INTRODUCTION

In this chapter you will learn to convert measurements using both the metric and the Imperial measuring systems. You will practice converting measurements within a measuring system, for example, inches to feet, cubic feet to cubic yards, and between measuring systems, for example, centimetres to inches.

As a trades worker you will use measurement to measure lengths, weights and volumes.

When you have completed this chapter you will be able to:

- ❑ Read Imperial tape measures to sixteenths of an inch.
- ❑ Read metric tape measures to millimetres.
- ❑ Convert between yards, feet and inches.
- ❑ Convert between metres, centimetres and millimetres.
- ❑ Convert between metric and Imperial units of measurement.
- ❑ Convert between squared units (area) of measurement.
- ❑ Convert between cubed units (volume) of measurement.

Using Imperial and Metric

There are two measurement systems commonly used in the construction trades. They are the Imperial system and the International System of Units (SI), generally referred to as the metric system.

The Imperial system uses inches, feet, yards and miles for linear measurements. Weight is measured in pounds and ounces. Liquids are measured using pints and gallons. Imperial measurement is often used on job sites in the construction industry to order and measure building materials. For example, paint is ordered in gallons, pipe is ordered according to its diameter in inches, and loads are measured in pounds. Drawings on many job sites use feet and inches. Therefore, it is important to be able to use these units of measurement and to be able to convert between units of measurement within the Imperial System. For example, you need to be able to convert between inches, feet and yards.

The International System of Units (SI), or the metric system, is common in most countries including Canada. During technical training, you will primarily use the metric system. The metric system uses millimetres, centimetres, metres and kilometres for linear measurements. Weight is measured in grams, milligrams and kilograms. Liquids are measured using litres. Again, it is important to be comfortable using the metric system and to be able to convert between units of measurement within the metric system. For example, you need to be able to convert between millimetres and metres. Drawings that are in metric use millimetres for linear measurement but workers often convert millimetres to metres when measuring lengths.

The Imperial System

Because the Imperial system is commonly used on job sites in the construction industry in Canada, trades workers must be comfortable working with measurements in fractions of an inch, inches and feet.

Rules for Writing Imperial Measurements

- Write abbreviations in lower case: in, yd, lb.
- The unit of measurement is always written in singular form.
- Leave a space between the amount and the unit of measurement: 4 in, 18 yd^3, 5 gal.

- The unit of measurement is written as an abbreviation when it follows a numeral: 4 in, 18 yd^3, 5 gal. When numbers are written as words, the unit of measurement is written in words: four inches, eighteen cubic yards, five gallons.

Note: In this math book, There are no periods after Imperial abbreviations.

Converting Within the Imperial System

Common Units of Measurement in the Imperial System

Linear Measure	Area Measure	Volume Measure for Solids
12 in = 1 ft	144 in^2 = 1 ft^2	27 ft^3 = 1 yd^3
36 in = 1 yd	9 ft^2 = 1 yd^2	1 728 in^3 = 1 ft^3
3 ft = 1 yd	640 acres = 1 mi^2	**Volume Measure for Fluids**
1 760 yd = 1 mile	43 560 ft^2 = 1 acre	1 quart (qt) = 2 pints (pt)
5 280 ft = 1 mile		1 Imperial gallon (gal) = 4 qt
		Volume Measure Equivalents
		1 ft^3 = 6.24 Imperial gallons
		1 ft^3 = 7.5 US gallons

Symbols:

inches: in, "	foot: ft, '	yard: yd
square inches: in^2	square foot: ft^2	square yard: yd^2
cubic inch : in^3	cubic foot: ft^3	cubic yard: yd^3

4 feet and 6 inches: 4' – 6", 4 ft 6 in

Example 1:

Convert 4 ft to inches.

1 ft = 12 in

4 ft = 4 × 12 = 48 in

Example 2:

Convert 60 in to feet.

1 ft = 12 in

60 in = 60 ÷ 12 = 5 ft

Example 3:

Convert 432 in^2 to square feet.

1 ft^2 = 144 in^2

432 in^2 = 432 in^2 ÷ 144 in^2 = 3 ft^2

Example 4:

Convert 3 ft^3 to Imperial gallons.

1 ft^3 = 6.24 Imp gal

3 ft^3 = 3 ft^3 × 6.24 Imp gal = 18.72 Imp gal

Convert the following Imperial measurements to the units indicated.

1) 1' = _____ in

2) 2' = _____ in

3) 3' - 6" = _____ in

4) 7' - 9" = _____ in

5) 5' - 11" = _____ in

6) 56" = _____ ft _____ in

7) 126" = _____ ft _____ in

8) 221" = _____ ft _____ in

9) 1 yd = _____ ft = _____ in

10) 3 yd = _____ ft = _____ in

11) 6 yd = _____ ft = _____ in

12) 1 ft^2 = _____ in^2

13) 3 ft^2 = _____ in^2

14) 1 yd^2 = _____ ft^2 = _____ in^2

15) 4 yd^2 = _____ ft^2 = _____ in^2

16) 1 296 in^2 = _____ ft^2

17) 1 008 in^2 = _____ ft^2

18) 1 728 in^3 = _____ ft^3

19) 8 640 in^3 = _____ ft^3

20) 12 960 in^3 = _____ ft^3

21) 4 ft^3 = _____ in^3

22) 1 yd^3 = _____ ft^3

23) 270 ft^3 = _____ yd^3

24) 6 ft^3 = _____ Imperial gallons

25) 8.5 ft^3 = _____ Imperial gallons

26) 24 Imp gal = _____ ft^3

27) 46 Imp gal = _____ ft^3

28) 11 ft^3 = _____ US gallons

29) 3 ft^3 = _____ US gallons

30) 30 US gal = _____ ft^3

Measuring Fractions

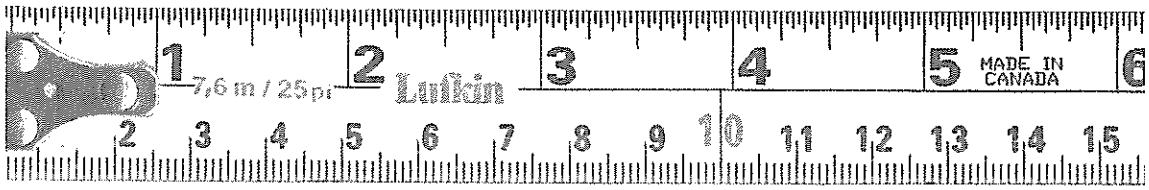
Trades workers constantly read and measure fractions when using the Imperial system. Errors in measurements are costly both in time and money. Experienced carpenters measure twice and cut once.

Trades workers work mostly in halves, fourths, eighths, sixteenths and occasionally in thirty-seconds depending on the degree of accuracy required.

Mark the measuring tape to show the following measurements.

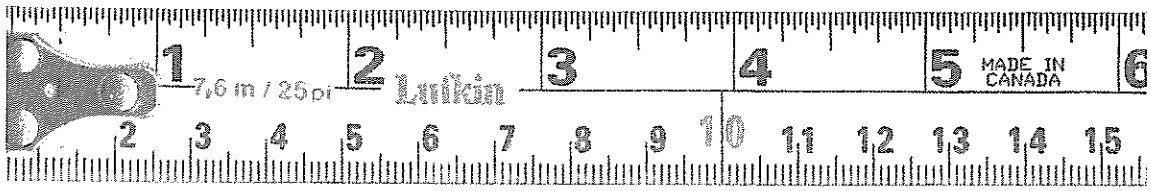
1) How many halves in one inch? _____

a. $1\frac{1}{2}$" b. $3\frac{1}{2}$" c. 5"



2) How many fourths in one inch? _____

a. $\frac{1}{4}$" b. $2\frac{1}{4}$" c. $4\frac{3}{4}$"



3) How many eighths in one inch? _____

a. $5\frac{3}{8}$" b. $6\frac{5}{8}$ c. $7\frac{7}{8}$"

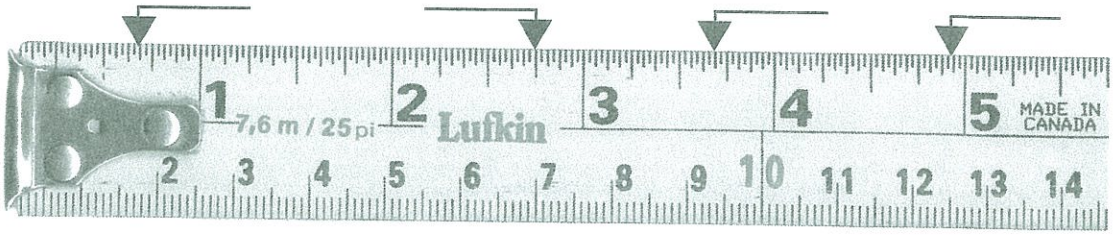
4) How many sixteenths in one inch? _____

a. $\frac{3}{16}$" b. $1\frac{7}{16}$" c. $3\frac{15}{16}$"

The illustrations below represent segments of an Imperial measuring tape. Write the measurements marked with arrows on the rulers.

Remember: count the lines not the spaces.

1)



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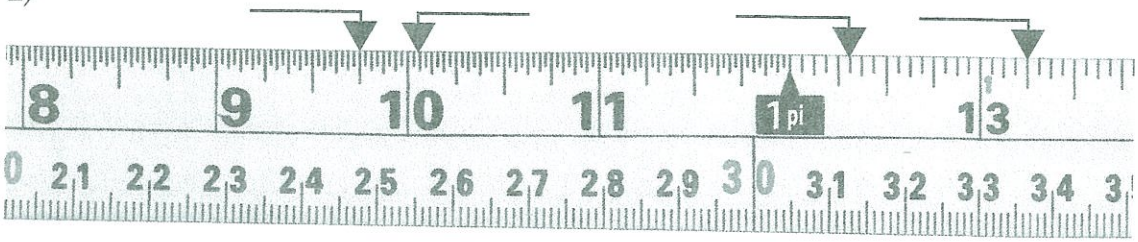

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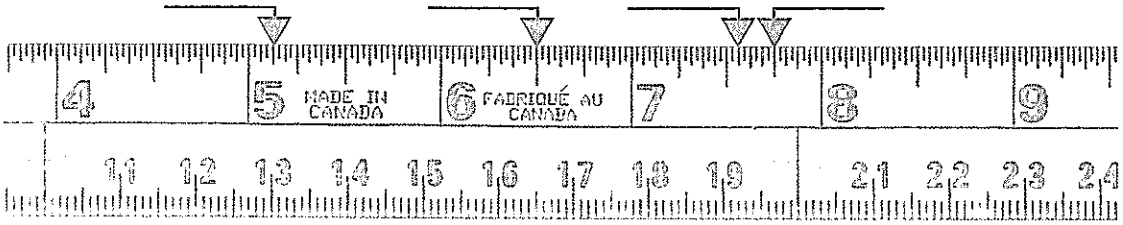

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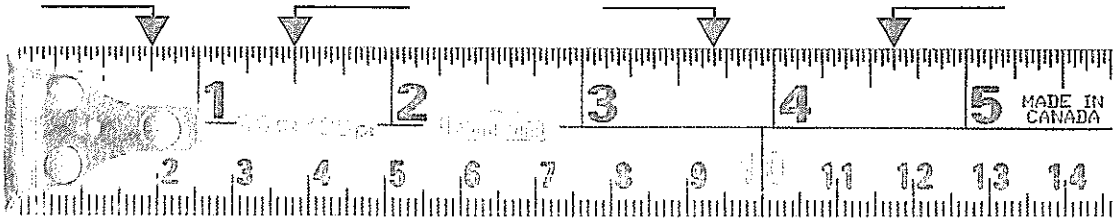


Measure the lengths of the lines below using an Imperial measuring tape. Give the measurements in inches and fractions of an inch.

Remember: accuracy is important.

1) _____ inches

2) _____ inches

3) _____ inches

4) _____ inches

5) _____ inches

6) _____ inches

7) _____ inches

8) _____ inches

9) _____ inches

10) _____ inches

Adding and Subtracting Feet and Inches

Step 1: Line up the measurements.
Put like units under like units.

Step 2: Add or subtract the inches. Add or subtract the feet.

Step 3: Change the inches to feet (divide by 12).

Step 4: Rewrite the total.

Example 1:

$$\begin{array}{r} 5 \text{ ft } 11 \text{ in} \\ +\ 3 \text{ ft } 9 \text{ in} \\ \hline 8 \text{ ft } 20 \text{ in} \end{array}$$

20 in = 1 ft 8 in

$$\begin{array}{r} 8 \text{ ft} \\ +\ 1 \text{ ft } 8 \text{ in} \\ \hline 9 \text{ ft } 8 \text{ in} \end{array}$$

Example 2:

$$\begin{array}{r} 8 \text{ ft } 6 \text{ in} \\ -\ 2 \text{ ft } 6 \text{ in} \\ \hline 6 \text{ ft } 0 \text{ in} \end{array}$$

Example 3:

Sometimes you have to borrow one foot from the feet column.

$$\begin{array}{rr} 6\text{ ft} & 2\text{ in} \\ -\ 2\text{ ft} & 8\text{ in} \end{array}$$

You can't subtract 8 in from 2 in. Borrow 1 ft.

$$\begin{array}{rr} 5\text{ ft} & 14\text{ in} \\ -\ 2\text{ ft} & 8\text{ in} \\ \hline 3\text{ ft} & 6\text{ in} \end{array}$$

Subtract 1 ft from the feet column. Add 12 in to the inches column.

Example 4:

Sometimes there are fractions of an inch that need to be added or subtracted. You must follow the rules for adding and subtracting fractions.

$$\begin{array}{rr} 5\text{ ft} & 6\frac{7}{8}\text{ in} \\ +\ 4\text{ ft} & 8\frac{3}{8}\text{ in} \\ \hline 9\text{ ft} & 14\frac{10}{8}\text{ in} \end{array} = 9\text{ ft } 15\frac{2}{8}\text{ in} = 10\text{ ft } 3\frac{1}{4}\text{ in}$$

Remember:

12 in. = 1 ft.

Example 5:

$$\begin{array}{rr} 17\text{ft} & 5\frac{7}{8}\text{ in} \\ -\ 10\text{ft} & 2\frac{3}{4}\text{ in} \end{array} = \begin{array}{rr} 17\text{ft} & 5\frac{7}{8}\text{ in} \\ -\ 10\text{ft} & 2\frac{6}{8}\text{ in} \\ \hline 7\text{ft} & 3\frac{1}{8}\text{ in} \end{array}$$

Hint:

Refer to the chapter on Fractions for more information about adding and subtracting fractions.

Add or subtract the following feet and inches.

1) $\begin{array}{rr} 7\text{ ft} & 5\text{ in} \\ +\ 3\text{ ft} & 7\text{ in} \end{array}$

2) $\begin{array}{rr} 2\text{ ft} & 9\text{ in} \\ - & 11\text{ in} \end{array}$

3) $\begin{array}{rr} 5\text{ ft} & 6\text{ in} \\ -\ 3\text{ ft} & 5\text{ in} \end{array}$

4) $\begin{array}{r} 10\text{ ft } 10\text{ in} \\ +\ 6\text{ ft } 9\text{ in} \\ \hline \end{array}$

5) $\begin{array}{r} 4\text{ ft } 7\text{ in} \\ +\ 8\text{ in} \\ \hline \end{array}$

6) $\begin{array}{r} 9\text{ ft } 2\text{ in} \\ -\ 4\text{ ft } 7\text{ in} \\ \hline \end{array}$

7) $\begin{array}{r} 9\text{ ft } 9\text{ in} \\ -\ 8\text{ ft } 10\text{ in} \\ \hline \end{array}$

8) $\begin{array}{r} 25\text{ ft } 5\text{ in} \\ +\ 7\text{ ft } 10\text{ in} \\ \hline \end{array}$

9) $\begin{array}{r} 12\text{ ft } 4\text{ in} \\ -\ 5\text{ ft } 11\text{ in} \\ \hline \end{array}$

10) $\begin{array}{r} 2\text{ ft } 3\frac{1}{4}\text{ in} \\ +\ 6\text{ ft } 4\frac{3}{4}\text{ in} \\ \hline \end{array}$

11) $\begin{array}{r} 4\text{ ft } 5\frac{3}{8}\text{ in} \\ +\ 8\text{ ft } 3\frac{4}{8}\text{ in} \\ \hline \end{array}$

12) $\begin{array}{r} 24\text{ ft } 7\frac{5}{16}\text{ in} \\ +\ 13\text{ ft } 4\frac{8}{16}\text{ in} \\ \hline \end{array}$

13) $\begin{array}{r} 5\text{ ft } 6\frac{5}{8}\text{ in} \\ +\ 3\text{ ft } 8\text{ in} \\ \hline \end{array}$

14) $\begin{array}{r} 7\text{ ft } 10\frac{3}{4}\text{ in} \\ +\ 12\text{ ft } 9\frac{1}{2}\text{ in} \\ \hline \end{array}$

15) $\begin{array}{r} 27\text{ ft } 3\frac{3}{4}\text{ in} \\ +\ 18\text{ ft } 10\frac{13}{16}\text{ in} \\ \hline \end{array}$

The Metric System

The International System of Units (SI) is often referred to as the metric system within the construction industry. The International System of units sets the standards for the metric system and provides exact measurements that have the same meaning everywhere in the world.

The metric system is based on 10. Calculations with the metric system are done with numbers such as 10, 100 and 1 000. Converting units within the metric system means moving the decimal point a specific number of places to the right or to the left.

Prefixes in the metric system are the same for measuring length, volume and mass (weight), for example, kilometre, kilolitre and kilogram.

Rules for Writing Metric Measurements

- Write abbreviations in lower case: cm, mm, km. The one exception is litre. It is written as a capital L.
- The unit of measurement is always written in singular form. For example, cm and not cms.
- Periods are not used after unit abbreviations except when at the end of a sentence.
- There are no commas to indicate thousands, tens of millions and so on. Numbers are written with a space to separate: 10 000, 250 000.
- Leave a space between the amount and the unit of measurement: 25 cm.
- The unit of measurement is written as an abbreviation when it follows a numeral. For example, 4 cm, 13 m^3, 10 L. When numbers are written as words, the unit of measurement is written in words:
four centimetres, thirteen cubic metres, ten litres.

Prefix Units	Symbol	Number of Base
tera	T	1 000 000 000 000
giga	G	1 000 000 000
mega	M	1 000 000
kilo	k	1 000
hecto	h	100
deca	da	10
No Prefix	Base Unit	1
deci	d	0.1
centi	c	0.01
milli	m	0.001
micro	μ	0.000 001
nano	n	0.000 000 001
pico	p	0.000 000 000 1

The highlighted rows are commonly used in the construction industry.

Common Units of Measurement in the Metric System		
Linear Measure 10 mm = 1 cm 1 000 mm = 1 m 100 cm = 1 m	**Area Measure** 100 mm^2 = 1 cm^2 1 000 000 mm^2 = 1 m^2	**Volume Measure for Solids** 1 m^3 = 1 000 000 cm^3
		Volume Measure for Fluids 1 L = 1 000 mL
		Volume Measure Equivalents 1 kg = 1 000 000 mg

Letter Symbols:

millimetre: mm	millimetre squared: mm^2	cubic millimetre: mm^3	
centimetre: cm	centimetre squared: cm^2	cubic centimetre: cm	
metre: m	metre squared: m^2	cubic metre: m^3	
litre: L	millilitre: mL	kilogram: kg	milligrams: mg

Converting Units

The table below is used to demonstrate a quick method of converting from one unit to another within the metric system. When you convert from one unit to another, the way the measurement is expressed changes. In other words, the number and the prefix change, but the length, volume or weight of the object does not change.

thousands	hundreds	tens	Base Units	tenths	hundredths	thousandths
kilometre km	hectometre hm	decametre dam	metre m	decimetre dm	centimetre cm	millimetre mm
kilolitre kL	hectolitre hL	decalitre daL	litre L	decilitre dL	centilitre cL	millilitre mL
kilogram kg	hectogram hg	decagram dag	gram g	decigram dg	centigram cg	milligram mg

The highlighted boxes or cells are commonly used by workers in the construction trades

Example 1:

A brick wall measures 450 000 mm in length.
Convert 450 000 mm to metres.

You are moving from small units to large units.

Step 1: Place a decimal after the amount. **450 000.**

Step 2: Locate the prefix of the known amount on the table. **milli**

Step 3: Locate the prefix or the base unit that you are converting to. **metre**

Step 4: Move the decimal point the same number of places in the same direction you move on the table. **450.000 m**

kilometre km	hectometre hm	decametre dam	metre m	decimetre dm	centimetre cm	millimetre mm

450.000 m **450 000 mm**

450 000 mm = 450 m

Note:

This set of steps only works for linear measures.

Note:

This set of steps only works for linear measures.

Example 2:

A piece of lumber measures 79.5 cm in length.
Convert 79.5 cm to millimetres.

You are moving from large units to small units.

Step 1: There is already a decimal in the amount so you will move this decimal point. **79.5**

Step 2: Locate the prefix of the known amount on the table. **centi**

Step 3: Locate the prefix or the base unit that you are converting to. **milli**

Step 4: Move the decimal point the same number of places in the same direction you move on the table. **795 mm**

kilometre km	hectometre hm	decametre dam	metre m	decimetre dm	centimetre cm	millimetre mm

79.5 cm **795 mm**

79.5 cm = 795 mm

Convert the following units.

1) 1 cm = _____ mm

2) 1 m = _____ mm

3) 1 m = _____ cm

4) 8 m = _____ mm

5) 35 mm = _____ cm

6) 155 mm = _____ cm

7) 100 mm^2 = _____ cm^2

8) 900 mm^2 = _____ cm^2

9) 375 mm^2 = _____ cm^2

10) 6 cm^2 = _____ mm^2

11) 17 cm^2 = _____ mm^2

12) 1 000 000 mm^2 = _____ m^2

13) 5 000 000 mm^2 = _____ m^2

14) 9 500 000 mm^2 = _____ m^2

15) 1 000 mL = _____ L

16) 11 000 mL = _____ L

17) 4 500 mL = _____ L

18) 10 L = _____ mL

19) 22 L = _____ mL

20) 1.4 L = _____ mL

21) 3.2 L = _____ mL

22) 1 kg = _____ mg

23) 6 kg = _____ mg

24) 2.7 kg = _____ mg

25) 1 m^3 = _____ cm^3

26) 4 m^3 = _____ cm^3

27) 6.4 m^3 = _____ cm^3

28) 1 000 000 cm^3 = _____ m^3

29) 8 000 000 cm^3 = _____ m^3

30) 2 500 000 cm^3 = _____ m^3

Measuring Centimetres and Millimetres

Trades workers read and measure centimetres and millimetres when using the metric system. You will use the metric system during technical training and on some jobs. Millimetres are commonly used for measurements on blueprints but can be awkward to calculate lengths, areas and volumes because of the number of digits. It is often more convenient to convert millimetres to metres to make calculations and to measure lengths.

Example:

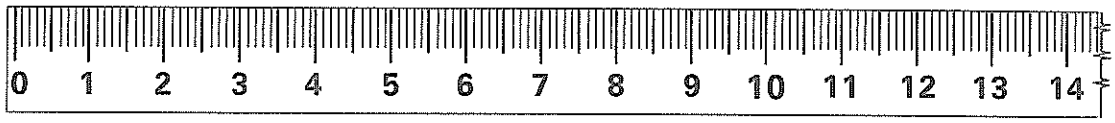
Calculate the area of wall that measures 12 000 mm by 3 000 mm.

In millimetres	In metres
Area = L × W	Area = L × W
= 12 000 mm × 3 000 mm	= 12 m × 3 m
= 36 000 000 mm^2	= 36 m^2

It would be very easy to miss one of the zeros or to add one zero too many when working in mm. Converting millimetres to metres makes the calculation less awkward.

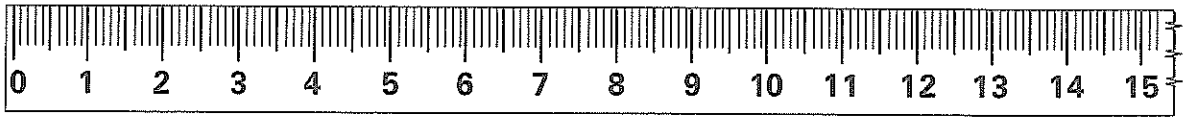
Draw an arrow to show the following measurements.

1) a. 9 mm b. 30 mm c. 85 mm



2) a. 16 cm b. 23 cm c. 29 cm

3) a. 12 mm b. 12 cm c. 14.5 cm

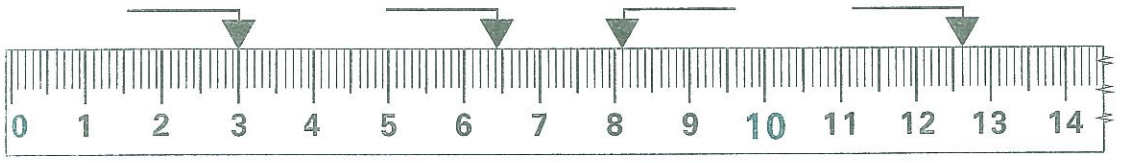


4) a. 25 mm b. 7.7 cm c. 112 mm

The illustrations below represent segments of a metric measuring tape. Write the measurements marked with arrows on the tapes.

Remember: Count the lines not the spaces.

1)



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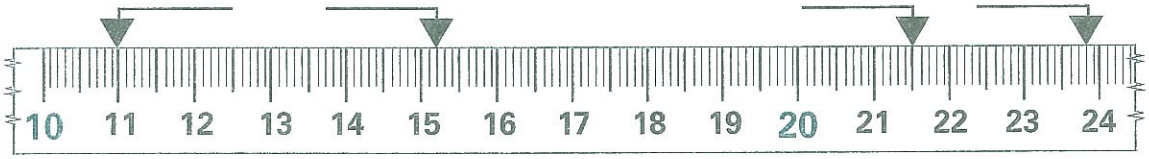

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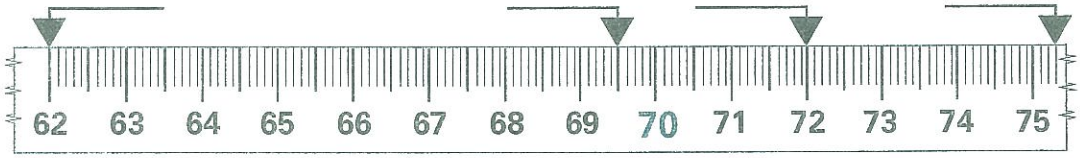

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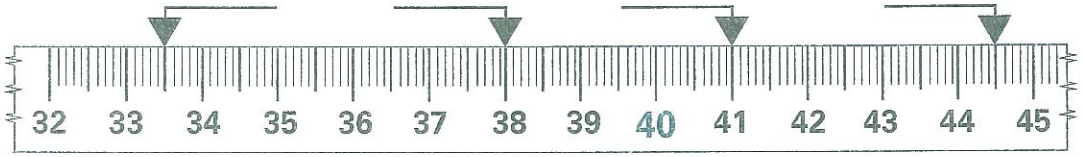

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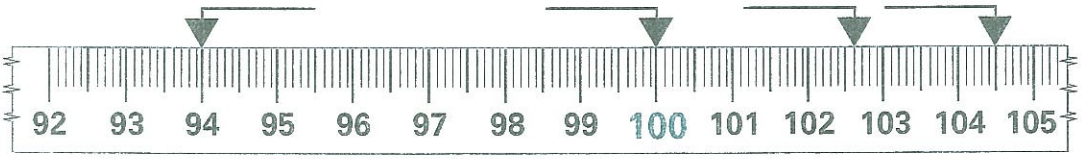


Use a metric measuring tape to measure the lines below.

1)

mm _____ cm _____ m _____

2)

mm _____ cm _____ m _____

3)

mm _____ cm _____ m _____

4)

mm _____ cm _____ m _____

5)

mm _____ cm _____ m _____

6)

mm _____ cm _____ m _____

7)

mm _____ cm _____ m _____

8)

mm _____ cm _____ m _____

9)

mm _____ cm _____ m _____

10)

mm _____ cm _____ m _____

Converting Between Metric and Imperial

Some common conversions are:

1" = 2.54 cm

39" = 1 m

1.3 yd^3 = 1 m^3

2.2 lb = 1 kg

Example 1:
Convert 6" to centimetres.
1" = 2.54 cm
6" = 6" × 2.54 = 15.24 cm

Example 2:
Convert 25 cm to inches.
1" = 2.54 cm
25 cm = 25 cm ÷ 2.54 = 9.8"

Example 3:
Convert 10" to millimetres.
1" = 2.54 cm
10" = 10" × 2.54 = 25.4 cm
25.4 cm = 254 mm

Example 4:
Convert 655 mm to inches.
655 mm = 65.5 cm
65.5 cm = 65.5 cm ÷ 2.54 = 25.8"

Convert the following measurements. Round off to two decimal places.

1) a) 1" = _____ cm b) 7" = _____ cm c) 15" = ____ mm

2) a) 5 cm = _____ " b) 75 cm = _____ " c) 105 cm = _____ "

3) a) 39" = _____ m b) 84" = _____ m c) 3' = _____ m

4) a) 6 m = _____ " b) 2.5 m = _____ " c) 8 m = _____ ft

5) a) 1.3 yd^3 = _____ m^3 b) 5 yd^3 = _____ m^3 c) 7.9 yd^3 = _____ m^3

6) a) 3 m^3 = _____ yd^3 b) 9.2 m^3 = _____ yd^3 c) 5 m^3 = _____ yd^3

7) a) 1 kg = _____ lb b) 12 kg = _____ lb c) 15.6 kg = _____ lb

8) a) 25 lb = _____ kg b) 64 lb = _____ kg c) 128 lb = _____ kg

ANSWER KEY

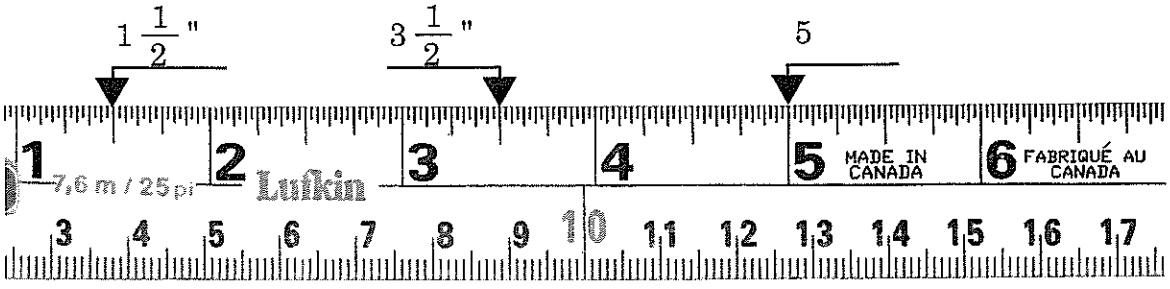
MEASUREMENT AND CONVERSION

Page 106, **Converting Within the Imperial System**

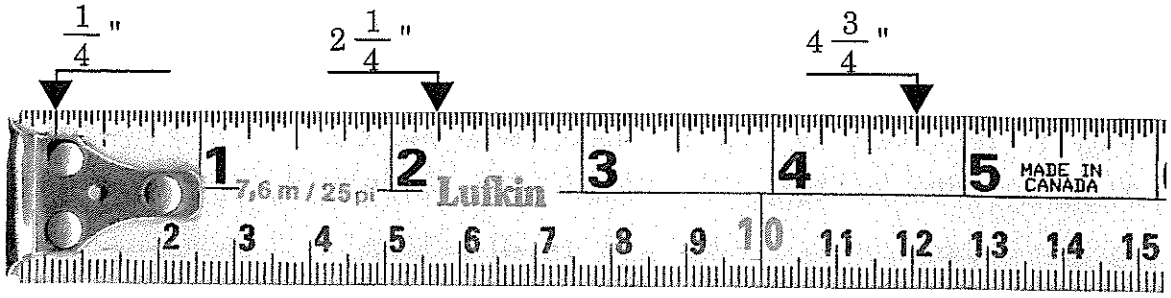
1) 12 in
2) 24 in
3) 42 in
4) 93 in
5) 71 in
6) 4 ft 8 in
7) 10 ft 6 in
8) 18 ft 5 in
9) 3 ft = 36 in
10) 9 ft = 108 in
11) 18 ft = 216 in
12) 144 in^2
13) 432 in^2
14) 9 ft^2 = 1 296 in^2
15) 36 ft^2 = 5 184 in^2
16) 9 ft^2
17) 7 ft^2
18) 1 ft^3
19) 5 ft^3
20) 7.5 ft^3
21) 6 912 in^3
22) 27 ft^3
23) 10 yd^3
24) 37.44 Imperial gallons
25) 53.04 Imperial gallons
26) 3.85 ft^3
27) 7.37 ft^3
28) 82.5 US gal
29) 22.5 US gallons
30) 4 ft^3

Page 107, **Measuring Fractions**

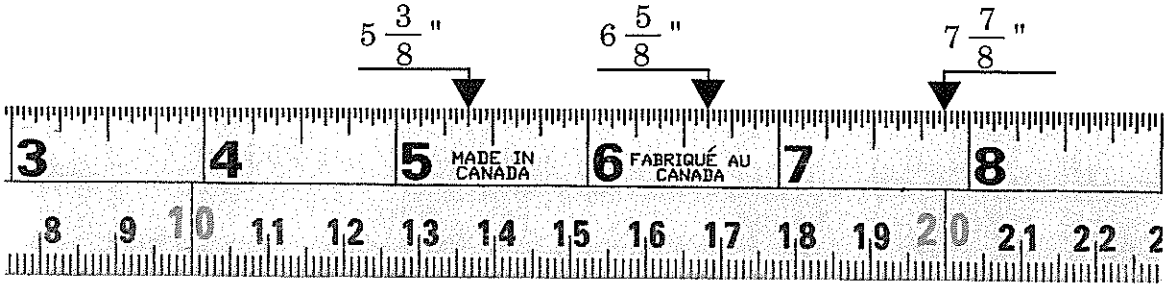
1) two



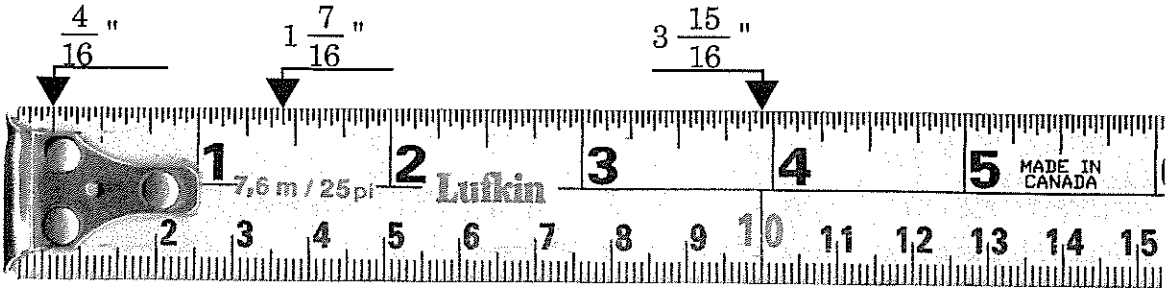
2) four



3) eight

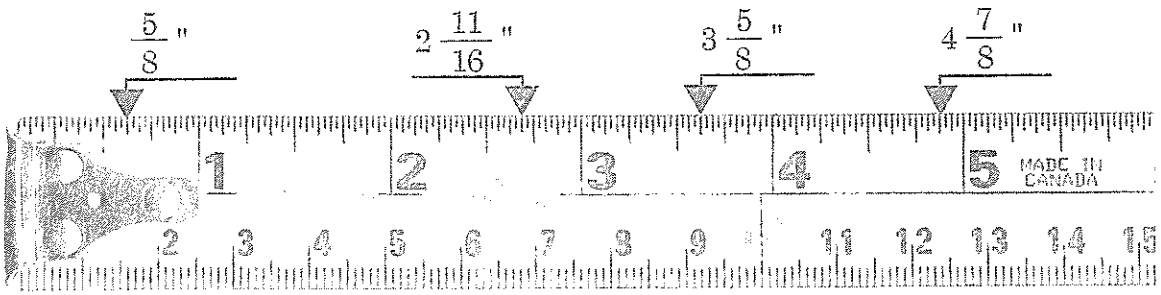


4) sixteen

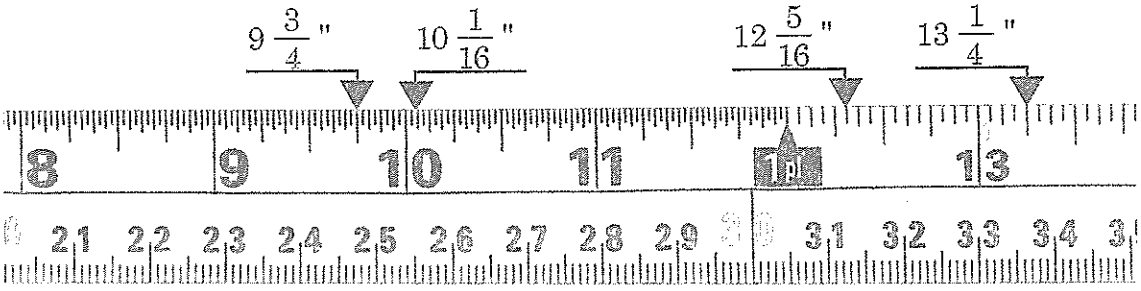


Page 108, **Measuring Fractions**

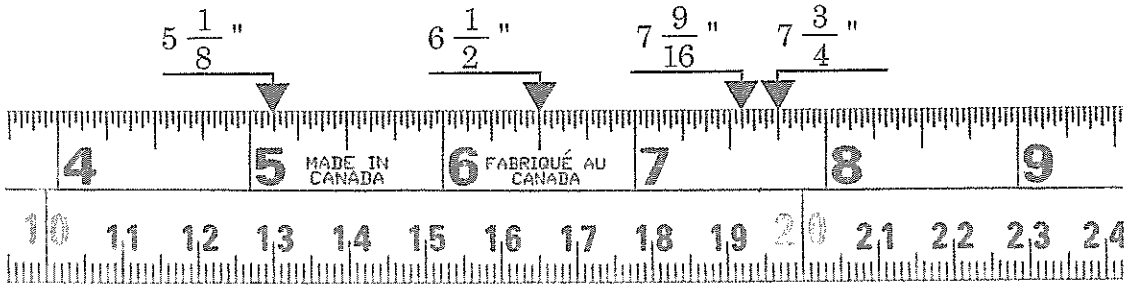
1)



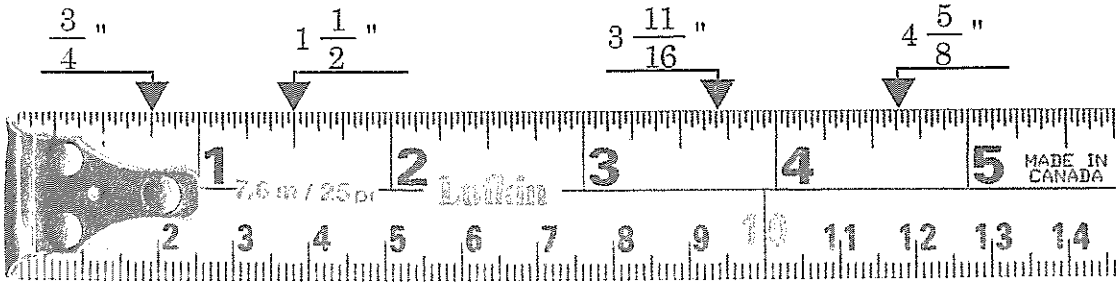
2)



3)



4)



Page 109, **Measuring Fractions**

1) $4\frac{1}{2}$ inches
2) $1\frac{3}{8}$ inches
3) $2\frac{1}{4}$ inches
4) $3\frac{5}{8}$ inches
5) $6\frac{1}{16}$ inches
6) $1\frac{15}{16}$ inches
7) $3\frac{3}{4}$ inches
8) $3\frac{7}{16}$ inches
9) $6\frac{1}{4}$ inches
10) $5\frac{3}{4}$ inches

Page 111, **Adding and Subtracting Feet and Inches**

1) 11 ft
2) 1 ft 10 in
3) 2 ft 1 in
4) 17 ft 7 in
5) 5 ft 3 in
6) 4 ft 7 in
7) 11 in
8) 33 ft 3 in
9) 6 ft 5 in
10) 8 ft 8 in
11) 12 ft $8\frac{7}{8}$ in
12) 37 ft 11 $\frac{13}{16}$ in
13) 9 ft $2\frac{5}{8}$ in
14) 20 ft $8\frac{1}{4}$ in
15) 46 ft $2\frac{9}{16}$ in

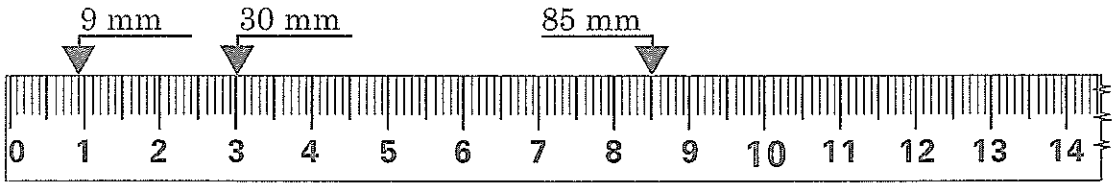
Page 116, **Converting Units**

1) 10 mm
2) 1 000 mm
3) 100 cm
4) 8 000 mm
5) 3.5 cm
6) 15.5 cm
7) 1 cm^2
8) 9 cm^2
9) 3.75 cm^2
10) 600 mm^2
11) 1 700 mm^2
12) 1 m^2
13) 5 m^2
14) 9.5 m^2
15) 1 L
16) 11 L

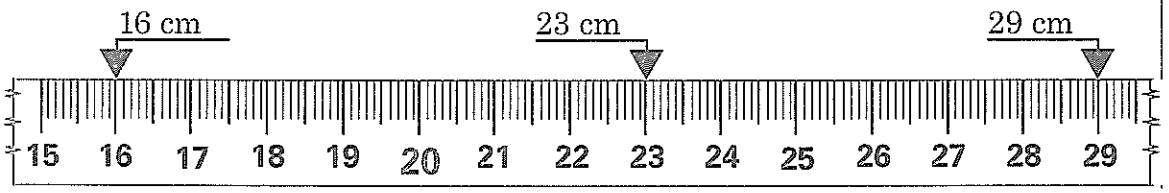
17) 4.5 L
18) 10 000 mL
19) 22 000 mL
20) 1 400 mL
21) 3 200 mL
22) 1 000 000 mg
23) 6 000 000 mg
24) 2 700 000 mg
25) 1 000 000 cm^3
26) 4 000 000 cm^3
27) 6 400 000 cm^3
28) 1 m^3
29) 8 m^3
30) 2.5 m^3

Page 118, **Measuring Centimetres and Millimetres**

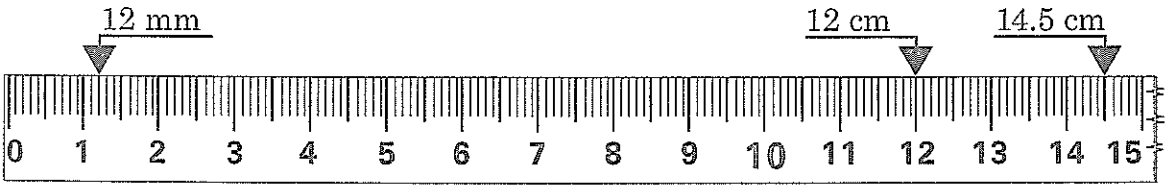
1)



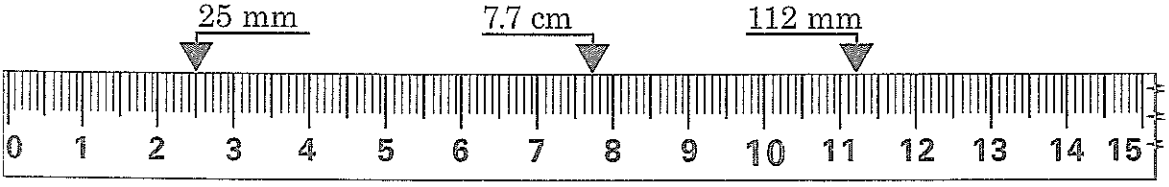
2)



3)

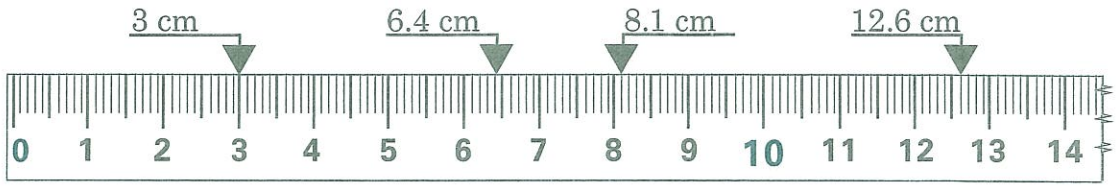


4)

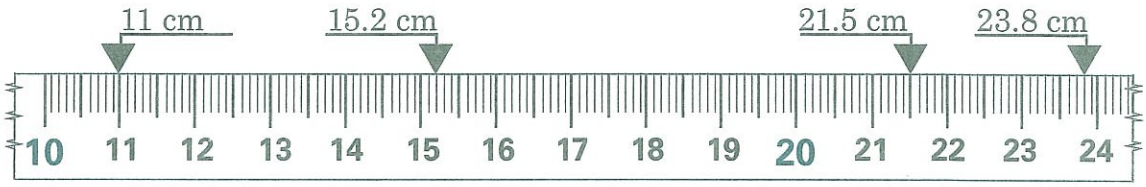


Page 119, **Measuring Centimetres and Millimetres**

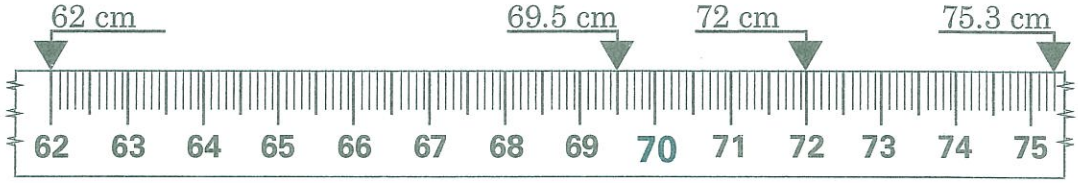
1)



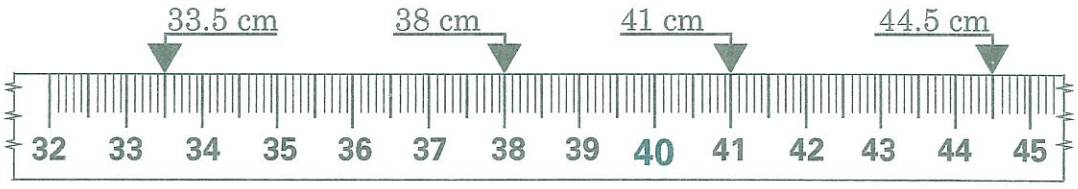
2)



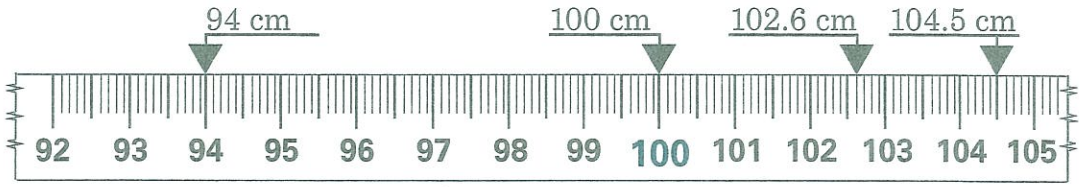
3)



4)



5)



Page 120, **Measuring Centimetres and Millimetres**

1) 60 mm, 6 cm, .06 m
2) 74 mm, 7.4 cm, .074 m
3) 35 mm, 3.5 cm, .035 m
4) 58 mm, 5.8 cm, .058 m
5) 40 mm, 4 cm, .04 m
6) 55 mm, 5.5 cm, .055 m
7) 66 mm, 6.6 cm, .066 m
8) 45 mm, 4.5 cm, .045 m
9) 82 mm, 8.2 cm, .082 m
10) 50 mm, 5 cm, .05 m

Page 122, **Converting Between Metric and Imperial**

1)	a) 2.54 cm	b) 17.78 cm	c) 381 mm
2)	a) 1.97"	b) 29.53"	c) 41.34"
3)	a) 1 m	b) 2.15 m	c) 0.92 m
4)	a) 234"	b) 97.5"	c) 26 ft
5)	a) 1 m^3	b) 3.85 m^3	c) 6.08 m^3
6)	a) 3.9 yd^3	b) 11.96 yd^3	c) 6.5 yd^3
7)	a) 2.2 lb	b) 26.4 lb	c) 34.32 lb
8)	a) 11.36 kg	b) 29.09 kg	c) 58.18 kg