

FUNCTIONAL SKILLS WORKSHOP

BUSINESS MATHS – LEVEL 2

Working in Partnership with



Education & Skills
Funding Agency

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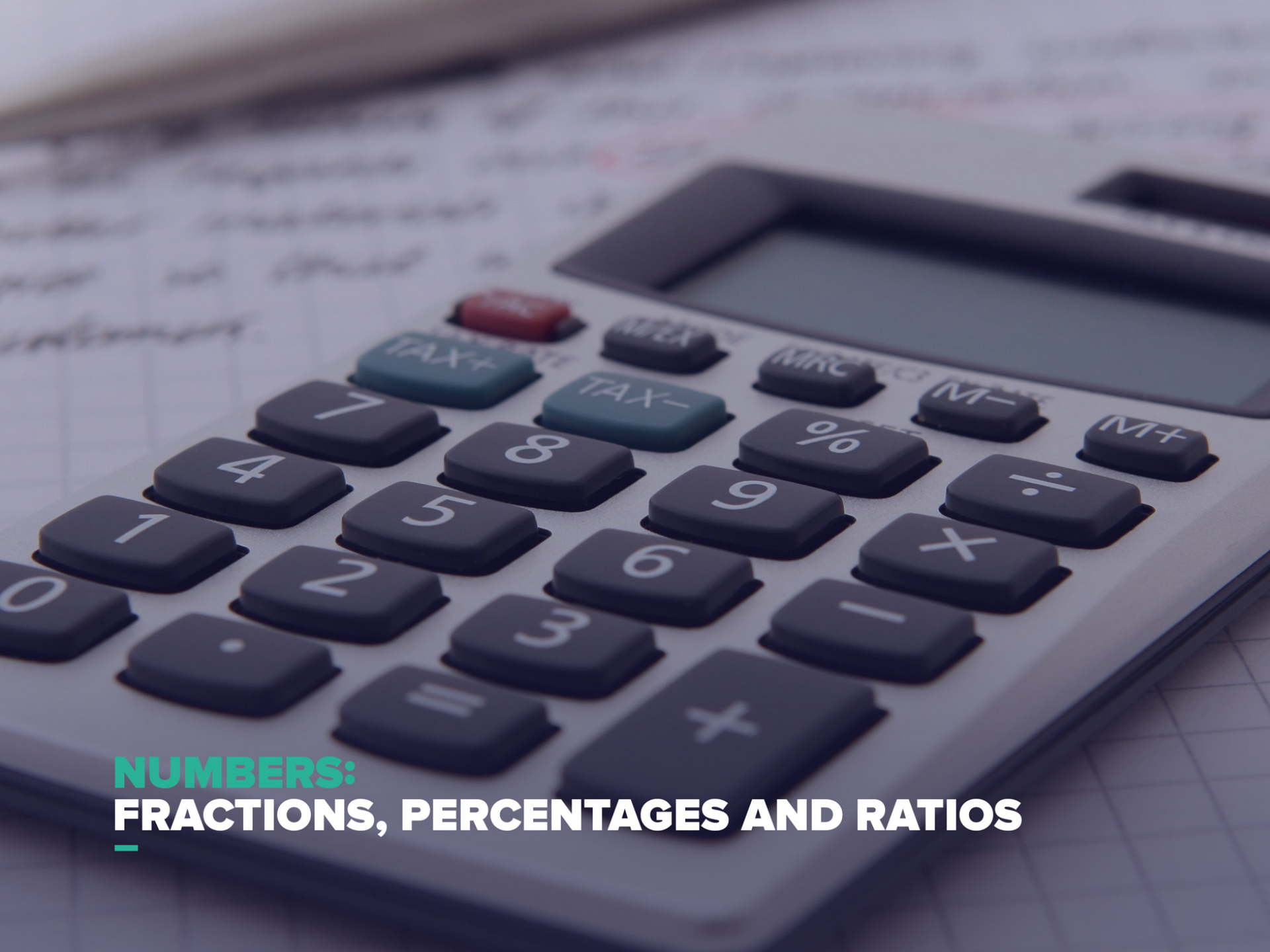
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NUMBERS:
FRACTIONS, PERCENTAGES AND RATIOS

FRACTIONS, DECIMALS AND PERCENTAGES

- $\frac{1}{2}$ is the same as 0.5, which is the same as 50%
- $\frac{1}{4}$ is the same as 0.25, which is the same as 25%

Changing fractions into percentages

Example: What is $\frac{2}{5}$ as a percentage?

- 1) Turn the fraction into a number: $2 \div 5 = 0.4$
- 2) Multiply this by 100 and add a % sign: $0.4 \times 100 = 40\%$

Example: 7 out of 15 people surveyed are against the closure of their local swimming pool. What percentage is this (1 decimal place)?

- 1) 7 out of 15 as a fraction is: $\frac{7}{15}$
- 2) Turn the fraction into a number: $7 \div 15 = 0.466666$
- 3) Multiply this by 100 and add a % sign: $0.466666 \times 100 = 46.66666\%$
- 4) Round up/down to 1 decimal place: 46.7%

PRACTICE

- 1 What is $\frac{4}{5}$ as **a)** a percentage? **b)** a decimal?
- 2 You have spent £3,300 of your £4,400 travel budget for this year. Give the fraction $\frac{3300}{4400}$ in its simplest form (as a decimal).
- 3 Your business carries out a staff welfare survey and you must create a report on this. Five out of 25 employees feel they are extremely stressed and it is affecting their welfare. What percentage of employees feel extremely stressed?
- 4 Which is greater; 0.04 or $\frac{6}{15}$?
- 5 You are trying to save money on your office comms set up. Vodacom usually offer broadband at £13.00 per month and line rental at £12.60 per month. At the moment though they are offering two deals:
Deal 1 – 25% off broadband. **Deal 2** – a third off line rental.

Which deal would save you the most money each month? Explain your answer.

PROPORTIONS

Proportions show how much of one part there is compared to the whole thing.



Out of 8 tiles, there are 2 green and 6 purple tiles. 2 out of 8 tiles are green, or 1 in every 4 tiles are green. 'One in every four' is the same as the fraction $\frac{1}{4}$.

Example: You move to a new office space. Out of the 60 employees moving, only 45 will fit into the main office, the 15 Customer Service Advisors are going to have to go in the room next door.

Q) What proportion of the team are Customer Service Advisors?

A) 15 out of 60 OR $\frac{15}{60}$

Q) How else can $\frac{15}{60}$ be written?

A) ...

RATIOS

Ratios are a way of showing how many of one thing there are compared to another.



Out of 8 tiles, there are 2 green and 6 purple tiles. In other words, for every green tile there are three purple tiles. So the ratio of purple to green is 3:1.

To answer questions relating to ratios, you usually need to start by working out the value of 1 part. For example the cost of one thing or the weight of one part.

Example: Chemicals for the staffroom dishwasher are diluted by adding four parts water to every one part of chemicals. How much water should be added to 25ml of chemicals?

- 1) Chemicals used is one part, so one part is 25ml
- 2) The amount of water needed is 4 parts to each part of chemicals.
So, the ratio of 1:4 becomes $(1 \times 25\text{ml}) : (4 \times 25\text{ml}) = 25\text{ml} : 100\text{ml}$
Therefore, the volume of water required is 100ml

PRACTICE

- 1** Ollie is making salad dressing. He mixes 1 part vinegar to 2 parts oil. Ollie makes 450ml of salad dressing. **How much oil does he use?**
- 2** A union votes on whether to go on strike. 120 people vote. The ratio of yes:no votes is 2:3. **a) How many people voted yes?**
b) How many people voted no?
- 3** You are making cheese sandwiches for guests to the office. For every 1 part of bread you use you require 2 parts cheese. You use 500g of bread. **How much do the sandwiches weigh?**
- 4** You are writing the annual report for your company. The ratio of male to female staff is 3:2. There are 180 male staff. **How many staff work at the company?**
- 5** The annual report also shows that 60 people at the company were born in London, the rest were born outside London. **What is the ratio of those born in London to those born outside London?**

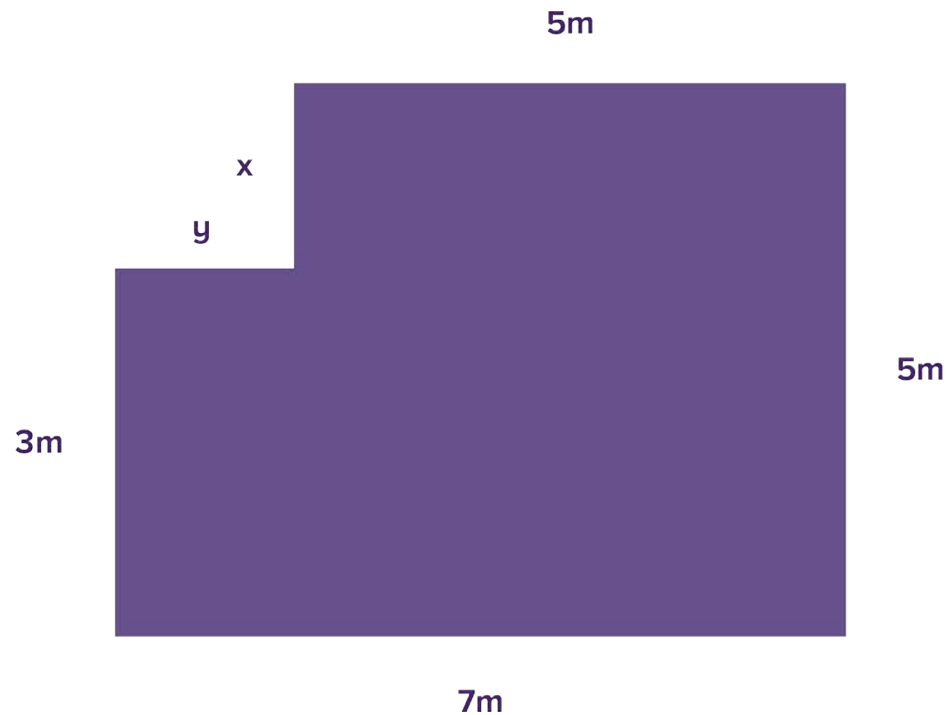


MEASURES, SHAPES AND SPACE

PERIMETER

The **perimeter** is the distance around the outside of the shape.

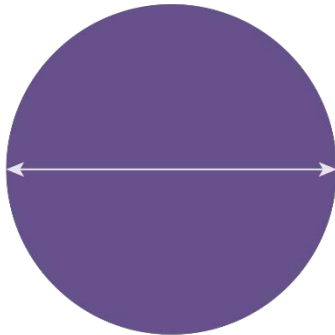
To find the perimeter, add up the lengths of all the sides.



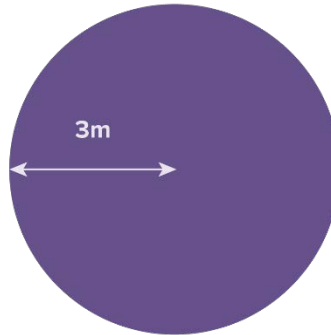
CIRCLES

The **diameter** is twice the radius.

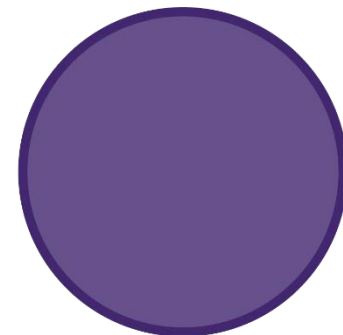
The **circumference** is the distance around the outside of the circle.



Diameter



Radius

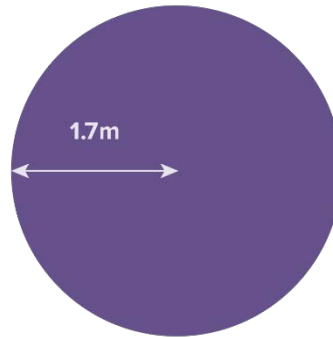


Circumference

- 1 To work out the circumference of a circle, you need to use π (Pi), we use 3.14 for this.
- 2 The formula for understanding the circumference of a circle is: **Diameter \times π**

PRACTICE

You are arranging an event for your clients and have had the tables below delivered.

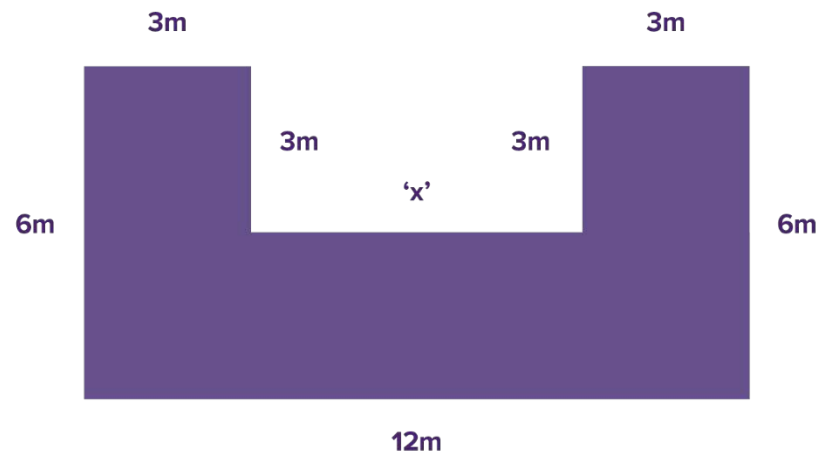


- 1 What is the table circumference?
- 2 Each attendee requires 1.5m of space at the table to sit comfortably. **How many clients can fit around each table?**
- 3 You have 50 clients attending. **How many tables are you going to need?**

AREA – SQUARES AND RECTANGLES

This shape is made up of two squares and one rectangle.

Multiply the height and width of a square or a rectangle to find its area.

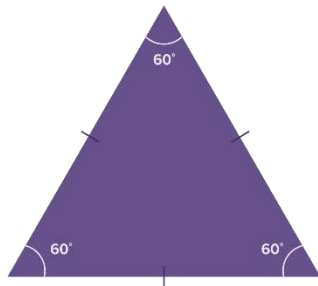


- 1 What is 'x'?
- 2 What is the area of each square?
- 3 What is the area of the rectangle?
- 4 Therefore, what is the area of the whole shape?

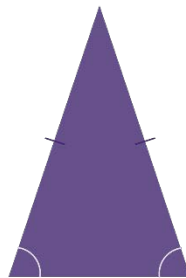
TRIANGLES

The three internal angles of a triangle always add up to 180°

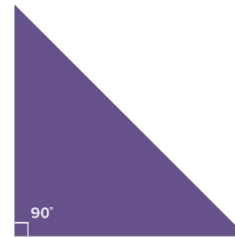
There are some main types of triangle you should know:



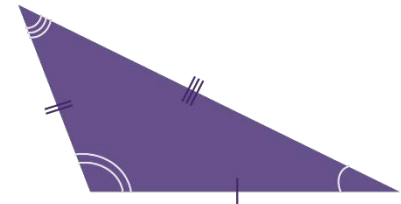
Equilateral triangles have three equal sides



Isosceles triangles have two equal sides



Right angle triangles have one right angle

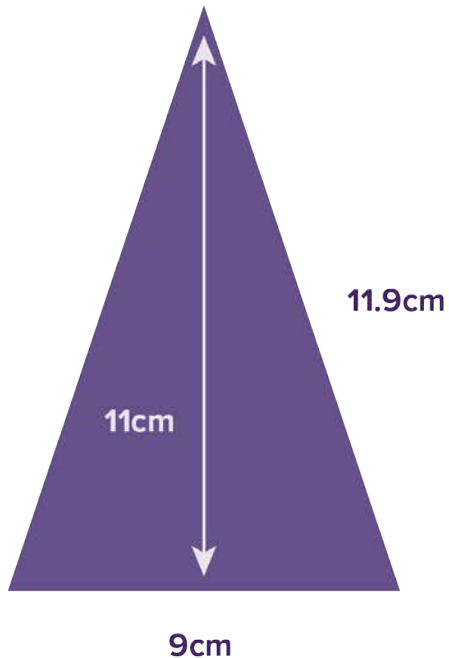


Some triangles have no equal sides

AREA – TRIANGLES

To work out the area of a triangle, you need to use the following formula:

Area of a triangle = base x height \div 2

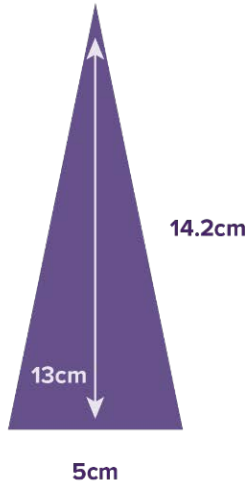


Example:

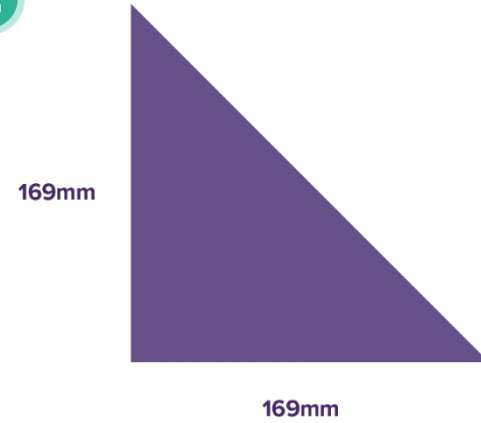
$$\begin{aligned}\text{Area of a triangle} &= \text{base} \times \text{height} \div 2 \\ &= 9 \text{ cm} \times 11 \text{ cm} \div 2 \\ &= 49.5 \text{ cm}^2\end{aligned}$$

PRACTICE

1



2

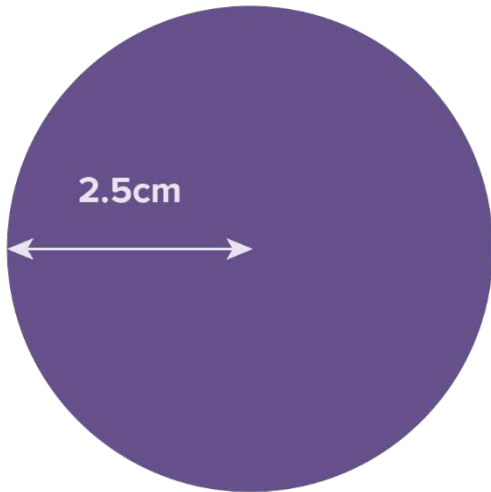


3



AREA – CIRCLES

Area of a circle = $\pi \times \text{radius}^2$

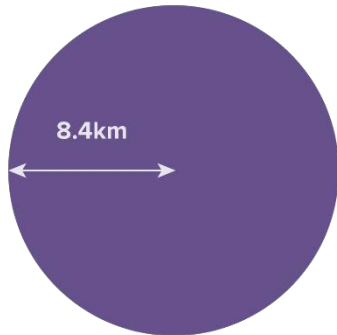


Example:

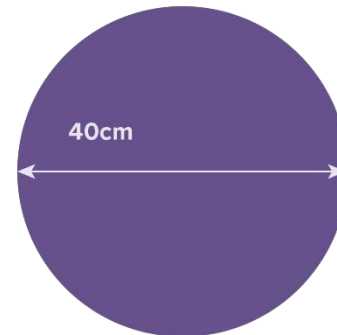
$$\begin{aligned}\text{Area of a circle} &= \pi \times \text{radius}^2 \\ &= \pi \times 2.5^2 \\ &= \pi \times 2.5 \times 2.5 \\ &= 3.14 \times 2.5 \times 2.5 \\ &= 19.63 \text{ cm}^2\end{aligned}$$

PRACTICE

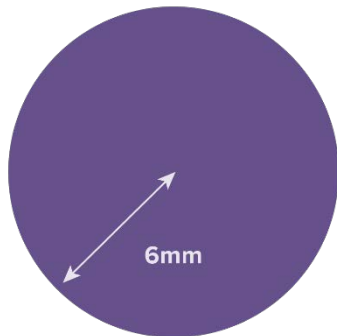
1



2



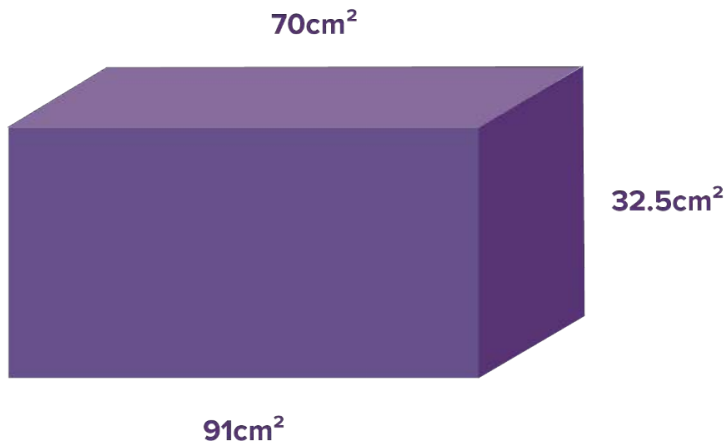
3



SURFACE AREA

Surface area is the total area of the shape.

You need to include any sides you can't see also:



Example:

The box here has

Two sides with an area of 91 cm^2

Two sides with an area of 70 cm^2

Two sides with an area of 32.5 cm^2

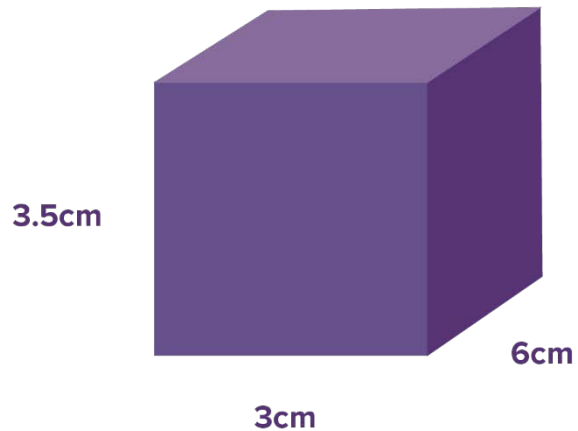
So the surface area of the shape is:

$$91+91+70+70+32.5+32.5 = 397\text{ cm}^2$$

Think about cubes and pyramids too. How would this work?

VOLUMES

Volume of a cube/cuboid = length x width x height



Example:

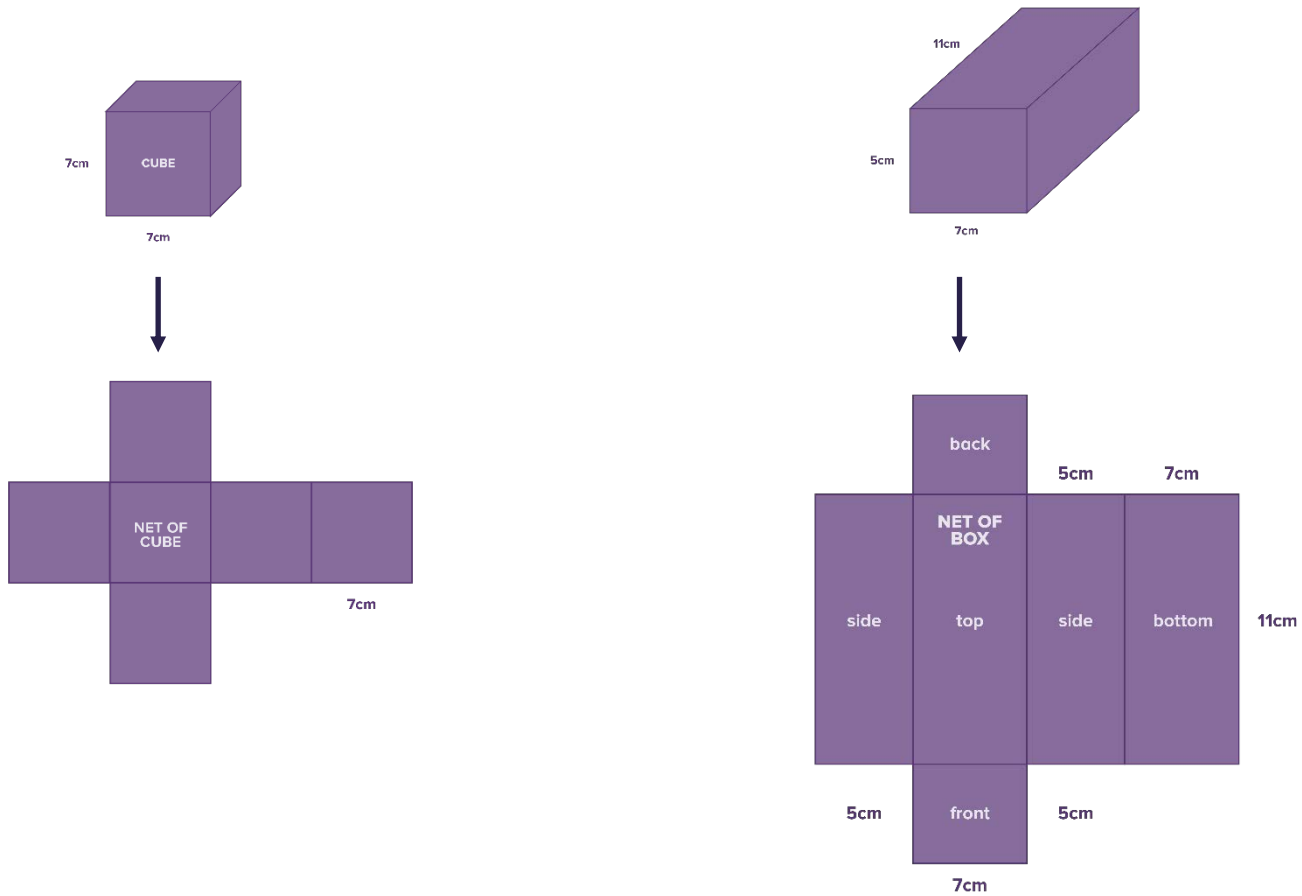
$$\begin{aligned}\text{Volume} &= \text{length} \times \text{width} \times \text{height} \\ &= 6 \text{ cm} \times 3 \text{ cm} \times 3.5 \text{ cm} \\ &= 63 \text{ cm}^3\end{aligned}$$

Make sure you always use the correct units – in this case cm^3

2D TO 3D SHAPES

You need to be able to draw nets.

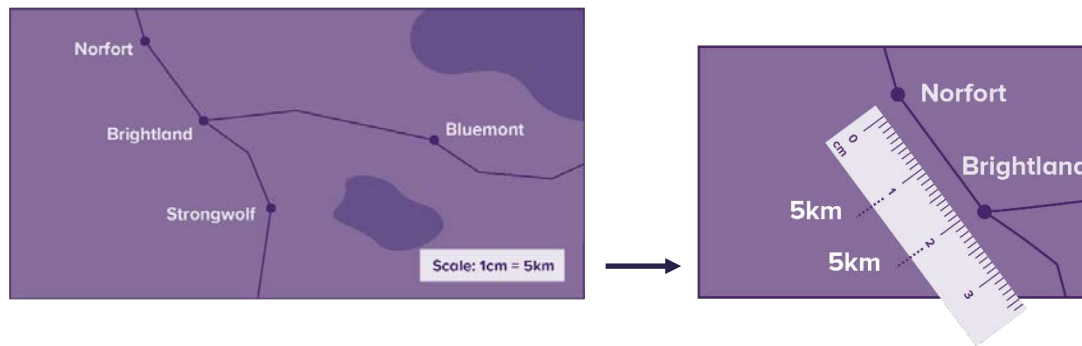
Nets are just a 3D shape folder out.



MAPS AND SCALES

Look at the map.

What is the distance between Norfort and Brightland in km?



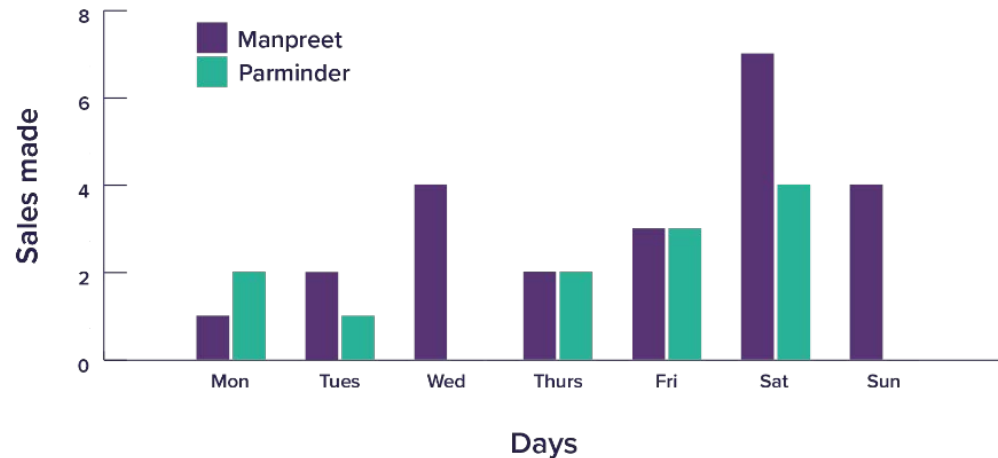
- 1** Put your ruler against the bit you're finding the length of. Make sure the zero on the ruler is lined up with the starting place (in this case, Norfort).
- 2** Mark off each whole cm and write the distance in km next to each one. In this case, 1cm = **5km**.
- 3** Add up all the km you just marked. So between Norfort and Brightland: $5\text{km} + 5\text{km} = \mathbf{10\text{km}}$.



HANDLING DATA

CHARTS

Duel bar charts show two sets of data (or more) at once so it's easy to compare the data. In this case, there are two sets of data for Manpreet's and Parminder's weekly sales for the business.



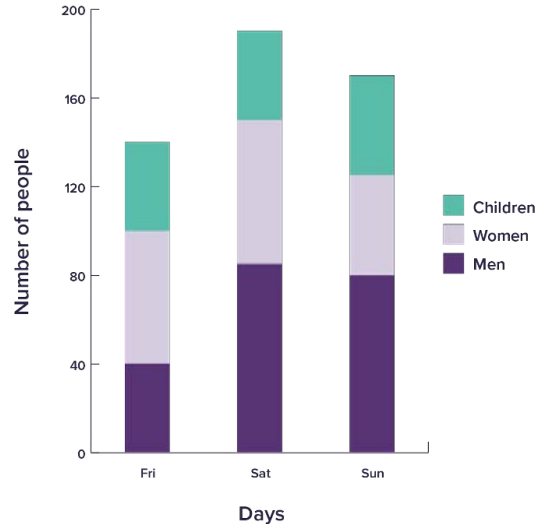
Look at the chart. What is it telling you?

Remember: Do not make assumptions, stick to the facts. Just because Parminder does not make any sales one day, it doesn't mean that they do not work those day

CHARTS

Composite bar charts are split into sections. The height of the bar shows the total and each section shows amounts of specific categories. This chart shows the number of people that attended a fundraising event for your organisation's charity:

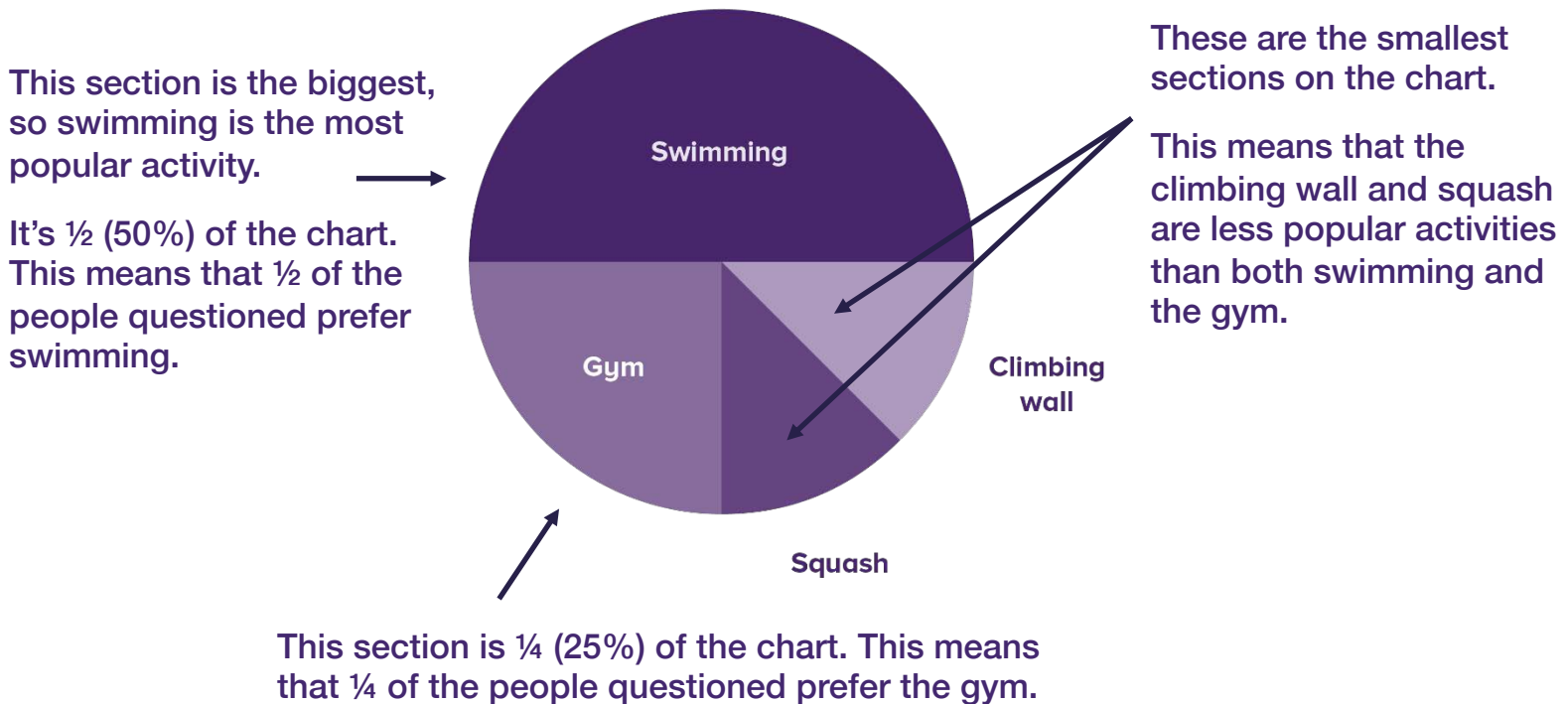
- This shows the number of men, women and children visiting over three days
- The height of the bar shows the total of visitors each day
- The sections show how many men, women and children visited each day



PIE CHARTS

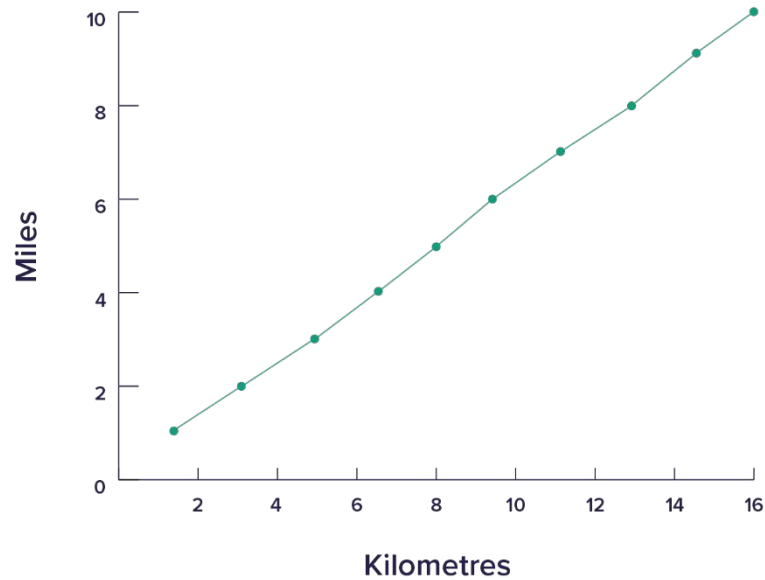
Employees were surveyed to see which of the following sporting discounts they would prefer as part of their employee benefit scheme.

The size of each section shows how many people prefer that activity.



PRACTICE

- 1 The graph below can be used for changing miles into kilometers.



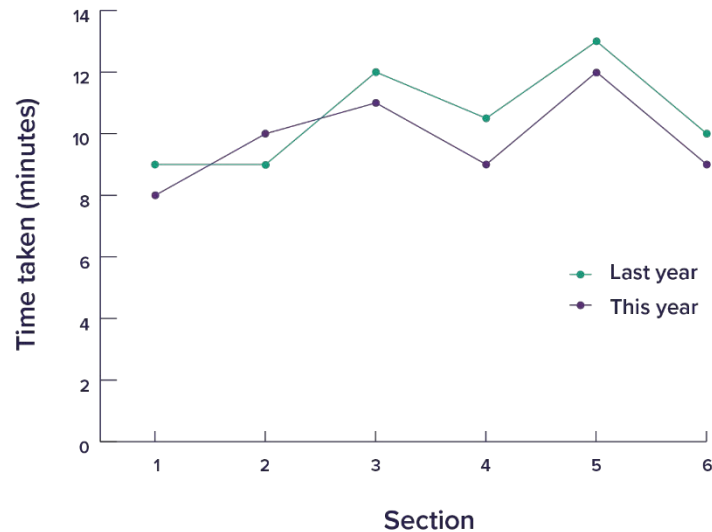
What is 5 miles in kilometres?

What is 12 kilometres in miles?

What is 14 kilometres to the nearest mile?

PRACTICE

- 2 Dave has entered a cycling race for the past two years. He has drawn a line graph to compare his times for the different sections.



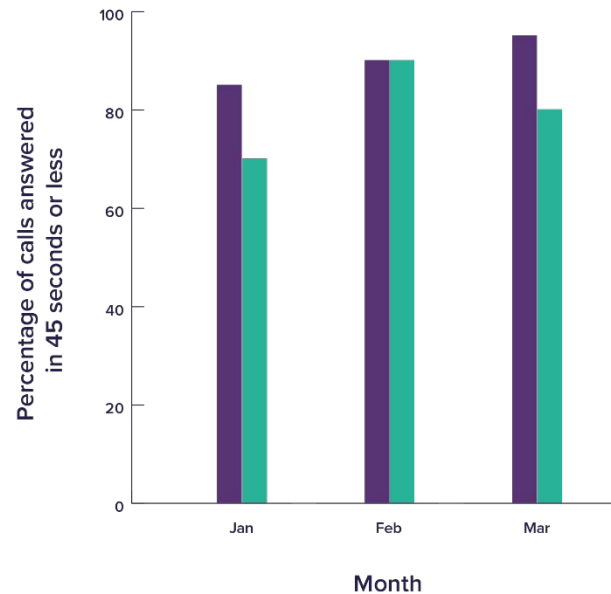
What was Dave's time for section 2 this year?

What was Dave's time for section 5 last year?

What was the difference between Dave's time for section 4 last year and this year?

PRACTICE

- 1 A company has two call centres. The target time for answering a phone call is 45 seconds. The bar chart shows the percentage of calls answered in the target time at each call centre.

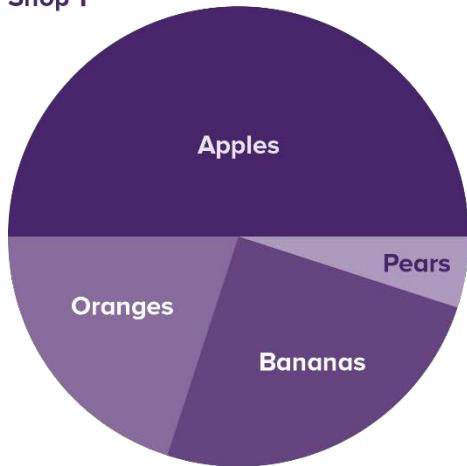


Which of the call centres was more successful at answering calls in the target time?
Explain your answer.

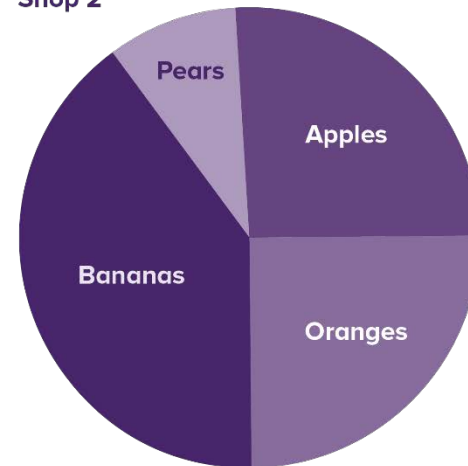
PRACTICE

- 2 A sales manager is looking at the sales of fruit in two different shops.

Shop 1



Shop 2



In which shop are bananas the most popular fruit?

In shop 1, what percentage of the fruit sold are apples?

In shop 2, what percentage of the fruit sold are oranges?

AVERAGES AND RANGES

Averages

Mean: Add up all the numbers. Divide the total by how many numbers there are.

Median: Arrange data in size order. The median is the middle value.

Mode: The mode is the most common value that appears in a dataset.

Ranges

- The range is the gap between the biggest and smallest
- To work out the range, write down the numbers from smallest to biggest
- Subtract the smallest number from the biggest

PRACTICE

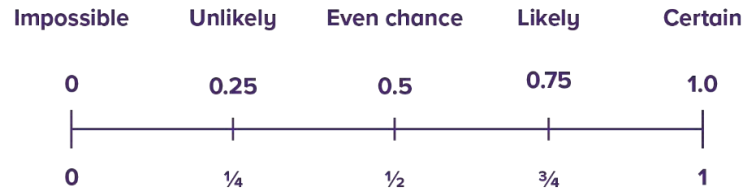
- 1** The weight of packages in kilograms that arrived at the office this week are:
2.2, 3.6, 2.6, 4.1, 4.0, 2.9, 2.4, and 3.2.

What is the range of weights?

- 2** Below are shown the percentage of staff that have hit KPIs over the last 12 months:
76%, 65%, 81%, 75%, 78%, 75%, 90%, 76%, 75%, 72%, 70%, 69%

- a) What is the mean percentage of staff who hit KPIs in the last year?**
b) What is the median average?
c) What is the modal average?

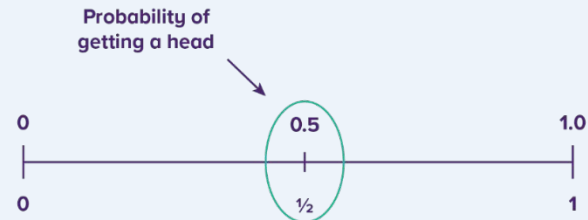
PROBABILITY



Example: What is the probability of getting a head when tossing a coin?

There is an even chance of getting a head or a tail so the probability is $\frac{1}{2}$ (or 0.5 or 50%).

This can be shown on a probability scale:



In the scale above, both the decimals and fractions are shown but, in the test, you would only need to show one of them.

PROBABILITY

You will need to work out the probability of something happening.

Example: You have a team of 16. You want to make 4 random project groups so you fill a box with tickets: 4 blue, 4 green, 4 red and 4 yellow. What is the probability of the first employee picking a blue ticket from the box?

There are 16 tickets and 4 blue tickets, so the probability is $\frac{4}{16}$ or simplified to $\frac{1}{4}$.

This probability can also be given as a percentage (25%) or a decimal (0.25).

PRACTICE

1 A travel company has a fleet of 16 coaches. 12 are painted black and four are painted white. At the start of the day all the coaches are available and you pick up a set of coach keys.

a) What is the probability you have keys to a white coach?

b) What is the probability you have keys to a black coach?

Give the probability as a fraction, a decimal and a percentage.

2 You have ordered new sets of pens for the office. Upon arriving the package has **four boxes of blue** pens, **six boxes of green** pens, **eight boxes of black** pens and **six boxes of red** pens. You grab a box out the package without looking, what is the probability that the box you grab is full of red pens?



ANSWERS



FRACTIONS, DECIMALS AND PERCENTAGES

Answers

- 1 a) 80% b) 0.8
- 2 0.75
- 3 $5/25 = 0.2$ or 20%
- 4 $6/15 = 0.4$ so this is greater than 0.04
- 5 Deal 2: A third off line rental. It saves you £4.20 a month compared to £3.25 a month for 25% off broadband.

RATIOS

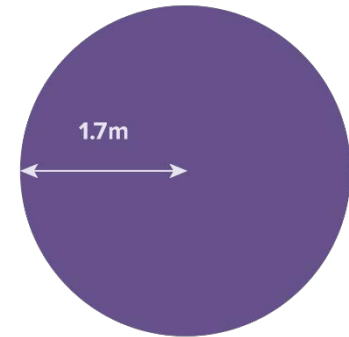
Answers

- 1 300ml
- 2 a) 48 b) 72 (1 part is $120/5 = 24$. Then multiply by the number of parts).
- 3 1500g
- 4 300 ($180/3 = 60$ for one unit. Multiply by 5 to find the total).
- 5 60:240 or 1:4

CIRCLES

Answers

You are arranging an event for your clients and have had the tables below delivered.



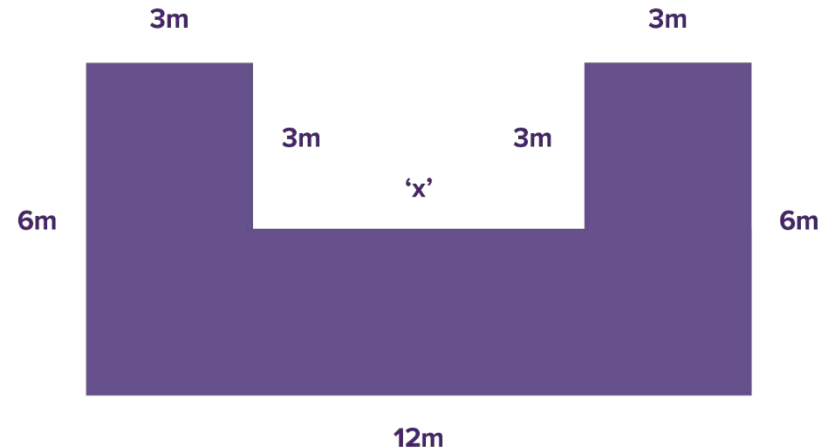
- 1** What is the table circumference? $1.7 \times 2 = 3.4 \times 3.14 = 10.626$
- 2** Each attendee requires 1.5m of space at the table to sit comfortably. **How many clients can fit around each table?** $10.626/1.5 = 7.084$ (so 7 clients)
- 3** You have 50 clients attending. **How many tables are you going to need?** $50/7 = 7.13$ (so 8 tables)

AREA – SQUARES AND RECTANGLES

Answers

This shape is made up of two squares and one rectangle.

Multiply the height and width of a square or a rectangle to find its area.

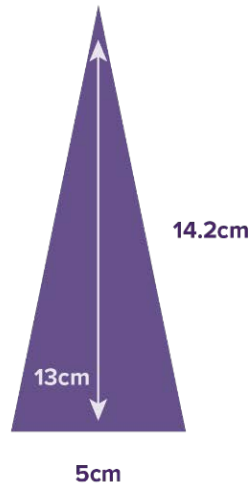


- 1 What is 'x'? $12 - (3 + 3) = 6\text{m}$
- 2 What is the area of each square? $3 \times 3 = 9\text{m}^2$
- 3 What is the area of the rectangle? $12 \times 3 = 36\text{m}^2$
- 4 Therefore, what is the area of the whole shape? $9 + 9 + 36 = 54\text{m}^2$

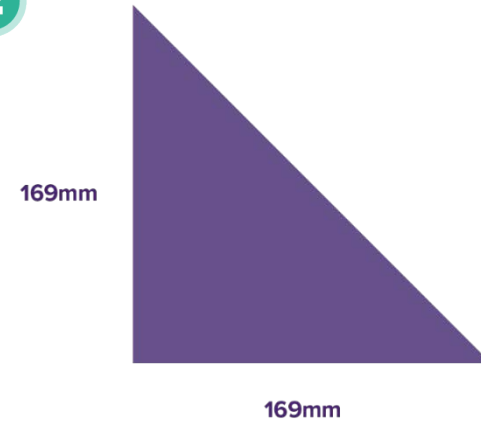
AREA – TRIANGLES

Answers

1



2



3



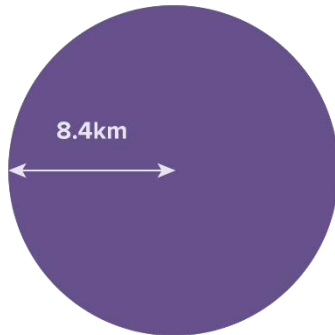
$$1) 5 \times 13 / 2 = 32.5\text{cm}^2$$

$$2) 169 \times 169 / 2 = 14,280.5 \text{ mm}^2$$

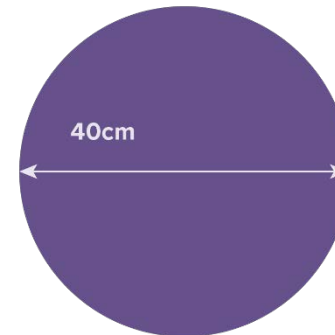
$$3) 9.9 \times 6.4 / 2 = 31.7 \text{ miles}^2 (31.68)$$

AREA – CIRCLES

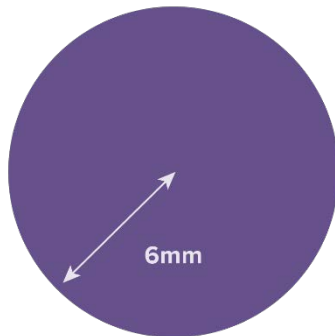
1



2



3



Answers

1) $3.14 \times 8.4^2 = 221.5584$ or 221.56 km^2

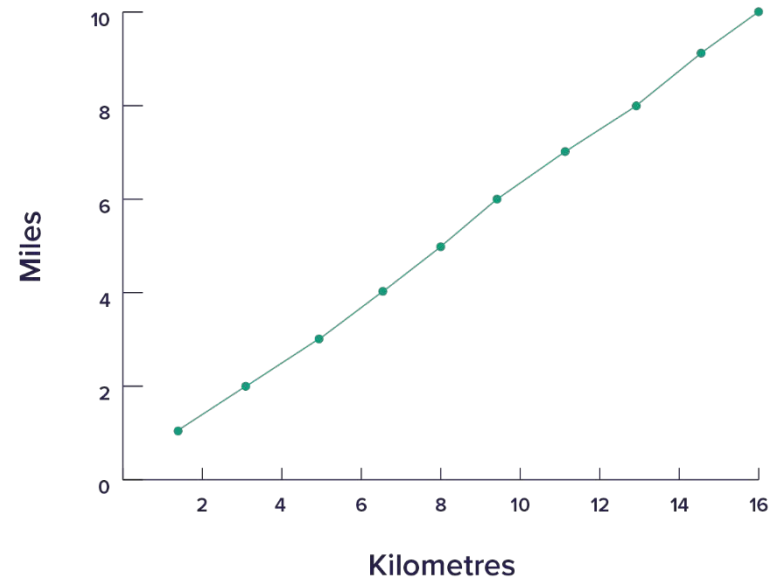
2) Radius $40/2 = 20$. so, $3.14 \times 20^2 = 1,256 \text{ cm}^2$

3) $3.14 \times 6^2 = 113.04 \text{ mm}^2$

CHARTS

Answers

- 1 The graph below can be used for changing miles into kilometres.



What is 5 miles in kilometres? 8km

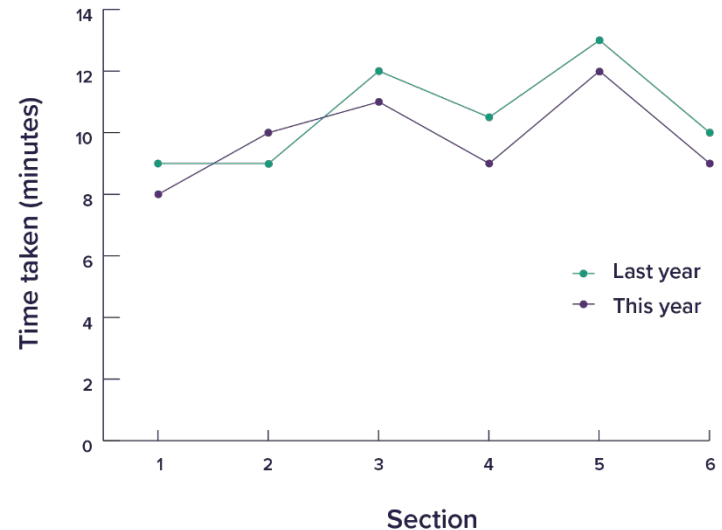
What is 12 kilometres in miles? 7.5 miles

What is 14 kilometres to the nearest mile? 9 miles

CHARTS

Answers

- 2** Dave has entered a cycling race for the past two years. He has drawn a line graph to compare his times for the different sections.



What was Dave's time for section 2 this year? 10 minutes

What was Dave's time for section 5 last year? 13 minutes

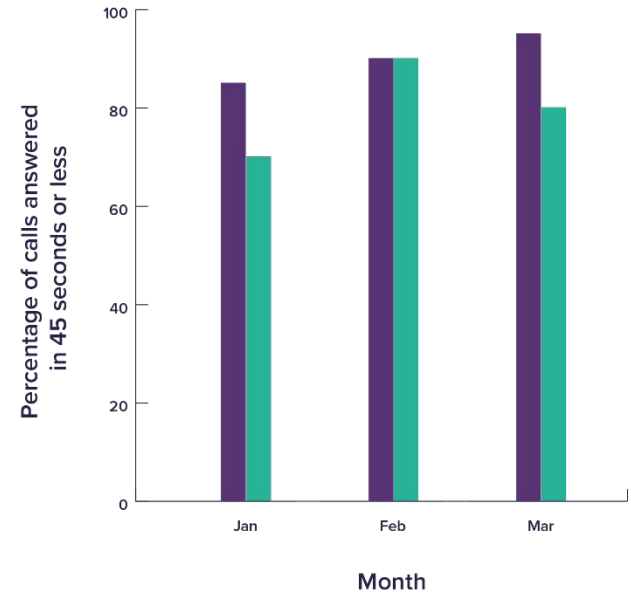
What was the difference between Dave's time for section 4 last year and this year?

(about) 1.5 minutes

CHARTS

Answers

- 1 A company has two call centres. The target time for answering a phone call is 45 seconds. The bar chart shows the percentage of calls answered in the target time at each call centre.



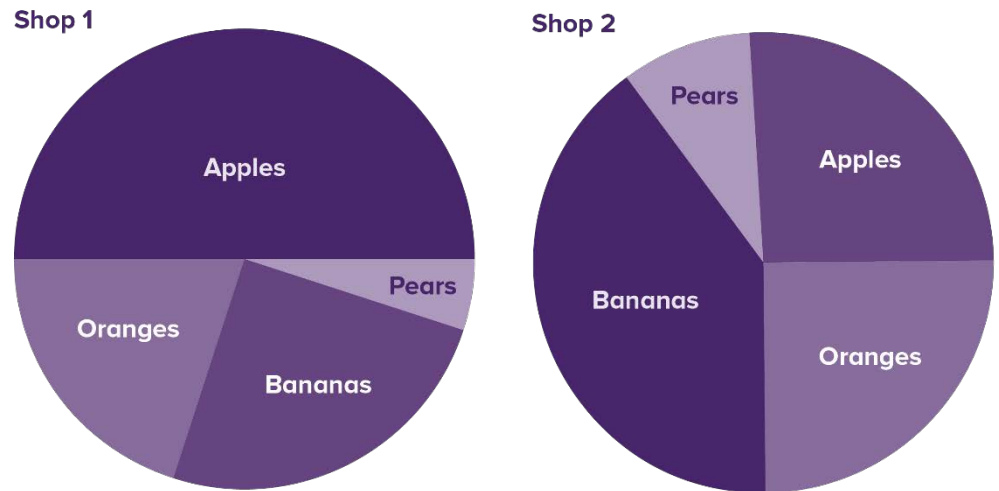
Which of the call centres was more successful at answering calls in the target time?

Call centre A, because they answered a higher percentage of calls in under 45 seconds (the target time) in 2 of the 3 months. Call centre B only managed the same percentage of calls answered in the target time as call centre A in 1 month (Feb).

CHARTS

Answers

- 2 A sales manager is looking at the sales of fruit in two different shops.



In which shop are bananas the most popular fruit? Shop 2

In shop 1, what percentage of the fruit sold are apples? 50%

In shop 2, what percentage of the fruit sold are oranges? 25%

AVERAGES AND RANGES

- 1** The weight of packages in kilograms that arrived at the office this week are:
2.2, 3.6, 2.6, 4.1, 4.0, 2.9, 2.4, and 3.2.

What is the range of weights?

- 2** Below are shown the percentage of staff that have hit KPIs over the last 12 months:
76%, 65%, 81%, 75%, 78%, 75%, 90%, 76%, 75%, 72%, 70%, 69%

- a) What is the mean percentage of staff who hit KPIs in the last year?**
b) What is the median average?
c) What is the modal average?

Answers

1) $4.1 - 2.2 = 1.9$ kilograms.

2) 65%, 69%, 70%, 72%, 75%, 75%, 75%, 76%, 76%, 78%, 81%, 90%

2a) 75.2%

2b) 75% (If there is an even number of terms, add the two middle terms and divide by 2 – in this case, the numbers are the same, so no worries).

2c) 75% (there are 3 of this number)

PROBABILITY

Answers

1

A travel company has a fleet of 16 coaches. 12 are painted black and four are painted white. At the start of the day all the coaches are available and you pick up a set of coach keys.

a) What is the probability you have keys to a white coach?

$4/16$ or $2/8$ or $1/4$, 0.25 and 25%.

b) What is the probability you have keys to a black coach?

$12/16$ or $6/8$ or $3/4$, 0.75 and 75%.

2

You have ordered new sets of pens for the office. Upon arriving the package has **four boxes of blue** pens, **six boxes of green** pens, **eight boxes of black** pens and **six boxes of red** pens. You grab a box out the package without looking, what is the probability that the box you grab is full of red pens?

$6/24$ or $3/12$ or $2/8$ or $1/4$ or 0.25 or 25%.