

# GCSE Maths – Geometry and Measures

## Units of Measure

Worksheet

**WORKED SOLUTIONS**

This worksheet will show you how to work out different types of units of measures questions. Each section contains a worked example, a question with hints and then questions for you to work through on your own.

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## Section A

### Worked Example

**Umar runs 5,200 metres every day. Work out how far Umar runs in 5 days in kilometres.**

**Step 1:** Find the conversion for metres to kilometres.

$$m \rightarrow \div 1000 \rightarrow km$$

**Step 2:** Calculate the value in kilometres.

$$5200 \div 1000 = 5.2$$

*Umar runs 5.2 km a day*

**Step 3:** Calculate the distance ran in 5 days.

$$5.2 \times 5 = 26$$

Umar runs 26 km in 5 days.

### Guided Example

**Shriya is 5 feet and 3 inches tall. Ayushi is 169 cm tall. Shriya says “I am the taller one”. Is she correct?**

**Step 1:** Convert all values to 1 unit.

*Change all values to cm*

**Step 2:** Use ratios to convert 5 feet to the chosen common unit.

$$\begin{array}{l} 1 \text{ foot} = 30 \text{ cm} \\ \times 5 \left( \begin{array}{l} \rightarrow 5 \text{ ft} = \underline{150} \text{ cm} \end{array} \right) \times 5 \end{array}$$

**Step 4:** Use ratios to convert 3 inches to the chosen common unit.

$$\begin{array}{l} 1 \text{ inch} = 2.5 \text{ cm} \\ \times 3 \left( \begin{array}{l} \rightarrow 3 \text{ inches} = \underline{7.5} \text{ cm} \end{array} \right) \times 3 \end{array}$$

**Step 5:** Add these heights together to calculate Shriya's height in centimetres. Compare Shriya's and Ayushi's heights.

$$150 + 7.5 = 157.5 \text{ cm} \leftarrow \text{Shriya's height}$$

*Shriya is wrong, Ayushi is taller as  $169 \text{ cm} > 157.5 \text{ cm}$*



## Now it's your turn!

If you get stuck, look back at the worked and guided examples.

1. Convert 0.02 kilometres to centimetres

$$\begin{array}{l} \text{km} \xrightarrow{\times 1000} \text{m} \xrightarrow{\times 100} \text{cm} \\ 0.02 \times 1000 = 20\text{m} \\ 20 \times 100 = 2000\text{cm} \end{array}$$

$$0.02\text{km} = 2000\text{cm}$$

2. Convert 45 feet to yards (3 feet = 1 yard)

$$\begin{array}{l} 3\text{ft} = 1\text{yard} \\ \div 15 \quad \left. \begin{array}{l} 3\text{ft} = 1\text{yard} \\ 45\text{ft} = 15\text{yards} \end{array} \right\} \times 15 \end{array}$$

$$45\text{feet} = 15\text{yards}$$

3. Ross travels 36 km from Birmingham to Coventry. He then drives 120 miles to London. Calculate the total distance Ross travels in miles. (5 miles = 8 km)

As the question asks for the distance in miles, convert all distances to miles.

$$\begin{array}{l} 5\text{miles} = 8\text{km} \\ \div 2 \quad \left. \begin{array}{l} 5\text{miles} = 8\text{km} \\ 22.5\text{miles} = 36\text{km} \end{array} \right\} \div 2 \end{array} \quad \text{Total Distance: } 22.5 + 120 = 142.5$$

$$142.5\text{miles}$$

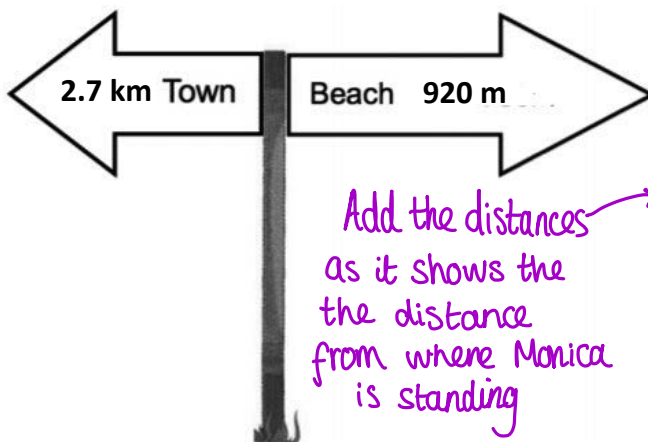
4. Rachel and Phoebe go running. Rachel runs 1km to Phoebe's house and together they run 5 miles. Rachel then runs back home. How many kilometres does Rachel run? (5 miles = 8 km)

$$+1 = 2\text{km} \quad (\text{to and fro Phoebe's house}) \quad \text{Total: } 2 + 8 = 10\text{km}$$

$$\text{miles} = 8\text{km} \quad (\text{they run 8km together})$$

$$\text{Rachel runs a total of } 10\text{km.}$$

5. Monica sees this sign. What is the distance between the Town and the Beach?



$$\text{km} \xrightarrow{\times 1000} \text{m}$$

$$2.7 \times 1000 = 2700\text{m}$$

$$\begin{array}{l} \text{Add the distances} \rightarrow \\ \text{as it shows the} \\ \text{distance} \\ \text{from where Monica} \\ \text{is standing} \end{array} \quad 2700 + 920 = 3620\text{m}$$

$$3620\text{m or } 3.62\text{km}$$



## Section B

### Worked Example

Convert  $760 \text{ mm}^2$  to  $\text{cm}^2$

Step 1: Convert  $\text{mm}^2$  to  $\text{cm}^2$ .

$$\text{mm}^2 \rightarrow \div 100 \rightarrow \text{cm}^2$$

Step 2: Calculate the required value.

$$760 \div 100 = 7.6$$

$$760 \text{ mm}^2 = 7.6 \text{ cm}^2$$

### Guided Example

Convert  $21 \text{ cm}^3$  to  $\text{mm}^3$

Step 1: Convert  $\text{cm}^3$  to  $\text{mm}^3$ .

$$\text{cm} \xrightarrow{\times 10} \text{mm}$$

$$\text{cm}^3 \xrightarrow[\text{(x 1000)}]{\times 10^3} \text{mm}^3$$

Step 2: Calculate the required value.

$$21 \text{ cm}^3 \times 1000 = 21000 \text{ mm}^3$$



## Now it's your turn!

If you get stuck, look back at the worked and guided examples.

6. Convert 3232 cm<sup>2</sup> to m<sup>2</sup>

$$cm \xrightarrow{\div 100} m$$

$$cm^2 \xrightarrow[\div 10000]{\div 100^2} m^2$$

$$3232 \div 10000 = 0.3232 m^2$$

7. Convert 9245 mm<sup>3</sup> to cm<sup>3</sup>

$$mm \xrightarrow{\div 10} cm$$

$$mm^3 \xrightarrow[\div 1000]{\div 10^3} cm^3$$

$$9245 \div 1000 = 9.245 cm^3$$

8. Convert 0.003 m<sup>2</sup> to mm<sup>2</sup>

$$m \xrightarrow{\times 1000} mm$$

$$m^2 \xrightarrow[\times 1000000]{\times 1000^2} mm^2$$

$$0.003 \times 1000000 = 3000 mm^2$$

9. A triangle's area is 12000 cm<sup>2</sup>. What is the area in m<sup>2</sup>?

$$cm \xrightarrow{\div 100} m$$

$$cm^2 \xrightarrow[\div 10000]{\div 100^2} m^2$$

$$12,000 \div 10,000 = 1.2 m^2$$

10. The volume of a box is 3000000 cm<sup>3</sup>. What is the volume in m<sup>3</sup>?

$$cm \xrightarrow{\div 100} m$$

$$cm^3 \xrightarrow[\div 1000000]{\div 100^3} m^3$$

$$3000000 \div 1000000 = 3 m^3$$



## Section C

### Worked Example

Charles pours lemonade out of a 1 litre jug. His cup holds 300 ml and he fills his cup exactly halfway. How much lemonade is left in the jug in ml?

**Step 1:** Convert the capacity of lemonade into millilitres.

$$\text{litres} \rightarrow \times 1000 \rightarrow \text{ml}$$

There is 1000 ml of lemonade in the 1 litre jug.

**Step 2:** Calculate how much lemonade is poured into Charles' glass.

$$300 \div 2 = 150$$

Charles pours 150 ml out of the jug

**Step 3:** Calculate the remaining capacity.

$$1000 - 150 = 850$$

There is 850 ml of lemonade left in the jug.

### Guided Example

Amy donates 30 pints of milk to Food Aid. Jake donates 3 gallons of milk. Who donates more milk?

**Step 1:** Convert all values to a chosen common unit.

Change all values to pints

**Step 2:** Use ratios to convert 3 gallons to pints.

$$\begin{array}{l} 8 \text{ pints} = 1 \text{ gallon} \\ \times 3 \quad \left( \right. \quad \left. \right) \div 3 \\ \quad \quad \quad \rightarrow \quad 24 \text{ pints} = \underline{3} \text{ gallons} \end{array}$$

**Step 3:** Work out who donates more milk.

30 pints > 24 pints. Amy donates more milk.



## Now it's your turn!

If you get stuck, look back at the worked and guided examples.

11. Convert 4000 ml to  $\text{cm}^3$

$$\begin{array}{l} 1 \text{ ml} = 1 \text{ cm}^3 \\ \div 4000 \quad \left. \begin{array}{l} 4000 \text{ ml} = 4000 \text{ cm}^3 \end{array} \right\} \times 4000 \end{array} \quad 4000 \text{ cm}^3$$

12. Convert 9 litres to gallons

$$\begin{array}{l} 1 \text{ gallon} \approx 4.5 \text{ l} \\ \times 2 \quad \left. \begin{array}{l} 2 \text{ gallons} \approx 9 \text{ l} \end{array} \right\} \div 2 \end{array} \quad 2 \text{ gallons}$$

13. Rosa is having a party. She mixes 4 litres of Apple Juice with 1800 ml of Mango Juice and 500 ml of Orange Juice. What is the total capacity of her drink?

Convert all to ml:

$$\begin{array}{l} 1 \text{ l} = 1000 \text{ ml} \\ \div 4 \quad \left. \begin{array}{l} 4 \text{ l} = 4000 \text{ ml} \end{array} \right\} \times 4 \end{array} \quad \begin{array}{l} \text{Total capacity} = 4000 + 1800 + 500 \\ = 6300 \text{ ml} \quad \text{or} \quad 6.3 \text{ l} \end{array}$$

14. Terry is mixing paint to make a specific colour of teal. He mixed 1 gallon of dark blue with 1.9 litres of Green Paint and 1140 ml of White Paint. He needs 7.5 litres of paint to cover his walls. Will Terry have enough paint?

Convert all to litres.

$$\begin{array}{l} 1 \text{ gallon} = 4.5 \text{ litres (dark blue)} \\ 1140 \text{ ml} \xrightarrow{\div 1000} 1.14 \text{ l (white)} \\ 4.5 + 1.14 + 1.9 = 7.54 \end{array}$$

Terry uses 7.54 l of paint,  $7.54 > 7.5$ .

Therefore Terry has enough paint.

15. Kevin and Ray are at a farm, milking cows. Kevin milks 6.75 litres and Ray milks 11 pints. Who milks more?

Converting to pints

$$\begin{array}{l} 1 \text{ l} \approx 1.76 \text{ pints} \\ \times 6.75 \quad \left. \begin{array}{l} 6.75 \text{ l} \approx 11.88 \text{ pints} \end{array} \right\} \times 6.75 \end{array} \quad 11.88 > 11$$

Kevin milks more.



## Section D

### Worked Example

**Gina receives an order weighing 1.9 kg. Another parcel arrives weighing 980 grams. What is the total mass of Gina's packages?**

**Step 1:** Convert mass from kilograms to grams.

$$kg \rightarrow \times 1000 \rightarrow g$$

The first order has a mass of 1900 g.

**Step 2:** Calculate the total mass of Gina's packages.

$$1900 + 980 = 2880 \text{ g}$$

The total mass of the packages is 2880 grams.

### Guided Example

**Doug is going on holiday and is travelling with 2 suitcases. The first suitcase weighs 9.5 kg, and the second suitcase weighs 3500 g. There is a 15 kg total limit, does Doug exceed the limit?**

**Step 1:** Convert mass from grams to kilograms.

$$g \xrightarrow{\div 1000} kg$$

$$3500 \div 1000 = 3.5$$

The second suitcase has a mass of 3.5 kg.

**Step 2:** Calculate the total mass of Doug's luggage.

$$9.5 + 3.5 = 13 \text{ kg}$$

**Step 3:** Evaluate whether the luggage exceeds the limit.

$$13 < 15$$

Therefore Doug does not exceed the limit.





### Now it's your turn!

If you get stuck, look back at the worked and guided examples.

16. Convert 45 ounces to grams ( $28\text{ g} = 1\text{ ounce}$ )

$$\begin{array}{l} 28\text{ g} = 1\text{ ounce} \\ \times 45 \quad \left\{ \begin{array}{l} 1260\text{ g} = 45\text{ ounces} \end{array} \right. \div 45 \end{array} \quad 1260\text{ g}$$

17. Convert 3 stones to grams ( $6.4\text{ kg} = 1\text{ stone}$ )

$$\begin{array}{l} 6.4\text{ kg} = 1\text{ stone} \\ \times 3 \quad \left\{ \begin{array}{l} 19.2\text{ kg} = 3\text{ stones} \end{array} \right. \div 3 \\ \text{kg} \xrightarrow{\times 1000} \text{g} \quad 19.2 \times 1000 = 19200\text{ g} \end{array}$$

18. Scully weighs 19.5 stones. Hitchcock weighs 120 kg. Who weighs more and by how much? ( $6.4\text{ kg} = 1\text{ stone}$ )

$$6.4\text{ kg} = 1\text{ stone}$$

$$124.8\text{ kg} = 19.5\text{ stones}$$

$$\text{Difference: } 124.8 - 120 = 4.8$$

$$124.8 > 120$$

Scully weighs more by 4.8 kg

19. Madeleine buys some vegetables. She buys 1.5 kg of potatoes, 400g of tomatoes, 2390 grams of onions and butternut squash weighing 1.1 kg. She carries them with 2 bags. Each bag can hold a mass of up to 2500 grams. Will Madeleine be able to carry the vegetables with 2 bags?

$$2\text{ bags can hold: } 2 \times 2500 = 5000\text{ g}$$

$$\text{kg} \xrightarrow{\times 1000} \text{g}$$

$$1.5 \times 1000 = 1500\text{ g}$$

$$1.1 \times 1000 = 1100\text{ g}$$

Total weight:

$$1500 + 1100 + 2390 + 400 = 5390$$

$$5390\text{ g} > 5000\text{ g}$$

Madeleine will not be able to hold all the vegetables with 2 bags.



20. A lift can hold up to 650 kg. There are 8 people in this lift and each person weighs 10 stones on average. Will the lift be able to carry the weight of all 8 people? (6.4 kg = 1 stone)

Total weight of the people:  $8 \times 10 = 80$  stones

$$\begin{array}{l} 6.4 \text{ kg} = 1 \text{ stone} \\ \times 80 \quad \left\{ \begin{array}{l} \rightarrow 512 \text{ kg} = 80 \text{ stones} \end{array} \right. \leftarrow \div 80 \end{array}$$

$$512 < 650$$

The lift will be able to carry all 8 people.

21. Cagney weighed 6.4 pounds when she was born. Lacey 100 ounces when she was born. Who weighed more at birth? (16 ounces = 1 pound)

$$\begin{array}{l} 16 \text{ ounces} = 1 \text{ pound} \\ \times 6.4 \quad \left\{ \begin{array}{l} \rightarrow 102.4 \text{ oz} = 6.4 \text{ pounds} \end{array} \right. \leftarrow \div 6.4 \end{array}$$

$$102.4 > 100$$

Cagney weighed more at birth.



## Section E

### Worked Example

**Convert 100 hours into days.**

**Step 1:** State the conversion from hours into days.

$$\text{Hours} \rightarrow \div 24 \rightarrow \text{Days}$$

**Step 2:** Calculate how many days 100 hours is in days.

$$100 \div 24 = 4.167 \text{ days}$$

So,

$$100 \text{ hours} = 4.2 \text{ days}$$

### Guided Example

Sophia does her Maths, Geography, and Economics homework. It takes her a total of three hours. She spends 70 minutes on her Economics homework and 80 minutes on her Geography Homework. How many minutes does Sophia spend doing her Maths homework?

**Step 1:** Convert from hours to minutes.

$$\begin{array}{l} \times 3 \left\{ \begin{array}{l} 1 \text{ hour} = 60 \text{ min} \\ 3 \text{ hours} = 180 \text{ min} \end{array} \right. \times 3 \end{array}$$

**Step 2:** Calculate how much time she has spent doing her Geography and Economics homework.

$$70 + 80 = 150$$

**Step 3:** Calculate the time she spends doing her maths homework.

$$180 - 150 = 30$$

Sophia spends 30min on her maths homework



## Now it's your turn!

If you get stuck, look back at the worked and guided examples.

22. Convert 2,160,000 seconds to hours.

$$\text{Sec} \xrightarrow{\div 60} \text{min} \xrightarrow{\div 60} \text{hours}$$

$$2160000 \div 60 = 36000 \text{ min}$$

$$36000 \div 60 = 600 \text{ hours}$$

23. Convert a fortnight to hours.

$$\text{Fortnight} = 2 \text{ weeks}$$

$$2 \text{ weeks} = 14 \text{ days}$$

$$14 \text{ days} = 336 \text{ hours}$$

$$1 \text{ day} = 24 \text{ hours}$$

$$14 \times 24 = 336$$

24. Ava is travelling on a train to Brooklyn. She leaves at 11:05. Her journey takes 1 hour and 57 minutes. What time is her train due to arrive in Brooklyn?

$$1 \text{ h } 57 \text{ min} = 2 \text{ h} - 3 \text{ min}$$

$$11:05 + 2 \text{ h} = 13:05$$

$$13:05 - 3 \text{ min} = 13:02$$

Ava arrives in Brooklyn at 13:02

or 1:02 pm

25. David is completing a puzzle. He takes 5 min and 45 seconds to complete it. Debby also completes a puzzle but takes 200 seconds longer. How long does Debby take to complete the puzzle?

$$1 \text{ min} = 60 \text{ sec}$$

$$200 \text{ sec} = 3 \frac{1}{3} \text{ min}$$

$$\frac{1}{3} \text{ min} = 20 \text{ sec}$$

Debby takes 3 min 20 sec longer.

$$5 \text{ min } 45 \text{ s} + 3 \text{ min} = 8 \text{ min } 45 \text{ s}$$

$$8 \text{ min } 45 \text{ s} + 20 \text{ s} = 9 \text{ min } 5 \text{ s}$$

Debby takes 9 min 5 sec / 545 sec to complete the puzzle

26. Nikolaj is watching a movie starting at 10:30 and ending at 3:05 pm. How long is the movie?

$$10:30 + 4 \text{ hours} = 14:30 / 2:30 \text{ pm}$$

$$2:30 \text{ pm} + 30 \text{ min} = 3:00 \text{ pm}$$

$$3:00 \text{ pm} + 5 \text{ min} = 3:05 \text{ pm}$$

$$4 \text{ hours} + 30 \text{ min} + 5 \text{ min} = 4 \text{ hours } 35 \text{ min}$$

The movie is 4 hours and 35 min long.



## Section F

### Worked Example

Jason goes to a shop and buys:

chocolate - 99p  
sweets - £1.29  
biscuits - 89p  
crisps - £2.25

What is the total cost of his shop in pounds?

**Step 1:** Convert all the prices to 1 unit (pounds).

$$99p = £0.99$$

$$89p = £0.89$$

**Step 2:** Once they are in the same unit, add up all the prices.

$$£0.89 + £0.99 + £1.29 + £2.25 = £5.42$$

Jason's total shop cost £5.42.

### Guided Example

Melanie is going on holiday to New York. She has £200 that needs to be converted to dollars before she goes. How many dollars will she receive if £1 = \$1.40?

**Step 1:** Use ratios to convert £200 to dollars.

$$\begin{array}{l} £1 = \$1.40 \\ \div 200 \quad \left( \right. \\ £200 = \$280 \quad \left. \right) \times 200 \end{array}$$

She will receive \$280.



## Now it's your turn!

If you get stuck, look back at the worked and guided examples.

27. Sharon goes to London. Her travel expenses cost £77.50, her food expenses cost 816p. She also bought some gifts for her family. In total she spent £100, how much did she spend on gifts? £1 = 100p

$$816p \stackrel{\div 100}{=} \pounds 8.16$$

$$77.50 + 8.16 + \text{gifts} = \pounds 100$$

$$\begin{array}{r} -77.5 \\ -8.16 \\ \hline \text{gifts} = \pounds 14.34 \end{array}$$

Sharon spends £14.34 on gifts

28. Marcus bought 2 pens at 64p each, 3 binders at £1.09 each and 1 rubber at £1.19. He pays with a £10 note. Work out how much change Marcus should get from £10.

$$\pounds 1 = 100p$$

$$\text{Pens} = 2 \times 64p = 128p \stackrel{\div 100}{=} \pounds 1.28$$

$$\text{Binders} = 3 \times \pounds 1.09 = \pounds 3.27$$

$$\text{Rubber} = \pounds 1.19$$

$$\text{Change} = \pounds 10 - \pounds 5.74$$

$$= \pounds 4.26$$

$$\text{Total} = 1.28 + 3.27 + 1.19$$

$$= \pounds 5.74$$

29. Mac went to Spain. He changed £450 into euros (€). The exchange rate was £1 = €1.62. How many euros does he get from £450?

$$\begin{array}{l} \pounds 1 = \text{€} 1.62 \\ \pounds 450 = \text{€} 729 \end{array}$$

Mac will get €729

30. A pencil costs 85p. Work out how many pencils can be bought with a £5 note.

$$\pounds 1 = 100p \quad \pounds 5 = 500p$$

$$500p \div 85p = 5.88... \text{ pencils}$$

← can't buy a fraction of a pencil always round down

5 pencils can be bought with £5.

31. Keith is going on holiday to Japan. He wants to change £150 into yen. The exchange rate is £1 = ¥168. How many Yen will Keith receive?

$$\begin{array}{l} \pounds 1 = \text{¥} 168 \\ \pounds 150 = \text{¥} 25200 \end{array}$$

Keith will receive ¥25200.

