The Imperial System of Units

<table>
<thead>
<tr>
<th>UNIT</th>
<th>QUANTITY MEASURED (circle one)</th>
<th>REPRESENTATIVE EXAMPLE or REFERENT (a comparison you could use)</th>
<th>3 EXAMPLES OF OBJECTS YOU WOULD MEASURE USING THIS UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCH</td>
<td>MASS?</td>
<td>She grew 5 inches over the summer</td>
<td>1. Height</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td>2. Food/sandwiches</td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td>3. Wood to build house</td>
</tr>
<tr>
<td>FOOT</td>
<td>MASS?</td>
<td>The boy is 6 ft tall</td>
<td>1. Height</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td>2. Houses</td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td>3. Length of pool</td>
</tr>
<tr>
<td>YARD</td>
<td>MASS?</td>
<td>He ran 10 yards in the football game</td>
<td>1. Football</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td>2. Farming</td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td>3. Soccer?</td>
</tr>
<tr>
<td>MILE</td>
<td>MASS?</td>
<td>You drive 10 miles</td>
<td>1. Driving</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td>2. Running</td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td>3. Travelling</td>
</tr>
<tr>
<td>GALLON</td>
<td>MASS?</td>
<td>The large plastic jug of milk at the grocery store.</td>
<td>1. Gas</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td>2. Drinks (e.g. milk)</td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td>3. Pool</td>
</tr>
</tbody>
</table>

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Converting Between Units Within the Imperial System

Conversion Factor: Multiplying or dividing by this number allows us to convert from one unit to another.

Eg. Convert 57 inches to feet.

\[ 57 \text{ inches} \times \frac{1 \text{ foot}}{12 \text{ inches}} = \frac{57}{12} \text{ feet} \]

\[ 4 \frac{9}{12} = 4 \frac{3}{4} \text{ feet} \]

Use the numbers in the table on page 5.

1 foot
12 inches
The unit on top is the one you are converting to!

One Unit Conversions

Convert the following. Answer in exact form (fraction or non-rounded decimal).

1. \(3 \text{ yd.} = \frac{9}{1} \text{ feet}\)
2. \(15 \text{ yd.} = \frac{3}{5} \text{ feet}\)
3. \(12.5 \text{ yd.} = \frac{37.5}{1} \text{ feet}\)
4. \(12 \text{ ft.} = \frac{4}{1} \text{ yards}\)
5. \(2.25 \text{ ft.} = \frac{27}{1} \text{ inches}\)
6. \(136 \text{ ft.} = \frac{3}{2} \text{ yards}\)
7. \(8 \text{ ft.} = \frac{16}{1} \text{ inches}\)
8. \(2.75 \text{ ft.} = \frac{33}{1} \text{ inches}\)
9. \(4.8 \text{ ft.} = \frac{57.6}{1} \text{ inches}\)
10. \(36 \text{ in.} = \frac{3}{1} \text{ feet}\)
11. \(140 \text{ in.} = \frac{28}{3} \text{ feet}\)
12. \(2016 \text{ in.} = \frac{168}{1} \text{ feet}\)
13. \(2 \text{ mi.} = \frac{3520}{1} \text{ yards}\)
14. \(4.2 \text{ mi.} = \frac{22176}{1} \text{ feet}\)
15. \(1500 \text{ yd.} = \frac{75}{1} \text{ miles}\)
16. \(5250 \text{ yd.} = \frac{189000}{1} \text{ inches}\)
17. \(160 \text{ oz.} = \frac{10}{1} \text{ pounds}\)
18. \(220 \text{ oz.} = \frac{13.75}{1} \text{ pounds}\)
19. \(4 \text{ lb.} = \frac{64}{1} \text{ ounces}\)
20. \(2.25 \text{ lb.} = \frac{36}{1} \text{ ounces}\)
21. \(6000 \text{ lb.} = \frac{3}{1} \text{ tons}\)
22. Mr. S placed 32 yard sticks end to end across his front yard. Find the width of his yard in feet.
23. Maisy can fit 8 blocks of butter in her backpack. Butter is sold in 1 pound blocks. How many ounces does Maisy carry?
24. Auntie Dee is making a frame for a photograph. The outer dimensions are 3 ft. by 5 ft. How many inches of frame must she purchase?

\[
\frac{3\text{ ft} + 5\text{ ft} + 3\text{ ft} + 5\text{ ft}}{4} = 16\text{ ft}
\]

\[
16\text{ ft} \times \frac{12\text{ in.}}{1\text{ ft}} = 192\text{ in.}
\]

25. Mr. J wants to update his living room with crown moulding. The room is rectangular and measures 180 in. by 260 in. Moulding is sold by the foot and costs $2.19 per linear foot. What is the cost of moulding required (not including any taxes)?

\[
880\text{ ft} = 73\frac{1}{3}\text{ ft} + 74\text{ ft} \times 2.19 = $162.06
\]

Convert each of the following measurements to the indicated units.

26. 140 feet to yards and feet.

\[
140\text{ ft} \times \frac{1\text{ yd}}{3\text{ ft}} = 46\frac{2}{3}\text{ yd}
\]

27. 256 feet to yards and feet.

\[
256\text{ ft} \times \frac{1\text{ yd}}{3\text{ ft}} = 85\frac{1}{3}\text{ yd}
\]

28. 356 inches to yards, feet and inches

\[
356\text{ in.} = 9\text{ yd} \frac{1}{3}\text{ ft} + 8\text{ in}
\]

29. 142 inches to feet and inches.

\[
142\text{ in.} = 11\text{ ft} \frac{10}{12}\text{ in.}
\]

30. 204 inches to yards and feet.

\[
204\text{ in.} = 5\text{ yd} \frac{2}{3}\text{ ft}
\]

31. 84260 ounces to tons, pounds and ounces.

\[
84260\text{ oz} = 21\text{ lb} \frac{5266}{128}\text{ oz}
\]

32. Shelby the French Bull Dog needs an outdoor area to run. Ben plans on building her the pen below. The fencing material is sold by the linear foot but his measuring tape only shows inches. How many feet will he need to purchase?

\[
\frac{888\text{ inches}}{12\text{ in.}} = 74\text{ ft}
\]

33. Convert your answer above to yards, feet and inches.

\[
24\text{ yd} \frac{2}{3}\text{ ft}
\]
34. What are the dimensions of the rectangular carpet below in feet?

\[
\begin{align*}
\text{Length} & = 72" \\
\text{Width} & = 84"
\end{align*}
\]

35. If the carpet is sold for $4.25 per square foot, what is the cost of carpet required? Include 12% tax.

\[
\begin{align*}
6' \times 7' & = 42' \times 4.25 = 178.50 \\
\text{Tax} & = 178.50 \times 0.12 = 21.42 \\
\text{Total Cost} & = 178.50 + 21.42 = 199.92
\end{align*}
\]

36. What is the perimeter of the garden shed in yards and feet?

\[
\begin{align*}
\text{Perimeter} & = 8' + 12' + 8' + 12' = 40' \\
\text{Area of Shed} & = 13 \frac{1}{3} \text{yd} \times 1 \text{ft} = 13 \frac{1}{3} \text{sq ft} \\
\text{Area of Yard} & = 12' \times 8' = 96 \text{sq ft} \\
\text{Actual Area} & = 96 \div \left( \frac{2}{3} \right) = 288 \text{sq ft} \\
\text{Shed Area} & = \left( \frac{1}{3} \right) \times 288 = 96\frac{1}{3} \text{sq ft} \\
\text{Grass Area} & = 288 - 96 = 192 \text{sq ft}
\end{align*}
\]

37. The shed covers one-third of the area of the yard. How many square feet of sod (grass) are shown in the yard above?

\[
\text{Grass per Yard} = \frac{192 \text{sq ft}}{3} = \frac{64 \text{sq ft}}{1}
\]

38. Sod-Warehouse sells sod by the roll. Each roll is 1 foot wide and 4 feet long. Each roll sells for $2.75. What is the cost (including 12% tax) to buy sod for the yard?

\[
\begin{align*}
\text{Total Area} & = 192 \text{sq ft} \\
\text{Number of Rolls} & = \frac{192}{4} = 48 \\
\text{Cost per Roll} & = 48 \times 2.75 = 132 \times 0.12 = 15.84 \\
\text{Total Cost} & = 132 + 15.84 = \$ 147.84
\end{align*}
\]
Two Unit Conversions {Be comfortable working in fraction form and always reduce.}

You will need to use TWO conversion factors. Simply follow the steps for one unit conversions, then repeat.

Eg. Convert 58 inches to yards.

\[
\begin{align*}
&\text{Step 1:} \quad 58 \text{ inches} \times \frac{1 \text{ foot}}{12 \text{ inches}} = \frac{58}{12} \text{ feet} \\
&\text{Step 2:} \quad \frac{58}{12} \text{ feet} \times \frac{1 \text{ yard}}{3 \text{ feet}} = \frac{58}{36} \text{ yards} \\
&= \frac{122}{36} \text{ yards} = 1 \frac{11}{18} \text{ yards}
\end{align*}
\]

Conversion Factors:

- Step 1: \( \frac{1 \text{ foot}}{12 \text{ inches}} \)
- Step 2: \( \frac{1 \text{ yard}}{3 \text{ feet}} \)

The unit on top is the one you are converting to!

39. \( 6025 \text{ feet} = \frac{176}{400} \text{ miles} \)

\[
6025 \text{ feet} \times \frac{1 \text{ yard}}{3 \text{ feet}} = \frac{6025}{3} \text{ yards} \\
\frac{6025}{3} \text{ yards} \times \frac{1 \text{ mile}}{1760 \text{ yards}} = \frac{6025}{5280} \text{ miles} \\
\frac{6025}{5280} = 1 \frac{149}{1056} \text{ miles}
\]

40. \( 123450 \text{ feet} = 75.18 \text{ miles} \)

\[
123450 \text{ feet} \times \frac{1 \text{ yard}}{3 \text{ feet}} = \frac{123450}{3} \text{ yards} \\
\frac{123450}{3} \text{ yards} \times \frac{1 \text{ mile}}{1760 \text{ yards}} = \frac{123450}{5280} \text{ miles} \\
= \frac{23.38 \text{ miles}}{}
\]

41. \( 2 \frac{1}{2} \text{ miles} = 158400 \text{ inches} \)

\[
\frac{1}{2} \text{ mile} \times \frac{12 \text{ inches}}{1 \text{ foot}} \times \frac{1 \text{ foot}}{1 \text{ yard}} \times \frac{1 \text{ mile}}{1760 \text{ yards}} = \frac{5280}{1760} \text{ inches} \\
= \frac{158400}{36} \text{ inches}
\]

42. \( 3.25 \text{ yards} = 1117 \text{ inches} \)

\[
3.25 \frac{1}{2} \text{ yards} \times \frac{36 \text{ inches}}{1 \text{ yard}} = \frac{117}{2} \text{ inches}
\]

43. \( 15 \frac{3}{5} \text{ yards} = 564 \text{ inches} \)

\[
15 \frac{3}{5} \text{ yards} \times \frac{36 \text{ inches}}{1 \text{ yard}} = \frac{564}{5} \text{ inches}
\]

45. Mr. J's measuring wheel clicks once for every yard it travels. On a walk to school, the wheel clicks 35200 times.

46. Gary is building picture frames to sell in a market. He has 75 yards of material and will make square frames with side lengths of 14 inches. How many frames can he make?

47. How many inches does he walk?

\[
35200 \times \frac{1}{36} \text{ inches} = 977.78 \text{ inches}
\]

48. How many miles?

\[
\frac{35200}{1760} \times \frac{1 \text{ mile}}{1 \text{ yard}} = 20 \text{ miles}
\]
### Conversions with Non-linear Measurements

- **50.** How do you calculate the area of a square?
  
  \[ \text{Area} = \text{length} \times \text{width} \]

- **51.** What is the area of the square to the left in square-feet?
  
  \[ 3 \text{ ft} \times 3 \text{ ft} = 9 \text{ ft}^2 \]

- **52.** What is the side length of the square in inches?
  
  \[ 3 \text{ ft} \times 12 = 36 \text{ in} \]

- **53.** What is the area in square inches?
  
  \[ 36 \text{ in} \times 36 \text{ in} = 1296 \text{ sq in} \]

- **54.** To convert the area of a figure from square feet to square inches, what calculations must you perform?
  
  \[ \frac{9 \text{ ft}^2}{1 \text{ ft}^2} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{12 \text{ in}}{1 \text{ ft}} = 7296 \text{ in}^2 \]

- **55.** A rectangular plot of land has dimensions of 0.5 miles by 0.4 miles. What is the area in ft²?
  
  \[ 0.5 \times 0.4 \text{ miles} = 0.2 \text{ miles}^2 \]

- **56.** To convert the area of a figure from square miles to square feet, what calculations must you perform?
  
  \[ \frac{1 \text{ mile}}{5280 \text{ ft}} \times \frac{5280 \text{ ft}}{1 \text{ mile}} = 5575680 \text{ ft}^2 \]

- **57.** A pizza has an area of 1.5 ft². If the pizza is to be sliced into six equal slices, how many square inches is each slice?
  
  \[ \frac{3 \times 12 \text{ in}}{2} \times \frac{12 \text{ in}}{2} = 216 \text{ in}^2 \]

- **58.** A circular carpet has an area of 100π ft² (approximately 314 ft²). What is the length of the radius in inches?
  
  \[ A = \pi \text{ in}^2 \times \frac{1 \text{ ft}}{12 \text{ in}} \times \frac{12 \text{ in}}{1 \text{ ft}} = 220 \text{ in} \]

- **59.** The cross-section of a concrete pipe is shown below. Calculate the area of the inner (open) part of the pipe to the nearest in².
  
  \[ A = \pi \text{ in}^2 \times \frac{1 \text{ ft}}{12 \text{ in}} \times \frac{12 \text{ in}}{1 \text{ ft}} = 101788 \text{ in}^2 \]

- **60.** The pipe in the previous question has concrete walls that are 5 feet thick. Calculate the cross-sectional area of concrete to the nearest in².
  
  \[ A = \frac{1256.637061 \text{ ft}^2}{1 \text{ ft}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{1 \text{ ft}}{12 \text{ in}} = 706.858347 \text{ ft}^2 \]

- **61.** The total area of the pipe is then:
  
  \[ A_T = A_i + A_c = 549.8 \text{ ft}^2 \]
<table>
<thead>
<tr>
<th>UNIT</th>
<th>QUANTITY MEASURED</th>
<th>REPRESENTATIVE EXAMPLE</th>
<th>3 EXAMPLES OF OBJECTS YOU WOULD MEASURE USING THIS UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milligram</td>
<td>MASS?</td>
<td>ONE GRAIN OF SALT</td>
<td>1. grain of sugar&lt;br&gt;2. grain of sand&lt;br&gt;3. medication</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gram</td>
<td>MASS?</td>
<td>ONE PAPER CLIP</td>
<td>1. mushroom&lt;br&gt;2. letter&lt;br&gt;3. piece of cheese</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kilogram</td>
<td>MASS?</td>
<td>ONE PINEAPPLE</td>
<td>1. big delivery box&lt;br&gt;2. cement&lt;br&gt;3. luggage</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millilitre</td>
<td>MASS?</td>
<td>≈ ⅓ or ⅓ TSP.</td>
<td>1. drop of water&lt;br&gt;2. eye drop&lt;br&gt;3. drop of food dye</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Litre</td>
<td>MASS?</td>
<td>ONE BOTTLE OF POP</td>
<td>1. carton of milk&lt;br&gt;2. pitcher of juice&lt;br&gt;3. shampoo</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millimetre</td>
<td>MASS?</td>
<td>LENGTH OF FINGERNAIL</td>
<td>1. thickness of paper clip&lt;br&gt;2. thickness of iphone 5&lt;br&gt;3. width of twizzler</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centimetre</td>
<td>MASS?</td>
<td>LENGTH OF FINGER</td>
<td>1. length of pencil&lt;br&gt;2. length of hair&lt;br&gt;3. thickness of arm</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metre</td>
<td>MASS?</td>
<td>TRACK RACES</td>
<td>1. distance from desk to board&lt;br&gt;2. height of giraffe&lt;br&gt;3. length of car</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kilometre</td>
<td>MASS?</td>
<td>FROM HOUSE TO SCHOOL</td>
<td>1. from Victoria to L.A.&lt;br&gt;2. from house to mall&lt;br&gt;3. airplane ride (distance travelled)</td>
</tr>
<tr>
<td></td>
<td>VOLUME?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISTANCE?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Converting Between Units in the Metric System (SI)

Conversion Factor: Multiplying or dividing by this number allows us to convert from one unit to another.

Eg. Convert 230 mm to cm.

\[ 230 \text{ mm} \times \frac{1 \text{ cm}}{10 \text{ mm}} = 23 \text{ cm} \]

Use the numbers in the table on page 5.

\[ \frac{1 \text{ cm}}{10 \text{ mm}} \]

The unit on top is the one you are converting to!

One Unit Conversions

Convert the following. Answer to the nearest tenth when necessary.

61. 1250 mm = \underline{125} \text{ cm}

\[ 1250 \text{ mm} \times \frac{1 \text{ cm}}{10 \text{ mm}} = 125 \text{ cm} \]

Or...simply move the decimal one place to the left.

62. 37.25 m = \underline{375} \text{ cm}

63. 0.8 cm = \underline{80} \text{ mm}

64. 138 m = \underline{138000} \text{ mm}

65. 1508 cm = \underline{151.1} \text{ m}

66. 3.28 cm = \underline{32.8} \text{ mm}

67. A circle has a radius of 10 cm. Find the circumference of the circle in millimetres.

\[ C = 2\pi r \]

\[ C = 2\pi (10) \]

\[ C = 62.83185 \text{ cm} \]

\[ \times 10 \]

\[ = 628.3 \text{ mm} \]

not squared??

68. A farmer builds a fence around a rectangular sheep pen. The pen is 5 metres long and 7 metres wide. What is the perimeter of the pen in centimetres?

\[ 5 + 7 + 5 + 7 = 24 \text{ m} \]

\[ 24 \text{ m} \times 100 = 2400 \text{ cm} \]

69. Find the height of a triangle with a base of 12 cm and an area of 75 cm². Answer in millimetres.

\[ A = \frac{bh}{2} \]

\[ \frac{(12\text{cm})}{2} = \frac{(75\text{cm}^2)}{2} \]

\[ 12\text{cm} \times h = \frac{150\text{cm}^2}{22\text{cm}} \]

\[ h = \frac{12.5\text{cm} \times 10}{125\text{mm}} \]
Two (or three) Unit Conversions

Use two conversion factors to make necessary conversions. Round to the nearest tenth of a unit if necessary.

<table>
<thead>
<tr>
<th>Question</th>
<th>Equation</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>70. Convert 3.45 m to mm.</td>
<td>3450 mm</td>
<td></td>
</tr>
<tr>
<td>71. Convert 12.357 km to m.</td>
<td>12357 m</td>
<td></td>
</tr>
<tr>
<td>72. Convert 0.176 mm to m.</td>
<td>0.000176 m</td>
<td>0.02 m</td>
</tr>
<tr>
<td>73. Convert 1.365 km to mm.</td>
<td>1365000 mm</td>
<td></td>
</tr>
<tr>
<td>74. Convert 17 (\frac{1}{2}) m to mm.</td>
<td>(17 \times 100 \times 10 = 17200 \text{mm})</td>
<td>(17200 \text{mm})</td>
</tr>
<tr>
<td>75. Convert 3 m to cm.</td>
<td>(0.75 \times 1000 \times 100 = 75000 \text{cm})</td>
<td>(75000 \text{cm})</td>
</tr>
<tr>
<td>76. The poliovirus is about 30 <strong>nanometers</strong> in diameter. That is 0.000 000 030 m. How many millimetres in diameter is the virus?</td>
<td>0.00003 mm</td>
<td></td>
</tr>
<tr>
<td>77. The Great Wall of Ming Dynasty in China has been measured to be 8851.8 km long. Approximately how many centimetres is this?</td>
<td>885 180 000 cm</td>
<td></td>
</tr>
<tr>
<td>78. A standard volleyball court is 18 m long and 9 m wide. Find the area in square millimetres.</td>
<td>(18 \text{m} \times 18000 \text{mm} = 16200000 \text{ mm}^2)</td>
<td>(16200000 \text{ mm}^2)</td>
</tr>
<tr>
<td>79. 2 m + 30 cm + 4 mm</td>
<td>2000 mm + 300 mm + 4 mm = 2304 mm</td>
<td>2304 mm</td>
</tr>
<tr>
<td>80. 1.35 km + 125 m + 40 cm</td>
<td>1350 m + 125 m + 0.4 m = 1475.4 m</td>
<td>1475.4 m</td>
</tr>
<tr>
<td>81. 1.35 km + 125 m + 120 mm</td>
<td>135000 cm + 12500 m + 12 cm = 147512 cm</td>
<td>147512 cm</td>
</tr>
</tbody>
</table>
Unit Conversion between Systems

One-Step Conversions:

Use the table on page 5. Write the conversion factors as a ratio (watch the units!).

Convert each of the following. Round to the nearest tenth.

82. 50 mi = \( \frac{80.5}{1} \) km
   Use: \( \frac{1.609 \text{ km}}{1 \text{ mi}} \) (from reference page)
   \[ 50 \text{ mi} \times \frac{1.609 \text{ km}}{1 \text{ mi}} = 80.45 \text{ km} \]
   \( \approx 80.5 \text{ km} \)

83. 185 lb = \( \frac{84.1}{1} \) kg
   \[ \frac{185 \text{ lb}}{1} \times \frac{1 \text{ kg}}{2.21 \text{ lb}} = 84.07 \text{ kg} \]

84. 150 m = \( \frac{163.9}{1} \) yd
   \[ \frac{150 \text{ m}}{1} \times \frac{1 \text{ yd}}{0.9144 \text{ m}} = 163.9 \text{ yd} \]

85. 72 in = \( \frac{182.9}{1} \) cm
   \[ \frac{72 \text{ in}}{1} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = 182.88 \text{ cm} \]

86. 42 oz = \( \frac{1190.7}{1} \) g
   \[ \frac{42 \text{ oz}}{1} \times \frac{28.359 \text{ g}}{1 \text{ oz}} = 1190.7 \text{ g} \]

87. 1245 km = \( \frac{778.1}{1} \) miles
   \[ \frac{1245 \text{ km}}{1} \times \frac{1 \text{ mile}}{1.609 \text{ km}} = 778.1 \text{ miles} \]

Two-Step or Three-Step Conversions:

Convert each of the following. Round to the nearest tenth.

88. 42 km = \( \frac{137824.7}{1} \) ft
   ① Convert from km \( \rightarrow \) mi
   ② Convert from mi \( \rightarrow \) ft
   \[ 42 \text{ km} \times \frac{1 \text{ mi}}{1.609 \text{ km}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \]
   \( \approx 137824.7 \text{ ft} \)

89. 54 m = \( \frac{2126.0}{1} \) in
   \[ 54 \text{ m} \times \frac{1 \text{ in}}{0.0254 \text{ m}} = 2125.98 \text{ in} \]
   \( \approx 2126.0 \text{ in} \)

90. 1250 g = \( \frac{2.8}{1} \) lb
   \[ 1250 \text{ g} \times \frac{1 \text{ lb}}{0.45359 \text{ kg}} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} = 2.75 \text{ lb} \]

91. Answer the question above using a different conversion strategy.
   \[ 42 \times 1000 = 42000 \text{ m} \]
   \[ \frac{42000 \text{ m}}{1} \times \frac{1\text{ ft}}{0.3048 \text{ m}} = 1377.95 \text{ ft} \]

92. 4.25 km = \( \frac{16332.8}{1} \) in
   \[ 4.25 \text{ km} \times \frac{1 \text{ in}}{0.0254 \text{ km}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = 167322.8 \text{ in} \]

93. 1.3 tons = \( \frac{1181.8}{1} \) kg
   \[ 1.3 \times 2000 = 2600 \text{ lb} \]
   \[ \frac{2600 \text{ lb}}{1} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} = 1181.8 \text{ kg} \]
Convert the following. Exact answers or round to the nearest hundredth when necessary.

<p>| | | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>94.</td>
<td>12 lbs 3 oz = 5.53 kg</td>
<td></td>
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<tr>
<td></td>
<td></td>
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<tr>
<td>95.</td>
<td>2 lbs 14 oz = kg</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>96.</td>
<td>7 lbs 8 oz = g</td>
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</tr>
</tbody>
</table>

1. Convert 3 oz to lbs.
   \[
   3 \text{ oz} \times \frac{1 \text{ lb}}{16 \text{ oz}} = 0.1875 \text{ lb}
   \]
2. Add: 12 + 0.1875 = 12.1875 lb
3. \[
   12.1875 \text{ lb} \times \frac{0.45359237 \text{ kg}}{1 \text{ lb}} = 5.53 \text{ kg}
   \]

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>97.</td>
<td>126&quot; = m</td>
<td></td>
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<tr>
<td></td>
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<tr>
<td>98.</td>
<td>8 yd 3' = 8.23 m</td>
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<td></td>
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<tr>
<td>99.</td>
<td>14 m 28 cm = ___ yd</td>
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</table>

100. Answer the question above using a different conversion strategy.
101. Answer the question above using a different conversion strategy.
102. Answer the question above using a different conversion strategy.

103. A pizza has a circumference of 5 feet 3 inches. Find the diameter in centimetres.

\[
\begin{align*}
2\pi r &= 63 \\
2r &= d \\
d &= 20.05352283\text{ in} \times 2.54 \\
d &= 50.9\text{ cm}
\end{align*}
\]

104. A volleyball has a diameter of 2 feet 2 inches. Find the circumference of the ball at its widest point. Answer to the nearest inch.

\[
\begin{align*}
2\pi r &= 26\text{ in} + 2\text{ in} + 13\text{ in} \\
C &= 2\pi (r + C/2) \\
C &= 82\text{ in}
\end{align*}
\]

105. Mr. J needs 2 m, 41 cm and 3 mm of edge grain fir to make each of his cabinet doors. How many linear feet does he need to make his 8 doors?

\[
\begin{align*}
2\text{ m} &= 200\text{ cm} \\
41\text{ cm} &= 0.41\text{ m} \\
3\text{ mm} &= 0.3\text{ cm}
\end{align*}
\]

\[
\begin{align*}
200 + 0.41 + 0.3 &= 241.3\text{ cm} \\
241.3\text{ cm} \times 8 &= 1930.4\text{ cm} \\
1930.4\text{ cm} &\times \frac{1\text{ ft}}{30.48\text{ cm}} \\
&= 63.33\text{ ft}
\end{align*}
\]

\*don't use 3.14, use \pi \* 
\* don't round until end \*
Geometry of 3-D figures.

Familiarize yourself with the shapes, names and formulas at the beginning of this booklet.

Using the reference page at the beginning of this unit.

- Choose the right formula.
- Fill in all known values into the formula.
- Calculate (remember BEDMAS).

Surface Area

Area is the **two-dimensional** size of a surface. Consider the area that this booklet is covering on the surface below it (unless you are on a computer of course).

The **surface area** of a solid is the total area of its exposed surfaces.

Consider a common cereal box. If you unfolded the sides, top, bottom, front and back...how much area on your desk would it cover? That would be the surface area of the box.

127. Refer to page 5 to answer the following question.
Find the surface area of the rectangular prism below to the nearest square metre.

128. Refer to page 5 to answer the following question.
Find the surface area of the square pyramid below to the nearest ten square inches.
Find the surface area of the rectangular prism below to the nearest square metre.

\[ SA = 2(hl + lw + hw) \]
\[ SA = 2[(1.5 \times 3) + (3 \times 2) + (1.5 \times 2)] \]
\[ SA = 2[4.5 + 6 + 3] \]
\[ SA = 27 \text{ m}^2 \]

Find the surface area of the square pyramid below to the nearest ten square inches.

\[ A = 2bs + b^2 \]
\[ A = 2(75)(s) + (75)^2 \]
\[ A = 2(75)(48.0) + (75)^2 \]
\[ A \approx 12830 \text{ sq in} \]

Need 's'

Use \( a^2 + b^2 = c^2 \)
\[ 37.5^2 + 30^2 = s^2 \]
\[ s = 48.0 \]

Calculate the surface area of the following figures. Answers should be given as indicated.

129. Nearest square inch.

\[ 2 \times \text{Area} = 14800 \text{ in}^2 \]
\[ 2 \times \text{Area} = 28268 \text{ in}^2 \]
\[ 2 \times \text{Area} = 38200 \text{ in}^2 \]
\[ = 81268 \text{ in}^2 \]

130. Nearest square inch.

\[ A = \pi r^2 + \pi rs \]
\[ A = \pi (46.5)^2 + \pi (46.5)(88.245) \]
\[ A = 19684 \text{ sq in} \]
Calculate the surface area of the following figures. Answers should be given as indicated.

131. Nearest square millimetre.

\[ r = 12 \text{ mm} \]

\[ SA = 4\pi r^2 \]

\[ SA = 4\pi (12)^2 \]

\[ SA = 1809.557368 \text{ sq mm} \]

\[ SA = 1810 \text{ sq mm} \]

132. Nearest square centimetre.

\[ r = 2.2 \text{ cm} \]

\[ h = 4 \text{ cm} \]

\[ SA = 2\pi r^2 + 2\pi rh \]

\[ SA = 2\pi (2.2)^2 + 2\pi (2.2)(4) \]

\[ SA = 85.70264759 \text{ sq cm} \]

\[ SA = 86 \text{ sq cm} \]

133. Nearest square foot.

\[ \text{slant height} = \sqrt{1^2 + 3^2} = \sqrt{10} \text{ ft} \]

\[ 1\text{yd} = 3\text{ft} \]

\[ 1\text{yd}^2 = 9\text{ft}^2 \]

\[ SA = \pi r^2 + \pi r s \]

\[ SA = \pi (15)^2 + \pi (15)(15) \]

\[ SA = 1884.95592 \text{ sq yd} \]

\[ SA = 1696.646 \text{ sq ft} \]

\[ 1696.65 \text{ sq ft} \]

134. Nearest square foot.

\[ SA = 2bs + b^2 \]

\[ SA = 2(89)(66) + 89^2 \]

\[ = 19669.9 \text{ sq in} \]

\[ = 136.5902778 \text{ sq ft} \]

\[ = 137 \text{ sq ft} \]

135. Calculate the surface area of a cone with a height of 10 cm and a base diameter of 12 cm. Answer to the nearest square centimetre.

\[ SA = \pi r^2 + \pi rs \]

\[ \frac{a^2 + b^2}{c^2} = \cos(35^\circ) \]

\[ = 0.70685834751 \]

\[ = 12.66190379 \text{ cm} \]

\[ 15 \text{ cm} \]

\[ SA = 333 \text{ cm}^2 \]

136. A cone has a base radius of 15 inches and a surface area of 1650 square inches. Find the slant height of the cone to the nearest inch.

\[ SA = \pi r^2 + \pi rs \]

\[ \frac{a^2 + b^2}{c^2} = \cos(35^\circ) \]

\[ 1650 \text{ in}^2 = \pi (15)^2 + \pi (15)s \]

\[ 1650 \text{ in}^2 = \pi (225) + 1650 \text{ in}^2 \]

\[ = 706.85834751 \text{ in} \]

\[ = 12.01 \text{ in} \]
137. Frank needs to find the surface area of the playground equipment below so he can estimate how much paint to buy. Explain the process he should use (he will not paint the bottom).

Explain: 
- 2 ends: \(2 \times (60.5)(85)\) = 
- 1 top: \(112(85)\) = 
- Front + Back: \(2(112)(60.5) - 2(20.75)^2\) = 
- Cylinder wrapper: \(2\pi(20.75)(85)\) = 

138. Find the surface area of the figure to the left to the nearest square inch.

- 2 ends: \(10285 \text{ in}^2\)
- 1 top: \(9520 \text{ in}^2\)
- F + B: \(10846.69603 \text{ in}^2\)
- CW: \(11081.96809 \text{ in}^2\)
- Total: \(41733.65839 \text{ in}^2\)

\[41734 \text{ sq in}\]

139. One quart of paint (a small can) covers 87.5 sq ft. How many quarts will Frank need to buy?

\[\frac{289.8194444}{87.5} = 3.312 \text{ or 4 quarts}\]

140. Find the surface area of the concrete curb below (all surfaces). Answer to the nearest square centimetre.

- Bottom: \((297)(378) = 260766 \text{ cm}^2\)
- Circle: \(\pi r^2 \rightarrow \pi (148.5)^2 = 69279.1866 \text{ cm}^2\)
- C: \(2\pi r = 2\pi (148.5) = 933.0530181 - 2 = 466.5265091\times 878 = 409610.275 \text{ cm}^2\)

\[SA = 739655.4616 \text{ sq cm}\]

\[SA = 739655.5 \text{ sq cm}\]

141. Calculate the surface area of the hexagonal prism (regular) to the nearest square metre.

\[6 \times 2 = 12m^2\]

\[1.5m = 17.1m^2\]

\[2 \times 3.29096534 = 12.5054068\]

\[a^2 = 0.0025 + a = 0.095\]

\[\frac{1}{2} \times 0.95 \times 6.252703415m = 1.656548267\]

\[SA: 3.6m^2\]
Volume

Volume is the amount of 3-dimensional space that a figure occupies or contains.

Consider the cereal box. The “amount” of Beacon Bits that fit inside the box is its volume. This is often referred to as the capacity of a container.

142. Challenge:
If each Beacon Bit is a cube 1 cm by 1 cm by 1 cm, how many Bits would fit in the box? Start by finding out how many would fit in the bottom layer:

\[ V = 35 \times 27 \times 8 = 7560 \text{ cm}^3 \quad (\text{box}) \]
\[ V = 1 \times 1 \times 1 = 1 \text{ cm}^3 \quad (\text{Beacon Bit}) \]

\[ 7560 \text{ cm}^3 \div 1 \text{ cm}^3 = 7560 \text{ Beacon Bits} \]

144. Refer to page 5 to answer the following question.

Find the volume of the cone to the nearest cubic inch.

\[ V = \frac{\pi r^2 h}{3} \]
\[ V = \frac{\pi (55)^2 (75)}{3} \]
\[ V = \frac{237583}{3} \text{ in}^3 \]
Find the volume of the box to the nearest cm$^3$.

$$V = lwh$$
$$V = (27)(8)(35)$$
$$V = 7560 \text{ cm}^3$$

145. Using the formula for the volume of a rectangular prism, $V = lwh$, explain why the units for volume are "cubed".

Because it is units (L) x units (W) x unit (H), and units x units x units makes units$^3$.

146. Refer to page 5. Compare the formulas to calculate volume of right prisms, right cylinders, and triangular prisms. What do they all have in common?

They are all base area x height

$$V = \left(\text{Base Area}\right)h$$

147. Timothy is building a garden water fountain in the shape of a "truncated" square pyramid. Describe how you would find the volume of concrete required to build this fountain.

Find volume of big square based pyramid

$$V = \frac{1}{3}(94 \times 58)(39)$$

then subtract cut out square based pyramid

$$V = \frac{1}{3}(21 \times 13)(8)$$

Find the volume of the cone to the nearest cubic inch.

$$V = \frac{1}{3}(\pi r^2)h$$
$$V = \frac{\pi(55)^2(75)}{3}$$
$$V = \frac{226875\pi}{3} \approx 75625\pi \approx 237583 \text{ sq in}$$

148. Find the volume to the nearest tenth of metre.

$$V = (\text{Base Area})h$$
$$V = (\pi r^2)(h)$$
$$V = \pi(1.35^2)(2)$$
$$V \approx 11.45110522 \text{ m}^3$$
$$V = [11.5 \text{ m}^3]$$
Calculate the volume of the following figures. Answers should be given as indicated.

149. Cubic centimetres.

\[ V = \text{Base Area} \times h \]
\[ V = 352 \times 168 \times 187 \]
\[ V = 11058432 \text{ cm}^3 \]

150. Cubic centimetres.

\[ V = \frac{1}{3} \pi r^2 h \]
\[ V = \frac{1}{3} \pi (153.7^2)(169.5) \]
\[ V = 4193205 \text{ cm}^3 \]

151. Cubic feet.

\[ V = \frac{1}{3} \times (8 \times 8) \times 4 \]
\[ V = \frac{1}{3} \times 512 \]
\[ V = 167.07 \text{ ft}^3 \]

152. Cubic metres.

\[ V = \frac{1}{3} \times 3.6 \times 3 \]
\[ \text{Answer: says } 24.4 \text{ m}^3 \]

153. Nearest tenth of a cubic metre.

\[ V = \frac{2}{3} \pi r^3 \]
\[ V = \frac{2}{3} \pi (1.8)^3 \]
\[ V = 7.1 \text{ m}^3 \]

154. A spray nozzle produces a cone-shaped spray pattern. Find the volume of the cone if the nozzle is 12 feet above the ground and produces a circle with a diameter of 16 feet. (Nearest cubic foot)

\[ V = \frac{1}{3} \pi r^2 h \]
\[ V = \frac{1}{3} \pi (8^2)(12) \]
\[ V = 804 \text{ ft}^3 \]
155. Find the volume to the nearest cubic inch.

\[ V = \frac{1}{3} \text{(Base Area)} \times \text{height} \]

\[ V = \frac{1}{3} \times (6 \times 6) \times 5 \]

\[ V = 60 \text{ in}^3 \]

156. If the pyramid to the left is enlarged by a factor of 2, what will the new volume be?

\[ V = \frac{1}{3} \text{(Base Area)} \times \text{height} \]

\[ V = \frac{1}{3} \times (12 \times 12) \times 10 \]

\[ V = 480 \text{ in}^3 \]

Can you make a rule (formula) for this?

Multiply final answer by 2 if enlarged by 2.

157. A square-based pyramid has a volume of 250 cubic yards and a height of 30 feet. Find the side length of the square base to the nearest foot.

\[ V = \frac{1}{3} \times s^2 \times h \]

\[ 250 = \frac{1}{3} \times s^2 \times 30 \]

\[ s^2 = \frac{250 	imes 3}{30} \]

\[ s = \sqrt{250} \]

\[ s = 26 \text{ ft} \]

158. A sphere has a volume of 3000 m\(^3\). Find the radius of the sphere to the nearest metre.

\[ V = \frac{4}{3} \pi r^3 \]

\[ \frac{4}{3} \times 3000 = \pi 	imes r^3 \]

\[ r = \sqrt[3]{\frac{4}{3} \times 3000} \]

\[ r = 8.94 \text{ m} \]

159. Charlie needs to paint the composite shape below. Before he purchases paint he needs to calculate the surface area to the nearest square foot. The bottom does not need to be painted. How many square feet does he need to paint?

\[ S.A = 2\pi r^2 + 2\pi rh \]

\[ \text{circle: } r^2 = \pi (4.33)^2 \]

\[ \text{wrap: } 2\pi rh = 2\pi (4.33)(6.25) \]

\[ 2 \text{ ends: } 2(2.5)(1.92) \]

\[ 2 \text{ sides: } 2(2.5)(6) \]

\[ = 268.54 \text{ ft}^2 \]

\[ = 269 \text{ ft}^2 \]

160. Find the volume of gravel in the pile to the nearest cubic yard.

\[ V = \frac{1}{3} \pi r^2 h \]

\[ V = \frac{1}{3} \pi (146.5)^2 (133) \]

\[ V = 2989203.68 \text{ cm}^3 \]

\[ V = 105.6 \text{ yd}^3 \]

\[ V = \frac{3.909730805}{1} \text{ yd}^3 \]

\[ V = 4 \text{ yd}^3 \]
161. Find a spherical object and measure the diameter. Calculate the surface area of your object. Draw a neat and detailed diagram showing your object and measurement. Record all measurements to the nearest tenth of a centimetre. Round your answer to the nearest square centimetre.

\[ \text{SA} = 4 \pi r^2 \]

\[ \text{SA} = 4 \pi (4.1)^2 \]

\[ \text{SA} = 211 \text{cm}^2 \]

162. Find a conical object. Make appropriate measurements to the nearest tenth of a centimetre. Draw a neat and detailed diagram showing your object and measurements. Calculate the volume of the cone to the nearest cubic centimetre.

\[ V = \frac{1}{3} \pi r^2 h \]

\[ V = \frac{1}{3} \pi (5.6^2) (11.4) \]

\[ V = 374 \text{ cm}^3 \]

163. One gallon of paint covers approximately 350 sq-ft. How many decorative balls can you paint with a 5-gallon bucket of paint if each ball has a radius of 12 cm.

\[ \text{SA} = 4 \pi r^2 \]

\[ \text{SA} = 4 \pi (12)^2 \]

\[ \text{SA} = 1809.567 \text{ cm}^2 \times 30.48 \text{ cm}^2 \]

\[ \text{SA} = 1.9479 \text{ m}^2 \]

\[ 350 \times 5 = 1750 \text{ ft}^2 \]

\[ 1750 \text{ ft}^2 \div 1.9479 \text{ ft}^2 = 898.4 \text{ balls} \]

\[ 898 \text{ balls} \times 897 \text{ balls} \]

164. A cylindrical can holds 3 tennis balls. The diameter of a tennis ball is 2 \( \frac{1}{2} \) inches. Calculate the volume of air in the can surrounding the 3 balls. The can is designed to hold exactly three tennis balls in terms of height and diameter. (Nearest tenth of a cubic inch).

\[ \text{Cylinder Volume} = \pi r^2 h \]

\[ \text{Cylinder Volume} = \pi (1.25)^2 (7.5) \]

\[ V = 36.81 \text{ in}^3 \]

165. A section of concrete pipe has an inside diameter of 2.2 m and an outside diameter of 2.5 m. Find the cross-sectional area of exposed concrete for one end of the pipe.

\[ A_0 = \pi r^2 \]

\[ A_0 = \pi (1.25)^2 \]

\[ A_0 = 4.908 \text{ m}^2 \]

\[ A_i = \pi r^2 \]

\[ A_i = \pi (1.1)^2 \]

\[ A_i = 3.801 \text{ m}^2 \]

\[ A_0 - A_i = 1.107 \text{ m}^2 \]

166. A sphere has a surface area of 260\( \pi \) square feet. Find the exact radius of the sphere.

\[ \text{Sphere Surface Area} = 4 \pi r^2 \]

\[ 4 \pi r^2 = 260 \pi \]

\[ r = 6.5 \text{ ft} \]

167. A sphere has a surface area of 289\( \pi \) square inches. Find the radius of the sphere to the nearest tenth of an inch.

\[ \text{Sphere Surface Area} = 4 \pi r^2 \]

\[ 4 \pi r^2 = 289 \pi \]

\[ r = 8.5 \text{ in} \]
168. Below is a model of a standard room at a storage facility. The interior walls are to be painted. The room measures 18' by 24' and the wall height is 8'. The door is standard height and width (36'' by 80''). Find the interior surface area of the walls.

Check out the huge aquarium! Mr. J wants to swim the fishes so he is building this aquarium in his home.

169. Calculate the volume of concrete in the floor of the aquarium in cubic feet.

\[ V = l \times w \times h \]
\[ V = 16 \text{ft} \times 28 \text{ft} \times 1 \text{ft} \]
\[ V = 448 \text{ft}^3 \]

170. Calculate the mass of the floor if concrete has a mass of 2400 kg per cubic metre.

\[ \frac{448 \text{ft}^3}{27 \text{ft}^3} \times 1 \text{m} \times 0.3048 \text{m} \times 0.3048 \text{m} \]
\[ = 304.8 \text{ft}^3 \times 2400 \text{kg} \]
\[ = 731,176 \text{kg} \]

171. Calculate the area of acrylic (aquarium wall) required to build this structure.

\[ 2 \times (16 \text{ft}^2 + 28 \text{ft}^2) \]
\[ = 2 \times (28 \text{ft}^2) \]
\[ = 112 \text{ft}^2 \]

172. Sheets of acrylic sell for $45/sq ft. If he could actually find sheets this size, what would be the cost (before taxes)?

\[ 112 \text{ft}^2 \times 45 \text{$/ft}^2 \]
\[ = 5040 \text{$/structure} \]

173. How many litres of water does the tank hold? How many gallons?

Note: 1 cm\(^3\) = 1 ml, 1000 ml = 1 litre, 1 gallon = 3.785 litres

\[ V = l \times w \times h \]
\[ V = 16 \text{ft} \times 28 \text{ft} \times 7 \text{ft} \]
\[ V = 3136 \text{ft}^3 \]

\[ \frac{3136 \text{ft}^3}{1000} \times \frac{1 \text{litre}}{1 \text{ft}^3} \times \frac{1 \text{gallon}}{3.785 \text{litres}} \]
\[ = 824.09 \text{gallons} \]

\[ \approx 824 \text{gallons} \]
174. A sphere has a volume of \( \frac{256 \pi}{3} \) cm\(^3\). Find the exact radius of the sphere.

175. A square-based pyramid with a height of 10 metres has a volume of 300 m\(^3\). Find the exact side length of the base.

176. Find the height of a cylinder if it has a volume of 1200 cm\(^3\) and a radius of 12 cm. Answer to the nearest tenth of a centimetre.

177. Find the exact volume of the right cone below. It has a height of 10 cm and a radius of 5 cm.

178. Find the exact volume of a cylinder with the same height and radius as the cone in the previous question.

179. What is the ratio of volumes for the two figures in the previous two questions?

180. Find the volume of the right prism below. Answer to the nearest cubic inch.

181. Below is a right pyramid with the same base and height as the prism in the previous question. Find the volume to the nearest cubic inch.

182. What is the ratio of volumes for the two previous figures?

183. In general, what is the relationship between the volumes of right pyramids and right prisms with the same dimensions?
Answers:

1. 9 ft
2. 45 ft
3. $37\frac{1}{2}$ or 37.5 ft
4. 4 yd
5. 27 inches
6. $45\frac{1}{3}$ yd
7. 96 in
8. 33 in
9. 57.6 in
10. 3 ft
11. $11\frac{1}{2}$ ft
12. 168 ft
13. 3520 yd
14. 22176 ft
15. $\frac{75}{32}$ miles
16. 189000 in
17. 1453 yd
18. $13\frac{3}{4}$ or 13.75 lbs
19. 64 oz
20. 36 oz
21. 3 tons
22. 96"
23. 128 oz
24. 192" 
25. $162.06$ for 74"
26. 46 yd, 2 ft
27. 85 yd, 1 ft
28. 9 yd, 2 ft, 8 in
29. 11’ 10"
30. 5 yd, 2 ft
31. 2 tons, 1266 lbs and 4 oz
32. 74 ft
33. 24 yd, 2 ft
34. 6’ x 7’
35. $199.92$
36. 13 yd, 1 ft
37. 192 sq ft
38. $147.84$ for 48 rolls
39. $1\frac{49}{50}$ miles (about 1.141 miles)
40. $29\frac{2}{3}$ or 23.4 miles
41. 158400"
42. 117"
43. 564"
44. 876"
45. 1536"
46. 48 frames
47. 1267200"
48. 20 miles
49. 116.5 yd
50. $A = lw$
51. 9 sq ft
52. 36 in
53. 1296 sq in
54. Multiply by the conversion factor (12) twice. That is, multiply by $12^2$
55. $5575.680$ sq ft
56. Multiply by $(5280)^2$
57. 36 sq in
58. 120"
59. 101788 sq in
60. 79168 sq in
61. 125 cm
62. 3725 cm
63. 8 mm
64. 138 000 mm
65. 15.1 m
66. 32.8 mm
67. 628 mm
68. 2400 cm
69. 125 mm
70. 3450 mm
71. 12357 m
72. 0.2 m
73. 1 365 000 mm
74. 17200 mm
75. 75 000 cm
76. 0.000 03 mm
77. 885 180 000 cm
78. 152 000 000 mm²
79. 2304 mm
80. 1475.4 m
81. 147512 cm
82. 80.5 km
83. 84.0 kg
84. 164.0 yd
85. 182.9 cm
86. 1190.7 g
87. 773.8 miles
88. 137824.7 ft
89. 2126.0 in
90. 2.8 lbs
91. 137795.3 ft
92. 167322.8 in
93. 11804 kg
94. 5.53 kg
95. 1.31 kg
96. 3402 g
97. 3.81 m
98. 8.23 m
99. 15.62 yd
100. 3.81 m
101. Try yards
102. Try m
103. 50.94 cm
104. 82"
105. $66\frac{1}{3} = 66.33$ linear ft.

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106. Your answers here.
107. Your answers here.
108. Your answers here.
110. Trundle wheel.
111. Vernier calipers.
112. Micrometer.
113. Inches, cm, mm.
114. Eg. Measuring tape. Cm, inches (and fractions thereof)
115. Eg. Measuring cup. Cups, ounces, ml,
116. Eg. Volumetric cylinder. ml
117. Eg. 2-pan balance scale. g, kg
118. Eg. Electronic scale. μg, mg, g
119. Diameter, distance.
120. Volume. ml
121. Diameter, distance.
122. One set of claws is for measuring inside diameters such as inside a tube. The other is for measuring outside diameter.
123. 1.97 mm
124. 3.15 cm
125. 3.68 cm
126. 0.40 mm
127. 27 m²
128. 12 830 sq in
129. 81 268 sq in
130. 19 684 sq in
131. 1810 mm²
132. 86 cm²
133. 16 965 sq ft
134. 137 sq ft
135. 333 cm²
136. 20"
137. Find the surface area of the rectangular prism, add the area of the curved cylindrical surface, subtract the bottom of the prism and the two circles.
138. 41 734 sq in
139. Frank should buy 4 quarts.
140. 739 655 cm² (with bottom) 478889 cm² (without bottom)
141. 36m²
142. 7560 Beacon Bits
143. 7560 cm³
144. 237 583 cubic inches
145. The three dimensions have units such as centimetres. If we multiply cm × cm × cm we get cm³.
146. Bottom (base area) multiplied by the height.
147. Find the volume of the large pyramid and subtract the volume of the small (removed) pyramid.
148. 11.5 m³
149. 1 058 432 cm³
150. 4 193 205 cm³
151. 85 cubic feet
152. 24.4 m³
153. 7.1 m³
154. 804 cubic feet
155. 60 cubic inches
156. 480 cubic inches
157. 26 ft
158. 9 m
159. 269 sq ft
160. 4 yd³
161. Your answer here.
162. Your answer here.
163. 897 balls
164. 12.3 cubic inches
165. 1.1 m²
166. Radius is \( \sqrt{65} \) ft
167. 8.5 in
168. 652 sq ft
169. 448 cubic feet or 12.69 m³
170. 30 446 kg
171. 616 sq ft
172. $27720
173. 88 800 l, 23 461 gal
174. 4 cm
175. \( 3\sqrt{10} \) m (approx 9.49 m)
176. 2.7 cm
177. \( \frac{250}{\pi} \) cm³
178. 250π cm³
179. 1:3 or \( \frac{1}{3} \)
180. 212628 cubic inches
181. 70876 cubic inches
182. 1:3 or \( \frac{1}{3} \)
183. Pyramids and cones will have volumes equal to one-third of their corresponding prism.