Learning Plan 4

Chapter 9

Question 1

The population of a country reached 309.5 million people. The total area is 3.25 million square miles. What is the population density for the country? Round to the nearest hundredth.

Solution

$$\frac{309.5 \text{ million people}}{3.25 \text{ million square miles}} \approx 95.2307\ldots \approx 95.23$$

Question 2

A dinosaur is 87 feet long. Convert the length to meters. Round to the nearest hundredth.

Solution

$$1 \text{ foot} = 30.48 \text{ cm}$$
$$1 \text{ meter} = 100 \text{ centimeters}$$

$$\frac{87 \text{ ft}}{1} \cdot \frac{30.48 \text{ cm}}{1 \text{ ft}} = 2651.76 \text{ cm} = 26.5176 \text{ m} \approx 26.51 \text{ m}$$

(You are multiplying 88 and 30.48,
then you are moving the decimal point two places to the left,
then you round to two decimal places).

Question 3

Table 9.2 Commonly Used Units of Linear Measure in the Metric System. (p. 578)

Question 4

Convert 3 yd to inches.

Solution

$$1 \text{ yd} = 36 \text{ in}$$

$$\frac{3 \text{ yd}}{1} \cdot \frac{36 \text{ in}}{1 \text{ yd}} = 108 \text{ in}$$

(You are multiplying 3 and 36).

Question 5

Convert 25,930 ft to mi

Solution

$$1\ mi = 5280\ ft$$

$$\frac{25{,}930\ ft}{1} \cdot \frac{1\ mi}{5280\ ft} \approx 4.9109848 \ldots \approx 4.91\ mi$$

(You are dividing $25930 \div 5280$)

Question 6

Convert 16.8 hm to m

Solution

$$16.8\ \text{hm} \cdot 100 = 1680\ \text{m}$$

(You are moving the decimal point two places to the right)

Question 7

Convert 34 in. to cm. Round to the nearest hundredth.

Solution

$$1\ \text{in.} = 2.54\ \text{cm}$$

$$\frac{34\ \text{in.}}{1} \cdot \frac{2.54\ \text{cm}}{1\ \text{in.}} = 86.36\ \text{cm}$$

(You are multiplying 34 and 2.54).

Question 8

Convert 215 km to mi. Round to the nearest hundredth.

Solution

$$1 \text{ mi} \approx 1.6 \text{ km}$$

$$\frac{215 \text{ km}}{1} \cdot \frac{1 \text{ m}}{1.6 \text{ km}} = 134.375 \text{ mi} \approx 134.38 \text{ mi}$$

(You are dividing $215 \div 1.6$)

Question 9

Use the unit fractions $\frac{36\ in.}{1\ yd}$ and $\frac{2.54\ cm}{1\ in.}$ to convert 13 yd to cm. Round to the nearest hundredth.

Solution

$$\frac{13 \text{ yd}}{1} \cdot \frac{36 \text{ in}}{1 \text{ yd}} \cdot \frac{2.54 \text{ cm}}{1 \text{ in}} = 1188.72 \text{ cm}$$

(You are multiplying $13 \cdot 36 \cdot 2.54$)

Question 10

Use the unit fractions $\frac{5280 \text{ ft}}{1 \text{ mi}}$, $\frac{60 \text{ min}}{1 \text{ hr}}$ and $\frac{60 \text{ sec}}{1 \text{ min}}$ to convert 480 miles per hour in feet per second.

Solution

$$\frac{480 \text{ mi}}{1 \text{ hr}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{1\ min}{60\ sec} = 704\ \frac{ft}{sec}$$

(You are performing the following: $480 \cdot 5280 \div 60 \div 60$)

Question 11

Lengths of different objects (p. 579)

Question 12

Volume and capacity in the Metric System (p. 591)

Question 13

Measuring Volume (p. 589)

Question 14

Use table 9.5, along with dimensional analysis, to approximately convert the given unit to unit indicated. Where necessary, round answers to two decimal places.

TABLE 9.5 English Units for Capacity

2 pints (pt)	= 1 quart (qt)
4 quarts	= 1 gallon (gal)
1 gallon	= 128 fluid ounces (fl oz)
1 cup (c)	= 8 fluid ounces

Volume in Cubic Units	Capacity
1 cubic yard	about 200 gallons
1 cubic foot	about 7.48 gallons
231 cubic inches	about 1 gallon

$$10{,}000 \text{ ft}^3 \text{ to gal}$$

Solution

$$10{,}000 \text{ ft}^3 = \frac{10{,}000 \text{ ft}^3}{1} \cdot \frac{7.48 \text{ gal}}{1 \text{ ft}^3} \approx 74{,}800 \text{ gal}$$

Question 15

Use table 9.7, along with dimensional analysis, to convert the given unit to unit indicated.

TABLE 9.7 Volume and Capacity in the Metric System

Volume in Cubic Units		Capacity
$1\ \text{cm}^3$	=	1 mL
$1\ \text{dm}^3 = 1000\ \text{cm}^3$	=	1 L
$1\ \text{m}^3$	=	1 kL

A milliliter is the capacity of a cube measuring 1 centimeter on each side.

A liter is the capacity of a cube measuring 10 centimeters on each side.

$$45{,}000\ cm^3 \text{ to } L$$

Solution

$$45{,}000\ cm^3 = \frac{45{,}000\ cm^3}{1} \cdot \frac{1\ L}{1000\ cm^3} = 45\ L$$

Question 16

Use table 9.7, along with dimensional analysis, to convert the given unit to unit indicated.

TABLE 9.7 Volume and Capacity in the Metric System

Volume in Cubic Units		Capacity
$1\ \text{cm}^3$	=	1 mL
$1\ \text{dm}^3 = 1000\ \text{cm}^3$	=	1 L
$1\ \text{m}^3$	=	1 kL

A milliliter is the capacity of a cube measuring 1 centimeter on each side.

A liter is the capacity of a cube measuring 10 centimeters on each side.

$$15\ cm^3 \text{ to } mL$$

Solution

Because $1\ \text{cm}^3 = 1\ \text{mL}$,

$$15\ \text{cm}^3 = 15\ \text{mL}$$

Question 17

Find the population density, to the nearest tenth, for each of the following states. Which state has the greatest population density? How many more people per square mile inhabit the state with the greater density than inhabit the state with the lesser density?

State A population: 12,121,577 area: $46{,}406\ \text{mi}^2$

State B population: 11,991,363 area: $40{,}290\ \text{mi}^2$

Which state has the greater population density? How many more people per square mile inhabit the state with the greater density than inhabit the state with the lesser density?

Solution

Find the population density for state A (round to the nearest tenth):

$$12{,}121{,}577 \div 46{,}406 = 261.2 \text{ people per square mile.}$$

Find the population density for state B (round to the nearest tenth):

$$11{,}991{,}363 \div 40{,}290 = 297.6 \text{ people per square mile.}$$

$$297.6 - 261.2 = 36.4$$

State B has the greater population density by 36.4 people per square mile.

Question 18

In the exercise below, use the following equivalents, along with the dimensional analysis, to convert the given measurement to the unit indicated.

$$16\ \text{oz} = 1\ \text{lb}$$
$$2000\ \text{lb} = 1\ \text{T}$$
$$1\ \text{oz} \approx 28\ \text{g}$$
$$1\ \text{lb} \approx 0.45\ \text{kg}$$
$$1\ \text{T} \approx 0.9\ \text{t}$$

$$36\ \text{oz to g}$$

Solution

$$36\ \text{oz} = \frac{36\ \text{oz}}{1} \cdot \frac{28\ \text{g}}{1\ \text{oz}} = 1008\ \text{g}$$

Question 19

Convert the given Celsius temperature to its equivalent temperature on the Fahrenheit scale. Where appropriate, round to the nearest tenth of a degree.

$$35°\text{C}$$

Solution

$$F = \frac{9}{5}C + 32$$

$$= \frac{9}{5} \cdot 35 + 32$$

$$F = 95°\text{F}$$

Question 20

Estimate the area of the top surface of a laptop.

Solution

My laptop is about 20 cm wide and 30 cm long. To find the area, I multiply these two numbers:

$$20 \cdot 30 = 600\ cm^2$$

So, I can say that I estimated the area of the top surface of my laptop, and it approximately $600\ cm^2$.

Question 21

Use dimensional analysis to convert the given square unit to the square unit indicated. Where necessary, round to two decimal places.

$$60\ m^2 \text{ to } yd^2.$$

Solution

TABLE 9.4 English and Metric Equivalents for Area		
1 square inch ($in.^2$)	≈	6.5 square centimeters (cm^2)
1 square foot (ft^2)	≈	0.09 square meter (m^2)
1 square yard (yd^2)	≈	0.8 square meter (m^2)
1 square mile (mi^2)	≈	2.6 square kilometers (km^2)
1 acre	≈	0.4 hectare (ha)

$$60\ m^2 = \frac{60\ m^2}{1} \cdot \frac{1\ yd^2}{0.8\ m^2} = 75\ yd^2$$

(You are dividing $60 \div 0.8$)

Question 22

Use the fact that a solid with a volume of 1000 cubic centimeters has a capacity of 1 liter, along with dimensional analysis, to convert the given unit to the unit indicated.

$$453.4\ mL \text{ to } cm^3.$$

Solution

Because $1\ \text{mL} = 1\ \text{cm}^3$,

$$453.4\ \text{mL} = 453.4\ \text{cm}^3$$

Question 23

If freight carrier charges 57 cents for a package up to one ounce and 38 cents for each additional ounce or fraction of an ounce, find the cost of shipping a package that weighs 252 grams.

Solution

$$\frac{252\ g}{1} \cdot \frac{1\ oz}{28\ g} = 9\ oz$$

$$57 + 38 \cdot 8 = 361\ cents = \$3.61$$

Question 24

Select the best estimate for the weight of a person.

Solution

In the metric system, the weight is measured in kilograms.