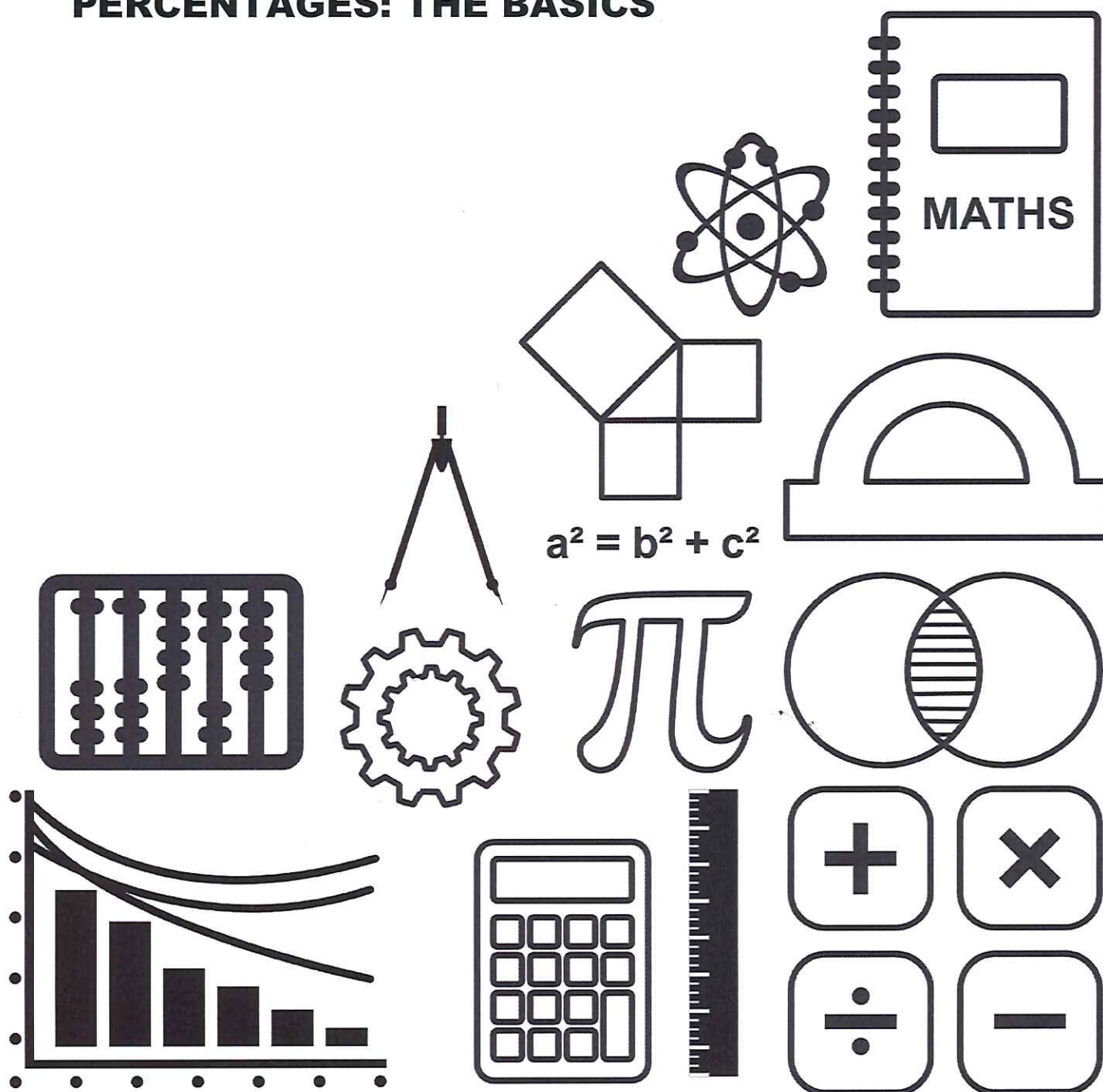


GCSE TOPIC BOOKLET PERCENTAGES: THE BASICS



1.

Show clearly whether the following statement is true or false.

[4]

'If you increase a positive number by 10% and then decrease that new value by 10%, you get back to your original number.'

Choose a number to test. I'm picking 100

$$10\% \text{ of } 100 = 10$$

$$\text{So, increase by } 10\% = 100 + 10 = 110$$

$$\text{New value} = \underline{110}$$

$$10\% \text{ of } 110 = 11$$

$$\text{Now, decrease by } 10\% = 110 - 11 = \underline{99}$$

FALSE

2.

Our recommended daily intake of food is often given in calories.



A small bag of 20 almonds provides 160 calories.

It is recommended that Joseff's diet should contain 1920 calories per day.

Joseff eats a large portion of almonds one day.
It is 25% of his recommended daily calories.

How many almonds does he eat?
You must show all your working.

[5]

25% of recommended daily calories

$$= 25\% \text{ of } 1920$$

$$= \frac{1}{4} \text{ of } 1920 = 4 \overline{)1920}$$

$$= \underline{480 \text{ calories}}$$

$$\text{Number of small bags eaten} = 480 \div 160 = \underline{3}$$

$$\text{Number of almonds eaten} = 3 \times 20 = \underline{60}$$

3.

800 students from the UK and 300 students from Russia apply to attend a Summer Camp. 20% of the UK students and 30% of the Russian students are chosen to attend the camp.

What percentage of all the students who are chosen to attend the camp are from Russia? [5]

$$20\% \text{ of } 800 = \frac{1}{5} \text{ of } 800 = 5 \overline{) 800} \quad 160 \text{ from UK}$$

$$30\% \text{ of } 600 = \frac{3}{10} \text{ of } 600, \quad 10 \overline{) 600} \quad 30 \times 3 = 90 \text{ from Russia}$$

$$90 + 160 = 250 \text{ students chosen}$$

$$\% \text{ from Russia} = \frac{90}{250} \times 100 = \frac{9}{25} \times 100 = 9 \times 4 = 36\%$$

4.

Gwen intends to sell her old computer. She originally paid £500 for this computer. Gwen enters the details on an internet selling website.

- (a) Gwen would be happy to make a 35% loss. How much money would Gwen receive if she made a 35% loss in selling her computer? [2]

$$10\% \text{ of } 500 = 50$$

$$30\% \text{ of } 500 = 3 \times 50 = 150$$

$$5\% \text{ of } 500 = 25$$

$$35\% = 150 + 25 = \underline{\underline{£175}}$$

$$\begin{array}{r} 491 \\ 500 \\ - 175 \\ \hline 325 \end{array}$$

$$\underline{\underline{£325}}$$

- (b) Gwen is offered £200 for her computer. What is the percentage loss if she sells at this price? [2]

$$\text{Loss} = \underline{\underline{£500 - £200}} = \underline{\underline{£300}}$$

$$\% \text{ Loss} = \frac{\text{Loss}}{\text{Original}} \times 100 = \frac{300}{500} \times 100 = \frac{300}{5} = \underline{\underline{60\%}}$$

$$\underline{\underline{60\%}}$$

Loss is 60 %

5.

A company offers its workers a choice on how much their salary will increase next year. Each worker can receive either a £500 increase or a 2% increase on their present salary.

Janet is currently on a salary of £24000 per year.

Which option should Janet choose? You must show the calculations that support your answer.

$$100\% = 24000$$

$$10\% = 2400$$

$$1\% = 240$$

$$2\% = 480 \quad (\text{less than } £500)$$

Janet should choose the £500 option

[3]

6.

Ms Franks needs a total of £1340 to buy a car.

She already has £584 in a savings account.

Ms Franks earns £1260 per month.

She adds 15% of her salary each month to her savings account.

How many months will it take Ms Franks to save enough money to buy the car?

You must show all your working.

$$£1340 - £584 = £756 \text{ more needed}$$

$$\begin{aligned} \text{1 month's savings} &= 15\% \text{ of } 1260 \\ &= 0.15 \times 1260 \\ &= £189 \end{aligned}$$

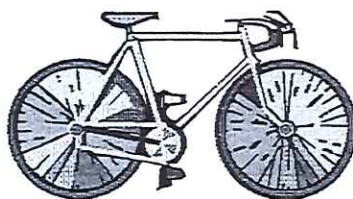
$$\text{No of months needed} = 756 \div 189 = 4$$

It will take Mrs Franks 4 months

[5]

7.

Daniel wants to buy a new bicycle. It is priced at £480.



Daniel can either

- pay £480 immediately, or
- pay a 15% deposit, followed by 24 monthly payments of £22.

(a) Calculate the total amount Daniel would pay using the deposit and monthly payments method. [3]

You must show all your working.

$$100\% = 480$$

$$10\% = 48$$

$$5\% = 24$$

$$15\% = 48 + 24 = \text{£72 deposit}$$

$$\begin{array}{r} 24 \\ \times 22 \\ \hline + 480 \\ + 48 \\ \hline 528 \end{array}$$

$$\begin{array}{r} 528 \\ + 72 \\ \hline \text{£}600 \end{array}$$

£600 total

Daniel would pay a total of £600

(b) Find the percentage increase in the cost of the bicycle when Daniel pays using the deposit and monthly payments method. [3]

$$\% \text{ increase} = \frac{\text{increase}}{\text{original}} \times 100$$

$$\begin{aligned} \text{increase} &= \\ \text{£}600 - \text{£}480 \\ &= \text{£}120 \end{aligned}$$

$$= \frac{120}{480} \times 100$$

$$= \frac{1}{4} \times 100 = \text{25\% increase}$$

8.

The table below shows some comparative data for 3 different European airlines.



	European Airlines		
	FreeFlight	Best2Fly	GoJet
Percentage of flights arriving on time, based on 30 000 flights	85%	88%	92%
Number of complaints, per 1000 passengers	0.62	0.68	0.78
Number of lost suitcases, per 1000 passengers	0.36	0.24	0.42

Use the information given in the table to answer the following questions.

- (a) FreeFlight, Best2Fly and GoJet all claim to be the best of these 3 airlines. Complete the following statements.

[2]

'FreeFlight are the best of these 3 airlines because fewest complaints.

'Best2Fly are the best of these 3 airlines because fewest lost suitcases.

'GoJet are the best of these 3 airlines because best arrival on time record.

(b) How many of the 30000 flights with Best2Fly were late?

[2]

$$\text{Late} = 100\% - 88\% = 12\%$$

$$12\% \text{ of } 30000$$

$$= 0.12 \times 30000$$

$$= 3600 \text{ late flights}$$

(c) FreeFlight and GoJet both expect to carry 500000 passengers next month.

How many more suitcases would you expect GoJet to lose than FreeFlight next month?

[3]

$$\text{FreeFlight} = 0.36 \times 500$$

$$= 180$$

(careful here as the 0.36 and 0.42 per 1000)

$$\text{GoJet} = 0.42 \times 500$$

$$= 210$$

$$210 - 180 = 30 \text{ more suitcases}$$

(d) Write down an estimate for the probability that a flight with GoJet does not arrive on time. Express your answer as a percentage.

[1]

$$100 - 92 = 8\%$$

9.

Use the following clues to find the missing whole number.

- The number is between 80 and 100.
- The number is less than $\frac{1}{3}$ of 282.
- The number is greater than 20% of 450.
- The number is not odd. even

$$\begin{array}{r} 94 \\ 3 \overline{) 282} \end{array}$$

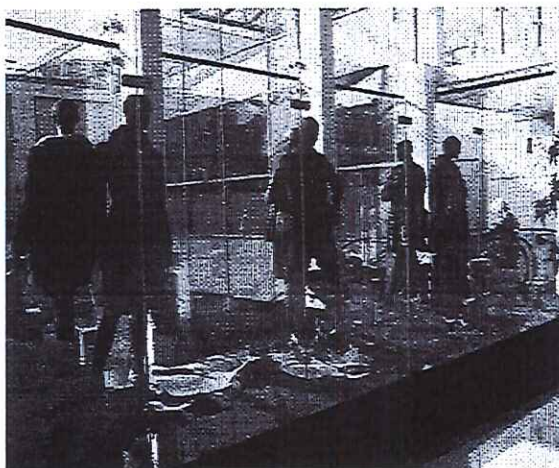
< 94

$$\begin{array}{r} 90 \\ 5 \overline{) 450} \end{array}$$

> 90 [4]

$$20\% \text{ of } 450 = \frac{1}{5} \text{ of } 450$$

The missing whole number is 92



Sale prices at P & A's Outlet Store are 40% below original prices.
On Saturdays an additional discount of 20% off the sale price is given.

- (a) If Lorraine shops at P & A's Outlet Store on a Tuesday and buys a coat that was originally priced at £140, how much discount will she get?

$$40\% \text{ of } 140$$

$$10\% \rightarrow 14$$

$$40\% \rightarrow 14 \times 4 = 56$$

$$\text{Discount} = \text{£ } 56$$

[2]

- (b) Lorraine is advised by her friend to wait until Saturday to purchase the coat.
How much will Lorraine pay for the coat on Saturday?

$$\text{Tuesday sale price} = \begin{array}{r} 140 \\ - 56 \\ \hline 84 \end{array}$$

$$\text{£}84$$

$$20\% \text{ off } 84$$

$$10\% \text{ of } 84 = \text{£}8.40$$

$$20\% \text{ of } 84 = \text{£}16.80$$

$$\begin{array}{r} 84.00 \\ - 16.80 \\ \hline 67.20 \end{array}$$

$$\text{£}67.20$$

[4]

11.

You will be assessed on the quality of your written communication in this question.

Arwyn needs four new tyres fitted on his car and would also like a new spare tyre. He sees two deals advertised at the garage.

→ 5 tyres

"Economy Tyres" £64 each No matter how many tyres fitted, total fitting charge £20

"Top Class Tyres" Made to last longer! £95 each 10% discount if you buy 4 or more tyres Free fitting
--

Arwyn has exactly enough money to buy four 'Top Class Tyres' and to have them fitted. Does he have enough money to buy, and have fitted, four 'Economy Tyres' with a fifth tyre as a spare?

You must show all your working.

[7]

Top class tyres

$$\begin{array}{r} £95 \\ \times 4 \\ \hline £380 \\ 2 \end{array}$$

£380

10% discount = £38

$$\begin{array}{r} 380 \\ - 38 \\ \hline £342 \end{array}$$

Arwyn has exactly £342

Economy Tyres

$$\begin{array}{r} £64 \\ \times 5 \\ \hline 320 \\ 2 \end{array}$$

£320

+ 20 (fitting)

£340

Yes Arwyn has exactly £342 so he has enough money to buy the 5 tyres at economy tyres and have them fitted.

12.

Harley has saved £210 towards the cost of buying a laptop computer. She earns £140 per week from a part-time job. Harley can only afford to save 12% of the amount she earns each week. She sees an advertisement, shown below, for the laptop computer she wants to buy.



Only for the next 6 weeks ...

15% off the marked price!

Remember this offer is only valid for the next 6 weeks.

Will Harley be able to buy the laptop computer at the reduced price? You must show all your working and give a reason for your answer.

$$\begin{array}{l}
 10\% \text{ of } 340 = 34 \\
 5\% \text{ of } 340 = 17 \\
 15\% \text{ of } 340 = 51
 \end{array}
 \qquad
 \begin{array}{r}
 131 \\
 2 \overline{) 340} \\
 \underline{340} \\
 - 51 \\
 \hline
 \pounds 289
 \end{array}$$

Laptop is £289 if bought in next 6 weeks

Harley must save £289 - £210 = £79

Each week Harley saves 12% of 140

$$\begin{array}{l}
 10\% \text{ of } 140 = 14 \\
 1\% \text{ of } 140 = 1.40 \\
 2\% \text{ of } 140 = 2.80 \\
 12\% \text{ of } 140 = \pounds 16.80
 \end{array}$$

[6]

Try 4 weeks

$$\begin{array}{r}
 16.80 \\
 \times 4 \\
 \hline
 \pounds 67.20
 \end{array}
 \quad \text{not enough}$$

Try 5 weeks

$$\begin{array}{r}
 16.80 \\
 \times 5 \\
 \hline
 \pounds 84.00
 \end{array}
 \quad \text{yes!}$$

Yes Harley can buy the computer as she would have saved enough money in 5 weeks.

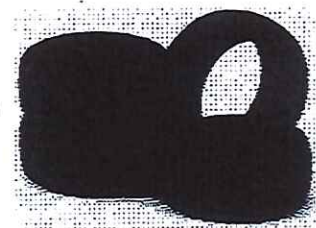
13.

(b) Lobetus sells 2 brands of tyre, Fudget and Gripwell.

Brand of tyre	Cost per tyre 	Expected lifetime of the tyre, in miles
Fudget	£82	20 000
Gripwell	£140	30 000

Gripwell tyres are currently on special offer.

20% off Gripwell when buying 4 tyres



Nerys needs to buy 4 new tyres.

Which brand of tyre would you recommend that Nerys buys?

You must give a reason for your choice by considering both the cost and the lifetime of the 4 tyres.

You must show all your working.

[8]

$$\begin{aligned} \text{Fudget cost } & \text{£82 for 20 000 miles} \times 4 \\ \text{cost per mile} & = 8200 \text{ p} \div 20000 \times 4 \\ & = 1.64 \text{ p} \end{aligned}$$

$$\begin{aligned} \text{Gripwell cost } & \text{£140} \times 4 = \text{£560} \\ \text{but 20\% discount} & = \frac{112}{5 \overline{) 560}} \end{aligned}$$

$$\begin{aligned} \text{£560} - \text{£112} & = \text{£448} \\ \text{cost per mile} & = 44800 \text{ p} \div 30000 \\ & = 1.49 \text{ p} \end{aligned}$$

Gripwell is the brand that I would recommend to Nerys because it is cheaper per mile

14.

You will be assessed on the quality of your written communication in this question.

Gwilym bought a camera for £150.

When he sold the camera, he made a loss of 6%.

For how much did Gwilym sell the camera?

[5]

$$\% \text{ loss} = 6\%$$

$$100\% = 150$$

$$10\% = 15$$

$$1\% = 1.50$$

$$6\% = 6 \times 1.50 = £9$$

$$150 - 9 = £141$$

Gwilym sold the camera for £141

15.

The ruling body for international football has rules for the dimensions of rectangular football pitches.

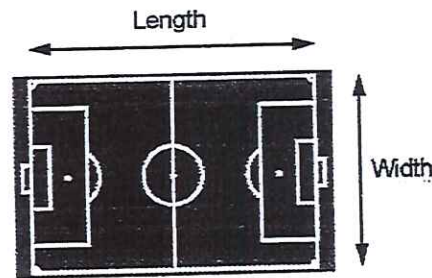


Diagram not drawn to scale

Football pitch dimension rules:

- the minimum width is 45m
- the maximum width allowed is double the minimum width
- the maximum length is 120m
- the minimum length allowed is three-quarters of the maximum length

Susan says

'The maximum area of a pitch is at least 50% greater than the minimum area of a pitch.'

Is Susan correct?

You must show all your working to justify your answer.

[4]

$$\text{Minimum length} = \frac{3}{4} \times 120 = 90\text{m}$$

$$\text{Maximum width} = 2 \times 45 = 90\text{m}$$

$$\begin{aligned} \text{Minimum area} &= \text{minimum length} \times \text{minimum width} \\ &= 90 \times 45 = 4050\text{m}^2 \end{aligned}$$

$$\begin{aligned} \text{Maximum area} &= \text{maximum length} \times \text{maximum width} \\ &= 120 \times 90 = 10800\text{m}^2 \end{aligned}$$

Yes. Susan is correct as twice 4050m² is less than 10800m²

16.

You will be assessed on the quality of your written communication in this question.

When Liam has a bath he uses 150 litres of water.

His sister Tina claims that when she has a shower she uses 40% less water than Liam uses when he has a bath.

To test this claim, Tina made the following two observations.

- 1 litre of water comes out of the shower head every 10 seconds
- Tina spends 15 minutes in the shower.

Is Tina's claim correct?

You must show all your working.

$$\begin{aligned}
 \underline{15 \text{ minutes in shower}} &= 15 \times 60 \text{ seconds} \\
 &= 900 \text{ seconds} \\
 &= 90 \times 10 \text{ seconds} \\
 &= 90 \times 1 \text{ litre} \\
 &= \underline{90 \text{ litres}}
 \end{aligned}$$

$$\text{Liam's bath} = 150 \text{ litres}$$

$$10\% \text{ of } 150 = 15$$

$$40\% \text{ of } 150 = 15 \times 4 = \underline{60 \text{ litres}}$$

$$\begin{aligned}
 \therefore \underline{40\% \text{ less than Liam's bath}} &= 150 - 60 \\
 &= \underline{90 \text{ litres}}
 \end{aligned}$$

Tina is correct. She uses 40% less than Liam's bath.

[8]

17.

Angharad earns £700 per month.
She plans to save 4% of this monthly salary for the next 8 months.

At the end of the eight months, she will give $\frac{1}{3}$ of the amount she has saved to her younger brother.

How much should her brother expect? Give your answer to the nearest pound. [5]

$$100\% = 700$$

$$10\% = 70$$

$$5\% = 35$$

$$1\% = 7$$

$$4\% = 35 - 7 = £28$$

$$\begin{array}{r} 8 \text{ months} = 28 \\ \times 8 \\ \hline 224 \\ 6 \end{array}$$

$$£224$$

$$\frac{1}{3} = \begin{array}{r} 74.66... \\ 3 \overline{) 224.00} \end{array}$$

Angharad's brother should expect £75

(nearest pound)