Claim 2: Problem Solving

The Smarter Balanced summative mathematics assessment and its relationship to instruction

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What is Claim 2?

- Addresses students' ability to solve a range of well-posed problems.
  - In context
  - Pure mathematics
- Students must develop a pathway to the solution that may not be readily apparent.

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More Information

- More information about problem solving for Claim 2 is available online in the [Mathematics Content Specifications](#).

Claim 2 requires use of content in the Standards

- Making sense of problems and solving them is at the heart of doing mathematics.
- Content for Claim 2 can come from on-grade-level or below skills.
- Some content lends itself easily to problem solving.

Primary problem-solving emphases by grade

Grade 3	Grade 4	Grade 5
3.OA.A	4.OA.A	5.NBT.B
3.OA.D	4.NBT.B	5.NF.A
3.NBT.A*	4.NF.A	5.NF.B
3.MD.A	4.NF.B	5.MD.A*
3.MD.B*	4.NFC	5.MD.C
3.MD.C	4.MD.A*	5.G.A*
3.MD.D*	4.MD.C*	

Grade 6	Grade 7	Grade 8
6.RP.A	7.RP.A	8.EE.B
6.NS.A	7.NS.A	8.EE.C
6.NS.C	7.EE.A	8.F.A
6.EE.A	7.EE.B	8.F.B*
6.EE.B	7.G.A*	8.G.A
6.EE.C	7.G.B*	8.G.B
6.G.A*		8.G.C*

*Denotes additional and supporting clusters

High School		
N-Q.A	A-REI.B	F-IF.C
A-SSE.A	A-REI.C	F-BF.A
A-SSE.B	A-REI.D	G-SRT.C
A-CED.A	F-IF.A	S-ID.C
A-REI.2	F-IF.B	S-CP.A

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Claim 2 is based on the Mathematical Practices

- Mathematical Practices 1, 5, 7, and 8 are foundational support for Claim 2
  - 1. Make sense of problems and persevere in solving them
  - 5. Use appropriate tools strategically
  - 7. Look for and make use of structure
  - 8. Look for and express regularity in repeated reasoning

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Additional information on Claim 2 and the Mathematical Practices

- The [Smarter Balanced Content Specifications](#), with additional information on how these practices inform Claim 2, is available online.

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Problem Solving: A variety of skills

- Claim 2 has four targets, built upon the foundation of four mathematical practices.

- The four targets are the same for all grades.

- Each target describes a skill that is important to the problem-solving process.

Target A: Solve well-posed problems

Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace.

- Problems should be completely formulated.

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Solving Problems

Grade 3

James gets home from school at 3:30 p.m. He completes 2 chores. Then he plays his computer game until 5:00 p.m.

Tasks	Time to Complete
Walk dog	20 minutes
Clean room	40 minutes

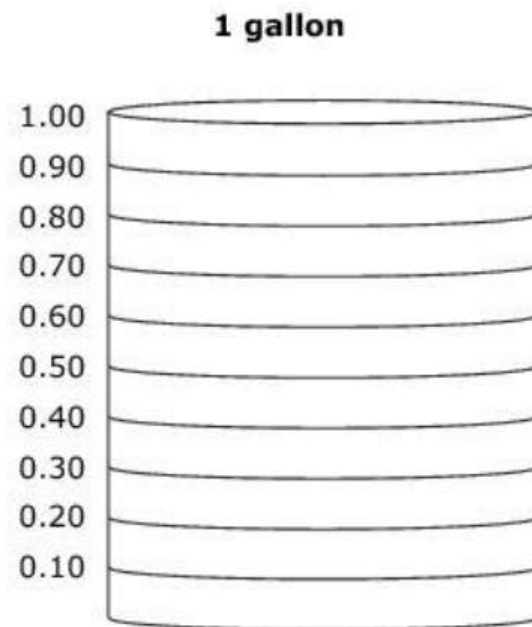Enter the **greatest** number of minutes that James can play his computer game.

Grade 7

Tim makes 80 gallons of paint by mixing 48 gallons of green paint with 32 gallons of blue paint.

What part of every gallon is from green paint?

The model represents 1 gallon of mixed paint.

Select the bars to show how much of the gallon is from green paint.

1 gallon

1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10

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Target B: Use of tools

Select and use appropriate tools strategically.

- Tools may include:
    - Graph paper
    - Protractors, compasses, calculators
    - Formulae
    - Other "tools" mathematicians use to help them solve problems.

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Tools

Nate waters the garden every 3 days and weeds it every 4 days.

He does both on April 2nd.

What is the next date that he will both water and weed his garden?

Select that date on the calendar.

APRIL						
Sun	Mon	Tues	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

➤ High School

Select the calculator viewing window that would allow you to see the maximum value of the following quadratic function.

$$f(x) = -3x^2 + 22x - 7.$$

A. $-7 \le x \le -3$ and $-40 \le y \le 0$

B. $-7 \le x \le -3$ and $0 \le y \le 40$

C. $3 \le x \le 7$ and $-40 \le y \le 0$

D. $3 \le x \le 7$ and $0 \le y \le 40$

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Target C: Interpret results in context

Interpret results in the context of a situation.

- Students interpret their solution based on the problem's context.

Grade 4

Greg has 76 marbles. He gives an equal number of marbles to each of 9 people. He keeps the remaining marbles. How many marbles does Greg keep?

High School

A rectangular garden measures 13 meters by 17 meters and has a cement walkway around its perimeter, as shown. The width of the walkway remains constant on all four sides. The garden and walkway have a combined area of 396 square meters.
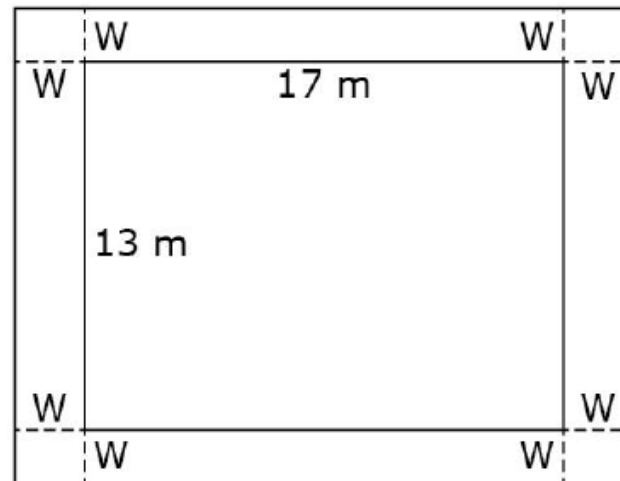
Part A
Enter an equation in the first response box that can be solved for the width, W, of the walkway.

Part B
Determine the width, in meters, of the walkway. Enter your answer in the second response box.

Target D: Identify quantities and map relationships

Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas).
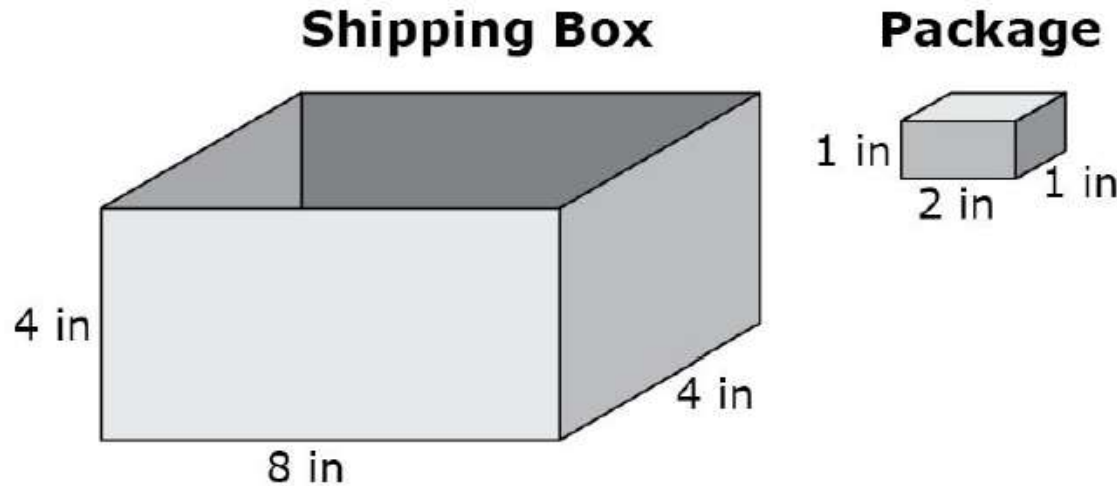
- Students must determine the relationship between two quantities given in a problem and then solve it.

Quantities

➡ Grade 5

Tonya must completely fill a shipping box with as many packages as possible. Each package measures 1 inch by 2 inches by 1 inch. The shipping box she must use measures 4 inches by 8 inches by 4 inches.

Shipping Box   **Package**

4 in

8 in

4 in

1 in

2 in

1 in

What is the **greatest** number of packages that can fit into the shipping box?

➡ Grade 8

A sphere and a cone have the same volume. Each has a radius of 3 inches. What is the height of the cone?

A.   4 inches
B.   6 inches
C.   9 inches
D.   12 inches

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More information on Claim 2 examples

- More example Claim 2 items for each target are available online in the [Smarter Balanced Content Explorer](#).
  - Begin by selecting a grade to explore, then select mathematics. Finally select the claim to explore.

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How Claim 2 informs assessment

- Claim 2 describes skills that make up the problem-solving process.
- Students will encounter situation situations they have not seen before.
- Students can enter the problem using a variety of strategies.
- Claim 2 are well-posed. Claim 4 are "messy."
- Together Claim 2 and 4 account for one-fourth of the summative assessment.

More information on Claim 2 assessment

- More information on Claim 2 on the summative assessment, both the computer-adaptive and the performance task portions, is available online in the [Test Blueprints](#).

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How Claim 2 informs instruction

- Key themes for problem-solving instruction
  - Grades 3–5: Fractions and the four basic operations
  - Grades 6–7: Ratios and proportions, number systems, and equations and expressions
  - Grade 8: Equations and expressions, functions, and geometry
  - High School: Algebra and functions

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How Claim 2 informs instruction: Continued

- Claim 2 target can help teachers understand the skills students should develop related to problem solving.

- Classroom instruction and assessment should not be limited by large-scale assessment restrictions.

- Problem solving helps deepen conceptual understanding and procedural fluency.

- Productive struggle develops a positive mindset.

- Applying all of the related math practices develops a strong foundation for problem solving.

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Further help

- Specific Claim 1, 3, and 4 videos are available on the website to get a more complete picture of each claim and the skills students should develop through focused instruction.

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