approaches, or representations. They also compare and understand different representations of problems and different solution pathways, both their own and those of others.

STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice

PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.2	Reason abstractly and quantitatively.
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OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students make sense of quantities and their relationships in problem situations. Students can contextualize and decontextualize problems involving quantitative relationships. They contextualize quantities, operations, and expressions by describing a corresponding situation. They decontextualize a situation by representing it symbolically. As they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects and when appropriate they interpret their solution in terms of the context.

STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.3	Construct viable arguments and critique the reasoning of others.

OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students construct mathematical arguments (explain the reasoning underlying a strategy, solution, or conjecture) using concrete, pictorial, or symbolic referents. Arguments may also rely on definitions, assumptions, previously established results, properties, or structures. Mathematically proficient students make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). Students critique others by affirming or questioning the reasoning of others. They can listen to or read the reasoning of others, decide whether it makes sense, ask questions to clarify or improve the reasoning, and validate or build on it. Mathematically proficient students can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.

STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.4	Model with mathematics.

OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. When given a problem in a contextual situation, they identify the mathematical elements of a situation and create a mathematical model that represents those mathematical elements and the relationships among them. Mathematically proficient students use their model to analyze the relationships and draw conclusions. They 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.

STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.8	Look for and express regularity in repeated reasoning.

OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students look for and describe regularities as they solve multiple related problems. They formulate conjectures about what they notice and communicate observations with precision. While solving problems, students maintain oversight of the process and continually evaluate the reasonableness of their results. This informs and strengthens their understanding of the structure of mathematics which leads to fluency.

STRAND		Quantitative Reasoning
CONCEPT / STANDARD	QR.MP	Standards for Mathematical Practice (MP)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	QR.MP.1	Make sense of problems and persevere in solving them.

OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. While engaging in productive struggle to solve a problem, they continually ask themselves, "Does this make sense?" to monitor and evaluate their progress and change course if necessary. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. Mathematically proficient students check their solutions to problems using different methods, approaches, or representations. They also compare and understand different representations of problems and different solution pathways, both their own and those of others.

STRAND		Quantitative Reasoning
CONCEPT / STANDARD	QR.MP	Standards for Mathematical Practice (MP)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	QR.MP.2	Reason abstractly and quantitatively.

OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students make sense of quantities and their relationships in problem situations. Students can contextualize and decontextualize problems involving quantitative relationships. They contextualize quantities, operations, and expressions by describing a corresponding situation. They decontextualize a situation by representing it symbolically. As they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects and when appropriate they interpret their solution in terms of the context.

STRAND		Quantitative Reasoning
CONCEPT / STANDARD	QR.MP	Standards for Mathematical Practice (MP)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	QR.MP.3	Construct viable arguments and critique the reasoning of others.

OBJECTIVE /
GRADE LEVEL
EXPECTATION

Mathematically proficient students construct mathematical arguments (explain the reasoning underlying a strategy, solution, or conjecture) using concrete, pictorial, or symbolic referents. Arguments may also rely on definitions, assumptions, previously established results, properties, or structures. Mathematically proficient students make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). Students critique others by affirming or questioning the reasoning of others. They can listen to or read the reasoning of others, decide whether it makes sense, ask questions to clarify or improve the reasoning, and validate or build on it. Mathematically proficient students can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.

STRAND		Quantitative Reasoning
CONCEPT / STANDARD	QR.MP	Standards for Mathematical Practice (MP)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	QR.MP.4	Model with mathematics.

OBJECTIVE / GRADE LEVEL EXPECTATION		Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. When given a problem in a contextual situation, they identify the mathematical elements of a situation and create a mathematical model that represents those mathematical elements and the relationships among them. Mathematically proficient students use their model to analyze the relationships and draw conclusions. They 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.
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STRAND		Quantitative Reasoning
CONCEPT / STANDARD	QR.MP	Standards for Mathematical Practice (MP)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	QR.MP.8	Look for and express regularity in repeated reasoning.

OBJECTIVE / GRADE LEVEL EXPECTATION		Mathematically proficient students look for and describe regularities as they solve multiple related problems. They formulate conjectures about what they notice and communicate observations with precision. While solving problems, students maintain oversight of the process and continually evaluate the reasonableness of their results. This informs and strengthens their understanding of the structure of mathematics which leads to fluency.
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**Arizona's College and Career Ready Standards
Science**

Grade 11 - Adopted: 2018

STRAND		Core Ideas for Knowing Science
CONCEPT / STANDARD		Earth and Space Science

PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	E1:	The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.
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STRAND		Core Ideas for Using Science
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CONCEPT / STANDARD	U2:	The knowledge produced by science is used in engineering and technologies to solve problems and/or create products.
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STRAND		High School Physical Sciences
CONCEPT / STANDARD		Chemistry – P1: All matter in the Universe is made of very small particles.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Nuclear Processes and Applications of Chemistry

OBJECTIVE / GRADE LEVEL EXPECTATION	HS.P1U3.4.	Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.
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STRAND		High School Earth and Space Sciences
CONCEPT / STANDARD		Earth and Space – E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Weather & Climate

OBJECTIVE / GRADE LEVEL EXPECTATION	HS+E.E1 U1.2.	Develop and use models to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
STRAND		High School Earth and Space Sciences
CONCEPT / STANDARD		Earth and Space – E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Roles of Water in Earth's Surface Processes

OBJECTIVE / GRADE LEVEL EXPECTATION	HS.E1U1. 12.	Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).
STRAND		High School Earth and Space Sciences
CONCEPT / STANDARD		Earth and Space – E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Earth and Human Activity

OBJECTIVE / GRADE LEVEL EXPECTATION	HS.E1U3. 14.	Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.
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OBJECTIVE / GRADE LEVEL EXPECTATION	HS+E.E1 U3.9.	Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
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OBJECTIVE / GRADE LEVEL EXPECTATION	HS+E.E1 U3.11.	Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.
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STRAND		High School Life Sciences
CONCEPT / STANDARD		Life Science – L2: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms & L4: The unity and diversity of organisms, living and extinct, is the result of evolution.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Ecosystems

OBJECTIVE / GRADE LEVEL EXPECTATION	HS.L2U3. 18.	Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.
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**Arizona's College and Career Ready Standards
Science
Grade 12 - Adopted: 2018**

STRAND		Core Ideas for Knowing Science
CONCEPT / STANDARD		Earth and Space Science

PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	E1:	The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.
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STRAND		Core Ideas for Using Science
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CONCEPT / STANDARD	U2:	The knowledge produced by science is used in engineering and technologies to solve problems and/or create products.
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STRAND		High School Physical Sciences
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CONCEPT / STANDARD		Chemistry – P1: All matter in the Universe is made of very small particles.
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PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Nuclear Processes and Applications of Chemistry
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OBJECTIVE / GRADE LEVEL EXPECTATION	HS.P1U3.4.	Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.
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STRAND		High School Earth and Space Sciences
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CONCEPT / STANDARD		Earth and Space – E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.
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PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Weather & Climate
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OBJECTIVE / GRADE LEVEL EXPECTATION	HS+E.E1.U1.2.	Develop and use models to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
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STRAND		High School Earth and Space Sciences
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CONCEPT / STANDARD		Earth and Space – E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.
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PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Roles of Water in Earth's Surface Processes
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OBJECTIVE / GRADE LEVEL EXPECTATION	HS.E1U1.12.	Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).
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STRAND		High School Earth and Space Sciences
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CONCEPT / STANDARD		Earth and Space – E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.
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PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Earth and Human Activity
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OBJECTIVE / GRADE LEVEL EXPECTATION	HS.E1U3.14.	Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.
OBJECTIVE / GRADE LEVEL EXPECTATION	HS+E.E1 U3.9.	Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
OBJECTIVE / GRADE LEVEL EXPECTATION	HS+E.E1 U3.11.	Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

STRAND		High School Life Sciences
CONCEPT / STANDARD		Life Science – L2: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms & L4: The unity and diversity of organisms, living and extinct, is the result of evolution.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Ecosystems

OBJECTIVE / GRADE LEVEL EXPECTATION	HS.L2U3.18.	Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.
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**Arizona's College and Career Ready Standards
Technology Education
Grade 11 - Adopted: 2022**

STRAND		Arizona Educational Technology Standards 2022
CONCEPT / STANDARD	Standard 4.	Innovative Designer - Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	9-12.4.a.	Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	9-12.4.b.	Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

STRAND		Arizona Educational Technology Standards 2022
CONCEPT / STANDARD	Standard 5.	Computational Thinker - Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	9-12.5.a.	Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models, and algorithmic thinking in exploring and finding solutions.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	9-12.5.b.	Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.

PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL 9-12.5.c. Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.

Grade 11 - Adopted: 2018

STRAND		Computer Science
CONCEPT / STANDARD		Practices
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	Practice 3.	Recognizing and Defining Computational Problems: The ability to recognize appropriate and worthwhile opportunities to apply computation is a skill that develops over time and is central to computing. Solving a problem with a computational approach requires defining the problem, breaking it down into parts, and evaluating each part to determine whether a computational solution is appropriate.

OBJECTIVE / GRADE LEVEL EXPECTATION 3.1. Identify complex, interdisciplinary, real-world problems that can be solved computationally.

OBJECTIVE / GRADE LEVEL EXPECTATION 3.2. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures.

STRAND		Computer Science
CONCEPT / STANDARD		Practices
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	Practice 5.	Creating Computational Artifacts: The process of developing computational artifacts embraces both creative expression and the exploration of ideas to create prototypes and solve computational problems. Students create artifacts that are personally relevant or beneficial to their community and beyond. Computational artifacts can be created by combining and modifying existing artifacts or by developing new artifacts. Examples of computational artifacts include programs, simulations, visualizations, digital animations, robotic systems, and apps.

OBJECTIVE / GRADE LEVEL EXPECTATION 5.2. Create a computational artifact for practical intent, personal expression, or to address a societal issue.

STRAND		Computer Science
CONCEPT / STANDARD		Practices
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	Practice 6.	Testing and Refining Computational Artifacts: Testing and refinement is the deliberate and iterative process of improving a computational artifact. This process includes debugging (identifying and fixing errors) and comparing actual outcomes to intended outcomes. Students also respond to the changing needs and expectations of end users and improve the performance, reliability, usability, and accessibility of artifacts.

OBJECTIVE / GRADE LEVEL EXPECTATION 6.1. Systematically test computational artifacts by considering all scenarios and using test cases.

OBJECTIVE / GRADE LEVEL EXPECTATION 6.3. Evaluate and refine a computational artifact multiple times to enhance its performance, reliability, usability, and accessibility.

STRAND		Computer Science
CONCEPT / STANDARD		Concept: Algorithms and Programming (AP)

PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Subconcept: Algorithms (A)
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OBJECTIVE / GRADE LEVEL EXPECTATION HS.AP.A. 1. Create prototypes that use algorithms for practical intent, personal expression, or to address a societal issue. Practice(s): Creating Computational Artifacts: 5.2

STRAND		Computer Science
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CONCEPT / STANDARD		Concept: Impacts of Computing (IC)
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PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Subconcept: Culture (C)
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OBJECTIVE / GRADE LEVEL EXPECTATION HS.IC.C.3 . Demonstrate ways a given algorithm applies to problems across disciplines. Practice(s): Recognizing and Defining Computational Problems: 3.1

**Arizona's College and Career Ready Standards
Technology Education
Grade 12 - Adopted: 2022**

STRAND		Arizona Educational Technology Standards 2022
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CONCEPT / STANDARD	Standard 4.	Innovative Designer - Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.
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PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL 9-12.4.a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.

PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL 9-12.4.b. Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

STRAND		Arizona Educational Technology Standards 2022
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CONCEPT / STANDARD	Standard 5.	Computational Thinker - Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
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PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL 9-12.5.a. Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models, and algorithmic thinking in exploring and finding solutions.

PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL 9-12.5.b. Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.

PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL 9-12.5.c. Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.

STRAND		Computer Science
CONCEPT / STANDARD		Practices
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	Practice 3.	Recognizing and Defining Computational Problems: The ability to recognize appropriate and worthwhile opportunities to apply computation is a skill that develops over time and is central to computing. Solving a problem with a computational approach requires defining the problem, breaking it down into parts, and evaluating each part to determine whether a computational solution is appropriate.

OBJECTIVE / GRADE LEVEL EXPECTATION	3.1.	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
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OBJECTIVE / GRADE LEVEL EXPECTATION	3.2.	Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures.
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STRAND		Computer Science
CONCEPT / STANDARD		Practices
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	Practice 5.	Creating Computational Artifacts: The process of developing computational artifacts embraces both creative expression and the exploration of ideas to create prototypes and solve computational problems. Students create artifacts that are personally relevant or beneficial to their community and beyond. Computational artifacts can be created by combining and modifying existing artifacts or by developing new artifacts. Examples of computational artifacts include programs, simulations, visualizations, digital animations, robotic systems, and apps.

OBJECTIVE / GRADE LEVEL EXPECTATION	5.2.	Create a computational artifact for practical intent, personal expression, or to address a societal issue.
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STRAND		Computer Science
CONCEPT / STANDARD		Practices
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	Practice 6.	Testing and Refining Computational Artifacts: Testing and refinement is the deliberate and iterative process of improving a computational artifact. This process includes debugging (identifying and fixing errors) and comparing actual outcomes to intended outcomes. Students also respond to the changing needs and expectations of end users and improve the performance, reliability, usability, and accessibility of artifacts.

OBJECTIVE / GRADE LEVEL EXPECTATION	6.1.	Systematically test computational artifacts by considering all scenarios and using test cases.
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OBJECTIVE / GRADE LEVEL EXPECTATION	6.3.	Evaluate and refine a computational artifact multiple times to enhance its performance, reliability, usability, and accessibility.
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STRAND		Computer Science
CONCEPT / STANDARD		Concept: Algorithms and Programming (AP)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Subconcept: Algorithms (A)

OBJECTIVE / GRADE LEVEL EXPECTATION HS.AP.A.1 Create prototypes that use algorithms for practical intent, personal expression, or to address a societal issue. Practice(s): Creating Computational Artifacts: 5.2

STRAND		Computer Science
CONCEPT / STANDARD		Concept: Impacts of Computing (IC)
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		Subconcept: Culture (C)

OBJECTIVE / GRADE LEVEL EXPECTATION HS.IC.C.3 Demonstrate ways a given algorithm applies to problems across disciplines. Practice(s): Recognizing and Defining Computational Problems: 3.1