Example 30

Convert
a 25 °C to °F   **b** 300 K to °C   **c** 200 °F to °C

> You will derive formulae like this to model real-life situtations in chapter 6.

Answers

a $\dfrac{9}{5} \times 25 + 32 = 77$ °F   *Use the formula $t_F = \dfrac{9}{5} \times t_C + 32$*

b $300 - 273.15 = 26.85$ °C   *Use the formula $t_C = t_K - 273.15$*

c $200 = \dfrac{9}{5} \times t_C + 32$ *Rearrange to make t_C the subject of the formula.*

$\quad t_C = (200 - 32) \times \dfrac{5}{9}$

$\quad t_C = 93.3$ °C (3 sf)

Exercise 1R

1 Convert into °C. Give your answer correct to one tenth of a degree.
   a 280 K   **b** 80 °F

2 Convert into °F. Give your answer correct to the nearest degree.
   a 21 °C   **b** 2 °C

3 **a** Convert 290 K to °C.
   b Hence convert 290 K to °F.

4 **a** The formula to convert from K to °C is $t_C = t_K - 273.15$.
      Find the formula used to convert from °C to K.

   b The formula to convert from °C to °F is $t_F = \dfrac{9}{5} \times t_C + 32$.
      Find the formula used to convert from °F to °C.

Review exercise

Paper 1 style questions

EXAM-STYLE QUESTION

1 Consider the numbers $5, \dfrac{\pi}{2}, -3, \dfrac{5}{4}, 2.\dot{3}$ and the number sets $\mathbb{N}, \mathbb{Z}, \mathbb{Q}$ and $\mathbb{R}$.

Complete the following table by placing a tick (✓) in the appropriate box if the number is an element of the set.

	5	$\dfrac{\pi}{2}$	-3	$\dfrac{5}{4}$	$2.\dot{3}$
$\mathbb{N}$					
$\mathbb{Z}$					
$\mathbb{Q}$					
$\mathbb{R}$					

2 Given the numbers

14.1×10^{-1} 1.4×10^2 $\sqrt{2}$ $0.001\,39 \times 10^2$ 1414×10^{-2}

a state which of these numbers is irrational

b write down $\sqrt{2}$ correct to five significant figures

c write down these numbers in ascending order.

3 The mass of a container is 2690 kg.

a Write down this weight in the form $a \times 10^k$ where $1 \le a < 10$ and $k \in \mathbb{Z}$.

Nelson estimates that the mass of the container is 2.7×10^3 kg.

b **i** Write down this mass in full.

ii Find the percentage error made by Nelson in his estimation.

4 Light travels in empty space at a speed of $299\,792\,458\,\text{m s}^{-1}$.

a Write this value correct to three significant figures.

b Use your answer to part **a** to find in km the distance that the light travels in 1 second.

c Use your answer to part **b** to find in km h^{-1} the speed at which the light travels in empty space. Give your answer in the form $a \times 10^k$ where $1 \le a < 10$ and $k \in \mathbb{Z}$.

5 The total mass of 90 identical books is 52 200 g.

a Calculate the exact mass of one book in kg.

b Write down your answer to part **a** correct to one significant figure.

Matilda estimates that the mass of any of these books is 0.4 kg. She uses the answer to part **b** to find the percentage error made in her estimation.

c Find this percentage error.

6 The volume, V, of a cubic jar is 1560 cm³.

a Write down V in dm³.

Sean works in the school cafeteria making juice. He pours the juice in these jars. He always fills the jars up to $\dfrac{3}{4}$ of their height.

b Find in ℓ the amount of juice that Sean pours in each jar.

He makes $25\,\ell$ of juice per day.

c **i** Find the number of jars that Sean pours per day.

ii Write down the amount of juice left.

7 Let $x = \dfrac{30y^2}{\sqrt{y+1}}$.

a Find the exact value of x when $y = 1.25$.

b Write down the value of x correct to three significant figures.

c Write down your answer to part **b** in the form $a \times 10^k$ where $1 \le a < 10$ and $k \in \mathbb{Z}$.

8 The side length of a square field is x m.

   a Write down in terms of x an expression for the area of the field.

   The area of the field is $2.56\,\text{km}^2$.

   b **i** Find the value of x.

      ii Find, in **metres,** the perimeter of the field.

9 The formula to convert from the kelvin scale to the Fahrenheit scale is

$$t_F = \frac{9}{5} \times t_K - 459.67$$

where t_K represents temperature in K and t_F represents temperature in °F.

   a Find the temperature in °F for 300 K.

   b Find the temperature in K for 100 °F. Give your answer to the nearest unit.

10 Consider the inequality $2x + 5 > x + 6$.

   a Solve the inequality.

   b Represent the solution to part **a** on a copy of the number line.

   c Decide which of these numbers are solutions to the inequality given in part **a**.
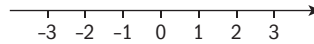
$$1 \qquad \frac{\pi}{4} \qquad -5 \qquad \sqrt{3} \qquad 2.0\dot{6} \qquad \frac{101}{100} \qquad 1.2 \times 10^{-3}$$

11 The size of an A4 sheet is $210\,\text{mm} \times 297\,\text{mm}$.

   a Find the area of an A4 sheet. Give your answer in mm^2.

   b Give your answer to part **a** in m^2.

   One ream has 500 pages. It weighs $75\,\text{g m}^{-2}$.

   c Find the mass of one page.

   d Find the mass of one ream. Give your answer in kg.

Paper 2 style questions

1 The figure shows a rectangular field. The field is 1260 m wide and 2500 m long.

   a Calculate the perimeter of the field. Give your answer in km.

   The owner of the field, Enrico, wants to fence it. The cost of fencing is $327.64 per km.

   b Calculate the cost of fencing the field. Give your answer correct to two decimal places.
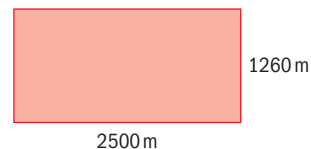
   1260 m

   2500 m

   Figure not to scale

Enrico estimates that the perimeter of the field is 7.6 km.
He uses this estimation to calculate the cost of fencing the field.

   c Calculate the percentage error made by Enrico when using his estimation of the perimeter of the field to calculate the cost of fencing.

   d Calculate the area of the field. Give your answer in square kilometres (km^2).

2 A running track is made of a rectangular shape 800 m by 400 m with semicircles at each end as shown in the figure below.

800 m

Figure not to scale

400 m
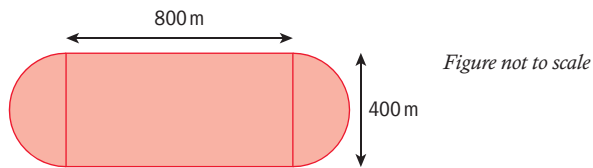
a Find the perimeter of the running track. Give your answer correct to the nearest metre.

Elger runs 14 200 m around the track.

b Find the number of complete laps that Elger runs around the running track.

Elger runs at an average speed of 19 km h⁻¹.

c Find the time it takes Elger to complete **one** lap. Give your answer in hours.

d Find the time **in minutes** it takes Elger to run 14 200 m. Give your answer correct to 5 sf.

Elger estimates that it takes him 44 minutes to run 14 200 m.

e Find the percentage error made by Elger in his estimation.

3 A chocolate shop makes spherical chocolates with a diameter of 2.5 cm.

a Calculate the volume of each of these chocolates in cm³.
   Give your answer correct to two decimal places.

The chocolates are sold in cylindrical boxes which have a radius of 12.5 mm and a height of 15 cm.

b Calculate the volume of each of these cylindrical boxes in cm³.
   Give your answer correct to two decimal places.

c Show that the maximum number of chocolates that fit in each of these boxes is 6.

The boxes are filled with 6 chocolates.

d Find the volume of the box that is **not** occupied by the chocolates.

e Give your answer to part **d** in mm³.

f Give your answer to part **d** in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$.