CORE Assessment Module
Module Overview

Content Area	Mathematics
Title	Photos
Grade Level	Grade 7
Problem Type	Performance Task

Standards for Mathematical Practice	**Mathematical Practice 2 (MP2):** Reason abstractly and quantitatively.
	 Mathematically proficient students:
	 • Make sense of quantities and their relationships in problem situations.
	 • Bring two complementary abilities to bear on problems involving quantitative relationships:
	    o Decontextualize—to abstract a given situation and represent it symbolically; and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents) and
	    o Contextualize— to pause as needed during the manipulation process in order to probe into the referents for the symbols involved).
	 • Use quantitative reasoning that entails creating a coherent representation of the problem at hand, considering the units involved, attending to the meaning of quantities (not just how to compute them) and knowing and flexibly using different properties of operations and objects.
	
	 Mathematical Practice 6 (MP6): Attend to precision.
	 Mathematically proficient students:
	 • Communicate precisely to others.
	 • Use clear definitions in discussion with others and in their own reasoning.
	 • State the meaning of the symbols they choose, including using the equal sign consistently and appropriately.
	 • Specify units of measure and label axes to clarify the correspondence with quantities in a problem.
	 • Calculate accurately and efficiently and express numerical answers with a degree of precision appropriate for the problem context.
	    o In the elementary grades, students give carefully formulated explanations to each other
	 In high school, students have learned to examine claims and make explicit use of definitions.

Common Core State Standards	**7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers. **7.RP.1** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas, and other quantities measured in like or different units.. **7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2a** Decide whether two quantities are in a proportional relationship. **7.RP.2b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **7.RP.2c** Represent proportional relationships by equations. o **7.RP.2d** Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the

	points (0,0) and (1, *r*) where *r* is the unit rate.
SBAC Assessment Claims	**Claim 4**: **Modeling and Data Analysis**—Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Task Overview	Students will be asked to solve constructed response questions examining the aspect ratio of various sizes of photographs compared to an 8 in.-by-12 in. photo paper. Students will analyze whether the ratio of the width to the height of a photograph is proportional to that of the paper, represent proportional relationships on a graph and/or by equations, and draw conclusions when the ratio is maintained and when it is not. Additionally, they will develop logical arguments and cite evidence to support their reasoning.
Module Components	1) Scoring Guide 2) Task

*Performance Tasks: Modified "Photos," Mars Task, grade 8, 2009.

Photos
Scoring Guide

Description The core element of performance required by this task is: • Show understanding of ratio and proportional relationships. Based on this, credit for specific aspects of performance should be given as follows:	Points	Total Points

1. a. Student gives correct answers: 8:12 4:6 2:3 1:1.5 16:24 24:36
  with **no extra ratios circled**
  • Partial credit can be given for:
   ○ 4 or 5 correctly circled with no extras or 6 correct and 1 extra
   ○ 3 or 2 correctly circled with no extras or 4 to 5 correct and 1 extra
	3
	
	(2)
	(1)
		3

b. Sample response should include statements such as:
  • 4:6 is a correct ratio because the ratio is "width to height"
  • Dividing both the numerator and denominator by 2 gives a ratio equivalent to 8:12
	
	1
	1
		2

c. Sample response should include statements such as: • 12:8 or 3:2 is an incorrect ratio because the ratio used is "height to width" and the correct ratio should be "width to height."	1	1
2. a. Student gives correct answer: 4 inches by 6 inches b. Student gives correct answer: 19 Students shows work for 2a and 2b (This may include correct process, but incorrect arithmetic)	1 1 2	4
3. a. Student gives correct answer: 1.5 inches	1	1

b. Student shows work for two different methods.
  • Set up the ratio 8:12 and divide both the numerator and denominator by 8
  • Set up and solve the proportion $8/12 = 1/x$
  Explanation should include at least two of these "look for" phrases:
  • If I must divide the 8-by-8 to get 1 inch for the width, then I must divide the 12-by-8 to get 1.5 inches for the height.
  • Set up the proportion, cross multiply, and solve for x.
  • Set up the proportion, multiply both sides by a common denominator and solve for x.
	
	1
	1
	
	1
	1
		4

c. Student gives correct answer: The maximum number is 64 photos.	1	1

d. Students writes a convincing argument that might include:
  • The area of each small picture is 1.5 in.^{2} and the area of the paper is 96 in.^{2}, so dividing 96 by 1.5 happens at most 64 times.
  • Because the aspect ratio of the width of the page to the height of the page is equivalent to the aspect ratio of the width of the small photo to the height of the small photo, then the orientation of the photos to the paper will maintain the aspect ratio. It will cover the whole paper and have no leftovers.
  • If the short side of every picture is oriented to the long side of the paper, you will only get 60 photos and there will be unused   space on the paper
  • You won't get as many photos because the aspect ratio would not be the same, i.e., 8:12 versus 1.5:1.
  • If you your photos have mixed orientations, it is possible to again get 64 photos and use up all of the paper; 64 in.^{2} is the maximum area possible.
	3
	or
	
	3
	
	or
	
	1
	
	1
	
	1
		3

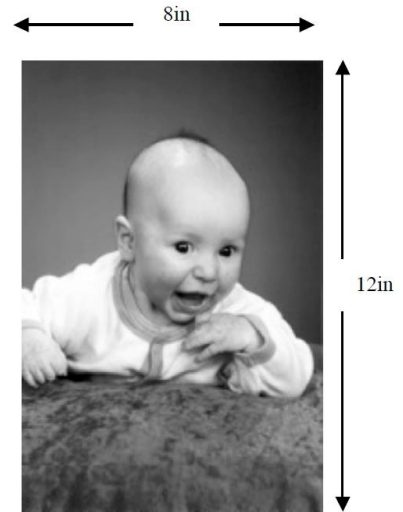| Description The core element of performance required by this task is: • Show understanding of ratio and proportional relationships. Based on this, credit for specific aspects of performance should be given as follows:	Points	Total Points
4. a. Students correctly plots (2, 3), (4, 6), and (8, 12) on a coordinate graph. Give 1 pt for each point plotted.	1–3	3
b. Student correctly draws 3 rectangles with (0, 0) as a common vertex: • First rectangle: (0, 0) as one vertex and (2, 3) as the diagonal vertex. • Second rectangle: (0, 0) as one vertex and (4, 6) as the diagonal vertex. • Third rectangle: (0, 0) as one vertex and (8, 12) as the diagonal vertex.	1 1 1	3
c. Student gives correct answer: It represents a photo that is 1 inch wide by 1.5 inches tall.	1	1
d. Student correctly explains that you would multiply the width by 1.5 to determine the height. Student may also refer to the slope of the line through the diagonals of the rectangles (1.5/1) to justify their reasoning. Give 1 pt for a limited response or 2 pt for a complete response	1–2	2
e. Student gives correct answer: Jan is not correct. Student correctly explains why Jan is incorrect: • Using the cross product with 8/12 = 5/7 gives 56 = 60; because they aren't equal, they are not proportional, so the aspect ratio isn't the same. • A geometric explanation would be that the point (5, 7) is not on the same diagonal as the other photos with an aspect ratio of 8:12.	1 2	3
5. a. Sample responses may include: (6, 9) (10, 15) (12, 18) (1.5, 2.25), etc.	1	3
b. Student gives correct answer, which are infinitely many Student explanation should include: • You can get an infinite number of rectangles with the same aspect ratio of 2:3 by doing the following: For any width that you are given, as long as you divide the width by 2 and multiply that answer by 3 you will generate the corresponding height. Give1 pt for a limited response or 2 pt for a complete response	1 1–2	3
6. a. Student gives correct answer: 600:800 or 3:4	1	1
b. Student correctly explains that the two ratios are not equal, which accounts for part of the photo being cropped off when it is developed. Give 1 pt for a limited response or 2 pt for a complete response	1–2	2
TOTAL POINTS: (possible points = 40 points)		

Photos

The *aspect ratio* of a photograph is the ratio of the photograph's width to its height.

1. a. Which of the ratios listed below correctly represents the aspect ratio of this 8-inch wide by 12-inch high baby photo? Circle each correct ratio.

   8:12   12: 8   4:6   2:3
   3:2   1:1.5   16:24   24:36

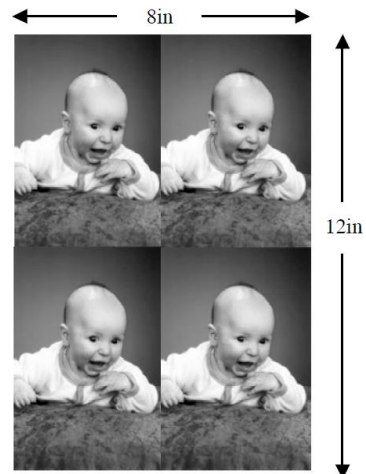   b. Choose one of the ratios that you circled and explain why it is correct.

   c. Choose a ratio that you did not circle and explain why it is incorrect.

2. When the length and width of the photo are halved, four photos fit on the 8-inch by 12-inch page. However, the aspect ratio of each photo is still the same as the original 8-inch by 12-inch photo.

   a. What are the new measurements of each photo?

   b. If you want 75 copies of this smaller size photo to use for holiday cards, how many 8-inch by 12-inch pages would you need to print?
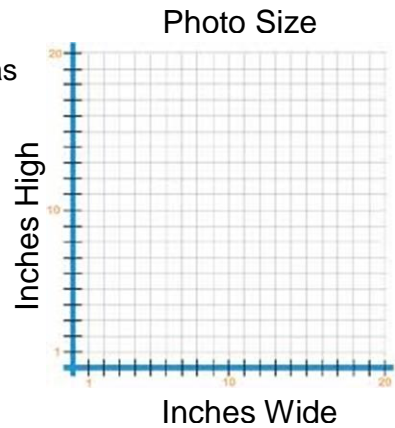
   Show your work.

3. To use the photo on a key chain, the photo is reduced to a width of 1 inch, keeping the aspect ratio the same.

   a. What is the height of the photo used for key chains?

   b. Show and explain two different ways to find this height.

   c. What is the maximum number of key chain size photos that will fit on the 8-inch by 12-inch page?

   d. How do you know that this is the maximum number of photos? Write a convincing argument for your answer.

4. You can draw rectangles on a coordinate plane to represent the size of possible photos. The width and height of the photo can be represented using ordered pairs (width, height) such as (2, 3).

   a. On a graph, plot the ordered pairs that represent each of the following three photo sizes. (Each size is given as width by height.)

      - 2 inches by 3 inches
      - 4 inches by 6 inches
      - 8 inches by 12 inches

   Photo Size

   Inches High

   Inches Wide

   b. Draw the rectangles, on the coordinate plane from 4a, that represent the three photos. These photos have the same aspect ratio.

   c. What does point (1, 1.5) on the graph from 4a represent?

   d. If you are given a photo's width and the photo has the same aspect ratio as the photos in part a, how could you find the photo's height?

   e. Jan claims that point (5, 7) represents a photo with the same aspect ratio as those in part a. Explain whether she is correct or not. Show the work to support your explanation.

5. a. Determine three additional photo sizes that have the same aspect ratio as those in question 4a.

    b. Predict how many additional rectangles could be drawn on the graph to represent photos with the same aspect ratio as those in question 4a. Explain your reasoning.

6. Most digital cameras capture images that are 600 pixels wide by 800 pixels high.

    a. What is the aspect ratio of a typical digital camera image?

    b. When you order 4-inch by 6-inch prints of photos taken on a digital camera, the original images are often cropped. This means that parts along the edges of the original images are not included in the printed photos. Use aspect ratios to explain why this occurs.