



Pearson

# International Baccalaureate® Resources Catalogue 2020



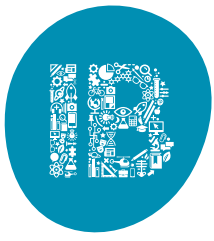


- 25 subjects covered
- 148 expertly-written textbooks
- 4,000+ interactive learning activities
- A pair of shoes with built-in jetpacks\*

\*OK, the jetpack bit isn't true, but we know that pointless gadgets aren't really what you need to teach the IB curriculum. What you need is a clear, effective and well-signposted toolkit. So, we've made sure all our resources are well-researched, clearly laid out and full of simple, practical ideas.

Everything you need, nothing you don't.  
And no jetpack shoes. Sorry.





# Welcome!

**Our comprehensive resources are well-researched, carefully crafted, and written by experts to ensure they provide IB learners with what they need for their IB journey.**

Using an international inquiry-based approach, our **PYP Readers and Companions Programme®** motivates learners to develop important early reading strategies.

**Pearson's International Mathematics for the Middle Years\*** is our best-selling, five-book series, giving learners the opportunity to learn mathematics with a global perspective.

Our high-quality **Diploma textbooks** for the IB are written by leading IB experts, and every title comes with a free enhanced eBook for on-the-move learning.

The accompanying **Essentials Series** is the perfect solution for your Diploma learners' revision needs. Clearly written with model answers, they're perfect for EAL learners too!

\* Middle Years Programme (MYP) and Diploma Programme (DP) are trademarks of the International Baccalaureate Organisation (IB), which was not involved in the production of these products.

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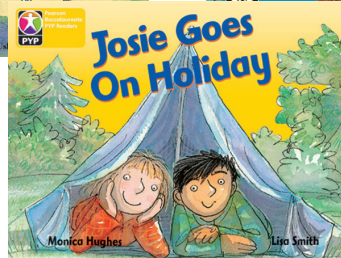
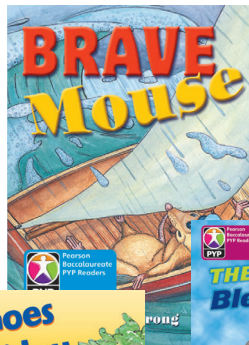
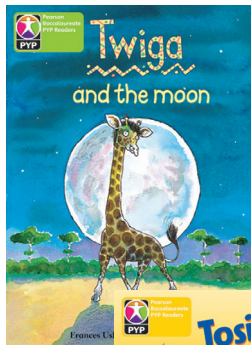
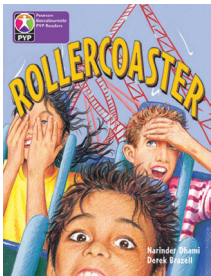
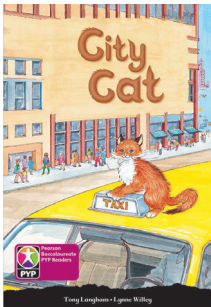
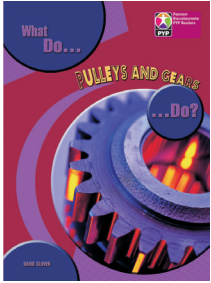


# Primary Years Readers and Companions Programme

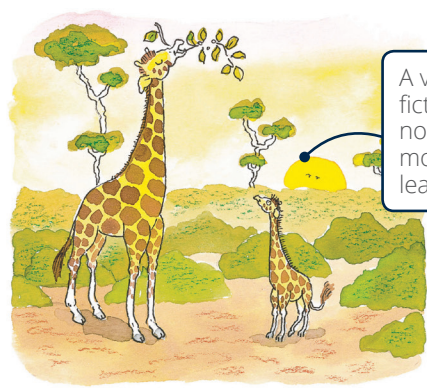
Our PYP Readers and Companions are specially designed to motivate younger learners and help them develop vital inquiry-based reading strategies.

This collection of 120 inquiry based readers provide plenty to explore, in line with the IB PYP core principles.

A ready made library of 120 titles, clearly categorised by age and organised into themes. These Readers span the six units of inquiry and come with nine Companions to support your PYP pupils with their learning.



The rain stopped. The giraffes came out from the trees and walked about by the river.  
Twiga looked up at the sky.  
'Look,' he said. 'The moon is back. When I am tall can I eat the moon?'



'You can't eat the moon,' said Twiga's father. 'But I will show you something that you can eat when you grow up.' He gave Twiga some beautiful fruit from the top of a very tall tree.  
'Mmmm, that's good,' said Twiga.



A variety of fiction and non-fiction will motivate all learners.

## Summary of components

- 120 high-quality, inquiry-based readers.
- Nine supporting Companions with activities to build up individual portfolios.
- Money-saving packs available, organised by grade/year and theme.

**ELL**  
 These books teach the higher-order skills and strategies that thinking readers need, and support comprehension and oral language.

Readers have a strong international approach and are all linked to the IB Learner Profile.

### Cocoa beans

Cocoa beans grow in pods on cocoa trees. When the pods are ripe, the farmers cut them from the tree and take out the beans.





Workers spread out the beans in the sun to dry. They pack the dried beans into large bags. Then they send the beans to local companies. They send the beans to the chocolate company.

**Who We Are**

### The heart

Explain how the heart pumps blood around the body, then label the diagram of the human heart, using these words to help you: left atrium, right atrium, left ventricle, right ventricle.

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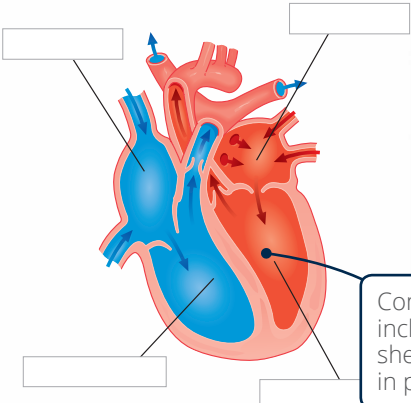
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Write five tips for how to look after your heart and keep it healthy:

- ✓ \_\_\_\_\_
- ✓ \_\_\_\_\_
- ✓ \_\_\_\_\_
- ✓ \_\_\_\_\_
- ✓ \_\_\_\_\_



Companions include tear-out sheets for inclusion in portfolios

8
Learner Profile Attributes: Well-balanced, Knowledgeable, Thinkers

# PYP Readers and Companions Programme

				TRANSDISCIPLINARY THEMES		
				Who we are UOI	Where we are in place and time UOI	How we express ourselves UOI
						
UK YEAR LEVEL	US GRADE LEVEL	PYP LEVEL	UOI	UOI	UOI	UOI
Lower Primary	F	Pre K	1 My favourite things  	Journeys  	Colours  	
	1	K	2 Friends  	Houses  	Creativity  	
			3 Families  	Holidays  	Feelings  	
	2	1	4 Our senses  	Past and present  	Celebrating  	
			5 A new baby  	Home sweet home  	Pictures that tell stories  	
Upper Primary	3	2	6 Emotions  	People around the world  	Artists  	
			7 Our bodies  	Mapping  	Communicating  	
	4	3	8 Right or wrong?  	Different places, different lives  	World music  	
	5	4	9 What's in a name?  	Legacies  	Architecture  	
	6	5	10 Healthy body, healthy mind  	World religions  	Media  	



TRANSDISCIPLINARY THEMES

How the world works



UOI

How we organise ourselves



UOI

Sharing the planet



UOI

Movement



Working together



Animals



COMPANION GUIDES

Push and Pull



In town



How we use things



Where food comes from



Communities



Water



Growth



Planning



Habitats



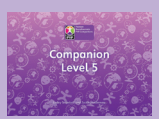
Discoveries and inventions



How things are made



Planet in danger



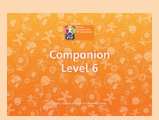
Mammals



Be prepared



Life cycles



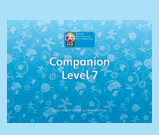
Water



Weather and seasons



Disappearing forests



Machines



Cities



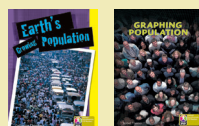
Global issues



Changing Earth



People on the move



Pollution



Renewable Energy



Government systems



Endangered species





## HOW TO SAMPLE

To evaluate this series, visit: [www.pearsonglobalschools.com/pyp](http://www.pearsonglobalschools.com/pyp)

## PEARSON PYP READERS AND COMPANIONS PROGRAMME

To place an order, contact your customer services team or local consultant [www.pearsonglobalschools.com/contact](http://www.pearsonglobalschools.com/contact)

### GROUP READER PACKS OF 6

#### Foundation/Pre K Readers

PYP L1 Animals in the Wild <b>Pack of 6</b>	978 0 435994 86 0	£25.90
PYP L1 Drawing <b>Pack of 6</b>	978 0 435994 80 8	£25.90
PYP L1 Elephant Walk <b>Pack of 6</b>	978 0 435994 77 8	£25.90
PYP L1 Fast and Slow <b>Pack of 6</b>	978 0 435994 83 9	£25.90
PYP L1 I Like to Jump <b>Pack of 6</b>	978 0 435994 81 5	£25.90
PYP L1 Journeys <b>Pack of 6</b>	978 0 435994 78 5	£25.90
PYP L1 Jumper for James <b>Pack of 6</b>	978 0 435994 79 2	£25.90
PYP L1 Ling and Turtle <b>Pack of 6</b>	978 0 435994 87 7	£25.90
PYP L1 My Chinese New Year <b>Pack of 6</b>	978 0 435994 76 1	£25.90
PYP L1 Shopping <b>Pack of 6</b>	978 0 435994 84 6	£25.90
PYP L1 This is Me <b>Pack of 6</b>	978 0 435994 75 4	£25.90
PYP L1 We work at the hospital <b>Pack of 6</b>	978 0 435994 85 3	£25.90

#### Year 1/Grade K Readers

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PYP L2 Field of Gold <b>Pack of 6</b>	978 0 435994 88 4	£25.90
PYP L2 From Seedling to tree <b>Pack of 6</b>	978 0 435995 07 2	£25.90
PYP L2 Furball to the rescue <b>Pack of 6</b>	978 0 435995 12 6	£25.90
PYP L2 I can't open it <b>Pack of 6</b>	978 0 435994 96 9	£25.90
PYP L2 Making Friends <b>Pack of 6</b>	978 0 435994 91 4	£25.90
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PYP L2 Shopping <b>Pack of 6</b>	978 0 435995 09 6	£25.90
PYP L2 Space Ant <b>Pack of 6</b>	978 0 435994 92 1	£25.90
PYP L2 The Dentist <b>Pack of 6</b>	978 0 435995 08 9	£25.90
PYP L2 Today and Long Ago <b>Pack of 6</b>	978 0 435994 93 8	£25.90
PYP L3 Baked beans <b>Pack of 6</b>	978 0 435995 24 9	£25.90
PYP L3 Camping <b>Pack of 6</b>	978 0 435995 20 1	£25.90
PYP L3 Caring <b>Pack of 6</b>	978 0 435995 22 5	£25.90
PYP L3 Grandma's Surprise <b>Pack of 6</b>	978 0 435995 14 0	£25.90
PYP L3 Josie goes on Holiday <b>Pack of 6</b>	978 0 435995 19 5	£25.90
PYP L3 Lake of Stars <b>Pack of 6</b>	978 0 435994 72 3	£25.90
PYP L3 Noah's Ark <b>Pack of 6</b>	978 0 435995 32 4	£25.90
PYP L3 Rivers and streams <b>Pack of 6</b>	978 0 435994 73 0	£25.90
PYP L3 That's Not My Hobby <b>Pack of 6</b>	978 0 435995 21 8	£25.90
PYP L3 The Fantastic Pumpkin <b>Pack of 6</b>	978 0 435995 23 2	£25.90
PYP L3 What can I feel <b>Pack of 6</b>	978 0 435995 18 8	£25.90
PYP L3 Who helps us in hospital <b>Pack of 6</b>	978 0 435994 71 6	£25.90

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PYP L4 Hats for the Carnival <b>Pack of 6</b>	978 0 435994 57 0	£25.90
PYP L4 Home Sweet Home <b>Pack of 6</b>	978 0 435993 96 2	£25.90
PYP L4 How big is it <b>Pack of 6</b>	978 0 435994 59 4	£25.90
PYP L4 How Music is Made <b>Pack of 6</b>	978 0 435994 58 7	£25.90
PYP L4 How Plants Grow <b>Pack of 6</b>	978 0 435993 99 3	£25.90
PYP L4 Mrs Bean <b>Pack of 6</b>	978 0 435993 98 6	£25.90
PYP L4 On Journeys <b>Pack of 6</b>	978 0 435994 56 3	£25.90
PYP L4 Peanuts <b>Pack of 6</b>	978 0 435993 97 9	£25.90
PYP L4 Save Bengal Tiger <b>Pack of 6</b>	978 0 435993 95 5	£25.90
PYP L4 Sensory System <b>Pack of 6</b>	978 0 435994 54 9	£25.90
PYP L4 Twiga and Moon <b>Pack of 6</b>	978 0 435994 53 2	£25.90
PYP L5 Art in the Past <b>Pack of 6</b>	978 0 435993 88 7	£25.90
PYP L5 Caring for Our World <b>Pack of 6</b>	978 0 435993 94 8	£25.90
PYP L5 Egypt's Greatest Treasure <b>Pack of 6</b>	978 0 435993 79 5	£25.90
PYP L5 Georgina and the Dragon <b>Pack of 6</b>	978 0 435993 87 0	£25.90
PYP L5 Homes around the World <b>Pack of 6</b>	978 0 435993 86 3	£25.90
PYP L5 How is chocolate made <b>Pack of 6</b>	978 0 435993 92 4	£25.90
PYP L5 New Brothers and Sisters <b>Pack of 6</b>	978 0 435993 84 9	£25.90
PYP L5 Poles Apart <b>Pack of 6</b>	978 0 435993 85 6	£25.90
PYP L5 Rollercoaster <b>Pack of 6</b>	978 0 435993 83 2	£25.90
PYP L5 Sydney the Kangaroo <b>Pack of 6</b>	978 0 435993 89 4	£25.90
PYP L5 The Great Tree Mouse Adventure <b>Pack of 6</b>	978 0 435993 93 1	£25.90
PYP L5 The Inventions of Thomas Edison <b>Pack of 6</b>	978 0 435993 90 0	£25.90

#### Year 3/Grade 2 Readers

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PYP L6 Life Cycles <b>Pack of 6</b>	978 0 435993 82 5	£33.70
PYP L6 Little Blue Big Blue <b>Pack of 6</b>	978 0 435993 77 1	£33.70
PYP L6 Mammals <b>Pack of 6</b>	978 0 435993 78 8	£33.70
PYP L6 My Caribbean Family History <b>Pack of 6</b>	978 0 435993 74 0	£33.70
PYP L6 Mzungu <b>Pack of 6</b>	978 0 435993 73 3	£33.70
PYP L6 Nothing ever happens here <b>Pack of 6</b>	978 0 435993 81 8	£33.70
PYP L6 Our Feelings <b>Pack of 6</b>	978 0 435993 72 6	£33.70
PYP L6 Perfect Present <b>Pack of 6</b>	978 0 435993 75 7	£33.70
PYP L6 Rescue <b>Pack of 6</b>	978 0 435993 91 7	£33.70
PYP L6 School Concert <b>Pack of 6</b>	978 0 435993 71 9	£33.70
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PYP L7 Feebleman <b>Pack of 6</b>	978 0 435993 63 4	£33.70
PYP L7 Little Match Girl <b>Pack of 6</b>	978 0 435993 67 2	£33.70
PYP L7 Mapping Your Community <b>Pack of 6</b>	978 0 435993 62 7	£33.70
PYP L7 Old Sticky <b>Pack of 6</b>	978 0 435993 69 6	£33.70
PYP L7 Seasons <b>Pack of 6</b>	978 0 435993 68 9	£33.70
PYP L7 Teeth <b>Pack of 6</b>	978 0 435993 60 3	£33.70
PYP L7 Water <b>Pack of 6</b>	978 0 435993 66 5	£33.70
PYP L7 Where are your manners <b>Pack of 6</b>	978 0 435993 64 1	£33.70

Year 4/Grade 3 Readers			
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PYP L8 City Cat <b>Pack of 6</b>	978 0 435993 54 2		£33.70
PYP L8 Future Bleak or Bright <b>Pack of 6</b>	978 0 435993 57 3		£33.70
PYP L8 Going Underground <b>Pack of 6</b>	978 0 435993 55 9		£33.70
PYP L8 Living in Amazon Rainforest <b>Pack of 6</b>	978 0 435993 49 8		£33.70
PYP L8 Percussion <b>Pack of 6</b>	978 0 435993 50 4		£33.70
PYP L8 Right or Wrong <b>Pack of 6</b>	978 0 435993 47 4		£33.70
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PYP L8 Wackiest Machine Ever <b>Pack of 6</b>	978 0 435993 53 5		£33.70
PYP L8 Weird Wambo <b>Pack of 6</b>	978 0 435993 48 1		£33.70
PYP L8 What do Pulleys and Gears do <b>Pack of 6</b>	978 0 435993 52 8		£33.70
PYP L8 World of Music Africa <b>Pack of 6</b>	978 0 435993 51 1		£33.70
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PYP L9 Clean Planet <b>Pack of 6</b>	978 0 435993 45 0		£33.70
PYP L9 Earth's Changing Crust <b>Pack of 6</b>	978 0 435993 37 5		£33.70
PYP L9 Earth's Growing Population <b>Pack of 6</b>	978 0 435993 38 2		£33.70
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PYP L9 The Ancient Romans <b>Pack of 6</b>	978 0 435993 41 2		£33.70
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PYP L10 The Earth's Resources <b>Pack of 6</b>	978 0 435993 31 3		£33.70
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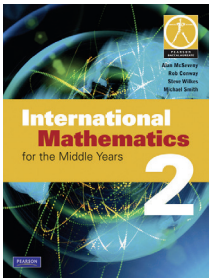
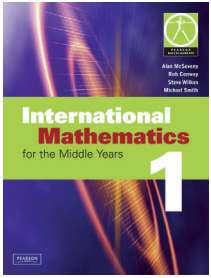
Reader Year Packs (contain one copy of each reader in that year)			
PYP L1 Foundation Year Pack (12 titles)	978 0 435994 99 0		£49.30
PYP L2-3 Year 1 Pack (24 titles)	978 0 435995 00 3		£95.10
PYP L4-5 Year 2 Pack (24 titles)	978 0 435995 01 0		£95.10
PYP L6-7 Year 3 Pack (24 titles)	978 0 435995 02 7		£126.20
PYP L8 Year 4 Pack (12 titles)	978 0 435995 03 4		£63.80
PYP L9 Year 5 Pack (12 titles)	978 0 435995 04 1		£63.80
PYP L10 Year 6 Pack (12 titles)	978 0 435995 05 8		£63.80
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PYP L3 Companion <b>Pack of 6</b>	978 0 435994 98 3		£29.60
PYP L4 Companion <b>Pack of 6</b>	978 0 435994 50 1		£29.60
PYP L5 Companion <b>Pack of 6</b>	978 0 435994 51 8		£29.60
PYP L6 Companion <b>Pack of 6</b>	978 0 435994 52 5		£29.60
PYP L7 Companion <b>Pack of 6</b>	978 0 435994 67 9		£29.60
PYP L8 Companion <b>Pack of 6</b>	978 0 435994 74 7		£29.60
PYP L9 Companion <b>Pack of 6</b>	978 0 435994 82 2		£29.60
PYP L10 Companion <b>Pack of 6</b>	978 0 435994 89 1		£29.60
Companion Class Packs (30)			
PYP L2 Companion Class <b>Pack of 30</b>	978 0 435995 10 2		£128.00
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PYP L5 Companion Class <b>Pack of 30</b>	978 0 435995 16 4		£128.00
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PYP L9 Companion Class <b>Pack of 30</b>	978 0 435995 34 8		£128.00
PYP L10 Companion Class <b>Pack of 30</b>	978 0 435995 35 5		£128.00
Theme Packs (contain one copy of all 20 readers in each theme)			
PYP Theme Pack How The World Works	978 0 435993 25 2		£89.10
PYP Theme Pack How We Express Ourselves	978 0 435993 24 5		£89.10
PYP Theme Pack How We Organise Ourselves	978 0 435993 26 9		£89.10
PYP Theme Pack Sharing the Planet	978 0 435993 27 6		£89.10
PYP Theme Pack Where We Are In Place and Time	978 0 435993 23 8		£89.10
PYP Theme Pack Who We Are	978 0 435993 22 1		£89.10



Download the PYP Readers and Companions Structure Chart  
[www.pearsonglobalschools.com/pyp](http://www.pearsonglobalschools.com/pyp)



# International Mathematics for the Middle Years



Our best-selling five-book series gives learners the opportunity to learn Mathematics with a global perspective.

- Each full-colour book contains graded exercises with differentiated questions, worked examples, investigations, mathematical terms and time-saving assessment grids, plus a FREE interactive CD-ROM.
- The Teacher Resource contains practice tests with answers and editable unit plans.
- The Companion websites provide additional resources including review questions and interactive activities.
- Mapped to the new curriculum, with over 98% of the content matching the 2014 subject guide.

### 4:03 | Division in Algebra

Answer the following:  
 1  $12 \div 8$     2  $(-12) \div 6$     3  $20 \div (-5)$     4  $(-24) \div (-6)$   
 Reduce these fractions to their simplest form:  
 5  $\frac{5}{12}$     6  $\frac{6}{10}$     7  $\frac{14}{21}$     8  $\frac{100}{35}$   
 Simplify:  
 9  $3 \div 5$     10  $x \div x$

**worked examples**

1  $6x \div 2 = \frac{6x}{2}$  (Divide top and bottom by 2.)  
 $= 3x$

2  $15xy \div 3x = \frac{15xy}{3x}$  (Divide top and bottom by 3 and x.)  
 $= 5y$

3  $12ac \div 8ab = \frac{12ac}{8ab}$   
 $= \frac{3c}{2b}$

4  $-6x \div 18xy = \frac{-6x}{18xy}$   
 $= -\frac{1}{3y}$

**8 = 2 and  $\frac{2}{3}$  are different ways of writing the same thing.**

**Express the division sum as a fraction and reduce it to its lowest terms.**

**Exercise 4:03**

1 Reduce these fractions to their lowest terms.  
 a)  $\frac{3x}{9}$     b)  $\frac{12x}{30}$     c)  $\frac{8x}{16}$     d)  $\frac{5x}{10a}$   
 e)  $\frac{7x}{35x}$     f)  $\frac{12m}{4m}$     g)  $\frac{10ab}{5b}$     h)  $\frac{24a}{6b}$

2 Simplify these divisions.  
 a  $12x \div 4$     b  $10y \div 5$     c  $3p \div 3$     d  $15m \div 3$   
 e  $2ab \div 2$     f  $20xy \div 5$     g  $9x^2 \div 3$     h  $14x \div 7$   
 i  $12a \div 3a$     j  $8x \div 4x$     k  $5x \div 5x$     l  $30y \div 9y$   
 m  $15m \div 10m$     n  $18x \div 4x$     o  $32a \div 12b$     p  $3 \div 20c$   
 q  $24xy \div 6x$     r  $84ab \div 14a$     s  $27x \div 21xy$     t  $12a \div 10ba$   
 u  $2 \div 18t$     v  $a \div 3a$     w  $3mn \div 10n$     x  $43ab \div 20bc$

3 Simplify.  
 a  $8p \div (-2)$     b  $(-9q) \div (-3)$     c  $(-20p) \div 4$     d  $(-24k) \div (-12k)$   
 e  $(-23) \div 13a$     f  $(-1) \div 2c$     g  $6ab \div 9b$     h  $(-34xy) \div (-8xy)$   
 i  $14a \div (-a)$     j  $20ab \div 12ba$     k  $(-13k) \div 5xy$     l  $-28mp \div (-7mp)$

**Challenge worksheet 4:03 Algebraic Simplification**

### 4:04 | Simplifying Algebraic Fractions

**4:04A Addition and subtraction**

**worked examples**

1  $\frac{2x}{5} + \frac{2x}{5} = \frac{2x+x}{5} = \frac{3x}{5}$

2  $\frac{7m}{3} - \frac{2m}{3} = \frac{7m-2m}{3} = \frac{5m}{3}$

3  $\frac{3a}{5} + \frac{2a}{4} = \frac{3a \times 4}{5 \times 4} + \frac{2a \times 5}{4 \times 5} = \frac{12a}{20} + \frac{10a}{20} = \frac{22a}{20} = \frac{11a}{10}$

4  $\frac{2n}{3} - \frac{2n}{5} = \frac{2n \times 2}{3 \times 2} - \frac{2n \times 2}{5 \times 2} = \frac{4n}{6} - \frac{4n}{10} = \frac{20n}{30} - \frac{12n}{30} = \frac{8n}{30} = \frac{4n}{15}$

**Cancel if possible.**

**Always look for the lowest common denominator!**

**Exercise 4:04A**

Simplify each addition or subtraction.

1 a  $\frac{x}{3} + \frac{x}{3}$     b  $\frac{3m}{7} + \frac{2m}{7}$     c  $\frac{3n}{8} - \frac{2n}{8}$   
 d  $\frac{3x}{5} - \frac{2x}{5}$     e  $\frac{7t}{8} - \frac{2t}{8}$     f  $\frac{4m}{7} - \frac{2m}{7}$

2 a  $\frac{7p}{10} - \frac{p}{10}$     b  $\frac{3q}{8} + \frac{q}{8}$     c  $\frac{3y}{6} - \frac{y}{6}$   
 d  $\frac{6x}{10} - \frac{3x}{10}$     e  $\frac{7x}{12} + \frac{x}{12}$     f  $\frac{2m}{6} - \frac{m}{6}$

3 a  $\frac{x}{3} - \frac{x}{2}$     b  $\frac{2a}{3} + \frac{a}{4}$     c  $\frac{m}{2} - \frac{m}{3}$     d  $\frac{2t}{3} - \frac{t}{2}$     e  $\frac{2x}{5} - \frac{2x}{5}$   
 f  $\frac{1}{3} - \frac{1}{3}$     g  $\frac{3w}{5} - \frac{w}{5}$     h  $\frac{3n}{2} - \frac{2n}{2}$     i  $\frac{2m}{3} - \frac{m}{2}$     j  $\frac{3a}{2} - \frac{3a}{2}$

4 a  $\frac{2a}{3} - \frac{a}{3}$     b  $\frac{3y}{2} + \frac{2y}{2}$     c  $\frac{2m}{3} - \frac{m}{3}$     d  $\frac{4m}{3} - \frac{m}{3}$     e  $\frac{3t}{3} - \frac{3t}{3}$   
 f  $\frac{6x}{9} - \frac{x}{9}$     g  $\frac{3a}{4} + \frac{a}{4}$     h  $\frac{7x}{4} + \frac{x}{4}$     i  $\frac{3n}{6} - \frac{2n}{6}$     j  $3y - \frac{3y}{8}$

5 a  $\frac{1}{2}m - \frac{1}{2}m$     b  $\frac{1}{2}y - \frac{1}{2}y$     c  $\frac{2}{3}x - \frac{1}{3}x$     d  $5y + \frac{1}{2}y$     e  $2m - \frac{1}{2}m$

**Remember that  $\frac{1}{2} + \frac{1}{3}$  is the same as  $\frac{1}{6} + \frac{2}{6}$  and that  $\frac{2m}{6}$  is the same as  $\frac{1}{3}m$ .  
 $+ 5y = \frac{5y}{1}$**

Worked examples show learners how to approach questions.

Levels of difficulty are indicated by colour.

Assessment grids increase learner awareness of criteria.

**Assessment Grid for Investigation 2:02 | A proportional flip**

The following is a sample assessment grid for this investigation. You should carefully read the criteria before beginning the investigation so that you know what is required.

Assessment Criteria (B, C, D) for this investigation		Achieved ✓
Criterion B Investigating Patterns	a None of the following descriptors has been achieved.	0
	b Some help was needed to apply mathematical techniques and problem solving to recognise the patterns.	1
	c Mathematical problem solving techniques have been applied and patterns recognised. A general rule has been suggested.	3
	d The correct techniques have been applied and patterns recognised as described in a general rule. Conclusions have been drawn consistent with the results.	4
	e All of the above have been achieved and conclusions are justified with a proof or further examples.	6
Criterion C Communication in Mathematics	a None of the following descriptors has been achieved.	0
	b There is a basic use of mathematical language and representation. Lines of reasoning are hard to follow.	1
	c There is a sufficient use of mathematical language and representation. Lines of reasoning are clear but not always logical or complete.	3
	d A good use of mathematical language and representation. Lines of reasoning are complete and concise.	6
Criterion D Reflection in Mathematics	a None of the following descriptors has been achieved.	0
	b An attempt has been made to explain whether the results make sense. An attempt has been made to draw a connection to real-life problems.	1
	c There is a correct but brief explanation of whether the results make sense. A description of a real-life application is given in question 7.	3
	d There is a critical explanation of whether the results make sense. Examples given in question 7 provide detailed applications of inverse proportion.	6

### 2:03 | Inverse Proportion (Inverse Variation)

In investigation 2:02 you found that as the number of one thing in the problem decreased, the other increased.

For example, if it takes 5 men 15 hours to do a job, it will take 1 man  $15 \times 5 = 75$  hours to do the same job. So, as the number of men decreases, the time taken to do the job increases.

Likewise, if it takes 1 man 75 hours to do the job, it will take 3 men  $\frac{75}{3} = 25$  hours to do the same job. So, as the number of men increases, the time taken to do the job decreases.

These are examples of inverse proportion (sometimes referred to as inverse variation).

**worked example**

If I travel at 30 km/h it will take me 3 hours to complete my journey. How long will it take to complete the journey if I travel at 60 km/h?

The faster I travel, the less time it takes, so this is an example of inverse proportion.

There are 2 methods of solving problems of this type:

**Method 1: Unitary method**  
 This requires us to find out how long it takes when travelling at 1 km/h and then at 60 km/h.

At 30 km/h it takes 3 hours  
 At 1 km/h it will take  $3 \times 30 = 150$  hours  
 At 60 km/h it will take  $\frac{150}{60} = 2\frac{1}{2}$  hours

**Method 2: Using a proportional statement**  
 Since this is an example of inverse proportion, time (t) is inversely proportional to speed (s).

$\therefore t \propto \frac{1}{s}$   
 $\therefore t = \frac{k}{s}$  this is  $k \times \frac{1}{s}$

Using the information we have been given:  
 $3 = \frac{k}{30}$   
 $\therefore k = 3 \times 30 = 150$   
 $\therefore k = \frac{150}{s}$

So to solve the problem:  $t = \frac{150}{60}$   
 $\therefore t = 2\frac{1}{2}$  hours

10

CHAPTER 4 ALGEBRA 23 24 INTERNATIONAL MATHEMATICS 4

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Links to foundation and challenge worksheets provide alternative exercises for consolidation or extension.

**Exercise 12:06**

**1** Each of the following solids has been built from 1 cm cubes. What is the surface area of each solid?

**2** The following solids have been built from a 2 cm cube and 1 cm cubes. Calculate the surface area of each solid?

**3** Calculate the surface area of the following solids. (All measurements are in centimetres.)

**4** Calculate the surface area of the following solids. (All measurements are in centimetres.)

**Investigation 12:06 | Perimeter and area**

Please use the Assessment Grid on the following page to help you understand what is required for this Investigation.

- Is there a connection between the area of a figure and its perimeter? If figure A has a greater perimeter than figure B does this mean it also has a greater area? Students often ask questions about the relationship between area and perimeter.
- One such question is: "Can rectangles with the same perimeter have different areas and, if so, which rectangle has the largest area?" We investigate that question here.

**Investigation**

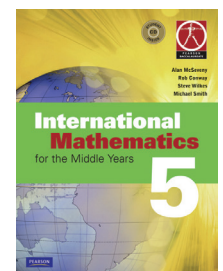
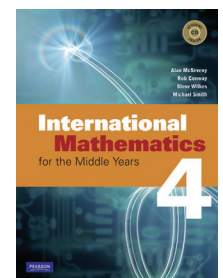
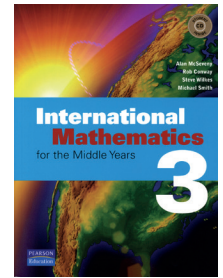
Think of all the rectangles that have a perimeter of 20 cm.

- 1 Give the dimensions of four rectangles that have a perimeter of 20 cm.
- 2 Calculate the area of each of your rectangles.
- 3 Complete the table below. (Let rectangle A be the one with the smallest area and rectangle D the one with the largest area.)

	Length	Width	Area
Rectangle A			
Rectangle B			
Rectangle C			
Rectangle D			

- 4 Can you predict the area of the largest rectangle with a perimeter of 20 cm?
- 5 Test your theory with rectangles of perimeter 36 cm and 48 cm.

• Composite solids of many types are present in these buildings. How would you describe them?



Investigations encourage learners to seek knowledge and develop research skills.

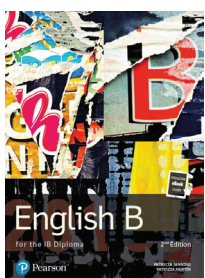
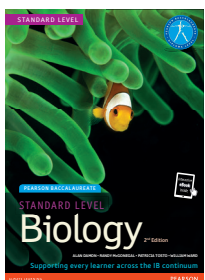
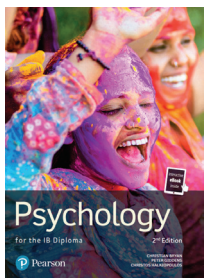
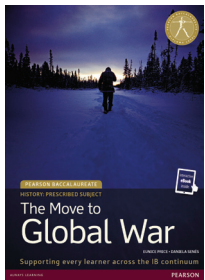
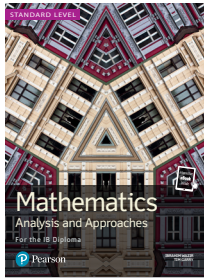
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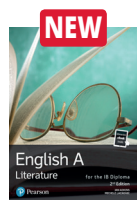
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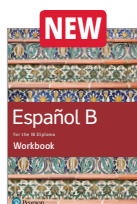
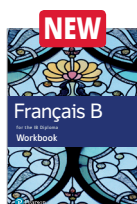
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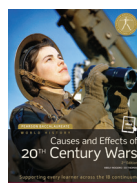
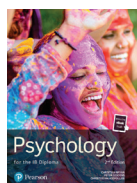
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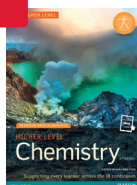
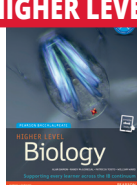
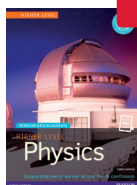
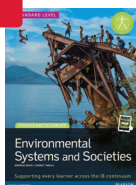
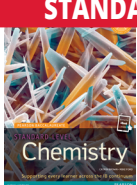
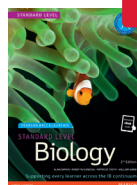
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**01 Cells**

There has been much sharing of data involving stem cell research. However, many nations have banned or restricted research in this area because of local cultural and religious traditions.

**1.2 The ultrastructure of cells**

**Understanding:**

- Prokaryotes have a simple cell structure without compartmentalization.
- Eukaryotes have a compartmentalized cell structure.
- Electron microscopes have a much higher magnification than light microscopes.

**Applications and skills:**

- Application: Structure and function of organelles within exocrine gland cells of the pancreas and within parietal mesothelial cells of the lung.
- Application: Prokaryotes divide by binary fission.
- Skill: Drawing of the ultrastructure of prokaryotic cells based on electron micrographs.
- Skill: Drawing of the ultrastructure of eukaryotic cells based on electron micrographs.
- Skill: Interpretation of electron micrographs to identify organelles and deduce the function of specialized cells.

**Guidance:**

- Drawings of prokaryotic cells should show the cell wall, pili, and flagella, and plasma membrane enclosing cytoplasm that contains 70S ribosomes and a nucleoid with naked DNA.
- Drawings of eukaryotic cells should show a plasma membrane enclosing cytoplasm that contains 80S ribosomes and a nucleus, mitochondria and other membrane-bound organelles (see present in the cytoplasm). Some eukaryotic cells have a cell wall.

**What is a prokaryotic cell?**

After extensive studies of cells, it has become apparent that all cells use some common molecular mechanisms. There are huge differences between different forms of life but cells are the basic unit and different cells have many characteristics in common. Cells are often divided into particular groups based on major characteristics. One such division separates cells into two groups: prokaryotic and eukaryotic cells. Prokaryotic cells are much smaller and simpler than eukaryotic cells. In fact, most prokaryotic cells are less than 1 µm in diameter. Because of this, and many other reasons that will be discussed later, the prokaryotic cells are thought to have appeared on Earth first. As bacteria are prokaryotic cells, you can see that such cells play a large role in the world today.

**Features of prokaryotic cells**

Study the figure of a prokaryotic cell (Figure 1.3) and make sure you can identify:

- the cell wall
- the plasma membrane
- flagella
- pili
- ribosomes
- the nucleoid (a region containing free DNA).

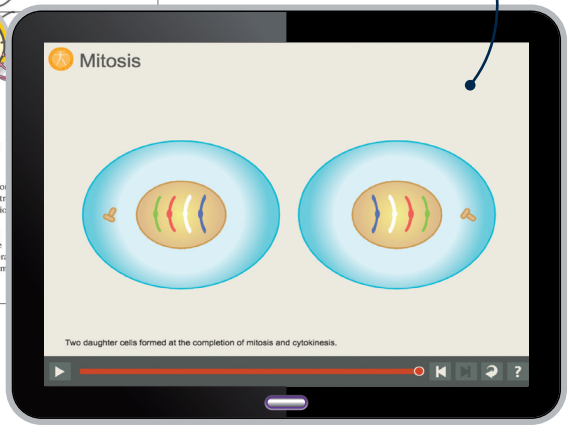
**Figure 1.3** This is a false colour scanning electron micrograph (SEM) of the bacterium *Escherichia coli*. Below is a drawing of a prokaryotic cell.

**The cell wall and plasma membrane**

The prokaryotic cell wall protects and maintains the shape of the cell. In most prokaryotic cells this wall is composed of a carbohydrate-protein complex called peptidoglycan. Some bacteria have an additional layer of a type of polysaccharide outside the cell wall. This layer makes it possible for some bacteria to adhere to structures such as teeth, skin, and food.

The plasma membrane is found just inside the cell wall and is similar in composition to the membranes of eukaryotic cells. To a large extent the plasma membrane controls the movement of materials into and out of the cell, and it plays a role in binary fission of the prokaryotic cell. The cytoplasm occupies the complete interior of the cell. The most visible structure with a microscope capable of high magnification is the chromosome or a molecule of DNA. There is no compartmentalization within the cytoplasm because there are no internal membranes other than the plasma membrane. Therefore, all cellular processes within prokaryotic cells occur within the cytoplasm.

Biology for the IB Diploma animation – just one of the many additional resources offered



**Part 1 Rivalry, mistrust and accord**

**Activity 5**

The Herblock cartoon shows Eisenhower and Khrushchev together in 1959 in the United States.

**The U-2 incident**

Again, although the meeting between Eisenhower and Khrushchev in the United States produced few concrete results, the talks were a success in terms of generating a positive atmosphere, which led people to talk of the 'spirit of Camp David' (Eisenhower's presidential retreat in Maryland). This optimism was short-lived, however, as a few days before the summit meeting convened in Paris, the Soviets announced that an American plane had been shot down over the Soviet Union on 1 May 1960. The Americans tried to claim it was only a weather plane, which had gone off course, but the Soviets were able to reveal that the aircraft was a high-altitude photo-reconnaissance plane. Even more damaging, the pilot, Gary Powers, who had been captured, confessed to the 'spy' nature of his task. Eisenhower then admitted the truth about the U-2 spy planes and took personal responsibility for the incident.

However, at the Paris Summit, Eisenhower refused to apologize for the U-2 incident or to condemn U-2 flights, saying that aerial surveillance was a distasteful, but vital necessity. Khrushchev then cancelled Eisenhower's planned visit to the Soviet Union and the meeting broke up with no further progress being made on a settlement for Berlin or a test-ban treaty. By 1962, any 'thaw' that might have been achieved was shown to be quite definitely at an end when the USA and the USSR had their most intense and dangerous conflict yet, over Cuba (see chapter 9).

**Activity 6**

**Self-management skills**

- What issues/events prevented any lasting Cold War 'thaw' during this period?
- Explain the meaning of the following co-existence, massive retaliation, New Look.
- Who or what was such of the following, and how did each one affect East-West relations during the 1950s?
  - the Suez Crisis
  - the Eisenhower Doctrine
  - the Hungarian Uprising
  - the Geneva Summit
  - Spain
  - the Gaither Report
  - the U-2 incident

NB for some of these, you may need to do extra research. See also chapters 12 and 18.

**Activity 7**

**Communication skills**

**Structuring the main body of an essay**

Here again is an essay question posed at the beginning of the chapter.

**To what extent was there a thaw in the Cold War between 1953 and 1960?**

**Introduction:** Look back at the work you did on introductions in the previous chapter and at the guidelines in chapter 3. What would be your starting point with the introduction for this essay?

**Main body of the essay:** As explained in the essay flow chart in chapter 3, you need to have a clear opening statement to start each paragraph. This sentence must make it obvious what the point of the paragraph is going to be, and it must clearly link back to the question. The rest of the paragraph should then provide evidence to support your opening statement.

- Look at the statements below. They can be grouped into three paragraphs to form the main body of the essay. Decide which statements fit better as:
  - opening statements for one of the paragraphs of the essay (3 evidence in the main body of the paragraphs)
  - 'The war in Korea was brought to a close.'
  - 'There were positive steps towards a reduction of tension and thus a 'thaw' after 1953. The USA continued to see the USSR as a threat in such areas as Asia.'
  - 'Tension increased dramatically in the late 1950s due to a series of incidents, which makes it clear that there was in fact no fundamental change in the relationship between the superpowers.'
  - 'The shooting down of the U-2 spy plane ended any good relations that had been built up during Khrushchev's visit to the United States.'
  - 'Nothing concrete was achieved at the Geneva Summit regarding the arms race or the German question. There is much evidence that there was still tension between the USA and the USSR after 1953.'
  - 'Sputnik raised new fears of superior Soviet technology and of a 'missile gap'. Khrushchev raised tensions over Berlin with an ultimatum to the West to leave.'
  - 'There was co-operation in cultural and economic areas following the 'spirit of Geneva'. Cuba brought the Soviet Union and the United States close to a direct nuclear confrontation.'
- In which order would you place the paragraphs? What other evidence might you add in each paragraph?
- Write a conclusion that supports the arguments that are in the main body of the essay.

**NB make sure you have made notes on the role of Khrushchev from this chapter, in chapter 9, we will analyse his policy of peaceful co-existence more fully and develop essay questions on this theme.**

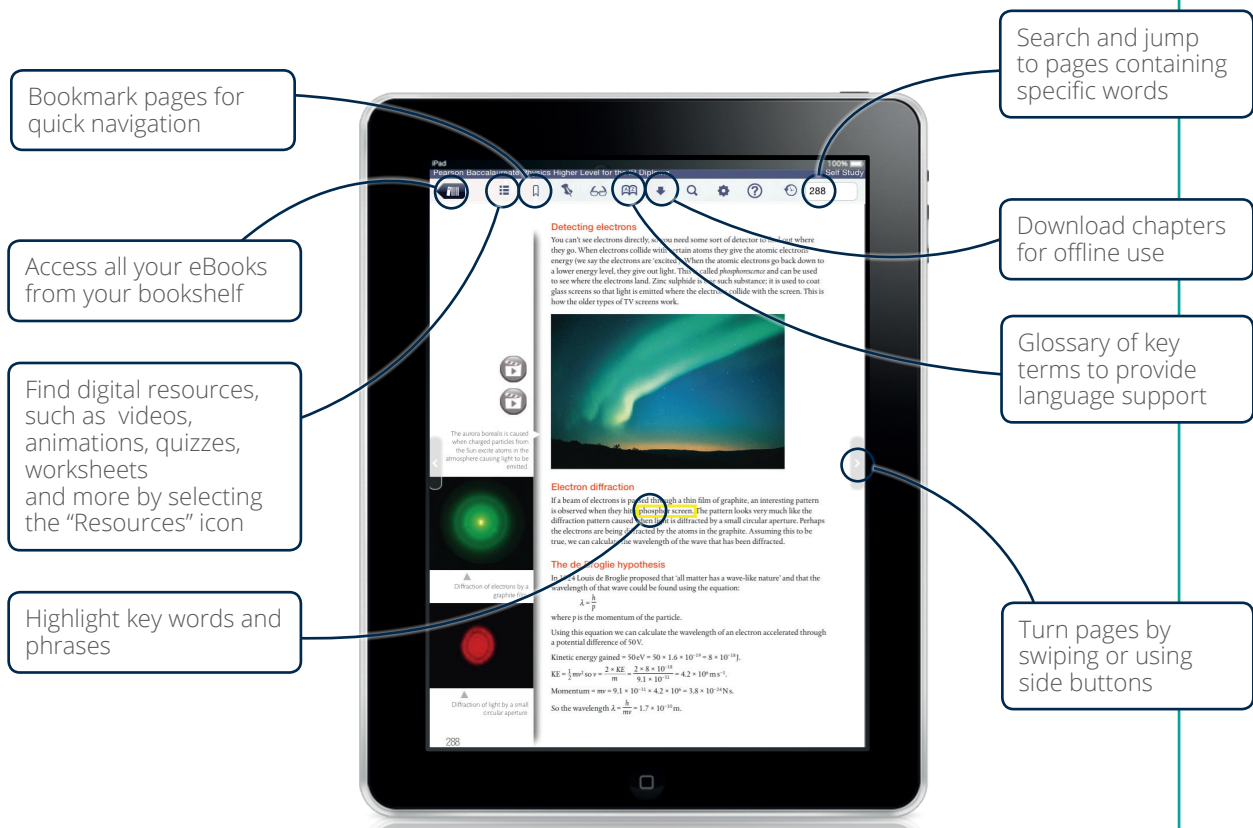
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**7 Exam support**

Paper 1 (stimulus-based paper) technique

**Paper 1 basics**

Both Higher Level and Standard Level students sit the same paper which lasts 1 hour 15 minutes. This paper is a stimulus-based paper on a topic taken from one of the four core units. Four stimuli are presented, which may be written, pictorial, diagrammatic, and which link to one of the four core units. Students must answer all four structured questions.

The maximum mark for this paper is 25. The paper is marked using a paper-specific analytic markscheme and for the fourth question, markbands are additionally used (see below).

Each question tests different assessment objectives. **READ THE QUESTIONS FIRST** – then you can read the sources knowing what you are looking for.

Question format and advice	Assessment objective	Relevant command terms (see page x)
<p><b>1. Tests understanding of a source</b></p> <p>You will be asked to extract information given to you in a source, which might be text, an image, or in the form of statistics. You must put it into your own words, showing that you have understood it. Five lines or so is probably about right. If you are asked to explain information from a source, take care not to simply copy the information word for word.</p> <p><b>Top tip</b> Aim to get through this question quickly – take no more than 5 minutes.</p>	<p>Assessment objective 1: Knowledge and understanding</p> <ul style="list-style-type: none"> <li>● Demonstrate knowledge and understanding of key political concepts and contemporary issues in global politics.</li> <li>● Demonstrate understanding of relevant source material.</li> <li>● Demonstrate understanding of a political issue in a particular experiential situation (engagement activity).</li> </ul>	<p><b>Describe</b> Give a detailed account.</p> <p><b>Define</b> Give the precise meaning of a word, phrase, concept or physical quantity.</p> <p><b>Identify</b> Provide an answer from a number of possibilities.</p> <p><b>Outline</b> Give a brief account or summary.</p>

**Synonyms**  
contemporary present

7 Exam support | 113

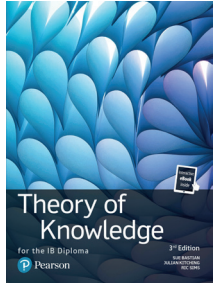
The **Essentials Series** is designed for revision and provides a condensed and practical exam preparation guide. Learners can get help on what is expected in the exam: model sentences, answer-openers, suggestions for case studies, and general exam advice.



# Theory of Knowledge

FOR SEPT 2020

Support your learners as they explore the latest Theory of Knowledge guide with our new edition text written by experts.



- The author team consists of Julian Kitching and Ric Sims, highly regarded members of the curriculum review panel, and Sue Bastian, the architect of the original TOK curriculum.
- Provides full coverage of the 2020 curriculum guide covering the Core, Optional themes, and Areas of knowledge.
- Structured to match the new knowledge framework.
- Examples of knowledge questions to help students recognise and decipher them.
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- Illustrations by TOK teacher Gary Goodwin, to add interest and humour.
- eBook version contains inspiring lesson plans, particularly helpful for supporting newly qualified TOK teachers.

Exercises throughout the book help learners reflect on what they have learned so far.

09
Ethics

**Exercises**

**11** Consider the list of vices that Pope Gregory the Great drew up in the 6th century. These are often referred to as 'the seven deadly sins'. Try to list the corresponding virtues and think about whether they are good in and of themselves, or is their main value to hold society together?

Vices	Virtues
lust	
anger	
envy	
gluttony	
sloth	
pride	
greed	

**12** If you could design a society, name three types of virtuous behaviour that would be regarded as central to the flourishing of the community (not necessarily the individual) and three vices that would be regarded as serious offences.

**The ancient world**

**The Code of Hammurabi**

The clay tablets in cuneiform writing of the Code of Hammurabi (1770 BCE) were discovered in Iran around 1900. They are mainly a list of do's and don'ts about contracts and relationships in Babylon. Yet despite the differences of costume and song, of foodstuff and manners, of time and place, there are surprising similarities to the way some communities behave today. Thus, we see the beginning of normative and virtue ethics – what to do to secure the common good (at least for those who counted as citizens).

**The Confucian Analects**

In China, Confucius (551–479 BCE) never stated whether man was born good or evil, but nevertheless held that 'by nature men are similar; by practice men are wide apart', implying that men should be 'conditioned by society towards the virtues of the saint, scholar and gentleman'. Or in today's vernacular – getting men to do the same thing will give you a stable society. (There is no reason to suppose that Confucius included women in the progress toward perfection.) These norms, like the Code of Hammurabi, were dogmatic and dictatorial unlike the use of reason and the dialectic that appeared with Socrates and the ancient Greek thinkers much later, around 350 BCE. But the older codes were on to something about shared values.

**The ancient Greeks**

When we begin to look at the thinkers of Greece in and around 350 BCE and read the dialogues of Plato, we see some of the rational methods used by scholars (and even ourselves) today: the dialectic back and forth of argument and the analysis of values – what are justice, love, beauty, and the nature of the good?

But back in 350 BCE, in Plato's dialogues we can almost see and hear the wise men of antiquity thrashing out one view after another. This teaching style is now called the Socratic method. And with Plato, the position of realism comes to the fore. The Platonic view is that there truly are moral values outside of ourselves: ideal forms that cannot be realized fully in this life, that are absolute, timeless, and unchanging.

The cast of characters in Plato's dialogues represent much that is the same in our time. We have only to think of news stories, novels, films, and our own experience: the moral nihilist, the sceptic, the relativism of the Sophists, the hedonist, and with Glaucon in *The Republic*, the individualist who is only 'looking out for number one'. And Thrasymachus of *The Republic* proclaims that 'might is right' 2000 years before the voice of Nietzsche in Germany echoed the same notions about his Superman in the 19th century.

In ancient Greece, ideas were a kind of intoxication stemming from the freedom of throwing off the shackles of polytheism and tradition. This is somewhat analogous to any child reaching maturity and finding that his or her parents and teachers are hopelessly flawed, so the best course is to figure out things for yourself! It was against this background of intellectual excitement that Socrates and Plato hoped to persuade men that lying, cheating, stealing, and other vices do more harm to the villain than to the victim and certainly are pernicious to the community. And that the best rulers are the philosopher-kings who know 'The Right' and, therefore, know right from wrong and desire only the right. Are there any philosopher-kings today in the world of politics?

**Knowledge questions**

**4** Do you agree that all sin comes from ignorance and reason is our only salvation?

**5** If not, how could a community survive unless human intelligence becomes the virtue that maintains social order?

**Practice essay title 2: Do you have to know "The Right" or the right thing to do in order to do the right thing?**

**Knowledge framework: Historical development –**  
What is the significance of the key points in the historical development of this area of knowledge?

Although **virtue ethics** is less fashionable today, it deserves a mention in any history of ethics, however briefly, because the approach of virtue ethics de-emphasizes rules, consequences and particular acts, and places the focus on the person. The issue is not primarily whether or not an intention is right, though that is important; nor is it primarily whether or not one is following the correct rule; nor is it primarily whether or not the consequences of action are good, though these factors are not irrelevant. What is primary is whether or not the person acting is expressing good character (moral virtues). See if this passage from Aristotle's Book II of the *Nicomachean Ethics* makes any sense to you. It certainly has seeds of the nature versus nurture debate still current in psychology today.

**Moral virtue comes about as a result of habit ... a slight variation from the word ethos (habit). From this it is also plain that none of the moral virtues arise in us by nature; for nothing that exists by nature can form a habit contrary to its nature. For instance the stone which by nature moves downwards cannot be habituated to move upwards, not**

**CHALLENGE YOURSELF**

How can we ever know these ideal forms?

**CHALLENGE YOURSELF**

Chances are if you pass a magazine stand in a train station or airport, you will find any number of headlines on how to take control of your life from the Alcoholics Anonymous 12-step programme to weight loss and exercise routines meant to implant the habits of the relevant physical or moral virtue. In what ways would a 'practice makes perfect' philosophy lead to success in school, professional, or social relationships?



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## About the authors



**Sue Bastian**  
*Series Editor*

Sue Bastian has served the IB as teacher, workshop leader, examiner, textbook author and Chief Assessor of Theory of Knowledge in the Philippines and at the UN School in New York City. She has just completed a review and revision of the TOK Lessons From Around the World and now is concentrating on teaching others how to design lessons for their classroom.



**Julian Kitching**  
*Author*

Over 30 years involvement with the IB, Julian Kitching has taught Theory of Knowledge, contributed to four successive reviews of the course, and served as a workshop leader and examiner, including an 8-year period as Chief Assessor until 2018. He is Director of Studies at the SOS-Hermann Gmeiner International College in Ghana.



**Ric Sims**  
*Author*

Ric Sims has taught ToK for nearly three decades as well as Economics, Philosophy, Maths and Music for the diploma. He has served on the senior examining team since the late 1990's, including more than a decade as Deputy Chief Assessor. He has participated in four curriculum reviews, led workshops for ToK teachers, and is a regular keynote speaker.

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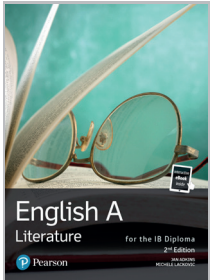


GROUP 1:

# Studies in Languages and Literature

COMING MAY 2020

## English Literature A



Written by IB expert authors to provide you and your students with comprehensive coverage of the requirements of the IB Guide for first assessments in 2021.

- Key terms from the guide explained and highlighted including Concepts, Areas of Exploration and Global Issues.
- Inclusion of carefully selected, up-to-date, texts to inspire learners.
- Activities to help strengthen appreciation and understanding of different works.
- Chapter insight summaries of the main points.
- Clear learning objectives and links to TOK throughout.
- Detailed support for the assessments including the Higher Level essay. Extended Essay guidance.
- Intertextual connections highlighted.

Clear learning objectives

**4** Approaches to teaching and learning in conventions of drama

**Learning objectives**

In this chapter you will:

- Connect drama to ATLs, course concepts, and areas of exploration
- Explore conventions and expectations of drama
- Consider the advantages and limitations of staging
- Understand the creation of momentum
- Identify and interpret dramatic structures and their effects on the audience
- Understand drama as performance literature
- Communicate ideas through a variety of individual and collaborative activities
- Analyse, evaluate, and appreciate a range of dramatic works through:
  - readers, writers, and texts
  - time and space
  - intertextuality
  - global issues

As we begin our study of dramatic conventions, it's important to note how the approaches to teaching and learning that foster knowledge in all IB coursework have particular applications in drama. As you read this chapter, note that your **line of inquiry** into dramatic texts will shift from that of a reader to that of an audience member. Understanding the concepts of **transformation** and **representation** will be key in understanding how aspects of performance, including staging, directing, and even the **context** in which a play is performed, affect its meaning. Every text requires you to hone your thinking skills, but for drama, the idea of **communication** often takes on a much broader meaning. You need to consider not only how the playwright communicates ideas, but also how such ideas are negotiated through directors, actors, and even audience members. Work on stage is a **collaborative** process by nature, and the outcomes of such collaborations are likely to affect how **stage performances** are received and understood. As such, this chapter will give you the opportunity to practise your **research** and your **social and self-management** skills. You will examine multiple versions of past performances, collaborate with others through discussion, role playing, and active listening, and build solid entries for your learning portfolio that will help keep you organised for your upcoming assessments.

Every play has one common aspect: it is written to be performed. What this means for you as a reader is that you must call upon your imagination to see the **characters** and to hear the same words, sounds, actions, and movements that you would experience as a member of an audience viewing a play. Imagination plays a role in many disciplines, but in drama it activates a reader's **creativity**, transforming flat text on a page into an animated form ready for life on the stage. As readers turn themselves into viewers, they negotiate a new role with writers and text, a role that makes the study of drama quite different from other literary forms.

Caption: Theatrical performances are among the most immediate forms of literary presentation.

Key terms highlighted.

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## About the authors

### Jan Adkins

Jan Adkins is now retired after teaching English for 40 years, including 24 years teaching IB English. Assistant Examiner for 15 years and has lead teaching training workshops for 25 years. Jan holds a PhD in English, and is the recipient of the Robert O Lawton Award for Teaching Excellence at Florida State University, and the Teaching Excellence Award at Eckerd College. Jan was a co-author of our previous best-selling Pearson English A Literature for the IB Diploma textbook.

### Michele Lackovic

Michele Lackovic has been involved with the IB for two decades. She began teaching IB Language A: literature in 2000 and TOK in 2008. She currently teaches IB Diploma Programme courses, coordinates the CAS programme, and chairs the English Department at Suncoast Community High School in Florida. She also leads teacher training workshops and marks IB English Literature exams as well as Extended Essays. Michele is a National Board Certified Teacher and holds an MA in English from Penn State University and a BA in English from UCLA.

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### Literature A and the Extended Essay

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GROUP 2:

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# Language Acquisition

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- Support for the Internal Assessment.

**1**

Identities

Personal – Reflection

**Grammar in context**

**-ing form**  
Complete these sentences using a suitable verb in the -ing form

- 1 Try to stop him \_\_\_\_\_.
- 2 I like my teacher \_\_\_\_\_ grammar to me.
- 3 He keeps the central heating \_\_\_\_\_ all winter.
- 4 The girl couldn't forgive the boy for \_\_\_\_\_ her phone.
- 5 I miss her \_\_\_\_\_ me to school in the mornings.

by Alegria Lores  
Below are the reflections of an educator who now lives in Costa Rica. Do you know where that is? Look online to find the location and see what else you can discover about Costa Rica.

**What it means to be a Cuban-American-Costa Rican**

by Alegria Lores  
*Answering the question "What is your native language?" is difficult for me. During my early years, my mother spoke to me in English and my father spoke to me in Spanish. She was from Minnesota, USA, and he was from Cuba. They lived in a Spanish-speaking area of Tangiers, Morocco, but we moved to New York City when I was three. There we lived among Hispanics, but school was in English. When I was nine my family moved to Costa Rica, where we settled. I married a Costa Rican and eventually adopted the Costa Rican citizenship in addition to my US citizenship.*

*My life has continued in this fashion, always immersed in a bilingual and bicultural environment. Depending on where it is, I become somewhat more fluent in that language – English or Spanish.*

*The advantages? Being equally comfortable attending school in either language, being able to translate and interpret in those languages, and the ability to have friends from many countries.*

*The disadvantages? Not identifying 100% with any one culture, feeling a bit like an outsider wherever I live, and people commenting "You have a different accent!"*

*Would I choose to have it any other way? Absolutely not! I consider myself extremely fortunate to have had the opportunity to live and learn in two cultures and, as a result, be comfortable in both almost effortlessly!*




Figure 1.2 Dried flowers in a Costa Rican market

**Paper 1 practice task**

Write a personal blog reflecting on your first language as it relates to your identity. Think about the following questions, plus any other ideas of your own when writing your blog.

- How does your life compare with Alegria's?
- How many countries have you lived in and how many languages have you learned?
- Do you agree with the advantages and disadvantages Alegria mentions? If not, explain your opinion.
- SL students should write 250 – 400 words. HL students should write 450 – 600 words.

**Tips for writing a blog**

- A blog is an online journal or informational website. It is usually started by one person who may then invite others to add their thoughts or comments.
- Before you start, decide:
  - why you are writing
  - what you want to say
  - which facts you want to include.
- Organize your ideas into paragraphs with key information and supporting details.
- Give your blog a strong heading and remember that people write blogs because they feel strongly about the topic.
- A blog is written in formal or semi-formal English. You can use phrases such as 'I strongly feel' or 'it is my opinion' because the style is often like a newspaper article.
- You must remember to show your knowledge of English by thinking about your choice of vocabulary and your use of correct grammar.

**How is our identity formed?**

**Paper 2 practice listening task (1.1) – Alumni Speech Day**

You will hear a speech made by an alumnus at his old school's Speech Day.

1 Complete the following gaps with words from his speech. Use no more than three words for each gap.

- a Life in an office working at a desk is now (1).
- b I was shy, physically weak, rather overweight, and (2) any kind of self-confidence.
- c I grew older of course, but that alone wouldn't (4).
- d I would still have been the boy people laughed at, who wasn't (5) anything, and was afraid of everybody.
- e Sport was really popular then, as it is now, but PE classes were (6) to put it mildly.

- 2 What has Martin been doing since he left school?
- 3 List three of the problems Martin had as a teenager.
- 4 What did Martin do to escape his problems?
- 5 What effect did running have on Martin's self-confidence?
- 6 What is the real lesson the friend taught Martin?

12

### NEW SYLLABUS

#### English B

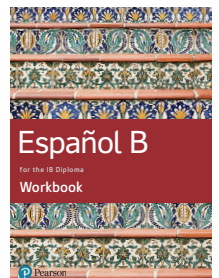
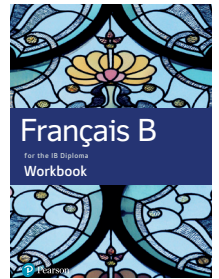
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**1** Expériences

**1.1 L'immigration en question**

**Séance échauffement**  
**Regards sur l'immigration**

**Activité 1**  
Regardez ces photos. C'est où? C'est quoi?  
Quels mots vous viennent à l'esprit? Justifiez. (8 mots ou concepts)  
Exemple: Un **bidonville**  
Les personnes vivent dans des tentes de fortune et dans des conditions de vie insalubres. On dirait un bidonville.

**Activité 2**  
a Reliez les mots de la colonne de gauche à leur définition.

1 un(e) sans-papier	Exemple d	a ligne-imaginaire-qui sépare un pays d'un autre pays.
2 fair son pays		b Personne qui a entamé une démarche légale pour obtenir l'autorisation de résider dans un pays.
3 l'exil		c Remplacer quelqu'un dans son pays d'origine.
4 un(e) réfugié(e)		d Personne qui est entré illégalement (clandestinement) dans un pays.
5 un(e) demandeur / demandeuse d'asile		e Situation de quelqu'un qui a été forcé de quitter son pays.
6 un(e) expatrié(e)		f Action de quitter son pays, souvent pour des raisons humanitaires ou politiques.
7 accueillir		g Personne qui fait le choix de s'exiler pour des raisons professionnelles.
8 un(e) étranger / étrangère		h Il / elle peut être politique ou climatique. Il / elle a été contraint(e) de quitter son pays d'origine et ne peut pas y retourner.
9 une frontière		i Recevoir une personne / accepter un étranger sur son territoire.
10 expulser		j Personne qui vient d'un autre pays, ou d'une autre communauté ou d'un autre groupe. Personne qui ne m'est pas familière.

b Choisissez 5 des mots de l'exercice a et écrivez 5 phrases pour exprimer une opinion sur l'immigration.

L'immigration en question

**Activité 3**

a Débattez-vous aux raisons qui poussent parfois les gens à quitter leur pays natal. Dresser une liste de 8 raisons.

- 
- 
- 
- 
- 
- 
- 
- 

b **Mini débat** – travail à deux  
Avec un(e) partenaire, essayez de justifier ces raisons. Le rôle de votre partenaire est d'essayer de vous convaincre que ce n'est pas une bonne idée et de contrecarrer vos arguments.  
Exemple: **Immigré**  
En Europe, je pourrais trouver du travail et gagner de l'argent.  
Exemple: **Argument opposé**  
Tu n'as pas les qualifications requises et le taux de chômage est élevé en Europe.

**Immigration: positive ou négative?**

a Faites une liste de 5 avantages et 5 problèmes que pose l'immigration:

- pour le pays où les personnes immigrer
- pour le pays dont les personnes sont originaires

Justifiez / illustrez chacune de vos réponses.

Pour le pays où les personnes immigrer

BIENFAITS	PROBLÈMES
Exemple: un surcroît de main-d'œuvre pour le pays d'accueil	

Pour le pays dont les personnes sont originaires

BIENFAITS	PROBLÈMES
Exemple: La personne qui a émigré peut envoyer de l'argent à sa famille restée au pays.	

**Approches de l'apprentissage requise**  
Compétences de communication et collaboration

**V** **conclure** – persuader  
**contrecarrer** un argument – donner un argument contraire / opposé

**Gramm'expert**  
Ce tableau  
Ce = adjectif démonstratif: désigne une personne / un objet en particulier.  
Adjectif = accord  
Masculin et féminin  
Masculin + voyelle ou "r": muet, cet homme / cet enfant.  
Féminin, cette femme  
Masculin et féminin pluriel: ces tableaux / ces femmes.

**Approches de l'apprentissage requise**  
Compétences de communication et collaboration

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GROUP 3:

# Individuals and Societies

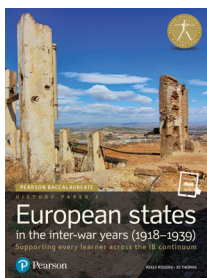
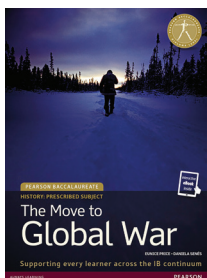
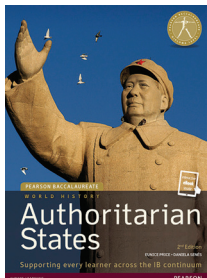
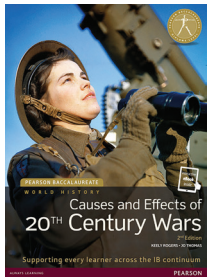
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**01 Causes of expansion, 1868-1930**

During the shogunate, Kyoto - where the imperial court was located - was the capital of Japan. However, the real seat of power was Edo, where the shogun lived (With the Meiji Restoration in 1868, Edo was renamed Tokyo (meaning eastern capital) and became the capital; the imperial court was moved there the following year).

**CHALLENGE YOURSELF**

**Thinking context, current issues, and real life**

Working with a classmate, find out about Francis Xavier and the Jesuits who brought Christianity to Japan in 1549. How did the Japanese respond to the arrival of Christian missionaries on their shores? Why was there such a hostile reaction to Christianity in Japan? Do they still have the gift of a human voice?

**Activity 1**

The source below is a contemporary Japanese print. Study the source and answer the question that follows.

**1. What does the source convey about how the Americans were perceived at this time in Japan?**

**Commodore Perry and the 'black ships'**

Commodore Matthew Calbraith Perry of the United States Navy sailed into Edo (Tokyo) harbour on 8 July 1853 under his command was a fleet referred to as the black ships of evil by the Japanese. Perry came to demand open trade with a country that, despite some early contact with Christian missionaries during the 17th century, had retreated into isolation from the West.

According to Ian Buruma:

Japanese rulers, fearful of foreign aggression and worried that Christianity, promoted by European missionaries, would make their subjects weak, had outlawed the Christian religion, expelled most foreigners and all priests, and forbidden Japanese to go abroad.

*From Ian Buruma, Inventing Japan 1853-1864, Modern Library, New York, 2004, page 11*

**CHALLENGE YOURSELF**

**Thinking, systems, power, and real life**

Today, the Yasukuni shrine remains controversial among the Japanese, it appears in the news almost every year. See what you can find out about it. Share your research with the class.

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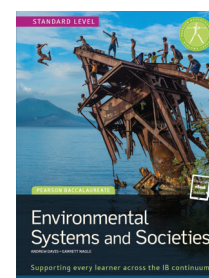
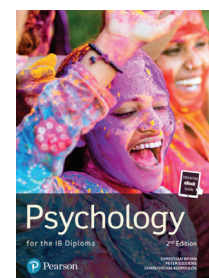
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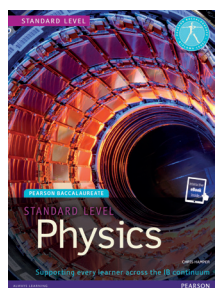
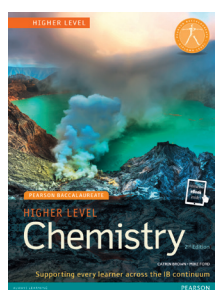
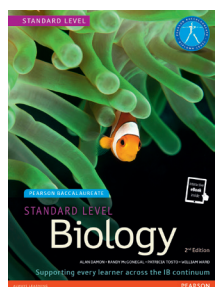


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Key fact boxes help learners identify core learning points.

**01** Stoichiometric relationships

properties, so compounds have completely different properties from those of their component elements.

A classic example of this is that sodium, Na, is a dangerously reactive metal that reacts violently with water, while chlorine, Cl<sub>2</sub>, is a toxic gas used as a chemical weapon. Yet when these two elements combine, they form the compound sodium chloride, NaCl, a white crystalline solid that we sprinkle all over our food.

Compounds are described using the chemical symbols for elements. A subscript is used to show the number of atoms of each element in a unit of the compound. Some examples are given below. (The reasons for the different ratios of elements in compounds will become clearer after we have studied atomic structure and bonding in Chapters 2 and 4.)

Name of compound	Symbol	Name of compound	Symbol
sodium chloride	NaCl	water	H <sub>2</sub> O
potassium oxide	K <sub>2</sub> O	glucose	C <sub>6</sub> H <sub>12</sub> O <sub>6</sub>
calcium bromide	CaBr <sub>2</sub>	ammonium sulfate	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>

**Chemical equations summarize chemical change**

The formation of compounds from elements is an example of **chemical change** and can be represented by a **chemical equation**. A chemical equation is a representation using chemical symbols of the simplest ratio of atoms, as elements or in compounds, undergoing chemical change. The left-hand side shows the **reactants** and the right-hand side the **products**.

For example: calcium + chlorine → calcium chloride  

$$\text{Ca} + \text{Cl}_2 \rightarrow \text{CaCl}_2$$

As atoms are neither created nor destroyed during a chemical reaction, the total number of atoms of each element must be the same on both sides of the equation. This is known as **balancing the equation**, and uses numbers called **stoichiometric coefficients** to denote the number of units of each term in the equation.

For example:

$$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$$

total on left side
total on right side

hydrogen atoms	4	4
oxygen atoms	2	2

$$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$$

total on left side
total on right side

hydrogen atoms	4	4
oxygen atoms	2	2

Note that when the coefficient is 1, this does not need to be explicitly stated.

**Figure 1.1** When hydrogen and oxygen react to form water, the atoms are rearranged, but the number of atoms of each element remains the same.

**Chemical equations are used to show all types of reactions in chemistry, including reactions of decomposition, combustion, neutralization, and so on. Examples of these are given below and you will come across very many more during this course. Learning to write equations is an important skill in chemistry, which develops quickly with practice.**

**Worked example**

Write an equation for the reaction of thermal decomposition of sodium hydrogencarbonate (NaHCO<sub>3</sub>) into sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>), water (H<sub>2</sub>O), and carbon dioxide (CO<sub>2</sub>).

**Solution**

First write the information from the question in the form of an equation, and then check the number of atoms of each element on both sides of the equation.

$$\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$$

	total on left side	total on right side
sodium atoms	1	2
hydrogen atoms	1	2
carbon atoms	1	2
oxygen atoms	3	6

In order to balance this we introduce coefficient 2 on the left.

$$2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$$

Finally check that it is balanced for each element.

**NATURE OF SCIENCE**

Early ideas to explain chemical change in combustion and rusting included the 'phlogiston' theory. This proposed the existence of a fire-like element that was released during these processes. The theory seemed to explain some of the observations of its time, although these were purely qualitative. It could not explain later quantitative data showing that substances actually gain rather than lose mass during burning. In 1783, Lavoisier's work on oxygen confirmed that combustion and rusting involve combination with oxygen from the air, so overturning the phlogiston theory. This is a good example of how the evolution of scientific ideas, such as how chemical change occurs, is based on the need for theories that can be tested by experiment. Where results are not compatible with the theory, a new theory must be put forward, which must then be subject to the same rigour of experimental test.

**Exercises**

1 Write balanced chemical equations for the following reactions:

- The decomposition of copper carbonate (CuCO<sub>3</sub>) into copper(II) oxide (CuO) and carbon dioxide (CO<sub>2</sub>).
- The combustion of magnesium (Mg) in oxygen (O<sub>2</sub>) to form magnesium oxide (MgO).
- The neutralization of sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) with sodium hydroxide (NaOH) to form sodium sulfate (Na<sub>2</sub>SO<sub>4</sub>) and water (H<sub>2</sub>O).
- The synthesis of ammonia (NH<sub>3</sub>) from nitrogen (N<sub>2</sub>) and hydrogen (H<sub>2</sub>).
- The combustion of methane (CH<sub>4</sub>) to produce carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O).

2 Write balanced chemical equations for the following reactions:

- K + H<sub>2</sub>O → KOH + H<sub>2</sub>
- C<sub>3</sub>H<sub>8</sub> + O<sub>2</sub> → CO<sub>2</sub> + H<sub>2</sub>O
- Cl<sub>2</sub> + KI → KI + I<sub>2</sub>
- Fe<sub>2</sub>O<sub>3</sub> + C → CO + Fe
- C<sub>6</sub>H<sub>5</sub>OH + O<sub>2</sub> → CO<sub>2</sub> + H<sub>2</sub>O
- CO<sub>2</sub> → C<sub>2</sub>O<sub>2</sub> + O<sub>2</sub>

Nature of science boxes encourage learners to think about the nature of scientific knowledge as it applies to chemistry.

Exercises encourage learners to apply their knowledge and test their understanding. The answers can be found in the eBook.

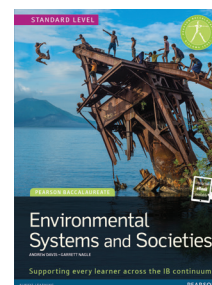
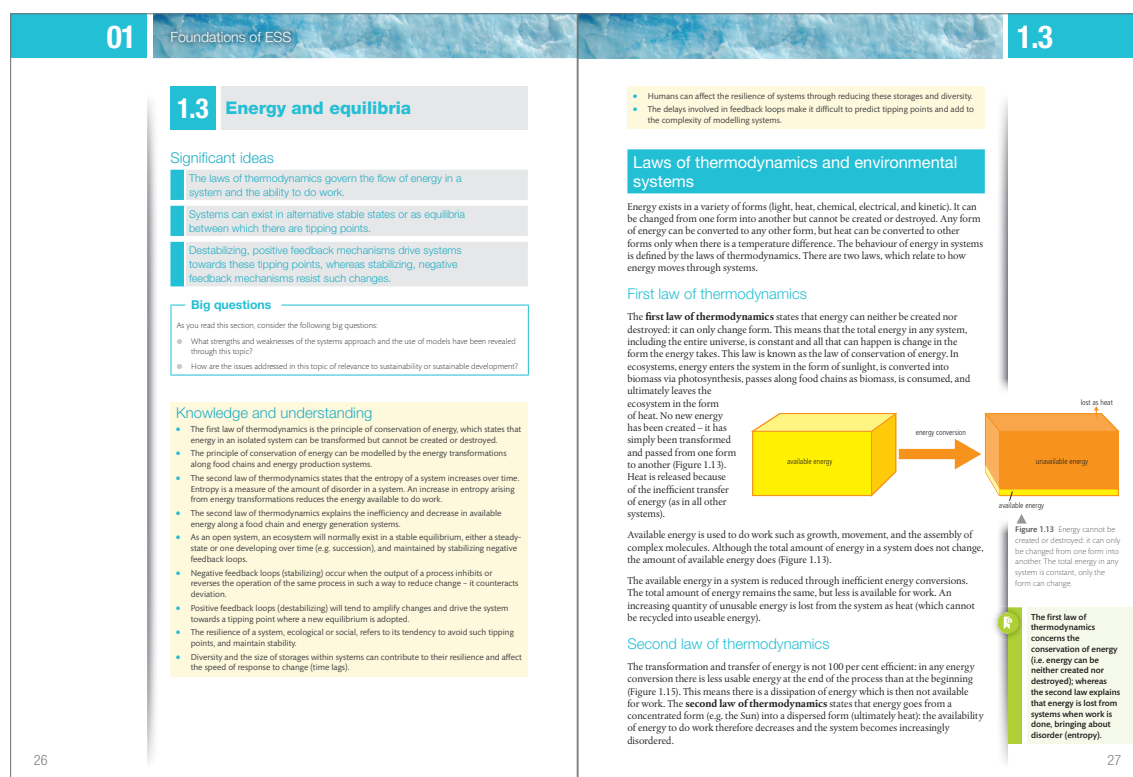
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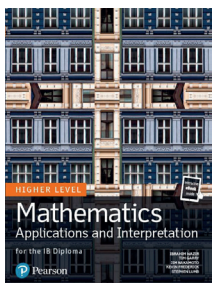
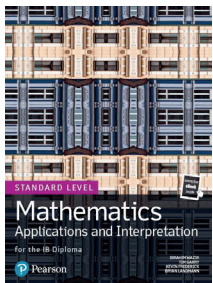
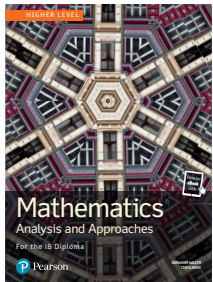
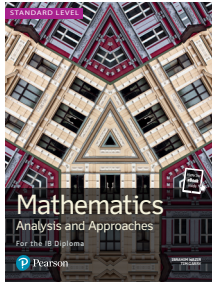
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6
Trigonometric functions and equations

**Figure 6.5** Axes with lengths equal to the radius placed along the circumference of a circle.

**Figure 6.6** Degree and radian measure for common angles.

Because  $2\pi$  is approximately 6.28 (3 s.f.), there are a little more than six radius lengths in one revolution, as shown in Figure 6.5.

**Figure 6.6** shows all of the angles between  $0^\circ$  and  $360^\circ$  inclusive that are multiples of  $30^\circ$  or  $45^\circ$ , and their equivalent radian measure. You will benefit by being able to convert quickly between degree measure and radian measure for these common angles.

**Example 6.4**

The diagram shows a circle of centre  $O$  with radius  $r = 6$  cm. Angle  $AOB$  subtends the minor arc  $AB$  such that the length of the arc is 10 cm. Find the measure of angle  $AOB$  in degrees, accurate to 3 significant figures.

**Solution:**  
Rearrange the arc length formula,  $s = r\theta$ , giving  $\theta = \frac{s}{r}$ . Remember that the result for  $\theta$  will be in radians. Therefore, angle  $AOB = \frac{10}{6} = \frac{5}{3}$  or 1.6 radians. Now, we convert to degrees:  $\frac{5}{3} \left( \frac{180^\circ}{\pi} \right) \approx 95.49297^\circ$ . The degree measure of angle  $AOB$  is approximately  $95.5^\circ$ .

**Arc length**

For any angle  $\theta$ , its radian measure is given by  $\theta = \frac{s}{r}$ . Simple rearrangement of this formula leads to another formula for computing arc length.

**Example 6.3**

A circle has a radius of 10 cm. Find the length of the arc of the circle subtended by a central angle of  $150^\circ$ .

**Solution:**  
To use the formula  $s = r\theta$ , we must first convert  $150^\circ$  to radian measure.  

$$150^\circ = 150 \left( \frac{\pi}{180^\circ} \right) = \frac{150\pi}{180} = \frac{5\pi}{6}$$
 Substituting  $r = 10$  cm into  $s = r\theta$  gives  

$$s = 10 \left( \frac{5\pi}{6} \right) = \frac{25\pi}{3} \approx 26.17994$$
 The length of the arc is 26.2 cm (3 s.f.).

**Sector of a circle**

A **sector of a circle** is the region bounded by an arc of the circle and the two sides of a central angle (Figure 6.7). The ratio of the area of a sector to the area of the circle ( $\pi r^2$ ) is equal to the ratio of the length of the subtended arc to the circumference of the circle ( $2\pi r$ ). If  $s$  is the arc length and  $A$  is the area of the sector, we can write the following proportion:

$$\frac{A}{\pi r^2} = \frac{s}{2\pi r}$$

Solving for  $A$  gives:

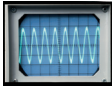
$$A = \frac{\pi r^2}{2\pi r} \cdot \frac{s}{2\pi r} = \frac{1}{2} r s$$

From the formula for arc length we have  $s = r\theta$ , with  $\theta$  the radian measure of the central angle. Substituting  $r\theta$  for  $s$  gives the area of a sector to be  $A = \frac{1}{2} r^2 \theta = \frac{1}{2} r(r\theta)$ .

## Learning objectives

By the end of this chapter you should be familiar with...

- angles measured in radians
- computing the length of an arc and the area of a sector
- the unit circle and the definitions for  $\sin\theta$ ,  $\cos\theta$  and  $\tan\theta$
- knowing exact values of  $\sin\theta$ ,  $\cos\theta$  and  $\tan\theta$  for  $0$ ,  $\frac{\pi}{6}$ ,  $\frac{\pi}{4}$ ,  $\frac{\pi}{3}$ ,  $\frac{\pi}{2}$  and their multiples
- the Pythagorean identities and double angle identities for sine and cosine
- the relationships between  $\sin\theta$ ,  $\cos\theta$  and  $\tan\theta$
- the graphs of  $\sin\theta$ ,  $\cos\theta$  and  $\tan\theta$ , and their amplitude and period transformations of graphs in the form  $a\sin(b(x+c))+d$  and  $a\cos(b(x+c))+d$
- applying trigonometry to real-life problems
- solving trigonometric equations in a finite interval
- the reciprocal trigonometric ratios  $\sec\theta$ ,  $\csc\theta$  and  $\cot\theta$
- the Pythagorean identities involving  $\tan\theta$ ,  $\sec\theta$ ,  $\csc\theta$  and  $\cot\theta$
- the inverse functions  $\arcsin x$ ,  $\arccos x$ ,  $\arctan x$ ; and their domains, ranges and graphs
- the compound angle identities for  $\sin\theta$  and  $\cos\theta$
- double angle identity for  $\tan\theta$
- relationships between trigonometric functions and the symmetry of their graphs.



The oscilloscope shows the pressure of a sound wave versus time for a high-pitched sound. The graph is a repetitive pattern that can be expressed as the sum of different sine waves. A sine wave is any transformation of the graph of the trigonometric function  $y = \sin x$  and takes the form  $y = a \sin [k(x+c)] + d$ .

Trigonometry developed from the use and study of triangles in surveying, navigation, architecture, and astronomy to find relationships between lengths of sides of triangles and measurement of angles. As a result, trigonometric functions were initially defined as functions of angles – that is, functions with angle measurements as their domains. With the development of calculus in the 17th century and the growth of knowledge in the sciences, the application of trigonometric functions grew to include a wide variety of periodic (repetitive) phenomena such as wave motion, vibrating strings, oscillating pendulums, alternating electrical current, and biological cycles. These applications of trigonometric functions require their domains to be sets of real numbers without reference to angles or triangles. Hence, trigonometry can be approached from two different perspectives – functions of angles or functions of real numbers. This chapter focuses on the latter – viewing trigonometric functions as defined in terms of a real number that is the length of an arc along the unit circle.

3

## 6.1 Angles, circles, arcs and sectors

An angle in a plane is made by rotating a ray about its endpoint, called the vertex of the angle. The starting position of the ray is called the initial side and the position of the ray after rotation is called the terminal side of the angle (Figure 6.1). An angle with its vertex at the origin and its initial side on the positive  $x$ -axis is in **standard position** (Figure 6.2a). A **positive angle** is produced when a ray is rotated in an anticlockwise direction, and a **negative angle** when rotated in a clockwise direction. Two angles in standard position that have the same terminal sides regardless of the direction or number of rotations are called **coterminal angles**. Greek letters are often used to represent angles, and the direction of rotation is indicated by an arc with an arrow at its endpoint. The  $x$  and  $y$  axes divide the coordinate plane into four quadrants (numbered with Roman numerals). Figure 6.2b shows a positive angle  $\alpha$  and a negative angle  $\beta$  that are coterminal in quadrant III.

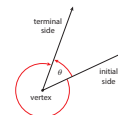


Figure 6.1 Components of an angle

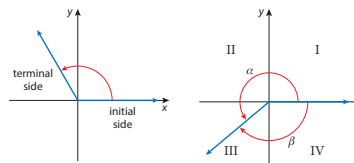


Figure 6.2a Standard position of an angle

Figure 6.2b Coterminal angles

$$\beta = \alpha - 360$$

## Measuring angles: degree measure and radian measure

A unit of one degree ( $1^\circ$ ) is defined to be  $\frac{1}{360}$  of one anticlockwise revolution about the vertex. There is another method of measuring angles that is more natural. Instead of dividing a full revolution into an arbitrary number of equal divisions (e.g. 360), consider an angle that has its vertex at the centre of a circle (a central angle) and subtends (or intercepts) a part of the circle, called an arc of the circle. Figure 6.3 shows three circles with radii of different lengths ( $r_1 < r_2 < r_3$ ) and the same central angle  $\theta$  subtending (intercepting) the arc lengths  $s_1$ ,  $s_2$ , and  $s_3$ . Regardless of the size of the circle (i.e. length of the radius), the ratio of arc length,  $s$ , to radius,  $r$ , for a given angle will be constant. For the angle  $\theta$  in Figure 6.3,  $\frac{s_1}{r_1} = \frac{s_2}{r_2} = \frac{s_3}{r_3}$ . Because this ratio is an arc length divided by another length (radius), it is just an ordinary real number and has no units.

4



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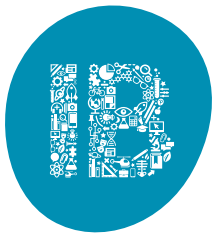
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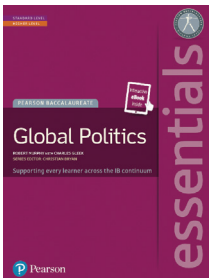


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**Hard power**  
Military forces was used against the Gaddafi regime in Libya in 2011, with a NATO air campaign authorized by the UN Security Council to protect civilians. However, the Obama administration was initially reluctant to use military force, focusing instead on withdrawing troops from Iraq and Afghanistan. During Obama's presidency, there was reluctance to deploy soldiers to new conflicts.

**Smart power**  
President Obama's speech in Cairo in 2009 pledged to reset relations with the Muslim world in the Middle East. However, this public message was combined with a continuation of military force in Iraq and Afghanistan. The US administration attempted to achieve a decisive outcome before withdrawing US troops in 2011 and 2014.

**Soft power**  
Natural disasters ranging from the South Asian tsunami in 2005; the Haiti earthquake in 2009; and the West African Ebola outbreak in 2014-15 have seen huge donations from states and even the deployment of troops to help. Sporting events such as the London and Sochi Olympic Games in 2012 and 2014 can be used to boost a state's global image.

**General vocabulary**  
Estate: a virus that causes bleeding from many parts of the body and usually causes death  
Inglemeals: not allowed or acceptable according to rules or agreements  
credibility: the quality of deserving to be believed and trusted  
comply: do what you have to do or we asked to do

**Synonyms**  
reluctant ..... unwilling  
troops ..... soldiers  
well-aided ..... well-armed strongly  
ultimatum ..... demand

**Articulation sentences:**  
Hard power relies on force, whereas soft power involves the use of persuasion. Smart power is the combination of both of these tactics.

**Challenges of soft power**  
Supporters of soft power argue that governments that have liberal values and practices may provide an attractive example to some people in states and societies that may lack democratic institutions. They may be attracted to democratic politics, economic systems based on freedom and choice, support for human rights, and other generally accepted standards and rights for individuals (see page vi for human rights' explanation). However, consistency and patience is needed. Soft power can take years to create, but may be lost in an instant or in a single image. For example, photographs of US soldiers mistreating prisoners in Abu Ghraib prison in Iraq in 2003 became synonymous with military campaigns that many people considered illegitimate and illegal. Trust and credibility are essential if states and groups want to use soft power in order to persuade. Soft power is also hard to use because cultures and values are embedded in society, and are therefore outside a government's control. States may also want to communicate different messages to different audiences through soft power; what persuades in Paris may not persuade in Damascus.

**Articulation sentence:**  
Soft power is fragile - it can easily be destroyed - and it is often embedded in society and not within a government's control

**Military power**  
Military power is essential when using hard power. Military resources (land, air or sea) are the ultimate means to force another group or state to comply or to change their behaviour. The most powerful states are often thought to be those with the largest armies, the most advanced weapons (including nuclear weapons), and the technology and willingness to use their military power against one or more targets.

It is possible to compare and measure the military resources available to states. We can look at the number of soldiers, the amount spent on defence, or the amount spent as a percentage of a state's GDP. As of 2015, *The Economist* estimated each of these as follows.

**Figure 12: State defence spending in \$ billion graph**

State	Defence spending (\$bn)
United Kingdom	41.8
Russia	70.0
Saudi Arabia	80.8
China	123.4
United States	516.9

**Figure 12: State defence spending as % of GDP graph**

State	Defence spending as % of GDP
Iraq	8.1
South Sudan	8.8
Saudi Arabia	10.4
Oman	12.0
Afghanistan	14.4

**Figure 13: State armed forces as % of GDP graph**

States	Armed forces (by 1,000)
1. China	2,332
2. United States	1,433
3. India	1,346
4. North Korea	1,190
5. Russia	771

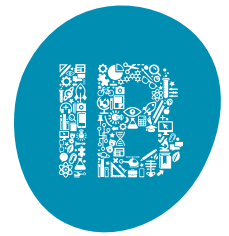
These data allow analysts to make different conclusions about military power. Poor but unstable states such as Afghanistan, South Sudan and Iraq have to spend a high proportion of their GDP on defence. They remain focused on their domestic instability and do not show any military power ambitions beyond reducing internal threats. States with large populations, such as China, the United States and India, unsurprisingly, have large numbers of troops (larger than the populations of some states). Weakly countries and those keen to play a global role in security spend the most on defence, with four of the UN Security Council members (US, China, Russia and the UK) having the largest defence budgets in the world. But it is dangerous to draw firm conclusions about military power from statistics about resources alone. What matters is whether military resources are actually used and whether they are successful when they are used. Success should be measured by whether the stated objectives of the use of military power are, in reality, achieved.

**General vocabulary**  
GDP: Gross Domestic Product: the total value of all goods and services produced in a country, in one year, except for income received from abroad  
budgets: the money that is available to an organization or person

**Synonyms**  
unstable ..... insecure  
firm ..... fixed

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## 2 Introduction to ways of knowing

**Synonyms**

processed ..... dealt with  
 constructed ..... built  
 retained ..... kept

**General vocabulary**

balanced giving equal attention to all sides or opinions  
 tools useful pieces of equipment, methods or skills  
 complex consisting of many different parts and often difficult to understand  
 gestures movements of a body part (especially hands or head) to show meaning or feeling

**The eight ways of knowing**

The ways of knowing assume knowledge is dynamic and is influenced by:

- how knowledge is received
- how knowledge is mentally processed
- how knowledge is emotionally processed
- how knowledge is constructed
- how knowledge is communicated
- how knowledge is shared
- how knowledge is retained, Figure 2.1.

**Figure 2.1** Knowledge is received, processed, constructed, communicated, shared and retained.

The ways of knowing also assume the way an individual or group of individuals knows is as important as what they know.

Students must explore a range of ways of knowing. The IB has identified eight ways of knowing. It is suggested that studying **four** of these eight in depth would be appropriate. The ways of knowing selected for detailed study should be carefully selected to ensure a coherent and **balanced** approach.

There are two central purposes to the ways of knowing in TOK. On the one hand they are the **tools** that answer the question 'how do we know?' and on the other hand they help us answer the question 'how do I know?', Figure 2.2.

**Language**

Language can refer to the mental faculty which allows people to learn and use complex communication systems, or it can refer to those systems themselves. The systems are based on agreed rules and signs such as letters, symbols, sounds, gestures, images, and so on.

**Sense perception**

Sense perception is the process by which we can gain knowledge about the outside world. Traditionally, there were believed to be five senses: sight, touch, smell, taste and hearing. However, many now argue that there are others such as a sense of heat, sense of pain, sense of movement, sense of balance and the senses of hunger and thirst, or a sense of where our body parts are.

**Emotion**

Emotions are strong feelings humans experience. They are the products of natural processes and have a **physiological element**, a **cognitive element**, and a behavioural element. The IB seems to regard *feelings, moods, emotions, and emotion* as the same. The **plural** and the **singular** are used **interchangeably**.

**Reason**

Humans do not form judgements based solely on facts. We 'go beyond' the facts to form our judgements. This is because we have the **ability** to think beyond our immediate experiences. Judgements are formed through thinking or arguing in a logical manner. We reason in many ways: using comparison, rational thinking, deductive and inductive reasoning. When we reason, we seek causes, explanations and justifications.

**Imagination**

Imagination is the ability to create mental ideas without the input of sense perception. Imagination is connected with images, both real and imaginative. It is about imagining things that do not exist or that we have not seen.

**Faith**

The term 'faith' is most frequently used to refer specifically to religious faith, but can also be used in a **secular** sense as a **synonym** for trust. Although most associated with belief in a God or gods, faith can be religious without being **theistic**. Alternatively, it can be seen as a commitment to a particular interpretation of experience and reality.

**Intuition**

Intuition is knowing something without knowing why. Intuition just happens and does not require evidence or justification. Intuition includes beliefs that have no apparent source. It is associated with **instinct** and **innate** knowledge.

**Memory**

Memory is the processing, storage, and retrieval of information. Some people (e.g. Christopher Hitchens) have suggested a further function of memory is to forget. If we could not forget, we would be **overburdened** with events and unable to function.

**Articulation sentence:**

The ways of knowing assume knowledge is dynamic and active. Knowledge can be seen as **malleable** and **relative**. Ways of knowing are the tools we can use to answer the question 'How do we know?' and they can also help us answer the question 'How do I know?'

**Subject vocabulary**

**physiological** relating to the way the body works and affects behaviour  
**cognitive** concerning mental processes such as memory, perception and attention  
**reason** think beyond our immediate experiences  
**rational** thoughts, decisions, etc. based on reason rather than emotion  
**deductive** using available knowledge and information to understand or form an opinion about something  
**inductive** using known facts to produce general principles  
**theistic** relating to belief in the existence of a god or gods  
**innate** inborn  
**malleable** changeable and open to influence  
**relative** specific to an individual, time or place; not fixed and can change

**Synonyms**

element ..... factor  
 plural ..... many  
 singular ..... one  
 solely ..... only  
 secular ..... non-religious  
 retrieval ..... recall  
 function ..... purpose

**General vocabulary**

**perception** the process by which humans gain knowledge about the outside world using the senses  
**balance** a state in which weight is evenly spread so a person or thing does not fall  
**interchangeably** in the same way to mean the same thing  
**synonym** an alternative word that has the same meaning  
**instinct** a natural tendency to behave in a particular way or a natural ability to know something, which is not learned  
**overburdened** having more of something than can be dealt with

Glossary, synonym and vocabulary boxes help identify and support understanding of subject-specific and difficult words using clear colour-coding within the page content.

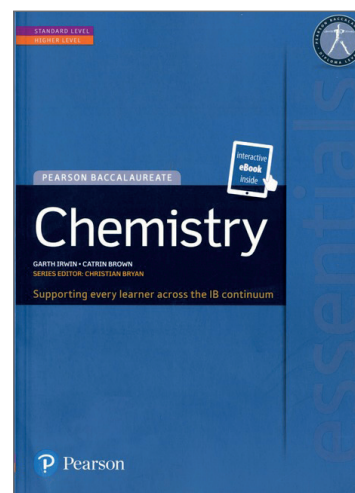
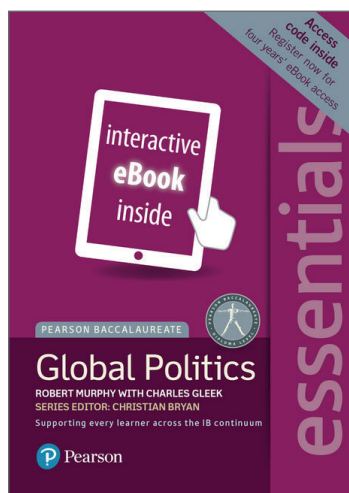
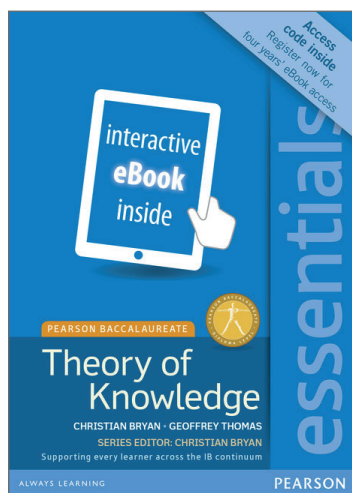
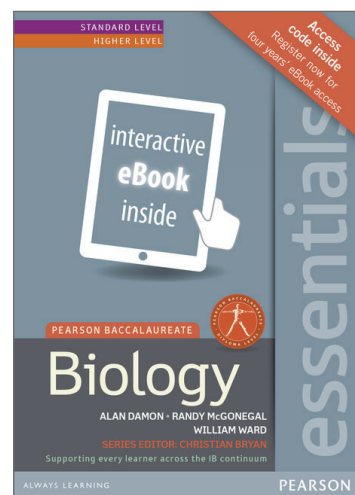
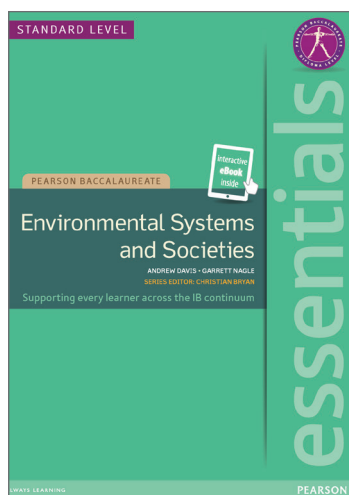
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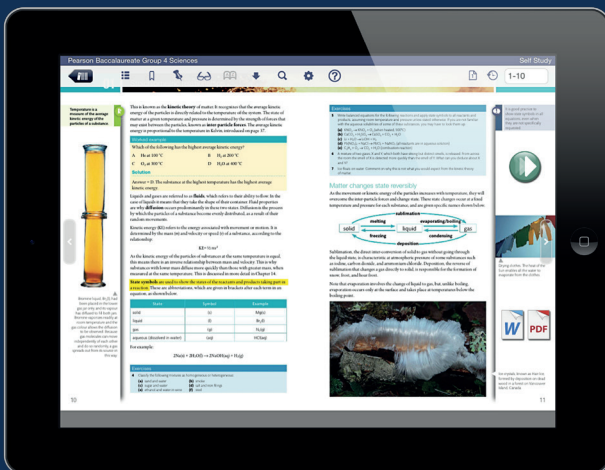
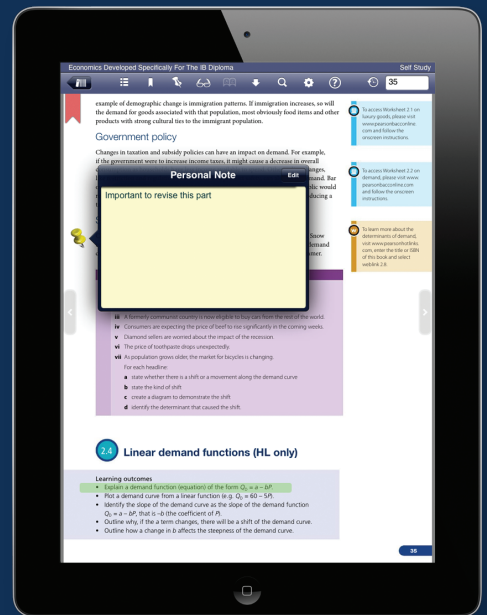
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