Smarter Balanced Assessment Consortium:

Picking a Pet Performance Task
Grade 6 Mathematics Practice Test
Scoring Guide
Draft July 2016

Picking a Pet

Your class is trying to decide what type of animal to get for the class pet. Your teacher is letting the class vote to choose a goldfish, a turtle, or a hamster as the class pet.

All 20 students in your class voted for both their 1st choice and their 2nd choice for the class pet. The results are shown in Table 1.

Table 1: Class Pet Votes

Student	1st Choice	2nd Choice	Student	1st Choice	2nd Choice
1	Turtle	Hamster	11	Turtle	Hamster
2	Goldfish	Hamster	12	Turtle	Goldfish
3	Goldfish	Turtle	13	Hamster	Turtle
4	Hamster	Turtle	14	Hamster	Goldfish
5	Goldfish	Turtle	15	Turtle	Goldfish
6	Turtle	Goldfish	16	Goldfish	Turtle
7	Hamster	Goldfish	17	Turtle	Goldfish
8	Turtle	Goldfish	18	Turtle	Goldfish
9	Goldfish	Hamster	19	Turtle	Hamster
10	Goldfish	Hamster	20	Goldfish	Hamster

1

Using the class data shown in **Table 1**, complete the following frequency table.

Pet	Total 1st Choice Votes	Total 2nd Choice Votes
Goldfish		
Hamster		
Turtle		

2

Create your own method for using the votes to decide a winner. Explain your method using the information from **Table 1** to determine the winning pet.

3

Your teacher wants to use a point system to select the winning pet. She wants each pet to get a certain number of points for each 1st choice vote and a certain number of points for each 2nd choice vote.

Your teacher decides to use these rules for her point system:

- Points need to be positive whole numbers.
- Points for a 1st choice vote have to be greater than or equal to the points for a 2nd choice vote.

Determine point values for the 1st and 2nd choice that would result in the **turtle winning.** Use words and numbers to explain how this point system results in the turtle winning.

(4)

Your classmate claims that there is **no** point system that could result in the goldfish winning. Do you agree or disagree with your classmate?

Use words and numbers to explain your reasoning.

(5)

Your principal surprises you by buying your class a turtle. He brings the turtle to your class along with a sheet from the pet store titled "Turtle Tank Rules."

The rules state:

- Tank walls must be at least 1 foot tall so the turtle can't climb out.
- There must be at least 400 square inches of floor space for the turtle to walk around on.

Your teacher says the volume of the tank must be smaller than 5000 cubic inches so it doesn't take up too much room in the classroom.

Give the dimensions of a tank that would work for your new turtle. Use words and numbers to explain how your tank satisfies the "Turtle Tank Rules" and your teacher's requirement.

Volume of a rectangular prism = length x width x height

(1)

Using the class data shown in **Table 1**, complete the following frequency table.

Pet	Total 1st Choice Votes	Total 2nd Choice Votes
Goldfish		
Hamster		
Turtle		

#1. Fill in table/numeric entry only - 1 point

Item	Claim	Domain	Target	DOK	Content	MP	Key
#1	2	SP, OA	2A	1	6.SP.B.5, 2.OA.A.1	1	See exemplar

Rubric (1 point): The student enters **all** correct values into the frequency table as shown below.

Pet	Total 1st Choice Votes	Total 2nd Choice Votes
Goldfish	7	8
Hamster	4	7
Turtle	9	5

Commentary:

The purpose of this question is primarily to assess whether the student understands the context and the representation (a table).

The context is reasonably authentic. Many schools have class pets. Keeping track of how many votes each pet earned is a reasonable expectation for 6th grade students.

Rationale for Content:

The content (addition and subtraction within 100) is securely held, as it is a 2nd grade standard. Although the primary standard (6.SP.B.5) is at grade level, students are essentially reading data from a table and summarizing the numerical data set in a context, which builds on standards addressed in previous grades.

> 6.SP.B.5: Summarize numerical data sets in relation to their context, such as by:
> > **a**. Reporting the number of observations.

Rationale for Claim:

The fact that the student must extract the quantities from a well-posed problem is what makes this item align to Target 2D.

> Claim 2, Target D: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas).

Rationale for DOK:

This item is a straightforward DOK 1. From the *Cognitive Rigor Matrix/Depth of Knowledge* chart:

> -Retrieve information from a table or graph to answer a question.

(2)

Create your own method for using the votes to decide a winner. Explain your method using the information from **Table 1** to determine the winning pet.

#2. Short answer – 2 points

Item	Claim	Domain	Target	DOK	Content	MP	Key
#2	4	SP	4E, 4D	3	4.OA.C.5, 6.SP.B	2, 3, 4	See sample responses

Rubric:
2 points: Student clearly describes his/her selected method for using votes to decide a winner AND explains which pet is the winner based on this method.

1 point: Student describes which pet won, but does not support his/her answer with a method, OR student clearly describes a method for using the given information to determine the winning pet, but then does not use his/her method to determine which pet won.

0 points: Student just states a winning pet without explanation.

Note: As long as students use their calculations correctly from Item 1 to answer Item 2, full credit should be granted.

Commentary:
The purpose of this question is for students to communicate their understanding of the context using the data provided in an authentic way: to determine the winning pet. Students are given some flexibility to utilize and assign values to the data in a way that makes sense to them. Students are asked to assign point values to the data and then communicate how those points determine the winning pet.

Rationale for Content:
The content of this item is securely held, as the standards comes from 4th grade.

> 4.OA.C.5: Generate a number pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

This aligns to the item because students are asked to create their own method for how the data are used and then use that rule to connect the data to the context.

Rationale for Claim:

This item is a "design under constraints" type of problem, which allows students to develop their own mathematical model and then interpret the results in the context. This is why this item falls under Claim 4, Targets E and D.

> Target E: Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.
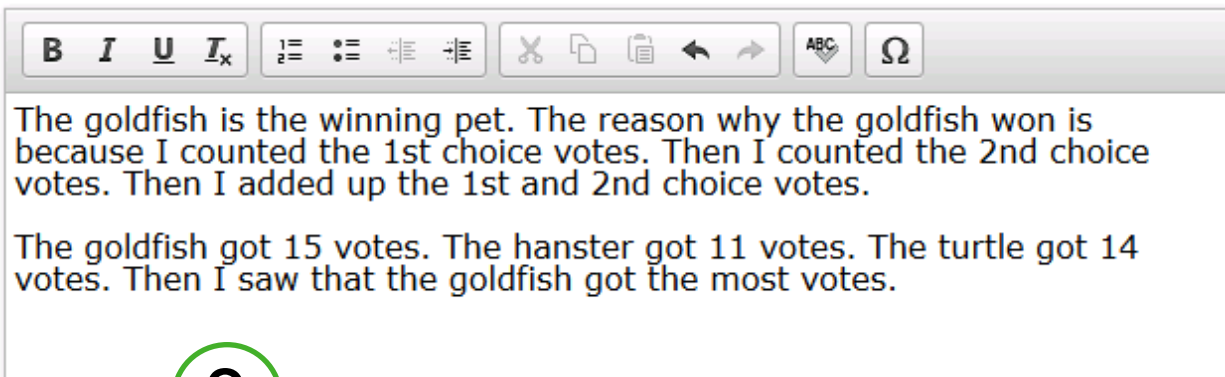>
> Target D: Interpret results in the context of a situation.

Rationale for DOK:

Because students are asked to develop a solution strategy and the item has more than one possible answer, this item is DOK 3.

What follows are sample responses and scoring annotations for Item 2.

Sample Response 2a

The goldfish is the winning pet. The reason why the goldfish won is because I counted the 1st choice votes. Then I counted the 2nd choice votes. Then I added up the 1st and 2nd choice votes.

The goldfish got 15 votes. The hanster got 11 votes. The turtle got 14 votes. Then I saw that the goldfish got the most votes.

SCORE POINT 2

The student clearly states his/her method of counting and adding the 1st and 2nd votes together to determine the winner. The response contains evidence of the student's competence in problem solving and modeling to the full extent that these processes apply to this item.

Sample Response 2b

> I would add the 1st choice and the 2nd choice and which ever is the highest would be the winner. I would do that because it would be fair.
>
> Goldfish 7 + 8 = 15 winner
> Hamster 4 + 7 = 11
> Turtle 9 + 5 = 14

2

The student shows his/her method of adding the 1st and 2nd votes together and states "which ever is the highest would be the winner." The response contains enough evidence of the student's competence in problem solving and modeling to receive full credit.

Sample Response 2c

> The pet that won is the turtle because it got more votes in the first time that is why its the winner.

1

Although it is true that the turtle got the most votes in the first round, the student did not clearly state that the method he/she used was to consider just the 1st place votes. The student has demonstrated only a **partial** understanding of the mathematical content and practices essential to this item.

Sample Response 2d

> The Goldfish won becuse it got the todle of 15 votes. first i counted the first vote and it was 7. Then i counted 2 votes and it was 8. Finaly I added 8 + 7 to get the todle.

SCORE POINT 1

The student states that he/she added the 1st and 2nd choice votes, but fails to compare this total with the other pets. The student has demonstrated only a **partial** understanding of the mathematical content and practices essential to this item.

Sample Response 2e

	first choice	second choice	
Goldfish	7	8	=15
Hamster	4	7	=11
Turtle	9	5	=14

SCORE POINT 0

Although correct information and calculations are shown, the student did not explain which pet won and did not describe a method for determining the winner. No evidence is present that demonstrates the student's understanding of the mathematical content and practices essential to this item.

(3)

Your teacher wants to use a point system to select the winning pet. She wants each pet to get a certain number of points for each 1st choice vote and a certain number of points for each 2nd choice vote.

Your teacher decides to use these rules for her point system:

- Points need to be positive whole numbers.
- Points for a 1st choice vote have to be greater than or equal to the points for a 2nd choice vote.

Determine point values for the 1st and 2nd choice that would result in the **turtle winning.** Use words and numbers to explain how this point system results in the turtle winning.

#3. Short answer – 2 points

Item	Claim	Domain	Target	DOK	Content	MP	Key
#3	4	SP	4D, 4B	3	4.OA.A	2, 3, 4	See sample responses

Rubric:

2 points: The student describes a method that meets the two criteria (assigns positive whole number of points to each first choice and second choice, and 1st choice is greater or equal to the 2nd choice values) AND gives a valid explanation for why the turtle wins using this method.

1 point: The student describes a method that meets the two criteria (assigns positive whole number of points to each first choice and second choice, and 1st choice is greater or equal to the 2nd choice values), but does not give a valid explanation for why the turtle wins using this method.

OR

The student gives a valid explanation for why the turtle wins using this method, but does not describe the method.

0 points: No viable method or viable explanation is provided.

Commentary:
The purpose of this question is allow students to design a point structure that has a predetermined outcome. There is no one correct solution, so students are given the freedom to design a point system and then defend why their system results in the turtle becoming the class pet.

Rationale for Content:
This is securely held content in that it is primarily adding, multiplying, and comparing whole numbers.

> 4.OA.A: Use the four operations with whole numbers to solve problems.

Rationale for Claim:
This question is intended to be a "design under constraints" modeling task. The students have data (the class voting data) and are asked to describe a method of assigning values that meet two criteria. Additionally, they need to explain how their method, when applied to the data, results in the desired outcome.

> Target D: Interpret results in the context of a situation.

> Target B: Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem.

Rationale for DOK:
This is a straightforward DOK 3 problem. From the *Depth of Thinking* chart:

DOK 3, Understand:
- Use concepts to solve non-routine problems
- Explain reasoning when more than one response is possible

What follows are sample responses and scoring annotations for Item 3.

| B | I | U | I$_x$ | | | | | | | | | | | | ABC | Ω |

```
              1st choice   2nd choice

Goldfish      7 x 10       8 x 5    = 70 + 40 = 110
Hamster       4 x 10       7 x 5    = 40 + 35 = 75
Turtle        9 x 10       5 x 5    = 90 + 25 = 115
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So what I did was make every 1st place vote times 10 and every 2nd place vote times 5. The turtle wins because it has 115 and the hamster has 75 and the goldfish has 110.

SCORE POINT 2

The student correctly describes a method that meets the criteria and provides a valid explanation for why the turtle wins using this method. The response contains evidence of the student's competence in problem solving and modeling to the full extent that these processes apply to this item.

| B | I | U | I$_x$ | | | | | | | | | | | | ABC | Ω |

I can make the turtle win by making all the first choice votes being 2 points and all the second choice votes being 1 point.

This way the goldfish has 7 times 2 and 8 points, so 22 points.
The hamster has 5 times 2 and 7 points, so 17 points.
And the turtle has 9 time 2 and 5 points, so 23 points.

SCORE POINT 2

The student clearly states his/her method of assigning 2 points to each 1st choice vote and 1 point to each 2nd choice vote and declares the turtle the winner with this method. Although, the hamster only had 4 1st choice votes, it is consistent with the student's tallies in question 1, therefore it receives full credit for the response.

Goldfish 21 16
Hamster 15 14
Turtle 27 10

Each 1st choice vote times 3 and each 2nd choice vote times 2.
The turtle wins because it has 37 points.

SCORE POINT 1

The student correctly described a method that meets the criteria of positive whole numbers and 1st choice points greater than or equal to 2nd choice points. However, the student didn't recognize that these point values create a tie between the goldfish and turtle. This error prevents the response from receiving full credit.

If the turtle wants to win in the first choice it would have 27 votes and for the second choice it would have 15 votes, which is 42 votes. That way the turtle would win over the goldfish and hamster. Each vote countes 3 points.

SCORE POINT 1

The student describes a method "each vote countes 3 points" implying that both 1st and 2nd choice votes receives 3 points and even correctly indicates the number of votes the turtle would have using the stated method. However, the student doesn't recognize that these point values would actually mean the goldfish would win and the explanation is incomplete. The student has demonstrated only a **partial** understanding of the mathematical content and practices essential to this item.

Goldfish 7
Hamster 4
Turtle 9

The turtle has more because it has 9 points and the rest have less.

SCORE POINT 0

The student gives a potentially valid explanation, but the method is not described. Additionally, the inferred method (1 point for first choice votes and 0 points for second choice votes) does not meet the criteria (positive whole number values). There are significant omissions that indicate a lack of comprehension in regard to the mathematical content and practices essential to this task.

4

Your classmate claims that there is **no** point system that could result in the goldfish winning. Do you agree or disagree with your classmate?

Use words and numbers to explain your reasoning.

#4. Short answer – 2 points

Item	Claim	Domain	Target	DOK	Content	MP	Key
#4	3	SP	3G, 3F	3	4.OA.A	3	Varies (see rubric)

Rubric:

2 points: The student disagrees with his/her classmate's claim and explains his/her reasoning by providing a point system for 1st and 2nd choice which meets the criteria from Item 3 and results in the Goldfish winning the contest. For example: Equal values for 1st and 2nd choice, 4 pts for 1st and 3 pts for 2nd, etc.

1 point: The student disagrees with his/her classmate's claim and provides a point system for 1st and 2nd choice which may be flawed or lack sufficient detail, OR the student agrees with his/her classmate's claim and provides a point system that supports his/her position.

0 points: No scoring method or incorrect scoring method given.

Commentary:
The purpose of this question is to allow students an opportunity to challenge the claim of a classmate and design a point system to achieve the outcome of a Goldfish victory to support their reasoning. There are multiple correct solutions, so students are given the freedom to design any point system and defend how their system results in the Goldfish winning the contest.

Rationale for Content:
This is securely held content in that it is primarily adding, multiplying, and comparing whole numbers.
>   4.OA.A: Use the four operations with whole numbers to solve problems.

Rationale for Claim:
This question is intended to be an opportunity for students to communicate reasoning by challenging a claim of a classmate. While the classmate's claim is true for some point systems, the student can argue that there are a number of alternative point systems that can result in the Goldfish winning and can provide an example of such to support his/her proposition.
>   Target G: At later grades, determine conditions under which an argument does and does not apply. (For example, area increases with perimeter for squares, but not for all plane figures.)
>
>   Target F: Base arguments on concrete referents such as objects, drawings, diagrams, and actions.

Rationale for DOK:
This is a straightforward DOK 3 problem. From the *Depth of Thinking* chart: DOK 3, Understand:
- Use concepts to solve non-routine problems
- Explain reasoning when more than one response is possible

(5)

Your principal surprises you by buying your class a turtle. He brings the turtle to your class along with a sheet from the pet store titled "Turtle Tank Rules."

The rules state:
- Tank walls must be at least 1-foot tall so the turtle can't climb out.
- There must be at least 400 square inches of floor space for the turtle to walk around on.

Your teacher says the volume of the tank must be smaller than 5000 cubic inches so it doesn't take up too much room in the classroom.

Give the dimensions of a tank that would work for your new turtle. Use words and numbers to explain how your tank satisfies the "Turtle Tank Rules" and your teacher's requirement.

Volume of a rectangular prism = length x width x height

#5. Short answer – 2 points

Item	Claim	Domain	Target	DOK	Content	MP	Key
#5	4	MD	4D, 4B	3	5.MD.C.5	2,3,4	Varies

Rubric:

2 points: The student gives dimensions that satisfy all three constraints (height, base area, and volume) and provides an explanation as to why the chosen dimensions meet all requirements.

1 point: The student gives dimensions that satisfy all three constraints (height, base area, and volume), but does not provide an explanation as to why the chosen dimensions meet all requirements, OR the student gives

dimensions that satisfy two of the three constraints and provides an explanation that supports those dimensions.

0 points: Student only gives dimensions to satisfy one of the constraints and does not provide any valid explanation.

Commentary:
This item is intended to give students flexibility in their approach and dimension choice. Given the three parameters (height, base area, and volume), students need to manipulate numbers within the context to satisfy all restrictions. This is a design under constraints item whose purpose is to allow students to think flexibly within a mathematical context.

Rationale for Content:
The content is securely held, as it comes from 5th grade Measurement and Data domain. Students are asked to use and calculate volume in a real-world context and interpret their selected measurements to determine whether the three parameters were met.

> 5.MD.C.5: Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume.

Rationale for Claim:
As a "design under constraints" problem, students are required to select values for the dimensions of the tank, interpret those values as they relate to volume, and determine whether those dimensions satisfy all three constraints. Because of this, this item is Claim 4, Target D and Target B.

> Target D: Interpret results in the context of a situation.

> Target B: Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem.

Rationale for DOK:
Because students are asked to develop a solution strategy and the item has more than one possible answer, this item is DOK 3.

The hand-scored items in this guide are both 2-point short-text items. The general rubric that is used as a basis for scoring all 2-point short-text items is shown below.

Although item-specific rubrics are also provided to scorers to facilitate the hand-scoring of short-text items, every response should be able to map back to this general rubric in a consistent and reliable manner.

Smarter Balanced Mathematics General Rubric for 2-Point Items

Score	Description
2	The student has demonstrated a **full and complete** understanding of all mathematical content and practices essential to this task. The student has addressed the task in a mathematically sound manner. The response contains evidence of the student's competence in problem solving, reasoning, and/or modeling to the full extent that these processes apply to the specified task. The response may, however, contain minor flaws that do not detract from a demonstration of full understanding.
1	The student has demonstrated a **partial** understanding of the mathematical content and practices essential to this task. The student's response contains some of the attributes of an appropriate response but lacks convincing evidence that the student fully comprehends the essential mathematical ideas addressed by this task. Such deficits include evidence of insufficient mathematical knowledge; errors in fundamental mathematical procedures; and other omissions or irregularities that bring into question the student's competence in problem solving, reasoning, and/or modeling related to the specified task.
0	The student has demonstrated **merely an acquaintance** with the topic, or provided a completely incorrect or uninterpretable response. The student's response may be associated with the task, but contains few attributes of an appropriate response. There are significant omissions or irregularities that indicate a lack of comprehension in regard to the mathematical content and practices essential to this task. No evidence is present that demonstrates the student's competence in problem solving, reasoning, and/or modeling related to the specified task.