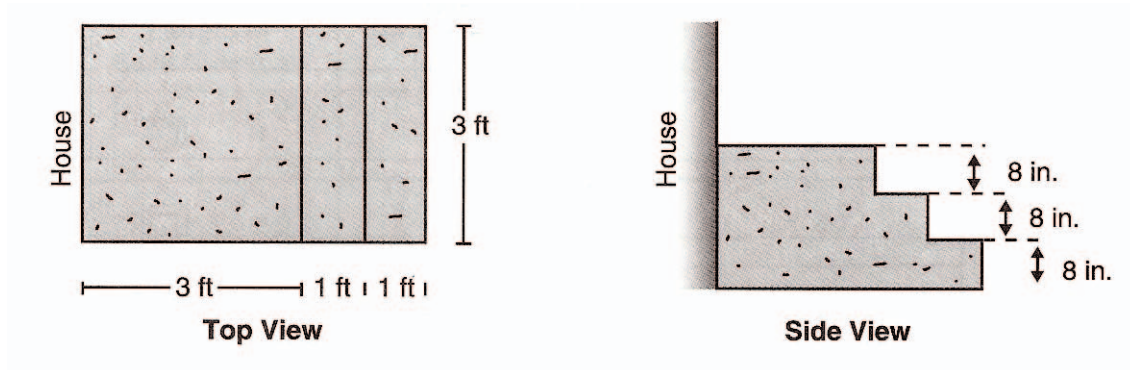


13. Homeowners want to replace some old wooden steps with concrete steps. They make the following drawings and bring them to your construction company. They want an estimate of the total cost.



You explain that a wooden form is built for each step, and concrete is then poured into the form. Concrete is delivered in cubic yards. The bottom step is completed first, then the middle, and then the top. You show them the drawing and the price list below.

	<p>Delivered ready-mixed concrete \$40/cu yd</p> <p>8 in. wide wooden forms with 1 in. thick boards. \$1.50/ft</p> <p>Surfacing the concrete. \$0.50/sq ft (putting smooth surface on step areas)</p>
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Scoring Rubric

Grade 10 Mathematics WASL Practice Test Item 13	
Strand: Communicates Understanding	
(CU02)	Learning Target: (Organize, Represent and Share Information) Organize, clarify, and refine mathematical information for a given purpose; use everyday and mathematical language and notation in appropriate and efficient forms to clearly express or represent complex ideas and information; explain and/or represent complex mathematical ideas and information in ways appropriate for audience and purpose in a context that is relevant to tenth grade students (4.2.1, 4.2.2, 4.2.3)
A 4-point response demonstrates mathematical communication by doing the following:	
<ul style="list-style-type: none">• Includes all four (4) components: wood, surfacing, concrete, and total.• Presentation has a layout that is clear, organized, includes identifications, and sequencing is appropriate.• Labels for at least two of the three components (ft, ft², and ft³) are used sufficiently to demonstrate understanding of and appropriate use.• Conversions between measurements such as cubic feet to cubic yards, and calculations are appropriate and accurate.	
A 3-point response includes <u>three</u> of the four listed above.	
A 2-point response includes <u>two</u> of the four listed above.	
A 1-point response includes <u>one</u> of the four listed above.	
A 0-point response shows little or no mathematical understanding of the task	

13. The homeowners ask you to figure out the total cost and explain it to them. Create an organized job list for the cost part of the estimate.

Make sure your estimate is supported by calculations of cost based on all materials used.

~~500.00 ft² = 300 cu ft~~ 3.3 = 9 2(11 1/2 * 3) 5.5
 2 1/3 ft * 3 ft * 3 ft = 6 cu ft 1.3 = 3
 2 1/3 ft * 3 ft * 4 ft = 8 cu ft 1.3 = 3
 2 1/3 ft * 3 ft * 5 ft = 10

$$\frac{24 \text{ cu ft}}{27} = .88 \text{ yd} \cdot 40 \$ = \boxed{\$35.50}$$
 3 ft lin
 4 ft lin
 5 ft lin

$$\frac{12 \text{ ft } 3 \text{ in}}{24 \text{ ft } 6 \text{ in} + 9 \text{ ft}} = 33 \text{ ft } \frac{9 \text{ in}}{12} = 33 \frac{3}{4} \text{ ft} = \boxed{\$50.30}$$

After finding the cubic feet, I divided by 27 to find the cubic yds. I multiplied to find the cost of the concrete. To find the amount of forms needed, I first found the I needed 3 boards on each side, measuring 3 ft lin, 4 ft lin and 5 ft lin. I added them then multiplied by 2 to find it on both sides. For the front forms I needed 3 3 ft boards. It totaled 33 ft 9 in * \$1.50 = \$50.30. After finding the surface area of all the surfaces uncovered by making to find the step area I multiplied by .50 to find the cost of the surfacing. Then I added all costs together.

Total cost = \$93.11

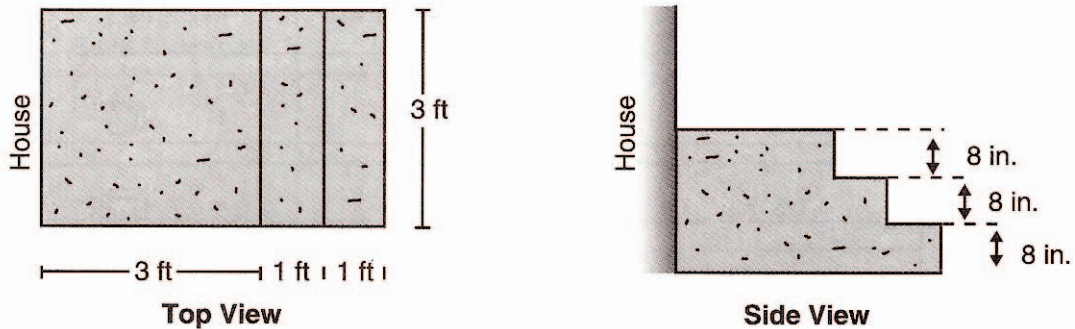
Score:

4

Annotation:

The student shows understanding of mathematical communication by including all four components; having a presentation that is clear and organized; appropriately using labels (3 of 3); and using appropriate conversions and calculations. This response addresses all four of the elements. This response earns four points.

13. Homeowners want to replace some old wooden steps with concrete steps. They make the following drawings and bring them to your construction company. They want an estimate of the total cost.



You explain that a wooden form is built for each step, and concrete is then poured into the form. Concrete is delivered in cubic yards. The bottom step is completed first, then the middle, and then the top. You show them the drawing and the price list below.

The drawing shows a 3D perspective of a wooden form for a concrete step. The form is made of wooden boards and is labeled "Step area" and "Wooden form".

Delivered ready-mixed concrete \$40/cu yd

8 in. wide wooden forms with 1 in. thick boards. ..\$1.50/ft

Surfacing the concrete. ..\$0.50/sq ft (putting smooth surface on step areas)

Handwritten calculations:

21
36 \$54

$2\frac{1}{2} \cdot \frac{2}{3} \cdot \frac{1}{2} = \frac{35}{216}$

step 24 ft^3 9 ft^3

$\frac{35}{36} \text{ ft}^3$ 8 yd^3

$\frac{2}{3} \cdot 3 \cdot 3 = 6 \text{ ft}^3$

$4 \cdot \frac{2}{3} \cdot 3 = 8 \text{ ft}^3$

10 ft^3

$\frac{8}{9}$

13. (continued)

The homeowners ask you to figure out the total cost and explain it to them. Create an organized job list for the cost part of the estimate.

Make sure your estimate is supported by calculations of cost based on all materials used.

1) Boards = $[(3+4+5) \cdot 2 + (3 \cdot 3)] \cdot 11.50 = \19.5

2) Concrete = $\frac{2}{3} \cdot 3 \cdot 3 = 6 \text{ ft}^3$, $4 \cdot \frac{2}{3} \cdot 3 = 8 \text{ ft}^3$, $5 \cdot \frac{2}{3} \cdot 3 = 10 \text{ ft}^3$. $6+8+10 = 24 \text{ ft}^3$

of concrete needed $\frac{8}{9} \text{ yd}^3 \cdot \frac{1}{27} = \frac{8}{243} \text{ yd}^3$ $\$35.56$

3) Surfacing concrete = $3 \cdot 3 = 9 \text{ ft}^2 + 1 \cdot 3 + 1 \cdot 3 = 15 \text{ ft}^2 \cdot .50 = \7.50

To make the steps you want, we must first get 33 ft of wood at \$1.50 per ft. That will cost \$49.50. To find this I added $[2(3+4+5) + (3+3+3)] = 33 \text{ ft}$.

To find the amount of concrete needed I found the area of the steps. To be exact the price is a little higher because I didn't subtract the area of the boards, but this is an estimate. Area equals $[(\frac{2}{3} \cdot 3 \cdot 3) + (4 \cdot \frac{2}{3} \cdot 3) + (5 \cdot \frac{2}{3} \cdot 3)] = 24 \text{ ft}^3$

There are 27 ft in a cubic yard so I divided the one by 27 to find the cubic yards needed which is $\frac{8}{27}$.

times that by 40 = 35.36. Find area of surface steps & times to \$7.50. Total cost = \$92.56

Score:

4

Annotation:

The student shows understanding of mathematical communication by including all four components; having a presentation that is clear and organized; appropriately using labels (3 of 3); and using appropriate conversions and calculations. (The response is not penalized for missing 1 on the wooden forms.) This response earns four points.

13. The homeowners ask you to figure out the total cost and explain it to them. Create an organized job list for the cost part of the estimate.

Make sure your estimate is supported by calculations of cost based on all materials used.

1. concrete:	
1st step: $2\frac{2}{3} \times 3 \times 5 = 10\text{ft}^3$	
2nd step: $2\frac{2}{3} \times 3 \times 4 = 8\text{ft}^3$	
3rd step: $2\frac{2}{3} \times 3 \times 3 = 6\text{ft}^3$	
total = $24\text{ft}^3 / 3 = 8\text{yds}^3$	
$8\text{yds}^3 \times \$40 = \320	
2. wood:	
1st step: $3\text{ft} + (3\text{ft} \times 2\text{ft}) = 9\text{ft}$	
2nd step: $3\text{ft} + (4\text{ft} \times 2\text{ft}) = 11\text{ft}$	
3rd step: $3\text{ft} + (5\text{ft} \times 2\text{ft}) = 13\text{ft}$	
total = 33ft	
$33\text{ft} \times \$1.50 = \49.50	
3. surfacing:	
1st step: $1\text{ft} \times 3\text{ft} = 3\text{ft}^2$	
2nd step: $1\text{ft} \times 3\text{ft} = 3\text{ft}^2$	
3rd step: $3\text{ft} \times 3\text{ft} = 9\text{ft}^2$	
total = 15ft ²	
$15\text{ft}^2 \times \$0.50 = \7.50	
	TOTAL:
	concrete 320
	wood 49.50
	surfacing 7.50
	<u>\$377.00</u>
Total cost = \$377.00	

Score:

3

Annotation:

The student shows partial understanding of mathematical communication by including all four; components; having a presentation that is clear, identified and organized; and appropriately using labels (2 of 3). One conversion error ("24 cu ft/3") occurs. This response addresses three of the four elements. This response earns three points.

13. The homeowners ask you to figure out the total cost and explain it to them. Create an organized job list for the cost part of the estimate.

Make sure your estimate is supported by calculations of cost based on all materials used.

Wooden Form

bot. stair $11 \times 1.50 = \$16.50$
mid $9 \times .50 = \$4.50$
top $7 \times 1.50 = \$10.50$
 $\$40.50$

Surfacing

bot. stair $14^2 \times .5 = \$5.50$
mid $11^2 \times .5 = \$3.50$
top $9^2 \times .5 = \$4.50$
 $\$5.50$

Concrete

bot. stair $\frac{8}{36} \cdot 1.213 = .37 \text{ yds}^3$
mid $\frac{8}{36} \cdot 1.113 = .3 \text{ yds}^3$
top $\frac{8}{36} \cdot 1.1 = .22 \text{ yds}^3$
 $.37 + .3 + .22 = .89 \text{ yds}^3$
 $.89 \times 40 = \$35.6$

First I had to figure out the cost of the concrete; to do that I had to find the total volume of the stairs. Convert to yards, to form like measures. I multiplied the volume by \$40 and got \$35.60. Then I found the cost of the wooden forms by adding each of the three sides of each stair together then multiplied it by \$1.50 I got \$40.50. Then I found the surface area of each stair & multiplied it by \$.50 then added the together to get \$5.50. I then added each cost up and got Total cost = \$82.6

Score:

3

Annotation:

The student shows partial understanding of mathematical communication by including all four components; having a presentation that is clear, identified and organized; and appropriately using labels (2 of 3). A calculation error occurs in the wooden form and surfacing, two steps are only 1 ft. wide. This response correctly addresses three of the four elements. This response earns 3 points.

13. The homeowners ask you to figure out the total cost and explain it to them. Create an organized job list for the cost part of the estimate.

Make sure your estimate is supported by calculations of cost based on all materials used.

<p>Wood: Bottom = 5ft, 3ft, 5ft = 13ft middle = 4ft, 3ft, 4ft = 11ft top = 3ft, 3ft, 3ft = 9ft Total = 33ft $\times 1.5 \text{ ft}$ \$49.50</p>	<p>Concrete 40/cu yard $\times 2 \text{ cu yard}$ \$80</p>
<p>Surfacing \$.50 sq ft 15 ft \$7.50</p>	
<p>49.50 + 80 + 7.5 = \$137</p>	

For the wood, each step requires different amounts. Bottom 13ft, middle, 11ft, top, 9ft. At \$1.5 a foot, wood costs 49.50

For concrete, its \$40/cu yard. The top step is about a cubic yard, and the other two will require more than the top, so you need 2 bags @ \$40.

For surfacing, theres 9ft on top, 3 on middle, and 3 on bottom. That's 15 ft @ \$.50 a foot. Add together

Total cost = \$137

Score:

3

Annotation:

The student shows partial understanding of mathematical communication by including all four components; having a presentation that is organized but mislabeled. Labels for two of the three components are accurate ("15 ft"). Calculations for the concrete are missing. This response correctly addresses three of the four elements. This response earns three points.

13. The homeowners ask you to figure out the total cost and explain it to them. Create an organized job list for the cost part of the estimate.

Make sure your estimate is supported by calculations of cost based on all materials used.

Surface	Forms	Ready Mix
$\left. \begin{array}{l} 3 \\ 4 \\ 5 \\ 2 \end{array} \right\} = 14$ $14 \cdot \$1.50$	$\begin{array}{r} 3 \cdot 3 \quad 9 \\ 3 \cdot 4 \quad 12 \\ 3 \cdot 5 \quad + 15 \\ \hline 36 \end{array}$ $36' \cdot \$1.50 =$	$\begin{array}{r} 10368 \\ 13824 \\ 17280 \\ \hline 41472'' \end{array}$ $41472'' \cdot 40 =$
\$7 —	\$54 —	\$? —
<p>For ready mix, I changed the measurements into inches, multiplied for each step, coming up with. Then, I added the totals and changed from inches to cu yd. Forms: length \cdot width. Took totals & added \uparrow, multiplied by $\\$1.50$. Surface added measurements total in feet times $50\phi = \\$7.00$</p>		
<p>Total cost = $\\$61 +$ ready-mix concrete</p>		

Score:

2

Annotation:

The student shows partial understanding of mathematical communication by including all four components and having a presentation that is identified and organized. No labels are used and the conversions and calculations are either incomplete or inaccurate. The response correctly addresses two of the four elements. This response earns two points.

13. The homeowners ask you to figure out the total cost and explain it to them. Create an organized job list for the cost part of the estimate.

Make sure your estimate is supported by calculations of cost based on all materials used.

$3 \cdot 5 = 15 \cdot \frac{2}{3} = 10$ $3 \cdot 4 = 12 \cdot \frac{2}{3} = 8$ $3 \cdot 3 = 9 \cdot \frac{2}{3} = 6$	$40 \div 3 = \$13 \text{ a foot}$ Concrete	total $\$312.00$ $\$50.00$ 3.00
$3 + 5 + 5 = 13 \text{ ft}$ $3 + 4 + 4 = 11 \text{ ft}$ $3 + 3 = 6 \text{ ft}$	$33 \cdot 1.50 = 50$	
$5 \text{ feet} \cdot .60 = \3.00		
You need a total of 24 cubic feet of concrete which will cost you \$312		
You need a total of 33 feet of wood which will cost you \$50 and you need 5 feet of surfacing the concrete which will cost you \$3.00 with a total of everything at \$365.00		
Total cost = <u>\$365.00</u>		

Score:

2

Annotation:

The student shows partial understanding of mathematical communication by including all four components and having a presentation that is clear and organized. Labels are inappropriately used; calculations are either incomplete or inaccurate and a conversion error occurs in concrete and surfacing. The response correctly addresses two of the four elements. This response earns two points.

13. The homeowners ask you to figure out the total cost and explain it to them. Create an organized job list for the cost part of the estimate.

Make sure your estimate is supported by calculations of cost based on all materials used.

<p>3ft = 1yd 1ft + 1ft = 2ft</p> <p>\$70 + 10 = \$80 for concrete</p> <p>3 wooden forms = 1.50 x 3 = \$4.50</p> <p>3ft + 1ft + 1ft = 5ft long + 3ft wide</p> <p>3sq ft x 5sq ft = 15sq ft · .50 = \$7.50</p> <p>\$80 + \$4.50 + \$7.50 = \$92</p>
<p>Total cost = \$92.00</p>

Score:
1

Annotation:
The student shows partial understanding of mathematical communication by including all four components. The presentation is not in an effective format for the situation; conversions and calculations are incomplete and/or inaccurate; and minimal labels are used. The response correctly addresses only one of the four elements. This response earns one point.

