CHAPTER

20

Measure Length

Chapter Outcomes:

- Demonstrate an understanding of the relationship between standard units and their sub-parts to solve practical problems involving linear measure.
- Demonstrate appropriate techniques when measuring.
- Solve problems involving linear measure.

Measuring, calculating, comparing and estimating lengths are practical activities that are used in everyday life during experiences, such as building, constructing, designing, and gardening. The ability to use and estimate with rulers and measuring tapes are necessary skills that enable us to quantify the world around us. These tools can tell us how tall we are, how long an object is or how far it is from here to there.

Getting Ready for Chapter 20

Tick the most appropriate unit for measuring each of the following.

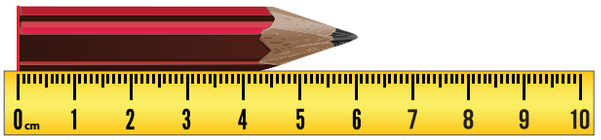
1. The length of a pencil

- ☐ centimetre
- ☐ metre
- ☐ kilometre

2. The mass of the banana

- ☐ grams
- ☐ kilograms

3. What is the length of the pencil below?



4.

m	cm
5	65
+ 6	82

5.

m	cm
6	23
− 3	41

Solve.

6. Complete the statement.
2.5 kilometres (km) = ____ metres (m)

7. A man runs 7 kilometres every day. How far would he run in a week?

8. How many 10 cm pieces of ribbon can be cut from roll of ribbon 5 m long?

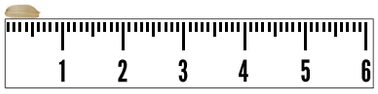
The Millimetre

Teaching Point 1:

Why do we need millimetres?

What standard unit can we use to measure a grain of rice?

It is less than 1 cm.



It is actually **6 millimetres** (**mm**) in length.

Each of these strokes represents **1 millimetre**

1 millimetre (mm) is about the thickness of a 10¢ coin.

You need a **smaller unit** than centimetres to measure the length of small objects.

10 millimetres = 1 centimetre

1 millimetre = $\frac{1}{10}$ centimetre

1 millimetre = 0.1 centimetre

Activity 1:

Express the following in millimetres.

1. 3 cm	**2.** 1 cm	**3.** 7 cm
4. 11 cm	**5.** 15 cm	**6.** 20 cm

7. $\frac{1}{2}$ cm	**8.** $\frac{2}{10}$ cm	**9.** $\frac{4}{10}$ cm
10. 0.5 cm	**11.** 0.9 cm	**12.** 0.4 cm
13. 2.7 cm	**14.** 8.3 cm	**15.** 12.6 cm
16. 3 cm 9 mm	**17.** 15 cm 8 mm	
18. 5 cm 7 mm	**19.** 8 cm 6 mm	

Activity 2:

Express the following in centimetres.

1. 40 mm	**2.** 70 mm	**3.** 90 mm
4. 250 mm	**5.** 300 mm	**6.** 560 mm
7. 130 mm	**8.** 760 mm	**9.** 980 mm
10. 45 mm	**11.** 26 mm	**12.** 105 mm
13. 69 mm	**14.** 135 mm	**15.** 16 mm

Solve.

16. Renaldo's pencil is 156 millimetres long. What is the length of his pencil in centimetres?

Estimate, Measure and Record Lengths

Teaching Point 1:

How do you estimate, measure and record length?

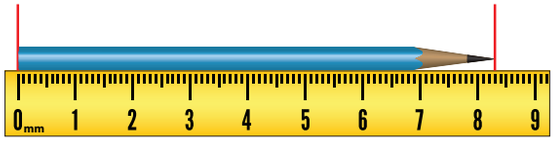
What is the length of the pencil?

Step 1: Estimate

The best unit to measure the pencil would be centimetres. The pencil can be about 6 centimetres in length.

Step 2: Measure

Line up the left edge of the object with the **zero mark** on the ruler.



The pencil is **exactly 8 cm 3 mm** long or **83 mm** long.

Step 3: Measure to the nearest centimetre

Find the centimetre mark closest to the right edge of the object.

The pencil is more than **8 cm** and less than **9 mm**. It is nearer to **8 cm** than to **9 cm**.

So the pencil is **approximately 8 cm** long.

Step 4: Record the measurement

The pencil is **8 cm 3 mm** long

The pencil is **8$\frac{3}{10}$** or **8.3 cm** long

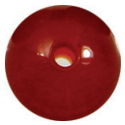
The pencil is **83 mm** long

The pencil is **approximately 8 cm** long.

Activity 1:

Estimate. Then measure and record the length of the following objects using millimetres.

1. thumb tack 	**2.** 10¢ coin 

3. raisin 	**4.** eraser 
5. pea 	**6.** paper clip 
7. shirt button 	**8.** seashell 
9. bead 	**10.** finger nail 
11. almond 	**12.** sharpener 
13. pumpkin seed 	**14.** small screw 

Activity 2:

Use your centimetre ruler and draw lines in your book with the following lengths.

1. 12 mm	**2.** 23 mm	**3.** 17 mm
4. 54 mm	**5.** 98 mm	**6.** 42 mm
7. 50 mm	**8.** 30 mm	**9.** 80 mm
10. 102 mm	**11.** 110 mm	**12.** 79 mm

Activity 3:

Estimate. Then measure and record the lengths of the following lines to the nearest centimetre.

1. _____

2. _____

3. _____

4. _____

5.

6.

7.

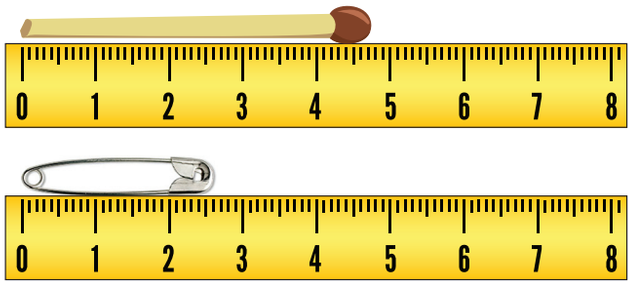
8. _____

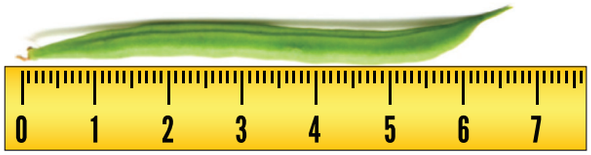
9.

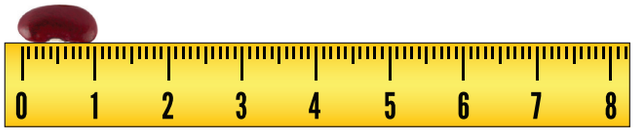
10. _____

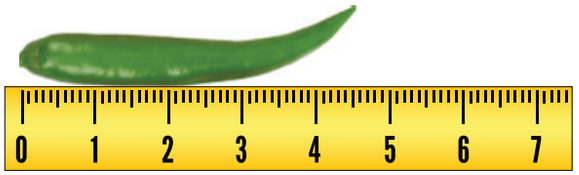
Activity 4:

Use the measurement for the objects below to complete items 1 to 7.









1. Record the length of each object using millimetres.
2. Write the length of each object using centimetres and millimetres.
3. Write the length of each object using centimetres only.
4. What is the length of each object to the nearest centimetre?
5. Order the objects from shortest to longest.
6. Calculate the total length of all the objects?
7. Which two objects have a total length of approximately 6 centimetres?

Activity 5:

Use your centimetre ruler and draw lines in your book with the following lengths.

1. 3 cm	2. 5 cm	3. 8 cm
4. 6.5 cm	5. 4.9 cm	6. 12.7 cm
7. 9.3 cm	8. 8.2 cm	9. 1.6 cm
10. 11 cm	11. 10.1 cm	12. 9.5 cm
13. 7 cm 8 mm	14. 5 cm 9 mm	

Activity 6:

Use a metre or centimetre ruler to measure the following lengths and record the measurements in your book.

1. The length of your arm from shoulder to finger
2. The length of your index finger
3. Your height
4. The length of your foot
5. The length of your big toe

Teaching Point 2:

How do measure from any mark on the ruler?

You can line up the left edge of the object at any mark on the ruler. Then count on or subtract to find the length.

The pencil above is lined up 3.

Step 1: Find the beginning and end mark.

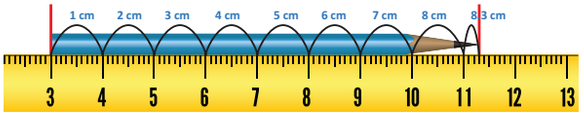
3 is the beginning mark.

11 cm 3 mm or 11.3 cm is the end mark.

Step 2: Count on or subtract.

Method 1:

Count on from 3 cm → 3 + 8.3 = 11.3 cm



Method 2:

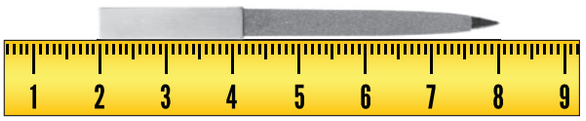
Subtract the beginning mark (3 cm) from the ending mark (11.3 cm).

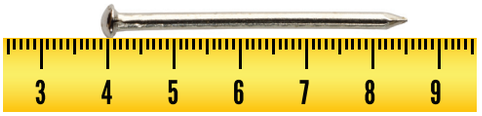
11.3 cm – 3 cm = 8.3 cm

The pencil is 8.3 cm long.

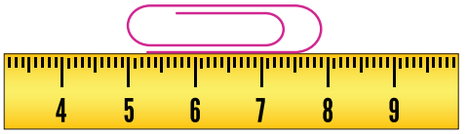
Activity 7:

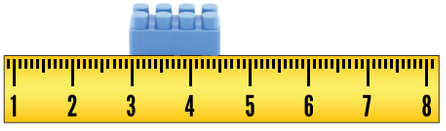
Write the length of each of the following objects in centimetres.

1. 

2. 

3. 

4. 

5. 

6. 

7. 

Teaching Point 3:

How can you measure objects that are longer than 1 metre?

1. Line up the edge of the object with the **zero mark** on the metre ruler.
2. Make a mark at 100cm.
3. Move the ruler and place the zero mark at the 100cm mark.
4. Repeat until the length is measured.
5. Record the number of metres, centimetres and millimetres.

Activity 8:

Measure the following lengths or distances. Record the lengths using a combination of metres, centimetres and millimetres.

1. The length of the chalk board
2. The height of the cupboard
3. The length of your classroom
4. The height of a door
5. The width of a window
6. The length of the school gate

7. The distance from your class to another class

8. The distance from your class to the principal's office

Use the Appropriate Unit

Teaching Point 1:

How can you select the most appropriate unit and tools to measure length?

1 millimetre (mm) is about the thickness of a 10¢ coin.

1 centimetre (cm) is about the tip of a finger.

1 metre (m) is about the height of a 4 year old child.

1 kilometre (km) is $2\frac{1}{2}$ times the distance around the stadium race track.

Activity 1:

What is the most appropriate unit to measure each.

1. height of a door	2. length of your arm
3. width of a room	4. length of a crayon
5. width of a paperclip	6. distance between two classrooms
7. distance travelled by plane	8. width of a watermelon seed
9. height of a school	10. length of a window
11. distance from home to school	12. distance from the class to the schoolyard

Compare Lengths

Teaching Point 3:

How can you compare lengths?

Compare 7.5 km and 7 000 m. Which is longer?

Step 1: Convert the measurements to similar units.

7 000 m = 7 km

Step 2: Then compare.

7.5 km > 7 km

So, 7.5 km is longer.

Activity 1:

Compare the lengths. Write >, < or = for each.

1. 6.4 cm ☐ 40 mm
2. 400 cm ☐ 4 m
3. 5 360 m ☐ 5.6 km
4. 1 200 mm ☐ 12 m
5. 5 800 cm ☐ 250 m
6. 8 m ☐ 8 000 mm
7. $\frac{3}{4}$ m ☐ 354 cm
8. $\frac{3}{4}$ km ☐ 750 m
9. 150 m ☐ $\frac{1}{4}$ km
10. $\frac{1}{2}$ cm ☐ 3 mm
11. 50 cm ☐ $\frac{1}{2}$ m
12. 3 km ☐ 5 000 m
13. 38.5 cm ☐ 385 mm
14. 1 m ☐ 900 mm

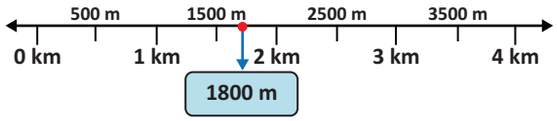
Approximate Distances and Lengths

Teaching Point 3:

How can you approximate lengths and distances?

Approximate 1 800 metres to the nearest kilometre.

Method 1: Use a number line.



Method 2: Use a rule.

1 000 m = 1 km

1 800 **rounded to thousands** → 2 000

or

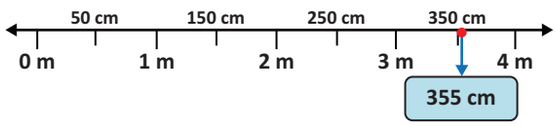
1 800 m = 1.8 km

1.8 **rounded to the nearest whole number** → 2.

So, 1 800 metres is approximately equal to 2 kilometres.

Approximate 355 centimetre to the nearest metre.

Method 1: Use a number line.



Method 2: Use a rule.

100 cm = 1 m

355 **rounded to hundreds** → 400

or

355 cm = 3.55 m

3.55 **rounded to the nearest whole number** → 4.

So, 355 centimetres is approximately equal to 4 metres.

Activity 1:

Approximate each length or distance to the nearest metre.

1.	367 cm	**2.**	407 cm	**3.**	56 cm
4.	98 cm	**5.**	123 cm	**6.**	530 cm
7.	563 cm	**8.**	987 cm	**9.**	1 300 cm
10.	4.2 m	**11.**	1.56 m	**12.**	3.06 m
13.	1 600 mm	**14.**	2 423 mm		

Activity 2:

Approximate each length or distance to the nearest kilometre.

1.	607 m	**2.**	1 307 m	**3.**	2 540 m
4.	3 009 m	**5.**	5 801 m	**6.**	2 476 m
7.	5 198 m	**8.**	2 671 m	**9.**	1 900 m
10.	2.35 km	**11.**	1.76 km	**12.**	3.6 km
13.	5.18 km	**14.**	8.07 km	**15.**	2.42 km

Calculation in Metres

Teaching Point 1:

How can you calculate in metres and centimetres?

m	cm
1	
3	59
+ 6	88
10	47

59 cm + 88 cm = 147 cm
147 cm ÷ 100 = 1.47 m
1 m 47 cm
3 m + 6 m + 1 m = 10 m

km	m	cm
1	1	
2	125	63
+ 4	894	57
7	20	20

63 cm + 57 cm = 120 cm
120 cm ÷ 100 = 1.2 m
1.2 m → 1 m 20 cm
125 m + 894 m + 1 m = 1 020 m
1 020 m ÷ 1 000 = 1.02 km
1.02 km → 1 km 20 m
2 km + 4 km + 1 km = 7 km

m	cm
5	124
~~6~~	24
− 2	74
3	50

24 cm is less than 74 cm
Regroup 1 m to 100 cm
124 cm − 74 cm = 50 cm
5 m − 2 m = 3 m

cm	mm
3	18
~~4~~	8
− 2	9
1	9

8 mm is less than 9 mm
Regroup 1 cm to 10 mm
10 mm + 8 mm = 18 mm
18 mm - 9 mm = 9 mm

3 cm − 2 cm = 1 cm

m	cm
1	
2	19
×	8
17	52

19 cm × 8 = 152 cm
152 cm ÷ 100 = 1.52 m
1 m 52 cm

2 m × 8 = 16 m
16 m + 1 m = 17 m

km	m
1	
5	165
×	12
61	980

125 m × 12 = 1 980 m
1 980 m ÷ 1 000 = 1.98 km
1.98 km → 1 km 980 m
5 km × 12 = 60 km
60 km + 1 km = 61 km

m	cm
	310
5) 8	10
1	62

8 m ÷ 5 = 1 remainder 3 m
3 m × 100 = 300 cm
300 cm + 10 cm = 310 cm
310 cm ÷ 5 = 62

km	m
	3 012
6) 9	12
1	502

9 km ÷ 6 = 1 remainder 3 km
3 km × 1 000 = 3 000 m
3 000 m + 12 m = 3 012 m
3 012 m ÷ 6 = 502

Activity 1:

Calculate the following.

1. 3 mm + 5 mm =

2. 5 km + 8 km =

3. 14 m + 25 m =

4. 37 cm + 15 cm =

5.

m	cm
5	25
+ 5	35

6.

m	cm
10	19
+ 2	5

7.

km	m
3	873
+ 6	479

8.

cm	mm
27	6
+ 21	7

9.

km	m
8	601
+ 2	969

10.

cm	mm
2	8
+ 2	9

11. 7 m 32 cm + 3 m 76 cm =

12. 1 km 972 m + 3 km 658 m + 6 m =

13. 24.8 cm + 12.5 cm =

14. 11.9 m + 15.8 m + 9.4 m =

15. 21.1 m + 14.8 m + 32.7 m =

Activity 2:

Calculate the following.

1. 9 mm – 4 mm =

2. 6 km – 1 km =

3. 70 m – 28 m =

4. 82 cm – 37 cm =

5.

m	cm
4	48
– 2	25

6.

m	cm
12	63
– 10	12

7.

cm	mm
40	1
– 26	6

8.

km	m
4	200
– 1	382

9.

km	m
11	308
– 9	561

10.

m	cm
2	20
–	39

11. 19 m 27 cm – 14 m 48 cm =

12. 6 km 32 m – 4 km 720 m =

13. 7 m 50 cm – 5 m 98 cm =

14. 21.1 km – 14.8 km =

15. 37.3 cm – 23.9 cm =

16. 40.5 m – 24.6 m =

Activity 3:

Calculate the following.

1. 19 m × 2 =

2. 15 cm × 6 =

3.
m	cm
6	8
×	5

4.
km	m
1	450
×	10

5.
m	cm
4	80
×	9

6.
km	m
3	326
×	8

7.
cm	mm
6	9
×	15

8.
m	cm
2	24
×	12

9. 2 m 62 cm × 5 =

10. 5 m 51 cm × 9 =

11. 1 km 5 m × 24 =

12. 6 km 20 m × 7 =

13. 4 m × 3.4 =

14. 5.3 cm × 1.7 =

Activity 4:

Calculate the following.

1. 24 mm ÷ 6 =

2. 15 cm ÷ 3 =

3. 68 m ÷ 4 =

4. 16 km ÷ 8 =

5.
cm	mm
5) 6	5

6.
km	m
8) 12	8

7.
m	cm
12) 6	60

8.
m	mm
6) 1	86

9. 4 m 52 cm ÷ 4 =

10. 3 km 60 m ÷ 6 =

11. 29 cm 7 mm ÷ 9 =

12. 21 m 15 cm ÷ 15 =

Solve Problems in Measurement

1. Kevin cycled 10 kilometres on Monday. He cycled twice as many kilometres on Tuesday. How many kilometres did he cycle in total on both days?

2. Maria walked 4 kilometres on Friday. On Saturday she walked 900 metres. On Sunday she walked 3.6 kilometres. How many kilometres did she walk in total?

3. A week ago Terry-Ann bought the pencil shown below. Now the pencil measures 12.5 centimetres. How many millimetres of the pencil has been used?

4. A ribbon is 4.36 metres long. Another ribbon is 3.14 metres shorter than it. What is the total length of both ribbons?

5. Lianna lives 3.56 kilometres away from the school. Keon lives 2 500 metres away from the school. Jervon lives $3\frac{1}{2}$ kilometres away from the school. Which child lives nearest to the school?

6. A piece of wood is 1.26 metres long. A carpenter used 0.9 metre of it. Then he cuts the remaining piece into two pieces of equal lengths. What is length of each piece?

7. Trees are planted along a road that is 2 kilometres 50 metres long. Eleven trees are planted at an equal distance apart along the road. What is the distance in metres between each tree?

8. An electrician has a length of pipe 268 centimetres long. He cuts the pipe into 4 equal pieces.

   (a) What is the length of each piece of pipe in metres?

   (b) Round your answer to the nearest tenth of a metre.

9. Every day Michael runs 4 laps of $1\frac{1}{2}$ kilometres each.

   (a) What is the total distance that Michael runs each day?

   (b) If he continues this routine, how many days will it take for him to run a total of 36 kilometres?

10. A string of Christmas lights is 12 metres long. The first light from the plug is 30 centimetres from the plug. If the lights are placed 10 centimetres apart, how many lights are on the string?

11. In a triathlon, an athlete swam 400 metres, cycled 10 kilometres and ran 2.5 kilometres. How many kilometres did the athlete cover altogether?

12. A roll of crepe paper that is 3.3 metres long is cut into smaller pieces. Each piece is 22 centimetres long. How much money will a shopkeeper receive if he sells each piece at $2.50?

13. A seamstress made 12 sheet sets for sale as shown below.

For each sheet set she used 2.5 metres of fabric to make a sheet and 0. 5 metres to make two pillowcases.

   (a) How much fabric did she use to make one sheet set?

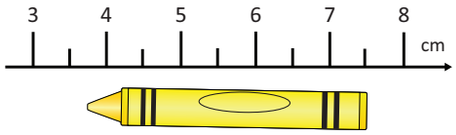
   (b) The fabric cost $25.00 per metre. If the seamstress sold each sheet set for $100, how much profit did she make?

Chapter Review

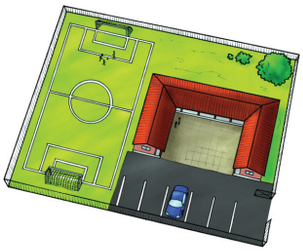
Answer the questions.

1. Convert 2.5 centimetres to millimetres.

2. What is the length of the crayon to the nearest centimetre?



3. The picture below shows a diagram of a school compound.



Tick the most appropriate metric unit for measuring the distance from the car to the football field.

- ☐ millimetre
- ☐ metre
- ☐ centimetre
- ☐ kilometre

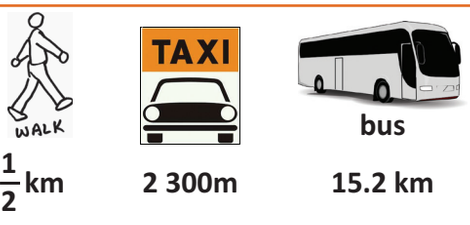
4.

km	m
17	462
+ 9	709

5.

m	cm
15	56
– 9	79

6. On a trip to the city Keon travelled the following distances.



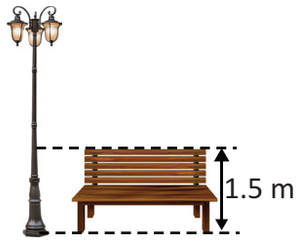
What is the total distance Keon travelled in kilometres?

7. Draw a line that is 5.4 cm long. What is the length of the line in millimetres?

8. Write the following lengths in ASCENDING order shortest first:

4.25 km 4 050 m $4\frac{1}{2}$ km

9. The diagram below shows a bench next to an lamp post.



The height of the bench is 1.5 m. Estimate the height of the lamp post.

10. The distance between Jenny's home and the school is 2 604 metres. What is the distance to the nearest kilometre?

11. A roll of ribbon is cut into 30 pieces, each piece $\frac{3}{4}$ metres long. What was the total length of the ribbon on the roll?

12. Eight children stand in a line. If they stand 3 metres apart, what is the distance between the first child and the last child?

13. Lisa and Leanna participated in the long jump at a track and field event. Lisa's jump was 1 metre. Leanna's jump was 132 centimetres.

(a) Who had the longer jump?

(b) How much longer?

14. Miss Russell needs 42 centimetres of ribbon to make 3 bows. She has a piece of ribbon that is $2\frac{1}{4}$ metres long.

(a) How many bows will she be able to make?

(b) How much ribbon will she have left after making the bows?