

**GRADE 10 ESSENTIAL
UNIT C – MEASUREMENT
WORKBOOK**

Name: Mr F 1

Instructions

Use any conversion ratios you have available.

CONVERT METRIC (SI) SYSTEM TO METRIC (SI) SYSTEM

1. Complete the table (use decimal values of course since it is metric)

metres (m)	centimetres (cm)
1	100
2	
3	
	400
4.5	450
	700
1,245	
7,100	
	438
	57.0
	5.7

3. Complete the table (use decimal values of course since it is metric)

kilograms (kg)	grams (g)
1	1,000
2	
3	
	4,000
4.5	4,500
	7,000
4.165	
8.1	
	7,320
	76.0
	7.3

2. Convert using proportions (solve for x):

a. $\frac{100 \text{ cm}}{1 \text{ m}} = \frac{x \text{ cm}}{3 \text{ m}}; \therefore x = \underline{\hspace{2cm}}$

b. $\frac{100 \text{ cm}}{1 \text{ m}} = \frac{400 \text{ cm}}{x \text{ m}}; \therefore x = \underline{\hspace{2cm}}$

c. $\frac{1 \text{ m}}{100 \text{ cm}} = \frac{x \text{ m}}{400 \text{ cm}}; \therefore x = \underline{\hspace{2cm}}$

4. Convert using proportions (solve for x):

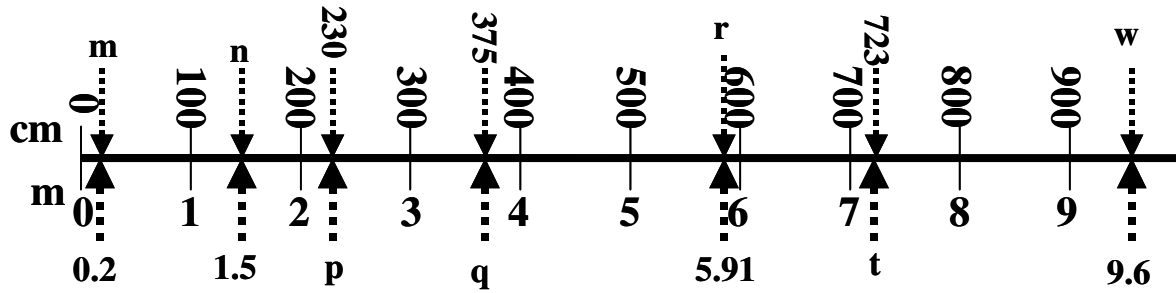
a. $\frac{1000 \text{ g}}{1 \text{ kg}} = \frac{x \text{ g}}{3 \text{ kg}}; \therefore x = \underline{\hspace{2cm}}$

b. $\frac{1000 \text{ g}}{1 \text{ kg}} = \frac{76 \text{ g}}{x \text{ kg}}; \therefore x = \underline{\hspace{2cm}}$

c. $\frac{1 \text{ kg}}{1,000 \text{ g}} = \frac{x \text{ kg}}{76 \text{ g}}; \therefore x = \underline{\hspace{2cm}}$

note: check b & c $\hat{!}$; easier if unknown unit is in top of proportion; less 'swapping'!

5. Convert using a number line:



State the measure of the following positions on the number line ↑.

m = _____; n = _____; p = _____; q = _____

r = _____; t = _____; w = _____

6. Convert the following metric lengths using proportions:

a. $\frac{100 \text{ cm}}{1 \text{ m}} = \frac{'m' \text{ cm}}{0.2 \text{ m}}$

b. $\frac{100 \text{ cm}}{1 \text{ m}} = \frac{'n' \text{ cm}}{1.5 \text{ m}}$

c. $\frac{100 \text{ cm}}{1 \text{ m}} = \frac{230 \text{ cm}}{'p' \text{ m}}$

d. $\frac{'q' \text{ m}}{375 \text{ cm}} = \frac{1 \text{ m}}{100 \text{ cm}}$

e. $\frac{'r' \text{ cm}}{5.91 \text{ m}} = \frac{100 \text{ cm}}{1 \text{ m}}$

f. you do the rest elsewhere

7. Convert using unit factors: (put the new unit in the top of the conversion factor)

Example: $0.2 \text{ m} = 0.2 \cancel{\text{m}} * \frac{100 \text{ cm}}{1 \cancel{\text{m}}} = 20 \text{ cm}$

a. $1.5 \text{ m} = 1.5 \text{ m} * \frac{(\quad) \text{ cm}}{(\quad) \text{ m}} = \quad \text{cm}$

b. $230 \text{ cm} = 230 \text{ cm} * \frac{1 \text{ m}}{100 \text{ cm}} = \quad$

c. $375 \text{ cm} = 375 \text{ cm} * \frac{\text{m}}{\text{cm}} = \quad$

d. $5.91 \text{ m} = 5.91 \text{ m} * \frac{\quad}{\quad} = \quad \text{cm}$

CONVERT IMPERIAL SYSTEM TO IMPERIAL SYSTEM



Imperial, or British, or Customary System of measurement. The 'old' system we do not use anymore! (?)

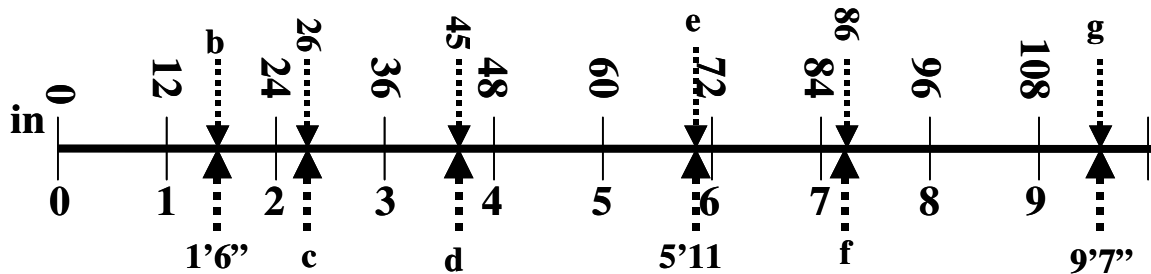
8. Complete the table (**do not use** decimal values of course, that is *mainly* for the metric system!)

feet (ft) and inches	inches (in)
1 ft	12 in
2 ft	
3 ft	
	48 in
4' 2" or 4 ft 2 in	50 in
	120 in
	131 in
5' 10" or 5ft 10 in	
	70 in or 70 "
8' 3 $\frac{3}{4}$ "	
	102 $\frac{3}{8}$ "

9. Complete the table (**do not use** decimal values of course, that is *mainly* for the metric system!)

pounds (lb)and oz	ounces (oz)
1 lb	16 oz
2 lb	
3 lb	
	48 oz
5lb 7oz	87oz
	120 oz
12 lb 5 oz	
8.125 lbs	
	4 oz
	8 oz
12.4 lbs no such thing really!	to nearest oz

10. Convert using the number line:



11. State the measure of the following positions on the number line $\hat{\uparrow}$.

b = _____; c = _____; d = _____; e = _____

f = _____; g = _____

12. Convert the following imperial (ie: ‘British’ or ‘conventional’) lengths using proportions. There is no such thing as a decimal foot; only whole feet! So the remaining inches are just leftover inches and sometimes fractions of inches

a. $\frac{12 \text{ in}}{1 \text{ ft}} = \frac{x \text{ in}}{1 \text{ ft}};$

so 1’6” is 1’ plus 6”
= _____ in

b. $\frac{1 \text{ ft}}{12 \text{ in}} = \frac{x \text{ ft}}{26 \text{ in}};$

so _____ whole feet and
_____ inches remainder

c. $\frac{1 \text{ ft}}{12 \text{ in}} = \frac{x \text{ ft}}{45 \text{ in}}$

so _____ whole feet and
_____ inches remainder

d. $\frac{12 \text{ in}}{1 \text{ ft}} = \frac{x \text{ in}}{5 \text{ ft}};$

so 5ft 11in is 5ft plus 11in
= _____ in

e. $\frac{1 \text{ ft}}{12 \text{ in}} = \frac{x \text{ ft}}{86 \text{ in}}$

so _____ whole feet and
_____ inches remainder

f. you do the rest elsewhere:

CONVERT BETWEEN IMPERIAL SYSTEM AND METRIC SYSTEM

13. Complete the table (convert metres to the nearest 0.01 or better, express imperial units as feet and nearest inch where indicated).

metres (m)	feet (ft) and inches
1	3.2808 just use 3.28
2	_____ft _____in
3.5	_____ft _____in
	4ft 6 inches
137.20 m	450 ft
	70ft 8 in
1,245 m	_____ft
7,100 m	_____ft
	438 ft
	57 ft
	5 ft 9 in
0.45 m	_____ft _____in

14. Complete the table (convert kilograms to nearest 0.01, calculate ounces to the nearest oz)

pounds (lb) and oz	kilograms (kg)
2.205	1.000
just use 2.2	
4.4 lb <i>no such thing really</i>	
6.6 lb <i>no such thing really</i>	
	4.00 kg
10 lb 2 oz	4.60 kg
	7.95 kg
4 lb 5oz	
8 lb 8 oz	
	78.42 kg
	76.09
73 lbs 9 oz	

15. Convert using proportions (ie: cross multiplying)

a. 2 m = _____ ft and _____ inches?

b. 40 ft = _____ m ?

$$\frac{3.28 \text{ ft}}{1 \text{ m}} = \frac{x \text{ ft}}{2 \text{ m}};$$

$$\frac{3.28 \text{ ft}}{1 \text{ m}} = \frac{40 \text{ ft}}{x \text{ m}}; \therefore \mathbf{x} = \underline{\hspace{2cm}}$$

$\therefore \mathbf{x} =$ _____ whole feet
plus _____ twelfths of a foot

c. 7,100 m = _____ ft? (to nearest foot)

d. 40 ft = _____ m ?

$$\frac{3.28 \text{ ft}}{1 \text{ m}} = \frac{x \text{ ft}}{7,100 \text{ m}}; \therefore \mathbf{x} = \underline{\hspace{2cm}}$$

$$\frac{1 \text{ m}}{3.28 \text{ ft}} = \frac{x \text{ m}}{40 \text{ ft}}; \therefore \mathbf{x} = \underline{\hspace{2cm}}$$

e. 70 ft 8 inches = _____ m

f. 5 ft 9 inches = _____ m

$$\frac{1 \text{ m}}{3.28 \text{ ft}} = \frac{x \text{ m}}{70\frac{8}{12} \text{ ft}}; \therefore \mathbf{x} = \underline{\hspace{2cm}}$$

$$\frac{1 \text{ m}}{3.28 \text{ ft}} = \frac{x \text{ m}}{5\frac{9}{12} \text{ ft}}; \therefore \mathbf{x} = \underline{\hspace{2cm}}$$

g. 10 lb 2oz = _____ kg

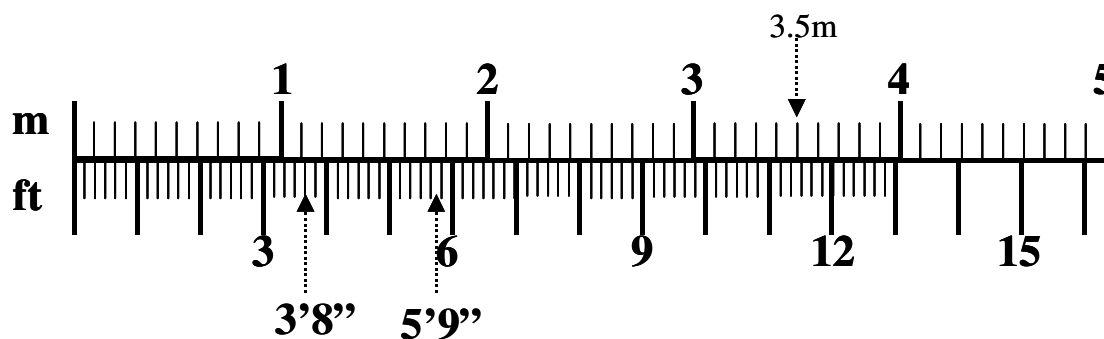
h. 4.6 kg = _____ lb and ____ oz

$$\frac{1 \text{ kg}}{2.2 \text{ lb}} = \frac{x \text{ kg}}{10\frac{2}{16} \text{ lb}}; \therefore \mathbf{x} = \underline{\hspace{2cm}}$$

$$\frac{2.2 \text{ lb}}{1 \text{ kg}} = \frac{x \text{ lb}}{4.6 \text{ kg}};$$

$\therefore \mathbf{x} =$ _____ whole pounds +
_____ 'sixteenths' of a pound

16. Use this number line to *help* you see some conversions between measures in feet and inches to and from metres.



17. CONVERTING (INVERTING) CONVERSION RATIOS

I have told you that there are **0.6214** miles in **1 kilometre (km)**! A secret recipe to make one kilometre!

But you may have seen elsewhere that there is **1.609** kilometres in one mile!

We are saying the same thing!! If there are 0.6214 miles in one km, then how many km are there in one mile?

$$\frac{1 \text{ km}}{0.6214 \text{ mi}} = \frac{x \text{ km}}{1 \text{ mi}}; \text{ so } \frac{1 * 1}{0.6214} = x = 1.609; \text{ so there is 1.609 km in one mile.}$$

It is like saying that if there are **4 raisins for every muffin** then there is a **quarter of a muffin for every raisin**! We are saying the same thing.

If there are **2.205 lbs** in **1 kg** (even though technically there is no such thing as 0.205 lbs since it would really be 3/4 ounces!) then how many kg are there in one pound?

$$\frac{1 \text{ kg}}{2.205 \text{ lb}} = \frac{x \text{ kg}}{1 \text{ lb}}; \text{ so one pound (lb) is the same as } \underline{\hspace{2cm}} \text{ kg}$$

18. CONVERT USING (UNIT) CONVERSION FACTORS

A factor is something that you multiply another value by! The best factors are one that convert one unwanted unit of measure to a desired unit of measure.

a. **Example 1:** 3 ft = _____ inches

$$3 \cancel{\text{ft}} * \frac{12 \cancel{\text{inches}}}{1 \cancel{\text{ft}}} = 36 \text{ inches}; \text{ so multiply by: } \frac{\text{wanted units}}{\text{unwanted units}}; \text{ make sure they cancel.}$$

b. **Example 2:** 37 weeks = _____ minutes;

$$\therefore 37 \text{ weeks} = 37 \text{ weeks} * \frac{7 \text{ days}}{1 \text{ week}} * \frac{24 \text{ hr}}{1 \text{ day}} * \frac{60 \text{ min}}{1 \text{ hr}} = 372,960 \text{ minutes}$$

c. 17 ft = _____ m; $\therefore 17 \text{ ft} * \frac{1 \text{ m}}{3.28 \text{ ft}} =$

d. 183 lb = _____ kg;

so: 183 lbs =

e. 4.3 km = _____ m

f. 4.3 km = _____ cm

g. 57 litres = _____ ImpGal

h. 2.3 miles = _____ inches

i. 7.119 tons = _____ grams

Advanced ↓:

j. 30 km / hr = _____ m / sec

k. 299,000,000 m / sec = _____ miles per hour [mi/hr] (the speed of light)