Student Book PYP

# Oxford **Mathematics**

## Primary Years Programme

6

Brian Murray

OXFORD

OXFORD
UNIVERSITY PRESS

Oxford University Press is a department of the University of Oxford. It furthers the University's objective of excellence in research, scholarship, and education by publishing worldwide. Oxford is a registered trademark of Oxford University Press in the UK and in certain other countries.

Published in Australia by
Oxford University Press
Level 8, 737 Bourke Street, Docklands, Victoria 3008, Australia.



First published 2019



ISBN 978 0 19 031225 1

Edited by Philip Bryan
Illustrated by Daniel Rieley
Typeset by Newgen KnowledgeWorks Pvt. Ltd., Chennai, India
Proofread by Vanessa Lanaway, Red Dot Scribble
Printed in China by Leo Paper Products Ltd

**Acknowledgements**
Cover: istock/Snowshill. Internal: Fir0002/Flagstaffotos: meerkat first appearing on page 4; other meerkats: Shutterstock.

# To the teacher

*Oxford Mathematics PYP* provides students with guided and independent work to support mathematical skills and understandings, as well as opportunities for problem-solving in real-world contexts. Teachers will find the supporting materials clear, comprehensive and easy to use. While the series offers complete coverage of the PYP mathematics scope and sequence, teachers can also use the topics that fit well with other areas of work to support student learning across the PYP curriculum.

## Student Books

Each topic features:

- **Guided practice** – a worked example of the concept, followed by the opportunity for students to practise, supported by careful scaffolding
- **Independent practice** – further opportunities for students to consolidate their understanding of the concept in different ways, with a decreasing amount of scaffolding
- **Extended practice** – the opportunity for students to apply their learning and extend their understanding in new contexts.

## Differentiation

Differentiation is key to ensuring that every student can access the curriculum at their point of need. In addition to the gradual release approach of the Student Books, the Teacher Books help teachers to choose appropriate pathways for students, and provide activities for students who require extra support or extension.

# Oxford **Mathematics**

Primary Years Programme

6

# Contents

## NUMBER, PATTERN AND FUNCTION



## MEASUREMENT, SHAPE AND SPACE



## DATA HANDLING




OXFORD
UNIVERSITY PRESS
AUSTRALIA & NEW ZEALAND

### Working with very large numbers

Large numbers have a gap between each set of three digits.

837452691 is easier to read if we write 837 452 691. It also makes it easier to say the number:

eight hundred and thirty-seven million, four hundred and fifty-two thousand, six hundred and ninety-one

## Guided practice

**1** Look at this number: 5 367 918

Show the value of each digit on the place-value grid.

| Millions | Hundred thousands | Ten thousands | Thousands | Hundreds | Tens | Ones | Write the number using gaps if necessary |
|---|---|---|---|---|---|---|---|
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 5 000 000 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**2** If we write nine hundred and five thousand, four hundred and seventy-six in digits, we use a zero to show there are no tens of thousands:

905 476

Remember to use a zero as a space-filler.

Write as digits:

**a** fifty-one thousand, six hundred and four _____

**b** two hundred thousand and twenty-six _____

**c** twelve thousand and ten _____

## Independent practice

**1** What is the value of the red digit?

**a** 463 290 _____

**b** 6 329 477 _____

**c** 2 406 219 _____

**d** 51 385 067 _____

**e** 80 487 003 _____

**f** 351 000 819 _____

**2** Write the numbers from question 1 in words.

**a** _____

**b** _____

**c** _____

**d** _____

**e** _____

**f** _____

**3** Write these numbers as digits.

**a** eighty million, four hundred and eighty-seven thousand

_____

**b** ten million, three hundred and sixty-two thousand and fifty-nine

_____

**c** one hundred and fourteen million, seven hundred and sixty thousand, two hundred and nine

_____

**d** one billion, four hundred million, five hundred and ninety-three thousand and one

_____

**4** Expand these numbers. The first one has been done for you.


**a** 374 596: 300 000 + 70 000 + 4000 + 500 + 90 + 6

**b** 214 867: 200 000 + _____

**c** 2 567 321: _____

**d** 5 673 207: _____

**e** 57 319 240: _____

**f** 407 508 004: _____

**5** Look at these digit cards.

| 7 | 3 | 4 | 5 | 9 | 1 | 2 |
|---|---|---|---|---|---|---|

**a** What is the **largest** number that can be made using all the cards?

_____

**b** What is the **smallest** number that can be made if the digit "5" is in the millions place?

_____

**c** What is the **largest** number that can be made if the "7" is seven ones?

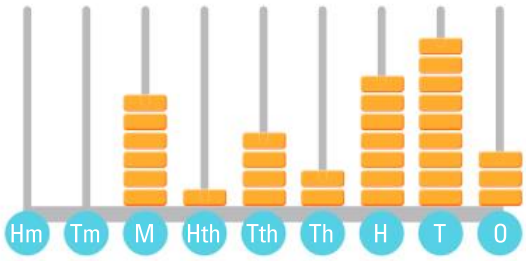
_____

**d** What is the **smallest** number that can be made if the "1" is in the tens of thousands place?

_____

**6** Write the number shown on each spike abacus as digits and in words.

**a**

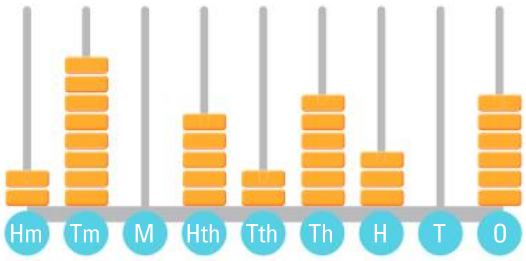



digits: _____

words: _____

_____

**b**




digits: _____

words: _____

_____

## Extended practice

**1** To change the calculator screen to show the second number, I would press:

**a** 24 550 _____ = 24 650

**b** 37 154 _____ = 77 154

**c** 739 255 _____ = 719 255

**d** 999 999 _____ = 1 000 000

**2** Sometimes large numbers are abbreviated. $1K means $1000. $1.3M can be used for $1 300 000. Write the new price of these houses using digits **in full**.

**a** $345K reduced by $5000 _____

**b** $725K reduced by $20 000 _____

**c** $875K reduced by $50K _____

**d** $1.5M reduced by $250K _____

**3** Imagine you have to choose just **one** digit in each of these numbers. Write:

- the digit you would choose
- the value of the digit
- the reason for your choice.

**a** A share of $574 612. _____

_____

**b** Writing out your times tables 574 612 times. _____

_____

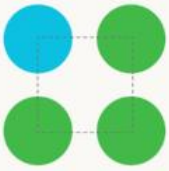
**c** Eating 574 612 of your favourite snack food in 10 minutes. _____

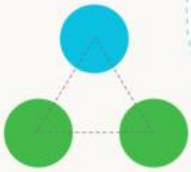
_____

# Square numbers and triangular numbers

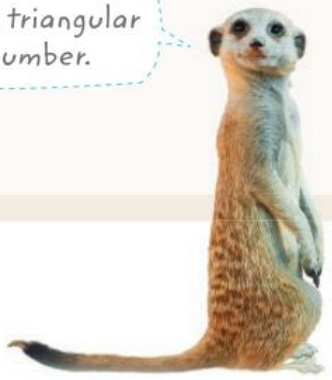
## Numbers can be arranged in patterns

4 is a square number.





3 is a triangular number.



## Guided practice

**1** These are the first six square numbers. Fill in the gaps.

1

$1 \times 1 = 1^2$

$1^2 = 1$

4

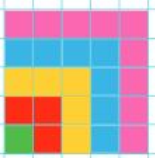
$2 \times 2 = 2^2$

$2^2 = 4$

9

$3 \times 3 = 3^2$

$4 \times 4 =$ ☐



☐

☐

**2** These are the first four triangular numbers. Fill in the gaps.

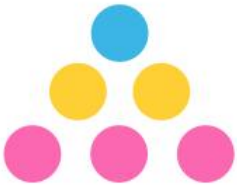
1

1

3

$1 + 2 = 3$

☐



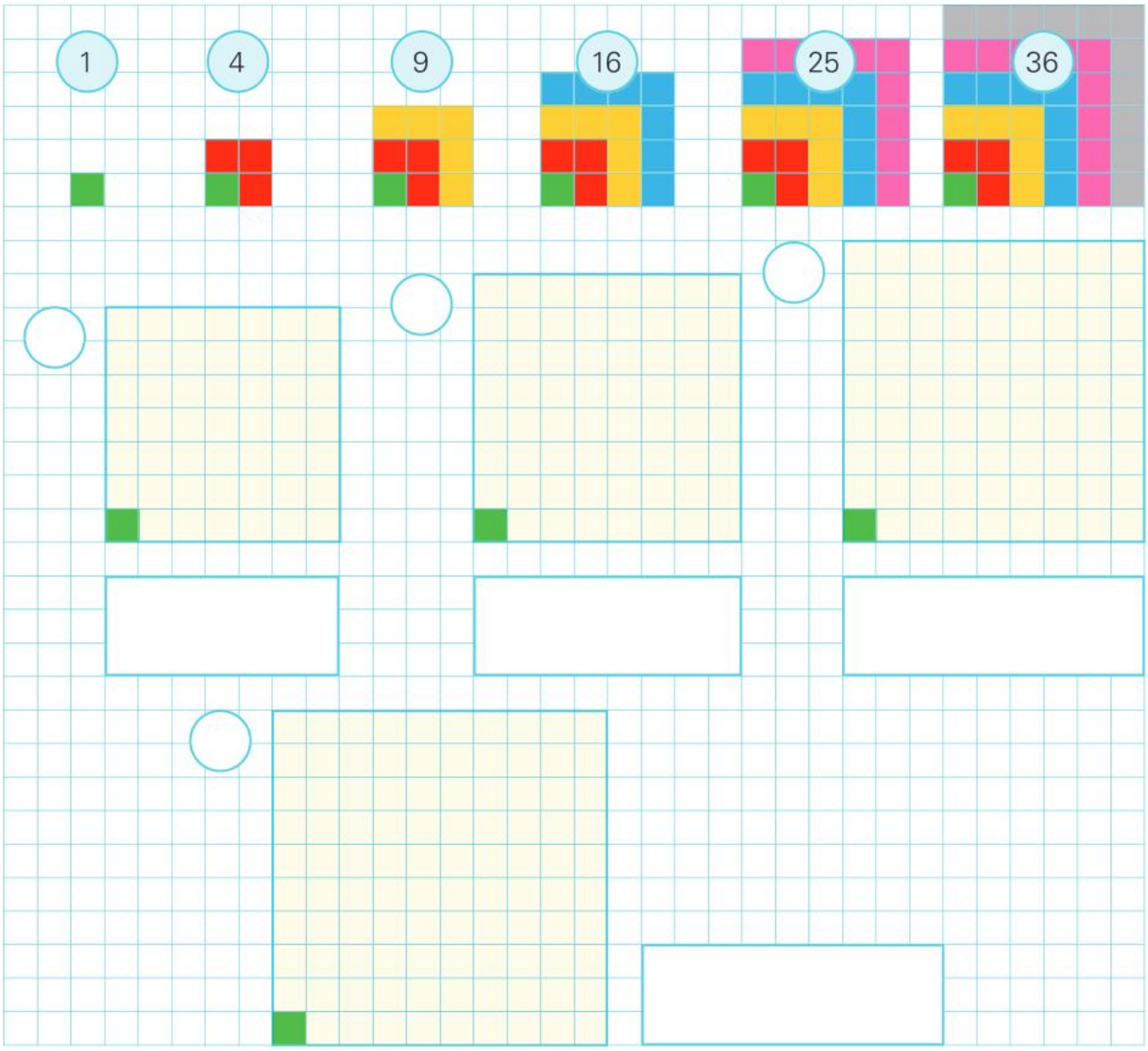
$1 + 2 + 3 =$ ☐

☐

☐

## Independent practice

**1** Complete the grid to show the first ten square numbers. Write the information as you did on page 10.



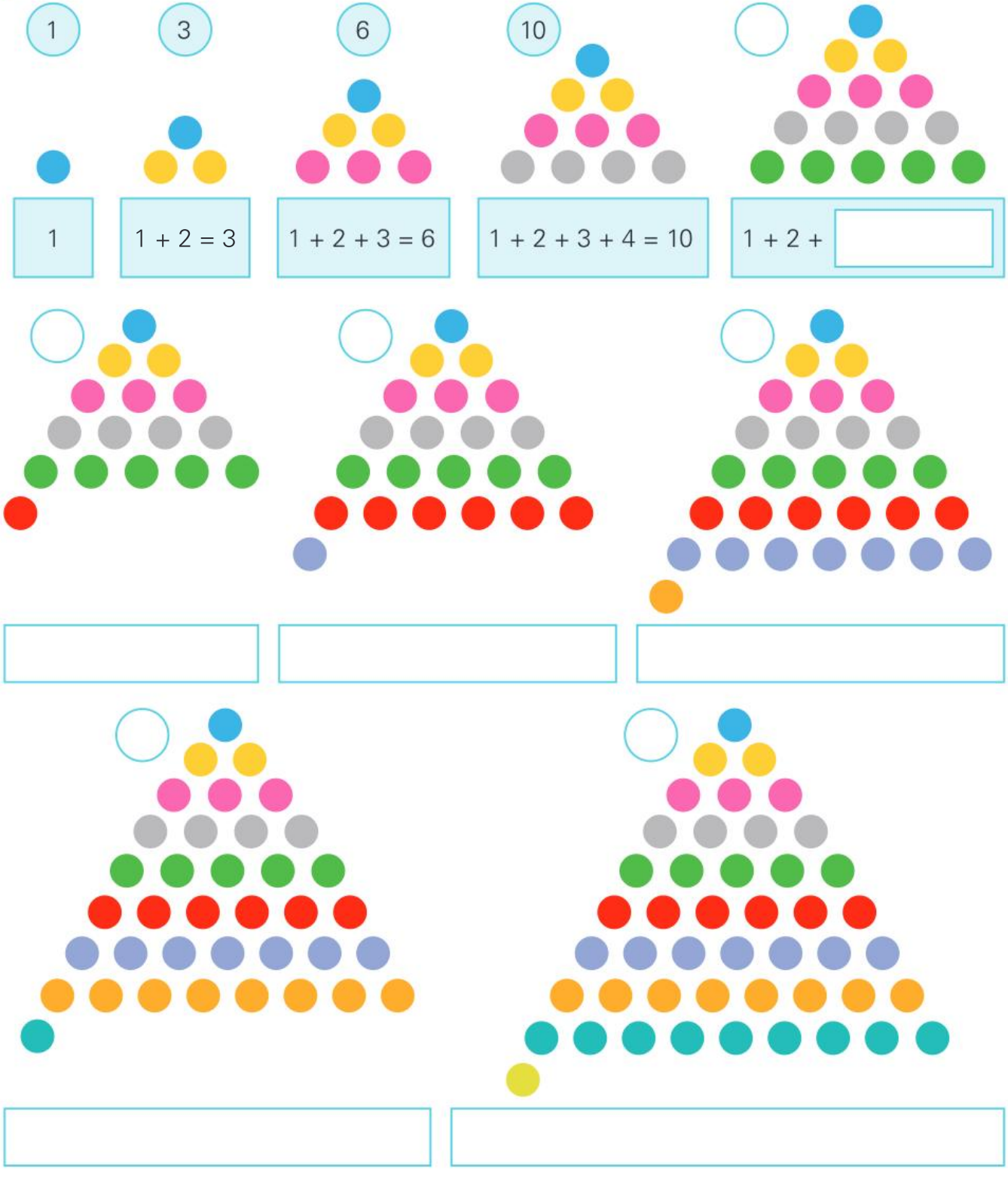

**2** **a** What is the next number in the square number pattern? ☐

**b** How does the digit in the ones column change in the square number pattern?

**c** Circle one answer. The 100th square number is:

**100** **1000** **10 000** **100 000**

**3** Complete the pattern and information to show the first 10 triangular numbers.




**4** **a** What is the 11th triangular number? ☐

**b** Apart from 1, which triangular number is also a square number? ☐

**c** How does the triangular number pattern grow? (Hint: Think about odd and even numbers.) _____

## Extended practice

**1** Continue this table.

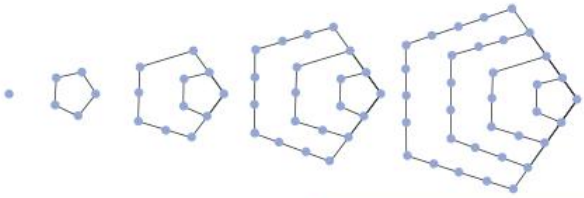
| Square number | Multiplication fact | Addition fact |
|---|---|---|
| $1^2 = 1$ | $1 \times 1 = 1$ | 1 |
| $2^2 = 4$ | $2 \times 2 = 4$ | $1 + 3 = 4$ |
| $3^2 = 9$ | $3 \times 3 = 9$ | $1 + 3 + 5 = 9$ |
| $4^2 =$ | | |
| $5^2 =$ | | |
| $6^2 =$ | | |
| $7^2 =$ | | |
| $8^2 =$ | | |
| $9^2 =$ | | |
| $10^2 =$ | | |

**2** **a** What do you notice about the way the addition facts grow in question 1?

**b** Write the facts for the 11th square number.

**c** How many would you add to the 11th square number to find the 12th square number?

**3** This pattern shows the first few pentagonal numbers.



**a** One of the numbers in this list is **not** a pentagonal number. Which number is it?

| 5, 12, 15, 22, 35 | |
|---|---|

**b** Write the first 5 pentagonal numbers.

**c** Write an explanation that would help a younger student to understand the connection between each pentagonal number and the one that follows it.

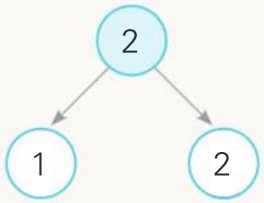
**d** On a separate piece of paper, draw a diagram of the 6th pentagonal number.

# Prime and composite numbers

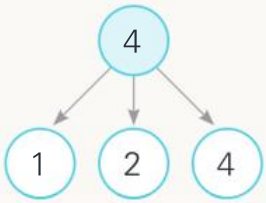
## How do we recognise a prime number?

We say a number is *prime* if it has just two factors: 1 and itself. The number 2 is the smallest prime number because it can only be divided by 1 and 2. Numbers that have more than two factors are called *composite* numbers.

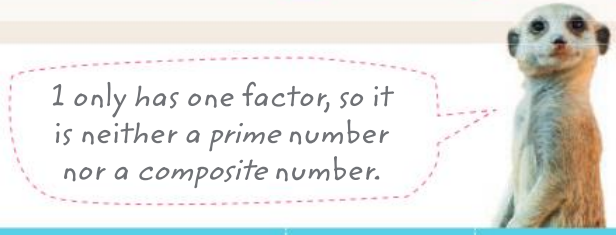
A prime number has just 2 factors.




A composite number has more than 2 factors.




## Guided practice




**1** Complete this chart.

| Number | Factors (numbers it can be divided by) | How many factors? | Prime or composite? | |
|---|---|---|---|---|
| | | | Prime | Composite |
| 1 | 1 | 1 | neither | |
| 2 | 1 and 2 | 2 | ✓ | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |

**2** **a** List the prime numbers between 2 and 20. _____

**b** Comment on the number of even prime numbers. _____

## Independent practice

**1** Follow these instructions to complete the grid. The grid has been started for you.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |

**a** 1 is neither prime nor composite. Draw a star around it.

**b** 2 is a prime number. Circle it.

**c** Lightly shade all the multiples of 2. They are composite numbers.

**d** Put a circle around the next prime number: 3

**e** Lightly shade all the multiples of 3. They are composite numbers.

**f** Put a circle around the next prime number: 5

**g** Lightly shade all the multiples of 5. They are composite numbers.

**h** Find the **next** prime number. Circle it.

**i** Lightly shade all its multiples.

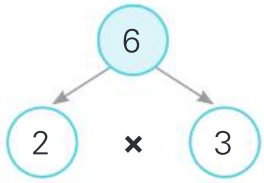
**j** Repeat Step h and Step i until you get to the end of the grid.

**2** **a** The highest prime number on the grid is: ☐

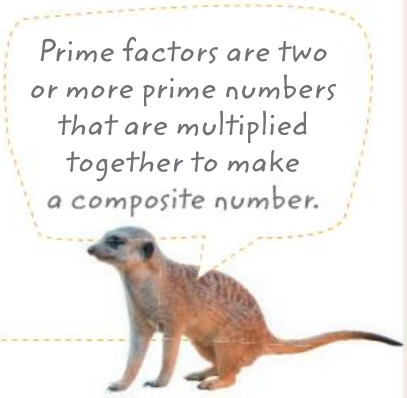
**b** True or false? All the prime numbers are odd. _____

**c** True or false? More of the composite numbers are even than odd. _____

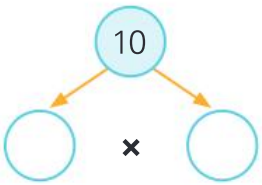
**3** All composite numbers are made by multiplying prime numbers. 6 is a composite number. It can be made by multiplying 2 prime numbers: 2 × 3. We can show it in a factor tree:



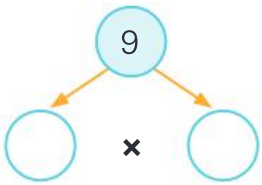

The prime factors of 6 are 2 and 3.
So 6 = 2 × 3



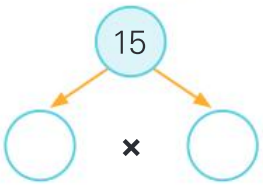

Fill in the gaps:



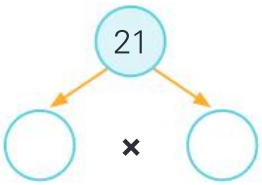

**a** The prime factors of 10 are _____.



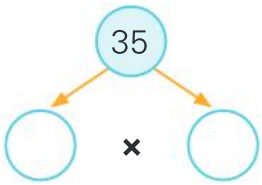

**b** The prime factors of 9 are _____.



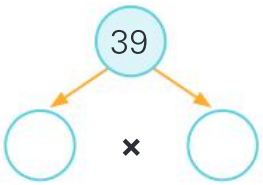

**c** The prime factors of 15 are _____.



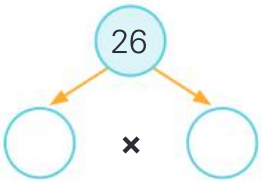

**d** The prime factors of 21 are _____.



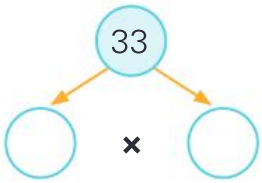

**e** The prime factors of 35 are _____.



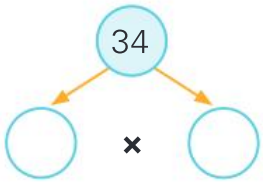

**f** The prime factors of 39 are _____.




**g** The prime factors of 26 are _____.




**h** The prime factors of 33 are _____.




**i** The prime factors of 34 are _____.

**4** Draw factor trees for:

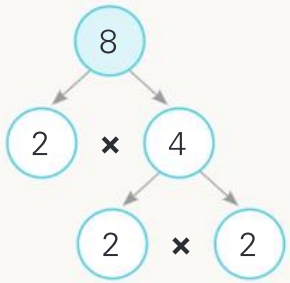
**a** 14

**b** 55

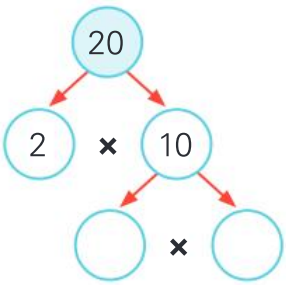
**c** 49

## Extended practice

The prime factors of 8 are 2, 2 and 2. To show the prime factors of 8, we can write $2 \times 2 \times 2$. We can also write $2^3$.

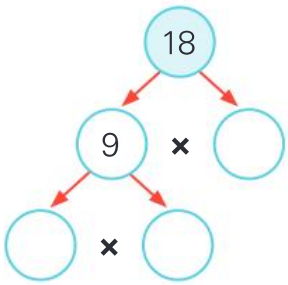



**1** Fill in the gaps.



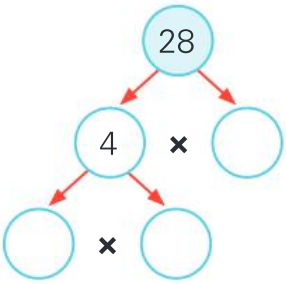

**a** $20 = 2 \times 2 \times$ ____

$20 = 2^{\square} \times$ ____



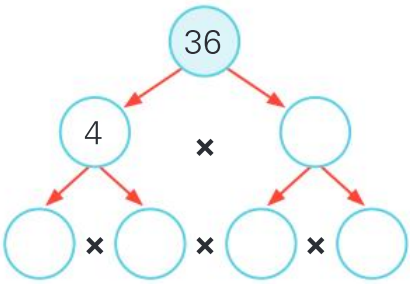

**b** $18 =$ ____ × ____ × ____

$18 =$ ____ $^{\square}$ × ____




**c** $28 =$ ____ × ____ × ____

$28 =$ ____ $^{\square}$ × ____




**d** $36 =$ ____ × ____ × ____ × ____

$36 =$ ____ $^{\square}$ × ____ $^{\square}$

**2** Draw factor trees to show the prime factors.

**a** 27

**b** 30

**c** 24

### Looking for short cuts

Round numbers are easy to work with. For example, 287 – 98 = ?

We could say, 287 – 100 = 187.

We took away 2 too many, so we add 2 back to the answer. So, 287 – 98 = 189.

## Guided practice

**1** Use rounding for these subtractions. Fill in the gaps.

| | Problem | Using rounding it becomes | Now I need to | Answer |
|---|---|---|---|---|
| a | 317 + 199 | 317 + 200 = 517 | take away 1 | 516 |
| b | 275 – 101 | 275 – 100 = 175 | take away another 1 | |
| c | 527 + 302 | 527 + = | add another | |
| d | 377 – 98 | 377 – = | | |
| e | 249 + 249 | | | |
| f | 938 – 206 | | | |
| g | 1464 + 998 | | | |

Splitting numbers can make addition easier.

For example, 160 + 830 = ?

Split (expand) the numbers: 100 + 60 + 800 + 30

Join the partners: 100 + 800 + 60 + 30 = 900 + 90 = 990


**2** Split the numbers. Fill in the gaps.

| | Problem | Expand the numbers | Join the partners | Answer |
|---|---|---|---|---|
| a | 370 + 520 | 300 + 70 + 500 + 20 | 300 + 500 + 70 + 20 | 890 |
| b | 2200 + 3600 | 2000 + 200 + 3000 + 600 | 2000 + 3000 + 200 + 600 | |
| c | 342 + 236 | 300 + 40 + 2 + 200 + 30 + 6 | | |
| d | 471 + 228 | | | |
| e | 743 + 426 | | | |
| f | 865 + 734 | | | |
| g | 4270 + 3220 | | | |