Oxford Revise GCSE Maths, Foundation tier

Home-learning Pack: NUMBER

THIS PACK CONTAINS pages from the Foundation Revision Workbook in the Oxford Revise series. It covers all the 'Number' topics within the GCSE Maths Foundation tier specification. The ebook can be access free at this link. The full print title can be found on Amazon at this link.

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OXFORD Revise

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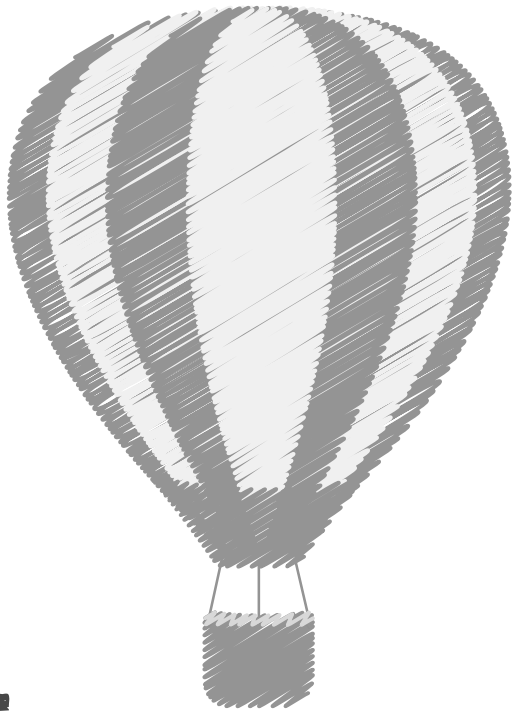
Edexcel GCSE (9–1) Maths

Foundation

Suitable for Grades 1–5



Revision Workbook

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The Oxford Revise GCSE Maths Series: Our approach

Our no-fuss approach lets you dive straight into the practice you need for the exam. GCSE Grades help you monitor your own progress on every page, and 'Guided answers' at the back help you mark your own solutions. The practice exam papers come with guidance too: for every question we let you know which page to turn to for extra practice. And you'll find perfectly matched support on the exact same page in the revision guide.

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Place value

Grade 1

1. Write the number ninety thousand, one hundred and twenty-four using digits.

..... **[I got ___ / 1 mark]**

Grade 2

2. Write down the value represented by the digit 2 in each of these numbers.

a) 4269

..... **[___ / 1 mark]**

b) 723 000

..... **[___ / 1 mark]**

c) 5.201

..... **[___ / 1 mark]**

Grade 2

3. Put one of the symbols <, > or = in each box to make a correct statement.

a) 0.36 ☐ 0.306 **[___ / 1 mark]**

b) 0.450 ☐ 0.45 **[___ / 1 mark]**

c) 1.9003 ☐ 1.903 **[___ / 1 mark]**

Grade 2

4. Put these numbers in order of size, starting with the smallest.

7.504 7.45 7.405 7.054

..... **[___ / 2 marks]**

Grade 2

5. Work out

a) 67.9 × 1000

Hint
Think about how many places the digits move and in what direction.

..... **[___ / 1 mark]**

b) 0.9 ÷ 100

..... **[___ / 1 mark]**

Grade 2

6. 10 packets of sweets cost £8.50. How much does one packet cost?

.....p **[___ / 2 marks]**

Grade 3

7. Given that 4.5 × 192 = 864, write down the answer to each of these calculations.

a) 4.5 × 19.2

..... **[___ / 1 mark]**

b) 450 × 0.0192

..... **[___ / 1 mark]**

c) 8.64 ÷ 0.45

..... **[___ / 1 mark]**

Order of operations

Grade 2

1. Work out

a) $2 + 3 \times 9$

..... **[I got ___ / 1 mark]**

b) $24 \div (6 - 2) \times 5$

..... **[___ / 1 mark]**

c) $10 - 3^2$

..... **[___ / 1 mark]**

Grade 3

2. Work out

a) $(12 - 4 \times 2)^3$

..... **[___ / 1 mark]**

b) $\dfrac{4 \times 5^2}{4 \times 5 \div 2}$

..... **[___ / 1 mark]**

c) $5 \times \sqrt{50 - 1} + 6 \times 3$

..... **[___ / 1 mark]**

Grade 3

3. Use your calculator to evaluate these expressions.

a) $\dfrac{2 \times 36 + 18}{20 - 12}$

..... **[___ / 1 mark]**

b) $\left(\dfrac{3}{5}\right)^3 + 9 \div 3$

..... **[___ / 1 mark]**

c) $\sqrt{7.29} \times 1000$

..... **[___ / 1 mark]**

Grade 3

4. Bavan says that $2 \times 3^2 = 36$ but Eva says $2 \times 3^2 = 18$
Who is correct? Explain your reasoning.

Hint
Explain your answer using accurate calculations.

.....

..... **[___ / 1 mark]**

Grade 3

5. Rewrite these statements using brackets to make them true.

a) $22 - 10 - 7 = 19$

..... **[___ / 1 mark]**

b) $20 - 5 - 2 + 6 = 11$

..... **[___ / 1 mark]**

Rounding and truncating

Grade 2

1. Round 258.3 to

a) the nearest integer

..... **[I got ___ / 1 mark]**

b) the nearest 10

..... **[___ / 1 mark]**

c) the nearest 100

..... **[___ / 1 mark]**

Grade 2

2. Round 19.902 to

a) the nearest integer

..... **[___ / 1 mark]**

b) 1 decimal place

..... **[___ / 1 mark]**

c) 2 decimal places.

..... **[___ / 1 mark]**

Grade 2

3. Truncate 8.2694 to

Hint
Remind yourself of the difference between truncation and rounding.

a) an integer

..... **[___ / 1 mark]**

b) a tenth

..... **[___ / 1 mark]**

c) a hundredth.

..... **[___ / 1 mark]**

Grade 2

4. One bag of grass seed covers an area of 3.66 m^2. What size of lawn will nine bags of seed cover?
Give your answer to the nearest integer.

..... m^2 **[___ / 2 marks]**

Grade 2

5. A jug contains 3000 ml of juice. A glass holds 310 ml. How many glasses can be filled from the jug?

..... **[___ / 2 marks]**

Grade 3

6. Mark is paid £18.93 an hour and works 7.5 hours a day.
Kwamé is paid £22.17 an hour and works 6.5 hours a day.
What is the difference between their daily pay?

Hint
Money is often rounded to 2 dp.

£..... **[___ / 3 marks]**

Significant figures

Grade 3

1. Round 20 193 to

a) 4 significant figures

..... **[I got ___ / 1 mark]**

b) 3 significant figures

..... **[___ / 1 mark]**

c) 2 significant figures

..... **[___ / 1 mark]**

d) 1 significant figure.

..... **[___ / 1 mark]**

Grade 3

2. Round 0.006 802 to

a) 1 significant figure

..... **[___ / 1 mark]**

b) 2 significant figures

..... **[___ / 1 mark]**

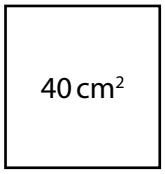
c) 3 significant figures.

..... **[___ / 1 mark]**

Grade 3

3. The area of a square is 40 cm^2. What is the length of the side of the square?
Give your answer to 3 significant figures.

Hint
You square the side length to get the area of a square.



..... cm **[___ / 2 marks]**

Grade 3

4. a) Evaluate this expression using your calculator.

$$\frac{4.56 \times 2.89}{12.1 - 0.56}$$

Write your answer as a decimal, giving all the digits on your calculator display.

..... **[___ / 1 mark]**

b) Write your answer to part **a** to 2 significant figures.

..... **[___ / 1 mark]**

Grade 4

5. Shirley rounds 0.065 29 to 2 significant figures and gives the answer 0.07
Shirley is wrong. Explain why.

Hint
Think about the difference between significant figures and decimal places.

.....

..... **[___ / 1 mark]**

Estimation

Grade 4

1. Estimate the value of 2.84×19.3. Show your working.

Hint
You usually round numbers to 1 sf to estimate.

..... **[I got ___ / 1 mark]**

Grade 4

2. Estimate the value of $\frac{317 + 48.6}{9.683}$. Show your working.

..... **[___ / 2 marks]**

Grade 4

3. Estimate the value of $\frac{2.67 \times 1.36}{0.11 + 0.42}$. Show your working.

..... **[___ / 2 marks]**

Grade 4

4. A biologist visits a lake at the start of January and works out that the number of fish in the lake is approximately 1000. She thinks that the population is growing at a rate of 17 fish per day. Estimate how many fish there will be in the lake five months later.

..... **[___ / 3 marks]**

Grade 5

5. In one week, an Italian restaurant sells 96 portions of lasagne. The restaurant sells a portion of lasagne for £8.95 and each portion costs £3.20 to make. Estimate the profit the restaurant makes from lasagne in the week.

£..... **[___ / 3 marks]**

Grade 5

6. James is driving to visit his Gran who lives 405 km away. He leaves at 8.30 am and drives at an average speed of 77 km/h, stopping for a 25-minute lunch break on the way. Estimate the time he arrives at his Gran's.

..... **[___ / 3 marks]**

Error intervals

Grade 5

1. A number is given as 5.3 rounded to 1 decimal place.
What is the smallest number this could be?

..... **[I got ___ / 1 mark]**

Grade 5

2. The length, L cm, of a rectangle is 14 cm to the nearest centimetre.
Complete the statement to show the range of possible values of L.

$\leq L <$ ..... **[___ / 2 marks]**

Grade 5

3. The length, p m, of a football pitch is given as 110 m.
Write the error interval for p if this value is rounded to

a) the nearest 10 metres

$\leq p <$ ..... **[___ / 2 marks]**

b) the nearest 5 metres

$\leq p <$ ..... **[___ / 2 marks]**

c) the nearest metre.

$\leq p <$ ..... **[___ / 2 marks]**

Grade 5

4. A number, x, is given rounded to a particular degree of accuracy.
Write the error interval for x in each case.

a) $x = 4.67$ to 2 decimal places

$\leq x <$ ..... **[___ / 2 marks]**

b) $x = 5000$ to 1 significant figure

$\leq x <$ ..... **[___ / 2 marks]**

Grade 5

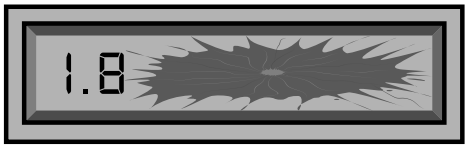
5. The average length, l seconds, of a chart song is 250 seconds to 2 significant figures.
Give the error interval for l.

Hint
Remember to use the correct inequality symbols: minimum ≤ x < maximum.

..... **[___ / 2 marks]**

Grade 5

6. Sienna uses her calculator to answer a question. The display breaks and she can only see 1.8 at the start of her answer. Let x be the unknown number on the display and write the range of possible values for x as an error interval.



..... **[___ / 2 marks]**

Calculating with negative numbers

Grade 1

1. The table shows the minimum temperature (in °C) across five months of the year.

Month	December	January	February	March	April
Minimum temperature (°C)	−1	−5	0	3	8

a) In which month is the lowest temperature recorded?

..... **[I got ___ / 1 mark]**

b) What is the difference in minimum temperature between December and January?

..... **[___ / 1 mark]**

c) What is the difference in minimum temperature between April and January?

..... **[___ / 1 mark]**

Grade 2

2. Evaluate

a) $2 + (-5)$

..... **[___ / 1 mark]**

b) $(-48) \div (-6)$

..... **[___ / 1 mark]**

c) $(-3)^2$

..... **[___ / 1 mark]**

Grade 3

3. Evaluate

Hint
Remember the order of operations.

a) $5 + (-3) \times 4$

..... **[___ / 2 marks]**

b) $(8 - 10) \times 4 - (-10)$

..... **[___ / 2 marks]**

c) $\dfrac{(-2) \times (-6)}{-10 + 7}$

..... **[___ / 2 marks]**

Grade 3

4. Thomas's bank balance is £241. He goes shopping and uses his bank card to spend £154 in the supermarket, £95 in the computer shop and £8.50 in a café. How much does Thomas need to pay into his bank account to bring the balance up to £100?

£..... **[___ / 3 marks]**

Calculating with decimals

Grade 2

1. Evaluate

a) 2.906 + 8.31

..... **[I got ___ / 2 marks]**

b) 25.043 – 17.82

..... **[___ / 2 marks]**

Grade 3

2. Evaluate

a) 7.4 × 0.26

Hint
*For part **b**, it's easier to divide by a whole number. How can you change the calculation to do this?*

..... **[___ / 2 marks]**

b) 17.12 ÷ 0.8

..... **[___ / 2 marks]**

c) $\frac{1.9 + 7.62}{9 - 8.3}$

..... **[___ / 3 marks]**

Grade 3

3. Seven identical toys cost a total of £55.65. How much does one toy cost?

£..... **[___ / 2 marks]**

Grade 3

4. Alex works out the answer to 14.5 × 2.6. Alex says the answer is 3.77

Explain, without working out the answer, how you can be sure Alex has made a mistake.

.....

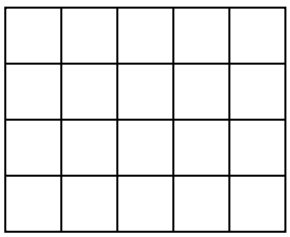
..... **[___ / 1 mark]**

Introduction to fractions

Grade 2

1. Which is the larger fraction, $\frac{1}{5}$ or $\frac{1}{4}$? Explain your answer.

You may use the diagram to help.



..... **[I got ___ / 1 mark]**

Grade 2

2. Write these fractions in order of size, starting with the smallest.

$\frac{3}{4}$ $\frac{2}{3}$ $\frac{5}{8}$ $\frac{7}{12}$

Hint
Find equivalent fractions with a common denominator.

..... **[___ / 2 marks]**

Grade 2

3. a) Write each mixed number as an improper fraction, giving your answer in its simplest form.

i) $1\frac{2}{5}$

..... **[___ / 1 mark]**

ii) $3\frac{3}{4}$

..... **[___ / 2 marks]**

b) Write each improper fraction as a mixed number, giving your answer in its simplest form.

i) $\frac{17}{9}$

..... **[___ / 1 mark]**

ii) $\frac{92}{40}$

..... **[___ / 2 marks]**

Grade 3

4. After a party, Dave has $2\frac{1}{3}$ bottles of cola left and Lizzie has $\frac{19}{8}$ bottles left. Who has the most cola? Show your working.

Hint
Here, you need to compare fractions that are presented differently. Convert both fractions to the same form.

..... **[___ / 3 marks]**

Proportions of amounts

Grade 2

1. Work out

a) $\frac{1}{5}$ of 45

..... **[I got ___ / 2 marks]**

b) 30% of 180

..... **[___ / 2 marks]**

c) $\frac{5}{7}$ of 14

..... **[___ / 2 marks]**

d) 62% of 50

..... **[___ / 2 marks]**

Grade 2

2. Every month, Faizal receives a bonus of 15% of his earnings in that month. In April, Faizal earnt £2460. How much was his bonus in April?

£..... **[___ / 2 marks]**

Grade 3

3. Which is bigger, 110% of 90 or $\frac{8}{7}$ of 84? Show all your working.

Hint
A diagram such as a bar model can help with these kinds of questions.

..... **[___ / 3 marks]**

Grade 3

4. Every year, a school raises money to donate to charity. One year, it chooses to donate $\frac{3}{8}$ of the money raised to a hospital. If the school raises £7200 that year, how much does it give to the hospital?

£..... **[___ / 2 marks]**

Grade 4

5. 48 children go on an outdoor activities day and must choose a morning activity.

25% of the children choose rock climbing.

$\frac{5}{12}$ of the children choose raft building.

The rest choose kayaking.

Work out how many children choose kayaking.

Hint
Calculate how many children choose rock climbing and how many choose raft building.

..... **[___ / 3 marks]**

Calculating with fractions 1

Grade 2

1. What is the reciprocal of 0.25?

..... **[I got ___ / 1 mark]**

Grade 3

2. Work out and simplify where possible

a) $\frac{1}{3} \times \frac{2}{5}$ ..... **[___ / 1 mark]**

b) $\frac{3}{7} \times \frac{14}{9}$ ..... **[___ / 2 marks]**

Grade 3

3. Evaluate and simplify where possible

a) $\frac{3}{4} \div \frac{1}{11}$ ..... **[___ / 2 marks]**

b) $\frac{6}{5} \div \frac{7}{10}$ ..... **[___ / 2 marks]**

Grade 3

4. A café uses up $\frac{2}{3}$ of a box of coffee beans every day. How many days will it take for the café to use up 16 boxes of coffee beans?

..... days **[___ / 2 marks]**

Grade 3

5. In a model village, everything is built at a size $\frac{1}{9}$ of the original size. If a street is 30 m long in real life, work out how long it is in the model village. Give your answer in its simplest form.

..... m **[___ / 2 marks]**

Grade 4

6. Rafael reserves $\frac{3}{10}$ of his monthly wage to pay his bills. $\frac{1}{4}$ of this amount is spent on his electricity bill. What fraction of his monthly wage does Rafael spend on his electricity bill?

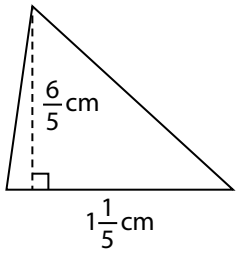
Hint
What calculation does the word 'of' represent?

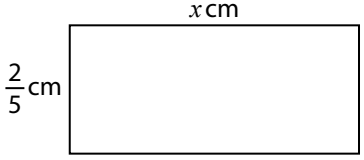
..... **[___ / 2 marks]**

Grade 5

7. A triangle has base $1\frac{1}{5}$ cm and perpendicular height $\frac{6}{5}$ cm.
A rectangle has the same area as the triangle. If the width of the rectangle is $\frac{2}{5}$ cm, what is its length, x cm? Give your answer in its simplest form.

Hint
This question combines fractions and geometry. Find the area of the triangle. What is the same about both shapes?





..... cm **[___ / 3 marks]**

Calculating with fractions 2

Grade 3

1. Work out and simplify where possible

a) $\frac{1}{3}+\frac{1}{5}$

..... **[I got ___ / 2 marks]**

b) $\frac{2}{9}+\frac{5}{6}$

..... **[___ / 2 marks]**

c) $1\frac{7}{8}+2\frac{3}{4}$

..... **[___ / 3 marks]**

Grade 3

2. Evaluate and simplify where possible

a) $\frac{7}{9}-\frac{1}{2}$

..... **[___ / 2 marks]**

b) $3\frac{1}{6}-2\frac{3}{4}$

..... **[___ / 3 marks]**

Grade 3

3. Janet says that $\frac{2}{5}+\frac{4}{5}=\frac{6}{10}$. Is Janet correct? Explain your reasoning carefully.

.....

..... **[___ / 1 mark]**

Grade 4

4. $\frac{1}{8}$ of the students in a class drive to school. $\frac{2}{3}$ of the students walk to school. The rest take the bus. What fraction of the students take the bus?

Hint
The whole class is represented by the number 1

..... **[___ / 3 marks]**

Grade 4

5. Daisy is building a model train track. Her track is $2\frac{4}{5}$ m long. She then takes out a piece of track which is $\frac{7}{8}$ m long and replaces it with a piece which is $1\frac{1}{20}$ m long. Work out the length of her track now.

..... m **[___ / 3 marks]**

Grade 4

6. Maxwell is reading a book on his e-reader. When he picks it up one day, it tells him he is $\frac{1}{3}$ of the way through the book. He reads some and when he puts it down he is $\frac{3}{4}$ of the way through the book. What fraction of the book did he read?

..... **[___ / 2 marks]**

Fractions, decimals, percentages

Grade 2

1. a) Write 0.4 as a fraction in its simplest form.

..... **[I got ___ / 1 mark]**

b) Write 6% as a decimal.

..... **[___ / 1 mark]**

c) Write $\frac{1}{8}$ as a percentage.

..... **[___ / 1 mark]**

Grade 2

2. a) Convert $\frac{6}{5}$ to a percentage.

..... **[___ / 1 mark]**

b) Convert 0.035 to a fraction in its simplest form.

..... **[___ / 1 mark]**

c) Convert 3.6% to a decimal.

..... **[___ / 1 mark]**

Grade 3

3. Write these numbers in order of size, starting with the smallest.

34% 0.3 $\frac{1}{3}$ $\frac{16}{50}$

..... **[___ / 3 marks]**

Grade 3

4. An online music streaming service, Dittify, does some research and finds that $\frac{7}{20}$ of its users listen to its daily mix playlist in the morning, $\frac{1}{5}$ of users listen to their own mix playlist and the rest choose an album.

What percentage of users choose an album?

Hint
Convert the fractions to percentages first.

..... **[___ / 3 marks]**

Grade 4

5. In Lin's class, 6 out of 25 students read fantasy books. In Jay's class, 8 out of 32 students read fantasy books. Lin says the proportion of students who read fantasy books is greater in her class than in Jay's. Is Lin correct? Explain your answer.

.....

..... **[___ / 2 marks]**

Powers and roots

Grade 2

1. Write down the value of

a) 4^2

..... **[I got ___ / 1 mark]**

b) 2^3

..... **[___ / 1 mark]**

c) $\sqrt{49}$

..... **[___ / 1 mark]**

d) $\sqrt[3]{27}$

..... **[___ / 1 mark]**

Grade 3

2. Evaluate

a) $2 \times \sqrt{9 + 16} + 6^2$

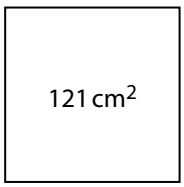
..... **[___ / 3 marks]**

b) $3^4 - 6 \times \sqrt[3]{8} + 50 \div 5^2$

..... **[___ / 3 marks]**

Grade 3

3. The area of a square is 121 cm^2. What is its perimeter?



Hint
Think how the side length of a square relates to its area and to its perimeter.

..... cm **[___ / 2 marks]**

Grade 4

4. a) Using your calculator, work out the value of $\frac{\sqrt[3]{3.6^2 + 91 \times 3.7}}{\sqrt{6.25} + 1.8^3}$

Write down all the figures on your calculator display.

Hint
Remind yourself how to round to 3 sf.

..... **[___ / 1 mark]**

b) Write your answer to part **a** to 3 significant figures.

..... **[___ / 1 mark]**

Grade 4

5. A cube-shaped box of side length 8 cm is made of solid metal. Work out how many smaller cubes of side length 2 cm will fill the box completely.

Hint
Consider the volume of the box and the volume of the smaller cubes.

..... **[___ / 3 marks]**

Calculating with indices

Grade 4

1. Simplify

Hint
Remind yourself of the rules of indices.

a) $7^2 \times 7^5$

..... **[I got ___ / 1 mark]**

b) $9^{10} \div 9^4$

..... **[___ / 1 mark]**

c) $2^5 \times 2^{-3}$

..... **[___ / 1 mark]**

d) $7^{-2} \div 7^{-6}$

..... **[___ / 1 mark]**

e) $(3^4)^4$

..... **[___ / 1 mark]**

Grade 4

2. Simplify

a) $(8^2)^{-5}$

..... **[___ / 1 mark]**

b) $\dfrac{9^3}{9^2 \times 9^4}$

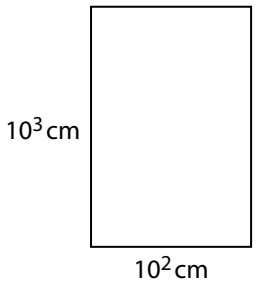
..... **[___ / 2 marks]**

c) $(2^7 \times 2^4)^{-1}$

..... **[___ / 2 marks]**

Grade 4

3. Work out the area of the rectangle, leaving your answer in simplified index form.



..... cm^2 **[___ / 2 marks]**

Grade 4

4. Peter says that $2^3 \times 5^2$ simplifies to 10^5. Peter is wrong. Explain why.

..... **[___ / 1 mark]**

Grade 5

5. Work out

a) 13^0

..... **[___ / 1 mark]**

b) 8^{-1}

..... **[___ / 1 mark]**

c) $\left(\dfrac{2}{5}\right)^3$

..... **[___ / 1 mark]**

d) $\left(\dfrac{1}{4}\right)^{-2}$

..... **[___ / 2 marks]**

Factors and multiples

Grade 2

1. Here is a list of numbers.

3 6 8 10 18 24 30 36

From the list, select

a) a factor of 12

..... **[I got ___ / 1 mark]**

b) a multiple of 9

..... **[___ / 1 mark]**

c) a number which is both a multiple of 12 and a multiple of 4

..... **[___ / 1 mark]**

d) a number which is both a factor of 24 and a factor of 16

..... **[___ / 1 mark]**

e) two numbers with a common factor of 5

..... **[___ / 1 mark]**

f) two numbers with a common multiple of 60

..... **[___ / 1 mark]**

Grade 3

2. What is the lowest common multiple of 9 and 12?

..... **[___ / 2 marks]**

Grade 3

3. What is the highest common factor of 18 and 12?

..... **[___ / 2 marks]**

Grade 4

4. Three alarms beep at the same time. The first alarm then beeps every 6 minutes, the second then beeps every 5 minutes and the third beeps every 15 minutes. Work out how long it is before all three alarms beep at the same time.

Hint
Is this an HCF or an LCM question?

..... minutes **[___ / 2 marks]**

Grade 4

5. Two 2-digit numbers have a highest common factor of 4 and a lowest common multiple of 60. What are the two numbers?

Hint
Remind yourself how to use prime factors to find the HCF and LCM.

..... **[___ / 2 marks]**

Prime factor decomposition

Grade 4

1. Write 110 as a product of its prime factors.

..... **[I got ___ / 2 marks]**

Grade 4

2. a) Write 540 as a product of powers of its prime factors.

..... **[___ / 2 marks]**

b) By looking at its prime factors, explain why 540 is divisible by 15

Hint
What are the prime factors of 15?

..... **[___ / 1 mark]**

Grade 4

3. a) Write 750 as a product of its prime factors. Give your answer in index notation.

..... **[___ / 2 marks]**

b) By looking at its prime factors, explain why 750 is not divisible by 4

..... **[___ / 1 mark]**

Grade 5

4. The prime factor decomposition of a number, x, is $2 \times 3^2 \times 7 \times 13$

a) Is x even or odd? Explain your reasoning.

..... **[___ / 1 mark]**

b) What is the prime factor decomposition of a number twice as big as x?

..... **[___ / 1 mark]**

Grade 5

5. A number is a multiple of 4, 5 and 6. Write the prime factor decomposition of the smallest number it could be.

..... **[___ / 2 marks]**

Finding HCF and LCM

Grade 4

1. a) Write 160 as a product of prime factors.

..... **[I got ___ / 2 marks]**

b) Find the highest common factor of 160 and 280

..... **[___ / 2 marks]**

c) Find the lowest common multiple of 160 and 280

..... **[___ / 2 marks]**

Grade 5

2. Two numbers have prime factor decompositions $2^3 \times 5 \times 11$ and $2 \times 3^2 \times 5$

Find

a) the highest common factor of the two numbers

Hint
You may wish to use a Venn diagram to help with this question.

..... **[___ / 2 marks]**

b) the lowest common multiple of the two numbers.

..... **[___ / 1 mark]**

Grade 5

3. Fran is sorting her books into piles. She has 225 yellow books and 324 orange books. She does not want to mix the colours and wants every pile to contain the same number of books. Work out the biggest number of books she can put in each pile.

..... **[___ / 3 marks]**

Standard form

Grade 3

1. Write these as ordinary numbers.

a) 1.56×10^8

..... **[I got ___ / 1 mark]**

b) 8.02×10^{-3}

..... **[___ / 1 mark]**

Grade 3

2. Write these numbers in standard form.

a) 48 000 000 000

..... **[___ / 1 mark]**

b) 0.000 0703

..... **[___ / 1 mark]**

c) 95×10^6

..... **[___ / 1 mark]**

d) 0.68×10^{-4}

..... **[___ / 1 mark]**

Grade 3

3. The distance from the Sun to Earth is approximately 150 000 000 km.
Write this number in standard form.

..... km **[___ / 1 mark]**

Grade 4

4. Put these numbers in order of size, starting with the biggest.

2.1×10^4 2.3×10^5 0.21×10^4 2200

Hint
Write all the numbers in the same form.

..... **[___ / 3 marks]**

Grade 4

5. The size of a bacteria cell is 4×10^{-7} m and the size of a virus is 0.000 000 05 m.
Which is smaller, the bacteria cell or the virus?

..... **[___ / 2 marks]**

Calculating with standard form

Grade 5

1. Work out the value of each expression, giving your answers in standard form.

a) $2 \times (3 \times 10^2)$

..... **[I got ___ / 1 mark]**

b) $(4 \times 10^{-4}) \div 2$

..... **[___ / 1 mark]**

c) $(3 \times 10^{-2}) + (5 \times 10^{-2})$

..... **[___ / 1 mark]**

d) $(9 \times 10^7) - (3 \times 10^7)$

..... **[___ / 1 mark]**

Grade 5

2. Everly says that $6 \times (3 \times 10^6)$ is written as 18×10^6 in standard form.

Is Everly correct? Explain your reasoning.

..... **[___ / 1 mark]**

Grade 5

3. Work out the value of $7 \times 10^{-2} \times 30\,000$. Give your answer in standard form.

..... **[___ / 2 marks]**

Grade 5

4. Work out the value of each expression, giving your answers in standard form.

a) $(5 \times 10^4) + (6 \times 10^5)$

..... **[___ / 2 marks]**

b) $(9 \times 10^{-3}) - (3 \times 10^{-4})$

..... **[___ / 2 marks]**

c) $(2.1 \times 10^8) \times (3 \times 10^{-5})$

..... **[___ / 2 marks]**

d) $(8.2 \times 10^3) \div (4.1 \times 10^7)$

..... **[___ / 2 marks]**

Guided answers

A correct final answer automatically scores all the marks, unless specified otherwise.

Page 1, Place value

1. 90 124
1 mark *for correct answer.*

2. a 200 **b** 20 000 **c** $\frac{2}{10}$ or 0.2
1 mark *for each correct answer.*

3. a > **b** = **c** <
1 mark *for each correct answer.*

4. 7.054, 7.405, 7.45, 7.504
2 marks *for correct order;* ***1 mark*** *for any three in correct order.*

5. a $67.9 \times 1000 = 67\,900$ **b** $0.9 \div 100 = 0.009$
1 mark *for each correct answer.*

6. £8.50 ÷ 10 = £0.85, so 1 packet costs 85p.
1 mark *for division;* ***1 mark*** *for 85p.*

7. a $4.5 \times 19.2 = 4.5 \times 192 \div \mathbf{10} = 864 \div \mathbf{10} = 86.4$
You could also estimate: $4.5 \times 19.2 \approx 5 \times 20 \approx 100$, which is close to 86.4

b $450 \times 0.0192 = 4.5 \times \mathbf{100} \times 192 \div \mathbf{10\,000}$
$= 864 \times \mathbf{100} \div \mathbf{10\,000} = 8.64$
You could also estimate: $450 \times 0.0192 \approx 500 \times 0.02 \approx 10$, which is close to 8.64

c You know that $864 \div 4.5 = 192$,
so $8.64 \div 0.45 = \frac{864 \div \mathbf{100}}{4.5 \div \mathbf{10}} = 192 \div \mathbf{10} = 19.2$
You could also estimate: $8.64 \div 0.45 \approx 10 \div 0.5 \approx 20$, which is close to 19.2

1 mark *for each correct answer.*

Page 2, Order of operations

1. a $2 + 3 \times 9 = 2 + 27 = 29$

b $24 \div (6 - 2) \times 5 = 24 \div 4 \times 5 = 30$

c $10 - 3^2 = 10 - 9 = 1$

1 mark *for each correct answer.*

2. a $(12 - 4 \times 2)^3 = (12 - 8)^3 = 4^3 = 64$

b $\frac{4 \times 5^2}{4 \times 5 \div 2} = \frac{4 \times 25}{10} = \frac{100}{10} = 10$

c $5 \times \sqrt{50 - 1} + 6 \times 3 = 5 \times \sqrt{49} + 6 \times 3$
$= 5 \times 7 + 6 \times 3$
$= 35 + 18 = 53$

1 mark *for each correct answer.*

3. a $\frac{2 \times 36 + 18}{20 - 12} = \frac{90}{8} = \frac{45}{4}$ or 11.25

b $\left(\frac{3}{5}\right)^3 + 9 \div 3 = \frac{27}{125} + 3 = \frac{402}{125}$ or 3.216

c $\sqrt{7.29} \times 1000 = 2.7 \times 1000 = 2700$

1 mark *for each correct answer.*

4. There are a number of ways to explain this. Two examples of correct explanations would be:
Eva is correct because you calculate 3^2, which is 9, then multiply by 2, so $2 \times 9 = 18$
Eva is correct. Bavan made the mistake of multiplying before squaring, whereas Eva squared before multiplying.
1 mark *for a correct, detailed explanation.*

5. a $22 - (10 - 7) = 19$ **b** $20 - (5 - 2 + 6) = 11$
1 mark *for each correct answer.*

Page 3, Rounding and truncating

1. a 258 **b** 260 **c** 300
1 mark *for each correct answer.*

2. a 20 **b** 19.9 **c** 19.90
1 mark *for each correct answer.*

3. a 8 **b** 8.2 **c** 8.26
1 mark *for each correct answer.*

4. $3.66 \times 9 = 32.94 \approx 33\ m^2$
1 mark *for correct multiplication;* ***1 mark*** *for rounding.*

5. 3000 ÷ 310 = 9.677, so the jug will fill 9 whole glasses.
1 mark *for correct division;* ***1 mark*** *for truncating to an integer.*

6. $18.93 \times 7.5 = 141.975$, so Mark earns £141.98 a day.
$22.17 \times 6.5 = 144.105$, so Kwamé earns £144.11 a day.
The difference in their pay is £144.11 − £141.98 = £2.13 a day.
1 mark *for Mark's pay;* ***1 mark*** *for Kwamé's pay;* ***1 mark*** *for the difference. Total 3 marks.*

Page 4, Significant figures

1. a 20 190 **b** 20 200
c 20 000 **d** 20 000
1 mark *for each correct answer.*

2. a 0.007 **b** 0.0068 **c** 0.006 80
1 mark *for each correct answer.*

3. Side length = $\sqrt{40} = 6.32455532 = 6.32$ cm to 3 sf
1 mark *for square rooting;* ***1 mark*** *for 6.32*

4. a $\frac{4.56 \times 2.89}{12.1 - 0.56} = 1.141\,975\,737$

b 1.141 975 737 = 1.1 to 2 sf
1 mark *for each correct answer.*

5. Shirley has rounded 0.065 29 to 2 dp instead of 2 sf.
The correct answer is 0.065
1 mark *for a correct explanation.*

Page 5, Estimation

1. $2.84 \times 19.3 \approx 3 \times 20 \approx 60$
1 mark *for correct answer.*

2. $\frac{317 + 48.6}{9.683} \approx \frac{300 + 50}{10} \approx \frac{350}{10} \approx 35$
1 mark *for rounding to 1 sf;* ***1 mark*** *for correct answer.*

3. $\frac{2.67 \times 1.36}{0.11 + 0.42} \approx \frac{3 \times 1}{0.1 + 0.4} \approx \frac{3}{0.5} \approx 6$
1 mark *for rounding to 1 sf;* ***1 mark*** *for correct answer.*

4. Number of fish at start of January ≈ 1000
Increase ≈ 20 fish per day
Five months ≈ 5 × 30 ≈ 150 days
Number of fish after five months ≈ 150 × 20 + 1000 ≈ 4000
1 mark *for rounding rate of increase to 1 sf;* ***1 mark*** *for correct calculation for the number of fish after five months;* ***1 mark*** *for correct answer. Total 3 marks.*

5. Number of portions sold ≈ 100
Sale price per portion ≈ £9.00
Cost per portion ≈ £3.00
Profit per portion ≈ £9.00 − £3.00 ≈ £6.00
Total profit ≈ £6.00 × 100 ≈ £600

1 mark *for rounding portions, sale price and cost to 1 sf;* ***1 mark*** *for a profit calculation;* ***1 mark*** *for correct answer. Total 3 marks.*

Note that you could also find the total estimated sale price (£900) and subtract the total estimated cost (£300) to get the total estimated profit.

6. Distance driven ≈ 400 km
Average speed ≈ 80 km/h
Time driving ≈ $\frac{400}{80}$ ≈ 5 hours
Time for whole journey ≈ 5 hours 30 minutes (including the break)
Time of arrival is roughly 2 pm (8.30 am + $5\frac{1}{2}$ hours).
1 mark *for rounding distance and speed to 1 sf;*
1 mark *for finding the time taken;* ***1 mark*** *for correct answer. Total 3 marks.*

Page 6, Error intervals

1. The smallest number this could be is 5.25, since 5.25 is the smallest number that rounds to 5.3 to 1 dp.
1 mark *for correct answer of 5.25*

2. $13.5 \leq L < 14.5$
1 mark *for 13.5;* ***1 mark*** *for 14.5*

3. a $105 \leq p < 115$ **b** $107.5 \leq p < 112.5$
c $109.5 \leq p < 110.5$
1 mark *for each correct minimum;* ***1 mark*** *for each correct maximum.*

4. a $4.665 \leq x < 4.675$ **b** $4500 \leq x < 5500$
1 mark *for each correct minimum;* ***1 mark*** *for each correct maximum.*

5. $245 \leq l < 255$
1 mark *for correct minimum and maximum;* ***1 mark*** *for correct interval notation.*

6. Sienna can see a truncation to 1 dp, so the error interval is $1.8 \leq x < 1.9$
1 mark *for correct minimum and maximum;* ***1 mark*** *for correct interval notation.*

Page 7, Calculating with negative numbers

1. a January **b** $-1 - (-5) = 4$ °C
c $8 - (-5) = 13$ °C
1 mark *for each correct answer.*

2. a $2 + (-5) = -3$ **b** $(-48) \div (-6) = 8$
c $(-3)^2 = (-3) \times (-3) = 9$
1 mark *for each correct answer.*

3. a $5 + (-3) \times 4 = 5 + (-12) = -7$
1 mark *for –12;* ***1 mark*** *for correct answer.*
b $(8 - 10) \times 4 - (-10) = (-2) \times 4 - (-10) = -8 - (-10) = 2$
1 mark *for –8;* ***1 mark*** *for correct answer.*
c $\frac{(-2) \times (-6)}{-10 + 7} = \frac{12}{-3} = -4$
1 mark *for either 12 in the numerator or –3 in the denominator;* ***1 mark*** *for correct answer.*

4. Total spend = £257.50
Bank balance = £241 − £257.50 = −£16.50
Thomas must pay in £100 + £16.50 = £116.50 to get the balance up to £100
1 mark *for subtracting the spend from £241;* ***1 mark*** *for –£16.50 or £16.50 overdrawn;* ***1 mark*** *for final answer of £116.50. Total 3 marks.*

Page 8, Calculating with decimals

1. a
$$\begin{array}{r} 2.906 \\ +\ 8.310 \\ \hline 11.216 \\ {\scriptstyle 1} \end{array}$$
1 mark *for lining up the digits correctly in a column;*
1 mark *for correct answer.*

b
$$\begin{array}{r} {\scriptstyle 1}{\scriptstyle 14}{\scriptstyle 15}{\scriptstyle 1} \\ 25.043 \\ -17.820 \\ \hline 7.223 \end{array}$$
1 mark *for lining up the digits correctly in a column;*
1 mark *for correct answer.*

2. a
$$\begin{array}{r} 74 \\ \times\ 26 \\ \hline 444 \\ +1480 \\ \hline 1924 \\ {\scriptstyle 1}\ {\scriptstyle 2} \end{array}$$
Since 74 × 26 = 1924,
7.4 × 0.26 = 1924 ÷ 10 ÷ 100 = 1.924
1 mark *for multiplying 74 × 26 to get 1924;* ***1 mark*** *for correct answer.*

b 17.12 ÷ 0.8 = 171.2 ÷ 8
$$8\overline{)171.2}$$
$$\begin{array}{r} 21.4 \\ 8\overline{)171.2} \\ {\scriptstyle 1}\ {\scriptstyle 3}\ {\scriptstyle 2} \end{array}$$
171.2 ÷ 8 = 21.4
1 mark *for dividing 171.2 ÷ 8;* ***1 mark*** *for correct answer.*

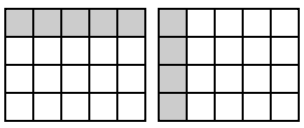
c $\frac{1.9 + 7.62}{9 - 8.3} = \frac{9.52}{0.7} = \frac{95.2}{7}$
$$\begin{array}{r} 13.6 \\ 7\overline{)95.42} \\ {\scriptstyle 2}\ {\scriptstyle 4} \end{array}$$
$\frac{95.2}{7} = 13.6$
1 mark *for getting correct numerator and denominator;*
1 mark *for dividing 95.2 ÷ 7;* ***1 mark*** *for correct answer. Total 3 marks.*

3. £55.65 ÷ 7 = £7.95
$$\begin{array}{r} 7.95 \\ 7\overline{)55.663}5 \\ {\scriptstyle 6}\ {\scriptstyle 3} \end{array}$$
1 mark *for attempting to divide;* ***1 mark*** *for correct answer.*

4. By estimating, 14.5 × 2.6 ≈ 15 × 3 ≈ 45. Alex's answer is not even close.
1 mark *for a correct explanation.*

Page 9, Introduction to fractions

1. $\frac{1}{4} > \frac{1}{5}$
Giving them a common denominator, $\frac{1}{4} = \frac{5}{20}$ and $\frac{1}{5} = \frac{4}{20}$
You can see $\frac{1}{4}$ is bigger.
Alternatively, you can say that $\frac{1}{4}$ must be bigger as one whole is split into four parts. Each part will be bigger than if the whole was split into five parts.
You can also show this by shading $\frac{1}{4}$ (horizontally) and $\frac{1}{5}$ (vertically) on the diagram:



1 mark *for a correct explanation.*

2. Giving each fraction a common denominator of 24,
$\frac{3}{4} = \frac{18}{24}$, $\frac{2}{3} = \frac{16}{24}$, $\frac{5}{8} = \frac{15}{24}$ and $\frac{7}{12} = \frac{14}{24}$
You can now put them in order by comparing the numerators and you have $\frac{7}{12}, \frac{5}{8}, \frac{2}{3}, \frac{3}{4}$
2 marks *for all correct,* ***1 mark*** *for three out of four correct.*

3. a i $1\frac{2}{5} = \frac{7}{5}$
1 mark *for correct answer.*

ii $3\frac{2}{4} = 3\frac{1}{2} = \frac{7}{2}$. Alternatively, $3\frac{2}{4} = \frac{14}{4} = \frac{7}{2}$
1 mark *for simplifying* $\frac{2}{4}$ *or* $\frac{14}{4}$*;* ***1 mark*** *for correct answer.*

b. i $\frac{17}{9} = 1\frac{8}{9}$
1 mark *for correct answer.*

ii $\frac{92}{40} = \frac{23}{10} = 2\frac{3}{10}$. Alternatively, $\frac{92}{40} = 2\frac{12}{40} = 2\frac{3}{10}$
1 mark *for simplifying* $\frac{92}{40}$ *or* $\frac{12}{40}$*;* ***1 mark*** *for correct answer.*

4. Dave has $2\frac{1}{3} = \frac{7}{3} = \frac{56}{24}$ bottles left.
Lizzie has $\frac{19}{8} = \frac{57}{24}$ bottles left.
$\frac{57}{24} > \frac{56}{24}$, so Lizzie has more.
Alternatively, Lizzie has $\frac{19}{8} = 2\frac{3}{8} = 2\frac{9}{24}$ bottles left.
Dave has $2\frac{1}{3} = 2\frac{8}{24}$ bottles left.
$2\frac{9}{24} > 2\frac{8}{24}$, so Lizzie has more.
1 mark *for converting* $2\frac{1}{3}$ *to an improper fraction (or for converting* $\frac{19}{8}$ *to a mixed number);* ***1 mark*** *for writing both fractions with a common denominator (such as 24);* ***1 mark*** *for a correct comparison and conclusion. Total 3 marks.*

Page 10, Proportions of amounts

1. a $\frac{1}{5}$ of $45 = 45 \div 5 = 9$

b 30% of $180 = 180 \div 10 \times 3 = 54$

c $\frac{5}{7}$ of $14 = 14 \div 7 \times 5 = 10$

d 10% of 50 = 5
So, 60% of $50 = 5 \times 6 = 30$
1% of 50 = 0.5
So, 2% of $50 = 2 \times 0.5 = 1$
62% of $50 = 30 + 1 = 31$
1 mark *for each correct calculation;* ***1 mark*** *for each correct answer.*

2. 10% of £2460 = £246
So, 5% of £2460 = £123
15% of £2460 = £246 + £123 = £369
1 mark *for correct calculation;* ***1 mark*** *for correct answer.*

3. 10% of 90 = 9
So, 110% of 90 = 90 + 9 = 99
$\frac{8}{7}$ of $84 = 84 \div 7 \times 8 = 96$
Since 99 > 96, 110% of 90 is bigger than $\frac{8}{7}$ of 84
1 mark *for finding 110% of 90;* ***1 mark*** *for finding* $\frac{8}{7}$ *of 84;*
1 mark *for a correct conclusion. Total 3 marks.*

4. $\frac{3}{8}$ of £7200 = £7200 ÷ 8 × 3 = £2700
1 mark *for correct calculation;* ***1 mark*** *for correct answer.*

5. Rock climbing: 25% of 48 = 48 ÷ 4 = 12
Raft building: $\frac{5}{12}$ of $48 = 48 \div 12 \times 5 = 20$
Kayaking: 48 − 12 − 20 = 16 children
1 mark *for the number who choose rock climbing;*
1 mark *for the number who choose raft building;* ***1 mark*** *for the number who choose kayaking. Total 3 marks.*

Page 11, Calculating with fractions 1

1. 4
1 mark *for correct answer.*

2. a $\frac{1}{3} \times \frac{2}{5} = \frac{2}{15}$
1 mark *for correct answer.*

b $\frac{3}{7} \times \frac{14}{9} = \frac{\cancel{3}^{1} \times \cancel{14}^{2}}{\cancel{7}_{1} \times \cancel{9}_{3}} = \frac{1 \times 2}{1 \times 3} = \frac{2}{3}$
1 mark *for multiplying;* ***1 mark*** *for the simplified answer.*

3. a $\frac{3}{4} \div \frac{1}{11} = \frac{3}{4} \times \frac{11}{1} = \frac{33}{4} = 8\frac{1}{4}$
1 mark *for turning into multiplication;* ***1 mark*** *for correct answer in improper fraction or mixed number form.*

b $\frac{6}{5} \div \frac{7}{10} = \frac{6}{5} \times \frac{10}{7} = \frac{6 \times \cancel{10}^{2}}{\cancel{5}_{1} \times 7} = \frac{6 \times 2}{1 \times 7} = \frac{12}{7} = 1\frac{5}{7}$
1 mark *for writing a correct multiplication;* ***1 mark*** *for correct, simplified answer in improper fraction or mixed number form.*

4. $16 \div \frac{2}{3} = \frac{16}{1} \times \frac{3}{2} = \frac{\cancel{16}^{8} \times 3}{1 \times \cancel{2}_{1}} = \frac{8 \times 3}{1 \times 1} = \frac{24}{1} = 24$ days
1 mark *for writing a division and turning into a correct multiplication;* ***1 mark*** *for correct answer.*

5. $\frac{1}{9}$ of $30 = \frac{1}{9} \times 30 = \frac{30}{9} = \frac{10}{3}$ m or $3\frac{1}{3}$ m
1 mark *for multiplying;* ***1 mark*** *for correct simplified answer (improper fraction or mixed number).*

6. $\frac{1}{4}$ of $\frac{3}{10} = \frac{1}{4} \times \frac{3}{10} = \frac{3}{40}$
1 mark *for multiplying;* ***1 mark*** *for correct answer.*

7. Area of triangle $= \frac{1}{2} \times 1\frac{1}{5} \times \frac{6}{5} = \frac{1}{2} \times \frac{6}{5} \times \frac{6}{5} = \frac{18}{25}$ cm^2
This is the area of the rectangle.
Length of rectangle $= \frac{18}{25} \div \frac{2}{5} = \frac{18}{25} \times \frac{5}{2} = \frac{\cancel{18}^{9} \times \cancel{5}^{1}}{\cancel{25}_{5} \times \cancel{2}_{1}} = \frac{9 \times 1}{5 \times 1}$
$= \frac{9}{5}$ cm or $1\frac{4}{5}$ cm
1 mark *for writing a correct multiplication;* ***1 mark*** *for writing a division and turning into a correct multiplication;*
1 mark *for correct, simplified answer (improper fraction or mixed number). Total 3 marks.*

Page 12, Calculating with fractions 2

1. a $\frac{1}{3} + \frac{1}{5} = \frac{5+3}{15} = \frac{8}{15}$
1 mark *for finding a common denominator;* ***1 mark*** *for correct answer.*

b $\frac{2}{9} + \frac{5}{6} = \frac{4}{18} + \frac{15}{18} = \frac{19}{18}$ or $1\frac{1}{18}$
1 mark *for finding a common denominator;* ***1 mark*** *for correct answer.*

c $1\frac{7}{8} + 2\frac{3}{4} = \frac{15}{8} + \frac{11}{4} = \frac{15}{8} + \frac{22}{8} = \frac{37}{8}$ or $4\frac{5}{8}$
1 mark *for converting mixed numbers to improper fractions;* ***1 mark*** *for finding a common denominator;*
1 mark *for correct answer. Total 3 marks.*

2. a $\frac{7}{9} - \frac{1}{2} = \frac{14-9}{18} = \frac{5}{18}$
1 mark *for finding a common denominator;* ***1 mark*** *for correct answer.*

b $3\frac{1}{6} - 2\frac{3}{4} = \frac{19}{6} - \frac{11}{4} = \frac{38}{12} - \frac{33}{12} = \frac{5}{12}$
1 mark *for converting mixed numbers to improper fractions;* ***1 mark*** *for finding a common denominator;*
1 mark *for correct answer. Total 3 marks.*

3. Janet is not correct. She has added the numerators and the denominators. She should have found a common denominator and then added the numerators only.
1 mark *for a correct explanation.*

4. $\frac{1}{8}+\frac{2}{3}=\frac{3+16}{24}=\frac{19}{24}$
$1-\frac{19}{24}=\frac{24}{24}-\frac{19}{24}=\frac{5}{24}$
1 mark *for finding a common denominator of 24;* ***1 mark*** *for adding to get* $\frac{19}{24}$*;* ***1 mark*** *for correct answer. Total 3 marks.*

5. $2\frac{4}{5}-\frac{7}{8}+1\frac{1}{20}=\frac{14}{5}-\frac{7}{8}+\frac{21}{20}=\frac{112}{40}-\frac{35}{40}+\frac{42}{40}=\frac{119}{40}$ m or $2\frac{39}{40}$ m
1 mark *for converting mixed numbers to improper fractions;* ***1 mark*** *for finding a common denominator;* ***1 mark*** *for correct answer. Total 3 marks.*

6. $\frac{3}{4}-\frac{1}{3}=\frac{9-4}{12}=\frac{5}{12}$
1 mark *for finding a common denominator;* ***1 mark*** *for correct answer.*

Page 13, Fractions, decimals, percentages

1. a $0.4=\frac{4}{10}=\frac{2}{5}$ **b** $6\%=0.06$ **c** $\frac{1}{8}=12.5\%$
1 mark *for each correct answer.*

2. a $\frac{6}{5}=1\frac{1}{5}=120\%$ **b** $0.035=\frac{35}{1000}=\frac{7}{200}$ **c** $3.6\%=0.036$
1 mark *for each correct answer.*

3. Convert everything to a percentage.
$0.3=30\%$, $\frac{1}{3}=33.\dot{3}\%$, $\frac{16}{50}=\frac{32}{100}=32\%$
The order is 0.3, $\frac{16}{50}$, $\frac{1}{3}$, 34%.
1 mark *for converting everything to a percentage (or everything to a decimal, or everything to a fraction with a common denominator), condone one mistake;* ***2 marks*** *for correct order (****1 mark*** *for three out of four correct). Total 3 marks.*

4. $\frac{7}{20}=\frac{35}{100}=35\%$, $\frac{1}{5}=20\%$
$35\%+20\%=55\%$
$100\%-55\%=45\%$ play an album.
1 mark *for converting both fractions to a percentage;* ***1 mark*** *for subtracting from 100%;* ***1 mark*** *for correct answer. Total 3 marks.*

5. Lin's class: $\frac{6}{25}=\frac{24}{100}=24\%$
Jay's class: $\frac{8}{32}=\frac{1}{4}=\frac{25}{100}=25\%$
Lin is not correct. Jay's class has a (slightly) higher proportion of students who read fantasy books.
1 mark *for finding either 24% or 25% or for giving both fractions with a common denominator;* ***1 mark*** *for a complete, correct explanation.*

Page 14, Powers and roots

1. a $4^2=16$ **b** $2^3=8$
c $\sqrt{49}=7$ **d** $\sqrt[3]{27}=3$
1 mark *for each correct answer.*

2. a $2\times\sqrt{9+16}+6^2=2\times\sqrt{25}+36=2\times5+36$
$=10+36=46$
1 mark *for* $\sqrt{25}=5$ *and* $6^2=36$ *first;* ***1 mark*** *for multiplying before adding;* ***1 mark*** *for correct answer. Total 3 marks.*

b $3^4-6\times\sqrt[3]{8}+50\div5^2=81-6\times2+50\div25$
$=81-12+2=71$
1 mark *for* $3^4=81$, $\sqrt[3]{8}=2$ *and* $5^2=25$ *first;* ***1 mark*** *for multiplying and dividing before adding and subtracting;* ***1 mark*** *for correct answer. Total 3 marks.*

3. Side length: $\sqrt{121}=11$ cm
Perimeter: $4\times11=44$ cm
1 mark *for side length of 11 cm;* ***1 mark*** *for correct perimeter.*

4. a $\frac{\sqrt[3]{3.6^2+91\times3.7}}{\sqrt{6.25}+1.8^3}=0.845\,537\,207$
b 0.845 537 207 = 0.846 to 3 sf
1 mark *for each correct answer.*

5. Volume of box = $8^3=512\,\text{cm}^3$
Volume of small cubes = $2^3=8\,\text{cm}^3$
$512\div8=64$ cubes will fit in the box.
Alternatively, $8\div2=4$, so 4 cubes fit along each side of the box and the total number of cubes that fit is $4^3=64$ cubes.
1 mark *for volume of box (or for finding that 4 cubes fit along each side);* ***1 mark*** *for volume of small cubes (or for* 4^3*);* ***1 mark*** *for correct answer. Total 3 marks.*

Page 15, Calculating with indices

1. a $7^2\times7^5=7^{2+5}=7^7$ **b** $9^{10}\div9^4=9^{10-4}=9^6$
c $2^5\times2^{-3}=2^{5+(-3)}=2^2$ **d** $7^{-2}\div7^{-6}=7^{-2-(-6)}=7^4$
e $(3^4)^4=3^{4\times4}=3^{16}$
1 mark *for each correct answer.*

2. a $(8^2)^{-5}=8^{2\times(-5)}=8^{-10}$
1 mark *for correct answer.*
b $\frac{9^3}{9^2\times9^4}=\frac{9^3}{9^6}=9^{3-6}=9^{-3}$
1 mark *for* 9^6 *in the denominator;* ***1 mark*** *for correct answer.*
c $(2^7\times2^4)^{-1}=(2^{7+4})^{-1}=(2^{11})^{-1}=2^{11\times(-1)}=2^{-11}$
1 mark *for* 2^{11} *in the bracket;* ***1 mark*** *for correct answer.*

3. Area = $10^3\times10^2=10^5\,\text{cm}^2$
1 mark *for multiplying the two lengths;* ***1 mark*** *for correct answer.*

4. Peter has multiplied the bases. Since the bases are different this cannot be simplified as a simple power of 10
1 mark *for a correct explanation.*

5. a $13^0=1$
1 mark *for correct answer.*
b $8^{-1}=\frac{1}{8}$
1 mark *for correct answer.*
c $\left(\frac{2}{5}\right)^3=\frac{2^3}{5^3}=\frac{8}{125}$
1 mark *for correct answer.*
d $\left(\frac{1}{4}\right)^{-2}=4^2=16$
1 mark *for 4;* ***1 mark*** *for correct answer.*

Page 16, Factors and multiples

1. a 3 or 6 **b** 18 or 36 **c** 24 or 36
d 8 **e** 10 and 30 **f** Any two of 3, 6, 10 and 30
1 mark *for each correct answer. Just one correct answer needed to get each mark.*

2. Multiples of 9: 9, 18, 27, (36), 45, …
Multiples of 12: 12, 24, (36), 48, …
LCM(9, 12) = 36
1 mark *for any correct common multiple;* ***1 mark*** *for correct answer.*

3. Factors of 18: 1, 2, 3, (6), 9, 18
Factors of 12: 1, 2, 3, 4, (6), 12
HCF(18, 12) = 6
1 mark *for any correct common factor;* ***1 mark*** *for correct answer.*

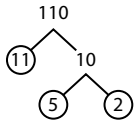
4. Multiples of 6: 6, 12, 18, 24, (30), 36, …
Multiples of 5: 5, 10, 15, 20, 25, (30), 35, …
Multiples of 15: 15, (30), 45, …
LCM(6, 5 and 15) = 30
The alarms next beep together after 30 minutes.
1 mark *for any correct common multiple;* ***1 mark*** *for correct answer.*

5. Multiples of 4: 4, 8, (12), 16, (20), …
Factors of 60: 1, 2, 3, 4, 5, 6, 10, (12), 15, (20), 30, 60
HCF(12, 20) = 4 and LCM(12, 20) = 60
The two numbers are 12 and 20
1 mark *for writing two numbers with a HCF of 4 or two numbers with a LCM of 60;* ***1 mark*** *for correct answer.*

Page 17, Prime factor decomposition

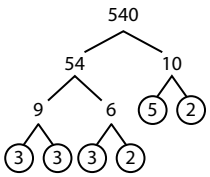
You might use a factor tree in your working with the same start and end as shown here but with different middle branches.

1.



$110 = 2 \times 5 \times 11$
1 mark *for finding or listing the prime factors;* ***1 mark*** *for correct answer.*

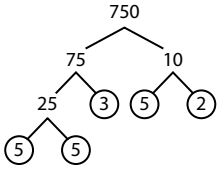
2. a



$540 = 2^2 \times 3^3 \times 5$
1 mark *for finding or listing the prime factors;*
1 mark *for correct answer.*

b Since $15 = 3 \times 5$ and both 3 and 5 are prime factors of 540, 540 must be divisible by 15
1 mark *for a correct explanation.*

3. a



$750 = 2 \times 3 \times 5^3$
1 mark *for finding or listing the prime factors;*
1 mark *for correct answer.*

b Since $4 = 2 \times 2$, but 750 only contains the factor of 2 once, 750 is not divisible by 4
1 mark *for a correct explanation.*

4. a $2 \times 3^2 \times 7 \times 13$ is even since 2 is a prime factor.
1 mark *for correct answer.*

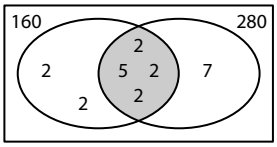
b To double a number, you multiply by 2, so the prime factor decomposition of a number twice as big will have another factor of 2. This is $2^2 \times 3^2 \times 7 \times 13$
1 mark *for correct answer.*

5. The prime factors of each number are:
$4 = 2 \times 2$; $5 = 5$; $6 = 2 \times 3$
Any number divisible by 4, 5 and 6 must have at least two 2s, one 5 and a 3, so the smallest such number is $2^2 \times 3 \times 5$
1 mark *for listing the prime factors of 4 and 6;* ***1 mark*** *for correct answer.*

Page 18, Finding HCF and LCM

1. a $160 = 2^5 \times 5$
1 mark *for finding or listing the prime factors;*
1 mark *for correct answer.*

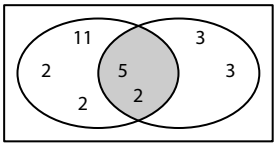
b $280 = 2^3 \times 5 \times 7$
A Venn diagram showing the prime factors looks like this:



$HCF(160, 280) = 2^3 \times 5 = 40$
1 mark *for multiplying the common factors;* ***1 mark*** *for correct answer.*

c From the Venn diagram,
$LCM(160, 280) = 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 7 = 1120$
1 mark *for multiplying all the appropriate factors;*
1 mark *for correct answer.*

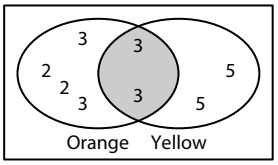
2.



a $HCF = 2 \times 5 = 10$

b $LCM = 2 \times 2 \times 11 \times 2 \times 5 \times 3 \times 3 = 3960$
1 mark *for correct Venn diagram or alternative method;*
1 mark *for HCF;* ***1 mark*** *for LCM. Total 3 marks.*

3. $225 = 3^2 \times 5^2$
$324 = 2^2 \times 3^4$
A Venn diagram would look like this:



The HCF of the two numbers is 9, so Fran can sort her books into piles of a maximum of 9 if they are to be the same size.
1 mark *for the prime factors of 225;* ***1 mark*** *for the prime factors of 324;* ***1 mark*** *for correct answer. Total 3 marks.*

Page 19, Standard form

1. a $1.56 \times 10^8 = 156\,000\,000$ **b** $8.02 \times 10^{-3} = 0.008\,02$
1 mark *for each correct answer.*

2. a $48\,000\,000\,000 = 4.8 \times 10^{10}$ **b** $0.000\,0703 = 7.03 \times 10^{-5}$
c $95 \times 10^6 = 9.5 \times 10^7$ **d** $0.68 \times 10^{-4} = 6.8 \times 10^{-5}$
1 mark *for each correct answer.*

3. 150 000 000 km = 1.5×10^8 km
1 mark *for correct answer.*

4. Putting all the numbers in either standard or ordinary form:
$2.1 \times 10^4 = 21\,000$, $2.3 \times 10^5 = 230\,000$,
$0.21 \times 10^4 = 2.1 \times 10^3 = 2100$, $2200 = 2.2 \times 10^3$
The order, starting with the biggest, is 2.3×10^5, 2.1×10^4, 2200, 0.21×10^4
1 mark *for converting at least two of the numbers correctly to an alternative form;* ***1 mark*** *for any three in the correct order;* ***1 mark*** *for all in the correct order. Total 3 marks.*

5. Virus: $0.000\,000\,05 = 5 \times 10^{-8}$ m
Bacteria cell: $4 \times 10^{-7} = 0.000\,0004$ m
The virus is smaller.
1 mark *for getting both numbers in the same form;*
1 mark *for correct conclusion.*

Page 20, Calculating with standard form

1. a 6×10^2 **b** 2×10^{-4}
c 8×10^{-2} **d** 6×10^7
1 mark *for each correct answer.*

2. Everly is not correct. 18 is not between 1 and 10 so it is not in standard form. The correct answer is 1.8×10^7
1 mark *for 'No' and correct explanation.*

3. $30\,000 = 3 \times 10^4$
$(7 \times 10^{-2}) \times (3 \times 10^4) = 21 \times 10^{(-2)+4} = 21 \times 10^2 = 2.1 \times 10^3$
1 mark *for 21×10^2;* ***1 mark*** *for correct answer.*

4. a $(5 \times 10^4) + (6 \times 10^5) = 50\,000 + 600\,000 = 650\,000$
$= 6.5 \times 10^5$
1 mark *for converting to ordinary numbers or the same power of 10;* ***1 mark*** *for correct answer.*

b $(9 \times 10^{-3}) - (3 \times 10^{-4}) = 0.009 - 0.0003 = 0.0087$
$= 8.7 \times 10^{-3}$
1 mark *for converting to ordinary numbers or the same power of 10;* ***1 mark*** *for correct answer.*

c $(2.1 \times 10^8) \times (3 \times 10^{-5}) = 6.3 \times 10^{8+(-5)} = 6.3 \times 10^3$
1 mark *for 10^3;* ***1 mark*** *for correct answer.*

d $(8.2 \times 10^3) \div (4.1 \times 10^7) = 2 \times 10^{3-7} = 2 \times 10^{-4}$
1 mark *for 10^{-4};* ***1 mark*** *for correct answer.*

Page 21, Terms and expressions

1. a $n - 2$ **b** $n - 2 + 11 = n + 9$
1 mark *for each correct answer.*

2. $3g$
1 mark *for correct answer.*

3. $2x + 3y$
1 mark *for $2x$ or $3y$;* ***1 mark*** *for correct answer.*

4. $7 + 4p + 3q$
1 mark *for correct answer (the three terms can be written in any order).*

5. a $2a + 3b = 2 \times 5 + 3 \times 2 = 10 + 6 = 16$
b $10 - c = 10 - (-4) = 14$
c $\frac{8a}{c} = \frac{8 \times 5}{-4} = \frac{40}{-4} = -10$
d $ac + b = 5 \times (-4) + 2 = -20 + 2 = -18$
For each part, ***1 mark*** *for substituting the numbers in the correct place;* ***1 mark*** *for correct answer.*

Page 22, Simplifying expressions

1. a $2x + 3x - x = 4x$
1 mark *for correct answer.*

b $3p - 5q + 7q - 2q + 4p = 7p$
1 mark *for $7p$ or $0q$;* ***1 mark*** *for correct answer.*

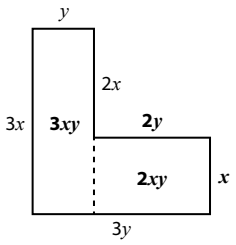
c $7 + 5t - 2 - 9t = 5 - 4t$
1 mark *for 5 or $-4t$;* ***1 mark*** *for correct answer.*

2. a $x^2 + 4x + 3x^2 - 6x + 1 = 4x^2 - 2x + 1$
1 mark *for $4x^2$ or $-2x$;* ***1 mark*** *for correct answer.*

b $9mn - 2m^2 + 7nm + 11m^2 = 16mn + 9m^2$
1 mark *for $16mn$ or $9m^2$;* ***1 mark*** *for correct answer (terms can be written in any order).*

3. $2x + 3x + x + 2 + x - 1 = 7x + 1$
1 mark *for adding all the sides together;* ***1 mark*** *for correct answer.*

4.



$3xy + 2xy = 5xy$
1 mark *for $3xy$;* ***1 mark*** *for $2xy$;* ***1 mark*** *for correct answer. Total 3 marks.*
Note that there are alternative methods.

5. Nikita: x, Gabriella: $2x$, Paulo: $x + 2x + 3 = 3x + 3$
Total number of figures: $x + 2x + 3x + 3 = 6x + 3$
1 mark *for $2x$;* ***1 mark*** *for $3x + 3$;* ***1 mark*** *for correct answer. Total 3 marks.*

Page 23, Formulae

1. a Cost = $80 + 5 \times 15 = 80 + 75 = £155$
1 mark *for substituting in;* ***1 mark*** *for correct answer.*

b $\frac{275 - 80}{15} = 13$ hours
1 mark *for 195 or subtracting 80 first;* ***1 mark*** *for correct answer.*

2. a $d = \frac{4+5}{2} = \frac{9}{2} = 4.5$
1 mark *for substituting in;* ***1 mark*** *for correct answer.*

b $d = 4^2 - 3 \times 4 = 16 - 12 = 4$
1 mark *for substituting in;* ***1 mark*** *for correct answer.*

c $4 = 2d - 12$
$2d = 4 + 12 = 16$
$d = \frac{16}{2} = 8$
1 mark *for substituting in;* ***1 mark*** *for rearranging;*
1 mark *for correct answer. Total 3 marks.*

3. $a = \frac{24 - 0}{8} = \frac{24}{8} = 3$ m/s^2
1 mark *for substituting in;* ***1 mark*** *for correct answer.*

4. $C = 100 + 40t$ or $C = 40t + 100$
1 mark *for $40t + 100$;* ***1 mark*** *for correct answer.*

5. Number of tablets = $\frac{17.5}{3.5} = 5$
1 mark *for substituting in;* ***1 mark*** *for correct answer.*

Page 24, Equations and identities

1.

Expression	Formula	Equation	Identity
e, g	b, f	(a), c	d, h

1 mark *for each correct answer. Total 7 marks.*

2. A, **D**, **E**
1 mark *for each correct answer. Total 3 marks.*