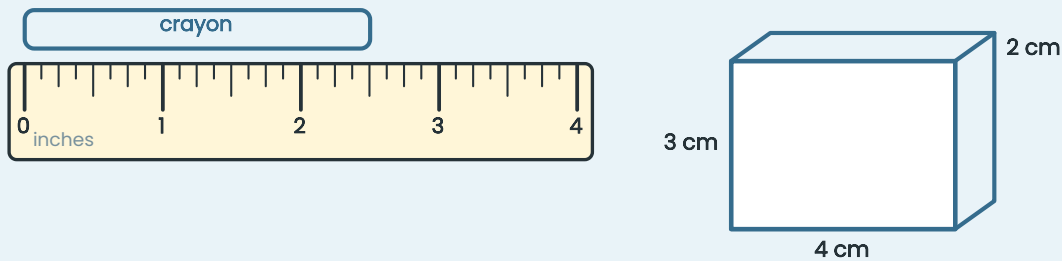


Winter Logic & Measurement: The Frost Valley Math Lab

6 complete activities from Winter Logic & Measurement, each with a worked answer.



HOW TO USE

1. Read the situation and the evidence first.
2. Show your thinking in the work boxes, not only an answer.
3. Explain how you know your answer makes sense.
4. Try the new problem at the bottom of the page.

6 activities • 3 answer pages • From the 16-activity collection

10 US Letter pages • Print at 100% / Actual Size

Original Bobotemp educational printable • Fictional names, places and prices

Name _____ Date _____

LEVEL 1



Use the table. Subtract the low from the high for each day.

The Frost Valley Weather Board shows fictional high and low temperatures in degrees Fahrenheit ($^{\circ}\text{F}$) for 7 days. The daily range is how many degrees the temperature changed from the low to the high. Find the daily range for each day. Which day had the greatest range, and what was it?

FROST VALLEY WEATHER BOARD (FICTIONAL DATA, °F)

Day	1	2	3	4	5	6	7
High	28	31	25	34	30	22	26
Low	15	20	12	25	18	6	14
Range (high - low)							

EVIDENCE TO USE

- All data are fictional. Scale: degrees Fahrenheit (°F).
- Highs, Days 1-7: 28, 31, 25, 34, 30, 22, 26
- Lows, Days 1-7: 15, 20, 12, 25, 18, 6, 14
- Daily range = high - low

1. Write the daily range for all 7 days.

[illegible]

2. Circle the day with the greatest range.

[illegible]

3. Write your answer in a complete sentence with units.

TRY IT • Day 8 has a high of 29°F and a daily range of 12 degrees. What was the low on Day 8?

Fraction Snow Gauge

Name _____ Date _____

LEVEL 2



Build a ratio table. Multiply both quantities by the same number.

The fair's warm-drink table uses a sample recipe card: 3 scoops of drink mix for every 2 cups of water. Volunteers plan to fill a pitcher with 10 cups of water. Build a ratio table to find how many scoops keep the same ratio. Grade 6 Stretch: find the unit rate in scoops per cup.

RATIO TABLE

Cups of water	2				10
Scoops of mix	3				?

EVIDENCE TO USE

- Recipe card: 3 scoops per 2 cups of water
- Pitcher: 10 cups of water
- Keep the ratio the same.

1. Complete a ratio table from 2 cups to 10 cups.

[illegible]

2. Write the number of scoops for 10 cups.

A large grid of 10 columns and 10 rows for drawing.

3. Show that your new ratio is equivalent to 3 : 2.

TRY IT • A bigger batch uses 24 scoops of drink mix. How many cups of water keep the same ratio?

Who Measured What?

5

Block Fort Blueprint

6

Map Route Planner

1. Reading the Weather Board

LEVEL 1

Day 6 had the greatest daily range: $22 - 6 = 16$ degrees F.

WORKED REASONING • Subtract the low from the high for each day. Day 1: $28 - 15 = 13$. Day 2: $31 - 20 = 11$. Day 3: $25 - 12 = 13$. Day 4: $34 - 25 = 9$. Day 5: $30 - 18 = 12$. Day 6: $22 - 6 = 16$. Day 7: $26 - 14 = 12$. The greatest range is 16 degrees, on Day 6. Check: Day 6 had by far the lowest low (6°F), so a large range makes sense even though Day 6 also had the lowest high.

WATCH FOR • Students may pick the day with the highest high (Day 4) instead of the greatest difference. Day 4 actually has the smallest range, 9 degrees, because its low was also high.

TRANSFER • The low was 17°F , because $29 - 12 = 17$.

2. Fraction Snow Gauge

LEVEL 1

The weekly total is $3 \frac{1}{2}$ inches of snow.

WORKED REASONING • Rewrite each amount in fourths: $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{2}{4}, \frac{5}{4}, \frac{0}{4}, \frac{1}{4}$. Add the numerators: $1 + 2 + 3 + 2 + 5 + 0 + 1 = 14$. The total is $\frac{14}{4}$ inches, and $\frac{14}{4} = 3 \frac{2}{4} = 3 \frac{1}{2}$ inches. The line plot has 1 X at 0, 2 Xs at $\frac{1}{4}$, 2 Xs at $\frac{1}{2}$, 1 X at $\frac{3}{4}$, and 1 X at $1 \frac{1}{4}$, for 7 Xs in all. Check: about $\frac{1}{2}$ inch a day for 7 days is about $3 \frac{1}{2}$ inches, so the total is reasonable.

WATCH FOR • A common error is adding numerators and denominators, such as $\frac{1}{4} + \frac{1}{2} = \frac{2}{6}$. The denominator names the size of the pieces, so rewrite every amount in fourths and add only the numerators.

TRANSFER • The difference is $1 \frac{1}{4}$ inches, because $1 \frac{1}{4} - 0 = 1 \frac{1}{4}$.

6. Recipe Scaling Kitchen

LEVEL 2

Use 15 scoops of drink mix for 10 cups of water.

WORKED REASONING • Ratio table: 2 cups → 3 scoops, 4 cups → 6 scoops, 6 cups → 9 scoops, 8 cups → 12 scoops, 10 cups → 15 scoops. Another way: $10 \div 2 = 5$ batches, and $5 \times 3 = 15$ scoops. Grade 6 unit rate: $3 \div 2 = 1 \frac{1}{2}$ scoops per cup, and $10 \times 1 \frac{1}{2} = 15$ scoops. Check: 15 : 10 simplifies to 3 : 2, the same ratio.

WATCH FOR • Adding the same amount to both quantities ($2 + 8 = 10$ cups, so $3 + 8 = 11$ scoops) changes the ratio. Equivalent ratios come from multiplying both quantities by the same number.

TRANSFER • 16 cups of water. $24 \div 3 = 8$ batches, and $8 \times 2 = 16$ cups.

7. Who Measured What?

LEVEL 2

Amara $\frac{1}{2}$ | Diego $1 \frac{1}{4}$ | Keiko $\frac{3}{4}$: Amara read $\frac{1}{2}$ inch, Diego read $1 \frac{1}{4}$ inches, and Keiko read $\frac{3}{4}$ inch.

WORKED REASONING • Clue 2: the pair sums are $\frac{1}{2} + \frac{3}{4} = 1 \frac{1}{4}$, $\frac{1}{2} + 1 \frac{1}{4} = 1 \frac{3}{4}$, and $\frac{3}{4} + 1 \frac{1}{4} = 2$. Only $\frac{1}{2}$ and $\frac{3}{4}$ work, so Amara and Keiko have those two readings, and Diego has $1 \frac{1}{4}$. Clue 3: Keiko's reading is greater than Amara's, so Keiko read $\frac{3}{4}$ and Amara read $\frac{1}{2}$. Clue 1 check: Diego's $1 \frac{1}{4}$ is greater than Keiko's $\frac{3}{4}$, which is true. Only one arrangement fits all three clues.

WATCH FOR • Some students mark Diego as the greatest reading after Clue 1 alone. Clue 1 only compares Diego and Keiko, so Amara could still have the greatest reading. Wait for more clues before making a final mark.

TRANSFER • Two arrangements fit: Amara $\frac{1}{2}$, Diego $1 \frac{1}{4}$, Keiko $\frac{3}{4}$; and Amara $\frac{3}{4}$, Diego $1 \frac{1}{4}$, Keiko $\frac{1}{2}$. Without Clue 3, the puzzle would not have exactly one solution.

11. Block Fort Blueprint

LEVEL 3

The fort needs 36 boxes in all, so the class needs 21 more boxes.

WORKED REASONING • Wall: $V = 8 \times 2 \times 3 = 48$ cubic ft. Tower: $V = B \times h = (2 \times 2) \times 6 = 24$ cubic ft. Total: $48 + 24 = 72$ cubic ft. One box: $2 \times 1 \times 1 = 2$ cubic ft. Boxes needed: $72 \div 2 = 36$. Still needed: $36 - 15 = 21$ boxes. Check: $36 \text{ boxes} \times 2 \text{ cubic ft} = 72 \text{ cubic ft}$.

WATCH FOR • Forgetting to add the tower, or dividing a length instead of a volume, gives the wrong count. Find the total volume first, then divide by the volume of one box.

TRANSFER • The fort would need 32 boxes. The tower would be $2 \times 2 \times 4 = 16$ cubic ft, the total would be $48 + 16 = 64$ cubic ft, and $64 \div 2 = 32$.

12. Map Route Planner

LEVEL 3

The route is 16 grid units, which takes 96 minutes (1 hour 36 minutes), so the group arrives at 12:06 p.m.

WORKED REASONING • Leg 1: $(2, 1)$ to $(2, 7)$ is $7 - 1 = 6$ units. Leg 2: $(2, 7)$ to $(9, 7)$ is $9 - 2 = 7$ units. Leg 3: $(9, 7)$ to $(9, 4)$ is $7 - 4 = 3$ units. Total: $6 + 7 + 3 = 16$ units. Time: $16 \times 6 = 96$ minutes = 1 hour 36 minutes. $10:30 \text{ a.m.} + 1 \text{ hour} = 11:30 \text{ a.m.}; + 30 \text{ minutes} = 12:00 \text{ noon}; + 6 \text{ minutes} = 12:06 \text{ p.m.}$

WATCH FOR • Comparing only the start point $(2, 1)$ and the end point $(9, 4)$ gives $7 + 3 = 10$ units, which ignores the route the group actually walks. Add the length of every leg.

TRANSFER • It saves 36 minutes. The new route is $7 + 3 = 10$ units, which takes $10 \times 6 = 60$ minutes, and $96 - 60 = 36$.