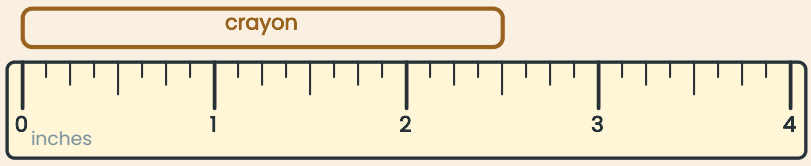
FREE STARTER

GRADES 4–6

Measurement Missions: Field Operations

6 complete activities from Measurement Missions, each with a worked answer.



Unit	Equals
1 ft	12 in
1 m	100 cm
1 lb	16 oz

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 32-activity collection

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

Original Bobotemp educational printable • Fictional names, places and prices

Name _____ Date _____

Museum Tag Rescue

LEVEL 1 ●○○

Use benchmarks to decide which unit makes sense. Cross out each unit that breaks a clue.

In the Fossil Hall, the tag on a dinosaur thighbone reads 'Length: 1.2 ___.' The unit sticker fell off. Four stickers lie on the floor: millimeters, centimeters, meters, and kilometers. Clue 1: The bone is longer than a 30-centimeter ruler. Clue 2: The bone fits inside the Fossil Hall, which is 20 meters long. Which unit belongs on the tag?

EVIDENCE TO USE

- A dime is a little more than 1 mm thick.
- A pinky fingernail is about 1 cm wide.
- A doorway is about 2 m tall.
- 1 km = 1,000 m

1. Test each unit against Clue 1. Which units survive?

2. Test the survivors against Clue 2. Which unit is left?

3. Write one sentence that uses a benchmark to justify your choice.

TRY IT • A label for a school bus says 'Mass: 11,000 ___.' Should the unit be grams or kilograms? Explain using a benchmark.

Name _____ Date _____

Track Meet Lane Table

LEVEL 1 ●○○

Build a conversion table, then use it to answer the questions.

The sprint lane at the track meet is 40 yards long. Coach Adeyemi's measuring wheel counts only in feet, and the long-jump crew measures in inches. Build a conversion table for 1, 2, 5, 10, and 40 yards. Then find the length of the sprint lane in feet.

CONVERSION TABLE

Yards	1	2	5	10	40
Feet					

EVIDENCE TO USE

- 1 yd = 3 ft
- 1 ft = 12 in
- When you change to a smaller unit, the count gets larger.

1. Complete the table: write 1, 2, 5, 10, and 40 yd in feet.

2. How many feet long is the sprint lane?

3. Use your answer to find the lane length in inches.

TRY IT • Maya's long jump measured 11 ft. How many inches is that?

Name _____ Date _____

Shipping Desk Scale

LEVEL 2 ●●○

Add mixed units and regroup. Check by converting to one unit.

At the shipping desk, Mateo weighs two packages that are going to the same address. Package A weighs 2 lb 11 oz, and Package B weighs 4 lb 9 oz. He will tape them together as one bundle. What is the total weight? Write it in pounds and ounces, and regroup if the ounces reach 16 or more.

EVIDENCE TO USE

- 1 lb = 16 oz
- Regroup 16 oz as 1 lb.
- To check, change both weights to ounces.

1. Add the pounds, then add the ounces separately.

2. Regroup the ounces and write the total in pounds and ounces.

3. Check by converting each package to ounces and adding.

TRY IT • A box weighs 5 lb 2 oz. After a 1 lb 7 oz book is taken out, how much does the box weigh?

Name _____ Date _____

Crosstown Bus Transfer

LEVEL 2 ●●○

Add the legs of the trip, then show the arrival time on a number line that crosses noon.

Priya rides two buses to the science center. Bus 14 leaves at 10:50 a.m., and the ride takes 45 minutes. Then she waits 15 minutes at the transfer stop. Bus 22 takes 1 hour 25 minutes. Find the total trip time and the time Priya arrives. Use a number line that shows noon.

EVIDENCE TO USE

- 1 h = 60 min
- 12:00 p.m. is noon.
- After 12:59 p.m., the clock reads 1:00 p.m.

1. Write each part of the trip in minutes and find the total.

2. Jump along a number line to find the arrival time.

3. Mark where the trip crosses noon and explain the change from a.m. to p.m.

TRY IT • A ride starts at 11:40 a.m. and ends at 12:25 p.m. How long is the ride?

Name _____ Date _____

Cyclist Rate Converter

LEVEL 3 ●●●

Use a ratio table to change the rate. Keep the unit labels on every step.

In the Rate Converter Lab, a cyclist on a test track travels 1,320 feet every minute at a steady pace. The lab board must show the speed in miles per hour. Use a ratio table to change feet per minute to feet per hour. Then change feet per hour to miles per hour. Keep the unit labels on every step.

RATIO TABLE

Minutes	1	10	60
Feet	1,320		

EVIDENCE TO USE

- 1 h = 60 min
- 1 mi = 5,280 ft
- 0.5 mi = 2,640 ft
- 60 min = 6 groups of 10 min

1. Complete the printed ratio table for 1 min, 10 min, and 60 min. Show your work for the feet here.

2. Convert the feet per hour to miles per hour.

3. Check: 1,320 ft is what fraction of a mile? Show how that gives the same answer.

TRY IT • A conveyor belt moves 0.5 ft per second. How many feet does it move in one hour?

Name _____ Date _____

Which Precision Wins?

LEVEL 3 ●●●

Test each level of precision against both clues. Explain what makes a measurement over-precise or under-precise.

Ana is cutting a shelf to fit inside a classroom cabinet. She must decide how precisely to record the width of the cabinet. Options: nearest foot, nearest inch, nearest 1/8 inch, nearest 1/64 inch. Clue 1: The largest possible rounding error must be less than 1/4 inch. Clue 2: Her tape measure is marked only to the nearest 1/16 inch, so she cannot read a finer measurement than that. Which option should she use?

EVIDENCE TO USE

- When you round to the nearest unit, you can be off by up to half of that unit.
- Example: rounding to the nearest 1/2 in can be off by up to 1/4 in.
- Compare each largest error with 1/4 in.

1. Which options pass Clue 1? Show the largest possible error for each option.

2. Which options pass Clue 2?

3. Name the one option that passes both clues. Explain which options are under-precise and which are over-precise.

TRY IT • To mark a 100-yard field for a game, is it more sensible to measure to the nearest yard or to the nearest 1/8 inch? Explain.

1. Museum Tag Rescue

LEVEL 1

meters (the bone is 1.2 m long)

WORKED REASONING • Clue 1: 1.2 mm is thinner than two dimes, and 1.2 cm is about one pinky fingernail wide. Both are shorter than a 30 cm ruler, so they are out. 1.2 m and 1.2 km are longer than the ruler, so they survive. Clue 2: 1.2 km is 1,200 m, which is far longer than the 20 m hall, so it is out. Only meters survives both clues. A 1.2 m bone is a little more than half the height of a doorway, which makes sense for a large dinosaur thighbone.

WATCH FOR • Students may choose centimeters because centimeters are the familiar ruler unit. The number 1.2 must be read together with its unit, and 1.2 cm is smaller than a paper clip, far too small for a large bone.

TRANSFER • Kilograms. 11,000 g is only 11 kg, about the mass of a small suitcase, and a bus is much heavier than that. 11,000 kg makes sense.

2. Track Meet Lane Table

LEVEL 1

120 feet (the lane is also 1,440 inches)

WORKED REASONING • Each yard holds 3 feet, so multiply the number of yards by 3. 1 yd = 3 ft, 2 yd = 6 ft, 5 yd = 15 ft, 10 yd = 30 ft, and 40 yd = 40 × 3 = 120 ft. Check: 40 yd is 4 groups of 10 yd, and 4 × 30 = 120 ft. To find inches, multiply by 12: 120 × 12 = 1,440 in. A foot is smaller than a yard, so the count got larger, which makes sense.

WATCH FOR • Some students divide 40 by 3 and get about 13 ft. Changing to a smaller unit always takes more of that unit, so the number of feet must be greater than 40.

TRANSFER • 132 inches (11 × 12 = 132)

11. Shipping Desk Scale

LEVEL 2

7 lb 4 oz (116 oz)

WORKED REASONING • Pounds: 2 + 4 = 6 lb. Ounces: 11 + 9 = 20 oz. Since 20 oz = 16 oz + 4 oz = 1 lb 4 oz, the total is 6 lb + 1 lb 4 oz = 7 lb 4 oz. Check: Package A is 2 × 16 + 11 = 43 oz, and Package B is 4 × 16 + 9 = 73 oz. 43 + 73 = 116 oz, and 116 = 7 × 16 + 4, which is 7 lb 4 oz.

WATCH FOR • Some students write 6 lb 20 oz, or they regroup every 10 ounces into a pound as if ounces worked like place value. A pound holds 16 ounces.

TRANSFER • 3 lb 11 oz

12. Crosstown Bus Transfer

LEVEL 2

Total trip time is 145 minutes (2 h 25 min); Priya arrives at 1:15 p.m.

WORKED REASONING • Parts of the trip: 45 + 15 + 85 = 145 min, since 1 h 25 min = 85 min. 145 min = 2 h 25 min. Number line: 10:50 a.m. + 45 min = 11:35 a.m. Then 11:35 a.m. + 15 min = 11:50 a.m. Next, 10 min reaches 12:00 p.m. (noon), and 75 more min reaches 1:15 p.m. Check: 10:50 a.m. + 2 h = 12:50 p.m., and 12:50 p.m. + 25 min = 1:15 p.m.

WATCH FOR • Some students write 1:15 a.m. after crossing noon. Others write 13:15, which is correct 24-hour time but not the a.m./p.m. form this page uses. In 12-hour time, the clock starts again at 1 after 12, and times after noon are p.m.

TRANSFER • 45 minutes

21. Cyclist Rate Converter

LEVEL 3

15 miles per hour

WORKED REASONING • Ratio table: 1 min → 1,320 ft; 10 min → 13,200 ft; 60 min → 79,200 ft. So the rate is 79,200 ft per hour. To find miles, divide by 5,280: 79,200 ÷ 5,280 = 15, so the speed is 15 mi per hour. Check: 1,320 ft = 1/4 mi, so the cyclist goes 1/4 mi per minute, and 60 × 1/4 = 15 mi per hour.

WATCH FOR • Some students divide 1,320 by 60 instead of multiplying and get 22. An hour is 60 times as long as a minute, so the cyclist covers 60 times as much distance per hour.

TRANSFER • 1,800 feet in one hour (0.5 ft per second × 3,600 seconds)

22. Which Precision Wins?

LEVEL 3

nearest 1/8 inch

WORKED REASONING • Clue 1: The largest possible errors are 6 in (nearest foot), 1/2 in (nearest inch), 1/16 in (nearest 1/8 inch), and 1/128 in (nearest 1/64 inch). Only nearest 1/8 inch and nearest 1/64 inch have errors less than 1/4 in. Clue 2: A tape marked in sixteenths can show feet, inches, and eighths, but not sixty-fourths. Only nearest 1/8 inch passes both clues. Nearest foot and nearest inch are under-precise for a good fit. Nearest 1/64 inch is over-precise because the tape cannot show it.

WATCH FOR • Some students think the most precise option is always best. A measurement cannot be more precise than the tool used, and extra digits that cannot be read are only guesses.

TRANSFER • The nearest yard (or nearest foot). The game does not need 1/8-inch precision across 100 yards, so measuring that finely would be over-precise.