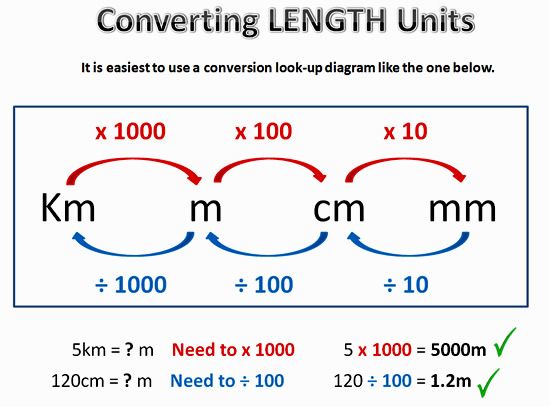
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| YEAR 9 MEASUREMENT  NOTES BOOKLET | NAME:    YEAR 9 STANDARD MATHS 2020 |

# Year 9 Measurement 2020

## PIC5A Length and Perimeter

Length is at the foundation of measurement from which the concepts of perimeter, circumference, area and volume are developed. From the use of the royal cubit (distance from tip of middle finger to the elbow) used by the ancient Egyptians to the calculation of pi (𝜋) by modern computers, units of length have helped to create the world in which we live.

*\* Courtesy of Year 9 Cambridge textbook.*



**Example 1: Convert the measurements into the units given in brackets**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **a** | 5 cm (mm) | **b** | 2.8 m (cm) | **c** 521 mm (cm) |
| **d** | 83.7 cm (m) | **e** | 4.6 km (m) | **f** 2170 m (km) |

* **Perimeter** is the distance around the outside of

a closed shape.

* + Sides with the same markings are of equal length.

5 cm

*P* 2 5 3

13 cm

3 cm

**Example 2:** [**Finding perimeter of simple shapes**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100219/)

18 m

6 cm 5 cm

3 cm

**b**

Find the perimeter of each of the following shapes.

**a**

12 m

**Example 3:** [**Find the Unknown length**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100220/)

4 m

5 m

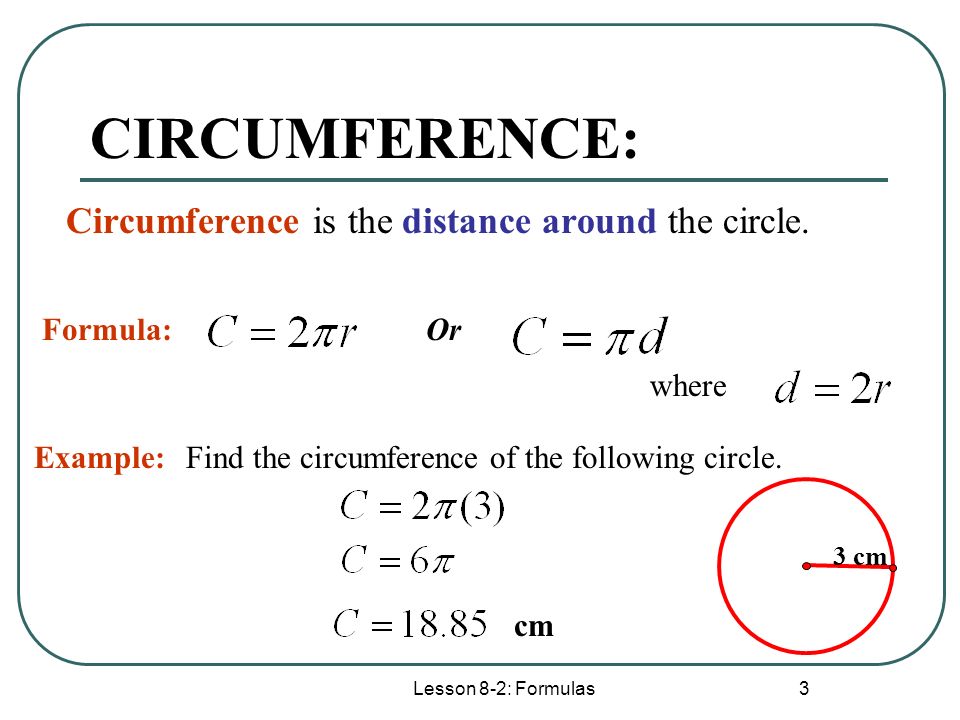
Perimeter 16 m

*x* m

Find the unknown side length in this shape with the given perimeter.

## 5B Circumference and Perimeter of a Sector

* Circumference is the length measured around a circle.
* A sector perimeter is a fraction of the length of a circle plus the two radii lengths where it has been segmented.

|  |
| --- |
|  |

**Example 4: Determine the fraction of the sector**



Determine the fraction of a circle shown in these sectors. Write the fraction in simplest form.

**a b c**

60



150



225



**Example 5:** [**Finding circumference and perimeter of sectors**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100237/)

Find the circumference of this circle and the perimeter of this sector correct to two decimal places.

**a b**

3 cm

100

7 m



**Example 6:** [**Using exact values**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/107780/)

4

2

Give the exact circumference/perimeter of these shapes.

**a b**

## 5C Area

* Below we can see which values to use when converting between units of area
* The second part shows the general formulas used to calculate the area for basic two dimensional shapes.



2

360

*A* 1 *xy*

*A* *θ* *π r*2

*A* *πr*2

*x*

*r*

*θ*

*r*

*r*

*y*

Sector

Circle

Kite

2

Area 1(*a* *b*)*h*

2

Area 1 *xy*

*a*

*x*

*h*

*b*

Area *b* *h*

*y*

*h*

Rhombus

2

Area 1 *b* *h*

*b*

*l*

Area *l* *w*

Trapezium

*b*

Area *l*2

Parallelogram

*h*

*w*

*l*

1 m2 1002 cm2

* The area of a two-dimensional shape is a measure of the space enclosed within its boundaries.

Square Rectangle Triangle

102 = 10 × 10 = 100

1002 = 100 × 100 = 10000

10002 = 1000 × 1000 = 1 000000

102

1002

mm2

cm2

m2

102

1002

10002

km2

10002

1 m 100 cm

1 m 100 cm

1 m2

* Conversion of area units

**Example 7:** [**Converting area measurements**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100260/)

Convert the following area measurements to the units given in the brackets.

**a** 859 mm2 (cm2) **b** 2.37 m2 (cm2)



11 km

1.5 cm

7 m

3 m

3 cm

**c**

5 km

**a b**

Find the area of each of the following plane figures.

**Example 8:** [**Finding areas of rectangles, triangles and parallelograms**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100261/)



**Example 9:** [**Finding areas of rhombuses and trapeziums**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100262/)

6 m

9 mm

4 m

3 m

**b**

10 mm

**a**

Find the area of each of the following plane figures.

**Example 10:** [**Finding areas of circles and sectors**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100263/)

Find the area of this circle and sector correct to two decimal places.

**a b**

260

5.1 cm

4 m

## 5D Composite shapes



For this high-rise office building in Oslo, Norway, the architect has designed windows with triangular, trapezoidal and composite shapes.

* **Composite shapes** are made up of more than one basic shape.
* Addition and/or subtraction can be used to find areas and perimeters of composite shapes.
* The layout of the relevant mathematical working needs to make sense so that the reader of your work understands each step.

**Example 11:** [**Finding perimeters and areas of composite shapes**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100271/)

Find the perimeter and area of this composite shape, rounding answers to two decimal places.

17 cm

14 cm

## 5E Surface area of prisms and pyramids

* The **total surface area** (TSA) of a solid is the sum of the areas of all the surfaces.
* A **net** is a two-dimensional illustration of all the surfaces of a solid.
* A right **prism** is a solid with a uniform cross-section with two identical ends and the remaining sides are rectangles.
  + They are named by the shape of their cross-section.



**Example 12:** [**Finding total surface area**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100283/)



Find the total surface area of this right rectangular prism and this right square-based pyramid.

**a**

**b**

2 cm

3 m

5 cm

3 cm

2 m

2 m

**5F Surface area of a cylinder**

2



* Surface area of a **cylinder** 2 circles 1 rectangle

2 *πr*2 *πr* *h*

∴TSA 2*πr*2 2*πrh*

*r*

*h*

2 circular ends curved area

* TSA = 2*1r*2 + 2*1rh* = 2*1r*(*r* + *h*)
* In many problems, you will need to decide which parts of the surface of the cylinder should be included.

25 m

5 m

Find the surface area of this cylinder, rounding to two decimal places.

**Example 13:** [**Finding the surface area of a cylinder**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100297/)

**Example 14:** [**Finding surface areas of cylindrical portions**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100298/)

Find the total surface area of this half cylinder, rounding to two decimal places.

8 cm

4 cm

**5G Volume of a Prism**



* Common metric units for **volume** include **cubic kilometres** (km3), **cubic metres** (m3), **cubic centimetres** (cm3) and **cubic millimetres** (mm3).

10003 1003 103

km3

m3

cm3

mm3

10003 1003

103

10003 1 000 000 000

1003 1 000 000

103 1000

* Common units of **capacity** include:
  + **megalitres** (ML) 1 ML 1000 kL
  + **kilolitres** (kL) 1 kL 1000 L
* **litres** (L) 1 L 1000 mL
* **millilitres** (mL)
* Also 1 cm3 = 1 mL so 1 L = 1000 cm3 and 1 m3 = 1000 L

**Example 15:** [**Converting volume units**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100315/)

Convert the following volume measurements to the units given in the brackets.

**a** 2.5 m3 (cm3) **b** 458 mm3 (cm3)



**Example 16:** [**Finding volumes of prisms and solids**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100316/)

6 cm

4 cm

1 cm

1 cm

3 cm

5 cm

Area 

10 cm2

3 cm

Find the volume of each of these three-dimensional objects.

**a b c**

**5H Volume of a Cylinder**



An oil refinery converts crude oil into many products including petrol, diesel, jet fuel, motor oils and asphalt base. Cylinder volumes are calculated for its storage tanks and

pipe capacity per m3.

*r*

*h*

* The volume of a cylinder is given by

*V* = *r*2 × *h* or *V* = *r*2*h*

* + *r* is the radius of the circular ends.
  + *h* is the length or distance between the circular ends.



**Example 17:** [**Finding the volume of a cylinder**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100325/)

0.3 m

10 cm

1.8 m

**b**

3 cm

**a**

Find the volume of these cylinders correct to two decimal places.

**Example 18:** [**Finding the capacity of a cylinder**](https://cambridgemaths.cambridge.edu.au/lessonSection/lesson.action#/resources/video/100326/)

Find the capacity, in litres, of a cylinder with radius 30 cm and height 90 cm. Round to the nearest litre.

**Chapter 5: Measurement**

**Chapter checklist: Success criteria**

|  |  |  |
| --- | --- | --- |
|  |  | ✔ |
| **5A** | **1. I can find the perimeter of simple shapes.**  e.g. Find the perimeter of the following shape.  *Ex 5A p. 299*  *Fluency 1, 2, 5(½), Problem-solving 7, 9, Reasoning 11(½),* |  |
| **5A** | **2. I can find the perimeter of composite shapes.**  e.g. Find the perimeter of the following shape.  *Ex 5A p. 299*  *Fluency 3, 4(½), 6de,*  *Problem-solving 8, 10, Reasoning, 12, Enrichment 14* |  |
| **5B** | **3. I can find the circumference of a circle.**  e.g. Find the circumference of this circle both in exact form and rounded to two decimal places.  *Ex 5B p. 305*  *Fluency 2, 5, Problem Solving 7, 8, Reasoning 12* |  |
| **5B** | **4. I can find the perimeter of a sector.**  e.g. Find the perimeter of this sector correct to two decimal places.  *Ex 5B p. 305*  *Fluency 3, 6(½), Reasoning 11def* |  |
| **5C** | **5. I can convert between units of area.**  e.g. Convert  to  and  to .  *Ex 5C p. 314*  *Fluency 2, Problem-solving 8* |  |
| **5C** | **6. I can find the area of simple shapes.**  e.g. Find the area of this rectangle and triangle.  *Ex 5C p. 314*  *Fluency 3abc, Problem-solving 9, 10* |  |
| **5C** | **7. I can find the area of a trapezium or rhombus.**  e.g. Find the area of the following trapezium and rhombus.  *Ex 5C p. 314*  *Fluency 4(½), 5(½), Problem-solving 11* |  |
| **5C** | **8. I can find the area of a circle or sector.**  e.g. Find the area of this circle and sector correct to two decimal places.  *Ex 5C p. 314*  *Fluency 6(½), Problem-solving 13, Reasoning 14/15* |  |
| **5D** | **9. I can find the perimeter and area of composite shapes.**  e.g. Find the perimeter and area of this composite shape, rounding answers to two decimal places.  *Ex 5D p. 320*  *Fluency 1, 2(½), Problem-solving 6, 7, 9, Reasoning 12* |  |
| **5E** | **10. I can find the surface area of a prism.**  e.g. Find the total surface area of this right rectangular prism.  *Ex 5E p. 327*  *Fluency 1a, 2, Problem-solving 6, 7, 9, Reasoning 11, Enrichment 12* |  |
| **5E** | **11. I can find the surface area of a pyramid.**  e.g. Find the total surface area of this right square-based pyramid.  *Ex 5E p. 327*  *Fluency 1b, 3* |  |
| **5F** | **12. I can find the surface area of a cylinder.**  e.g. Find the surface area of this cylinder correct to two decimal places.  *Ex 5F p. 334*  *Fluency 1-5 (½), Problem-solving 8, Reasoning 10* |  |
| **5F** | **13. I can find the surface area of cylindrical portions.**  e.g. Find the total surface area of this quarter-cylinder, rounding to two decimal places.  *Ex 5F p. 334*  *Problem-solving 6 (½), Enrichment 12* |  |
| **5G** | **14. I can convert between units of volume.**  e.g. Convert  to  and  to .  *Ex 5G p. 342*  *Fluency 2 (½)* |  |
| **5G** | **15. I can find the volume of an object with a constant cross-section.**  e.g. Find the volume of this solid object.  *Ex 5G p. 342*  *Fluency 4 (½), Problem-solving 8, Reasoning 10* |  |
| **5G** | **16. I can find the volume of a prism.**  e.g. Find the volume of this triangular prism.  *Ex 5G p. 342*  *Fluency 5 (½), Problem-solving 9, Reasoning 15* |  |
| **5H** | **17. I can find the volume of a cylinder.**  e.g. Find the volume of this cylinder correct to two decimal places.  *Ex 5H p. 347*  *Fluency 2 (½)* |  |
| **5H** | **18. I can find volume in terms of capacity.**  e.g. Find the capacity in litres of a cylinder with radius 20 cm and height  80 cm. Round to the nearest litre.  *Ex 5H p. 347*  *Fluency 3 (½), Problem-solving 4, 7(½) Reasoning 8* |  |