

# GCSE Mathematics

Deep Dive into AO2 Questions

Chris Seager and Mel Muldowney



# Welcome!

First and foremost...we are teachers!

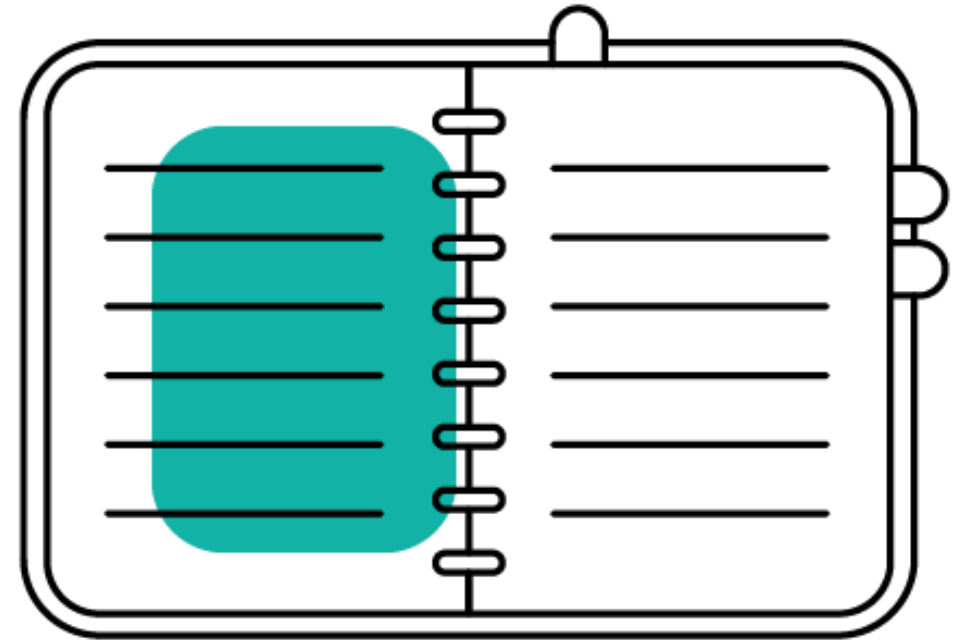
- Most improved school in England ... TWICE!
- TES Maths Team of year
- JustMaths



# Aims and objectives

After this, we hope you will:

- Look at some AO2 style questions:
  - the common mistakes
  - some ideas to improve outcomes
- Create a network of support with other delegates today

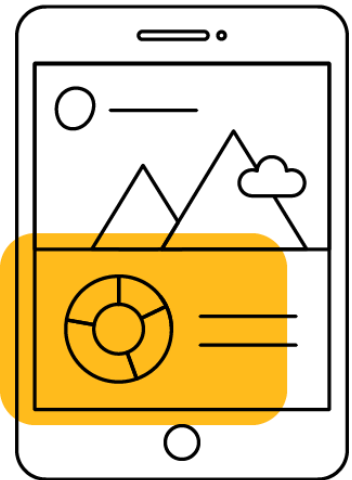



A large teal circle is centered on a white background. Inside the circle, the text "Starter question" is written in a black, sans-serif font. Below it, the question "What's your favourite shape and why?" is written in the same font, split across two lines.

## Starter question

What's your favourite shape  
and why?


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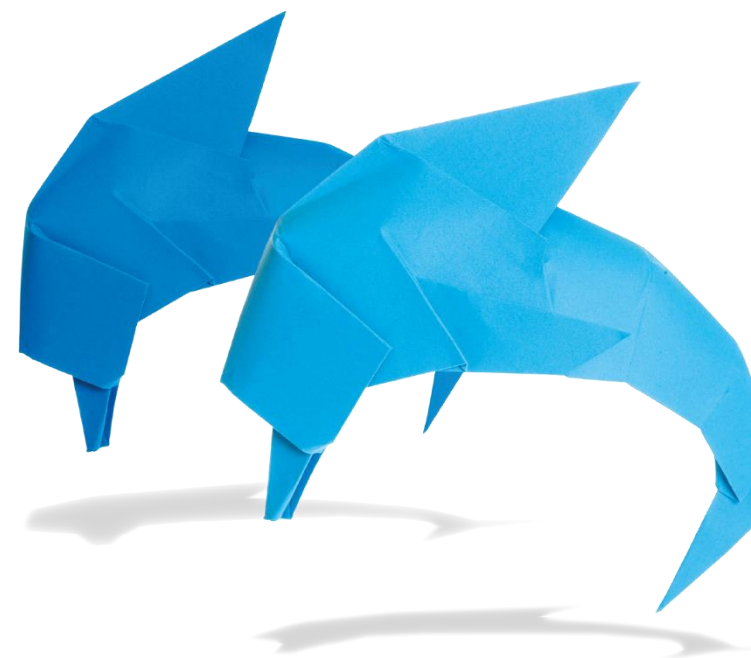


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# What are AO2 Questions?



# AO2

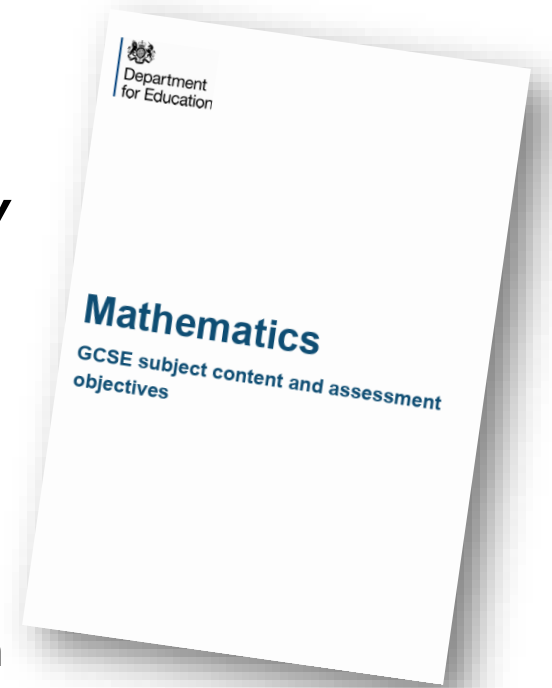
## ***Reason, interpret and communicate mathematically***

Students should be able to:

- make deductions, inferences and draw conclusions from mathematical information
- construct chains of reasoning to achieve a given result
- interpret and communicate information accurately
- present arguments and proofs
- assess the validity of an argument and critically evaluate a given way of presenting information

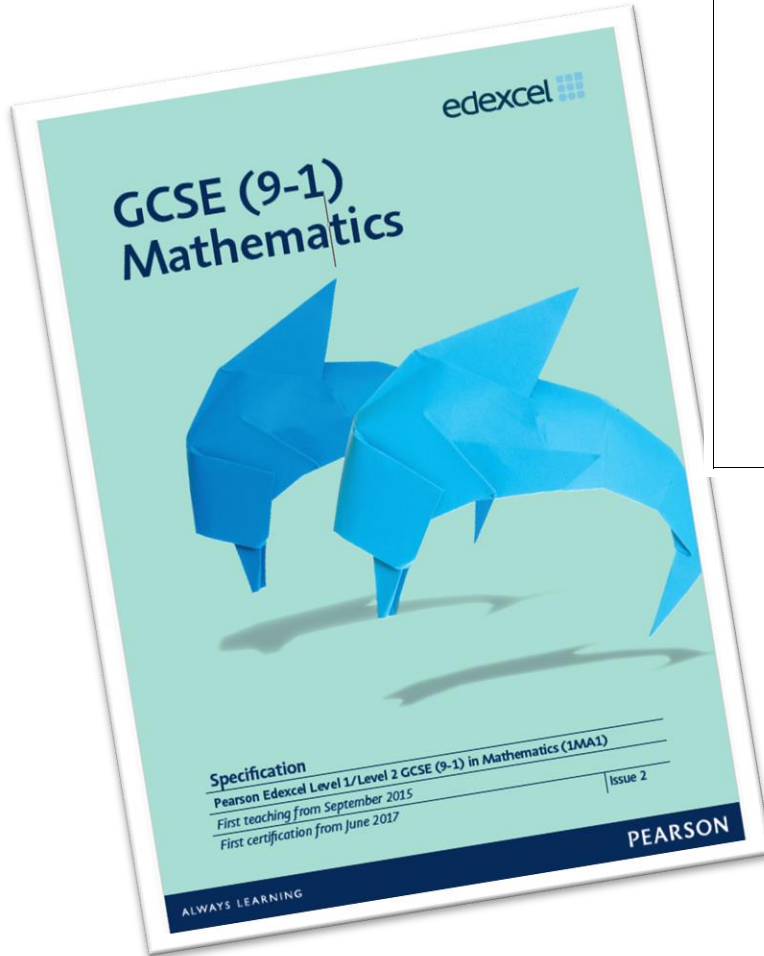
*Where problems require candidates to ‘use and apply standard techniques’ or to independently ‘solve problems’ a proportion of those marks should be attributed to the corresponding Assessment Objective*

*Weighting: Foundation 25% Higher 30%*



# AO2

***But ... the specification breaks this down even further***



<b>AO2</b>	<b>Reason, interpret and communicate mathematically</b> Students should be able to: <ul style="list-style-type: none"> <li>• make deductions, inferences and draw conclusions from mathematical information</li> <li>• construct chains of reasoning to achieve a given result</li> <li>• interpret and communicate information accurately</li> <li>• present arguments and proofs</li> <li>• assess the validity of an argument and critically evaluate a given way of presenting information.</li> </ul> Where problems require students to 'apply standard techniques' or to 'solve problems' a proportion of those should be attributed to the corresponding Assessment Objective.		30
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<b>AO2 Reason, interpret and communicate mathematically</b>	
<b>Strands</b>	<b>Elements</b>
1 – Make deductions, inferences and draw conclusions from mathematical information	1a – make deductions to draw conclusions from mathematical information
	1b – make inferences to draw conclusions from mathematical information
2 – Construct chains of reasoning to achieve a given result	2 – <i>construct chains of reasoning to achieve a given result</i>
3 – Interpret and communicate information accurately	3a – interpret information accurately
	3b – communicate information accurately
4 – Present arguments and proofs	4a – present arguments
	4b – present proofs ( <b>higher tier only</b> )
5 – Assess the validity of an argument and critically evaluate a given way of presenting information	5a – assess the validity of an argument
	5b – critically evaluate a given way of presenting information



AO2

*Other subjects ...*

SCIENCE

## ENGLISH

Explain how language, structure and form contribute to writers' presentation of ideas, themes and settings.

- **PEE** - point/evidence/explain
- **PEEL** - point/evidence/explain/link to point
- **PEA** - point/evidence/analysis
- **SEAL** - state your point/evidence/analyse/link
- **WET** - words/effect/techniques
- **RATS** - reader's response/author's intention/theme/structure

**WE ARE NOT ALONE!**

## GEOGRAPHY

### 1.19 Geography

Objective	Requirements
-----------	--------------

AO1	Demonstrate knowledge of locations, places, processes, environments and different scales.
AO2	Demonstrate geographical understanding of concepts and how they are used in relation to places, environments and processes, and the inter-relationships between places, environments and processes.
AO3	Apply knowledge and understanding to interpret, analyse and evaluate geographical information and issues and to make judgements.

## HISTORY

### 1.21 History

Objective	Requirements
-----------	--------------

AO1	Demonstrate knowledge and understanding of the key features and characteristics of the periods studied.
AO2	Explain and analyse historical events and periods studied using second-order historical concepts.
AO3	Analyse, evaluate and use sources (contemporary to the period) to make substantiated judgements, in the context of historical events studied.
AO4	Analyse, evaluate and make substantiated judgements about interpretations (including how and why interpretations may

- 1 – Apply knowledge and understanding of scientific ideas.**
- 2 – Apply knowledge and understanding of scientific enquiry, techniques and procedures.**

## GCSE (9-1) Mathematics

### Command words

Here are the most commonly used command words that you might see in different questions throughout your exam.

<b>Explain</b> Write a sentence or a mathematical statement to show how you got to your answer or reached your conclusion.	<b>Show</b> All working needed to get to a given answer or complete a diagram to show given information.	<b>Expand</b> Remove brackets.	<b>Describe</b> Write a sentence that gives the features of the situation.	<b>Justify</b> Show all working and/or give a written explanation.
<b>Draw</b> Produce an accurate drawing (unless a sketch is being drawn).	<b>Find</b> Some working will be needed to get to the final answer.	<b>Expand and simplify</b> Remove brackets and then collect like terms.	<b>Complete</b> Fill in missing values.	<b>Solve</b> Find the solution of an equation or inequality.
<b>Draw a sketch of... Sketch</b> Produce a drawing that does not have to be drawn to scale or a graph that is drawn without working out each coordinate.	<b>Factorise</b> Insert brackets by taking out common factors.	<b>Work out</b> Some working will be needed in order to get the answer.	<b>Write down</b> No working is needed.	<b>Solve algebraically</b> Find the solution of an equation or inequality; algebraic manipulation must be shown.
<b>Simplify</b> Simplify the given expression.	<b>Factorise fully</b> Insert brackets by taking out all the common factors.	<b>Change</b> Usually convert from one unit to another, either using known metric unit conversions or the use of a conversion graph.	<b>Write</b> No working needed for 1 mark questions. Working may be needed for questions with more than 1 mark.	<b>Prove</b> More formal than 'show', all steps must be proved. In the case of a geometrical proof, reasons must be given.
<b>Simplify fully</b> Simplify the given expression. Answer must be given in its simplest form.	<b>Express</b> He writes in another form, some working may be needed.	<b>Give a reason</b> Must be clear and accurate reasons. If the reasons are geometrical then make sure you: ✓ provide a reason for each stage of working (if required) ✓ use correct geometric terminology.	<b>Calculate</b> A calculator and some working will be needed.	<b>Prove algebraically</b> Use algebra in the proof.

Pearson Edexcel

Pearson Command Word Poster

## COMMAND WORDS

<b>EXPAND</b> Remove brackets from an algebraic expression. $5(2x + 3) = 10x + 15$	<b>EXPRESS</b> Express $2^5 \times 2^8$ as a power of 2. $2^5 \times 2^8 = 2^{13}$	<b>EVALUATE</b> Find the VALUE. Evaluate $4^2$ : $4 \times 4 \times 4 = 64$	<b>EXPLAIN</b> Give reasons to support the decision or the answer.
<b>SOLVE</b> Find the answer to a problem. Solve: $2x + 13 = 35$ $x = 11$	<b>SIMPLIFY</b> Make an algebraic expression simpler by collecting like terms: $3x + 4 + 2x = 5x + 4$ Make a fraction simpler by cancelling common factors: $\frac{12}{6} = \frac{2}{1}$	<b>ROUND</b> (GIVE YOUR ANSWER TO) 74.26 rounded to ... 2 significant figures is 74 1 decimal place is 74.3	<b>WRITE</b> Give the answer without needing to show working out. Write $\frac{3}{4}$ as a decimal: 0.75
<b>ORDER</b> Use a rule to arrange. Order from smallest to largest: $\sqrt{45}, \sqrt[3]{20}, 4.33$ $\sqrt[3]{20}, 4.33, \sqrt{45}$	<b>FACTORISE</b> Put brackets into an algebraic expression. $x^2 + 6x + 8 = (x + 2)(x + 4)$ $15y + 12 = 3(5y + 4)$	<b>ESTIMATE</b> Give a sensible approximate answer using rounding. Estimate $21.7 \times 6.3$ : $20 \times 6 = 120$	<b>CALCULATE WORK OUT</b> Perform one or more steps to get an answer. Calculate 15% of £40: $10\% \rightarrow £4 \Rightarrow 5\% \rightarrow £2$ $15\% \rightarrow £6$
<b>DRAW</b> Create an accurate drawing of a shape or diagram.	<b>CONSTRUCT</b> Make a number rational by removing surds.	<b>RATIONALISE</b> Rationalise the denominator of $\frac{4}{\sqrt{7}}$ : $\frac{4}{\sqrt{7}} = \frac{4 \times \sqrt{7}}{\sqrt{7} \times \sqrt{7}} = \frac{4\sqrt{7}}{7}$	<b>PROVE</b> The angles on a straight line add up to $180^\circ$ .
<b>SKETCH</b> Create a rough drawing that shows key features. Sketch the graph of $y = 2^x$	<b>SHOW THAT</b> Use reasons or logic to explain why a given fact or statement is true. e.g. Show that the equation $x^2 + 6x - 1 = 0$ has a solution between $x = 1$ and $x = 2$	<b>PLOT</b> Mark a point or draw a graph on a set of axes. Plot the graph of $y = x^2 - 2$	<b>COMPARE</b> Describe the similarities and differences between two (or more) things.
<b>GIVE REASONS JUSTIFY</b> Use reasons to explain thinking, such as	<b>REPRESENT</b> Display information in a chart or graph, such as	<b>COMPLETE</b> Fill in missing values in a table such as: $y = 2x + 1$	<b>PROVE</b> Create a convincing argument using a logical chain of steps.

How much time do you dedicate to delving into the different meaning of key command words in maths?

# AO2 Why?

## From the skills maps

- Measurable impact?
- Improve student outcomes?
- Create better mathematicians?

1F NON CALCULATOR			(F)	Edexcel averages: mean scores of students who achieved grade									
AO	Question	Skill tested	Mean score	Max score	Mean %	ALL	5	4	3	2	1	U	
	1	Q01	Rounding; Inequality notation to specify error	0.71	1	71	0.71	0.91	0.86	0.77	0.63	0.45	0.26
	1	Q02	Conversion between fractions, decimals and percentages	0.83	1	83	0.83	0.98	0.95	0.88	0.77	0.62	0.42
	1	Q03	Conventional geometrical terms and notation	0.28	1	28	0.28	0.51	0.40	0.29	0.19	0.10	0.04
	1	Q04	Order numbers	0.68	1	68	0.68	0.95	0.89	0.76	0.55	0.30	0.13
	1	Q05	Roots and powers	0.73	1	73	0.73	0.96	0.91	0.81	0.63	0.39	0.19
	3	Q06	Apply four operations	2.98	4	75	2.98	3.73	3.53	3.22	2.72	1.90	1.05
	2	Q07	Bar charts	2.93	4	73	2.93	3.51	3.32	3.09	2.77	2.20	1.17
	1	Q08i	Apply angle facts	1.70	2	85	1.70	1.97	1.94	1.87	1.68	1.08	0.40
	2	Q08ii	Apply angle facts	0.31	1	31	0.31	0.65	0.49	0.31	0.15	0.05	0.01
	1	Q09a	Inverse and composite functions; formal functions	0.83	1	83	0.83	0.97	0.95	0.91	0.81	0.56	0.25
	1	Q09b	Inverse and composite functions; formal functions	1.34	2	67	1.34	1.81	1.71	1.54	1.16	0.54	0.18
	2	Q09c	Inverse and composite functions; formal functions	1.25	2	63	1.25	1.82	1.66	1.42	1.01	0.46	0.15
	1	Q10	Ratio notation, reduction to simplest form	1.49	2	75	1.49	1.94	1.86	1.66	1.28	0.79	0.34
	1	Q11a	Apply four operations	0.52	1	52	0.52	0.74	0.64	0.56	0.45	0.28	0.12
	1	Q11b	Index notation	0.65	1	65	0.65	0.86	0.81	0.73	0.57	0.30	0.10
	3	Q11c	BIDMAS and inverse operations	0.67	1	67	0.67	0.92	0.86	0.73	0.55	0.37	0.20
	3	Q12	Perimeters of 2D shapes	1.91	4	48	1.91	3.46	2.85	1.97	1.16	0.66	0.38
	1	Q13a	Randomness, fairness and equally likely outcomes	0.52	1	52	0.52	0.79	0.67	0.54	0.42	0.31	0.18
	3	Q13b	Randomness, fairness and equally likely outcomes	0.63	2	32	0.63	1.40	0.99	0.64	0.31	0.11	0.03
	1	Q14	Apply four operations	2.10	3	70	2.10	2.80	2.65	2.35	1.80	1.04	0.40
	1	Q15a	Stem and leaf diagrams	0.45	1	45	0.45	0.80	0.67	0.50	0.27	0.09	0.02
	1	Q15b	Stem and leaf diagrams	1.12	2	56	1.12	1.89	1.71	1.29	0.67	0.22	0.05
	2	Q15c	Measures of central tendency (median, mode, range)	0.49	1	49	0.49	0.81	0.71	0.53	0.32	0.16	0.07
	3	Q16	Solve problems involving direct and inverse proportion	1.83	3	61	1.83	2.78	2.54	2.06	1.35	0.64	0.24
	1	Q17	Solve linear equations	1.34	3	45	1.34	2.76	2.27	1.38	0.57	0.20	0.05
	1	Q18	Index notation	0.32	1	32	0.32	0.70	0.53	0.31	0.16	0.08	0.04
	2	Q19	Transformations	0.29	2	14	0.29	0.91	0.51	0.21	0.07	0.02	0.00
	2	Q20	The nth term of a sequence	0.91	2	46	0.91	1.72	1.43	0.97	0.50	0.18	0.04
	1	Q21a	Apply four operations	0.94	2	47	0.94	1.78	1.54	1.02	0.46	0.14	0.03
	3	Q21b	Apply four operations	0.31	1	31	0.31	0.70	0.54	0.31	0.11	0.03	0.01
6/G17	3	Q22a	Areas of composite shapes	1.14	4	28	1.14	3.36	2.15	0.89	0.26	0.09	0.03
	3	Q22b	Use compound units	0.31	1	31	0.31	0.71	0.49	0.29	0.16	0.08	0.03
	2	Q23a	Enumerate sets and combinations of sets	0.05	1	5	0.05	0.23	0.09	0.03	0.01	0.00	0.00
	2	Q23b	Enumerate sets and combinations of sets	0.65	2	33	0.65	1.30	1.01	0.68	0.36	0.14	0.03
	1	Q24a	Approximation and estimation	1.18	3	39	1.18	2.07	1.76	1.32	0.73	0.26	0.08
	3	Q24b	Approximation and estimation	0.27	1	27	0.27	0.54	0.43	0.29	0.13	0.03	0.01
	2	Q25a	Graphs and equations of lines	0.24	3	8	0.24	1.04	0.37	0.13	0.05	0.02	0.00
	2	Q25b	Graphs and equations of lines	0.04	1	4	0.04	0.17	0.05	0.02	0.01	0.00	0.00
4/12	3	Q26	Ratio in real context	0.83	5	17	0.83	2.43	1.42	0.71	0.25	0.07	0.02
	1	Q27	Percentages and problems involving percentages	0.24	2	12	0.24	0.97	0.43	0.13	0.04	0.02	0.02
	1	Q28	Solve linear inequalities	0.16	3	5	0.16	0.78	0.28	0.07	0.01	0.00	0.00
			36.17	80	45	36.17	60.13	49.87	38.19	26.10	14.98	6.77	
	1			18.13	35	51.80%	18.13	27.94	24.43	19.69	13.85	7.77	3.30
	2			7.16	19	37.68%	7.16	12.16	9.64	7.39	5.25	3.23	1.47
	3			10.88	26	41.85%	10.88	20.03	15.80	11.11	7.00	3.98	2.00

# AO2 Why?

## Foundation tier

AO	Edexcel averages: mean scores of students who achieved grade										On
	Mean score	Max score	Mean %	ALL	5	4	3	2	1	U	
1F NON CALCULATOR (F)											
1	18.13	35	51.80%	18.13	27.94	24.43	19.69	13.85	7.77	3.30	
2	7.16	19	37.68%	7.16	12.16	9.64	7.39	5.25	3.23	1.47	
3	10.88	26	41.85%	10.88	20.03	15.80	11.11	7.00	3.98	2.00	
2F CALCULATOR (F)											
1	18.26	33	55.33%	18.26	27.63	24.06	19.45	13.88	8.50	3.72	
2	9.08	23	39.48%	9.08	15.41	12.14	9.21	6.49	4.23	1.98	
3	11.96	24	49.83%	11.96	19.46	16.31	12.87	8.66	4.26	1.07	
3F CALCULATOR (F)											
1	17.54	31	56.58%	17.54	26.36	22.96	18.66	13.50	8.07	3.10	
2	12.26	21	58.38%	12.26	17.78	15.78	12.84	9.62	6.53	2.61	
3	11.05	28	39.46%	11.05	21.17	15.51	11.08	7.29	3.63	0.94	

# AO2 Why?

## Higher tier

AO	Mean score	Max score	Mean %	Edexcel averages: mean scores of students who achieved grade								
				ALL	9	8	7	6	5	4	3	U
1H NON CALCULATOR (H)												
1	13.53	21	64.43%	13.53	19.18	17.57	15.98	13.77	10.80	7.56	4.56	2.49
2	14.33	27	53.07%	14.33	24.47	21.66	17.92	13.70	9.48	5.95	3.36	1.86
3	12.27	32	38.34%	12.27	24.56	17.71	13.93	11.03	8.69	6.16	3.49	2.06
2H CALCULATOR (H)												
1	14.47	22	65.77%	14.47	21.03	19.57	17.23	14.12	11.06	8.63	6.20	3.69
2	13.31	28	47.54%	13.31	24.06	20.44	16.54	12.51	8.70	5.23	2.63	1.11
3	12.72	30	42.40%	12.72	25.97	20.73	15.46	11.09	7.86	4.94	2.25	0.97
3H CALCULATOR (H)												
1	18.12	29	62.48%	18.12	27.38	25.35	22.55	18.19	12.85	8.74	5.63	3.29
2	9.66	20	48.30%	9.66	16.15	12.92	10.80	9.16	7.61	5.70	3.48	1.83
3	16.79	31	54.16%	16.79	28.29	24.21	20.39	16.24	11.84	7.68	3.99	2.00



# The “Non” Problems

Not all AO2 questions cause issues

- Pictograms
- Pie charts
- Two way tables
- Bar Charts
- Line graphs
- Probability trees
- Coordinates
- Nth term rule
- Quadratic graphs (with a table!!)
- Non-linear graphs
- Graphs of trig functions
- Cumulative frequency
- Regions
- Gradient of a curve / Area under the curve
- Circle theorems

We focus here on the opportunities

# The Problems (F P1)

Omitting the word “point”

Using unrelated angle facts

Know the difference between a “reason” and their calculations

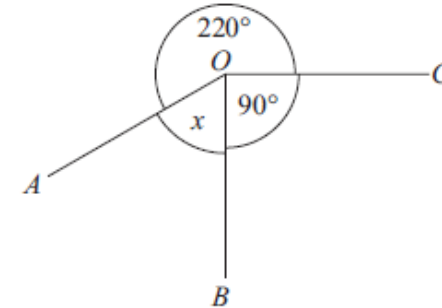
## Strategies

Use of language when teaching

Use of language when marking

Don't compromise

8  $OA$ ,  $OB$  and  $OC$  are three straight lines.



(i) Work out the size of the angle marked  $x$ .

$$\begin{array}{r} 0 \\ 310 \end{array} \quad 360 - 310 = 50$$

$$\begin{array}{r} 50 \\ \hline \end{array} \quad (2)$$

(ii) Give a reason for your answer.

Angles that meet at a point add up to  $360^\circ$

(1)

(Total for Question 8 is 3 marks)

# The Problems (F P1)

Not understanding what “compare” means – simply restating values

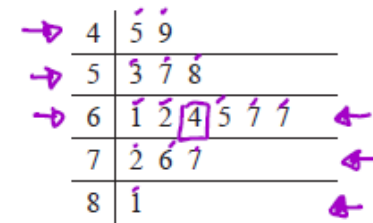
Incorrect values stated

The context!

## Strategies

Use sentence starters for compare style questions

- 15 Tessa recorded the times that 15 adults took to complete a run. She showed her results in a stem and leaf diagram.



Key:

4 | 5 represents 45 minutes

- (a) Find the median.

minutes

(1)

- (b) Find the range.

$$81 - 45$$

$$\begin{array}{r} 781 \\ - 45 \\ \hline 36 \end{array}$$

36

minutes

(2)

Tessa also recorded the times that 15 children took to complete the run.

For the children, the median was 75 minutes. For the adults median = 64

- (c) Compare the times that the adults took with the times that the children took.

The adults were on average faster to complete the race as they had a smaller median

(1)

(Total for Question 15 is 4 marks)



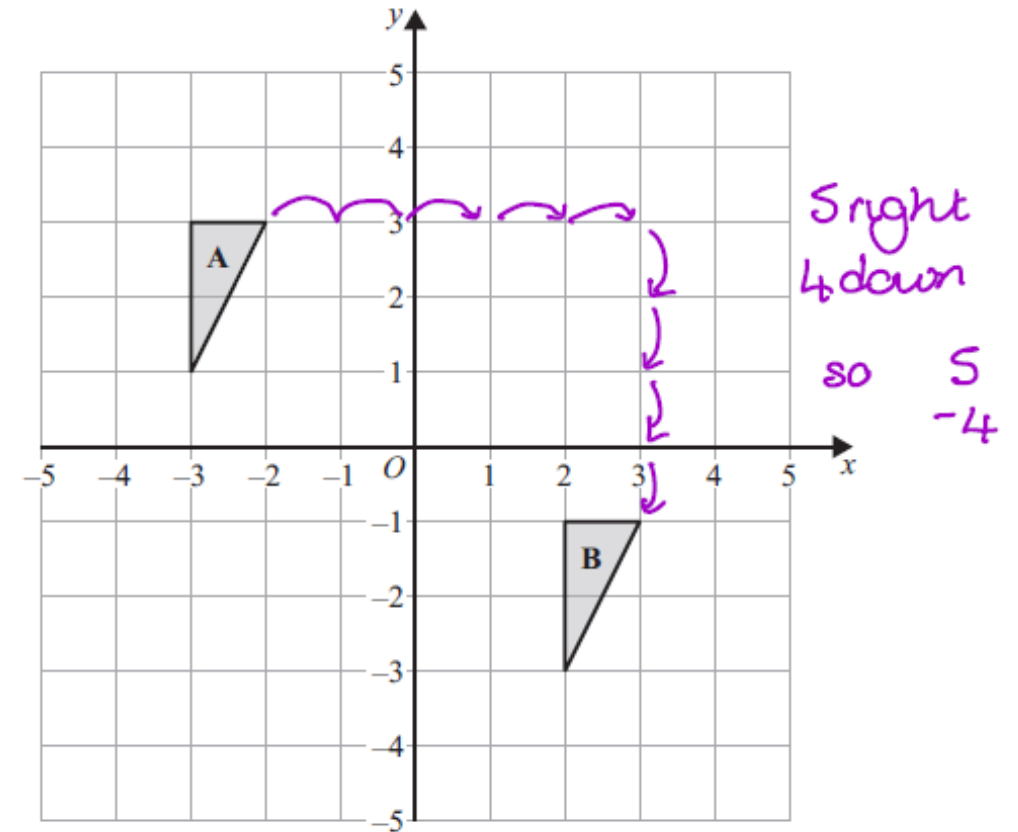
# The Problems (F P1)

Only a minority of students were able to get full marks

## Strategies

Practice all four transformations as part of your exam prep

19



Describe fully the **single** transformation that maps triangle A onto triangle B.

Translation  $\begin{pmatrix} 5 \\ -4 \end{pmatrix}$

(Total for Question 19 is 2 marks)

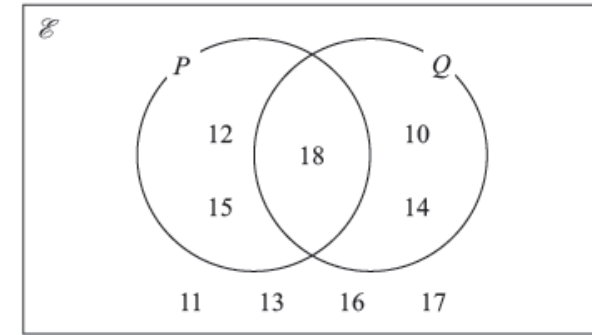
# The Problems (H & F P1)

Complement (not a print error!)

Strategies

Practice

4 Here is a Venn diagram.



(a) Write down the numbers that are in set  $P'$  *← LOOK means not in P*

11, 13, 16, 17, 10, 14

(1)

A number is chosen at random from the universal set,  $E$

(b) Find the probability that this number is in the set  $P \cup Q$

*union*

9/5

(2)

(Total for Question 4 is 3 marks)

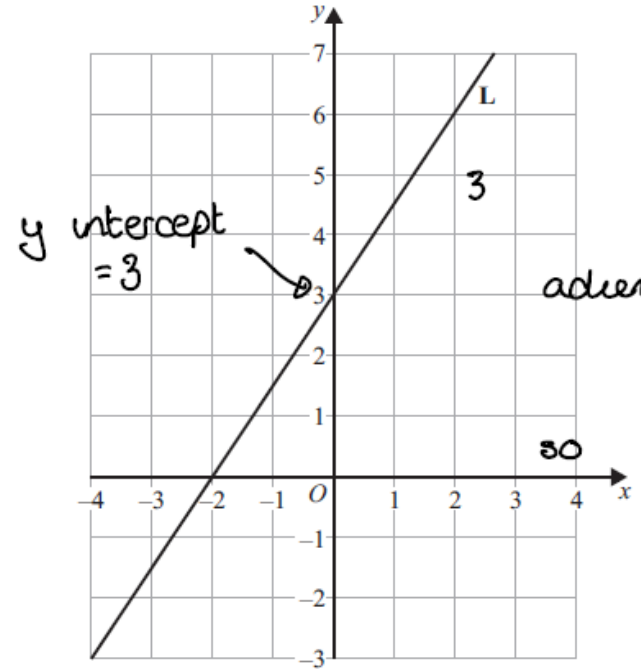
# The Problems (H & F P1)

Not being able to apply  $y = mx + c$  (F)

## Strategies

Focus on identifying the intercept for weaker students

6 Here is a straight line **L** drawn on a grid.



$$\begin{aligned} \text{gradient} &= \frac{3}{2} \\ &= 1.5 \\ \text{so } &= 1.5x + c \end{aligned}$$

(a) Find an equation for **L**.

$$\begin{aligned} y &= 1.5x + 3 \\ \text{or } y &= \frac{3}{2}x + 3 \end{aligned}$$

**M** is a different straight line with equation  $y = 5x$

(b) Write down the equation of a straight line parallel to **M**.

$$y = 5x +/- \text{ "a number"}$$

# The Problems (H P1)

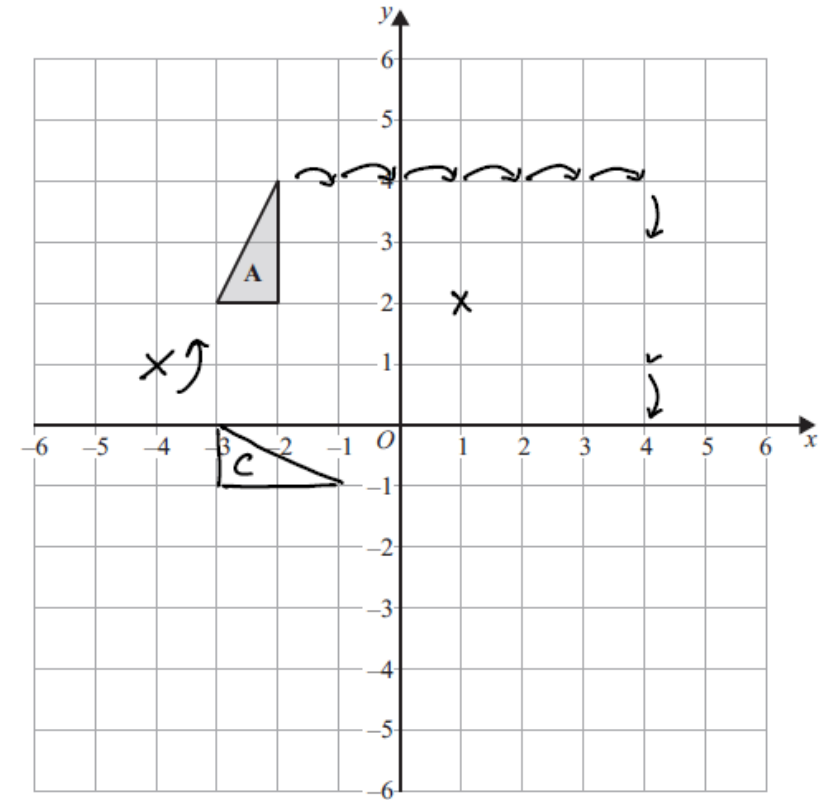
Not carrying out the transformations

## Strategies

Don't just restate the question

RTQ ... “single” transformation

11



Triangle A is translated by the vector  $\begin{pmatrix} 6 \\ -4 \end{pmatrix}$  to give triangle B.

Triangle B is rotated  $90^\circ$  clockwise about the point (1, 2) to give triangle C.

Describe fully the single transformation that maps triangle A onto triangle C.

ROTATION,

$90^\circ$  CLOCKWISE

CENTRE (-4, 1)

(Total for Question 11 is 3 marks)

9

# The Problems (H P1)

Recurring notation & not using ellipses ...

## Strategies

Don't just convert single numbers in class, find a variety of questions (the EMC textbook)

18 Show that  $0.\dot{1}\dot{5} + 0.2\dot{2}\dot{7}$  can be written in the form  $\frac{m}{66}$  where  $m$  is an integer.

$$\begin{array}{l} 100x = 15.1515... \\ x = 0.1515... \end{array}$$

$$99x = 15$$

$$x = \frac{15}{99}$$

$$\frac{15}{99} \div 3 = \frac{5}{33}$$

$$\begin{array}{l} 100x = 22.72727... \\ x = 0.22727... \end{array}$$

$$99x = 22.5$$

$$x = \frac{22.5}{99} = \frac{225}{990}$$

$$\frac{225}{990} = \frac{75}{330}$$

$$\frac{75}{330} = \frac{25}{110}$$

$$\frac{25}{110} = \frac{5}{22}$$

$$\text{so: } \frac{5}{33} + \frac{5}{22}$$

$$\frac{10}{66} + \frac{15}{66} = \frac{25}{66} \quad \text{where } m = 25$$

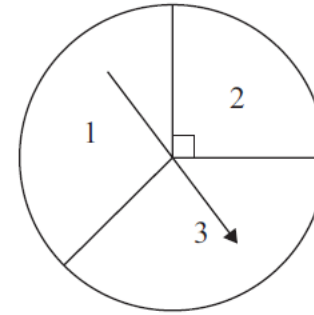
# The Problems (F P2)

No decision made

## Strategies

Make the decision for them and focus on the reasons

11 Majid has a spinner.



Majid is going to spin the arrow.

The arrow can land on 1 or on 2 or on 3

Majid says,

“The probability that the arrow will land on 2 is  $\frac{1}{3}$  because the spinner has three sections.”

Is Majid correct?

You must give a reason for your answer.

No, it would be  $\frac{1}{4}$

(Total for Question 11 is 1 mark)

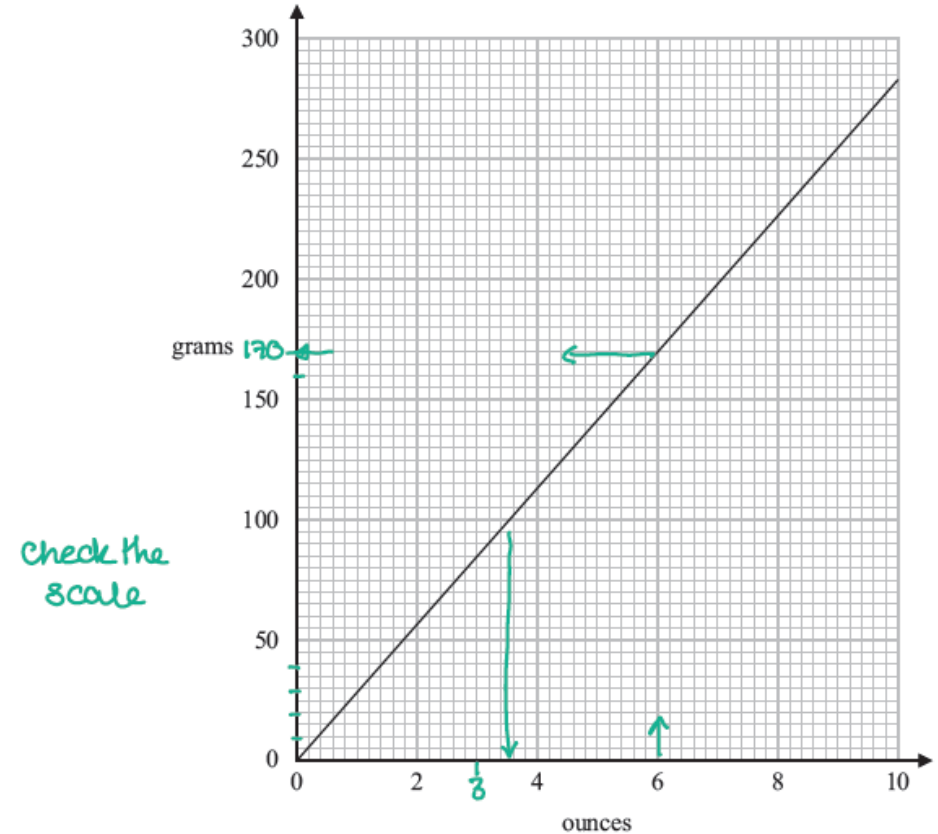
# The Problems (F P2)

Extrapolation / build up methods?

Strategies

Practice this!

16 You can use this graph to change between ounces and grams.



(a) Change 6 ounces to grams.

170 grams  
(1)

(b) Change 1 kg to ounces.

$$\begin{aligned} 100\text{g} &= 3.5\text{ ounces} \\ \times 10 & \quad \times 10 \\ 1000\text{g} &= 35\text{ ounces} \end{aligned}$$

35 ounces  
(2)

(Total for Question 16 is 3 marks)



# The Problems (F & H P2)

Many not able to start the question

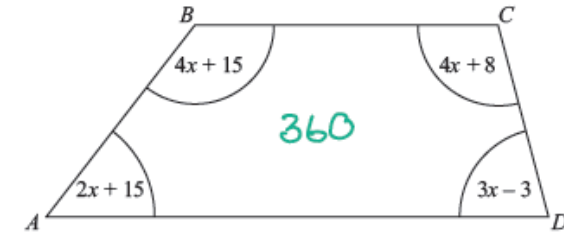
Not knowing the properties of a trapezium

## Strategies

Exam wizard for questions

Practice!

26  $ABCD$  is a quadrilateral.



All angles are measured in degrees.

Show that  $ABCD$  is a trapezium.

$$4x + 15 + 4x + 8 + 3x - 3 + 2x + 15 = 360$$

$$13x + 35 = 360$$

$$13x = 360 - 35$$

$$13x = 325$$

$$x = \frac{325}{13}$$

$$= 25$$

$$A = 2 \times 25 + 15 = 65$$

$$B = 4 \times 25 + 15 = 115$$

$$C = 4 \times 25 + 8 = 108$$

$$D = 3 \times 25 - 3 = 72$$

$$A + B = 65 + 115 = 180$$

so are consecutive angles

$$C + D = 108 + 72 = 180$$

so are consecutive angles

so..  $AD$  must be parallel to  $BC$  and  $ABCD$  is a trapezium.

(Total for Question 26 is 4 marks)

100

## Lots of contradictions

## Not making a decision

## Strategies

Tell them for example she is wrong

## Focus on the reasons

9 A number  $N$  is rounded to 2 significant figures. The result is 7.3

(a) Write down the least possible value of  $N$ .

$7.2$        $7.3$        $7.4$   
 $\uparrow$        $\uparrow$   
 $7.25$        $7.35$

---

$7.25$   
(1)

Leila says,

“The value of  $N$  cannot be greater than 7.349 because 7.350 would round up to 7.4”

(b) Is Leila correct?  
You must give a reason for your answer.

No, for example  $7.3491$  is greater than  $7.349$  and would still round to  $7.3$

(1)

**(Total for Question 9 is 2 marks)**

# The Problems (H P2)

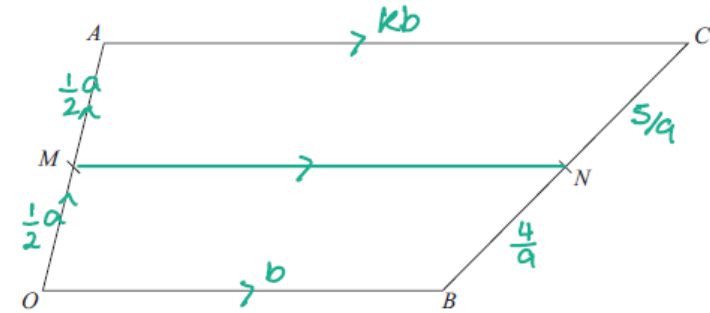
Not being able to explain why?

## Strategies

Tell them, for example it's not parallel

Focus on the reasons

19 The diagram shows quadrilateral  $OACB$ .



$M$  is the midpoint of  $OA$ .

$N$  is the point on  $BC$  such that  $BN:NC = 4:5$

$\vec{OA} = \mathbf{a}$   $\vec{OB} = \mathbf{b}$   $\vec{AC} = k\mathbf{b}$  where  $k$  is a positive integer.

- (a) Express  $\vec{MN}$  in terms of  $k$ ,  $\mathbf{a}$  and  $\mathbf{b}$ .  
Give your answer in its simplest form.

$$\vec{BC} = -\mathbf{b} + \mathbf{a} + k\mathbf{b}$$

$$\vec{CB} = -k\mathbf{b} - \mathbf{a} + \mathbf{b}$$

$$\vec{CB} = \mathbf{b} - k\mathbf{b} - \mathbf{a}$$

$$\vec{CN} = \frac{5}{9}(\mathbf{b} - k\mathbf{b} - \mathbf{a})$$

$$\vec{MN} = \frac{1}{2}\mathbf{a} + k\mathbf{b} + \frac{5}{9}(\mathbf{b} - k\mathbf{b} - \mathbf{a})$$

$$= \frac{1}{2}\mathbf{a} - \frac{5}{9}\mathbf{a} + k\mathbf{b} + \frac{5}{9}\mathbf{b} - \frac{5}{9}k\mathbf{b}$$

$$= \frac{9}{18}\mathbf{a} - \frac{10}{18}\mathbf{a} + \frac{18kb}{18} + \frac{10b}{18} - \frac{10kb}{18}$$

$$= \frac{1}{18}(9\mathbf{a} - 10\mathbf{a} + 8k\mathbf{b} + 10\mathbf{b})$$

$$\frac{1}{18}(-\mathbf{a} + 8k\mathbf{b} + 10\mathbf{b}) \quad (4)$$

- (b) Is  $MN$  parallel to  $OB$ ?  
Give a reason for your answer.

No,  $MN$  is not a multiple of  $\mathbf{b}$

# The Problems (F P3)

Using T =

## Strategies

Know when to use “T = “ and when not to

16 (a) Simplify  $m \times m \times m \times m$

$$\frac{m^4}{(1)}$$

In a competition, a player gets

5 points for each game they win  
2 points for each game they draw  
0 points for each game they lose.

Amy wins  $x$  games and draws  $y$  games.

(b) Write down an expression, in terms of  $x$  and  $y$ , for the total number of points Amy gets.

$$5x + 2y$$

$$\frac{5x + 2y}{(2)}$$

(Total for Question 16 is 3 marks)

# The Problems (F P3)

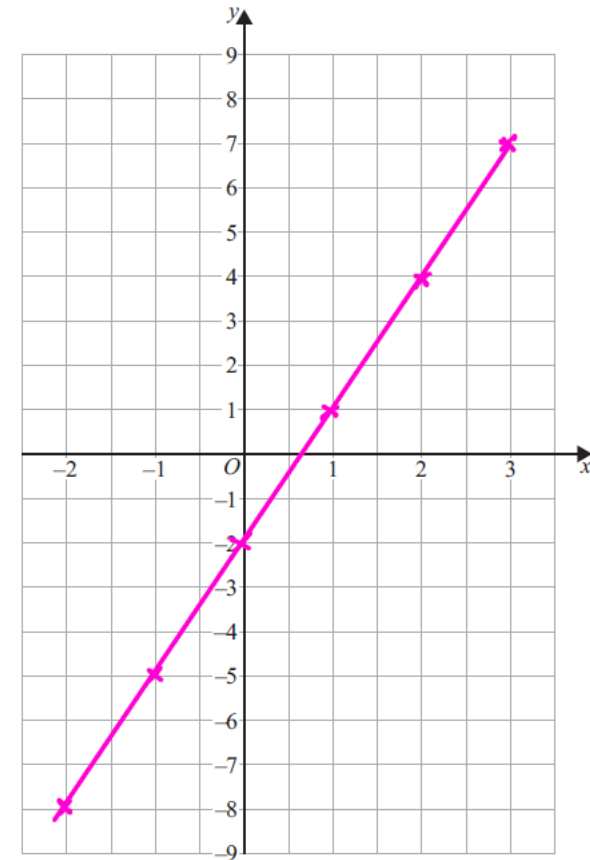
Where a table of values was drawn students usually gained 3 marks

## Strategies

Use a variety of examples / questions when teaching

19 On the grid below, draw the graph of  $y = 3x - 2$  for values of  $x$  from  $-2$  to  $3$

$x$	-2	-1	0	1	2	3
$y$	-8	-5	-2	1	4	7



(Total for Question 19 is 3 marks)

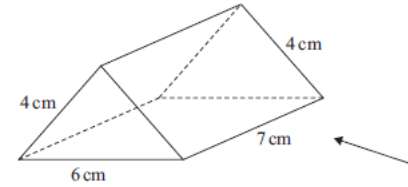
# The Problems (F & H P3)

Many thought it would be a parallelogram

## Strategies

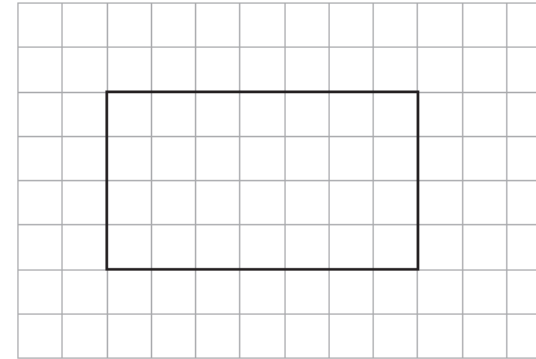
Use concrete models

24 The diagram shows a solid triangular prism.



Rana is trying to draw the side elevation of the solid prism from the direction of the arrow.

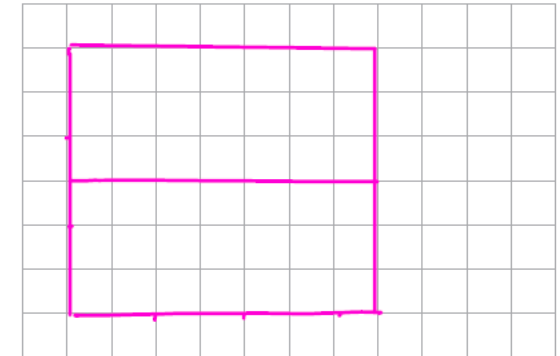
Here is her answer on a centimetre grid.



(a) Explain why Rana's side elevation is not correct.

The height of the triangle will be less than 4 cm

(b) On the centimetre grid below, draw a plan of the solid prism.



(2)

(Total for Question 24 is 3 marks)

# The Problems (H P3)

Direction arrow missing

Strategies

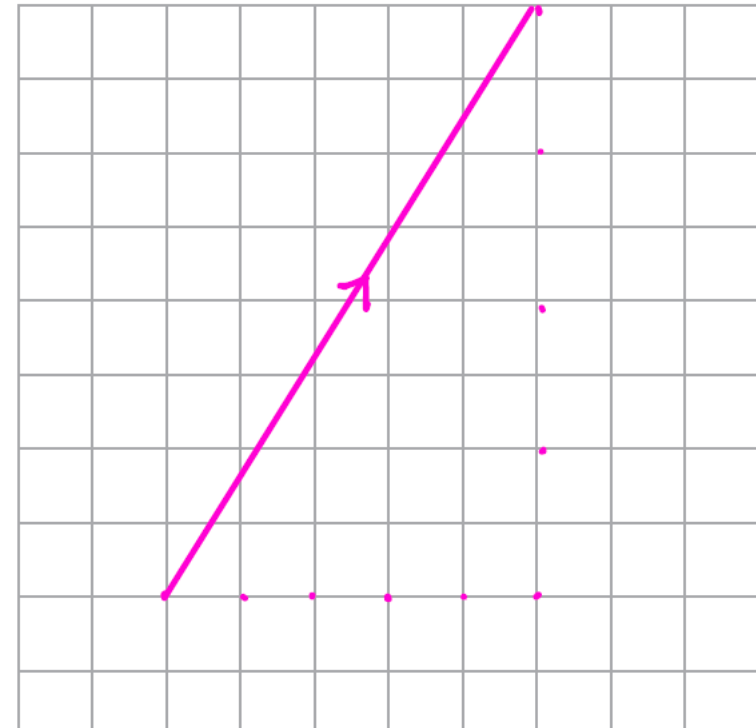
Use concrete models

8  $\mathbf{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$   $\mathbf{b} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$

On the grid below, draw and label the vector  $2\mathbf{a} + \mathbf{b}$

$$2\mathbf{a} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} 6 \\ 4 \end{pmatrix} + \begin{pmatrix} -1 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 8 \end{pmatrix}$$



# The Problems (H P3)

Context (again!!)

Strategies

Sentence starters

Fill in the gap style questions

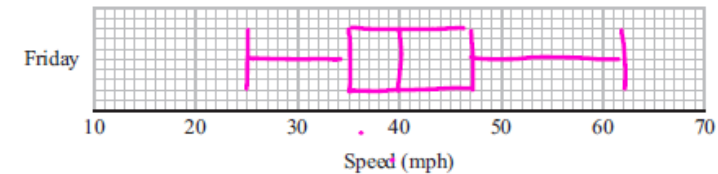
- 11 Mina records the speeds, in mph, of some cars on a road on Friday. She uses her results to work out the information in this table.

	Speed (mph)
Lowest speed	25
Lower quartile	35
Median	40
Interquartile range	12
Range	37

$$UB = 35 + 12 = 47$$

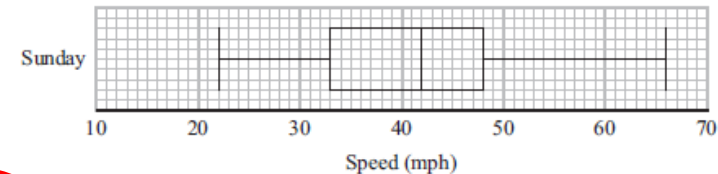
$$Greatest = 25 + 37 = 62$$

- (a) On the grid, draw a box plot to show the information in the table.



(3)

- Mina also records the speeds of some cars on the same road on Sunday. She uses her results to draw this box plot.



- (b) Compare the distribution of the speeds on Friday with the distribution of the speeds on Sunday.

The median on Sunday is greater so on average the cars were faster on Sunday.  
The IQR is smaller on Friday so the speeds were more consistent than on Sunday.

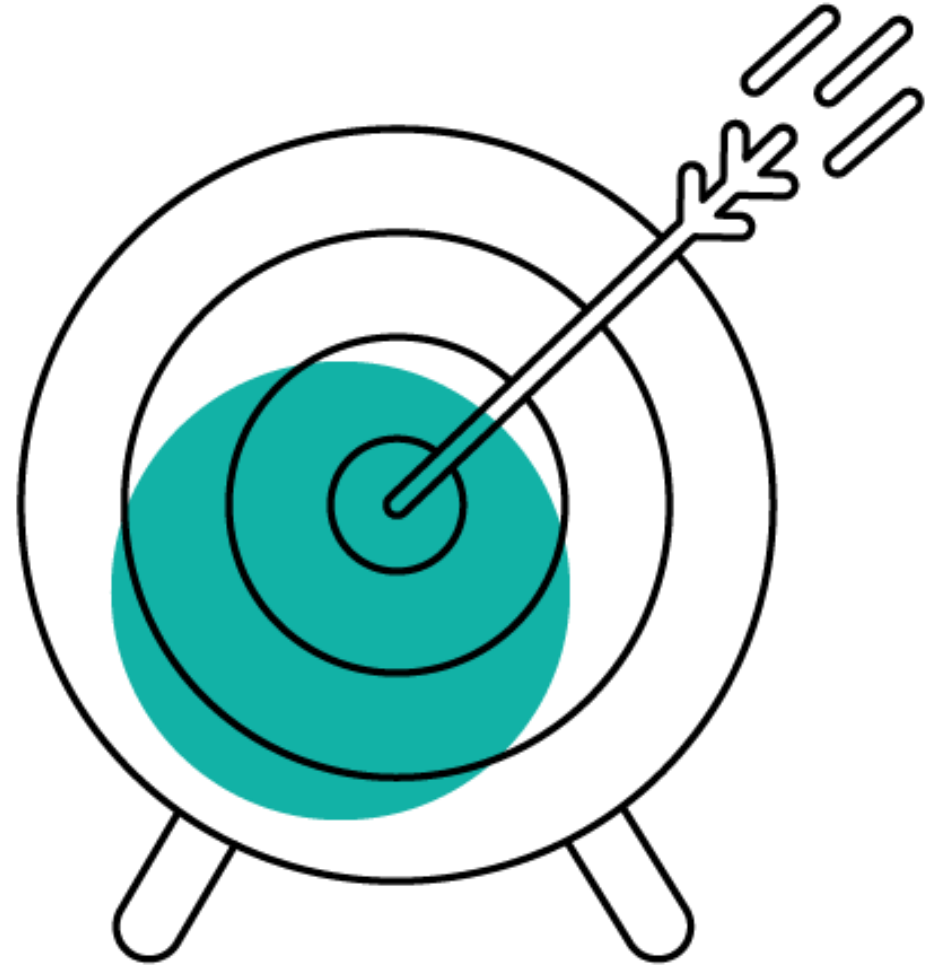
(2)

(Total for Question 11 is 5 marks)

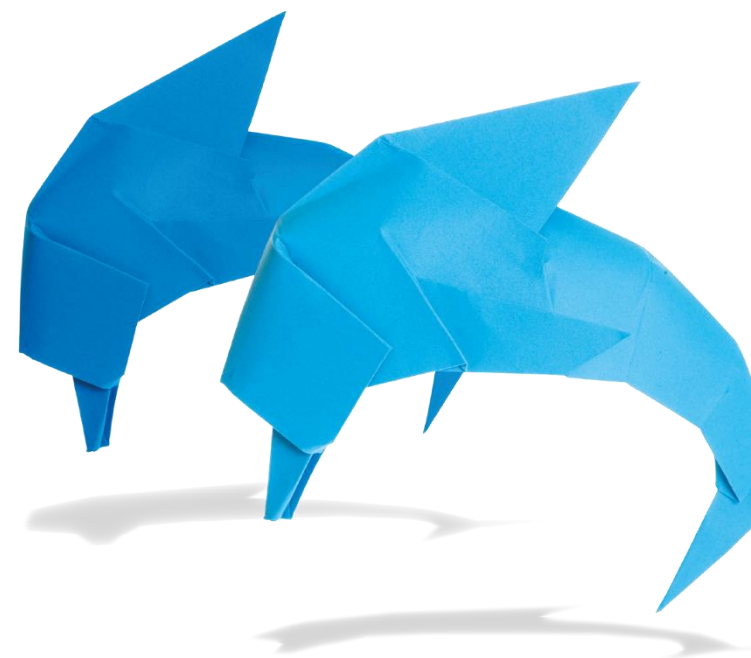


# So ... in the classroom

- Give them the conclusion and focus on reasons
- Share the command words
- Fill in the gap style questions
- Speak to other departments

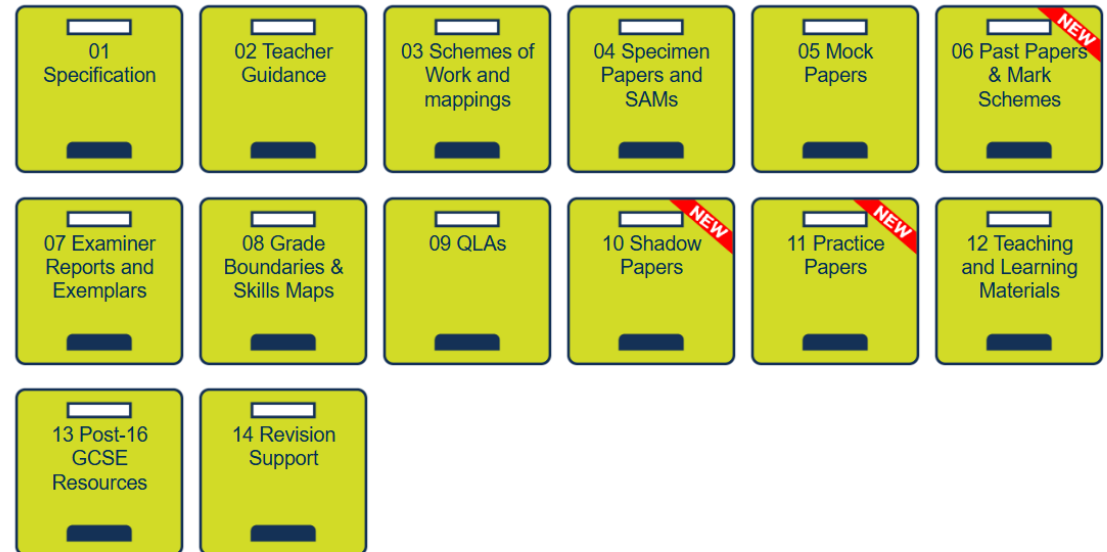


# Support from Pearson

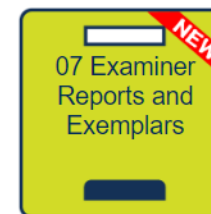


# Unmatched Post Exam Support

- GCSE Mathematics Exam Insights (online Network)
  - GCSE Marking Guidance (online network)
  - Shadow Papers
  - Exemplars
  - Cross over papers
  - Reordered papers
- Aiming for papers
  - Skills maps (Enhanced)
  - QLA (Enhanced)



# New Exemplars for GCSE Maths



For the 2024 exam series we have produced our exemplars in a new PowerPoint format.

These are ready made slide decks with marking guidance on selected questions from the exam series. They use real candidate responses and have been annotated by the chair of examiners.

These have been designed for teachers to use for CPD but could also be used with students in the classroom.

3/4

Question 25 – Response A

25 Andy, Luke and Tina share some sweets in the ratio 1:6:14

Tina gives  $\frac{3}{7}$  of her sweets to Andy.

Tina then gives  $12\frac{1}{2}\%$  of the rest of her sweets to Luke.

Tina says,

“Now all three of us have the same number of sweets.”

Is Tina correct?  
You must show how you get your answer.

*Tina is correct*

*A = 31.5*  
*L = 27*  
*T = 63*

*100 ÷ 21 = 4.76*

*63 ÷ 7 = 9 × 3 = 27*

*53 - 27 = 26*

*27 + 4.76 = 31.76*

*31.76 - 4.76 = 27*

*4.76 + 27 = 31.76*

*100% = 31.76*  
*10% = 3.176*  
*1% = 0.3176*  
*2% = 0.6352*

*0.5% = 0.1588*  
*4.76 + 0.1588 = 4.9188*

*12.5% = 4.9188*

(Total for Question 25 is 4 marks)

**Note:** Students are allowed to choose a number for the total sweets they may have. Hopefully, it is a multiple of 21. If not, then you can allow decimal answers, rounded or truncated to 2 decimal places.

**P1** Clearly shown process of  $100/21$  to find one share but there is an arithmetic error, it should be 4.76. Then correctly finds  $3/7$  of 63 = 27 as number given to Andy. The value 63 is Tina's  $14 \times 4.5$ .

**P1** Subtracts this value from Tina's share and finds 12.5% of the remainder and adds to Luke.

**P1** Finds all the final amounts for the three people.

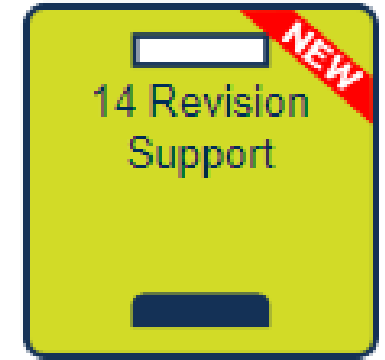
**C0** Not supported by correct figures due to the initial arithmetic error.

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62

# New and Updated Revision Programmes

The foundation six-week revision programme has been updated in September 2024 to include questions from Summer and November 2023 exams. This six-week revision programme has been designed for students aiming for a grade 4.



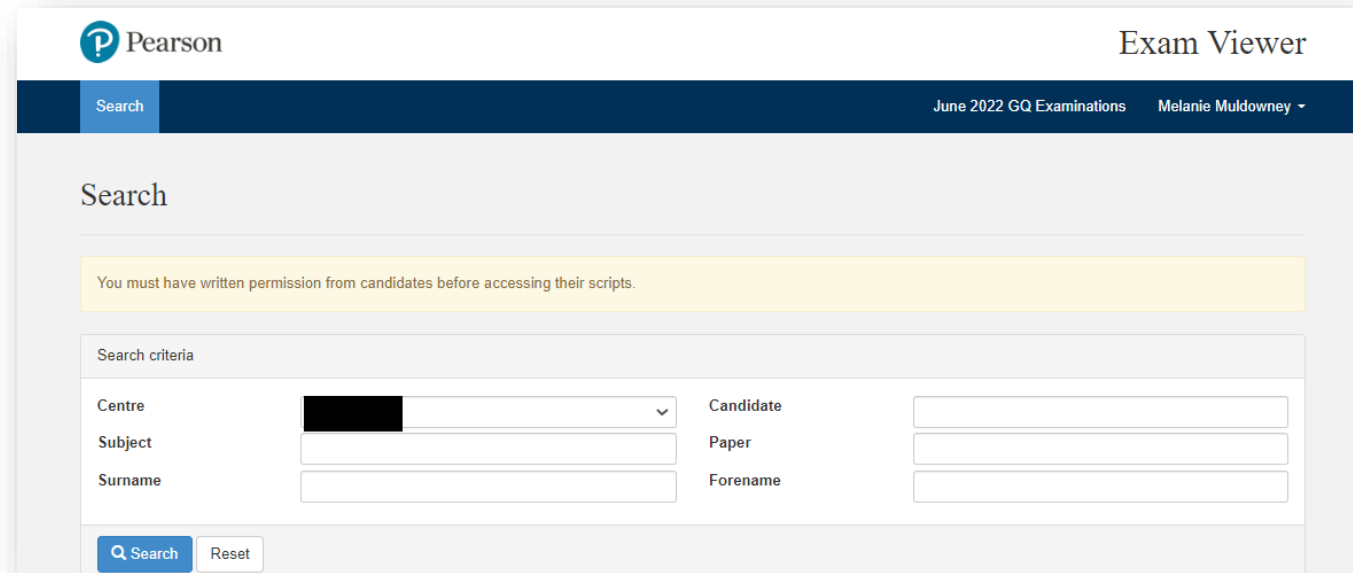
We have also now released two \*brand new\* higher 6-week revision programmes, one aimed at students aiming for grades 4 to 6 and one for students aiming for grades 7 to 9.

These programmes include 6 weekly task booklets (mark schemes included or separate), teacher and student guidance and a ready-made tracker so you can keep track of how your students are doing. They make use of Pearson's resources in a structured manner whilst supporting students by providing information about both their strengths and weaknesses.

You can find these programmes on the Maths Emporium in the [Revision Support](#) resources cabinet.

# Access to Scripts

- Access to scripts is a **free** service that allows you to look at a students examination papers question by question.
- A powerful CPD tool to share good practice.
- Reduces the uncertainty when requesting a remark.



The screenshot shows the Pearson Exam Viewer interface. At the top, the Pearson logo is on the left and 'Exam Viewer' is on the right. Below this is a dark blue navigation bar with a 'Search' tab on the left and 'June 2022 GQ Examinations' and 'Melanie Muldowney' on the right. The main content area is titled 'Search' and contains a yellow warning box stating: 'You must have written permission from candidates before accessing their scripts.' Below the warning box is a 'Search criteria' section with two columns of input fields. The left column has 'Centre' (a dropdown menu with a blacked-out selection), 'Subject' (a text input field), and 'Surname' (a text input field). The right column has 'Candidate' (a text input field), 'Paper' (a text input field), and 'Forename' (a text input field). At the bottom of the search criteria section are two buttons: a blue 'Search' button with a magnifying glass icon and a white 'Reset' button.

Pearson

Exam Viewer

Search

June 2022 GQ Examinations Melanie Muldowney

### Search

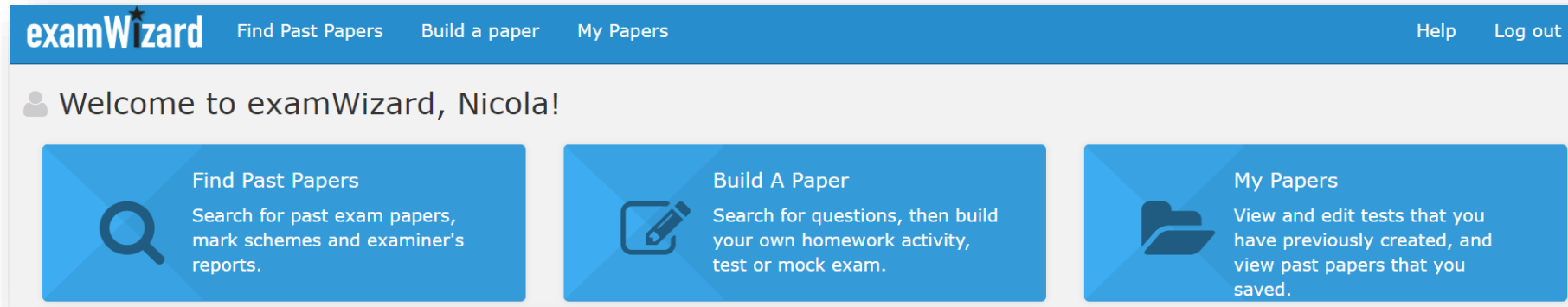
You must have written permission from candidates before accessing their scripts.

Search criteria

Centre	<input type="text"/>	Candidate	<input type="text"/>
Subject	<input type="text"/>	Paper	<input type="text"/>
Surname	<input type="text"/>	Forename	<input type="text"/>

# Exam Wizard

- Exam Wizard is a free resource that allows you to find past examination questions to make your own bespoke papers.
- To access Exam Wizard you will need an EOL username and password – your Exams Officer will be able to issue this.
- Exam wizard is an online application that can be accessed [here](#).



# Our subject specialists

- Our team of credible specialists is made up of current classroom practitioners that share their knowledge with our schools through centre visits, online training and networks



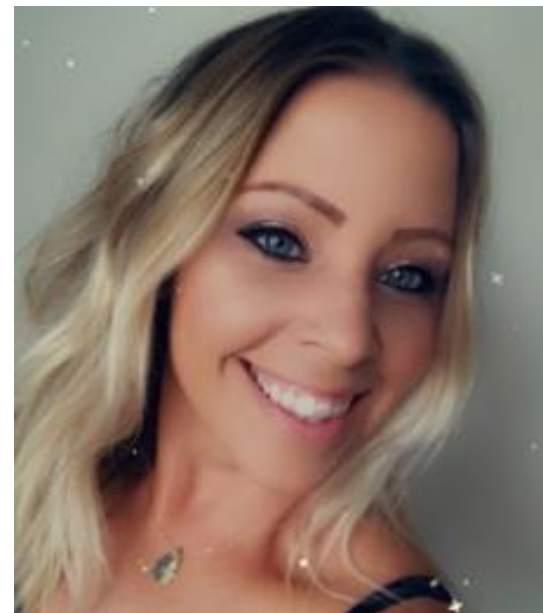


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**Vicky Wood**

Vicky works closely with the wider maths team to support teachers in UK centres in delivering Pearson Edexcel qualifications in Mathematics and Statistics [teachingmaths@pearson.com](mailto:teachingmaths@pearson.com)  
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**Nicola Woodford-Smith**

Nicola works as the maths Subject Partner in the maths team at Pearson Edexcel. She helps to create resources and delivers CPD to support you and your team through the lifecycle of our qualifications.

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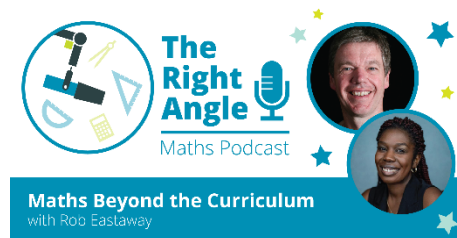
You can also find the [recordings](#) of our launch event and Getting Ready to Teach event on the Maths Emporium.



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The Right Angle invites topical discussions, debates and insights from a range of thought leaders, award-winning maths educators and facilitators. Our subject partner hosts, Mark Heslop and Nicola Woodford-Smith lead conversations on themes such as the evolution of technology to support learning, student engagement and diversity and inclusion across the education of mathematics. Listen and subscribe for FREE on Apple Podcasts, Spotify and on Soundcloud.





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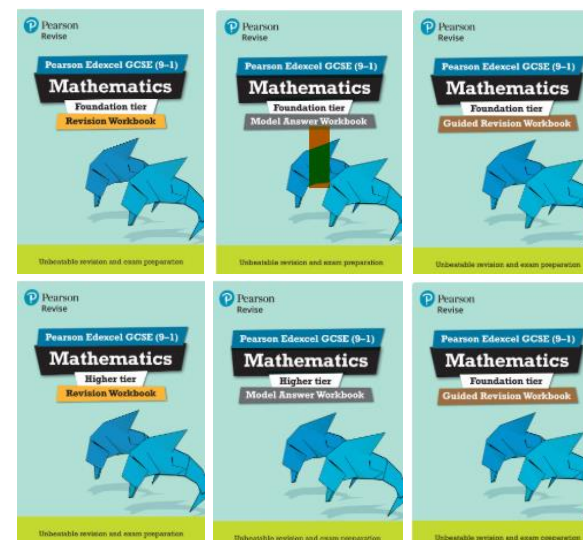


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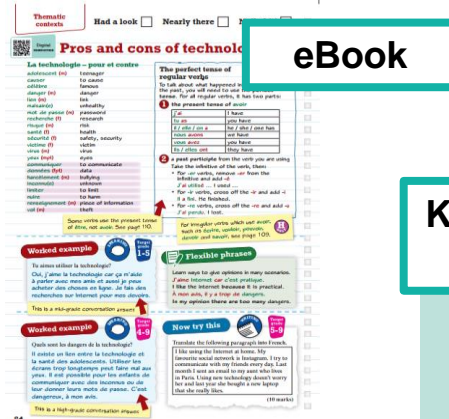
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eBook

Knowledge checks

Number

Questions 1 of 10

Work out  $3 \times 10^3$ .

Do not use a calculator.

160

49

147

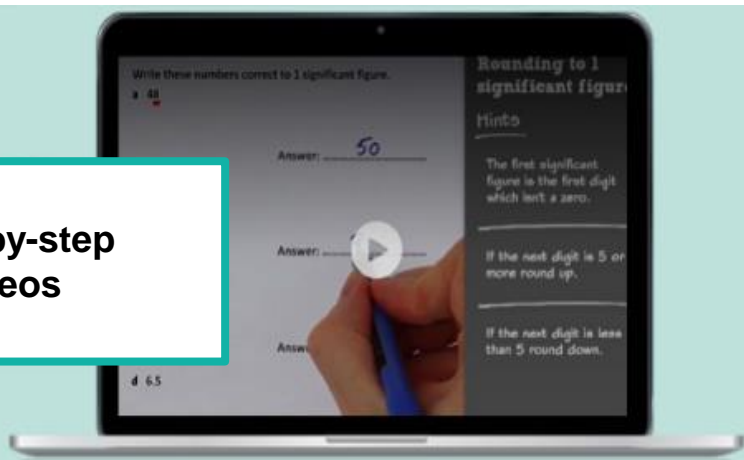
7

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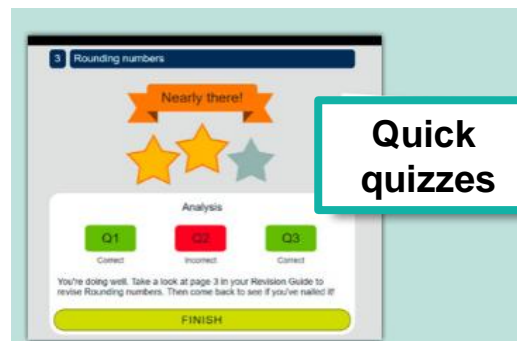
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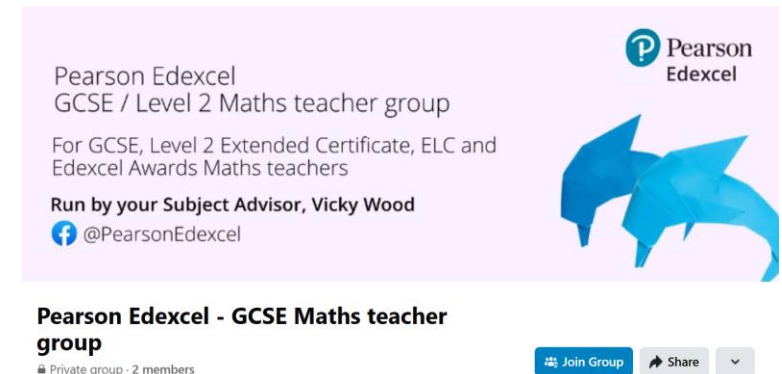
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Be sure to also join our Pearson Edexcel GCSE Maths teacher group on Facebook. Created to give Maths teachers a private, professional space to have discussions. The group is managed by your Subject Advisor, Vicky Wood.

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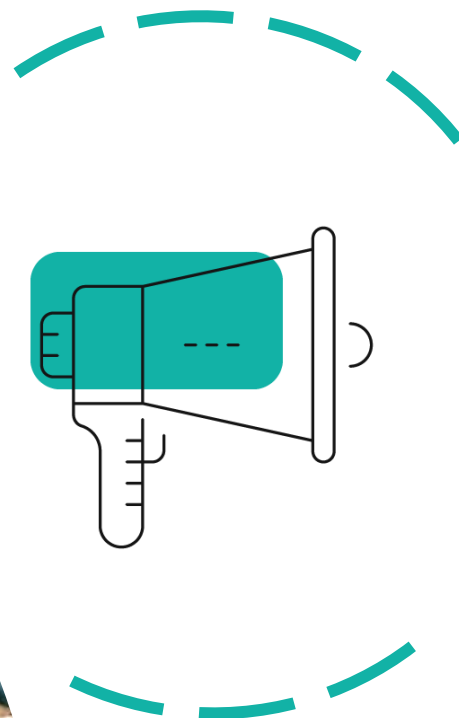


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# Your Feedback Matters

Following this event, you will receive an invitation to share your thoughts about the session. Your feedback is invaluable to us, as it helps us tailor our professional development materials to better meet your needs. Please don't hesitate to let us know what you'd like to see more of and what areas you think could be improved.

# Contact us

Mel Muldowney  
[mel@justmaths.co.uk](mailto:mel@justmaths.co.uk)

Christian Seager  
[christian@justmaths.co.uk](mailto:christian@justmaths.co.uk)

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