Units of Measurement

Program 4 Guide

The *Go Figure? Interactive Multimedia Kit* may be used in a classroom or intervention setting. Presented in a fun and creative way, each program on the *Go Figure?* DVD can be used as an introduction to or a review of basic mathematics concepts. The accompanying CD-ROM edu-game was designed for use by students on an individual basis. The object of the edu-game is to solve a mystery. In order to do this, the student must solve mathematics problems in the specific content areas presented by the DVD dramatic video series. Consequently, programs on the DVD are used to generate interest in and enthusiasm for learning mathematics concepts, while the CD-ROM edu-game allows students to practice the concepts in a challenging game format.

The three main characters in each DVD video program – the mysterious Pythagleo, plus two students named Carter and Chris who are trying to solve the mystery of Etna High School – discuss the targeted math concepts.

Chris, and to a lesser extent, Carter, verbalizes what each is thinking as they work through problems associated with the math concepts. The DVD programs assume that, like Chris and Carter, your students have already been introduced to the math concepts presented in the episode. The dialog may be too quick for some students. Every step that some of your students will need to solve similar problems on their own may not be mentioned in the programs. Therefore, pausing the DVD to review or present additional information will help adapt the learning situation to the needs of your students. See additional materials about teaching with videos and differentiated instruction in the Introduction of the Teacher Resources Guide.

Ohio Mathematics Content Standards and Benchmarks

Measurement Benchmarks

A. Select appropriate units to measure angles, circumference, surface area, mass, and volume, using:
   - U. S. customary units: e.g., degrees, square feet, pounds, and other units as appropriate;
   - Metric units, e.g., square meters, kilograms and other units as appropriate.

B. Convert units of length, area, volume, mass, and time within the same measurement system.

Math Content

- How to add and subtract units of time
- Length, standard units
- Length, metric units
- Metric units are based on powers of 10.
- Square units are used for surface area, cubic units for volume
- Weight, standard units
- Weight, metric units
- Capacity
- Temperature, Celsius/Fahrenheit

Episode Note

- Carter is trapped in a locked basement room when he searches for a girl who keeps appearing and disappearing. Chris must answer units of measure questions to get the combination to free Carter.

Teacher's Notes

Example:
Determine the amount of time between 2:41p.m. and 4:17 p. m..

Reminders:

- Time: 1 hour = 60 minutes
- Since 1 hour ≠ 10 minutes, one cannot use base ten regrouping strategies when regrouping between hours and minutes.

4 hrs 17 min =	3 + 1 hours and 17 min =	3 hours and 60 + 17 min =
- 2 hrs 41 min =		- 2 hrs 41 min
		1 hr 36 min

Helpful units of measurement (Customary and Metric)

Time:

1 hour	=	60	minutes

Distance:

1 foot	=	12	inches
1 yard	=	3	feet
1 mile	=	5,280	feet
1 kilometer	=	1000	meters
1 centimeter	=	0.01	meter
1 millimeter	=	0.001	meter

Weight:

1 ton	=	2,000	pounds
1 pound	=	16	ounces

Capacity:

1 gallon	=	4	quarts
1 pint	=	2	cups

C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Pint		Pint		Pint		Pint		Pint		Pint		Pint		Pint	
Quart				Quart				Quart				Quart			
Gallon															

Temperature

32° Fahrenheit	=	0°	Celsius (freezing point of water)
212° Fahrenheit	=	100°	Celsius (boiling point of water)

Common Metric Prefixes:

.001 10^{-3}	.01 10^{-2}	1	1000 10^{3}	1,000,000 10^{6}	1,000,000,000 10^{9}	1,000,000,000,000 10^{12}
milli-	centi-	meter liter gram	kilo-	mega-	giga-	tera-

Units of Measurement
Worksheet 1

Choice *E*, in multiple-choice questions, is always: *I request help from the teacher*.

You may mark E in addition to one other choice if you think that you have the right answer to the question but you do not feel that you have a complete understanding of the problem.

Your teacher will decide whether to use the two-point or four-point scoring rubric for problems that use numbers, pictures, or words to justify/explain your answer(s). You may request help for these questions, too. Write the word "teacher" by your answer(s).

1. It takes Carter 45 minutes to get dressed for school, 10 minutes to eat his Pop Tart, and 15 minutes to walk the dog. If the bus comes at 8:15 a.m., what time must be set his alarm clock to have just enough time to get ready for school?

   A. 7:00 a.m. B. 7:05 a.m. C. 7:30 a.m. D. 7:45 a.m. E. Teacher

2. An appropriate unit of measurement for the capacity of a freezer is:

   A. cubic gallons B. meters C. pounds D. cubic feet E. Teacher

3. Carter and Chris walked to Etna High School. Chris walked from her house to the high school, which is one mile and three yards. Carter walked to the school from his house which was 5,000 feet. After walking to Etna High and back to their own houses, how many more feet has Chris walked than Carter?

   A. 289 ft. B. 578 ft. C. 293 ft. D. 576 ft. E. Teacher

4. Pythagleo wanted $1\frac{1}{2}$ gallons of lemonade for a party. He only has a pint measuring utensil. How many pints will he need?

   A. 6 B. 8 C. 12 D. 3 E. Teacher

5. Which could be a possible temperature of a freezer?

   A. 8°F B. 8°C C. 32°C D. 34°F E. Teacher

6. In October of 1964, three Enigma, Ohio students – Miriam, Mindy, and Susie – went trick or treating. They weighed the bags of candy when they returned home. Miriam had 2 lb. 11 oz., Mindy had 3 lb. 2 oz., and Susie had 2 lb. 10 oz. How much candy did they collect together?

   A. 9 lb. 3 oz. B. 8 lb. 7 oz. C. 7 lb. 22 oz. D. 8 lb. 6 oz. E. Teacher

7. Mrs. Sawyer is having a picnic for her stepson, Carter, and five of his friends. She plans to make two quarter-pound hamburgers for each person. She will not eat any hamburgers herself. How many pounds of hamburger meat should she buy?

   A. 3 lbs. B. 10 lbs. C. 5 lbs. D. 1 lb. E. Teacher

8. Chris measured Carter's height and found it to be 68 inches. What is another way to give the measure of Carter's height?

   A. 6 ft. 8 in. B. 4 ft. 4 in. C. 5 ft. 5 in. D. 5 ft. 8 in. E. Teacher

9. Pythagleo said that for some unknown reason, the school nurse gave all 500 missing Etna High students and staff a flu shot shortly before they disappeared. If each injection of the flu vaccine was 3 milliliter, how many liters of vaccine are needed?

   A. 1500 liters B. 150 liters C. 15 liters D. 1.5 liters E. Teacher

10. Which would be the best metric unit to measure the distance from one's elbow to one's shoulder?

    A. kilometer B. millimeter C. meter D. centimeter E. Teacher

Units of Measurement
Worksheet 2

Choice *E*, in multiple-choice questions, is always: *I request help from the teacher*.

You may mark E in addition to one other choice if you think that you have the right answer to the question but you do not feel that you have a complete understanding of the problem.

Your teacher will decide whether to use the two-point or four-point scoring rubric for problems that use numbers, pictures, or words to justify/explain your answer(s). You may request help for these questions, too. Write the word "teacher" by your answer(s).

1. Before they all disappeared, the Junior Class sold $1\frac{1}{2}$ tons of citrus fruit (oranges, grapefruit, and tangerines) as a fund raiser. How many 10 lb. sacks of fruit are there?

   A. 3,000 B. 300 C. 350 D. 30 E. Teacher

2. Which unit is the best to use for weighing sacks of coffee beans?

   A. pounds B. tons C. ounces D. cubic inches E. Teacher

3. The average human body temperature is

   A. 98.6° C B. 98.6° F C. 32° C D. 100° C E. Teacher

4. Carter ran 9,000 meters, while Chris ran 8,500 meters in the Enigma Arthritis Foundation "New Knees Run" for arthritis research. How many kilometers did they run in total to benefit the research?

   A. 17,500 B. 1.75 C. 17.5 D. 175 E. Teacher

5. At the Etna High reunion party, Pythagleo wanted to serve orange juice and, strange as it may seem, 15 gallons of juice mysteriously appeared! Pythagleo expected 250 to attend and thought that each person would drink 8 ounces of juice. Determine whether 15 gallons of orange juice would be enough for each of 250 people to get 8 ounces. Uses numbers, pictures, or words to support your answer.

6. Pythagelo searched for $3\frac{3}{4}$ hours trying to find more people to come to his reunion party. How many minutes did he search?

   A. 90 minutes B. 180 minutes C. 225 minutes D. 240 minutes E. Teacher

7. The Etna High School mascot was a Norwegian Elkhound. Elkhounds are very tall dogs. Pythagleo decided to make a doghouse in hopes that the dog, Thor, would someday reappear. Thor would need a doghouse that is at least 1.75 meters tall. What is the height of the doghouse in millimeters?

   A. 175 mm B. 1,075 mm C. 1,705 mm D. 1,750 mm E. Teacher

8. Pythagleo bought a half gallon of milk. He drank one cup of milk with his breakfast, one cup at lunch, and one pint of milk simply disappeared. Explain or show how much milk is left. Use numbers, pictures, or words to support your answer.

9. On the day of the most disappearances from Etna High in 1966, the temperature was 68ºF at 7:00 a.m. At noon on that same day, the temperature had dropped to 38ºF. By 6:00 p.m. that day, the temperature was 80ºF. Which is the most appropriate way to describe the average rate of change in temperature?

   A. hours per degree
   B. minutes per degree
   C. degrees per hour
   D. degrees per minute
   E. Teacher

10. The chemistry teacher had 13 liters of hydrogen chloride when school began. After 30 experiments (which each used 0.25 liters of hydrogen chloride), how much is left for more experiments?

    A. 5.5 liters B. 10 liters C. 3 liters D. 7.5 liters E. Teacher

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Answer Keys, Program 4: Worksheets 1 - 2

Each question on every worksheet offers the students the option of marking "Teacher" instead of or in conjunction with answering the question. The "Teacher" option is included to support student understanding and achievement. Students may have as much help and guidance as they need to understand concepts and master skills.

Instructors may decide whether to use the two or four point scoring rubric for constructed response problems (problems that use numbers, pictures, or words to justify/explain student answers). See the appendix for the complete rubrics.

Two-Point Scoring Rubric	Four-Point Scoring Rubric
2 – Complete	4 – Complete
1 – Partial	3 – Clear
0 – Inadequate	2 – Partial
	1 – Minimal
	0 - Inadequate

Worksheet 1

1. B. 7:05 a.m.
2. D. cubic feet
3. B. 578 ft.
4. C. 12
5. A. 8°F
6. B. 8 lb. 7 oz.
7. A. 3 lbs.
8. D. 5 ft. 8 in.
9. D. 1.5 liters
10. D. centimeter

Worksheet 2

1. B. 300
2. A. pounds
3. B. 98.6° F
4. C. 17.5
5. No, 15 gallons was not enough for 250 people to have 8 ounces each. Answers should reflect the following: **1)** 250 people x 8 ounces = 2000 ounces needed. **2)** 16 cups in a gallon x 8 ounces per cup = 128 ounces in a gallon. **3)** 15 gallons x 128 ounces = 1920 ounces of juice in 15 gallons. **4)** 2000 ounces > 1920 ounces.
6. C. 225 minutes
7. D. 1,750 mm
8. 1 quart. Answers should reflect the following. **1)** Convert gallons to cups. $\frac{1}{2}$ gallon = 8 cups. **2)** Convert pints to cups 1 pint = 2 cups. **3)** Determine the number of missing and used cups of milk. 1 + 1 + 2 = 4 cups of milk. 4). Determine how much milk is left. 8 cups – 4 cups = 4 cups. **4)** Convert the cups back into pints/quarts. 4 cups = 2 pints or 1 quart.
9. C. degrees per hour
10. A. 5.5 liters