

LENGTH – CONVERT, EXTEND TO KILOMETRES.

INVESTIGATIONS OVERVIEW PAGE

THIS PAGE IS A SUMMARY OF THE INVESTIGATIONS THAT STUDENTS MAY ENGAGE IN TO DEEPEN THEIR RELATIONAL UNDERSTANDING. INVESTIGATIONS WITH INSTRUCTIONS TO STUDENTS FOLLOW ON SUBSEQUENT PAGES.

- In pairs, students measure lengths and perimeters in centimetres and millimetres, and in metres and centimetres. They record their measurement as a number of millimetres, and then as a number of centimetres and millimetres (for example, 38 mm and 3 cm and 8 mm) or as a number of centimetres, and then as a number of metres and centimetres (for example, 386 cm and 3 m and 86 cm). They record the length in centimetres and a fraction of a centimetre (for example, $3\frac{8}{10}$ cm) or in metres and a fraction of a metre (for example, $3\frac{86}{100}$ m), then in centimetres and a decimal fraction of a centimetre (for example, 3.8 cm) or in metres and decimal fraction of a metre (3.86 m). They then convert between centimetres and millimetres, and between metres and centimetres, by multiplying and dividing by 10 or 100 related to multiplicative place value, for example, $38 \div 10 = 3.8$ so 38 mm = 3.8 cm and $3.8 \times 10 = 38$ so 3.8 cm = 38 mm, or $386 \div 100 = 3.86$ so 386 cm = 3.86 m and $3.86 \times 100 = 386$ so 3.86 m = 386 cm. **Reflection:** How can we measure length in centimetres and metres and fractions of metres and convert using multiplicative place value? How can we measure length in millimetres and centimetres and fractions of metres and convert using multiplicative place value?
- In pairs, children have a pack of playing cards. They select cards to make numbers to represent a length in metres, or in a combination of kilometres and metres. They convert between metres and kilometres by changing 1000 metres to 1 kilometre, for example, 3862 metres, change the 3000 metres into 3 kilometres, and record the length as 3 kilometres and 862 metres. They convert between kilometres and metres by changing every 1 kilometre into 1000 metres, for example, 15 kilometres and 260 metres, change the 15 kilometres into 15 000 metres, and record the length as 15 260 metres. **Reflection:** How can we convert between kilometres and metres?
- In pairs, children research Imperial units of measurement to measure length, as well as their histories and current usage. (Google and YouTube are great). They discuss how these units were not created by multiplying and dividing by the same number repeatedly, and so are less easy to convert between. **Reflection:** What is the Imperial measurement system for length?
- In pairs, children construct a triangle with 2 sides the same length, for example, 3.8 centimetres (3 cm and 8 mm). They measure the third side. They could then measure the angles (links to Measurement and Geometry 48 and 49) and classify the triangle using side and angle properties, for example, scalene triangle (2 sides and angles equal) or equilateral triangle (3 sides and angles equal). **Reflection:** How can we measure sides of triangles?
- In pairs, children construct a quadrilateral with 2 sides the same length, for example, 3.8 centimetres (3 cm and 8 mm). They measure the 2 remaining sides. They could then measure the angles (links to Measurement and Geometry 48 and 49) and classify the quadrilateral using side and angle properties, for example,

square (4 sides and angles equal), rectangle (opposite sides and angles equal), rhombus (4 sides equal, opposite sides equal, each pair of opposite angles only equal), kite (2 adjacent sides equal, 1 pair opposite angles equal), trapezium (1 pair of opposite sides parallel). [Reflection: How can we measure sides of quadrilaterals?](#)

- In pairs, children construct quadrilaterals and triangles with given perimeters, then classify the quadrilateral or triangle as scalene, isosceles or equilateral, or as a square, rhombus, rectangle, trapezium, kite or non-special. [Reflection: How can we measure perimeter?](#)
- In pairs, children have a piece of string 24 centimetres in length to create shapes with a perimeter of 24 centimetres. They record the shape and the length of each side in centimetres, and in millimetres, and in combinations of centimetres and millimetres, converting between the units of measurement. They could then measure the angles (links to Measurement and Geometry 48 and 49) and classify the shapes using side and angle properties, for example, scalene triangle, irregular pentagon, etc. [Reflection: How can we measure length?](#)
- In small groups, children have 12 metres of string to create shapes with a perimeter of 12 metres. They record the shape and the length of each side in metres, in centimetres, and in combinations of metres and centimetres, converting between the units of measurement. [Reflection: How can we measure length?](#)
- In pairs, children have a large object, for example a garbage or storage bin. They predict whether the height or the perimeter (or circumference) will be longer. They measure both, converting between metres and centimetres, or between centimetres and millimetres. [Reflection: How can we measure height and perimeter?](#)
- In pairs or small groups, children are given a part of a ball of wool. They estimate the length of the wool in millimetres, centimetres and metres, then measure it. [Reflection: How can we measure length?](#)
- In pairs, children use a map of the local area. They are given a route to follow to a local landmark, for example a park. They use the scale and string to estimate where they think 1 kilometre is along the route. Children are taken along the route marked on the map, measuring using a trundle wheel or app, and stopping at 1 kilometre. (If using a trundle wheel, children investigate trundle wheels, measuring the circumference of the wheel by marking the ground where the wheel starts, then marking the ground when the wheel has completed a revolution. They explain how trundle wheels measure in lengths of 1 metre.) They look at their maps to see how close their estimate was. They discuss the length of a kilometre. They could also estimate how long they think it will take them to walk 1 kilometre, then test it. [Reflection: How can we estimate, then measure a kilometre?](#)
- If possible, take children to the top of a hill, a large field, or straight road where it is possible to see 1 kilometre. [Reflection: How far is a kilometre?](#)
- In pairs or small groups, children plan the route for a fun run that is 1 kilometre / a number of kilometres in length. Children measure the route using a trundle wheel or app. [Reflection: How can we estimate, then measure in kilometres?](#)
- Children estimate, then measure the perimeter of the school using a trundle wheel or app, then convert between units of measurement. They compare it with the perimeter of their garden, the local park, a sports field, etc. [Reflection: How can we estimate, then measure in kilometres?](#)

Length – Convert, Extend to Kilometres.

Measure lengths and perimeters in

<ul style="list-style-type: none"> centimetres and millimetres 	<ul style="list-style-type: none"> metres and centimetres
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Record your measurement as

<ul style="list-style-type: none"> a number of millimetres, a number of centimetres and millimetres (for example, 38 mm, and 3 cm and 8 mm) 	<ul style="list-style-type: none"> a number of centimetres, a number of metres and centimetres (for example, 386 cm, and 3 m and 86 cm)
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Record the length in

<ul style="list-style-type: none"> centimetres and a fraction of a centimetre (for example, $3\frac{8}{10}$ cm) then in centimetres and a decimal fraction of a centimetre (for example, 3.8 cm) 	<ul style="list-style-type: none"> metres and a fraction of a metre (for example, $3\frac{86}{100}$ m) then in metres and decimal fraction of a metre (3.86 m)
<ul style="list-style-type: none"> Convert between centimetres and millimetres, by multiplying and dividing by 10 related to multiplicative place value, for example, $38 \div 10 = 3.8$ so $38 \text{ mm} = 3.8 \text{ cm}$ and $3.8 \times 10 = 38$ so $3.8 \text{ cm} = 38 \text{ mm}$ 	<ul style="list-style-type: none"> Convert between metres and centimetres by multiplying and dividing by 100 related to multiplicative place value, for example, $386 \div 100 = 3.86$ so $386 \text{ cm} = 3.86 \text{ m}$ and $3.86 \times 100 = 386$ so $3.86 \text{ m} = 386 \text{ cm}$

Reflection:

How can we measure length in millimetres and centimetres and fractions of centimetres and convert using multiplicative place value?	How can we measure length in centimetres and metres and fractions of metres and convert using multiplicative place value?
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Length – Convert, Extend to Kilometres.

Have a pack of playing cards.

Select cards to make numbers to represent

- a length in metres, or
- a length in a combination of kilometres and metres.

Convert between metres and kilometres by changing 1000 metres to 1 kilometre, for example, 3862 metres, change the 3000 metres into 3 kilometres, and record the length as 3 kilometres and 862 metres.

Convert between kilometres and metres by changing every 1 kilometre into 1000 metres, for example, 15 kilometres and 260 metres, change the 15 kilometres into 15 000 metres, and record the length as 15 260 metres.

Reflection: How can we convert between kilometres and metres?

Length – Convert, Extend to Kilometres.

Research Imperial units of measurement to measure length,

- their histories
- current usage. (Google and YouTube are great).

Discuss how these units were not created by multiplying and dividing by the same number repeatedly, and so are less easy to convert between.

Reflection: What is the Imperial measurement system for length?

Length – Convert, Extend to Kilometres.

Construct a triangle with 2 sides the same length, for example, 3.8 centimetres (3 cm and 8 mm).

Measure the third side.

You could then measure the angles and classify the triangle using side and angle properties, for example,

- scalene triangle (2 sides and angles equal) or
- equilateral triangle (3 sides and angles equal).

Reflection: How can we measure sides of triangles?

Length – Convert, Extend to Kilometres.

Construct a quadrilateral with 2 sides the same length, for example, 3.8 centimetres (3 cm and 8 mm).

Measure the 2 remaining sides.

You could then measure the angles and classify the quadrilateral using side and angle properties, for example,

- square (4 sides and angles equal),
- rectangle (opposite sides and angles equal),
- rhombus (4 sides equal, opposite sides equal, each pair of opposite angles only equal),
- kite (2 adjacent sides equal, 1 pair opposite angles equal),
- trapezium (1 pair of opposite sides parallel).

Reflection: How can we measure sides of quadrilaterals?

Length – Convert, Extend to Kilometres.

Construct quadrilaterals and triangles with given perimeters, then classify the quadrilateral or triangle.

Classify the quadrilateral or triangle as scalene, isosceles or equilateral, or as a square, rhombus, rectangle, trapezium, kite or non-special.

Reflection: How can we measure perimeter?

Length – Convert, Extend to Kilometres.

Have a piece of string 24 centimetres in length to create shapes with a perimeter of 24 centimetres.

Record the shape and the length of each side in:

- millimetres,
- combinations of centimetres of millimetres,
- centimetres and fraction of a centimetre,
- centimetres and a decimal fraction of a centimetre.

Convert between millimetres and centimetres using a multiplicative place value chart.

You could then measure the angles and classify the shapes using side and angle properties, for example, scalene triangle, irregular pentagon, etc.

Reflection: How can we measure length?

Length – Convert, Extend to Kilometres.

Investigate with some friends.

Have 12 metres of string to create shapes with a perimeter of 12 metres.

Record the shape and the length of each side in

- centimetres,
- combinations of metres and centimetres,
- metres and fraction of a metre,
- metres and a decimal fraction of a metre.

Convert between metres and centimetres using a multiplicative place value chart.

Reflection: How can we measure length?

Length – Convert, Extend to Kilometres.

Have a large object, for example a garbage or storage bin.

Predict whether the height or the perimeter (or circumference) will be longer.

Measure both, converting between metres and centimetres, or between centimetres and millimetres.

Reflection: How can we measure height and perimeter?

Length – Convert, Extend to Kilometres.

Have a part of a ball of wool.

Estimate the length of the wool in millimetres, centimetres and metres, then measure it.

Reflection: How can we measure length?

Length – Convert, Extend to Kilometres.

Use a map of the local area.

Select a route to follow to a feature on the map, for example, a local park.

Use the scale and string to estimate where you think 1 kilometre is along the route.

Take the route marked on the map, measuring using a trundle wheel or app, and stopping at 1 kilometre. (If using a trundle wheel: Investigate trundle wheels first, measuring the circumference of the wheel by marking the ground where the wheel starts, then marking the ground when the wheel has completed a revolution. Explain how trundle wheels measure in lengths of 1 metre.)

Look at your map to see how close your estimate was.

Discuss the length of a kilometre.

You could also estimate how long you think it will take you to walk 1 kilometre, then test it.

Reflection: How can we estimate, then measure a kilometre?

Length – Convert, Extend to Kilometres.

Plan the route for a fun run that is 1 kilometre / a number of kilometres in length.

Measure the route using a trundle wheel or app.

Reflection: How can we estimate, then measure in kilometres?

Length – Convert, Extend to Kilometres.

Estimate, then measure the perimeter of the school using a trundle wheel, then convert between units of measurement.

Compare it with the perimeter of your garden, the local park, a sports field, etc.

Reflection: How can we estimate, then measure in kilometres?