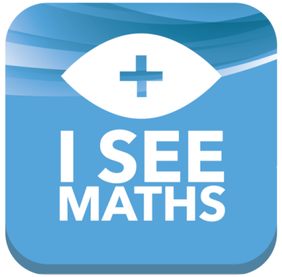
Enhancing Mathematical Reasoning in Y5 and Y6

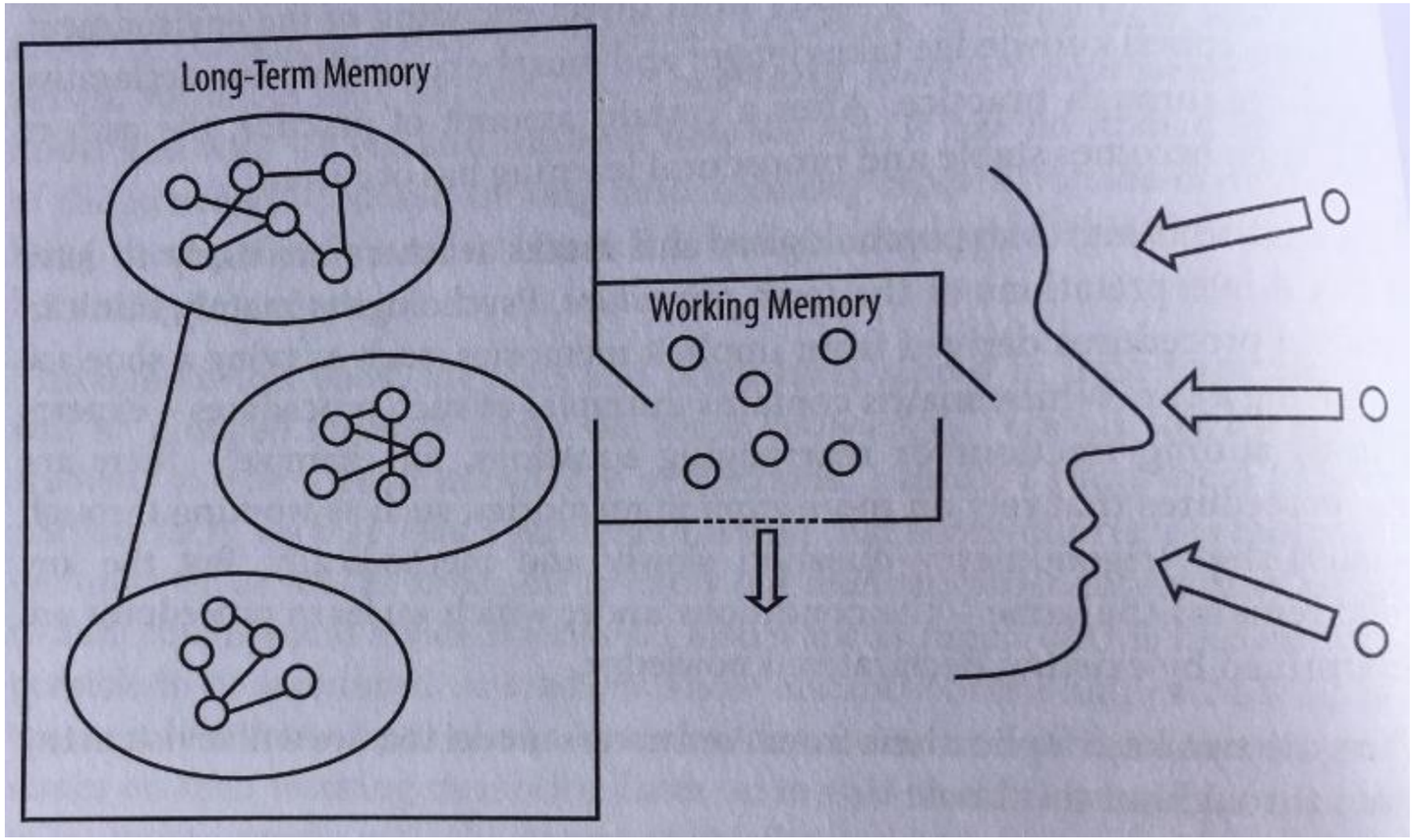


Breaking down calculation

Using sequences of questions

Exploring word question structures

Flexible thinking, deep application



Novice → **Expert**

Start of sequence → **End of sequence**

I know… so…

72 ÷ 3 = 24

78 ÷ 3 = ☐

84 ÷ 6 = 14

168 ÷ 6 = ☐

48 ÷ 6 = 8

108 ÷ 6 = ☐

98 ÷ 7 = 14

91 ÷ 7 = ☐

72 ÷ 4 = 18

144 ÷ 8 = ☐

112 ÷ 4 = 28

192 ÷ 4 = ☐

I know… so…

72 ÷ 3 = 24

78 ÷ 3 = 26

84 ÷ 6 = 14

168 ÷ 6 = 28

48 ÷ 6 = 8

108 ÷ 6 = 18

98 ÷ 7 = 14

91 ÷ 7 = ☐

72 ÷ 4 = 18

144 ÷ 8 = ☐

112 ÷ 4 = 28

192 ÷ 4 = ☐

Small Difference Questions

56 ÷ 4 = 14

112 ÷ 4 = 28

224 ÷ 8 = 28

304 ÷ 8 = 38

344 ÷ 8 = 43

108 ÷ 3 = 36

216 ÷ 6 =

216 ÷ 3 =

246 ÷ 3 =

261 ÷ 3 =

Small Difference Questions

56 ÷ 4 = 14

112 ÷ 4 = 28

224 ÷ 8 = 28

304 ÷ 8 = 38

344 ÷ 8 = 43

108 ÷ 3 = 36

216 ÷ 6 = 36

216 ÷ 3 =

246 ÷ 3 =

261 ÷ 3 =

Small Difference Questions

56 ÷ 4 = 14

112 ÷ 4 = 28

224 ÷ 8 = 28

304 ÷ 8 = 38

344 ÷ 8 = 43

108 ÷ 3 = 36

216 ÷ 6 = 36

216 ÷ 3 = 72

246 ÷ 3 =

261 ÷ 3 =

Small Difference Questions

56 ÷ 4 = 14

112 ÷ 4 = 28

224 ÷ 8 = 28

304 ÷ 8 = 38

344 ÷ 8 = 43

108 ÷ 3 = 36

216 ÷ 6 = 36

216 ÷ 3 = 72

246 ÷ 3 = 82

261 ÷ 3 =

Small Difference Questions

56 ÷ 4 = 14

112 ÷ 4 = 28

224 ÷ 8 = 28

304 ÷ 8 = 38

344 ÷ 8 = 43

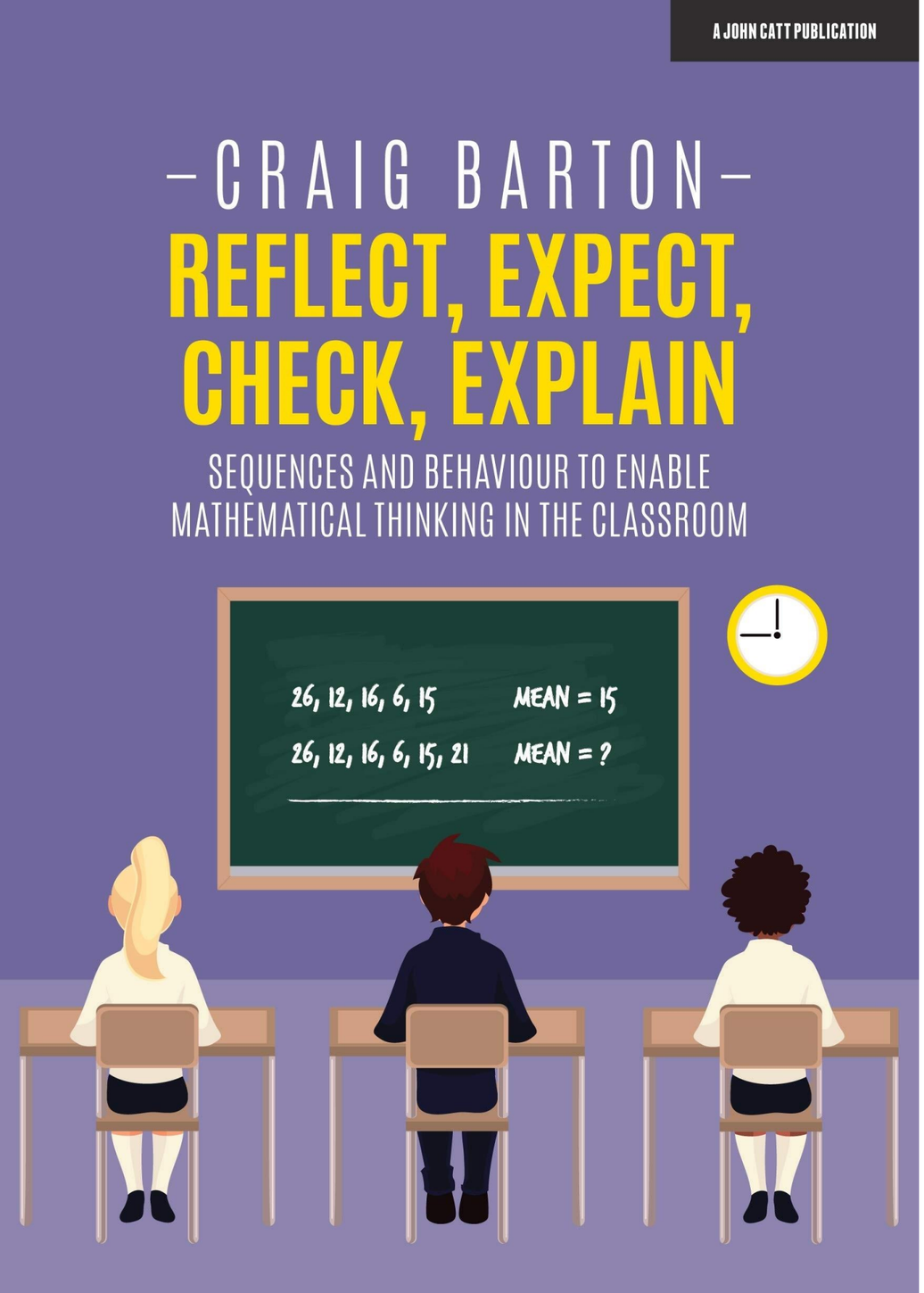
108 ÷ 3 = 36

216 ÷ 6 = 36

216 ÷ 3 = 72

246 ÷ 3 = 82

261 ÷ 3 = 87



Reflect: spotting similarities/differences

Expect: how will the next answer be different?

Check: was this what you expected? Seeing the answer you noticed…

Explain: this is because…

$100 - 10 \times 6 =$ 

$100 - (10 \times 6) =$ 

$(100 - 10) \times 6 =$ 

$(100 - 6) \times 10 =$ 

$100 - 6 \times 10 =$ 

$6 \times 10 - 100 =$ 

$100 - 10 \times 6 =$ 40

$100 - (10 \times 6) =$ ☐

$(100 - 10) \times 6 =$ ☐

$(100 - 6) \times 10 =$ ☐

$100 - 6 \times 10 =$ ☐

$6 \times 10 - 100 =$ ☐

$100 - 10 \times 6 =$ 40

$100 - (10 \times 6) =$ 40

$(100 - 10) \times 6 =$

$(100 - 6) \times 10 =$

$100 - 6 \times 10 =$

$6 \times 10 - 100 =$

$100 - 10 \times 6 =$ 40

$100 - (10 \times 6) =$ 40

$(100 - 10) \times 6 =$ 540

$(100 - 6) \times 10 =$ ☐

$100 - 6 \times 10 =$ ☐

$6 \times 10 - 100 =$ ☐

$100 - 10 \times 6 =$ 40

$100 - (10 \times 6) =$ 40

$(100 - 10) \times 6 =$ 540

$(100 - 6) \times 10 =$ 940

$100 - 6 \times 10 =$

$6 \times 10 - 100 =$

$100 - 10 \times 6 =$ **40**

$100 - (10 \times 6) =$ **40**

$(100 - 10) \times 6 =$ **540**

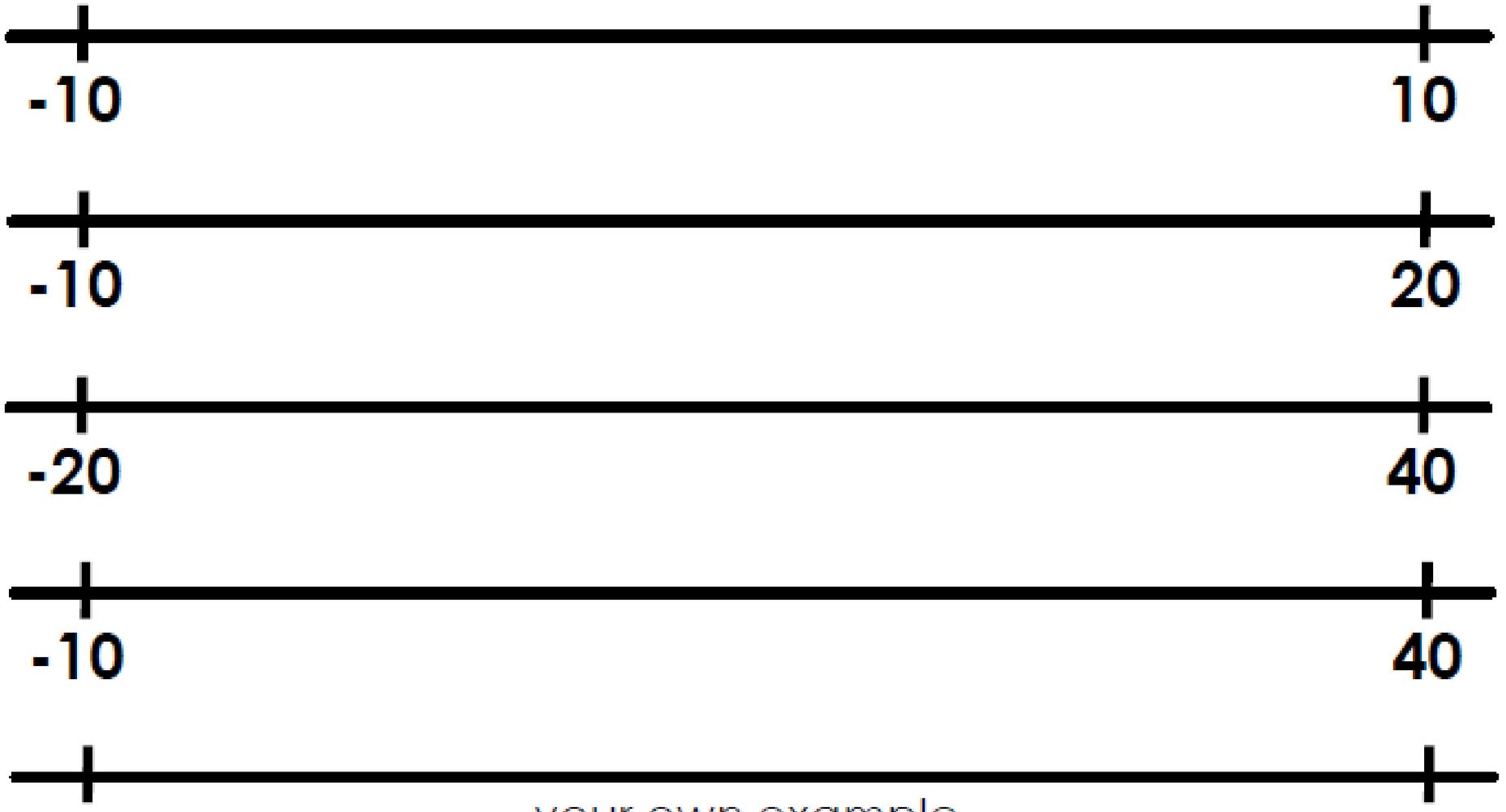
$(100 - 6) \times 10 =$ **940**

$100 - 6 \times 10 =$ **40**

$6 \times 10 - 100 =$ **-40**

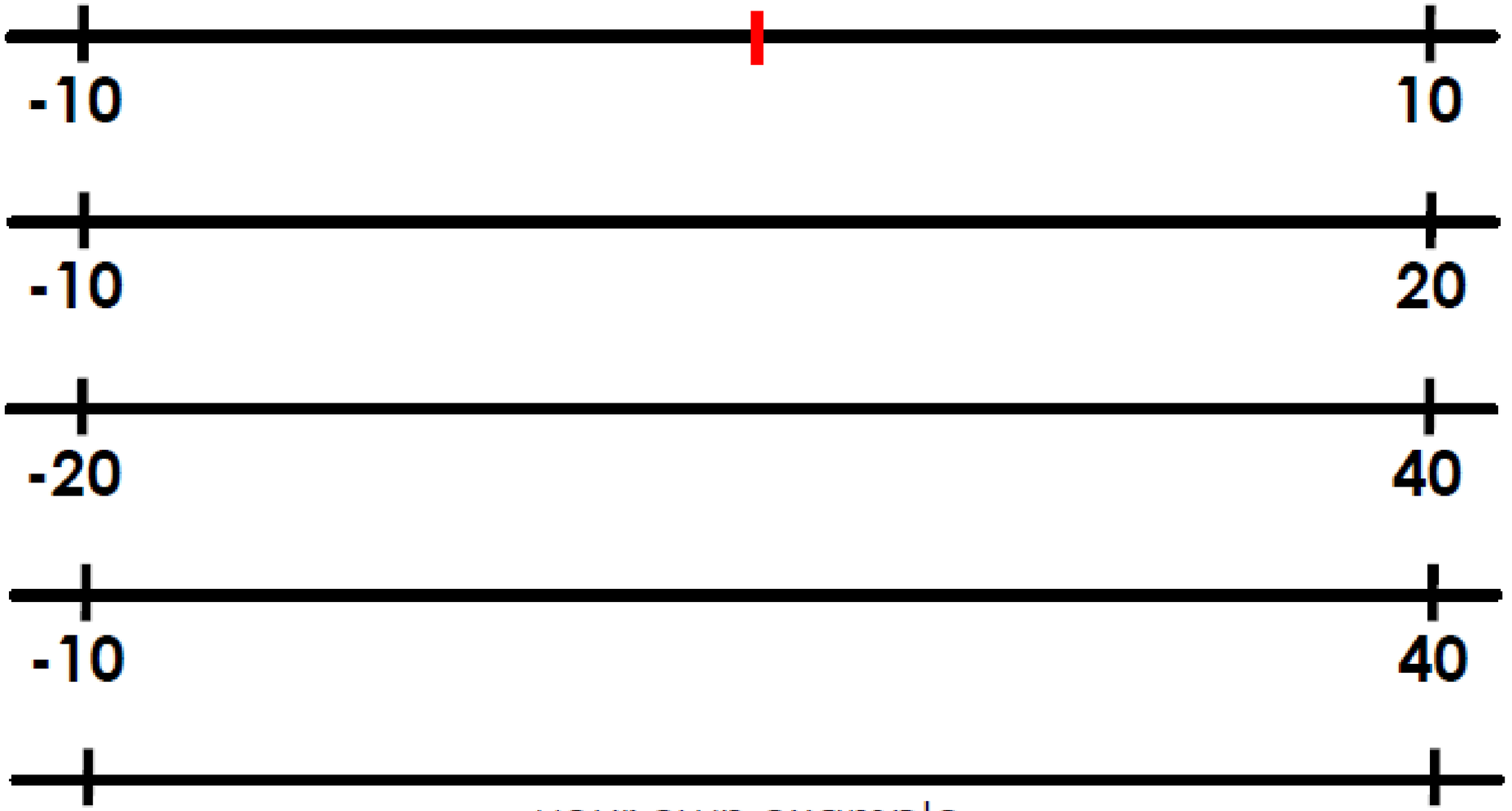
Estimate

Position 0 on each number line:



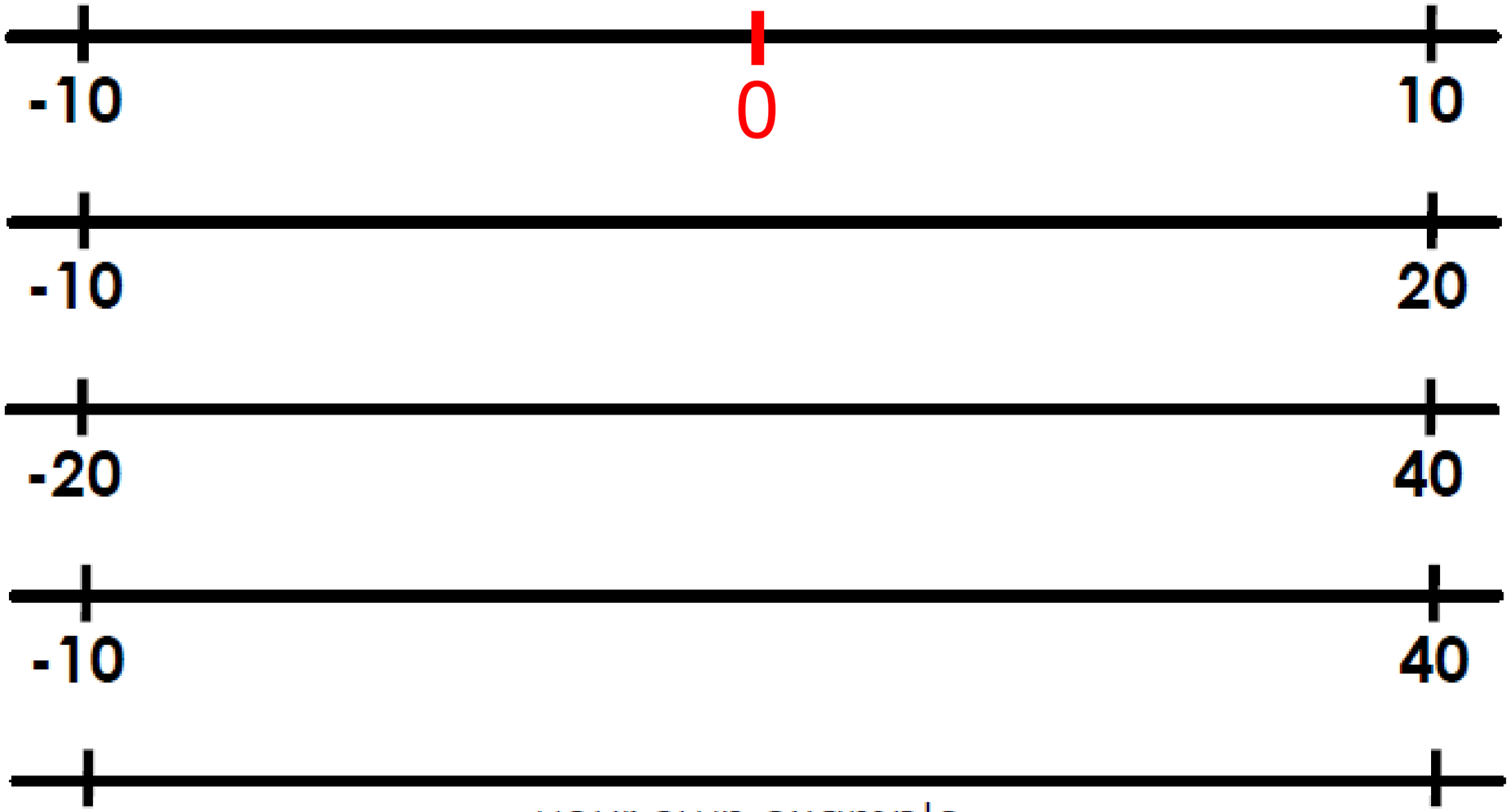
Estimate

Position 0 on each number line:



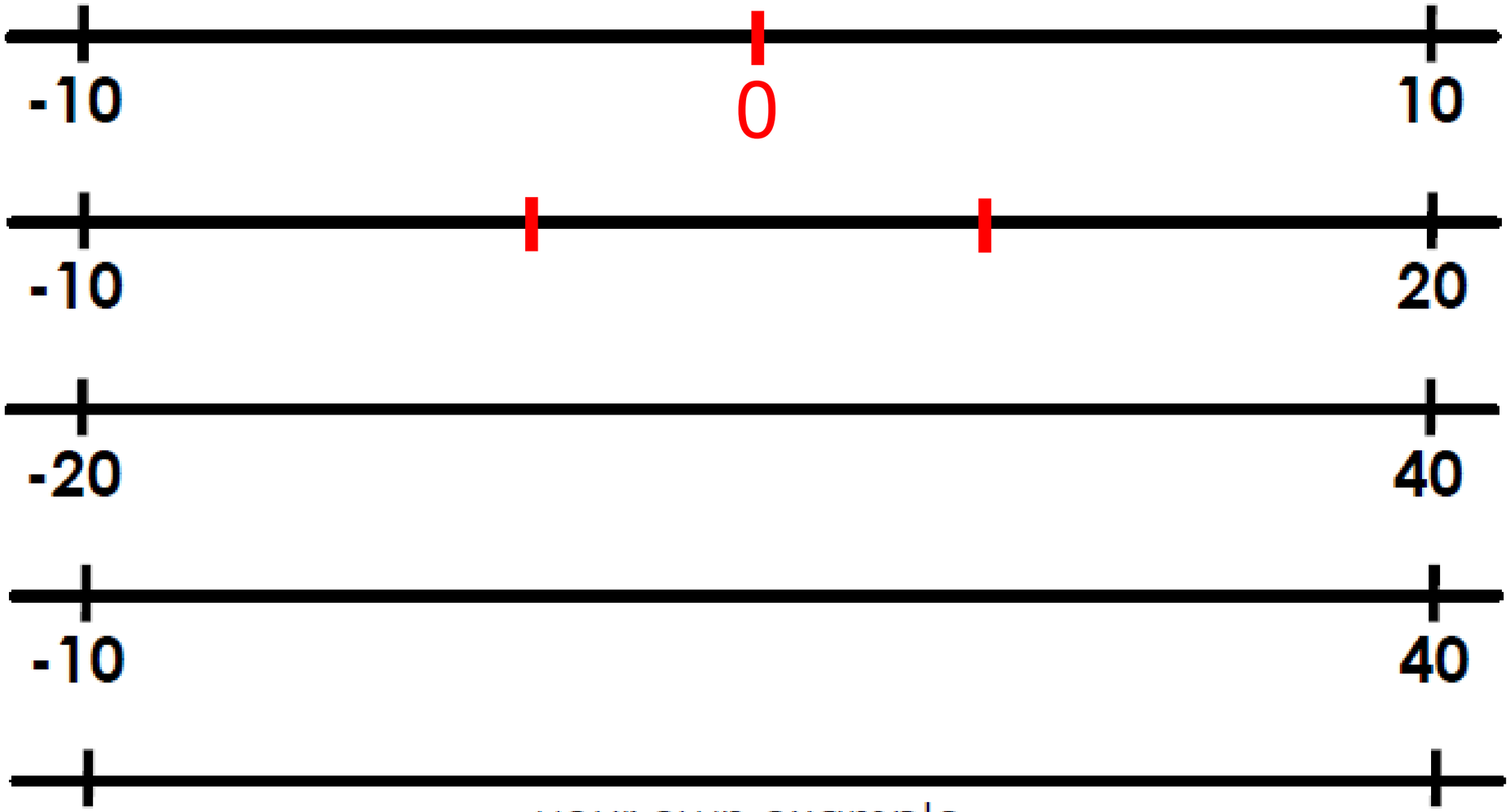
Estimate

Position 0 on each number line:



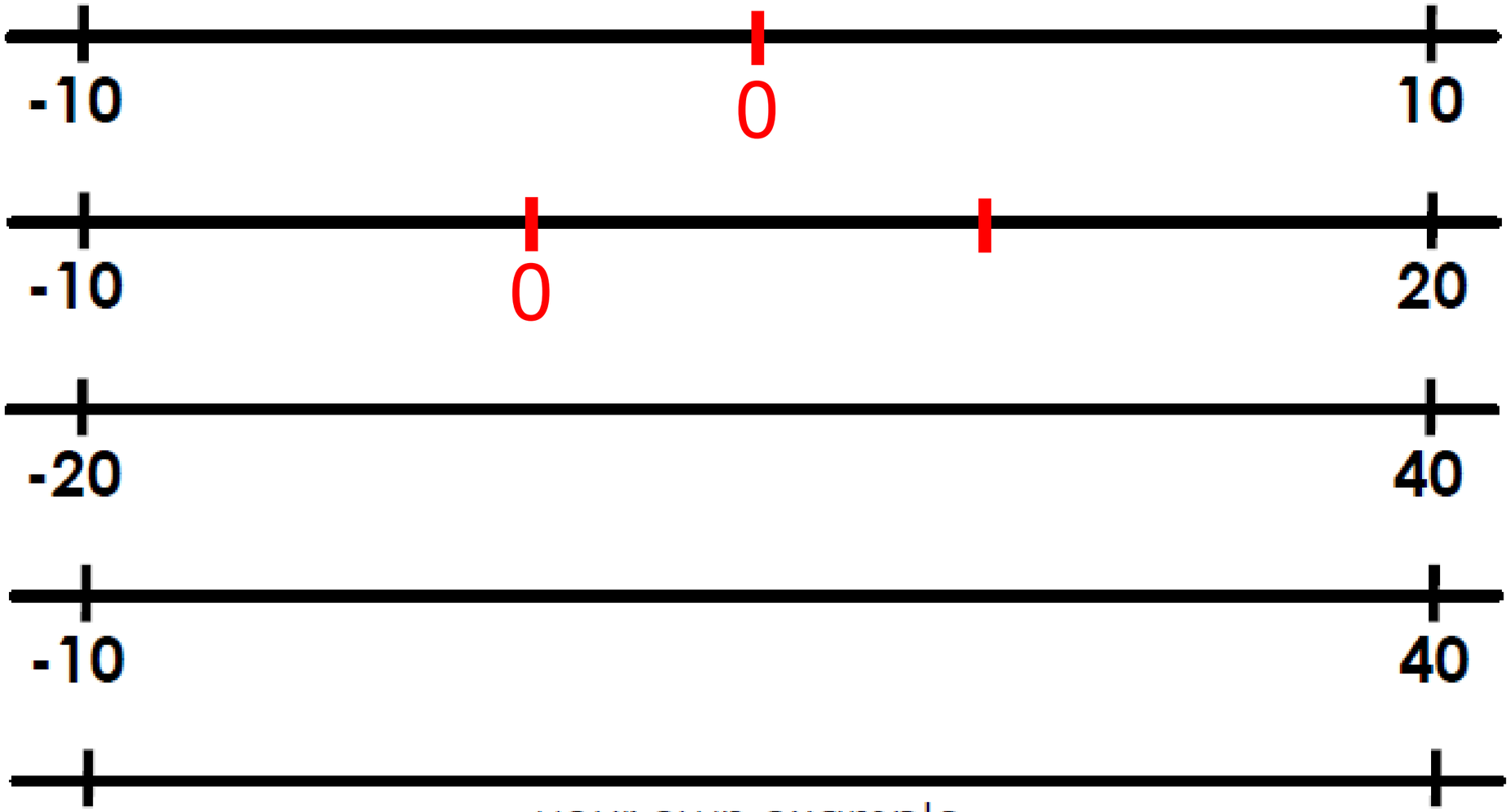
Estimate

Position 0 on each number line:



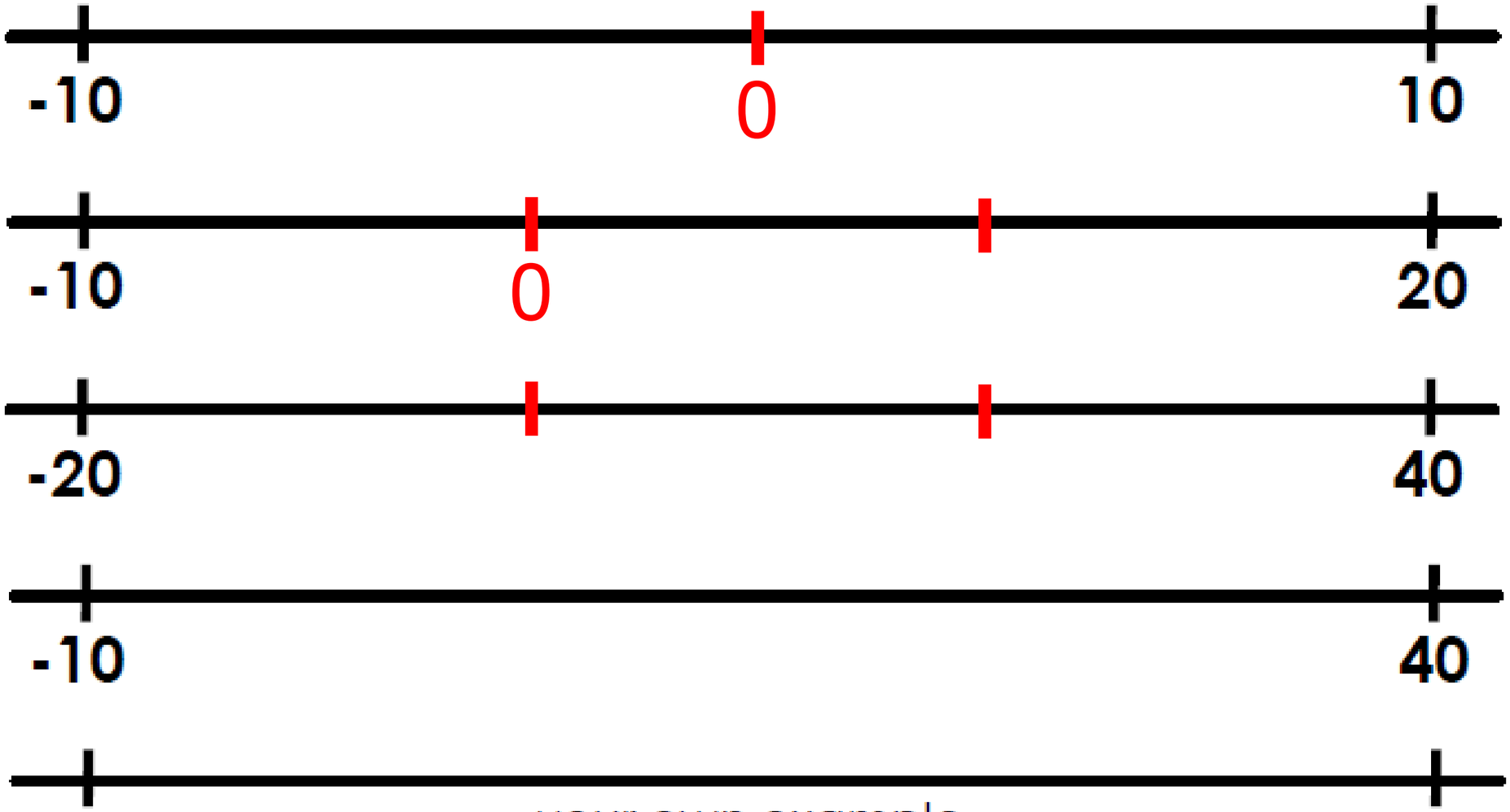
Estimate

Position 0 on each number line:



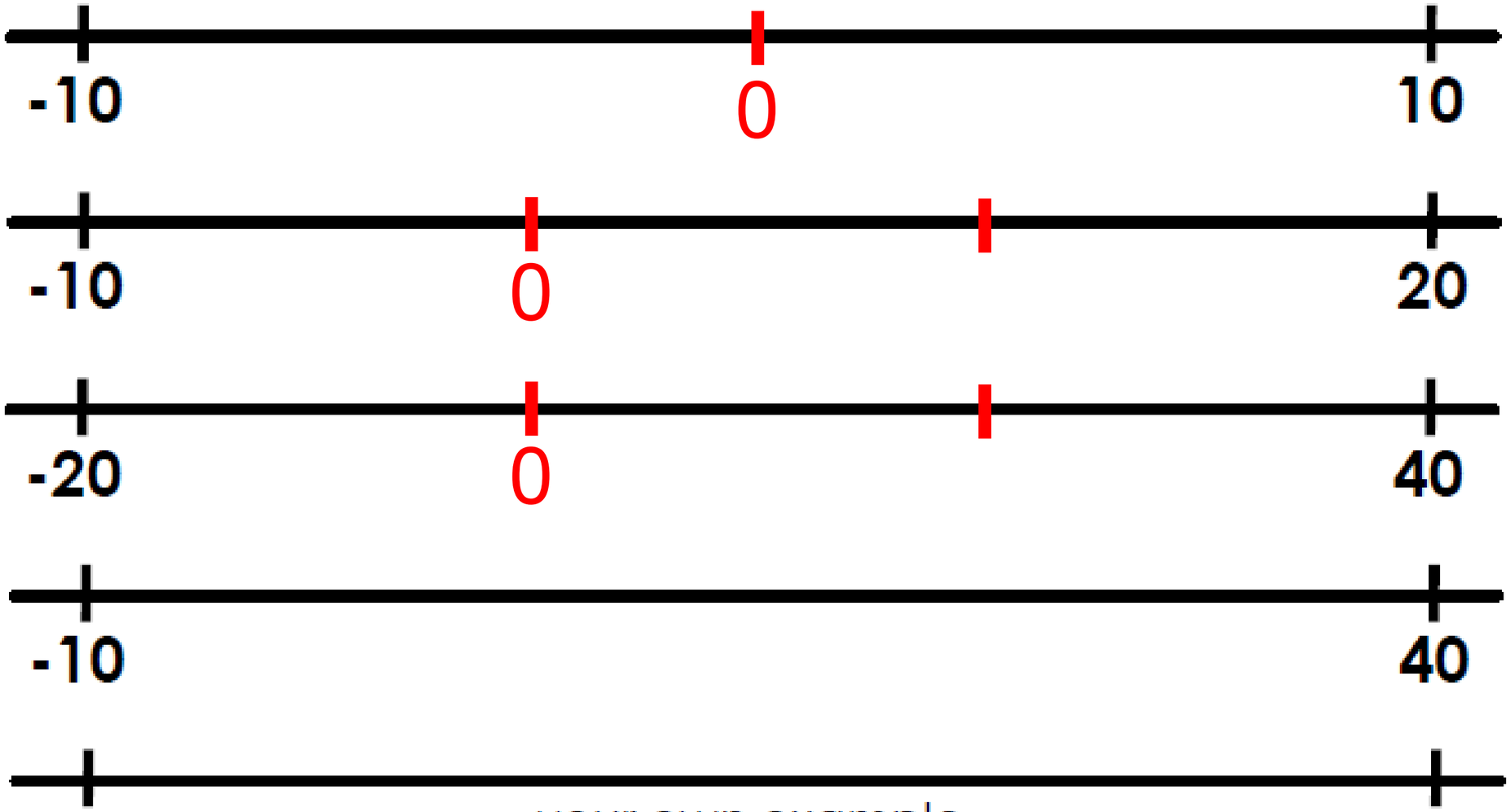
Estimate

Position 0 on each number line:



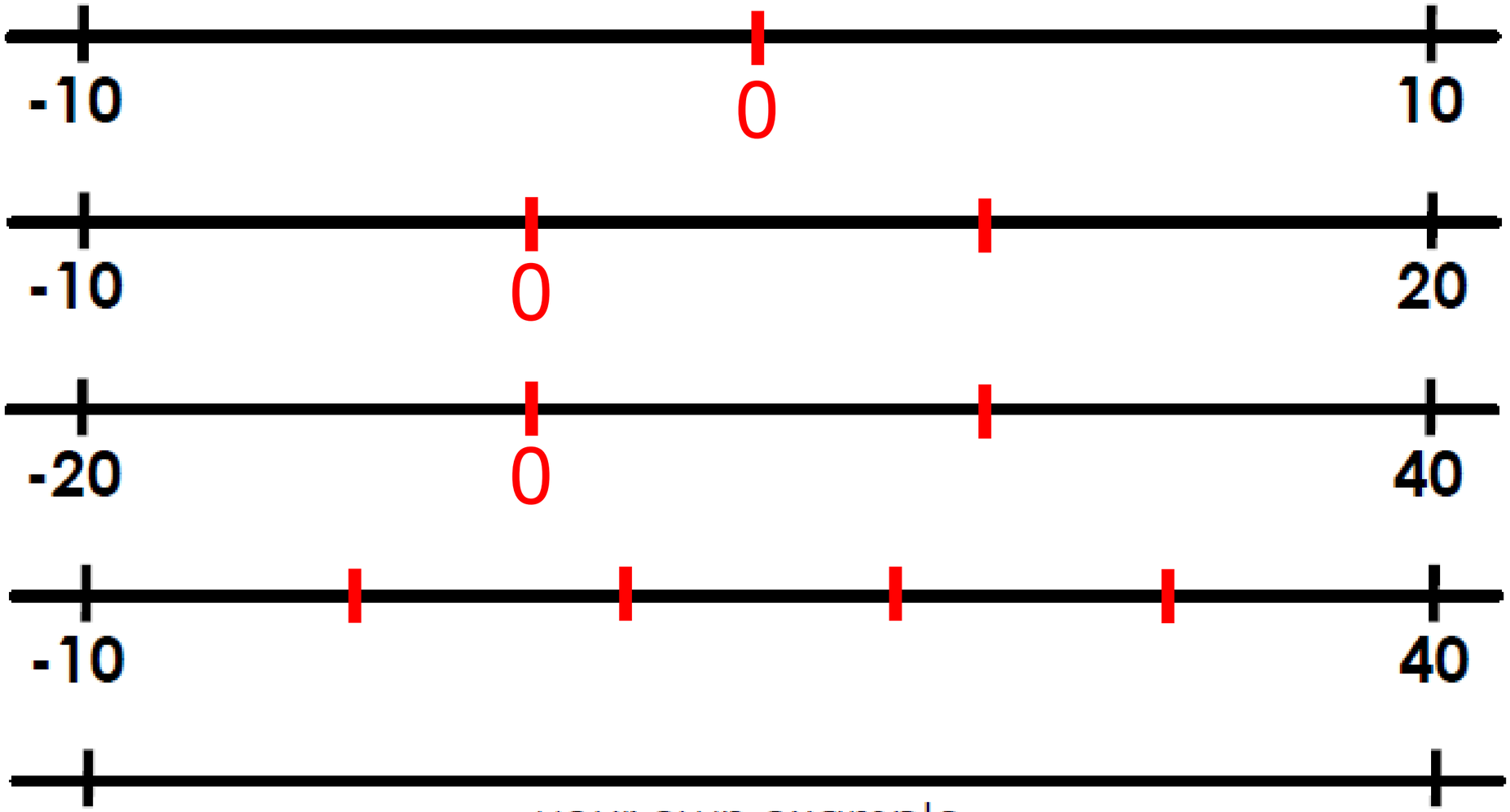
Estimate

Position 0 on each number line:



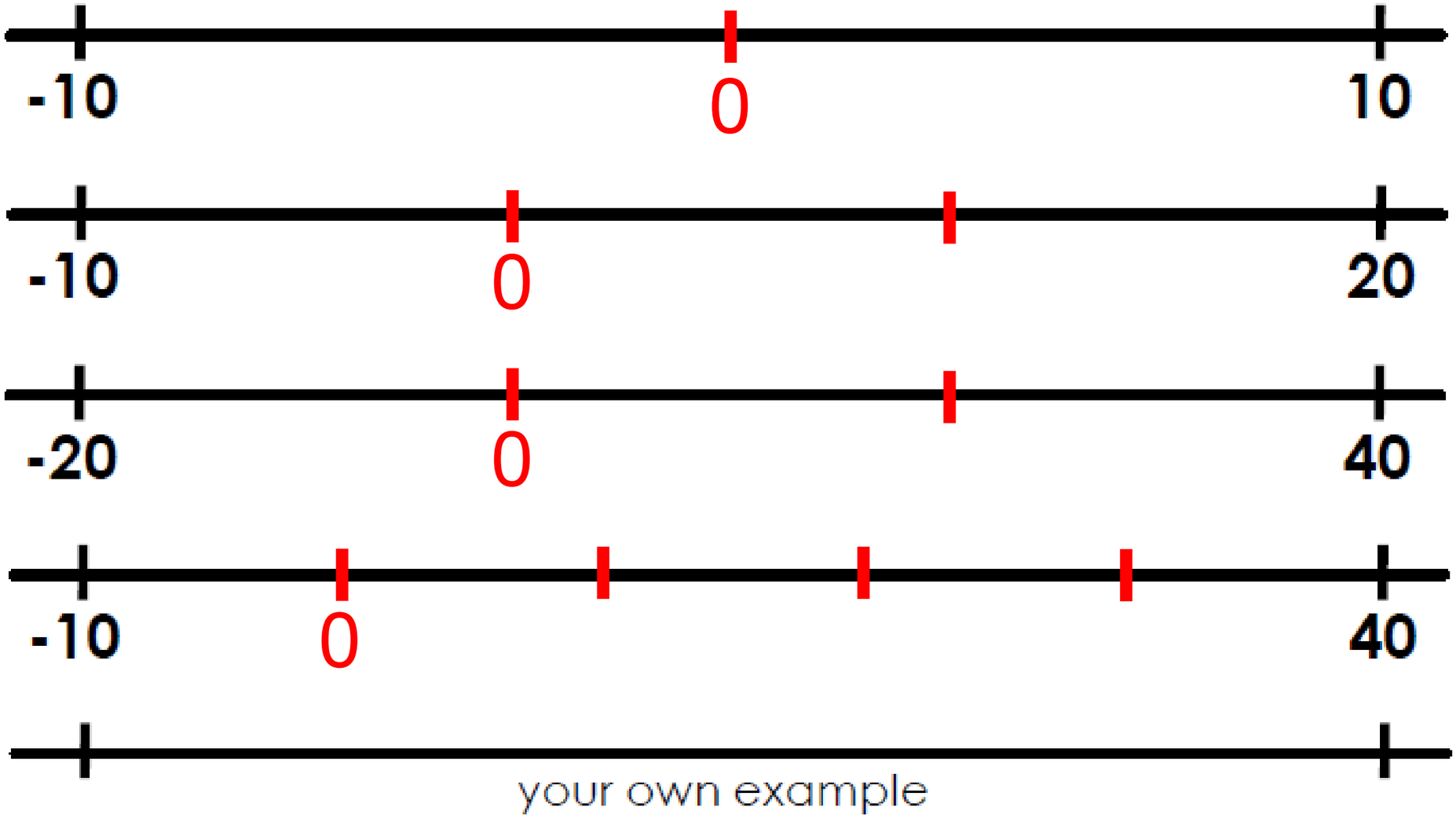
Estimate

Position 0 on each number line:



Estimate

Position 0 on each number line:



Small Difference Questions

1 less than **XLIII** is ☐

1 more than **XLIII** is ☐

10 more than **XLIII** is ☐

10 less than **XLIII** is ☐

1 less than **XXX** is ☐

10 more than **XXX** is ☐

50 more than **XXX** is ☐

XLIII is **43**

XXX is **30**

I = 1

V = 5

X = 10

L = 50

Small Difference Questions

1 less than **XLIII** is XLII

1 more than **XLIII** is XLIV

10 more than **XLIII** is LIII

10 less than **XLIII** is XXXIII

1 less than **XXX** is

10 more than **XXX** is

50 more than **XXX** is

XLIII is **43**

XXX is **30**

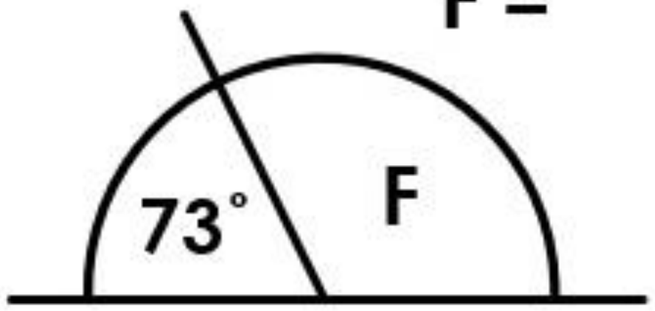
I = 1

V = 5

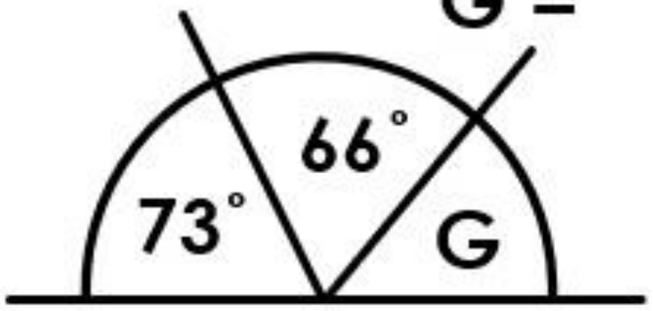
X = 10

L = 50

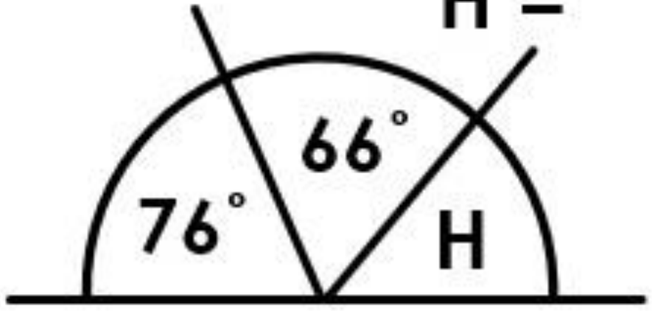
F =

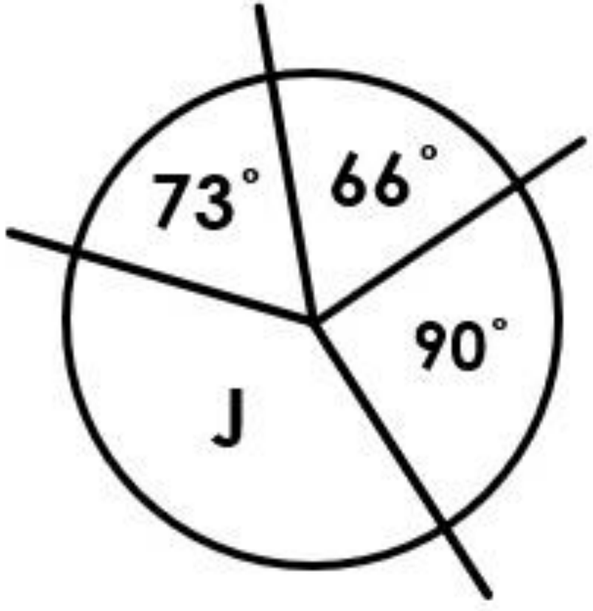


G =

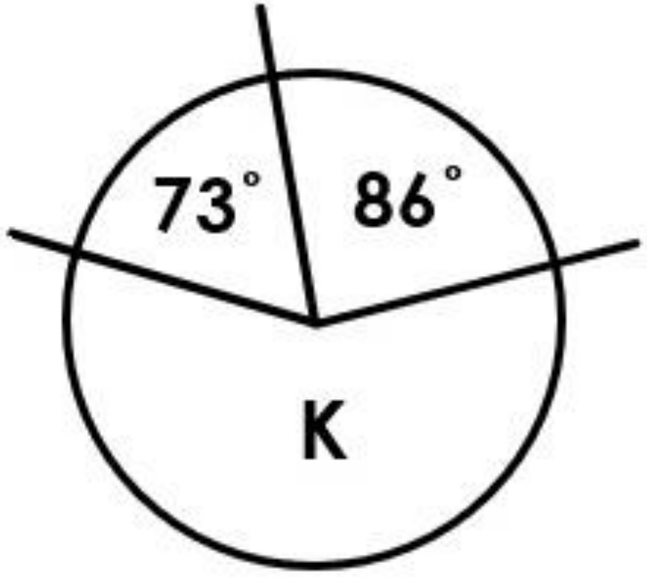


H =



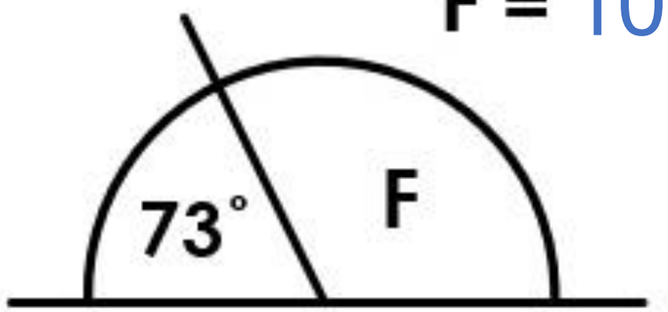


J =

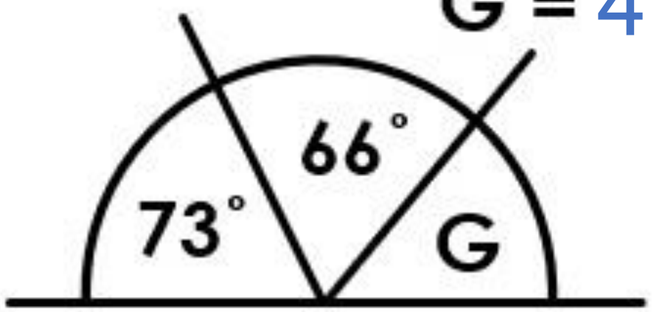


K =

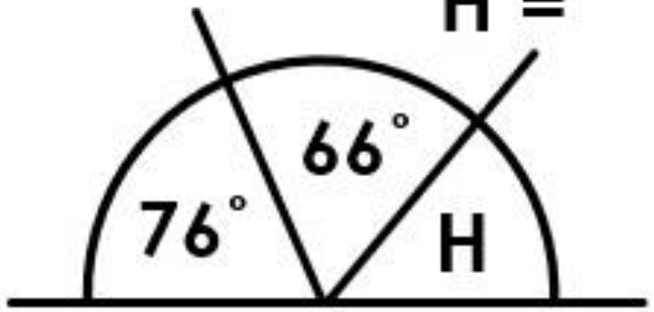
F = 107°

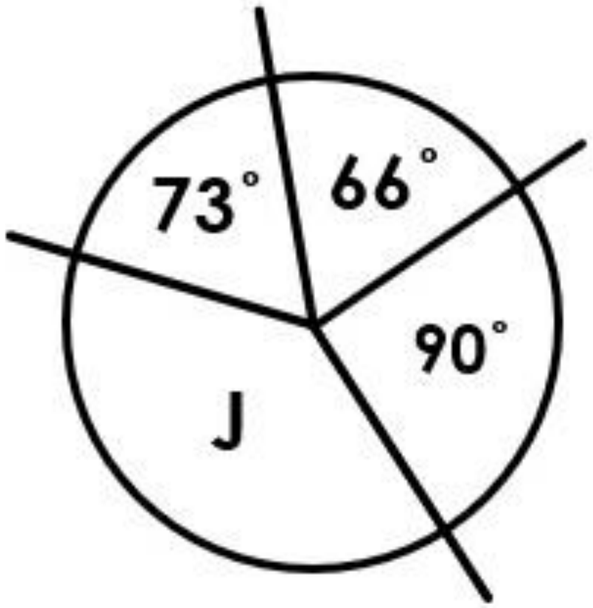


G = 41°

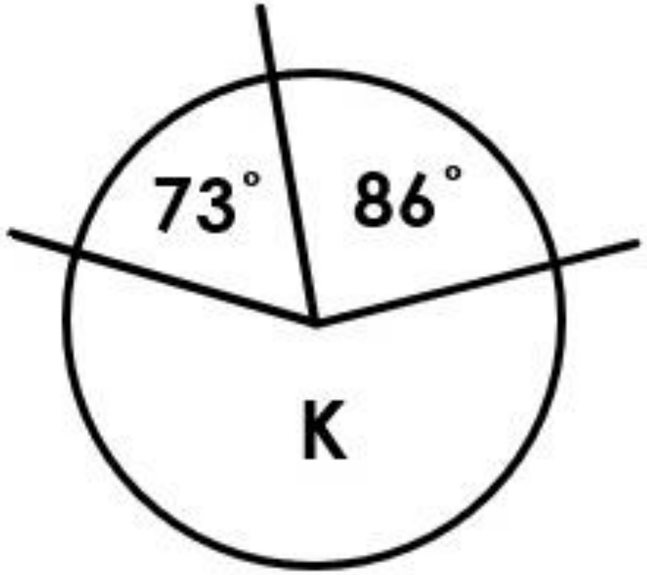


H =





J =



K =

$385 + 146$

$406 - 258$

18×3.5

385 + 146

400 + 131

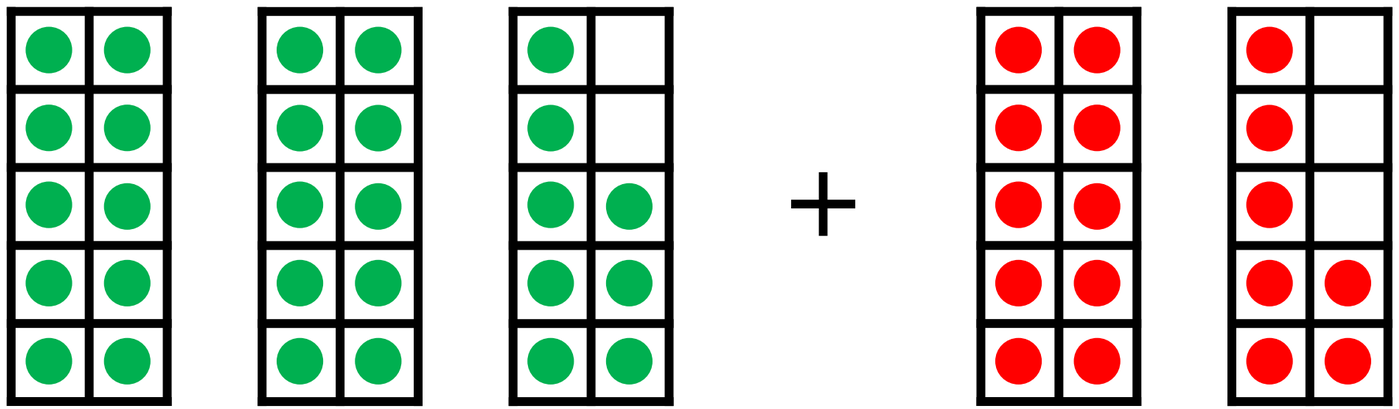
406 – 258

399 – 251

18 × 3.5

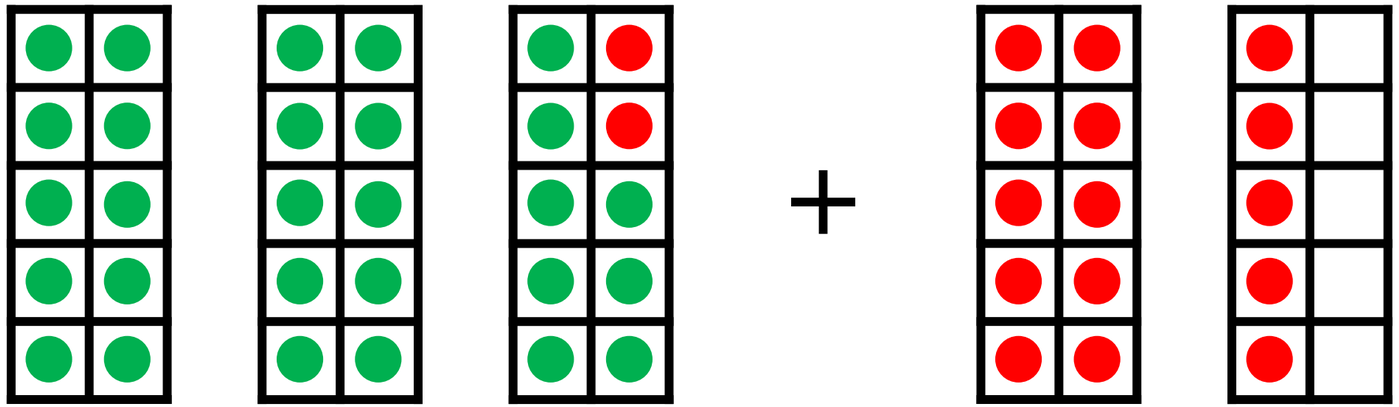
9 × 7

28 + 17



28 + 17

30 + 15



Simplify

494 + 238 = 500 + ☐

396 + 189 = 600 – ☐

785 + 145 = 800 + ☐

615 + 283 = 900 – ☐

Extend: *Create your own 'simplify' addition questions.*

Mental or Written Method?

4731 + 5268 =

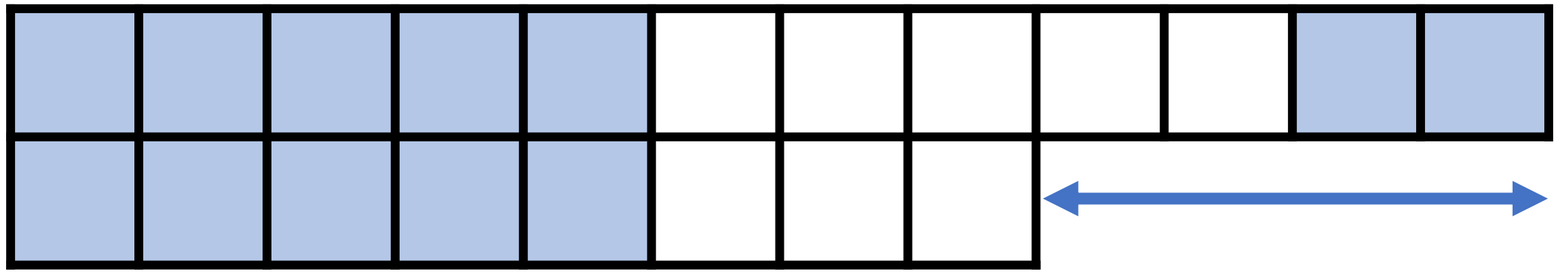
895 + 385 =

463 + 278 =

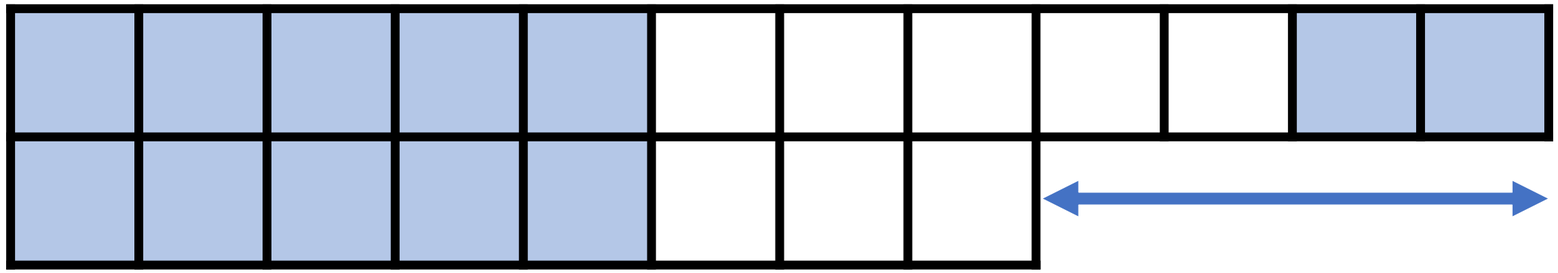
2480 + 2520 =

$$12 - 8 =$$

$12 - 8 = 4$

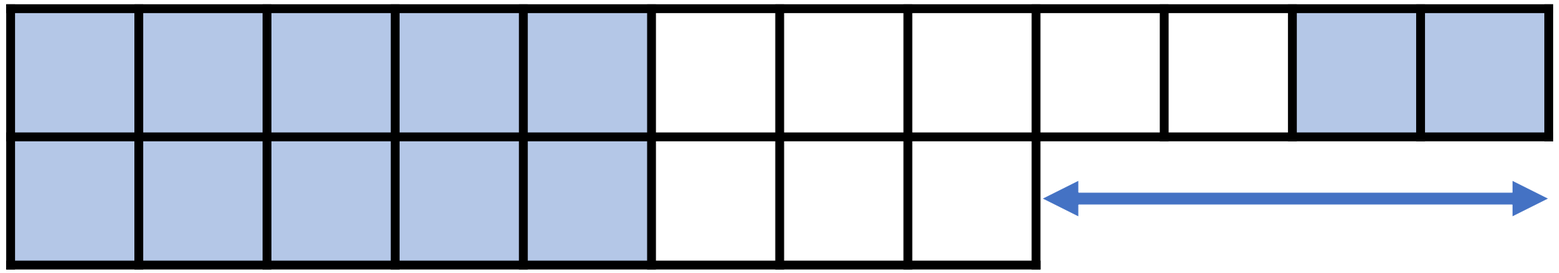


12 – 8 = 4

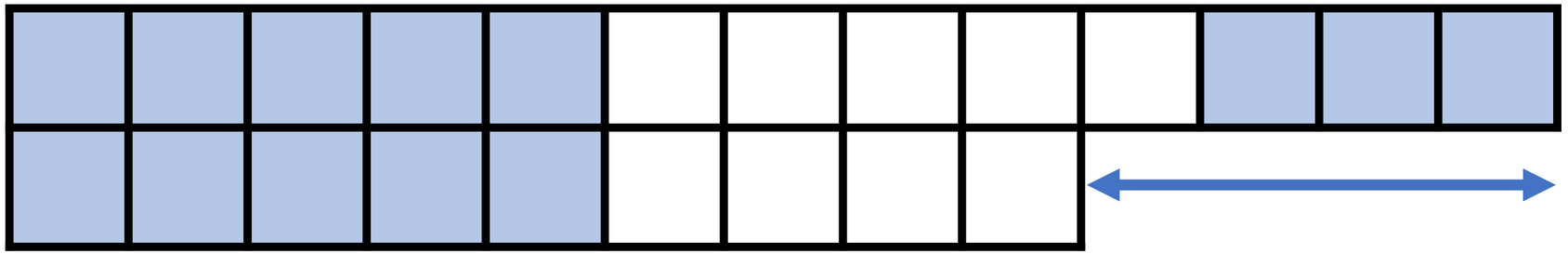


13 – 9 =

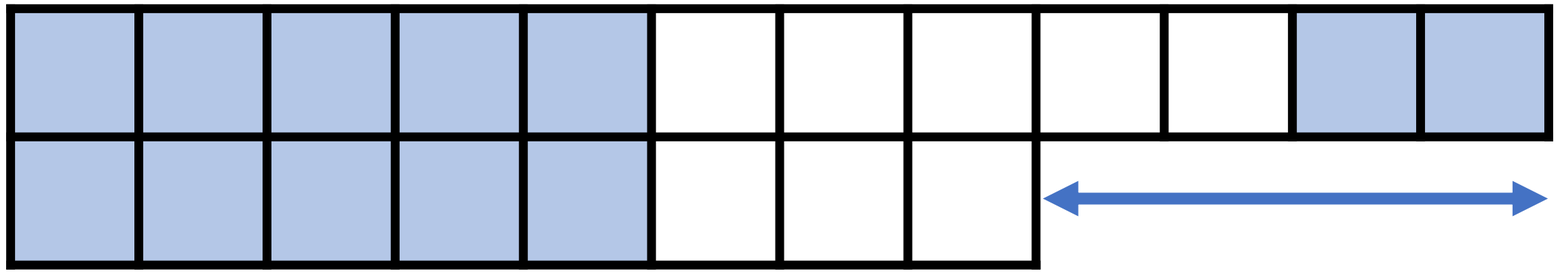
$12 - 8 = 4$



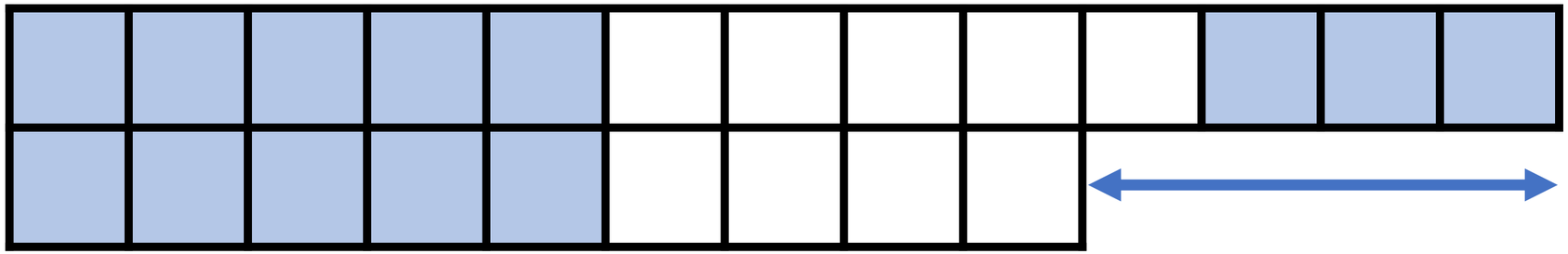
$13 - 9 = 4$



12 – 8 = 4

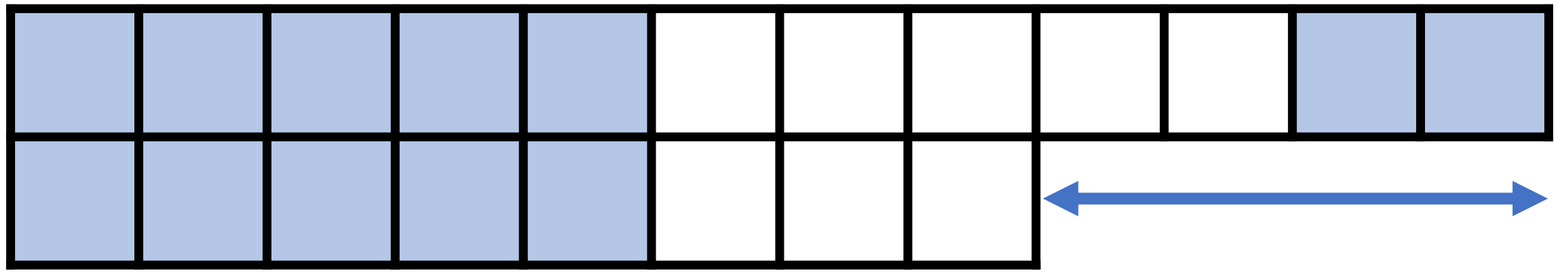


13 – 9 = 4

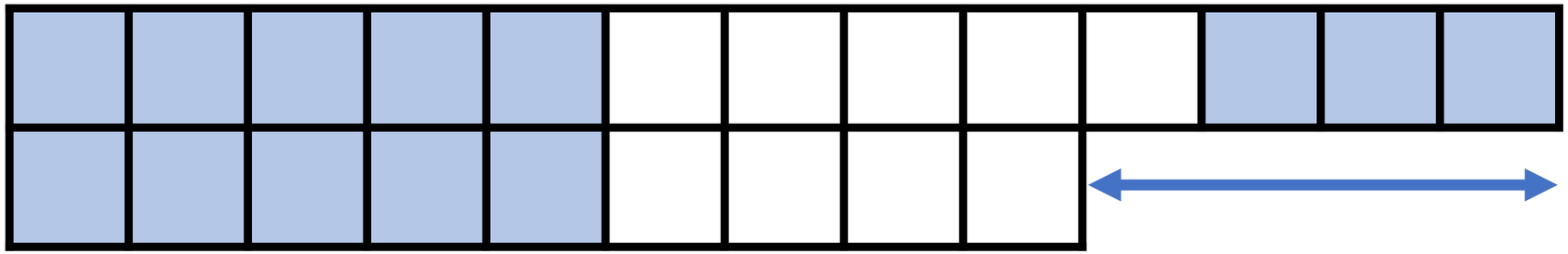


14 – 10 =

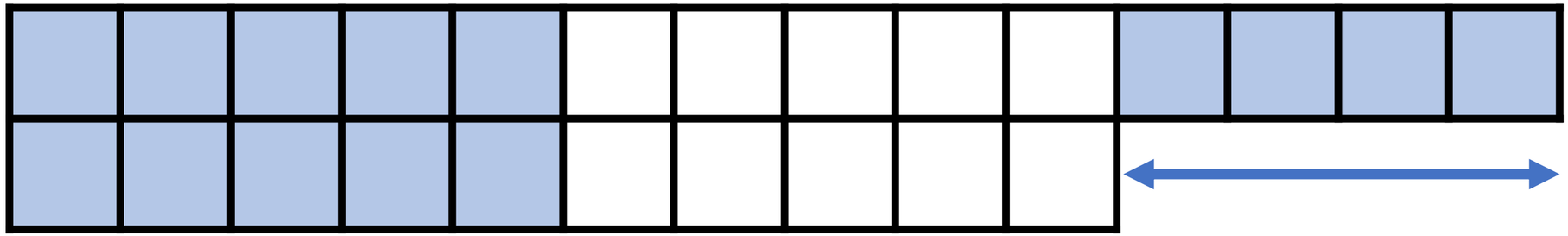
$12 - 8 = 4$



$13 - 9 = 4$



$14 - 10 = 4$



Broken Calculator

'The 7 and 5 keys on my calculator are broken!'

How can I use my calculator to work out:

750 + 850 =

505 – 367 =

866 – 597 =

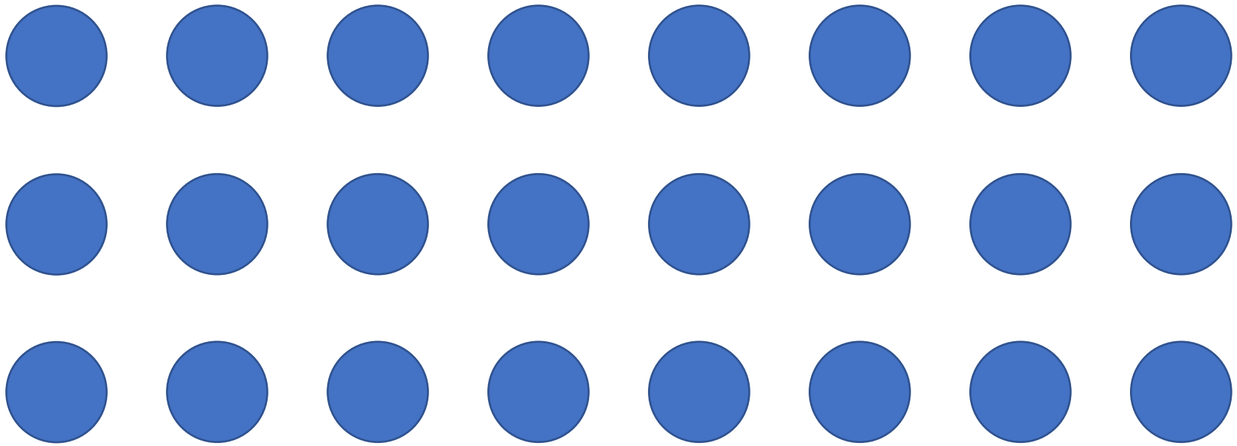
7.5 – 5.5 =

63.5 + 79.5 =

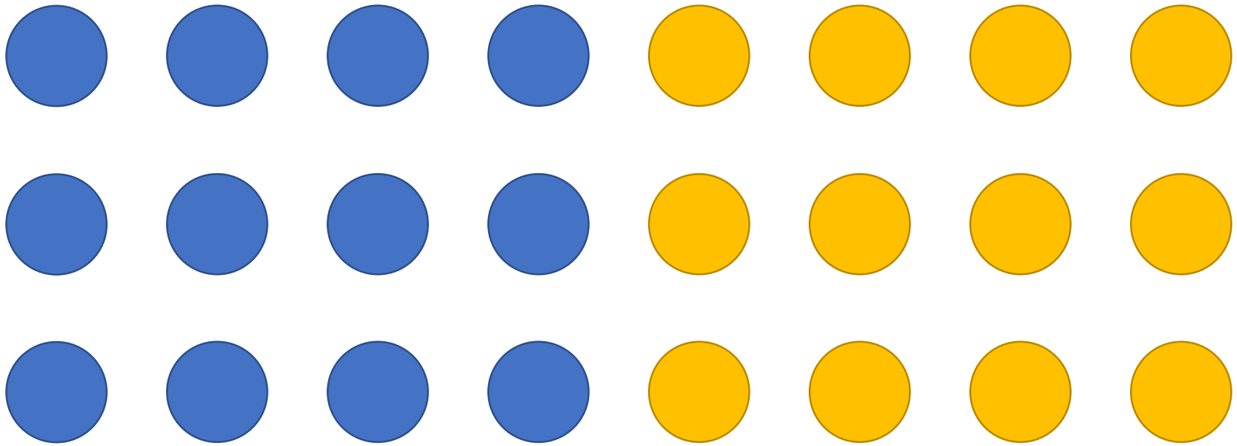
1.4 – 0.7 =

Extend: *design your own 'Broken Calculator' questions.*

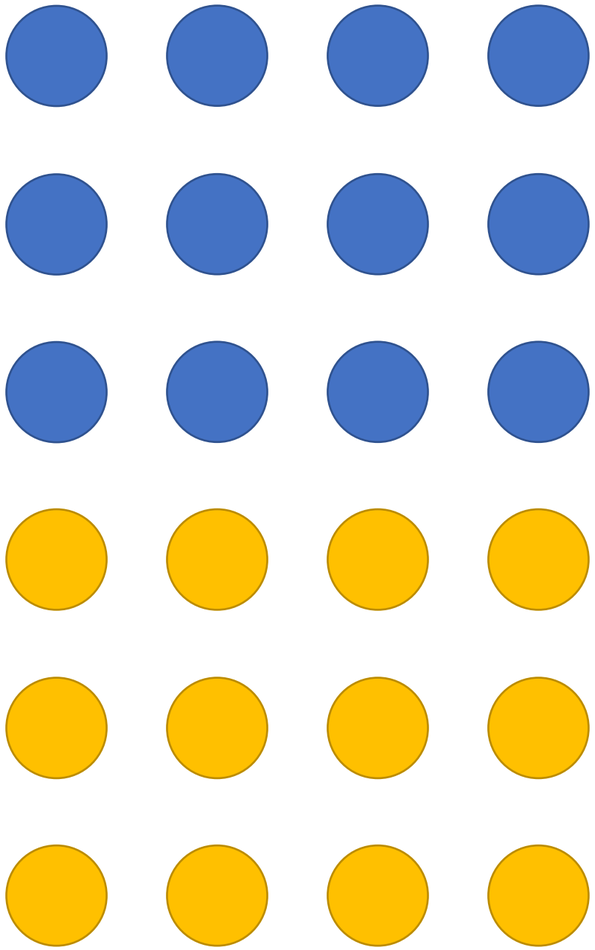
8 × 3



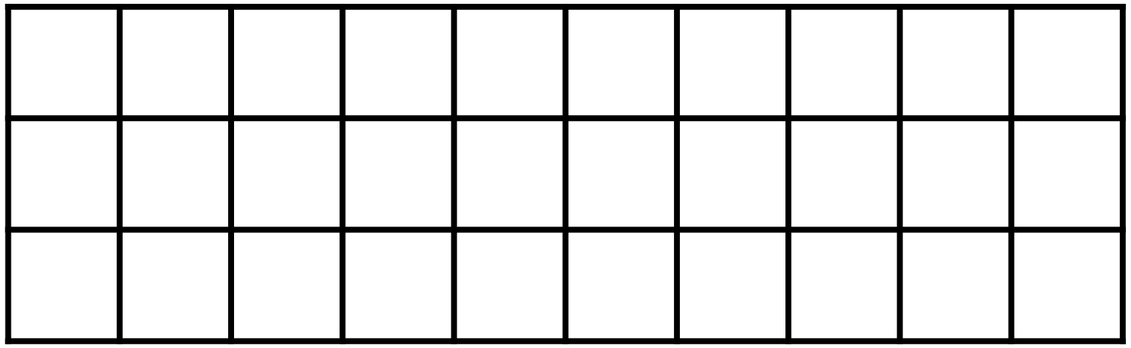
8 × 3



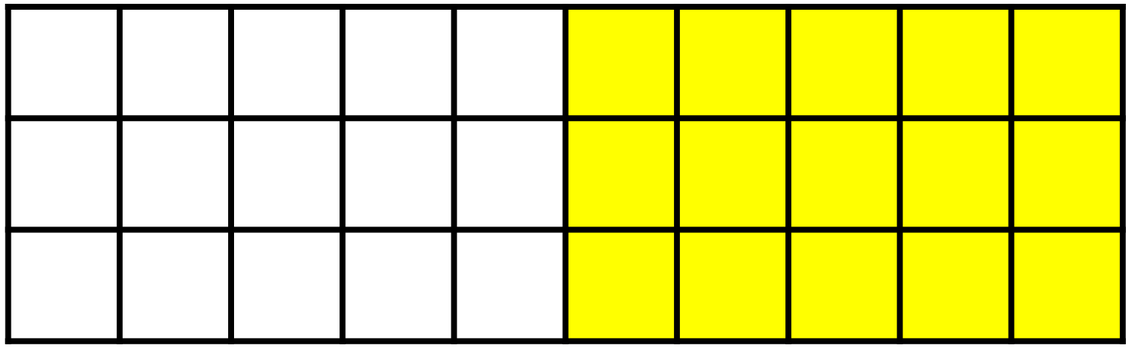
4 × 6



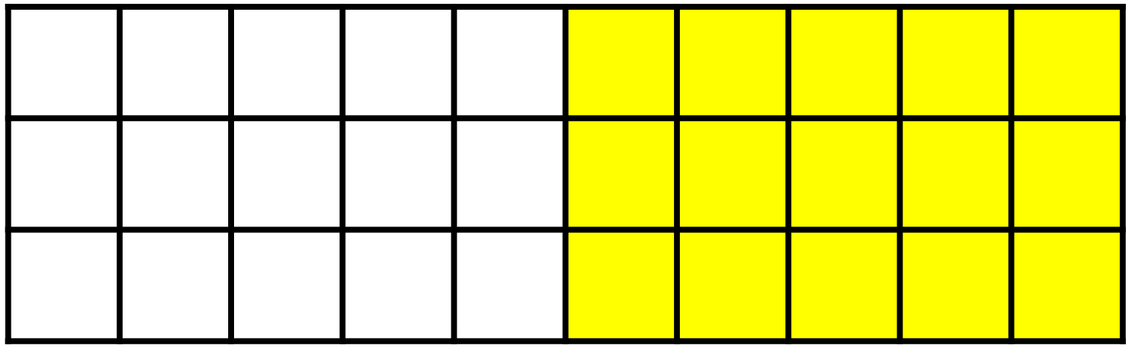
10 × 3

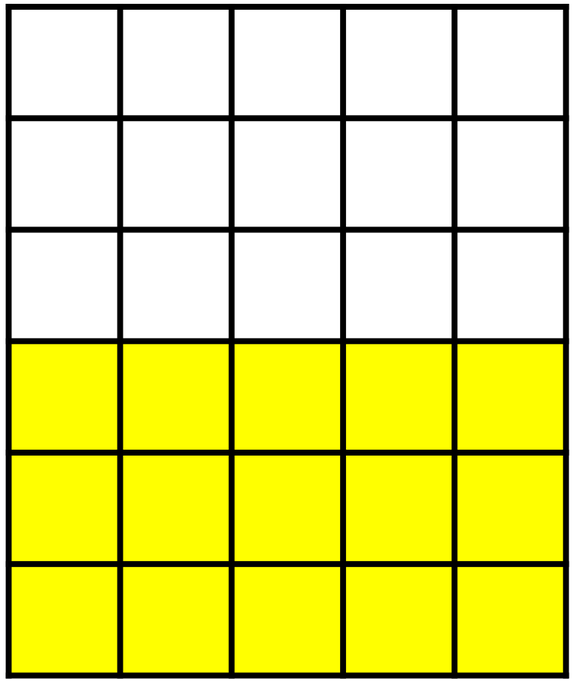


10 × 3

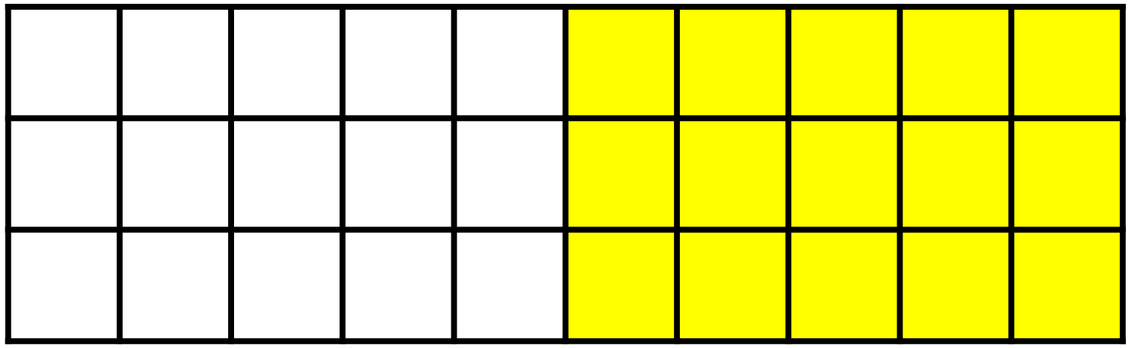


10 × 3

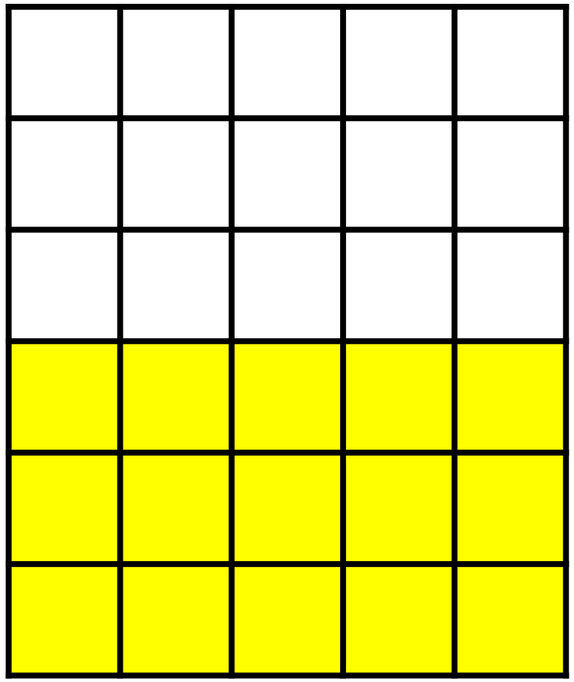




10×3



6×5



Different Methods

Double one number, halve the other number, the product is the same.

Example: $8 \times 12 = 96$ $16 \times 6 = 96$

Which of these questions are **made easier** by a **doubling and halving strategy?**

26×24 **14×25** **1.5×6**

80×60 **5×18**

Broken Calculator

'The 2 and 5 keys on my calculator are broken!'

How can I use my calculator to work out:

35 × 26

25 × 12

Contexts

In these questions, some of the numbers are hidden.

For each question, which operation is needed?

addition + *multiplication* × *division* ÷

(a) 10 friends spend a total of  at the café.

How much money does each person pay?

(b) Mike is 3 years old. Tom is  years old.

When Mike is 9 years old, what age will Tom be?

(c) Joy has  times as much money as Zara. Zara has £12.

How much money does Joy have?

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

Explore

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

Spot the Difference

Answer the questions:

(a) Ruth earns £15 each day delivering newspapers.
How much money does Ruth earn each week?

(b) Kate plays the piano for 15 minutes every day.
How long, in hours and minutes, does Kate spend playing the piano each week?

What's the same? What's different?

Different Question Types

1. Amy bought a sandwich, a pizza slice and a drink. She paid £5.
How much change does she get?

2. Tim has £5. He wants a sandwich, two pizza slices and a drink.
How much more money does Tim need?

3. Sam has £10.
How many pizza slices can he afford?

4. Grace spent £10 on 5 items.
She got £2.85 change. ***What did she buy?***

Sandwich: £2.75
Pizza Slice: £1.30
Fruit: 45p
Drink: 60p

Recap
Q & A

Breaking down calculation

Using sequences of questions

Word questions: exploring structures

Flexible thinking, deep application