

Calculating Percentages and Percentage Changes

Percentages

Method and Worked Example

To calculate a percentage, divide one number (the part) by another (the whole) and multiply the result by 100.

For example, let's say that a business selling handbags wanted to know the percentage of customers that returned handbags to them for a refund so that they could monitor their return rate to help them make improvements to the handbags they sold. Suppose that in January, 12 customers returned handbags to the store out of a total of 150 customers that visited the store that month. Based on this information, the percentage of customers that returned their handbags can be calculated as follows:

$$\frac{12}{150} \times 100 = 8\%$$

Suppose the handbag business knew that 10% of its customers returned handbags from the 170 they sold in February. Using this information, it is possible to calculate the number of customers that returned handbags as follows:

$$\begin{array}{l} 10\% \\ (0.1) \end{array} \times 170 = 17 \text{ customers}$$

Question 1

James Moore is a local mechanic in Hull. In order to attract more customers, James designed and distributed a leaflet to local residents, which included a coupon for 15% off the price of their next bill at the garage. James distributed 300 leaflets to addresses in the neighbourhood where his garage is located. Within 3 months, 72 people had used the voucher at James' garage to obtain their discount.

Calculate the percentage of people that used the voucher from the total amount that James distributed.

Question 2

Junaid is an aspiring entrepreneur. He recently qualified as an electrician and is now hoping to start his own company, offering electrical services to residential properties. Junaid carried out market research in the city where he lives, which involved door-to-door enquiries asking people whether they already had an electrician they were happy using. In total, Junaid surveyed 150 households and found that 60 households were happy with their current electrician, 45 households were not happy with their current electrician, and the remaining households did not currently use an electrician.

Calculate the percentage of households that James surveyed that were not happy with their current electrician.

Question 3

Laura Holloway is a nail artist in the North of England. On average, 80% of Laura's customers are women and 20% are men. If Laura has 20 customers a day, how many are likely to be women according to the average percentages?

Question 4

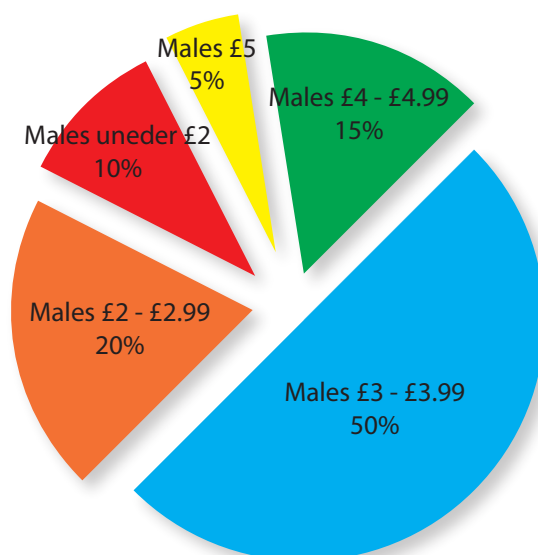
In 2016, Tesco's market share of the grocery market was 28.2%. Given that annual sales in this market was £177 billion for 2016, what was the value of Tesco's sales to the nearest £ billion.

Question 5

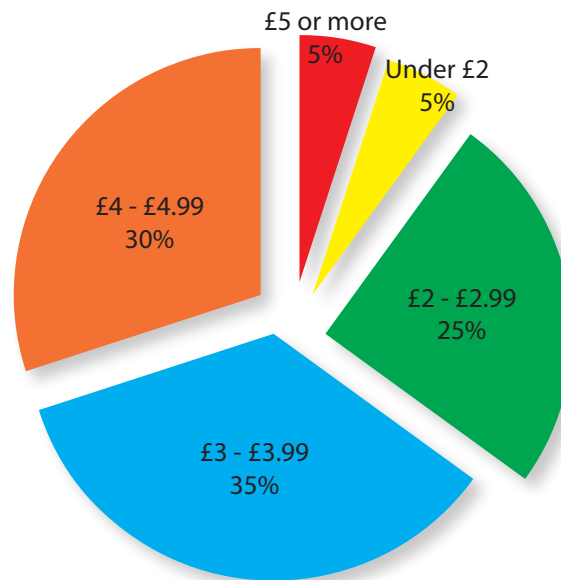
The Glossy Magazine Company (GMC) has conducted primary market research to find answers to various questions about a new monthly magazine that they are planning to publish, entitled 'Vegan Voice'. The magazine will contain recipes, competitions, articles and stories from their subscribers. The GMC surveyed a total of 350 vegans they had identified at a food trade event in Newcastle. A summary of some of the data from the results of the survey are shown below:

Sex	Age (years)	Responses
Male	Under 20	4
	20 - 39	22
	40 - 59	34
	60 - 79	7
	80 and over	3
		<hr/>
Total Male		70
Female	Under 20	21
	20 - 39	52
	40 - 59	147
	60 - 79	51
	80 and over	9
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Total Female		280
Total Male and Female		350

Price range prepared to pay (Males - total of 70 responses)



Price range prepared to pay (Females - total of 280 responses)

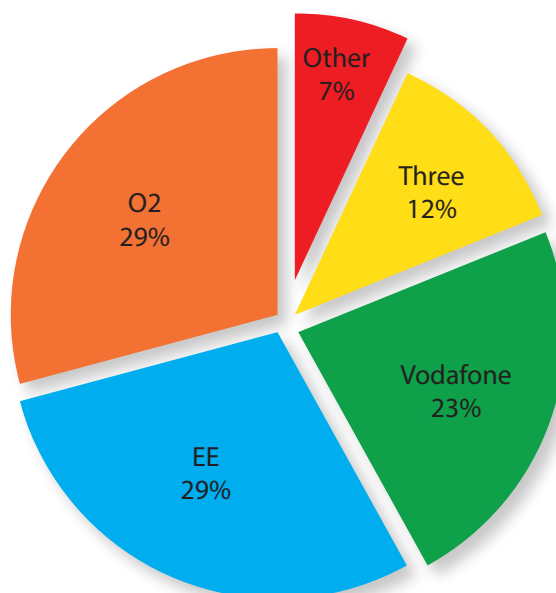


- What was the most common age range of the males that were surveyed?
- How many more females than males were surveyed?
- What percentage of people surveyed were female?
- What price range are males more prepared to pay?
- What number of males indicated that they are prepared to pay between £2 and £2.99?
- What percentage of females are prepared to pay between £2 and £4.99?
- What **number** of females indicated that they are prepared to pay between £4 and £4.99?
- How many people surveyed in total were aged 80 and over?

Question 6

The pie chart below shows the market share of mobile phone operators in the UK in 2015. The number of mobile phone subscriptions in the UK in 2015 was 89 900 000.

Market share of UK mobile phone operators



Using the data above, calculate how many mobile phone subscriptions there were to Vodafone?

Which two companies have the largest proportion of the market?

Calculating Percentage Changes

Method and Worked Example

To calculate the percentage change in two figures, the following technique is used:

$$\frac{\text{Difference between figures (New - Original)}}{\text{Original figure}} \times 100$$

For example, Olivia runs a pet shop that sells dog and cat food. In 2015, her shop made an annual turnover of £92 000 and in 2016 Olivia's annual turnover was £95 000. Olivia wants to know by how much her sales changed between the two years. The technique above can be used to calculate this, as follows:

$$\frac{\text{Difference between figures (£95 000 - £92 000)}}{\text{The original figure (£92 000)}}$$

$$\frac{£3\,000}{£92\,000} \times 100 = 3.3\% \text{ (1 d.p.)}$$

Therefore, Olivia's sales increased by 3.3% between 2015 and 2016.

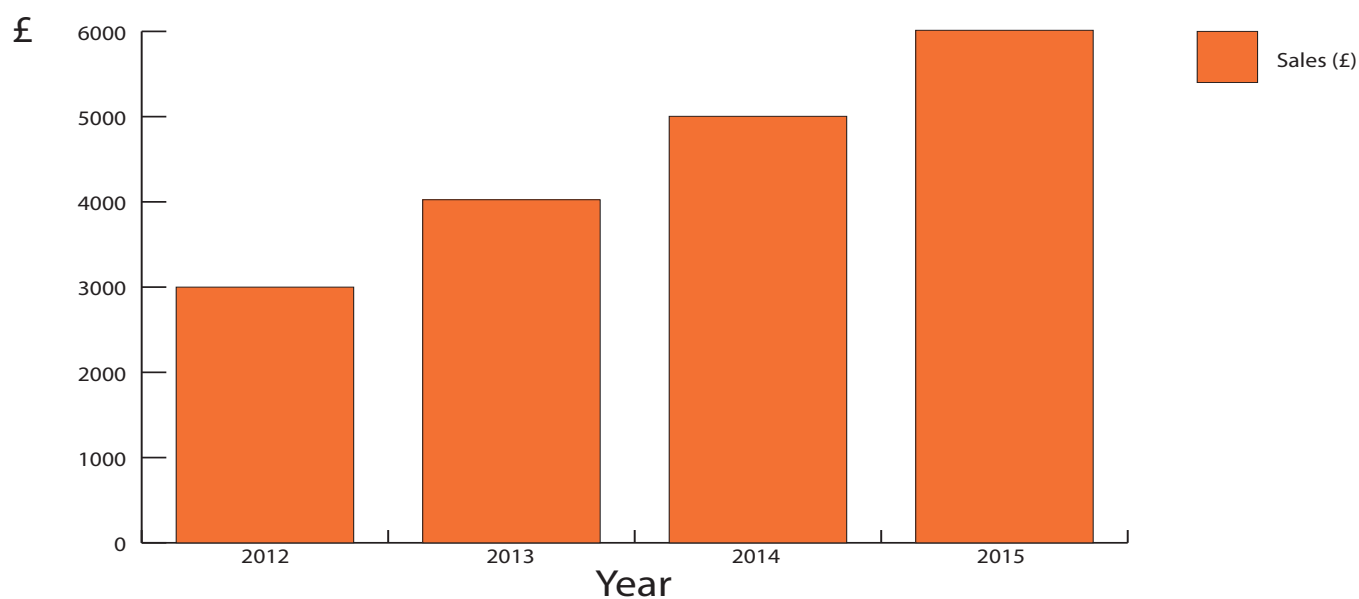
Question 1

The national minimum wage for employees aged 21 – 24 increased to £6.95 in October 2016 compared to £6.70 in October 2015.

Calculate the percentage change in the hourly national minimum wage rate to 1 d.p.

Question 2

Fizzah owns an online business selling sweets. She has been trading for four years and has achieved sales in each year as follows:



- Calculate the percentage change in sales between 2013 and 2015 to 1 d.p.
- Calculate the percentage change in sales over the 4 year period.

Question 3

Parris owns a flower shop in Birmingham. Parris has recorded the number of customers she has served since opening in January, as below:

Month	January	February	March	April	May
Number of customers	375	550	500	350	400

Calculate the percentage fall in the number of customers Parris served between March and April. Give your answer to 1 d.p.

Question 4

Varun rents a small office in an office building where he works as a freelance IT consultant. He currently pays £300 per month rent but Varun's landlord has given notice that the rent will increase to £350 per month. Calculate the percentage increase of Varun's rent payment to 1 d.p.

Question 5

The table below shows the average petrol price per litre, in pence, between November 2015 and October 2016.

Month (Year)	Average petrol price per litre (pence)
Nov (2015)	107.7
Dec (2015)	104.6
Jan (2016)	102.3
Feb (2016)	102.0
Mar (2016)	103.0
Apr (2016)	107.2
May (2016)	109.3
Jun (2016)	111.6
Jul (2016)	111.9
Aug (2016)	110.5
Sep (2016)	111.9
Oct (2016)	114.8

Calculate the percentage rise in the average price per litre of petrol between Apr (2016) and Sep (2016). Give your answer to 1 d.p.

Answers - Percentages

Question 1

24%

Question 2

30%

Question 3

16

Question 4

£50 billion

Question 5

- a) 40-59 years
- b) 210
- c) 80%
- d) £3-3.99
- e) 14
- f) 55%
- g) 84
- h) 12

Question 6

- a) 20 677 000
- b) EE and O2

Answers - Percentage Changes

Question 1

3.7%

Question 2

25%

100%

Question 3

30%

Question 4

16.7%

Question 5

4.4%