

ME1 Section 8.2: Capacity & Volume

Vocabulary: Volume: the measure of space in a container is the volume of the container

Example: The box has a volume of 3 cubic inches.

Capacity: how much liquid a container will hold

Example: The milk carton has a capacity of 1 gallon.

Liter: a liter is the base ^{unit} for capacity in the metric system, also, 1 liter = 1000 milliliters

Example: The Coke is in a 2-liter bottle

Exploration 1:

item	capacity prediction	actual capacity
1. hat	2 quarts	3.5 quarts
2. fish tank	20 gallons	32 gallons
3. bucket	10 gallons	10 gallons

Answers will vary

Example 1: $3 \text{ quarts} \cdot \frac{4 \text{ cups}}{1 \text{ quart}} = \boxed{12 \text{ cups}}$ OR $3 \text{ quarts} \cdot \frac{2 \text{ pints}}{1 \text{ quart}} \cdot \frac{2 \text{ cups}}{1 \text{ pint}} = 12 \text{ cups}$

Example 2: a) 1 quart : 1 gallon
1 quart : 4 quarts
a quart is $\boxed{\frac{1}{4}}$ of a gallon

b) 1 pint : 1 gallon
1 pint : 4 quarts 1 quart : 2 pints
1 pint : 8 pints
a pint is $\boxed{\frac{1}{8}}$ of a gallon

Exploration 2: larger than liters: kiloliter, hectoliter, dekaliter
smaller than liters: deciliter, centiliter, milliliter

Example 3: $20 \text{ liters} \cdot \frac{1000 \text{ mL}}{1 \text{ L}} = \boxed{20,000 \text{ mL}}$

Problem 5: 1. a)

$$100 \text{ fl. oz.} \cdot \frac{1 \text{ cup}}{8 \text{ fl. oz.}} \cdot \frac{1 \text{ quart}}{4 \text{ cups}}$$

$$= \boxed{\frac{25}{8} \text{ quarts}}$$

$$b) 9 \text{ quarts} \cdot \frac{2 \text{ pints}}{1 \text{ quart}} = \boxed{18 \text{ pints}}$$

$$c) 20 \text{ fl. oz.} \cdot \frac{1 \text{ cup}}{8 \text{ fl. oz.}} = \boxed{\frac{5}{2} \text{ cups}} \text{ or } 2.5 \text{ cups}$$

$$d) 18 \text{ pints} \cdot \frac{2 \text{ cups}}{1 \text{ pint}} \cdot \frac{8 \text{ fl. oz.}}{1 \text{ cup}} = \boxed{288 \text{ fl. oz.}}$$

$$e) 6 \text{ gallons} \cdot \frac{16 \text{ cups}}{1 \text{ gallon}} \cdot \frac{8 \text{ fl. oz.}}{1 \text{ cup}} = \boxed{768 \text{ fl. oz.}}$$

$$f) 13 \text{ pints} \cdot \frac{1 \text{ gallon}}{8 \text{ pints}} = \boxed{\frac{13}{8} \text{ gallons}} \text{ or } 1.625 \text{ gallons}$$

$$2) a) 350 \text{ mL} \cdot \frac{1 \text{ L}}{1000 \text{ mL}} = \boxed{0.35 \text{ L}}$$

$$b) 4 \text{ kL} \cdot \frac{1000 \text{ L}}{1 \text{ kL}} = \boxed{4000 \text{ L}}$$

$$c) 2000 \text{ mL} \cdot \frac{1 \text{ L}}{1000 \text{ mL}} = \boxed{2 \text{ L}}$$

$$d) 37 \text{ L} \cdot \frac{1000 \text{ mL}}{1 \text{ L}} = \boxed{37,000 \text{ mL}}$$

$$e) 6 \text{ kL} \cdot \frac{1,000,000 \text{ mL}}{1 \text{ kL}} = \boxed{6,000,000 \text{ mL}}$$

OR:

$$6 \text{ kL} \cdot \frac{1000 \text{ L}}{1 \text{ kL}} \cdot \frac{1000 \text{ mL}}{1 \text{ L}} = 6,000,000 \text{ mL}$$

$$f) 8,500,000 \text{ mL} \cdot \frac{1 \text{ kL}}{1,000,000 \text{ mL}} = \boxed{8.5 \text{ kL}}$$

$$3) a) 120 \text{ fl. oz.} \cdot \frac{1 \text{ cup}}{8 \text{ fl. oz.}} \cdot \frac{1 \text{ gallon}}{16 \text{ cups}} = \boxed{\frac{15}{16} \text{ gallons}}$$

$$b) 120 \text{ fl. oz.} \cdot \frac{1 \text{ cup}}{8 \text{ fl. oz.}} \cdot \frac{1 \text{ qt.}}{4 \text{ cups}} = \boxed{3.75 \text{ quarts}}$$

$$c) 120 \text{ fl. oz.} \cdot \frac{1 \text{ cup}}{8 \text{ fl. oz.}} \cdot \frac{1 \text{ pint}}{2 \text{ cups}} = \boxed{7.5 \text{ pints}}$$

$$4) a) 9320 \text{ mL} \cdot \frac{1 \text{ L}}{1000 \text{ mL}} = \boxed{9.32 \text{ L}}$$

$$b) 9320 \text{ mL} \cdot \frac{1 \text{ kL}}{1000000 \text{ mL}} = 0.00932 \text{ kL}$$

$$c) 9320 \text{ mL} \cdot \frac{1 \text{ cL}}{10 \text{ mL}} = 9.32 \text{ cL}$$

$$5) 4700 \text{ mL} \cdot \frac{1 \text{ L}}{1000 \text{ mL}} = \boxed{4.7 \text{ L}}$$

$$6) 40 \text{ gallons} - 32 \frac{1}{2} \text{ quarts} \rightarrow 160 \text{ quarts} - 32.5 \text{ quarts} \\ 40 \text{ gallons} \cdot \frac{4 \text{ quarts}}{1 \text{ gallon}} = 160 \text{ quarts} \quad \rightarrow \quad \boxed{127.5 \text{ quarts}}$$

7) 50 centiliters + 1267 milliliters + 12 deciliters

$$50 \text{ centiliters} \cdot \frac{10 \text{ mL}}{1 \text{ cL}} = 500 \text{ mL}$$

$$12 \text{ deciliters} \cdot \frac{100 \text{ mL}}{1 \text{ dL}} = 1200 \text{ mL}$$

$$500 \text{ mL} + 1267 \text{ mL} + 1200 \text{ mL} = \boxed{2967 \text{ mL}} \text{ in all 3 months}$$

March April May

The most rainfall was in April.

$$8) \text{ April: } 6 \text{ pints} \cdot \frac{2 \text{ cups}}{1 \text{ pint}} = 12 \text{ cups}$$

May: 18 cups

$$\text{June: } 1 \text{ gallon} \cdot \frac{16 \text{ cups}}{1 \text{ gallon}} = 16 \text{ cups}$$

May drank the most water

$$9) 6 \text{ gallons} - 18 \text{ pints} \quad 6 \text{ gallons} \cdot \frac{4 \text{ quarts}}{1 \text{ gallon}} \cdot \frac{2 \text{ pints}}{1 \text{ quart}} = 48 \text{ pints} \\ 48 \text{ pints} - 18 \text{ pints} = \boxed{30 \text{ pints used}}$$

$$10) a) 1 \text{ cup to } 1 \text{ gallon} = 1 \text{ cup to } 16 \text{ cups} = \frac{1}{16}$$

$$b) 1 \text{ milliliter to } 1 \text{ liter} = 1 \text{ mL to } 1000 \text{ mL} = \frac{1}{1000}$$

$$c) 1 \text{ liter to } 1 \text{ kiloliter} = 1 \text{ L to } 1000 \text{ L} = \frac{1}{1000}$$

$$d) 1 \text{ ounce to } 1 \text{ pint} = 1 \text{ oz to } 2 \text{ cups} = 1 \text{ oz to } 16 \text{ oz} = \frac{1}{16}$$

$$e) 1 \text{ cup to } 1 \text{ quart} = 1 \text{ cup to } 4 \text{ cups} = \frac{1}{4}$$