The Washington State
BOARD OF EDUCATION

Math Performance-Based Pathway Task Model

Background Information:

In order to complete the Performance-Based Pathway in mathematics, students will need to complete a project that they have designed or chosen with guidance from an advisor. This project should connect in some way with the student's goals, interests, or creative pursuits aligned with their High School and Beyond Plan. The project must be designed so that the final products produced by the student will enable an educator to assess whether they have met the high school focus standards. (The advisor and the evaluator may or may not be the same person. The advisor could be a school staff person or community member, but there needs to be a teacher with a Mathematics endorsement involved in the evaluation of the student work.)

Schools may approach the creation of this project or learning experience in various ways. Schools could design a learning experience that students could modify to align with their High School and Beyond Plan, could have students design their projects or learning experiences individually, with guidance from an advisor, or do both. In some cases, students might work with advisors or mentors from the community as well as or in place of an advisor from the school. If the project will be evaluated by someone other than the students' project advisor, the evaluator should review the plan before the student begins their work. It will be important that everyone involved in designing the learning experience or project consult the Mathematics Graduation Pathways rubric as they envision what the student will create.

This document is designed to serve as a guide for educators who will be supporting a student who is developing a proposal for a learning experience that allows them to successfully complete the Performance-Based Graduation Pathway. **The task model is a list of required features of that learning experience.**

Performance Indicators

While students only need to have evidence of meeting five or more of the mathematical practices, the assessment should be designed with all of these performance indicators in mind in order to provide students with the opportunity to practice all eight of these practices:

Mathematical Practice #1: Make sense of problems and persevere in solving them.

A. Clearly break down the problem by explaining the existing conditions, requirements, limitations, assumptions, and goals of the project.

B. Develop and describe a well-thought out solution pathway after considering multiple approaches to the problem.
C. Document regular monitoring and evaluation of progress, adjust methods when needed, and continue to work even when challenged.
D. Check work using two or more approaches and make any necessary modifications. Explain the reasonableness of the solution within context and why it makes sense.

Mathematical Practice #2: Reason abstractly and quantitatively.

A. Translates the context of the problem into mathematical representations (expressions, equations, graphs, etc.) to create a coherent representation of the problems at hand.
B. Use applicable mathematical reasoning and calculation to manipulate their symbolic representation in problem solving.

Mathematical Practice #3: Construct viable arguments and critique the reasoning of others.

A. Provide an introduction that includes stated assumptions, definitions, and previously established results to construct a compelling and well-supported mathematical argument.
B. Create a logical progression of statements that support tentative conclusions.
C. Provide an explanation of reasoning that others can follow including addressing one or more counter-arguments or examples.

Mathematical Practice #4: Model with Mathematics.

A. Make reasonable assumptions and approximations to simplify a complicated problem.
B. Identify important quantities and map relationships using tools such as diagrams, two-way tables, graphs, flowcharts, and formulas.
C. Interpret and describe the relationship between quantities, mathematically recognizing patterns, trends, and functions as applicable, and then use them to draw conclusions and make decisions.

Mathematical Practice #5: Use appropriate tools strategically.

A. Consider a wide range of available tools and then make sound decisions about which of these tools might be helpful and when to use them.
B. Select and use external mathematical resources to pose and solve problems, and describe their application and benefit in solving the problem.

Mathematical Practice #6: Attend to precision.

A. Consistently and appropriately use clear definitions, state the meaning of the symbols chosen, specify units of measure, and when needed, label graphs and diagrams to clarify correspondence with quantities within the problem.

B. Use applicable vocabulary to explain and support the reasoning and solution pathway.
C. Perform calculations accurately and efficiently. Then express numerical answers with a degree of precision appropriate to the problem context.

Mathematical Practice #7: Look for and make use of structure.

A. Recognize patterns and structures within quantities and expressions.
B. Use recognized patterns or structures to make predictions or decisions (rather than repeated calculations).
C. Decompose complicated quantities into single objects or a composition of several objects.

Mathematical Practice #8: Look for and express regularity in repeated reasoning.

A. Recognize calculations or results that repeat and use them mathematically through substitution or other processes.
B. Identify and use progressions of calculations to create procedural shortcuts.

Task Model

Any Performance Assessment that is designed to elicit student work that will allow the student to demonstrate they have met the learning standards in the Performance-Based Graduation Pathway for Mathematics, must include these elements:

Note: Throughout this task model, the word "problem" is a general term for "a question that needs to be answered, or something that needs to be figured out, addressed, or solved."

- ☐ The student will engage in a learning experience that has an authentic, real-world problem (aligned to their High School and Beyond Plan) that they can break down, analyze, and decontextualize, ultimately representing the problem symbolically as part of any final work product. ***(Performance Indicators 1A, 2A and 2B)***
- ☐ The student will engage with and develop a written plan to address a problem that has enough complexity for multiple entry points and solution paths. ***(Performance Indicators 1A and 1B)***
- ☐ Throughout the learning experience, the student will create a reflection (written, oral*, or video) or set of reflections that show they were able to:
    - ☐ (1) make strategic assumptions and approximations to simplify complex problems ***(Performance Indicator 4A)***
    - ☐ (2) decompose complicated quantities into single objects or compositions of several objects ***(Performance Indicators 7C)***

- ☐ (3) use recognized patterns or structures to make predictions or decisions *(Performance Indicator 7B)*
- ☐ (4) recognize calculations or results that repeat and use them mathematically through substitution or other processes *(Performance Indicator 8A)*

☐ The student's final product must contain some elements (for example, a diagram, two-way table, graph, flowchart, and/or formulas) that demonstrate their ability to identify important quantities and map relationships. The student should be given the opportunity to describe the relationship between quantities, mathematically recognizing patterns, trends, and functions as applicable, and then use them to draw conclusions and make decisions. *(Performance Indicators 4B and 4C)*

☐ The student will create a written text, oral presentation, or video explanation that uses applicable vocabulary to communicate the following information (along with the student's final solution) *(Performance Indicator 6B)*:

- ☐ (1) stated assumptions, definitions, and previously established results that frame the problem; *(Performance Indicator 3A)*
- ☐ (2) arguments and tentative conclusions through a series of logical statements that offer a hypothesis on the solution to the problem, including addressing counter-arguments or examples; *(Performance Indicators 3B and 3C)*
- ☐ (3) description of problem-solving process that highlights the meaning of symbols chosen, units of measure, precise calculations, patterns and structures within resulting quantities and expressions, and an ability to both decontextualize and re-contextualize the project in order to determine if the result is plausible *(Performance Indicators 2A, 2B, 6A, 6C, 7A)*

☐ At the end of the learning experience, the student will produce a reflection (written, oral*, or video) in which they explain how they:

- ☐ (1) correctly, efficiently, and strategically used a variety of tools and external mathematics resources to solve the problem. *(Performance Indicators 5A and 5B)*
- ☐ (2) monitored and evaluated their progress, created procedural shortcuts, checked their work using different methods, adjusted their approach, and persevered through challenges. *(Performance Indicators 1C, 1D, and 8B)*
- ☐ (3) clearly identified which high school mathematics standards they learned and/or created evidence for during the learning experience.
- ☐ (4) connected their learning to their preparation for their post high school goals (from their High School and Beyond Plan) - including a self-evaluation of the skills and learning gained.

***NOTE:** The student may choose to reflect verbally when conferencing with the educator throughout their learning experience. The educator should take notes so that there is an

artifact to refer to when completing the final assessment of the student's evidence for the pathway.

Additionally, the Performance Assessment must be designed to elicit student work that will allow the student to

demonstrate they have met at least two high-school level mathematics standards from each of at least two conceptual categories (limited to: Number and Quantity, Algebra, Functions, Geometry, Statistics and Probability). These standards should be:

- ☐ Clearly applicable and relevant to the learning experience
- ☐ Easily identifiable within the student's submission of evidence

Here are three hypothetical examples of learning experiences that could be designed using this task model. *Note: the creation of these projects/learning experiences will be very individualized and connected to the context of the student, school and community. These hypothetical examples are intended to serve as samples of possibilities, rather than exemplars. The expectation is that the products represent the students' own work, recognizing that students learn within communities and their work is often built from multiple conversations and active use of supportive tools.*

Here are three hypothetical examples of projects that could be designed using this task model. *Note: the creation of these projects/learning experiences will be very individualized and connected to the context of the student, school and community. These hypothetical examples are intended to serve as samples of possibilities, rather than exemplars.*

Career Exploration	Creative Endeavor	Civic Action, Environmental Concern, or Research
The student has a vision of a business that they would like to create or design after leaving high school - for example, a beauty salon. They articulate some mathematical problems that they will need to solve as a business owner (such as setting prices for services, rates of pay for staff, costs for products sold, etc. in such a way that the business can yield a profit). They produce these items: 1. A product that expresses their learning in some way	The student is passionate about a form of creative expression. They articulate some mathematical problems that they would need to solve in order to create a particular piece of art (for example, the geometry behind a sculpture, mural, or other piece of visual art, or the mathematics behind chord progressions in music.) They produce these items: 1. A product that expresses their learning in some way to an audience of their	The student is passionate about a school, local, tribal, state, national, or international issue. They seek out resources to deepen their understanding of this issue. They also identify rich mathematical questions or problems that need to be solved in order to understand the issue or propose solutions. Using their research and calculations they make decisions or propose solutions to address the problem and, produce these items:

to an audience of their choice (i.e. business plan, website, brochure, etc.). This product should document their process as well as the end result of their reasoning, calculations, and recommendations or solutions. This should include key elements, such as diagrams, two-way tables, graphs, flowcharts, and/or formulas that identify important quantities and map relationships. 2. Description of problem-solving process including all the necessary calculations and reasoning needed to assess for completion of the Pathway. 3. Reflections on how they have demonstrated at least five of the mathematics practices.	choice (i.e. business plan, website, brochure, etc.). This product should document their process as well as the end result of their reasoning, calculations, and recommendations or solutions. This should include key elements, such as diagrams, two-way tables, graphs, flowcharts, and/or formulas that identify important quantities and map relationships. 2. Description of problem-solving process including all the necessary calculations and reasoning needed to assess for completion of the Pathway. 3. Reflections on how they have demonstrated at least five of the mathematics practices.	1. A product that expresses their learning in some way to an audience of their choice (i.e. business plan, website, brochure, etc.). This product should document their process as well as the end result of their reasoning, calculations, and recommendations or solutions. This should include key elements, such as diagrams, two-way tables, graphs, flowcharts, and/or formulas that identify important quantities and map relationships. 2. Description of problem-solving process including all the necessary calculations and reasoning needed to assess for completion of the Pathway. 3. Reflections on how they have demonstrated at least five of the mathematics practices.

Schools may design a variety of ways to support students in crafting their projects, engaging in research and creation, getting feedback, revising, and polishing final products. Some schools may design elective or core classes in which students work on Graduation Pathways; other schools may bring in community volunteers to mentor students in their Pathway projects; some schools may use enrichment blocks or Advisory classes to support this work; other schools may design other creative approaches. No matter how the school chooses to provide student support, these steps will probably be helpful:

1. The student works with a mentor or mentors to design their project in alignment with their own High School and Beyond Plan.

2. The student and mentor/s establish a timeline with specified project benchmarks, check-ins, and opportunities to get feedback
3. The student works on their reading and product creation, receiving feedback and revising along the way. During this process, both the students and the mentors use the Graduation pathway rubric to self-assess or give feedback.
4. The student turns in a final product and is evaluated using the ELA Graduation Pathway Rubric. The final product must include a short reflection (written, oral or recorded) about how this project connects with the student's High School and Beyond Plan, including a self-evaluation of the skills and learning that were gained.
5. We estimate that this process would take approximately a semester to complete.

Student Checklist

Student projects will all be unique and personalized to connect with the High School and Beyond Plan. However, no matter what you will be creating for your project, the following elements must be included in your work:

Learning Experience Design & Planning

- ☐ Did you select a learning experience that has an authentic, real-world problem (aligned to your High School and Beyond Plan)? *Note: Throughout this checklist, the word "problem" is a general term for "a question that needs to be answered, or something that needs to be figured out, addressed, or solved."*
- ☐ Did you identify a problem within that learning experience that has enough complexity to be addressed with multiple approaches?
- ☐ Did you show that you could break down, analyze, and translate the context of the problem into mathematical representations?
- ☐ Did you develop a written plan to address that problem?

Reflection

- ☐ Throughout the process, did you create a reflection (written, oral*, or video) or set of reflections that show you are able to:
    - ☐ (1) make strategic assumptions and approximations to simplify complex problems?
    - ☐ (2) decompose complicated quantities into single objects or compositions of several objects?
    - ☐ (3) use recognized patterns or structures to make predictions or decisions?
    - ☐ (4) recognize calculations or results that repeat and use them mathematically through substitution or other processes?
- ☐ At the end of the learning experience, did you produce a reflection (written, oral*, or video) that explains how you:
    - ☐ (1) correctly, efficiently, and strategically used a variety of tools and external mathematics resources to solve the problem?

- ☐ (2) monitored and evaluated your progress, created procedural shortcuts, checked your work using different methods, adjusted your approach, and persevered through challenges?
- ☐ (3) clearly identified which high school mathematics standards you learned and/or created evidence for during your learning experience?
- ☐ (4) connected your learning to your preparation for your post high school goals (from your High School and Beyond Plan) - including a self-evaluation of the skills and learning gained?

Creation of a Final Product:

- ☐ Does your final product contain some elements (for example, a diagram, two-way table, graph, flowchart, and/or formulas) that demonstrate your ability to identify important quantities and map relationships?
- ☐ Did you describe the relationship between quantities, mathematically recognizing patterns, trends, and functions as applicable, and then use them to draw conclusions and make decisions?
- ☐ Did you create a written text, oral presentation, or video explanation that uses applicable vocabulary to communicate the following information (along with your final solution):
  - ☐ (1) stated assumptions, definitions, and previously established results that frame the problem?
  - ☐ (2) arguments and tentative conclusions through a series of logical statements that offer a hypothesis on the solution to the problem, including addressing counter-arguments or examples?
  - ☐ (3) description of a problem-solving process that highlights the meaning of symbols chosen, units of measure, precise calculations, patterns and structures within resulting quantities and expressions, and a way to determine if the result is plausible?

Checking Your Work and Attention to Detail:

- ☐ In all of the evidence you plan to submit, have you reviewed your work using multiple methods and checked all solutions for reasonableness within the context of your learning experience?
- ☐ Have you used the Math Performance-Based Graduation Pathways rubric to review, self-assess, and revise the components of your project, or to seek feedback from others?