

Task Specific Rubric

The Great Kayak Expedition

Grade 8

A Few Notes about Rubrics, Benchmark Papers and Scoring...

- Proficiency levels are determined by the content and performance standards, teachers should always compare the student's performance to the standards to assess proficiency levels.
- It is helpful for teachers to discuss the proficiency levels before scoring student work.
- The benchmark papers and task specific rubric are designed to help the teacher analyze student thinking and understanding at each of the four performance levels: Novice, Apprentice, Proficient/Practitioner, and Expert (NAPE).
- It is recommended that teachers use the task specific rubric given for the assessment to identify the specific math skills that make up each section of the four performance levels for the task.
- Teachers should also review the benchmark papers provided to get a sense of the mathematics that students will use to solve the task.
- Teachers should scan their students' papers to get a sense of the mathematical thinking their students are using to solve the task before they begin scoring student work.
- The benchmark papers and task specific rubric are generalizations of what student work could look like.
It is not possible to anticipate every answer a student can give, so in scoring student work the teacher must use these generalizations to come to their own conclusions as to where a student is performing on the assessment.
- Teachers should use the three analytic criteria of Understanding, Strategies and Communication to determine a student's holistic performance on a task. The holistic score reflects the overall student's performance on the task and indicates the student's understanding of the mathematical concepts being assessed in the task.



Rubric: The Great Kayak Expedition

Target APS Mathematics Performance Standards

Strand I: Global Mathematical Processes

- ✓ **Communicates** mathematical thinking coherently and clearly to others.

Strand V: Patterns, Functions, and Algebraic Concepts – Grade 8

- ✓ **Represents, describes, and analyzes** numerical patterns and relationships using tables, graphs, words, and standard algebraic notation.
- ✓ **Develops and tests** strategies for solving multi-step equations.

Level	Understanding	Strategies, Reasoning, & Procedures	Communication
Unscorable	<ul style="list-style-type: none"> ✓ The student demonstrates no understanding of the mathematics in the problem. 	<ul style="list-style-type: none"> ✓ The student does not attempt to implement a strategy or procedure for solving the problem. ✓ The student makes random attempts to solve the task that clearly do not relate to the task. 	<ul style="list-style-type: none"> ✓ The student does not attempt to use mathematical representations, language or symbols to communicate a solution to the problem.

Level	Understanding	Strategies, Reasoning, & Procedures	Communication
Novice	<p>The student understands that:</p> <ul style="list-style-type: none"> The task is a multi-step problem, but does not have the mathematical knowledge to complete the task; and will only attempt to solve one or two aspects of the problem. 	<ul style="list-style-type: none"> The student starts the problem but has difficulty applying the mathematics needed to complete the calculations to solve the problem. The student has attempted to implement a strategy to find the rate of the river going downstream and upstream, but the solution is incorrect or incomplete. <p>The student may be able to:</p> <ul style="list-style-type: none"> Calculate the downstream rate (30 min for 3 miles), but cannot accurately calculate the upstream rate. <p>Sample Strategies: The student attempts to solve the task by finding the up and downstream rate, but cannot use the information to complete the task.</p> <p>Downstream: 3 miles in 30 minutes = 10 min miles Upstream: 3 miles in 90 minutes = 30 min miles</p>	<ul style="list-style-type: none"> The student cannot represent their work in a clear, organized manner. The student does not label the work or state a final answer. The student cannot explain the steps needed to solve the problem using appropriate mathematical language and symbols.

Level	Understanding	Strategies, Reasoning, & Procedures	Communication												
Apprentice	<p>The student understands that:</p> <ul style="list-style-type: none"> • The task is a multiple step problem, but cannot use the information at each of the steps to solve the problem. • The length of the trip each way is 3 miles. • S/he must calculate the average rate of speed (in mph) for the downstream and upstream trip, but makes errors in his/her calculations or cannot apply the rates properly to the overall expedition. 	<ul style="list-style-type: none"> ✓ The student does not use an effective strategy to solve the problem. ✓ The student starts the problem but has difficulty applying the mathematics needed to complete the calculations to solve the problem. <p>For example the student may be able to:</p> <ul style="list-style-type: none"> • Determine the rate of speed up and downstream, but may miscalculate the rate in miles per hour or not determine the rate of travel (speed) for the overall expedition. • Calculate one rate of speed correctly, but miscalculate the other rate of speed and the overall rate. • Calculate Ethan’s rate of speed minutes per mile, but cannot accurately calculate the speed in mph. <p>Sample Strategies: The student creates a chart/table for the expedition, but makes calculation errors or may not be able to complete the chart.</p> <table border="1" data-bbox="789 1068 1409 1256"> <thead> <tr> <th></th> <th>Downstream</th> <th>Upstream</th> </tr> </thead> <tbody> <tr> <td>Distance</td> <td>3</td> <td>3</td> </tr> <tr> <td>Time</td> <td>30 minutes</td> <td>90 minutes</td> </tr> <tr> <td>Rate</td> <td>6 mph</td> <td>30 min per mile</td> </tr> </tbody> </table> <p>Ethan’s expedition took 120 minutes and he traveled 6 mph downstream and 30 minutes per mile upstream.</p>		Downstream	Upstream	Distance	3	3	Time	30 minutes	90 minutes	Rate	6 mph	30 min per mile	<ul style="list-style-type: none"> ✓ The student cannot represent their work in a clear, organized manner. ✓ The student does not label the work or state a final answer. ✓ The student cannot explain the steps needed to solve the problem using appropriate mathematical language and symbols. ✓ The student does not state their final answer: the varying rates of speed for the downstream, upstream, and roundtrip expedition in miles per hour.
	Downstream	Upstream													
Distance	3	3													
Time	30 minutes	90 minutes													
Rate	6 mph	30 min per mile													

Level	Understanding	Strategies, Reasoning, & Procedures	Communication																				
Practitioner/Proficient	<p>The student understands that:</p> <ul style="list-style-type: none"> The task is a multiple step problem and uses the information at each of the steps to solve the task. The length of the trip each way is 3 miles and the roundtrip is 6 miles. S/he must determine the rate of speed up and downstream in miles per hour. S/he must calculate the rate of the overall expedition in miles per hour. 	<ul style="list-style-type: none"> ✓ The student uses one accurate and appropriate strategy to correctly solve all the steps of the task. ✓ The student must use an organizational system (i.e., chart or table) to record the three stages of the expedition. <p>The student must:</p> <ul style="list-style-type: none"> Calculate Ethan’s rate of speed downstream (6 mph) in miles per hour. Calculate Ethan’s rate of speed upstream (2 mph) in miles per hour. Calculate Ethan’s rate of speed (3 mph) in miles per hour for the entire expedition. 6 miles in 120 minutes is 3 mph. <p>Sample Strategies: The student creates a chart to organize the information for the expedition and uses the information to support his/her thinking.</p> <table border="1" data-bbox="793 894 1474 1203"> <thead> <tr> <th></th> <th>Downstream</th> <th>Upstream</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>Time</td> <td>30 minutes</td> <td>90 minutes</td> <td>120 minutes</td> </tr> <tr> <td>Distance</td> <td>3 miles</td> <td>3 miles</td> <td>6 miles</td> </tr> <tr> <td>Travel</td> <td>10 minutes per mile</td> <td>30 minutes per mile</td> <td>Average – 20 minutes per mile</td> </tr> <tr> <td>Rate</td> <td>6 mph</td> <td>2 mph</td> <td>3 mph</td> </tr> </tbody> </table> <p>Ethan travels downstream at 6 mph, he travels upstream at 2 mph. The overall expedition is 6 miles and takes 120 minutes; his overall rate of travel is 3 mph.</p>		Downstream	Upstream	Total	Time	30 minutes	90 minutes	120 minutes	Distance	3 miles	3 miles	6 miles	Travel	10 minutes per mile	30 minutes per mile	Average – 20 minutes per mile	Rate	6 mph	2 mph	3 mph	<ul style="list-style-type: none"> ✓ The student can represent his/her work in a clear, organized manner. ✓ The student states the final answer. ✓ The student explains the steps needed to solve the problem using appropriate mathematical language and symbols. ✓ The student uses the mathematical data in the problem to support his/her conclusions about Ethan’s varying rates of speed up and downstream, and his overall rate of speed for the expedition.
	Downstream	Upstream	Total																				
Time	30 minutes	90 minutes	120 minutes																				
Distance	3 miles	3 miles	6 miles																				
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Rate	6 mph	2 mph	3 mph																				

Level	Understanding	Strategies, Reasoning, & Procedures	Communication
Expert	<p>The student’s understanding will demonstrate all of the ‘proficient’ criteria.</p> <p>Task Extension: The expert in some way will demonstrate an exemplary understanding of the task and the mathematical concepts of applying or comparing rates.</p> <p>Here are some examples of an expert extension:</p> <ul style="list-style-type: none"> • The student explains the connection between the rate, time and distance. • The student may defend, justify, or analyze their mathematical procedures in regards to Ethan’s rate of speed and the rate of the river. 	<p>The student’s solution will demonstrate all of the ‘proficient’ criteria.</p> <p>Task Extension: The expert in some way will demonstrate an exemplary strategy of the task and the mathematical concepts.</p> <p>Here are some examples of an expert extension:</p> <ul style="list-style-type: none"> ✓ The student may solve the problem in more than one way and defend, justify or analyze their mathematical procedures. ✓ The student may explain the connection between the rate, time and distance. <p>Downstream: $\frac{3 \text{ miles}}{30 \text{ minutes}} = 10 \text{ minutes per mile} = 6 \text{ mph}$ ratio 6:1 (miles to hours)</p> <p>Upstream: $\frac{3 \text{ miles}}{90 \text{ minutes}} = 30 \text{ minutes per mile} = 2 \text{ mph}$ ratio 2:1 (miles to hours)</p> <p>Roundtrip: $\frac{6 \text{ miles}}{120 \text{ minutes}} = 20 \text{ minutes per mile} = 3 \text{ mph}$ ratio 3:1 (miles to hours)</p> <p>Ethan travels 6 mph downstream, 2 mph upstream and 3 mph for the overall expedition. The Up and downstream rates can’t be averaged, the time and distance ratio must be used to find the overall rate. 6 miles in 30 + 90 minutes (120 minutes) = 6:2 or 3:1 (miles to hours).</p>	<p>The student’s communication will demonstrate all of the ‘proficient’ criteria.</p> <p>Task Extension: The expert in some way will demonstrate an exemplary strategy of the task and the mathematical concepts.</p> <p>Here is an example of an expert extension:</p> <ul style="list-style-type: none"> ✓ Including a written rule, equation, generalization, and/or observation about his/her mathematical insights on the connection between rate, time, and distance. rates.