## Using Numberless Prompts to Deconstruct Word Questions, $Y4 \rightarrow Y6$

## Build understanding of the deep structure of multi-step word questions. Focus thinking on structures, give all children success, break questions into small steps, vary the challenge.

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 $Y4 \rightarrow Y6$ 











## carrots £1.80 per kg









## carrots £1.80 per kg









How much change does he get from £5?

## carrots £1.80 per kg







Jack buys 
$$1\frac{1}{2}$$
 kg of potatoes and  $\frac{1}{2}$  kg of ca

How much change does he get from £5?

## carrots £1.80 per kg

## arrots.

A box contains 2.6 kg of washing powder.



Jack uses 65 grams of powder for each wash.

He uses all the powder.

How many washes did Jack do?



When students are presented with a mathematics word problem, their first response often is to try to compute an answer, even before they have tried to understand the problem.

Studies of expertise have shown that experts attend more to the underlying structure of a problem, whereas novices rely more on surface features.

Expert problem solvers typically spend more time thinking about problems and trying to understand them than do novices, who tend to immediately execute a solution.

**Removing Opportunities to Calculate Improves Students' Performance on Subsequent Word Problems.** Givvin and Stigler (2019)

A group of tourists planned a 3-day walking trip from Big Rock to Eagles Landing, a total of 66 km. On the first day they walked 22 km. On the second day they walked 20 km. **How far would they have to walk on the third day of their trip?** 

A group of tourists planned a 3-day walking trip from Big Rock to Eagles Landing. On the first day they walked one third of the total distance. On the second day they walked a little less. **How far would they have to walk on the third day of their trip?** 

**Removing Opportunities to Calculate Improves Students' Performance on Subsequent Word Problems.** Givvin and Stigler (2019)

Participants who explained the non-calculable problems performed significantly better on the transfer test than participants who explained the calculable problems.

We hypothesized that the mechanism at play was a reduction in instrumental thinking and an increase in relational thinking.

**Removing Opportunities to Calculate Improves Students' Performance on Subsequent Word Problems.** Givvin and Stigler (2019)

## Lola gives £655 to two charities.



She shares it so that the 'Donkey Rescue Centre' gets 4 times as much as the 'Home for Stray Dogs'.





## Lola gives £24 to two charities.



She shares it so that the 'Donkey Rescue Centre' gets 2 times as much as the 'Home for Stray Dogs'.









## Lola gives £24 to two charities.



She shares it so that the 'Donkey Rescue Centre' gets 3 times as much as the 'Home for Stray Dogs'.











## She gives £24 to the Home for Stray Dogs.



## She gives £24 to the Home for Stray Dogs.



## She gives £24 to the Donkey Rescue Centre.



## She gives £24 to the Donkey Rescue Centre.



## She gives £24 to the Donkey Rescue Centre.

1. Tom splits £300 between two charities. He gives Oxfam twice as much as Barnardo's. How much money does he give to Oxfam?

2. Amy splits £300 between two charities. She gives RSPCA three times as much as Age Concern. How much money does she give to RSPCA?

3. Raj spends three times as much on music as on computer games. He spends £60 on computer games. How much does he spend on music?

4. Hannah spends 60 minutes longer cycling than running per week. She spends three times as much time cycling compared to running. How much time does she spend running per week?



## **Small Difference Questions**

Question 1: For every 2 boys in Year 4, there are 3 girls. There are 30 girls in Year 4. How many children in Year 4? Question 2: For every 2 girls in Year 5, there are 3 boys. There are 30 boys in Year 5. How many girls in Year 5? Question 3: For every 2 boys in Year 6, there are 3 girls. There are 30 children in Year 6. How many boys in Year 6? Extend: write your own question to continue this sequence.



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Question 2: There were 18 children at running club. There were two girls for every boy at running club. Then, two boys left running club.

Now, how many girls for every boy at running club?





Laura has a bag of jelly beans. She eats  $\frac{3}{8}$  of them. She has 15 left.

How many jelly beans were in the bag?



# jelly beans in the bag.

left.









## [ ] jelly beans in the bag. Laura eats $\begin{bmatrix} \frac{3}{5} \\ \frac{3}{5} \end{bmatrix}$ of them. She has **12** left.





- 1. Sam's book is 300 pages long. He has read 160 pages. How many pages does he have left?
- 2. Ava's has read 126 pages of her book. She has 63 pages left. How many pages are there in the book?
- 3. Emma's book is 120 pages long. She has read  $\frac{1}{4}$  of her book. How many pages does she have left?
- 4. Dan's book is 120 pages long. He has read  $\frac{3}{4}$  of his book. How many pages does he have left?
- 5. Harry has read  $\frac{3}{4}$  of his book. He has 50 pages left. How long is Harry's book?

The sides of the rectangle are parallel to the axes.



### Point C is the centre of the rectangle.





## (22,16)

The sides of the rectangle are parallel to the axes.



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# Small Variation, Sequences of Questions

Removing numbers, reducing language, making different questions by varying the unknown Questions to use, visual representations, planning questions, differentiation

## Sequences of questions that gradually increase in challenge

Finding/writing the sequences, benefits, drawbacks, adding depth

## **Building Questions**

# For each question, give the missing information:

Melons: 90p Pineapples: 75p Mangoes: 55p

Information	Question	Answer
	How much change did she get?	75p
	How much more money does he need?	15p
	How many melons can she afford?	5 melons

# **Building Questions**

Draw lines to join the blue information to matching the red question.

> Raja buys three apples and three bananas.

> > Mo has £2.

Ben has £2. He wants four oranges and three apples.

Matt has £2. He wants four oranges and three bananas.





does he get?

How much more money does he need?



# How much change

### How much does it cost him?

#### How many oranges can he afford?

# **Small Difference Questions**

- **1.** Zack bought a sandwich, an apple and a drink. How much did it cost?
- **2.** Nada wants a sandwich, an apple and a drink. She has £2. How much more money does she need?
- **3.** Jen bought a sandwich, an apple and a drink. She paid £3. How much change did she get?
- **4**. Tom has £2.
- How many apples can he afford?
- **5**. Joy has £2.
- How many oranges can she afford?
- 6. Andy spent £2 on 3 items. He got 80p change. What does he buy?

Sandwiches: £1.80 Oranges: 35p Apples: 25p Drinks: 50p

# Explore

- At the market, apples cost 25p each.
- At the shop, it costs £1.10 for a bag of 6 apples.
- Using this information, think of a question that involves: (a) Multiplication
- (b) Multiplication and addition
- (c) Multiplication and subtraction(d) Division

## 6 apples. n that involves:

## Contexts

Which operation(s) does each question involve? addition subtraction multiplication division (a) Tim is years old. Jack is years old. When Tim is , how old will Jack be? (b) Zara has t-shirts, pairs of trousers and hats. How many different outfits can Zara wear?

(c) Holly is saving for a bike that costs  $\pounds$  . She has  $\pounds$  . Holly earns £ per week. How many weeks will Holly need to save up for?



1500 people are travelling from Sheffield to Leeds to go to the match. They travel by car or by coach.

200 people fit in a coach. 5 people fit in a car.

Using this information, think of a question with the answer: (a) 6 coaches

(b) 140 cars

Amina is making designs with two different shapes.

She gives each shape a value.



Total value is 147

Total value is 111

#### Calculate the value of each shape.



## Explore











A box of chocolates weighs 280g.

The box contains 8 identical chocolates.

Manish eats 3 chocolates.

The box of chocolates now weighs 199g.

If the box is empty, how much would it weigh?







## = 280g

## = 27g

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## = 280g

## = 27g

Tony and his 5 friends buy tickets for a musical. They each pay £17.50



How much do they pay altogether?

## Tony and his friends buy tickets for a musical. They each pay



How much do they pay altogether?

Tony and his 3 friends buy tickets for a musical. They each pay £20



How much do they pay altogether?



## **Misconceptions**



Tick ( $\checkmark$ ) the times the clock is showing.





## **Misconceptions**



Tick ( $\checkmark$ ) the times the clock is showing.

### 11:35

### Twenty five minutes to eleven



## **Misconceptions**



Tick ( $\checkmark$ ) the times the clock is showing.

## Twenty five minutes to twelve

11:35

Twenty five minutes to eleven

23:35



There are **20** big cats in the zoo altogether.



Tick the statements that are **true**.

There are more cheetahs than jaguars.

There are more than 5 jaguars.

- The total number of lions and tigers is 10
- One-quarter of the big cats are cheetahs.











# Wilmslow Albion, 2020-2021 Season

Won: 7 Drawn: 3 Lost: 10



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Halifax	13:47	13:59	14:14	14:25
Bradford	14:00	14:12	14:27	14:38
Leeds	14:22	14:34	14:49	15:00
Micklefield	14:43	14:55	15:10	15:21
York	15:07	15:19	15:34	15:45

Hassan needs to be in Leeds by 14:45

What time does he need to get the train from Halifax?



Halifax	13:47	13:59	14:14	14:25
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24	V		
Halifax			
Bradford			
Leeds			
Micklefield			
York	15:07	15:19	15:3



Here is a train timetable.

Halifax	13:47	13:59	14:14	14:25
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York	15:07	15:19	15:34	15:45

At what time does the 3<sup>rd</sup> train...

How long does it take to travel from...

Tim is going from... to... He needs to arrive at... At what time...

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York	15:07	15:19	15:34	15:45

## How long is the journey?



Here is a train timetable.

Halifax	13:47	13:59	14:14	14:25
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Joy gets the 2<sup>nd</sup> train from Bradford to York.

How long is the journey?

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York	15:07	15:19	15:34	15:45

### At what time does her train depart from Leeds?

Here is a train timetable.

Halifax	13:47	13:59	14:14	14:25
Bradford	14:00	14:12	14:27	14:38
Leeds	14:22	14:34	14:49	15:00
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York	15:07	15:19	15:34	15:45

Kelly arrives in York at 15:34

At what time does her train depart from Leeds?

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## What time does he need to get the train from Halifax?

Here is a train timetable.

Halifax	13:47	13:59	14:14	14:25
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York	15:07	15:19	15:34	15:45

Hassan needs to be in Leeds by 14:45

What time does he need to get the train from Halifax?

#### **Agree or Disagree?** Train timetable:

Manchester	7:15	8:31	9:44	11:02
Huddersfield	7:43	9:01	10:15	11:33
Dewsbury	7:55	9:11	10:25	11:42
Leeds	8:10	9:27	10:39	11:57
York	8:34	9:52	11:04	12:23

The first train It takes 26 minutes for the arrives in second train to get from York at 11:02 Huddersfield to Leeds

It takes 15 minutes to travel from Dewsbury to Leeds

If I get to Manchester station at 8:40 and get the next train, I will arrive in York at 9:52
### **Read the Table** Train timetable:

Manchester	7:15	8:31	9:44	11:02
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- At what time does the third train arrive at Dewsbury?
- 2. How long does the fourth train take to go from Manchester to Leeds?
- 3. Larrive in Huddersfield at 10:25. At what time does the next train leave?

4. I arrive in Dewsbury at 9:40. How long until the next train leaves? **Extend:** Write two different 'how long...' questions. Write two different 'at what time...' questions.

# What's the Question?

At Oak Vale Junior School, children are split into five different teams. They earn team points for their team. Here are the team points for this term:

	Blue	Red	Green	Yellow	Orange
Year 3	31	25	40	36	28
Year 4	29	36	28	30	39
Year 5	24	27	31	28	28
Year 6	34	33	35	31	37

Create a question with the answer...

(b) 2 (c) blue (d) Year 5 (a) 34 Create a question where, to find the answer, you need... (e) ... four pieces of information (f) ... five pieces of information

## Explain

Serena Williams is one of the greatest female tennis players of all time. Here are her results in the 2012 – 2016 seasons:

Year	Matches Won	Matches Lost	Tournaments Played	Tournaments Won
2012	58	4	11	7
2013	78	4	15	11
2014	52	8	15	7
2015	53	3	8	5
2016	38	6	8	2

1. How many matches did Serena play in 2016?

2. How many tournaments did Serena win between 2012 – 2016?

3. Which was Serena's most successful year? Explain why.

4. What was Serena's second most successful year? Explain why.



Predicting questions, identifying required information Removing numbers, exploring inverses Representing key ideas, addressing misconceptions Writing sequences of questions with small differences Deepening or opening up challenges