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**FUNCTIONAL SKILLS**

Maths Level 2



**Area: Measure, shape and space**

Criterion: 15. Calculate using compound measures, including speed, density and rates of pay

**Speed, distance and time**

Simply put, speed is a measurement of how fast something travels, and how far it can travel within a certain amount of time.

The standard measures for speed are as follows:

* metres per second (m/s)
* miles per hour (mph)
* kilometres per hour (km/h)

Speed, distance and time are related. Each can be calculated by using the following equations:

* speed = distance ÷ time
* distance = speed x time
* time = distance ÷ speed

Distance

Speed

Time

D = S x T

S = D ÷ T

T = D ÷ S

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**Example questions**

**Calculating speed**

Sarah runs 6km in 30 minutes. What is her speed in kilometres per hour (km/h)?

You have been asked to calculate the kilometres per hour. However, the question uses minutes.

Therefore, first convert the minute to hours.

60 minutes = 1 hour

30 minutes is half of an hour

30 minute = 0.5 hours

Next, calculate the speed using the formula

Speed = distance ÷ time

Distance = 6km

Time = 0.5 hours

6 ÷ 0.5 = 12km/h

**Calculating time**

A train is moving at a speed of 20m/s.

How long does it take for the train to travel 80m?

Time = distance ÷ speed

80 ÷ 20 = 4 seconds

**Calculating distance**

A train is moving at a speed of 30m/s.

How far does the train travel in 9 seconds?

Distance = speed x time

30 x 9 = 270m

**Question 1**

You walk a total of 25km in 10 hours. Calculate your speed.

(Show your working out.)

(2 marks)

|  |
| --- |
| Answer: \_\_\_\_\_\_\_\_ km/h |

**Question 2**

A bus travels 18km in 120 minutes. Calculate the bus’s speed in kilometres per hour.

(Show your working out.)

(3 marks)

|  |
| --- |
| Answer: \_\_\_\_\_\_\_\_ km/h |

**Question 3**

You finish a 100m race in 12.5 seconds. Calculate your speed.

(Show your working out.)

Insert number of marks if applicable

|  |
| --- |
| Answer: \_\_\_\_\_\_\_\_ m/s |

**Question 4**

A train is travelling at 60mph. How far will the train travel in 4 hours?

(Show your working out.)

(2 marks)

|  |
| --- |
| Answer: \_\_\_\_\_\_\_\_ miles |

**Question 5**

You go on a cycling trip. You travel at 10mph for 2 hours, then you travel at 15mph for 90 minutes.

What is the total distance travelled?

(Show your working out.)

(6 marks)

|  |
| --- |
| Answer: \_\_\_\_\_\_\_\_ miles |

**Question 6**

A car is travelling at 40km/h. How far will it have travelled in 18 minutes?

(Show your working out.)

(3 marks)

|  |
| --- |
| Answer: \_\_\_\_\_\_\_\_km |

**Question 7**

You are travelling to a friend’s house. They live 140 miles away. You are travelling at 35mph. How long will it take for you to arrive?

(Show your working out.)

(2 marks)

|  |
| --- |
| Answer: \_\_\_\_\_\_\_\_hours |

**Question 8**

You are on a flight from England to America. The aeroplane is travelling at 885km/h and will cover 7,080km. How long will the journey take?

(Show your working out.)

(3 marks)

|  |
| --- |
| Answer: \_\_\_\_\_\_\_\_km |

**Density, mass and volume**

Density measures the relationship between the mass of something and its volume.

The following units are typically used for density:

* grams per cubic centimetres (g/cm³)
* kilograms per cubic metres (kg/m³)

Density, mass and volume are related. Each can be calculated by using the following equations:

* density = mass ÷ volume
* mass = density x volume
* volume = mass ÷ density

Mass

Density

Volume

D = M ÷ V

M = D x V

V = M ÷ D

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**Example questions**

**Calculating density**

A cube weighs 19.41g and has a volume of 20cm³.

Calculate the density of the cube.

Give your answer to 2 decimal places.

Use the formula: density = mass ÷ volume

19.41 ÷ 25 = 0.7764

Rounded to 2 decimal places = 0.78g/cm³.

If the volume provided is in cm³, always check whether the answer is required in cm³ or m³.

**Calculating mass**

A brick has a volume of 100cm³ and a density of 22.7g/cm.

Calculate the brick’s mass. Give your answer in kilograms.

Use the formula: mass = density x volume

22.7 x 100 = 2,270g.

Convert grams to kilograms.

1,000g = 1kg.

2,270 ÷ 1,000 = 2.27kg.

**Calculating volume**

A block of silver has a density of 10.5g/cm³ and a mass of 3,150g.

Calculate the volume of the silver block to 1 decimal place.

Use the formula: volume = mass ÷ density

3,150g ÷ 10.5 = 300cm³.

**Question 9**

An object has a mass of 490g and a volume of 1,950cm³.

Calculate the object’s density. Give your answer to 3 decimal places.

(Show your working out.)

(3 marks)

|  |
| --- |
| Answer: \_\_\_\_\_\_\_\_ g/cm³ |

**Question 10**

A sphere has a mass of 1,200g and a volume of 1,500cm³.

Calculate the sphere’s density.

(Show your working out.)

(2 marks)

|  |
| --- |
| Answer: \_\_\_\_\_\_\_\_ g/cm³ |

**Question 11**

A block of wood has a volume of 196cm³ and a density of 0.8g/cm.

Calculate the mass of the block of wood.

(Show your working out.)

(2 marks)

|  |
| --- |
| Answer: \_\_\_\_\_\_\_\_ g |

**Question 12**

A block of gold has a density of 19.3g/cm³ and a mass of 2500g.

Calculate the volume of the gold block to 1 decimal place.

(Show your working out.)

(3 marks)

|  |
| --- |
| Answer: \_\_\_\_\_\_\_\_ g/cm³ |

**Rates of pay**

Rate of pay is how much something costs per a set amount of time. For example, an employee earning £12.35 per hour, or a phone call costing 23p per minute.

Questions may require you to calculate a total amount using a rate of pay. They may also ask you to combine a rate of pay with a fixed fee (standard charge), or use 2 different pay rates.

For example, Mark works in a café. He earns £13.50 per hour and works 38 hours per week. This week, he earned £42 in tips.

How much did Mark earn this week in total?

First, we need to calculate how much Mark earns per week using his hourly rate.

Pay x hours per week

£13.50 x 38 = £513

Next, we need to add the amount Mark received in tips to his weekly pay.

£42 + £513 = £555

Mark earned £555 this week.

**Question 13**

You want to retile your bathroom and replace the sink.

A tiler charges £25 per hour and says the re-tiling work will take 12 hours.

A plumber charges £29.50 per hour and says it will take 2.5 hours to replace the sink.

Calculate the total cost of the completed work.

(Show your working out.)

(5 marks)

|  |
| --- |
| Answer: £\_\_\_\_\_\_\_\_ |

**Question 14**

A premium-rate telephone line charges 73p per minute, plus a fixed cost of £4.60.

Calculate how much a 30-minute phone call would cost.

Give your answer in pounds.

(Show your working out.)

Insert number of marks if applicable

|  |
| --- |
| Answer: £\_\_\_\_\_\_\_\_ |

**Question 15**

You earn £550 a week. Calculate how much you will earn in 12 weeks.

(Show your working out.)

(2 marks)

|  |
| --- |
|  |

**Answers**

**Calculating speed, distance and time**

**Question 1**

Speed = distance ÷ time

25 ÷ 10 = 2.5km/h.

**Question 2**

Speed = distance ÷ time

Convert 120 minutes to hours.

60 minutes = 1 hour.

120 minutes = 2 hours.

18 ÷ 2 = 9km/h.

**Question 3**

Speed = distance ÷ time

100 ÷ 12.5 = 8m/s.

**Question 4**

Distance = speed x time

60 x 4 = 240 miles.

**Question 5**

Distance = speed x time

Calculate the distance travelled in the first part of the trip.

10 x 2 = 20 miles.

Next, convert the minutes in the second part of the trip.

60 minutes = 1 hour.

90 minutes = 1.5 hours.

Calculate the distance travelled in the second part of the trip.

1.5 x 15 = 22.5 miles.

Finally, add the 2 distances to calculate the total distance travelled.

20 + 22.5 miles = 42.5 miles.

**Question 6**

Distance = speed x time

Convert the 18 minutes into hours.

18 ÷ 60 = 0.3 hours.

Calculate the distance travelled.

0.3 x 40 = 12km

**Question 7**

Time = distance ÷ speed

140 ÷ 35 = 4 hours

Question 8

Time = distance ÷ speed

7,080 ÷ 885 = 8 hours

**Density, mass and volume**

**Question 9**

Density = mass ÷ volume

490 ÷ 1,950 = 0.25128g/cm³

Rounded to 3 decimal places = 0.251g/cm³

**Question 10**

Density = mass ÷ volume

1,200g ÷ 1,500cm³ = 0.8 g/cm³

**Question 11**

Mass = density x volume

0.8 x 196 = 156.8g

**Question 12**

Volume = mass ÷ density

2500 ÷ 19.3 = 129.533679

Rounded to 1 decimal place = 129.5cm³

**Rates of pay**

**Question 13**

Calculate the cost of the tiler.

Hourly rate x time required

£25 x 12 = £300

The tiler will cost £300

Calculate the cost of the plumber.

Hourly rate x time required

£29.50 x 2.5 = £73.75

The plumber will cost £73.75

Calculate the total cost of both projects.

£300 + £73.75 = £372.75

**Question 14**

Convert 73p to pounds

£1 = 100p

73 ÷ 100 = £0.73

Calculate the cost for 30 minutes.

£0.73 x 30 = £21.90

Next, add the fixed cost.

£21.90 + £4.60 = £26.50

**Question 15**

Calculate how much you will earn in 12 weeks.

Pay per week x number of weeks

£550 x 12 = £6,600

**Your functional skills exam**

Your functional skills exams will consist of 2 papers.   
These papers will take place over the following time periods:

* Non-calculator paper – 40 minutes
* Calculator – 1 hour 50 minutes

Further information on the format that your test will take can be obtained from your training provider.

**Hints and tips**

* Find out what format your exam will be in. It may be paper-based   
  or on-screen.
* Plan what you are going to revise in advance. Don’t leave it until the last minute.
* Do as many past papers as you can so you are prepared for the day. If possible, try to complete the past papers following the same format as the actual exam.
* Find a quiet place to study and revise. It helps to sit at a table or a desk, don’t revise in bed.
* Don’t stay up all night revising the night before your exam. It’s important to have a good rest so you feel refreshed and ready to go.
* Read the question 3 times. The first time to ensure you understand what is being asked, the second time to get an understanding of what you need to do, and a third time to figure out exactly what maths techniques you should be applying.
* If you are struggling with a question, skip it and come back to it later. Try not to sit getting worked up about a difficult question, it will only waste exam time. Move on and come back to it after you have answered the other questions.
* Take note of the number of marks available. This will give you an indication of how much working out you must show. For example, 1 mark will need an answer only and more marks will need you to show your working out.
* When you’ve finished the exam, go back and check your answers. If you still have time remaining, use it to check your answers and when you have checked your answers check them again.