THIRD SPACE LEARNING

Specialist 1-to-1 maths interventions and curriculum resources

Rapid Reasoning

Year 5 | Week 5

This week, no new Year 5 objectives are introduced, with questions continuing to focus on **addition and subtraction**.

The following Year 5 objectives continue to be a focus from week 4:

- adding and subtracting numbers with more than four digits, including using formal written methods where they are appropriate
- using rounding to check answers to calculations and make estimations.

Objectives from *Fluent in Five* that are also tested in a reasoning context this week include:

- solving problems involving Year 5 level multiplication and division.

Please note that some questions are worth two marks, and by their very nature, answers to these questions are never clear-cut. For a full breakdown of how marks would be awarded for these questions, please refer to the mark schemes provided.

Q1 Abu knows the multiplication fact for 8 × 9.

He uses this fact to help him mentally calculate the answer to related calculations.

Complete the missing numbers.

If 8 × 9 = ☐,

then 80 × 9 = ☐

and 80 × 90 = ☐.

1 mark

Q2 An aeroplane takes 3 hours to fly between two cities.

Is this more or less than 200 minutes?
Explain your answer.

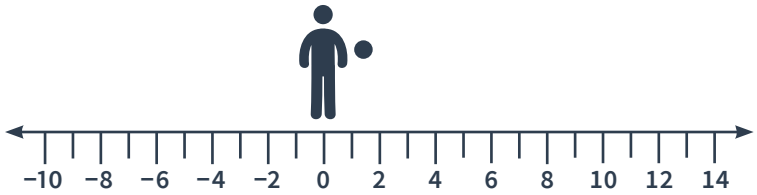
more ☐ less ☐

_____

_____

1 mark

Q3 Syed and Laura roll a ball in different directions along a line split into metres.



a Syed stands on 0 metres and rolls the ball forwards 5 metres.

Laura then rolls the ball 8 metres backwards.

Where does the ball end up?

☐

1 mark

b They start from 0 again.

This time, Laura rolls the ball backwards one more metre than Syed's first roll.

Where does the ball end up?

☐

1 mark

Q1 Abu knows the multiplication fact for 8 × 9.

He uses this fact to help him mentally calculate the answer to related calculations.

Complete the missing numbers.

If 8 × 9 = **72** ,

then 80 × 9 = **720**

and 80 × 90 = **7,200** .

1 mark

Q2 An aeroplane takes 3 hours to fly between two cities.

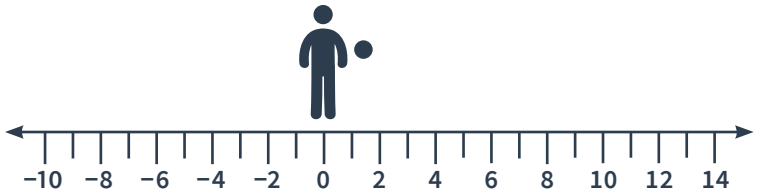
Is this more or less than 200 minutes? Explain your answer.

more ☐ less ☑

See mark scheme for example

1 mark

Q3 Syed and Laura roll a ball in different directions along a line split into metres.



a Syed stands on 0 metres and rolls the ball forwards 5 metres.

Laura then rolls the ball 8 metres backwards.

Where does the ball end up?

−3

1 mark

b They start from 0 again.

This time, Laura rolls the ball backwards one more metre than Syed's first roll.

Where does the ball end up?

−1

1 mark

	Requirement	Mark	Additional guidance
Q1	72 720 7,200	1	
Q2	This is less than 200 minutes. There are 60 minutes in an hour and so 3 × 60 = 180 minutes.	1	
Q3a	−3	1	
Q3b	−1	1	

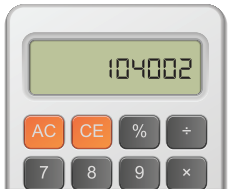
Q1 The same addition is typed into three calculators.

The addition is 50,021 + 63,981.

Two of the calculators are broken and give the wrong answer.

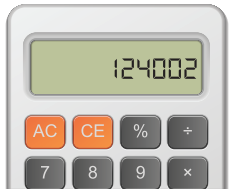
One of them is correct.

A



B

C



Without working out the exact answer, use rounding to work out an estimate and find the correct calculator.

Write your estimation as a number sentence.

[ ] + [ ] = [ ]

So, calculator [ ] is correct.

1 mark

Q2 A concert is being held with all the money made being donated to charity.

2,305 people buy tickets for the concert.

Each ticket costs £4.

The organisers also make an extra £1,396 for charity by selling t-shirts.

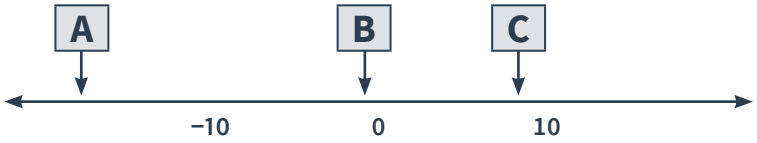
How much money is raised altogether for charity?

£

2 marks

Q3 This number line shows three mystery numbers.

They are all **whole numbers.**



Estimate the numbers that are being shown.

A = ☐

B = ☐

C = ☐

1 mark

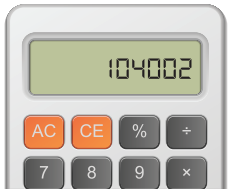
Q1 The same addition is typed into three calculators.

The addition is 50,021 + 63,981.

Two of the calculators are broken and give the wrong answer.

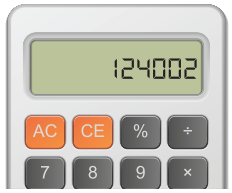
One of them is correct.

A



B

C



Without working out the exact answer, use rounding to work out an estimate and find the correct calculator.

Write your estimation as a number sentence.

50,000 + 64,000 = 114,000

So, calculator B is correct.

1 mark

Q2 A concert is being held with all the money made being donated to charity.

2,305 people buy tickets for the concert.

Each ticket costs £4.

The organisers also make an extra £1,396 for charity by selling t-shirts.

How much money is raised altogether for charity?

£ 10,616

2 marks

Q3 This number line shows three mystery numbers.

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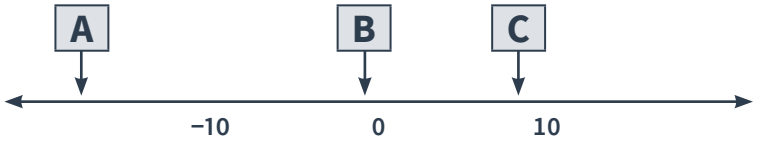


Estimate the numbers that are being shown.

A = **−17**

B = **−1**

C = **9**

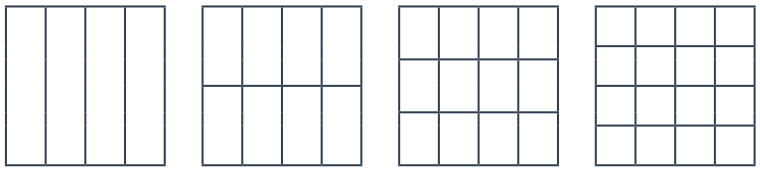
1 mark

	Requirement	Mark	Additional guidance
Q1	50,000 + 64,000 = 114,000	1	Accept any other reasonable ways of using rounding to estimate the correct answer. Do **NOT** accept an exact calculation.
Q2	£10,616 Award **TWO** marks for a correct answer. Award **ONE** mark for correct method shown, but with arithmetic errors. Correct method involves multiplying 2,305 by 4 to find the total amount of money raised by selling tickets (£9,220) and then adding a further 1,396 to find the overall total (£10,616).	2	
Q3	A = Accept any value less than −10 (negative sign must be clear and answer should be reasonable, for example: −17). B = Accept any value less than 0, but more than −5 (i.e. −4, −3, −2 or −1). C = Accept any value more than 5, but less than 10 (i.e. 6, 7, 8 or 9).	1	

Q1 These shapes can be used to show fractions that are **equivalent to a quarter**.

Shade $\frac{1}{4}$ of each of the shapes.

Write the fraction you have shaded.



$\frac{1}{4} = \frac{\square}{8} = \frac{\square}{12} = \frac{\square}{16}$

2 marks

Q2 Olivia knows the multiplication fact for 7 × 6.

She says, "I can use this fact to solve other calculations in my head, using doubling to help."

Use Olivia's strategy to help complete the missing numbers.

If 7 × 6 = ☐ ,

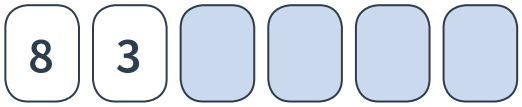
then 14 × 6 = ☐

and 14 × 12 = ☐ .

1 mark

Q3 Jamie takes six digit cards and places them in a line, upside-down.

He turns the first two cards over.



Jamie says, "This six-digit number will round to 830,000 when rounded to the nearest 10,000."

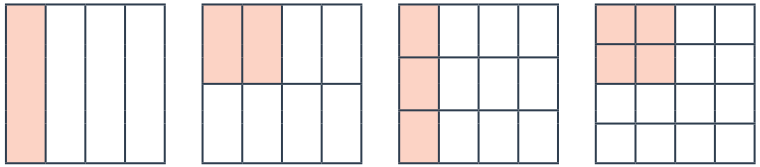
Is this **always**, **sometimes** or **never** true?
Explain your answer.

1 mark

Q1 These shapes can be used to show fractions that are **equivalent to a quarter**.

Shade $\frac{1}{4}$ of each of the shapes.

Write the fraction you have shaded.



$\frac{1}{4} = \frac{2}{8} = \frac{3}{12} = \frac{4}{16}$

2 marks

Q2 Olivia knows the multiplication fact for 7 × 6.

She says, "I can use this fact to solve other calculations in my head, using doubling to help."

Use Olivia's strategy to help complete the missing numbers.

If 7 × 6 = 42 ,

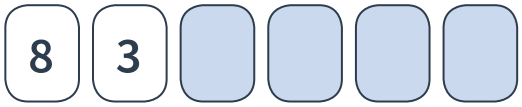
then 14 × 6 = 84

and 14 × 12 = 168 .

1 mark

Q3 Jamie takes six digit cards and places them in a line, upside-down.

He turns the first two cards over.



Jamie says, "This six-digit number will round to 830,000 when rounded to the nearest 10,000."

Is this **always**, **sometimes** or **never** true?
Explain your answer.

sometimes

See mark scheme for examples

1 mark

	Requirement	Mark	Additional guidance
Q1	Award **ONE** mark for correct shading of $\frac{1}{4}$: Any one part of the first rectangle, any two parts of the second rectangle, any three parts of the third rectangle and any four parts of the fourth rectangle. Award **ONE** mark for correct labelling of all three fractions: $\frac{2}{8}$, $\frac{3}{12}$ and $\frac{4}{16}$.	2	Shaded parts do *not* need to correspond across the shapes (for example, *any* two parts of the second rectangle can be shaded, not just the two that correspond to the initial $\frac{1}{4}$ in the first rectangle).
Q2	42 84 168	1	
Q3	This will be **sometimes** true. Whether the number rounds up or down depends on what the thousands digit will be. If it is four or less, Jamie will be correct. If it is five or more, the number will round up to 840,000.	1	Children should use reasoning to explain how they need to know the value of the thousands digit before they know whether the number will round up or down. So, Jamie's statement is sometimes true.

Q1 Tilly, Rhian and Chris are working out the difference between 35,975 and 12,017.

Tilly says the answer is 19,958.

Rhian says the answer is 27,958.

Chris says the answer is 23,958.

Use rounding to work out an **estimation** of the answer. Write your estimation as a number sentence.

☐ – ☐ = ☐

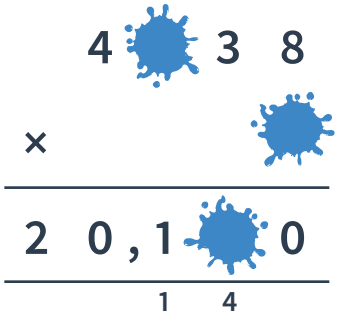
One of the children is correct. Who do you think has the right answer?

☐

1 mark

Q2 Keziah is working out the answer to a multiplication using a written method.

She has spilled ink on her work and some of the digits are covered over.

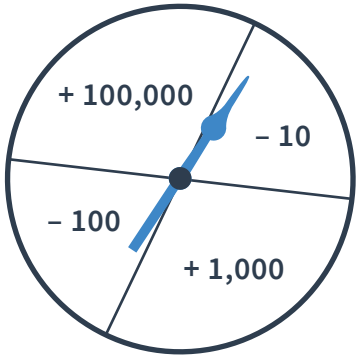


Write out the multiplication to show the missing digits.

1 mark

Q3 Adam starts with the number 250,478.

He spins this spinner **twice** and calculates his new score.



Which of these scores is **not** possible?
Tick your answers.

250,458 ☐

360,478 ☐

251,468 ☐

350,488 ☐

2 marks

Q1 Tilly, Rhian and Chris are working out the difference between 35,975 and 12,017.

Tilly says the answer is 19,958.

Rhian says the answer is 27,958.

Chris says the answer is 23,958.

Use rounding to work out an **estimation** of the answer. Write your estimation as a number sentence.

36,000	–	12,000	=	24,000

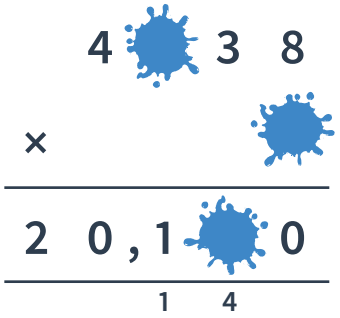
One of the children is correct. Who do you think has the right answer?

Chris

1 mark

Q2 Keziah is working out the answer to a multiplication using a written method.

She has spilled ink on her work and some of the digits are covered over.



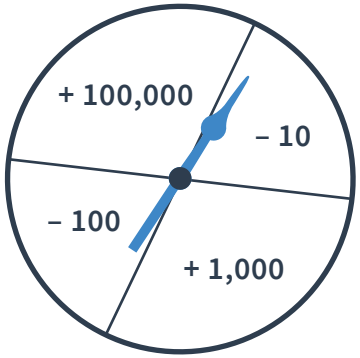
Write out the multiplication to show the missing digits.

				4	0	3	8		
			×				5		
			2	0 , 1	9	0			
					1	4			

1 mark

Q3 Adam starts with the number 250,478.

He spins this spinner **twice** and calculates his new score.



Which of these scores is **not** possible?
Tick your answers.

250,458	
360,478	✓
251,468	
350,488	✓

2 marks

	Requirement	Mark	Additional guidance
Q1	36,000 − 12,000 = 24,000 **Chris** is correct.	1	
Q2	$\begin{array}{r} 4\,0\,3\,8 \\ \times \qquad 5 \\ \hline 2\,0,1\,9\,0 \\ \hline \quad\;\; 1\;\;4 \end{array}$	1	
Q3	360,478 350,488 Award **ONE** mark for each correct answer ticked.	2	

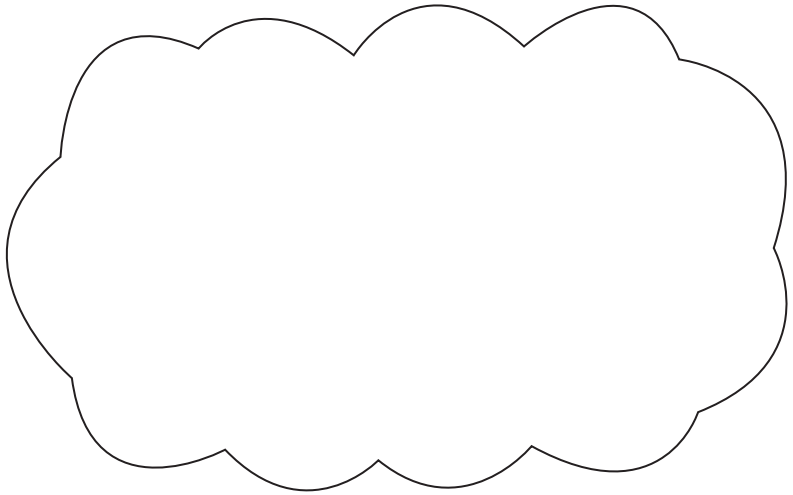
Q1 Which of these division calculations is more difficult than the others? Explain your answer.

A) 490 ÷ 7

B) 720 ÷ 8

C) 294 ÷ 3

D) 360 ÷ 6



1 mark

Q2 A room has an area of 24m^2.

Tick **all** of the dimensions that the room could have.

A	LENGTH = 6m, WIDTH = 4m	☐
B	LENGTH = 6m, WIDTH = 6m	☐
C	LENGTH = 10m, WIDTH = 2m	☐
D	LENGTH = 8m, WIDTH = 3m	☐

1 mark

Q3 A number is rounded to 173,500 when rounded to the nearest hundred.

It is an odd number.

Every digit in the number is different.

What could the number be? Write three possible answers.

☐ ☐ or ☐

2 marks

Q1 Which of these division calculations is more difficult than the others? Explain your answer.

A) 490 ÷ 7

B) 720 ÷ 8

C) 294 ÷ 3

D) 360 ÷ 6

See mark scheme for examples

1 mark

Q2 A room has an area of 24m^2.

Tick **all** of the dimensions that the room could have.

A	LENGTH = 6m, WIDTH = 4m	✓
B	LENGTH = 6m, WIDTH = 6m	
C	LENGTH = 10m, WIDTH = 2m	
D	LENGTH = 8m, WIDTH = 3m	✓

1 mark

Q3 A number is rounded to 173,500 when rounded to the nearest hundred.

It is an odd number.

Every digit in the number is different.

What could the number be? Write three possible answers.

173,509 173,529 or 173,549

2 marks

	Requirement	Mark	Additional guidance
Q1	Division **C** will be the most difficult. All the others can be solved using knowledge of times tables facts (for example, 49 ÷ 7 = 7, so 490 ÷ 7 = 70).	1	Accept any other reasonable explanation that describes how known facts can be applied to find answers A, B and D. Do **NOT** accept generalised answers without any coherent reasoning. For example: Division C will be most difficult because it doesn't end in a zero.
Q2	**A** and **D** should be ticked.	1	Only award the mark for both answers (and only these).
Q3	173,509 173,529 173,549 Award **ONE** mark for two correct answers and **TWO** marks for three correct answers.	2	These are the only three possible answers, given the limitations. The ones place must have a 9 in it and any other even numbers in the tens place will round up to 173,600 (173,569 and 173,589).

What are examiners looking for?

Q1 **Which of these division calculations is more difficult than the others? Explain your answer.**

A) 490 ÷ 7

B) 720 ÷ 8

C) 294 ÷ 3

D) 360 ÷ 6

Division C will be the most difficult. All the others can be solved using knowledge of times tables facts (for example, 49 ÷ 7 = 7, so 490 ÷ 7 = 70).

1 mark

Why are we asking this question?

This question has been written in order to encourage children to recognise the common mental strategies that they can use to solve HTO ÷ O problems. Children should use reasoning when justifying their answers.

What common errors do we expect to see?

Some children may think that a calculation involving larger numbers will necessarily be the most difficult to work out mentally. Children who think this will give the answer 720 ÷ 8 as both numbers are larger.

Some children may give answers that do not have coherent reasoning with reference to the strategies they can use. For example, they may suggest that Division C is the most difficult, but say that this is because it does not end in a zero, rather than explaining in more detail which strategies they can use to help with the other calculations.

How to encourage children to solve this question

Encourage children to look for numerical patterns in the questions they are being asked. Do any of the combinations of numbers look familiar? For example, they will find it helpful if they can spot the '49' in 490 ÷ 7. By identifying these core, known facts, children should see that they can apply them in order to solve each problem apart from 294 ÷ 3 (which requires a different strategy).

Children may also benefit by considering the place value behind each known fact. For example, if 49 ones split into 7 groups is equal to 7 ones, then they can use this to help find out what 49 tens split into 7 groups is equal to. They should consider which of the calculations they can apply this same strategy to solve.

To check their reasoning, it may be worth children finding each answer and seeing whether their choice of 'most difficult' calculation really was!

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