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## LESSON 1: LENGTH – PART I

### Introduction

In 1999, NASA lost a \$125 million orbiter because of one simple and seemingly innocuous mistake — the engineering team that built the orbiter used **English units** of measurements to make their calculations, while the agency responsible for launching the rocket used the **metric system**.

Mistakes like this happen all the time. Since there are two sets of systems that are both widely used, conversion from one system to another has become incredibly important. Whether you are engineering a rocket, calculating the speed of your car, or baking a cake — knowing how to convert from the traditional system to the metric system in your head gives you a huge advantage.

In the United States, most measurements are done in traditional (or customary) units, a system of measurements widely used in the United Kingdom and developed from English units. Ironically, even after the United Kingdom switched to the metric system, the United States continues to use the traditional measurement system. There are only three countries in the world — the United States, Liberia, and Burma/Myanmar — that have not yet switched to the International System of Units (SI) metric system as their official system of weights and measures.

So, let us start learning to convert between the two systems by beginning with units of length.

### Vocabulary

Before we start learning metric system conversions, we need to learn some terms.

#### *Traditional Measures of Length:*

Name	Abbreviation
Inch or inches	<i>in</i>
Foot or feet	<i>ft</i>
Yard or yards	<i>yd</i>
Mile or miles	<i>mi</i>

#### *Metric Measures of Length:*

Name	Abbreviation
Millimeter(s)	<i>mm</i>
Centimeter(s)	<i>cm</i>
Decimeter(s)	<i>dm</i>
Meter(s)	<i>m</i>
Kilometer(s)	<i>km</i>

*Milli* - means 1/1000, or one-thousandth

*Centi* - means 1/100, or one-hundredth  
(remember, one cent is one-hundredth of a dollar)

*Deci* - means 1/10, or one-tenth

*Kilo* - means 1000, or one thousand

## Conversions

### Traditional Units

Here is what you need to know to convert within the traditional system, meaning from one unit of the traditional system to another unit of the traditional system.

$1 \text{ ft} = 12 \text{ in}$
$1 \text{ yd} = 3 \text{ ft}$ or $36 \text{ in}$
$1 \text{ mi} = 1760 \text{ yd}$ or $5280 \text{ ft}$

#### **Things to remember:**

*Convert feet into inches by multiplying the number of feet by 12*

*Convert yards to feet by multiplying the number of yards by 3*

*Convert inches into feet by dividing the number of inches by 12*

### Metric Units

Here is what you need to know to convert within the metric system, meaning from one unit of the metric system to another unit of the metric system.

*Metric units of length are related to a meter:*

A millimeter (mm) is  $1/1000$  or one-thousandth of a meter.

A centimeter (cm) is  $1/100$  or one-hundredth of a meter.

A decimeter (dm) is  $1/10$  or one-tenth of a meter.

A kilometer (km) is 1000 meters.

$1 \text{ cm} = 10 \text{ mm}$
$1 \text{ dm} = 10 \text{ cm}$ or $100 \text{ mm}$
$1 \text{ m} = 10 \text{ dm}$ , $100 \text{ cm}$ , and $1,000 \text{ mm}$
$1 \text{ km} = 1,000 \text{ m}$

*In other words:*

$1 \text{ mm} = 0.1 \text{ cm}$ or $0.01 \text{ dm}$
$1 \text{ cm} = 0.1 \text{ dm}$ or $0.01 \text{ m}$
$1 \text{ m} = 0.001 \text{ km}$

**Can you see it?**  
These two tables  
are the same

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## Converting between Traditional and Metric units

Here is what you need to know to convert units from one system to the other system. Remember, in Verbal Math, we round up numbers to simplify calculations.

### **Do not forget to round off!**

The ratio between inches and centimeters is about 1 *inch* = 2.54 *cm*. For practical reasons we will consider 1 *in* equal to 2.5 *cm* and use this ratio for our verbal calculation. Hence,

$$1 \text{ in} = 2.5 \text{ cm}$$

$$2 \text{ in} = 5 \text{ cm}$$

$$10 \text{ in} = 25 \text{ cm}$$

$$20 \text{ in} = 50 \text{ cm}$$

and so on...

With rounding in mind, there are 0.39 *inches* in a *centimeter*, but we will use 0.4 *in* equal to 1 *cm* in your calculations. Hence,

$$1 \text{ cm} = 0.4 \text{ in}$$

$$2 \text{ cm} = 0.8 \text{ in}$$

$$5 \text{ cm} = 2 \text{ in}$$

$$10 \text{ cm} = 4 \text{ in}$$

and so on...

Here is some more important rounding you should keep in mind:

There are 91.44 *cm* in 1 yard. We will use 1 *yd* = 90 *cm* for convenience.

There are 30.48 *cm* in 1 foot. We will use 1 *ft* = 30 *cm*.

There are 3.2808399 *ft* in 1 meter, but we will be using 1 *m* = 3.3 *ft*.

## Conversion Table

$1 \text{ yd} = 3 \text{ ft}$ $1 \text{ in} = 2.5 \text{ cm}$ $1 \text{ ft} = 12 \text{ in}$ $1 \text{ ft} = 30 \text{ cm}$ $1 \text{ yd} = 0.9 \text{ m}$	$1 \text{ m} = 100 \text{ cm}$ $1 \text{ m} = 40 \text{ in}$ $1 \text{ m} = 3.30 \text{ ft}$ $1 \text{ m} = 1.1 \text{ yd}$
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**Exercises** - Use the table above to answer these questions

How many meters are in 120 *cm*?

Ans: **1.2 m**

How many meters are in 340 *cm*?

Ans: **3.4 m**

How many centimeters are in 20 *mm*?

Ans: **2 cm**

How many meters are in 20 *cm*?

Ans: **0.2 m**

How many meters are in 5 *cm*?

Ans: **0.05 m**

How many meters are in 50 *cm*?

Ans: **0.5 m**

How many meters are in 500 *mm*?

Ans: **0.5 m**

How many feet are in 24 *in*?

Ans: **2 ft** (there are 12 inches in a foot)

How many feet are in 60 *in*?

Ans: **5 ft**

How many feet are in 120 *in*?

Ans: **10 ft**

How many feet are in 10 *in*?

Ans:  $\frac{10}{12} \text{ ft}$  or  $\frac{5}{6} \text{ ft}$

How many feet are in 25 *in*?

Ans: **2 ft 1 in**

How many feet are in 50 *in*?

Ans: **4 ft 2 in**

How many decimeters are in 30 *mm*?

Ans: **0.3 dm**

How many decimeters are in 80 *cm*?

Ans: **8 dm**

How many meters are in 9.9 *cm*?

Ans: **0.099 m**

How many centimeters are in 250 *mm*?

Ans: **25 cm**

How many meters are in 32 *cm*?

Ans: **0.32 m**

How many meters are in 51 *mm*?

Ans: **0.051 m**

How many feet are in 6 *in*?

Ans: **0.5 ft**, because 12 inches is 1 ft.

How many feet are in 126 *in*?

Ans: **10 ft 6 in or 10.5 ft**

How many feet are in 9 *in*?

Ans: **0.75 ft** ( $\frac{9}{12} \text{ ft}$  or  $\frac{3}{4} \text{ ft}$ )

How many feet are in 4 *in*?

Ans: **0.33 ft** ( $\frac{1}{3} \text{ ft}$ )

How many feet are in 8 *in*?

Ans: **0.66 ft**

## Conversion Table

$1 \text{ in} = 2.5 \text{ cm}$ $1 \text{ ft} = 30 \text{ cm}$
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Convert 3 inches into centimeters.

Ans: **7.5 cm**

What is 4 *in* in *cm*?

Ans: **10 cm**

What is 8 *in* in *cm*?

Ans: **20 cm**

What is 12 *in* in *cm*?

Ans: **30 cm**

What is 1 *ft* in *cm*?

Ans: **30 cm**

What is 4 *ft* in *cm*?

Ans: **120 cm or 1.20 m**

What is 10 *in* in *cm*?

Ans: **25 cm**

What is 6 *in* in *cm*?

Ans: **15 cm**

What is 5 *in* in *cm*?

Ans: **12.5 cm**

What is 24 *in* or 2 *ft* in meters?

Ans: **0.6 m**

What is 10 *cm* in inches?

Ans: **4 in**

What is 20 *cm* in inches?

Ans: **8 in**

What is 100 *cm* in inches?

Ans: **40 in**

What is 1 *m* in inches?

Ans: **40 in**

What is 1 *dm* in inches?

Ans: **4 in** (1 *dm* = 10 *cm*)

What is 50 *cm* in inches?

Ans: **20 in**

What is 12.5 *cm* in inches?

Ans: **5 in**

What is 25 *cm* in inches?

Ans: **10 in**

What is 0.75 *m* in inches?

Ans: **30 in**

What is 0.2 *m* in inches?

Ans: **8 in**

### Reminder:

Because we use approximations in our mental calculations there might be small discrepancy between the answers with different conversion formulas. We'll be offering alternative answers whenever possible.

## Problems

1. Beatrice has to cut 1 foot of ribbon but has only a metric ruler. How many centimeters will she need to measure?  
Ans: **about 30 cm**
2. Dion was not sure if 5 *in* is longer or shorter than 15 *cm*. Can you help?  
Ans: **5 in is shorter**, because 15 *cm* is equal to 6 *in*. Remember that 10 *cm* are equal to 4 *in*.
3. 10 *cm* were cut off from a 1 *ft* wire. How long (in inches) is the wire now?  
Ans: **8 inches left**, because 10 *cm* is equal to 4 *in*. Remember that 1 *ft* is equal to 12 inches.
4. A new  $\frac{1}{2}$  *ft* long pencil got shortened by 5 *cm*. How long (in centimeters) is it now?  
Ans: **10 cm**; if 1 foot is 30 *cm*, then one-half of it is 15 *cm*. Next, 15 *cm* - 5 *cm* = 10 *cm*.
5. A plank is 2 feet long. How many *cm* is that?  
Ans: **60 cm**
6. Callie's collie is 3 *ft* long from the tip of his nose to the end of his tail. How much is the pup in centimeters?  
Ans: **90 cm**
7. How many feet and inches are in 1 meter?  
Ans: **3 ft and 4 in**  
Solution: 1 *m* is 100 *cm* or 40 inches and if there are 12 inches in foot, then 40 inches are equal to approximately 3.3 *ft*, or 3 *ft* 4 *in*.
8. A pond is 15 *ft* long. How many meters is that?  
Ans: **4.5 m**, 1 *ft* is 30 *cm* or 0.3 *m*, then 15 *ft* are equal to  $0.3 \times 15 = 4.5$  (*m*) or 4 *m* 50 *cm*.  
*Use Verbal Math when multiplying by 15; first multiply by 10, and then add half of the product:  $0.3 \times 10 = 3$ , one-half of 3 is 1.5. Then  $3 + 1.5 = 4.5$  and our answer.*
9. A whip is 12 *ft* long. How many meters is that?  
Ans: **3.6 m** ( $0.3 \text{ m} \times 12 = 3.6 \text{ m}$ )
10. A door is 8 *ft* tall. How many meters is that?  
Ans: **2.4 m**
11. A ceiling is 9 *ft* tall. How many meters is that?  
Ans: **2.7 m**
12. A pine tree is 9 meters tall. How many feet is that?  
Ans: **30 ft**  
Solution: Remember that 3 *ft* = 90 *cm* or 0.9 *m*, then 9 *m* are 10 times more. If you used the conversion 1 *m* = 3.3 *ft* and came up with 29.7 *ft* answer, it is also correct.
13. A truck is 1.8 *m* long. How many feet is that?  
Ans: **almost 6 ft**
14. A TV screen is 60 *in* across. How many feet is that? What is that in centimeters?  
Ans: **5 ft, 150 cm**
15. Another TV screen is 40 *in* across. How much is it in metric measurements?  
Ans: **1 m**
16. A cord is 72 *in* long. What is that in *ft*? What is it in metric units?  
Ans: **6 ft, 180 cm (or 1.8 m)**

17. If each guitar is 3 *ft* long, how long are 6 strings in metric units?  
 Ans: **5.4 m**; if one string is 3 *ft* or 0.9 *m* then 6 strings (which are 18 *ft*) are 5.4 *m*.
18. A ladder is 20 *ft* long. How long is it in metric units?  
 Ans: **6 m**; if we use 1 *ft* = 0.3 *m* conversion.
19. Jim is taller than Al by 2 *ft*. How much is that in metric units?  
 Ans: **60 cm or 0.6 m**
20. My well is deeper than my cousin's by 11 *ft*. How much is it in metric units?  
 Ans: **by 3.3 m**; if 1 *ft* = 30 *cm*, then 11 *ft* = 330 *cm*, or 3 *m* 30 *cm*, or 3.3 *m*.
21. A birch tree is 33 *ft* tall and a pine tree is 42 *ft*. By how much (in metric units) the pine is taller than the birch?  
 Ans: **2.7 m**  
 Solution: A pine is taller than birch by 42 *ft* – 33 *ft* = 9 *ft*. If 1 *ft* = 30 *cm*, then 30 *cm* x 9 = 270 *cm* or 2.7 *m*.
22. We dug 9 *ft* deep hole and were asked to dig 5 *ft* deeper. How deep, in metric units, will the new hole be?  
 Ans: **4.2 m**
23. A phone has a reception range of 100 *ft*. How far is that in metric units?  
 Ans: **30 m**
24. Another phone has a reception range of 100 *m*. How far is that in feet?  
 Ans: **330 ft**; if 1 *m* = 3.3 *ft*, then 100 *m* = 330 *ft*
25. Tony ran 200 *m* and Yoshi 190 *m* ran less. How many *ft* did Yoshi run?  
 Ans: **33 ft**
26. Liam threw a ball 24 meters away. How many feet is that?  
 Ans: **almost 80 ft (79.2 ft to be precise)**  
*Use Verbal Math when multiplying by 3.3. Because 3.3 x 3 is almost equal to 10, you can multiply the number by 10 and then divide it by 3. Then, 24 x 10 = 240, and then 240 ÷ 3 = 80*
27. A flag pole is 12 *m* high. How high is it in *ft*?  
 Ans: **about 40 ft (39.6 ft to be more precise)**  
*Here is another Verbal Math trick – when multiplying by 3.3, first, multiply by 3, then add 10% of the product; 12 x 3 = 36, next, 10% of 36 is 3.6. Together, 36 + 3.6 = 39.6 and is the answer to the problem.*
28. There are 3 diving boards, one is 1 *m*, another is 3 *m*, and the last is 6 *m*. Approximately how high are these in *ft*?  
 Ans: **3.3 ft, 9.9 ft (or almost 10 ft), and 19.8 ft (or almost 20 ft)**
29. Pete's pony is one and a half meters tall. How tall is it in feet and inches?  
 Ans: **5 ft**; one meter is 40 *in* and half-a-meter is 20 *in*. Together, 60 *in* or 5 *ft*
30. Jordan is 6 feet tall. How tall is he in metric units?  
 Ans: **1 m and 80 cm or 1.8 m**
31. Shawn Bradley, the tallest American basketball player, is 7 *ft* 6 *in* tall. How tall is he in metric units?  
 Ans: **about 225 cm or 2.25 m (the more accurate measurement is 229 cm but in Verbal Math we use approximate numbers).**

32. The shortest NBA player was Tyrone “Muggsy” Bogue, 5 ft 3 in. How tall is he in metric units?

Ans: **about 157.5 cm** (5 ft = 150 cm and 3 in = 7.5 cm)

33. Marcia is 4 ft tall. How tall is she in metric units?

Ans: **1 m 20 cm**

34. April is 1.5 m tall. How tall is she in ft and in?

Ans: **5 ft or 60 in**

35. May is 160 cm tall. How tall is she in traditional units?

Ans: **5 ft 4 in**

36. June is 155 cm tall. How tall is she in traditional units?

Ans: **5 ft 2 in**

37. Julie is 1 m 45 cm tall. How tall is she in traditional units?

Ans: **4 ft 10 in**

Solution: If 1.5 m is equal to 5 ft, then 1.45 m is 5 cm or 2 inches less.

38. How tall are you in traditional units?

Ans: \_\_\_\_\_

39. How tall are you in metric units?

Ans: \_\_\_\_\_

40. How many meters is a 100 yd dash?

Ans: **90 m**

*An easy way to look at this conversion is to think of a yard as roughly 10% shorter than a meter. Then, 100 yards roughly convert to  $100 - 10 = 90$  (meters).*

41. How many yards is a 100 meter dash?

Ans: **110 yd**

*An easy way to look at that conversion is a meter is roughly 10% longer than a yard. Use 10% rule for only rough approximations.*

42. My yard is 20 meters long. How long is my yard in yards?

Ans: **22 yd**

43. There are 30 yds from the house to the mailbox. How many meters is that?

Ans: **27 m**

*Napoleon Bonaparte, the French Emperor, was described as being 5 ft 2 in tall. He introduced metric system in France and was measured at 170 cm. That wouldn't make sense if we use British measurement of a foot as 30.48 cm. But at that time in France, they used a “French foot”, which equaled 32.25 cm. That means he was 5 ft 7 in in the British system of measurements. Turns out he was not that short after all.*

## LESSON 2: LENGTH – PART II

### Introduction

Understanding how to convert units of length is incredibly important, since they are so often used. Mistakes in converting between units of length are the most common type of conversion error, as there are so many different conversions to remember and we see plenty of both types of measurement in daily life. Think about the different races people compete in – most official races are measured in kilometers. A marathon is measured as 42 kilometers, and we often refer to shorter athletic races as a “10K” or a “5K”. However, when you run on a treadmill or use a special pedometer to measure how far you have run during your practice, it is almost always measured in miles. Confusing! Here are some tables and problems to practice converting units of length.

### Conversion Table

1 in = 2.5 cm	1 m = 3.3 ft
1 ft = 12 in	1 yd = 3 ft
1 ft = 30 cm	1 yd = 0.9 m
1 m = 100 cm	1 m = 1.1 yd
1 km = 1000 m	
1 m = 40 in	

### Quick Review:

- 1 *centimeter* is 10 times longer than a *millimeter*
- 1 *decimeter* is 10 times longer than a *centimeter*
- 1 *meter* is 10 times longer than a *decimeter*
- 1 *kilometer* is 1000 times longer than a *meter*

In other words:

Convert distance in *centimeters* into *meters* by dividing it by 100, because *centi-* means  $\frac{1}{100}$ .

Convert distance in *decimeters* into *meters* by dividing it by 10, because *deci-* means  $\frac{1}{10}$ .

Convert distance in *centimeters* into *decimeters* by dividing it by 10, because there are 10 *centimeters* in every *decimeter*.

Convert distance in *millimeters* to *meters* by dividing it by 1000, because *milli-* means  $\frac{1}{1000}$ .

Convert distance in *kilometers* to *meters* by multiplying it by 1000, because *kilo-* means 1000 and there are 1000 *meters* in each *kilometer*.

### Fun Facts About Meters

- 1) In addition to be a unit of length, a *meter* also refers to a special measurement of the arrangement of work in poetry, as well as musical notes.
- 2) Another meaning of the word *meter* includes various devices to measure time, speed, flow, time. We also use it words like “postage meter” and “parking meter”, as well as in money and time measuring machines.
- 3) Since the XIX century, the International Bureau of Weights and Measures in Sevres, France stores a 1 meter bar made of platinum and iridium, which as the prototype of the length unit.

### Quick Quiz

- 2 in = \_\_\_ cm?      Ans: **5**  
4 in = \_\_\_ cm?      Ans: **10**  
5 in = \_\_\_ cm?      Ans: **12.5**  
5 cm = \_\_\_ in?      Ans: **2**, because 1 in = 2.5 cm  
10 cm = \_\_\_ in?      Ans: **4**  
25 cm = \_\_\_ in?      Ans: **10**  
10 in = \_\_\_ cm?      Ans: **25**  
100 in = \_\_\_ cm?      Ans: **250**  
100 cm = \_\_\_ in?      Ans: **40**

How many centimeters (*cm*) are in 1 meter (*m*)?

Ans: **100**

How many millimeters (*mm*) are in 1 meter (*m*)?

Ans: **1000**

How many millimeters (*mm*) are 1 centimeter (*cm*)?

Ans: **10**

How many millimeters (*mm*) are 1 decimeter (*dm*)?

Ans: **100**

How many millimeters (*mm*) are 1 meter (*m*)?

Ans: **1000**

How many centimeters (*cm*) are in 10 meters (*m*)?

Ans: **1000**

How many centimeters (*cm*) are in 0.1 meter (*m*)?

Ans: **10**

How many meters (*m*) are in 1 centimeter (*cm*)?

Ans: **0.01**

How many meters (*m*) are in 1 kilometers (*km*)?

Ans: **1000**

How many meters (*m*) are in 0.01 kilometer (*km*)?

Ans: **10**, because there are 1000 meters in each kilometer.

How many kilometers (*km*) are in 100 meters (*m*)?

Ans: **0.1**

How many feet (*ft*) are 1 *yd*?

Ans: **3**

How many feet (*ft*) are in 1 meter?

Ans: **3.3**

How many inches (*in*) are in 1 *yd*?

Ans: **36**

About how many inches (*in*) are in 1 meter?

Ans: **about 40** (more precise, 39.37)

How many inches (*in*) are in 10 meters?

Ans: **400**

How many yards are in 1 kilometer?

Ans: **1100**, because there are almost 1.1 yards (more accurately, 1.0936 yards) in each meter.

About how many meters are in 1000 yards?

Ans: **about 900** (more precise, 914.4)

### Conversion Table

$1 \text{ dm} = 10 \text{ cm}$
--------------------------------

How many centimeters are in decimeter?

Ans: **10**

How many decimeters are in 1 meter?

Ans: **10**

How many meters are in 100 decimeters?

Ans: **10**

How many decimeters are in 1,000 centimeters?

Ans: **100**

How many meters are in 10 decimeters?

Ans: **1**

How many meters are in 1,000 centimeters?

Ans: **10**

How many decimeters are in 10,000 centimeters?

Ans: **1,000**

How many centimeters are in 100 decimeters?

Ans: **1,000**

How many decimeters are in 1 kilometer (*km*)?

Ans: **10,000** because there are 1000 meters in 1 *km* and there are 10 times as many decimeters.

How many inches are in one decimeter?

Ans: **4**

How many inches are in 1 meter?

Ans: **40**

How many inches are in 100 meters?

Ans: **4,000**

How many inches are in 1 *km*?

Ans: **40,000**

About how many feet are in 1 meter?

Ans: **about 3.3** (3.28 to be more precise)

About how many decimeters are in 1 foot?

Ans: **3**

About how many feet are in 1 *km*?

Ans: **3,300**

How many yards are in 1 *km*?

Ans: **1,100**

How many meters are in 10 yards?

Ans: **9**

How many kilometers are in 1,000 yards?

Ans: **0.9**

How many decimeters are in 1 yard?

Ans: **9**, because there are roughly 90 centimeters in 1 yard.

### Conversion Table

1 <i>in</i> = 2.5 <i>cm</i>	1 <i>m</i> = 3.3 <i>ft</i>
1 <i>ft</i> = 12 <i>in</i>	1 <i>yd</i> = 3 <i>ft</i>
1 <i>ft</i> = 30 <i>cm</i>	1 <i>yd</i> = 0.9 <i>m</i>
1 <i>m</i> = 100 <i>cm</i>	1 <i>m</i> = 1.1 <i>yd</i>
1 <i>m</i> = 1,000 <i>mm</i>	
1 <i>m</i> = 40 <i>in</i>	

## Problems

1. Inez cut  $5.5\text{ dm}$  from a  $1\text{ m}$  pipe. How many centimeters were left in?

Ans: **45 cm**

Solution: The answer has to be in centimeters and we need to convert all measurements into this value. Then,  $100\text{ cm} - 55\text{ cm} = 45\text{ cm}$

2. Puja wrapped  $270\text{ cm}$  of fabric 6 times around her waist. How long was each wrap in *ft*?

Ans: **1.5 ft**

Solution: If  $270\text{ cm}$  were wrapped 6 times, then each wrap was  $270 \div 6 = 45\text{ (cm)}$ . Next,  $1\text{ ft} = 30\text{ cm}$ , which would make  $1.5\text{ ft}$  per wrap

3. Philip stretched a rubber band to  $20\text{ cm}$ . How many inches is that?

Ans: **8 in**

*Use a Verbal Math trick here – when dividing by 2.5. First, divide by 10, then multiply by 4 (you can also multiply by 4 first and then divide by 10). You can use the trick because you can imagine 2.5 as equal to 10:4. In this problem,  $20 \div 10 = 2$ , then  $2 \times 4 = 8$  and your answer*

4. Mercutio's sword is  $36\text{ in}$  long. How many decimeters (*dm*) is that?

Ans: **9 dm**

*You can use the trick in reverse when multiplying by 2.5. First, divide by 4, then multiply by 10 (you can also multiply by 10 first and then divide by 4). Here,  $36 \div 4 = 9$ , then  $9 \times 10 = 90\text{ (cm)}$  or  $9\text{ dm}$ , the answer to the problem.*

5. Tybalt's sword is  $8\text{ dm}$  long. How long is it in inches?

Ans: **32 in**

Solution: Convert  $8\text{ dm}$  into centimeters and then divide that number 2.5.

6. A bicycle wheel is  $700\text{ mm}$  in diameter. How many meters (*m*) is that?

Ans: **0.7 m**, because there are  $1,000\text{ mm}$  in 1 meter.

7. An earthworm is  $170\text{ mm}$  in length. How long is it in decimeters?

Ans: **1.7 dm**

8. A snake is  $759\text{ mm}$  in length. What is its length in *dm*?

Ans: **7.59 dm**

9. A white hippo's horn is  $1,500\text{ mm}$ . How long is it in inches?

Ans: **60 in**

Solution: The horn is  $150\text{ cm}$  and an inch is equal to  $2.5\text{ cm}$ . Hence,  $150 \div 2.5 = 60\text{ (in)}$

10. Donkey's tail is  $1.2\text{ m}$  long. How many millimeters is that?

Ans: **1,200 mm**

11. A newborn dolphin is  $150\text{ cm}$  long. How many inches long is a baby dolphin?

Ans: **60 in**

12. A newborn human baby is only  $50\text{ cm}$  long. How many inches is that?

Ans: **20 in**

13. A alligator is  $75\text{ dm}$  long. How many meters is that?

Ans: **7.5 m** (the alligator looks less scary if you measure it in meters).

14. A gibbon can jump  $30\text{ ft}$ . How many decimeters can it jump?

Ans: **90 dm**. There are  $30\text{ cm}$  or  $3\text{ dm}$  in each foot, then  $30 \times 3 = 90\text{ (dm)}$ .

15. A kangaroo can jump 40 *ft*. How many decimeters is that?  
Ans: **120 dm**
16. Alfred can jump 21 *ft*. How many meters is that?  
Ans: **6.3 m**  
Solution: A foot is equal to 30 *cm* or 3 *dm*, or 0.3 *m*. It might be easy to do the calculations in decimeters and then convert the results into meters:  $21 \times 3 = 63$ , next  $63 \div 10 = 6.3$  (*m*).
17. The biggest spider web is about 80 *ft*. How many meters?  
Ans: **24 m** ( $80 \times 3 = 240$ ; then  $240 : 10 = 24$  (*m*)).  
*This web,weaved by Darwin's Bark Spider and found in Madagascar, is about as long as two city buses. It is also the strongest spider web known to man.*
18. The length of person's intestine is 750 centimeters. How many feet?  
Ans: **almost 25 ft** (there are 30 *cm* in each foot)
19. A hedgehog is 250 *mm* in length. How many inches is that?  
Ans: **10 in** ( $1 \text{ in} = 25 \text{ mm}$ )
20. A pencil is 6 *in* long. How many millimeters (*mm*) is that?  
Ans: **150 mm**
21. A board is 4 *in* thick. How many millimeters (*mm*) is that?  
Ans: **100 mm**
22. A castle wall is 30 *m* tall. How many feet tall is that?  
Ans: **almost 100 ft** ( $1 \text{ m} = 3.3 \text{ ft}$ ).
23. A drawbridge is 18 *m* long. How many feet long is that?  
Ans: **almost 60 ft** (59.4 *ft* to be more precise)
24. An arrow shot from a castle, flew 990 *ft*. How many meters is that?  
Ans: **300 m**  
*The furthest shot from a hand-held bow is 1,336 yd (1,222 m), was made by Don Brown in 1987.*
25. An old map says:  
"... Walk 33 feet from the tree, turn left, and go 66 feet. Then dig 30 inches to find the treasure".  
Can you translate these directions into metric unit?  
Ans: "... **Walk 10 meters from the tree, turn left and go 20 meters, then dig 75 centimeters to find the treasure**".
26. Gwen walked 100 meters to the store before realizing that she left her wallet at home. How far, in yards, does she need to walk to retrieve her money?  
Ans: **220 yd**; she has to go all the way home 110 *yd* and then back ( $1 \text{ m} = 1.1 \text{ yd}$ ).
27. Mount Diablo is 3,840 *ft* high. How many yards is that?  
Ans: **1280 yards** ( $1 \text{ yd} = 3 \text{ ft}$ )
28. The distance between two houses is 3.5 *km*. How many meters is that?  
Ans: **3500 m**
29. The distance between two desks is 3.45 *m*. How many *cm* is that?  
Ans: **345 cm**
30. The distance between two cockroaches is 3.45 *cm*. How many *mm* is that?  
Ans: **34.5 mm**
31. The distance between two butterflies is 4.5 *mm*. How many centimeters is that?