

Percentages (F)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	@MrsttsNumeracy
Total Marks:	

1. Find 20% of 450.

$$10\% \text{ of } 450 = 450 \div 10 = 45$$

$$20\% \text{ of } 450 = 2 \times 45 = 90$$

..... 90 [2]

2. The price of a watch is £230.

In a sale this price is reduced by 16%.

Calculate the sale price.

$$10\% \text{ of } £230 = £23$$

$$5\% \text{ of } £230 = £11.50$$

$$1\% \text{ of } £230 = 2.30^+$$

$$£36.80$$

$$\begin{array}{r} 1'29 \\ £230.00 \\ - £36.80 \\ \hline £193.20 \end{array}$$

£ 193.20 [3]

3. Antonio works Monday, Tuesday and Wednesday.

He starts work at 4.00 pm and finishes at 10.30 pm.

Antonio is paid £10 per hour on weekdays.

One week, he also works for 4 hours on Sunday.

He is paid 50% more on Sundays.

How much does Antonio earn altogether this week?

$$4\text{pm} \rightarrow 10.30\text{pm} : 6\frac{1}{2} \text{ hours}$$

$$6.5 \times 10 = £65$$

$$4 \times £15 = £60$$

$$£65 + £60 = £125$$

$$50\% \text{ of } £10 = £5$$

$$£10 + £5 = £15 / \text{hr on Sunday}$$

£ 125 [6]

4. A shop sold goods worth a total of £50 000 in January.

The value of goods sold in February was 10% lower than in January.

(a) Calculate the value of goods sold in February.

$$10\% \text{ of } 50000 = 5000$$

$$£50000 - £5000 =$$

$$£45000$$

$$£ \dots 45000 \dots [2]$$

(b) Each month, the value of goods sold continued to be 10% lower than the previous month.

When the value of goods sold was less than £35 000, the shop closed at the end of that month.

Show that the store closed at the end of May.

You must show your working.

	Start	10%	-10%
Jan	50000	5000	45000
Feb	45000	4500	40500
Mar	40500	4050	36450
Apr	36450	3645	32805
May	32805		

[3]

(c) The store reopens under new management and sells goods worth £100 000 in the first month.

- The value of goods sold in the second month is 20% more than the first month.
- The value of goods sold in the third month is 10% less than the second month.

Find the percentage increase in the total value of goods sold from the first month to the third month.

$$20\% \text{ of } 100000 = 10000 \times 2 = 20000$$

$$£100000 + £20000 = £120000$$

$$10\% \text{ of } 120000 = 12000$$

$$£120000 - £12000 = £108000$$

$$£108000 - £100000 = £8000 \text{ (increase)}$$

$$\% \text{ increase} = \frac{8000}{100000} \times 100 = 8\% \dots 8\% [5]$$

5. Ann, Bob and Carol have a total budget of £500 to rent a holiday apartment.

The apartment normally costs £50 per night, but they can get a 20% discount if they book early.

Calculate how many extra nights they can stay in the apartment if they book early.

Without a discount: $\frac{£500}{£50} = 10$ (or 10 nights)

20% of £50 = $\frac{50}{10} \times 2 = £10$

$12 - 10 = 2$ extra nights.

$£50 - £10 = £40$

$\frac{£500}{£40} = 12\frac{1}{2} \rightarrow 12$ nights.

..... 2 nights [4]

6. Bridget took a maths test. She scored 28 marks out of 40.

Sam took an English test. He scored 32 marks out of 47.

Sam said

I did better than Bridget as I scored more marks.

By writing each score as a percentage, show that Sam is wrong.

Bridget: $\frac{28}{40} = \frac{70}{100}$ [70%]
 $\xrightarrow{\times 2.5}$
 $\xrightarrow{\times 2.5}$

Sam: $\frac{32}{47} \approx 68\%$
 $\frac{0.6800...}{47 \overline{) 32.0000}}$
 68% < 70%
 [3]

7. A shop has a sale that offers 20% off all prices.

On the final day they reduce all sale prices by 25%.

Alex buys a hairdryer on the final day.

Work out the overall percentage reduction on the price of the hairdryer.

$100\% - 20\% = 80\%$

$100\% - 25\% = 75\%$

Overall reduction
 $100\% - 60\% = 40\%$

$\frac{80}{100} \times \frac{75}{100} = \frac{6000}{10000} = \frac{60}{100} = 60\%$

..... 40% [6]

8. Lemon drinks are made by mixing concentrate with water.

- (a) Sian has a lemon drink made by mixing 120ml of concentrate with 180ml of water.

What percentage of her lemon drink is concentrate?

$$\text{Total liquid} = 120 + 180 = 300 \text{ ml}$$

$$\frac{120}{300} \times 100 = 40$$

..... 40 % [3]

- (b) Sophia has a lemon drink made by mixing 70ml of concentrate with 180ml of water.

Tommy has a lemon drink made by mixing 90ml of concentrate with 270ml of water.

Who has the stronger drink, Sophia or Tommy?

Show your working.

$$\text{Sophia: } 70 + 180 = 250 \text{ ml} \quad \text{Tommy: } 90 + 270 = 360 \text{ ml}$$

$$\frac{70}{250} \times 100 = 28\%$$

$$\frac{90}{360} \times 100 = 25\%$$

~~250~~ Sophia has the stronger drink. [4]

9. Work out 51% of 400

$$\frac{51}{100} \times 400 = \underline{\underline{204}}$$

[2]

10. Sam wants to buy a camera for £345

He has already saved £96

Each week

- his pay is £80
- he saves 30% of this pay.

$$£345 - £96 = £249$$

$$30\% \text{ of } 80 = 8 \times 3 = £24$$

How many more weeks must he save?

$$10 \text{ weeks: } £24 \times 10 = £240$$

$$11 \text{ weeks: } £240 + £24 = £264$$

He must save for 11 more weeks.

[4]

11. Work out 15% of 80

$$\begin{array}{r} 10\% \text{ of } 80 = 8 + \\ 5\% \text{ of } 80 = 4 \\ \hline 15\% \text{ of } 80 = 12 \end{array}$$

..... 12 [2]

12. In a company, the ratio of the number of men to the number of women is 3:2

40% of the men are under the age of 25

10% of the women are under the age of 25

What percentage of all the people in the company are under the age of 25?

Men: $\frac{3}{5}$ of company = 60%

Women: $\frac{2}{5}$ of company = 40%

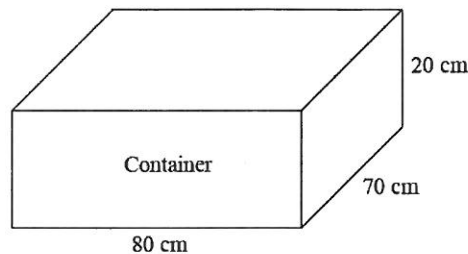
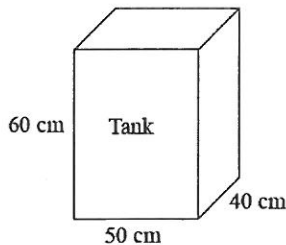
40% of 60% = $6 \times 4 = 24\%$

$24 + 4 = 28$

10% of 40% = 4%

..... 28% [4]

13. The diagram shows a tank in the shape of a cuboid.



It also shows a container in the shape of a cuboid.

The tank is full of oil.

The container is empty.

35% of the oil from the tank is spilled.

The rest of the oil from the tank is put into the container.

Work out the height of the oil in the container.

Give your answer to an appropriate degree of accuracy.

Volume of tank =

$60 \times 50 \times 40 = 120000 \text{ cm}^3$

Container:

Area (base) = $80 \times 70 = 5600 \text{ cm}^2$

$100\% - 35\% = 65\%$

Height = $\frac{78000}{5600}$

$56 \overline{) 780000}$
 $\underline{560000}$
 220000
 $\underline{560000}$
 160000

$50\% \text{ of } 120000 = 60000$
 $+ 10\% \text{ of } 120000 = 12000$
 $5\% \text{ of } 120000 = 6000$

 $65\% \text{ of } 120000 = 78000$

$65\% \text{ of } 120000 = 78000 \text{ cm}^3$

..... 13.9 cm
 (1 dp) [5]

14. Work out 234% of 150

$$100\% \text{ of } 150 = 150$$

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

$$30\% \text{ of } 150 = 45$$

$$1\% \text{ of } 150 = 1.5$$

$$4\% \text{ of } 150 = 6$$

$$150 + 150 + 45 + 6 = 351$$

..... 351 [2]

15. A and B are two companies.

The table shows some information about the sales of each company and the number of workers for each company in 2004 and in 2014

	Company A		Company B	
	Sales (£ millions)	Number of workers	Sales (£ millions)	Number of workers
2004	320	2960	48	605
2014	388	3200	57	640

Work out the percentage increase in sales from 2004 to 2014 for Company A.

$$\text{Increase in sales} = 388 - 320 = 68 \text{ (£ millions)}$$

$$\% \text{ increase} = \frac{68}{320} \times 100$$

..... 21.25 % [2]

16. Find 10% of £320

$$320 \div 10 = 32$$

£... 32 [1]

17. Ryan and Carl each get paid a basic pay of £60 per day.

One day, Ryan also gets a bonus of 25% of his basic pay.

Carl also gets £20 in tips from customers.

Work out the difference between the total amounts of money that Ryan and Carl each get.

Ryan :

$$25\% \text{ of } 60 = 60 \div 4$$

$$= 15$$

$$£60 + £15 = £75$$

$$\text{Carl: } £60 + £20 = £80$$

$$£80 - £75 = £5$$

..... £5 [3]

18. Some people were asked if they liked swimming or cycling or running.

	Swimming	Cycling	Running
Male	2	6	4
Female	8	5	5

Work out the percentage of the 30 people that are female.

$$\text{Total female} = 8 + 5 + 5 = 18$$

$$\frac{18}{30} \times 100 = 60$$

..... 60 % [2]

19. Irena sells ice creams.

One day she sells 80 ice creams.

The next day she sells 108 ice creams.

Work out the percentage increase in the number of ice creams she sells.

$$\text{Increase in sales} = 108 - 80 = 28$$

$$\% \text{ increase} = \frac{28}{80} \times 100 = 35$$

..... 35 % [3]

20. Rachel carried out a survey of 10 people to find out the type of fruit they like best.

The table gives information about her results.

Type of fruit	Number of people
apple	2
banana	5
orange	3

In Rachel's survey, 2 out of 10 people like apples best.

Write 2 out of 10 as a percentage.

..... 20 % [1]

21. A gym has 275 members.

40% are bronze members.

28% are silver members.

The rest are gold members.

Work out the number of gold members.

$$40 + 28 = 68$$

$$100 - 68 = 32$$

32% are gold members.

$$\frac{32}{100} \times 275 = 88$$

88

[3]

22. In 1999 the minimum wage for adults was £3.60 per hour.

In 2013 it was £6.31 per hour.

Work out the percentage increase in the minimum wage.

$$\text{Increase in wages} = \pounds 6.31 - \pounds 3.60 = \pounds 2.71$$

$$\% \text{ increase} = \frac{2.71}{3.60} \times 100 = \underline{75.3\%} \text{ (1 dp)}$$

_____ % [3]

23. 24 boys, 45 girls and 281 adults are the members of a badminton club.

50 more children join the club.

The number of girls is now 18% of the total number of members.

How many of the 50 children were boys?

$$\text{Total members} = 24 + 45 + 281 + 50 = 400$$

$$\frac{(45 + n)}{400} \times 100 = 18 \quad 45 + n = 18 \times 4 = 72$$

$$n = 72 - 45 = 27$$

where n = number of new girls.

$$\therefore \text{number of new boys} = 50 - 27 = \underline{23}$$

[4]

24. Hayley and Tom have £2000 to spend on food at their wedding.

Here are their two options.

Work out the maximum number of people they can pay for.

Wonderful Weddings!	
Normal price	£32 per person
Special offer	
10% off	

Kim the Caterer	
Number of people	Price per person
100 & over	£24.50
80 to 99	£26.50
60 to 79	£28.50
up to 59	£30.50

Show working to compare the maximum number of people for both options.

Wonderful Weddings

$$10\% \text{ of } 32 = £3.20$$

$$£32 - £3.20 = £28.80$$

$$£2000 \div £28.80$$

$$= 69.4$$

→ 69 people

70 > 69

Kim the Caterer

$$24.50 \times 100 = £2450 \quad \times$$

$$26.50 \times 80 = £2120 \quad \times$$

$$28.50 \times 60 = £1710 \quad \checkmark$$

$$£2000 \div £28.50 = 70.175\dots$$

→ 70 people

[5 marks]

They could have one extra person if they used Kim the Caterer.

25. Here is some information about a group of children.

	Boys	Girls
Left-handed	3	8
Right-handed	12	20

Total boys = 15

$\frac{3}{15} \times 100 = 20$

What percentage of the boys are left-handed?

20%

[2]

26. Increase 4200 by 38%

$4200 \times 1.38 = 5796$

[2]

27. Work out 258% of 6300

$6300 \times 2.58 = 16254$

[2]

28. In a school, 60% of the students are girls.

50% of the girls walk to school.

20% of the boys walk to school.

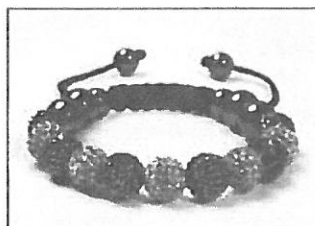
What percentage of the students walk to school?

50% of 60% = 30%
20% of 40% = 8%

$30 + 8 = \underline{38\%}$

[3]

29.



A fashion store buys 200 bracelets for £6.30 each.

The store sells 60% of the bracelets for £10 each.

The remaining bracelets are later sold at a reduced price of £4 each.

How much profit or loss did the fashion store make?

You must show all your working.

$$\begin{aligned} \text{Purchase price} &= 200 \times \pounds 6.30 = \underline{\pounds 1260} \\ 60\% \text{ of } 200 &= 200 \div 10 \times 6 = 120 \\ 120 \times \pounds 10 &= \pounds 1200 & \text{Sales} &= \pounds 1200 + \pounds 320 \\ & & &= \underline{\pounds 1520} \\ 200 - 120 &= 80 & \text{Profit} &= \pounds 1520 - \pounds 1260 = \underline{\pounds 260} \\ 80 \times \pounds 4 &= \pounds 320 & & \text{[6]} \end{aligned}$$

30. On 1 January 2014, Jasmine weighed 84 kg and was overweight for her height.

By eating healthy food and exercising she lost 6% of her body weight during the first three months of 2014.

Her weight then remained the same for the next two months.

During June, Jasmine cycled every day and, by doing so, she lost 2.8% of her April body weight.

(a) Calculate Jasmine's body weight at the end of June.

$$\begin{aligned} 100\% - 6\% &= 94\% \\ 94\% \text{ of } 84 \text{ kg} &= 84 \div 100 \times 94 = 78.96 \text{ kg} \\ 100\% - 2.8\% &= 97.2\% \\ 97.2\% \text{ of } 78.96 &= 76.74912 & \underline{\underline{76.7 \text{ kg (1dp)}}} & \text{[3]} \end{aligned}$$

(b) What percentage of her original body weight did Jasmine lose in these six months?

$$\begin{aligned} 84 - 76.7 &= 7.3 & (84 - 76.74912 &= \underline{7.25088}) \\ \frac{7.3}{84} \times 100 &= 8.6\% & & \text{[2]} \end{aligned}$$

31. What percentage is £95 of £250?

$$\frac{95}{250} \times 100 = \underline{\underline{38\%}} \quad \text{[2]}$$

32. Work out 70% of £90

$$\frac{70}{100} \times 90 = \underline{\underline{\pounds 63}} \quad \text{[2]}$$

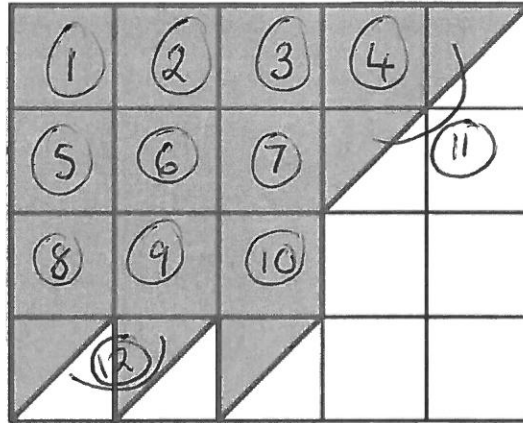
$$\begin{aligned} \text{or } 10\% \text{ of } 90 &= 9 \\ 70\% \text{ of } 90 &= 7 \times 9 \end{aligned}$$

33. What percentage of this shape is shaded?

12.5
 \nearrow
 $12\frac{1}{2}$ squares shaded.

$$\frac{12\frac{1}{2}}{20} = \frac{62.5}{100}$$

$$\begin{matrix} \times 5 \\ \times 5 \end{matrix} \left[\begin{array}{l} 12.5 \times 5 \\ = 12.5 \times 10 \div 2 \end{array} \right]$$



$5 \times 4 = 20$ squares

62.5%

[3]

34. In a shop, the normal price of a coat is £65

The shop has a sale.

In week 1 of the sale, the price of the coat is reduced by 20%

In week 2 of the sale, the price of the coat is reduced by a further £10

Maria has £40

Does Maria have enough money to buy the coat in week 2 of the sale?

You must show how you get your answer.

$$20\% \text{ of } £65 = £6.5 \times 2 = £13$$

$$£65 - £13 = £52$$

$$£52 - £10 = £42$$

$$£42 > £40$$

Maria does not have enough money for the coat.

[3]

CREDITS AND NOTES

Q	Awarding Body	Q	Awarding Body	Q	Awarding Body
1	OCR	13	Pearson Edexcel	25	AQA
2	OCR	14	Pearson Edexcel	26	AQA
3	OCR	15	Pearson Edexcel	27	AQA
4	OCR	16	Pearson Edexcel	28	AQA
5	OCR	17	Pearson Edexcel	29	WJEC Eduqas
6	OCR	18	Pearson Edexcel	30	WJEC Eduqas
7	OCR	19	Pearson Edexcel	31	WJEC Eduqas
8	OCR	20	Pearson Edexcel	32	Pearson Edexcel
9	AQA	21	AQA	33	Pearson Edexcel
10	AQA	22	AQA	34	Pearson Edexcel
11	Pearson Edexcel	23	AQA		
12	Pearson Edexcel	24	AQA		

Notes:

These questions have been retyped from the original sample/specimen assessment materials and whilst every effort has been made to ensure there are no errors, any that do appear are mine and not the exam board s (similarly any errors I have corrected from the originals are also my corrections and not theirs!).

Please also note that the layout in terms of fonts, answer lines and space given to each question does not reflect the actual papers to save space.

These questions have been collated by me as the basis for a GCSE working party set up by the GLOW maths hub - if you want to get involved please get in touch. The objective is to provide support to fellow teachers and to give you a flavour of how different topics "could" be examined. They should not be used to form a decision as to which board to use. There is no guarantee that a topic will or won't appear in the "live" papers from a specific exam board or that examination of a topic will be as shown in these questions.

Links:

AQA <http://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300>

OCR <http://ocr.org.uk/gcsemaths>

Pearson Edexcel <http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html>

WJEC Eduqas <http://www.eduqas.co.uk/qualifications/mathematics/gcse/>

Contents:

This version contains questions from:

AQA – Sample Assessment Material and Practice set 1

OCR – Sample Assessment Material and Practice set 1

Pearson Edexcel – Sample Assessment Material, Specimen set 1 and Specimen set 2.

WJEC Eduqas – Sample Assessment Material

