

1 Number

1.1 Calculations

Key points

- The priority of operations is: Brackets, Indices, Division and Multiplication, Addition and Subtraction.
- Adding and subtracting are inverse operations; multiplying and dividing are inverse operations. You can use inverse operations to check answers.
- Finding the square root is the inverse of finding the square.
- Finding the cube root is the inverse of finding the cube.

△ Purposeful practice 1

Calculate

1 $2 \times 4 + 8$

2 $8 + 2 \times 4$

3 $(8 + 2) \times 4$

4 $(8 - 2) \times 4$

5 $8 - 2 \times 4$

6 $-2 \times 4 + 8$

7 $\frac{8 \times 4}{2}$

8 $\frac{8}{2} \times 4$

9 $8 \times \frac{4}{2}$

10 $\frac{8}{2} \times \frac{4}{2}$

11 $\frac{8}{4} \times \frac{4}{2}$

12 $\frac{8}{4} \times \frac{4}{4}$

Reflect and reason

Why do **Q7–9** have the same answer?

△ Purposeful practice 2

Calculate

1 $5 + 2 - 2$

2 $5 \times 2 - 2$

3 $5 \times 2 \div 2$

4 $5^2 \div 2$

5 $5^2 \div 5$

6 $\sqrt{5^2}$

Reflect and reason

Why do **Q1** and **Q3** give the same answer?

Does it matter if you replace the 5 in each calculation with a different number? Explain.

△ Purposeful practice 3

Write a calculation using the inverse operation to check

1 $11 \times 3 = 33$

2 $11^3 = 1331$

3 $11^3 + 3 = 1334$

4 $(11 + 3)^3 = 2744$

5 $11^3 \times 3 = 3993$

6 $\frac{11^3 \times 3}{11} = 363$

Reflect and reason

Did you use your answer to **Q2** to check the answer to **Q3**? How?

Did you use your answer to **Q5** to check the answer to **Q6**? How?

Problem-solving practice

1 Use all the numbers 1, 2, 3, 4, 5, brackets and the operations + and \times .
Write one calculation that gives the answer 29.

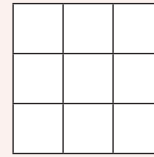
2 $7 + 5 \times 3 + 8 = 30$.

Insert a pair of brackets to change the answer to 62.

3 Copy this 3×3 grid.

Write the numbers $-4, -3, -2, -1, 0, 1, 2, 3, 4$ into the grid.

Every row, column and diagonal should total 0.

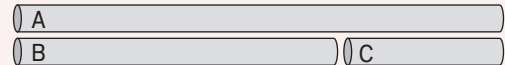


4 Here are three poles.

Pole A is equal in length to the sum of poles B and C.

A is 18 m long. C is half the length of B.

What is the length of C?



5 Place the numbers 1, 7 and 8 in the boxes to make the calculation correct.

$$\frac{2 \times (11 - \square)}{\square} = \square$$

6 Sarah wants to find out how much it will cost to decorate her kitchen.

A tin of paint costs £4. She needs 80 tins of paint.

She says the paint will cost £20 because $80 \div £4$ is £20.

Is Sarah correct? Show your method.

7 Use the numbers 3, 4, 5 and 6 to create two calculations that give the same answer.

How many ways can you do this?

Exam practice

1 Claire and four friends go on a weekend holiday.
The five friends will share the costs for the holiday equally.
Here are the costs for the holiday.

£430 for the hotel

£1075 for the flights

£75 for the cost of airport transfers

Work out how much Claire has to pay for her share of the costs.

(3 marks)

Adapted from IMA1/1F, June 2018, Q10

2 Work out $5 + 3 \times 11$

(1 mark)

Adapted from IMA1/1F, November 2017, Q2

Exam feedback

ResultsPlus

Q1: Most students who achieved a **Grade 2** or above answered a similar question well.

Q2: Whilst this question tested the priority of operations, many students gave an answer of 88 and did not follow the rules of arithmetic.

1.2 Decimal numbers

Key points

- To divide by a decimal, multiply both numbers by powers of 10 (10, 100, ...) until you have a whole number to divide by. Then work out the division.
- To round a number to 1 decimal place (1 d.p.), look at the digit in the 2nd decimal place. If it is 5 or more, round up.

Purposeful practice 1

Calculate

- | | | | |
|---------------------|---------------------|---------------------|----------------------|
| 1 15×20 | 2 15×2 | 3 15×0.2 | 4 15×0.02 |
| 5 1.5×0.02 | 6 15×0.002 | 7 $15 \div 5$ | 8 $15 \div 0.5$ |
| 9 $15 \div 0.05$ | 10 $1.5 \div 0.05$ | 11 $0.15 \div 0.05$ | 12 $0.015 \div 0.05$ |

Reflect and reason

Which calculations from **Q7–12** give the same answer? Why?

Purposeful practice 2



Calculate

- | | | | |
|--------------------|--------------------|-------------------|------------------|
| 1 $10 \div 5$ | 2 10×0.5 | 3 10×0.2 | 4 $10 \div 2$ |
| 5 $20 \div 5$ | 6 20×0.5 | 7 20×0.2 | 8 $20 \div 2$ |
| 9 4×0.25 | 10 4×0.4 | 11 $4 \div 4$ | 12 $4 \div 0.4$ |
| 13 $4 \div 0.04$ | 14 4×25 | 15 $1 \div 0.04$ | 16 1×25 |
| 17 $0.1 \div 0.04$ | 18 $0.1 \div 0.05$ | | |

Reflect and reason

Which calculations form pairs that give the same answer?

Rewrite the decimals as fractions in these calculations. What pattern do you notice?

Purposeful practice 3

Round these numbers to 1 decimal place.

- | | | | |
|---------|---------|----------|-----------|
| 1 3.45 | 2 3.54 | 3 3.545 | 4 11.545 |
| 5 0.545 | 6 3.78 | 7 3.88 | 8 3.98 |
| 9 10.98 | 10 0.98 | 11 0.098 | 12 0.0098 |
| 13 9.80 | 14 9.08 | 15 19.98 | |

Reflect and reason

Jack says that the answer to **Q3** is 3.6. What mistake has he made?

Did you change the units digit in **Q8**, **Q9** or **Q10**? Explain.

Problem-solving practice

- Harry buys a pizza for £18.68. Harry shares the pizza equally with three of his friends.
 - How much should they each pay?
 - They want to give a tip worth 0.1 of the price of the pizza. How much should they each pay as a tip? Round your answer to the nearest penny.
- A number rounded to 1 decimal place is 3.8.
 - What is the largest number it could be?
 - What is the smallest number it could be?
- Which of these divisions will give the same answer as $864 \div 12$?
A $86.4 \div 12$ **B** $864 \div 1.2$ **C** $86.4 \div 1.2$ **D** $8.64 \div 0.12$
E $8.64 \div 1.2$ **F** $0.864 \div 0.12$ **G** $86.4 \div 0.12$
- Bill says that multiplying always makes a number bigger. Write a calculation to show that Bill is incorrect.
- A horse needs 1.5 acres of land to graze.
Each acre of land costs £40.50 per month to rent.
Kris has 5 horses.
How much will Kris pay each month for the land for his 5 horses?
- To convert a number from pounds to kilograms, divide by 2.2.
Advaith has 33 pounds of flour. He needs 20 kg of flour to bake his cupcakes.
Does he have enough flour?
- Penny wants to buy some packs of football stickers.
Each pack costs £1.45. Penny has £30.
What is the largest number of packs of football stickers Penny can buy?
- Sam makes some strawberry tarts.
Each tart costs £1.18 to make.
Sam sells 20 tarts for £1.50 each. How much money does Sam make?

Exam practice

- Write 4.18 correct to 1 decimal place. (1 mark)
Adapted from IMA1/2F, May 2018, Q2
- Work out 62.5×3.4 (3 marks)
Adapted from IMA1/1F, June 2017, Q23

Exam feedback

ResultsPlus

Q1: Most students who achieved a **Grade 3** or above answered a similar question well.

Q2: Most students who achieved a **Grade 5** or above answered a similar question well.

1.3 Place value

Key points

- The first significant figure (s.f.) is the one with the highest place value.
- Rounded numbers must have the same place value as the original number.
For numbers greater than zero, this means you may need to put in zeros as 'place fillers'.
- To estimate the answer to a calculation, you can round every number to 1 s.f.

△ Purposeful practice 1

Round

- | | | | | | |
|----|--------------------|----|-------------------|----|-------------------|
| 1 | 127 to 1 s.f. | 2 | 172 to 1 s.f. | 3 | 1270 to 1 s.f. |
| 4 | 1279 to 1 s.f. | 5 | 1.27 to 1 s.f. | 6 | 0.127 to 1 s.f. |
| 7 | 0.00127 to 1 s.f. | 8 | 0.00172 to 1 s.f. | 9 | 0.00172 to 2 s.f. |
| 10 | 0.001072 to 2 s.f. | 11 | 0.00102 to 2 s.f. | 12 | 3.00172 to 2 s.f. |

Reflect and reason

Round the numbers in **Q5–12** to 1 decimal place. Do you get the same answers?
In **Q10**, which zero is significant? Why is this zero significant?

△ Purposeful practice 2

Estimate

- | | | | | | |
|---|---------------------------------|---|-------------------------------------|---|-------------------------------------|
| 1 | 127×172 | 2 | $172 \div 12$ | 3 | $1279 \div 1270$ |
| 4 | $\frac{1270}{1.72}$ | 5 | $\frac{1270 + 172}{1.27}$ | 6 | $\frac{1270 \times 1.27}{1.72}$ |
| 7 | $\frac{1720 \times 1.72}{1.27}$ | 8 | $\frac{1270 + 172}{1.27 + 0.00102}$ | 9 | $\frac{1270 + 172}{1.27 + 3.00172}$ |

Reflect and reason



Work out the exact answers to **Q6** and **Q7**. For each answer, is your estimate an overestimate or underestimate? Why?

△ Purposeful practice 3

- 1 Use the information that $32 \times 27 = 864$ to work out the missing numbers.
- | | | | | | | | |
|---|----------------------------|---|----------------------------|---|---------------------------|---|----------------------------|
| a | $320 \times 27 = \square$ | b | $32 \times \square = 8640$ | c | $3.2 \times 27 = \square$ | d | $32 \times \square = 86.4$ |
| e | $3.2 \times \square = 864$ | f | $864 \div 32 = \square$ | g | $864 \div \square = 32$ | h | $86.4 \div \square = 32$ |
- 2 Use the information that $60 \times 5 = 300$ to work out the value of
- | | | | | | | | |
|---|---------------|---|---------------|---|---------------|---|---------------|
| a | 59×5 | b | 59×6 | c | 59×4 | d | 6×50 |
|---|---------------|---|---------------|---|---------------|---|---------------|

Reflect and reason

Were you able to use the same strategy in **Q2** that you used in **Q1**? Explain.

Problem-solving practice

- Max has 12 months to save £5775 before he goes to university.
 - Estimate how much Max should save each month.
 - If Max saves as much as you estimated in part a, will he save enough? Explain.
- Carrie earns £2140 a month and Arjun earns £1389.94 a month. They want to buy a house worth £210 985. They can afford it if it costs less than five times their yearly earnings.
 - Estimate whether they can afford the house. Show your working.
 - Is your answer to part a an overestimate or an underestimate? Give reasons.
- One cup of flour weighs 4.25 ounces. Reyhan needs 3.2 cups of flour to bake a cake.
 - Estimate how many ounces of flour Reyhan needs.
 - Is your answer an overestimate or an underestimate? Explain.
 - Reyhan finds out that his type of flour weighs more than 4.25 ounces. One cup weighs 4.7 ounces. How does this change your answer to part a?
- Given that $54 \times 87 = 4698$, write a calculation with the answer 4.698.
- Sam estimates $\frac{378 \times 56}{0.5}$ by finding 400×60 and halving the answer. Sam is wrong. What should Sam have done?
- Shan can swim 82.3 metres in 98.76 seconds. Estimate how many minutes it would take Shan to swim 1000 metres.

Exam practice

- Billy and Sarah use a calculator to work out $\frac{236}{3.72^2 + 4.06}$
Billy's answer is 13.1855
Sarah's answer is 131.855
One of these answers is correct.
Use approximations to find out which answer is correct. **(3 marks)**
Adapted from, IMA1/1F, November 2017, Q20
- Write 86.573 correct to one significant figure. **(1 mark)**
Adapted from IMA1/2F, June 2017, Q2

Exam feedback

ResultsPlus

- Q1:** A similar question was answered in a variety of ways. An approximation was required but some students tried to work out the actual calculation.
- Q2:** In a similar question, many students gave an answer of 86.6, rounding to 1 decimal place instead of 1 significant figure.

1.4 Factors and multiples

Key points

- A prime number has exactly two factors, itself and 1.
- The highest common factor (HCF) of two numbers is the largest number that is a factor of both numbers.
- The lowest common multiple (LCM) of two numbers is the smallest number that is a multiple of both numbers.

△ Purposeful practice 1

- 1 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30.

Which of these numbers are

- | | |
|--|-------------------------|
| a multiples of 2 (in the 2 times table) | b multiples of 3 |
| c multiples of 5 | d multiples of 7 |
| e multiples of 11 | f prime numbers |

- 2 List the prime numbers between 30 and 40.
3 List the prime numbers between 40 and 50.

Reflect and reason

In **Q1**, how can you use the answers to parts **a–e** to help you answer part **f**? Explain.

△ Purposeful practice 2

- 1 List all the factors of

- | | | | | |
|------------|------------|-------------|-------------|-------------|
| a 6 | b 5 | c 30 | d 60 | e 45 |
|------------|------------|-------------|-------------|-------------|

- 2 List the first five multiples of

- | | | | | |
|------------|------------|-------------|-------------|-------------|
| a 6 | b 5 | c 30 | d 60 | e 45 |
|------------|------------|-------------|-------------|-------------|

Reflect and reason

In **Q1**, what do you notice about the factors of 5 and 6 compared with the factors of 30?

In **Q2**, is it possible to list all the multiples of each number? Explain.

△ Purposeful practice 3

- 1 Use your answers from **Q1** of Purposeful practice 2 to find the HCF of

- | | | | | |
|--------------------|-------------------|--------------------|------------------|------------------------|
| a 30 and 45 | b 30 and 6 | c 30 and 60 | d 5 and 6 | e 30, 45 and 60 |
|--------------------|-------------------|--------------------|------------------|------------------------|

- 2 Use your answers from **Q2** of Purposeful practice 2 to find the LCM of

- | | | | | |
|--------------------|-------------------|--------------------|------------------|------------------------|
| a 30 and 45 | b 30 and 6 | c 30 and 60 | d 5 and 6 | e 30, 45 and 60 |
|--------------------|-------------------|--------------------|------------------|------------------------|

Reflect and reason

In **Q1** and **Q2**, how can you use the answers to parts **a–c** to answer part **e**? Explain.

Problem-solving practice

- 1 Write two numbers with a HCF of 6. Is there more than one answer?
- 2 The HCF of two numbers is 10. The LCM is 120. What could the two numbers be?
- 3 Jamie says that 6 is a factor of 45. How do you know Jamie is wrong?
- 4 Tom says that if you square a prime number, the answer is always odd. Is Tom right? Give an example.
- 5 Is 8 a factor of 254? Show how you know.
- 6 Is 678 a multiple of 3? Show how you know.
- 7 There is a bus to Doncaster every 20 minutes.
A bus to Sheffield leaves from the same stop every 15 minutes.
A bus to Doncaster and a bus to Sheffield both leave at 8 am.
What is the next time both buses will leave together?
- 8 Veggie burgers come in packs of 8. Each pack of veggie burgers costs £3.
Buns come in packs of 12. Each pack of buns costs £2.
How much would you need to spend to buy an equal number of buns and veggie burgers?
- 9 Luca is 1.5 times as old as Paul. The LCM of their ages is 90. How old are Luca and Paul?
- 10 Mr Hunt prepares fruit boxes for a school trip. He wants each box to be the same with no fruit left over.
Mr Hunt has 40 apples and 90 strawberries.
What is the greatest number of boxes he can prepare?

Exam practice

- 1 Here is a list of numbers
1, 2, 4, 9, 16, 17, 18, 24, 25
 - a From the numbers in the list, write down a number that is a multiple of both 3 and 8.
 - b Write down all the prime numbers in the list. **(2 marks)**

Adapted from IMA1/2F, June 2017, Q8b and Q8c
- 2 Maja adds together two different prime numbers.
Her answer is a multiple of 6.
Find two prime numbers that Maja could have used. **(2 marks)**

Adapted from IMA1/3F, November 2017, Q9

Exam feedback

ResultsPlus

Q1a: Most students who achieved a **Grade 1** or above answered a similar question well.

Q1b: Most students who achieved a **Grade 5** answered a similar question well.

Q2: In a similar question, many students incorrectly gave 1 as one of the two prime numbers.

1.5 Squares, cubes and roots

Key points

- Expressions with square roots like $3\sqrt{2}$ are in surd form.
- $3\sqrt{2}$ means $3 \times \sqrt{2}$.
- An answer in surd form is an exact value (it has not been rounded up or down).

Purposeful practice 1

Evaluate

- | | | | | | | | | | | | | | |
|---|-------|---|-------|----|-------|----|----------|----|----------|----|----------|----|----------|
| 1 | 2^2 | 2 | 3^2 | 3 | 4^2 | 4 | $(-2)^2$ | 5 | $(-3)^2$ | 6 | -3^2 | 7 | $(-4)^2$ |
| 8 | 2^3 | 9 | 3^3 | 10 | 4^3 | 11 | $(-2)^3$ | 12 | $(-3)^3$ | 13 | $(-4)^3$ | 14 | -4^3 |

Reflect and reason

What happens to the sign when you square a negative number? What about when you cube it? Why?

Purposeful practice 2

1 Evaluate

- a $\sqrt{4}$ b $\pm\sqrt{4}$ c $\pm\sqrt{9}$ d $\pm\sqrt{16}$ e $\sqrt[3]{27}$ f $\sqrt[3]{-27}$

2 Evaluate

- a $\sqrt{1.6}$ to 3 s.f. b $\sqrt{0.16}$ c $\sqrt[3]{2.7}$ to 3 s.f. d $\sqrt[3]{0.27}$ to 3 s.f.
e $\sqrt[3]{0.027}$ f $\sqrt[3]{0.000027}$ g $\sqrt{2.5}$ to 3 s.f. h $\sqrt{0.25}$
i $\sqrt{0.025}$ to 3 s.f. j $\sqrt[3]{8}$ k $\sqrt[3]{0.08}$ to 3 s.f. l $\sqrt[3]{0.008}$

Reflect and reason

How many possible answers are there for Q1e?

Predict the number that gives the answer 0.04 when square rooted.

Check your prediction on a calculator.

Purposeful practice 3

Work out these. Give your answers in surd form using the $\boxed{S \leftrightarrow D}$ key on your calculator.

- | | | | | | | | | | |
|---|------------------------|---|------------------------|---|-----------------------------|---|----------------------------|----|----------------------------|
| 1 | $\sqrt{9} + \sqrt{16}$ | 2 | $\sqrt{9+16}$ | 3 | $\sqrt{9} \times \sqrt{9}$ | 4 | $\sqrt{3} \times \sqrt{3}$ | 5 | $\sqrt{3} + \sqrt{3}$ |
| 6 | $\sqrt{12} + \sqrt{3}$ | 7 | $\sqrt{12} - \sqrt{3}$ | 8 | $\sqrt{12} \times \sqrt{3}$ | 9 | $\sqrt{12} \div \sqrt{3}$ | 10 | $\sqrt{4} \times \sqrt{3}$ |

Reflect and reason

Why might surd form be more useful when you are working out the answers to calculations?

Problem-solving practice

- 1 The cube root and the square root of a number are the same.
What is the number?
- 2 The length of one side of a square is 4.6 cm.
What is the area of the square?
- 3 The area of a square is 36 cm^2 .
What is the perimeter of the square?
- 4 A rectangle measures 2 cm by 8 cm.
What is the side length of a square with the same area?
- 5 Two consecutive numbers are squared.
The difference between their squares is 7.
What are the two original numbers?
- 6 Two consecutive numbers are squared.
The square root of the difference between the two square numbers is 3.
What are the two original numbers?
- 7 Fill in the box: $6^2 + 8^2 = \square^2$
- 8 The area of one square is 49 cm^2 .
The area of another square is 0.49 cm^2 .
How many times longer is each side of the larger square?
- 9 Lexie says that the cube of a number will always be greater than the square of the same number.
Give an example to prove Lexie wrong.
- 10 Freda says, 'Square rooting a number makes it smaller'.
Give an example to prove Freda wrong.

Exam practice

- 1 Work out 3^3 (1 mark)
Adapted from IMA1/1F, May 2017, Q1
- 2 Here are three numbers.
15 11 23
Jordan says that the sum of the three numbers is a square number. Is Jordan correct?
You must show how you get your answer. (2 marks)
Adapted from IMA1/3F, Specimen Papers, Set 1, Q12
- 3 Work out $(-5)^3$ (1 mark)
Adapted from IMA1/1F, Specimen Papers, Set 1, Q5

Exam feedback

ResultsPlus

Q1: Most students who achieved a **Grade 3** or above answered a similar question well.

1.6 Index notation

Key points

- In index notation, the number that is being multiplied by itself is called the base. The number written above the base is called the index or the power. The index tells you the number of times that the base must be multiplied by itself.

base $\rightarrow a^n$ \swarrow index or power

- To multiply powers of the same number, add the indices.
- To divide powers of the same number, subtract the indices.

Purposeful practice 1

Write each product using powers.

1 $3 \times 3 \times 3 \times 3$

2 $3 \times 3 \times 3 \times 3 \times 5 \times 5$

3 $3 \times 5 \times 3 \times 3 \times 5 \times 3$

4 $3 \times 3 \times 3 \times 3 \times 5 \times 5 \times 5 \times 5$

5 $3 \times 5 \times 3 \times 5 \times 3 \times 5 \times 3 \times 5$

Reflect and reason

Can you write **Q2–5** as a power with a single base? Explain.

Purposeful practice 2

Write as a single power.

1 $6^2 \times 6 \times 6 \times 6$

2 $6^2 \times 6^2 \times 6$

3 $5^3 \times 5^3$

4 $(5^3)^2$

5 $(5^3)^4$

6 $(5^3)^2 \times 5$

7 $5^5 \div 5^2$

8 $\frac{5^7}{5^3}$

9 $\frac{5^7 \times 5^3}{5^3}$

10 $\left(\frac{5^7 \times 5^3}{5^3}\right)^2$

11 $\frac{(5^7 \times 5^3)^2}{5^3}$

12 $\frac{5^7 \times 5^3}{(5^3)^2}$

Reflect and reason

Why do you 'add the indices' when multiplying powers of the same number? Use your answers to Purposeful practice 1 and 2 to explain.

Purposeful practice 3

1 Write as a power of 10

a 100

b 1000

c 10 000

d 10

e 1

f 0.1

g 100×1000

h 0.01

2 Write with powers of 10

a 3×100

b 5×100

c 5.3×1000

d 3×0.01

e 3.8×0.001

Reflect and reason

Convert the decimals in **Q1f** and **Q1h** to fractions.

What do you notice about the denominator and the power of 10?

Problem-solving practice

1 Write $2 \times \sqrt{4}$ as a single power of 2.

2 Write $\frac{9 \times 3^2}{\sqrt{81}}$ as a single power of 3.

3 Find the missing value.

$$3^3 - \square = 3^2$$

4 $\frac{3 \times 3 \times 5 \times 15}{3}$

Can this be written as a single power? Explain.

5 Change one number so that this calculation can be written as a single power of 10.

$$\frac{(10^2)^3 \times 4 \times 3}{40 \times 2}$$

6 Given that $3^k = 3^8 \div 3^5$, evaluate 5^k

7 $p^3(p^8 \div p^5) = p^g$

Find the value of g .

8 Amelia says that $4^3 + 5^3 = 9^3$.

Is Amelia correct? Explain.

9 Clark multiplied a number by 3. He then multiplied the answer by 3 again.

Clark says that this is the same as multiplying the original number by 6.

Allison says he is wrong and that this is the same as multiplying the original number by 3^2 .

Who is correct? Explain.

Exam practice



1 a $3^2 \times 3^x = 3^{12}$

Find the value of x .

(1 mark)

b $(4^3)^y = 4^6$

Find the value of y .

(1 mark)

c $1000^a = 10^6$

Find the value of a .

(2 marks)

Adapted from IMA1/2F, November 2017, Q21

Exam feedback

ResultsPlus

Q1c: In a similar question, most students missed the connection to powers of 10 to work out the correct algebraic power.

1.7 Prime factors

Key point

- All numbers can be written as a product of prime factors. This is called prime factor decomposition.

Purposeful practice 1

Express these numbers as products of their prime factors.

- | | | | | |
|------|-------|-------|-------|--------|
| 1 20 | 2 40 | 3 120 | 4 60 | 5 15 |
| 6 45 | 7 180 | 8 360 | 9 300 | 10 200 |

Reflect and reason

How can you use the prime factors of 20 to help you find the prime factors of 40 and 60?

Purposeful practice 2



Express these numbers as products of their prime factors.

- | | | | |
|------|-------|--------|--------|
| 1 16 | 2 36 | 3 81 | 4 100 |
| 5 64 | 6 216 | 7 1728 | 8 7056 |

Reflect and reason

The numbers in **Q1–5** are all square numbers. The numbers in **Q5–7** are all cube numbers. What do you notice about their prime factor decomposition? Predict whether 7056 is a square number or a cube number.

Purposeful practice 3

Use prime factors to find the HCF of

- | | | | |
|--------------|---------------|---------------|---------------|
| 1 40 and 45 | 2 80 and 45 | 3 80 and 90 | 4 120 and 300 |
| 5 20 and 200 | 6 200 and 300 | 7 180 and 190 | 8 180 and 19 |

Reflect and reason

What happens to the HCF between **Q1** and **Q2**? Why?

Purposeful practice 4

Use prime factors to find the LCM of

- | | | | |
|-------------|---------------|---------------|---------------|
| 1 40 and 45 | 2 120 and 300 | 3 120 and 200 | 4 200 and 300 |
| 5 80 and 45 | 6 80 and 90 | 7 180 and 190 | 8 180 and 19 |

Reflect and reason

Do your answers follow the same rules as **Q1** and **Q5** in Purposeful practice 3?

Problem-solving practice

- 1 A cat needs to be taken to the vet every 180 days.
A dog needs to be taken to the vet every 135 days.
Both animals were taken to the vet on 3 February.
Will they be taken to the vet together again this year? Explain.
- 2 A pack of 12 cartons of juice costs £3.
A tub of ice cream containing 16 servings costs £6.
Is it possible to buy equal amounts of juice and ice cream for £35 without any left over?
- 3 Given that $A = 2 \times 3 \times 5^2$ and $B = 3 \times 5 \times 7$, what is the LCM of A and B?
- 4 Given that the HCF of two numbers is 96, is it possible for one of the numbers to be 144? Explain.
- 5 The LCM of two numbers is 81.
Thomas says that both the numbers have to be in the 3 times table.
Is Thomas correct? Explain.
- 6 Ms Case teaches six classes of 30 students.
A box of 25 pencils costs £2.50.
A box of 20 erasers costs £2.
Ms Case wants to buy each student a pencil and an eraser.
How much will it cost?
Will there be any pencils or erasers left over?
- 7 Jaden bakes cakes for a party.
The cakes are baked in trays of 8.
Jaden puts a marshmallow on each cake.
Marshmallows come in packs of 3.
 - a What is the least number of cakes Jaden can make without any marshmallows left over?
 - b Each tray of cakes takes 25 minutes to bake. Jaden's party is at 6 pm.
What is the latest time he could start baking?

Exam practice

- 1 Express 160 as the product of its prime factors. (2 marks)

Adapted from IMA1/1F, June 2017, Q22

- 2 Find the lowest common multiple (LCM) of 32 and 46. (2 marks)

Adapted from IMA1/2F, June 2018, Q21a

Exam feedback

ResultsPlus

Q1: Most students who achieved a **Grade 5** answered a similar question well.

Q2: Most students who achieved a **Grade 5** answered a similar question well.