Use Dimensional Analysis to solve the following problems. When appropriate, express your answer scientific notation.

How many MONTHS old are you? (If you are born before the 15\textsuperscript{th} of the month, round down. If you are born on or after the 15\textsuperscript{th} round up. Use this number for problem (a).

a. How many seconds old are you (you should use your answer from part (a) to begin this problem)? You may use 30 days/month, and 24 hours/day.

b. Jane lives 17.3 miles from school. Convert this to inches.

c. How many kilometers is it from Jane’s house to school? (1 km = .6214 miles)

d. A person’s weight is 154 pounds. Convert this to kilograms. (1 lbs. = 454 grams)

e. An aspirin tablet contains 325 mg of salicylic acid. How many grains is this equivalent to? (1 gram = 15.432 grains)

Use Dimensional Analysis to solve the problems below. The conversion factors are listed in the table on the back.

a. Your cruise ship is leaving for a 610-league adventure. How many nautical miles is this?

b. Later the ship is discovered at 38 fathoms deep under water. Convert this to meters.

c. Fortunately you survived! You are stranded on a deserted island that is located 12.5 degrees north of the equator. How many kilometers is this?

d. If you are rationed to 32 gills of fresh water a day. How many liters is this?

e. The island has an area of 3.5 townships. How many square yards is this? (Please use scientific notation.)

f. To reach the top of a palm tree for a coconut you will have to climb 7.4 meters. How many hands is this?

g. The island is rich with hot chile peppers. You can collect 1.6 pecks a day. How many liters could you collect in 1 week?
<table>
<thead>
<tr>
<th>Length</th>
<th>Area</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 nautical mile = 6076.12 feet</td>
<td>1 township = 36 square miles</td>
<td>4 gills = 1 pint</td>
</tr>
<tr>
<td>1 inch                 = 2.54 cm</td>
<td>*Derive your area conversion factors by working with length and squaring all dimensions.</td>
<td>2 pints = 1 quart</td>
</tr>
<tr>
<td>1 league               = 5 280 yards</td>
<td>Ex. 12² inch² = 1² foot² or 144 square inch = 1 square foot</td>
<td>1 liter = 1.0567 quarts</td>
</tr>
<tr>
<td>1 cable                = 120 fathoms</td>
<td></td>
<td>1 bushel = 4 pecks</td>
</tr>
<tr>
<td>1 fathom               = 6 feet</td>
<td></td>
<td>1 bushel = 32 quarts</td>
</tr>
<tr>
<td>3.281 ft               = 1 meter</td>
<td></td>
<td>1 gallon = 4 quarts</td>
</tr>
<tr>
<td>1 degree               = 69.047 miles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 mile                 = 5280 feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 hand                 = 4 inches</td>
<td></td>
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</tr>
</tbody>
</table>

**Bonus Problems (optional)**

a. Each liter of air has a mass of 1.80 grams. How many liters of air are contained in 2.5 x 10³ kg of air?

b. 16.0 grams of food contain 130 calories. How many grams of food would you need in order to consume 2150 calories?

c. The cost of 1.00 Liters of gas is 26.9 cents. How many dollars will 12.0 gallons cost?

d. Light travels 186 000 miles / second. How long is a light year in meters? (1 light year is the distance light travels in one year)

e. 1 mole of Si atoms contains 6.02 x 10²³ atoms. 6.02 x 10²³ atoms of Si have a mass of 28.1 g. How many atoms of Si are contained in a computer chip that masses 38.02-mg?
a) Months ~ 175 months  

b) ~ 4.5 x 10^8 seconds old  
c) 1,096,128 = 1.1 x 10^6  
d) 27.84 km  
e) 69916 g = 69.916 kg  
f) 5.015 grains  

Part II  

a) 610 leagues * 5280 yds/league * 3 feet/yard * (1/6076.12 nm/feet) = 1590 nautical miles  
b) 38 fathoms * 6 ft/fathom * (1/3.281 meter/ft) = 69.5 meters  
c) 12.5 * 69.047 mile/deg * 5280 ft/mil * (1/3.281 meter/ft) * (1/1000 km/m) = 1389 km  
d) 32 gills * 1/4 pt/gill * ½ qt/pint * 1/1.0567 liter/qt = 3.79 liters  
e) 3.5 townships * 36 (sq mile/township) *[5280 ft/mi]^2 * [1 yd/3 ft]^2 = 390297600 = 3.9 x 10^8 yd^2  
f) 7.4 m * 100 cm/m * 1/2.54 in/cm * 1 hand/4 inch = 72.8 hands  
g) 1.6 pecks/day * 7 days/week * ¼ bushel/peck * 32 qt/bushel * 1/1.0567 liter/qt = 84.8 liters/week  

Part III [Bonus]  

610 leagues  

120 ft^2