

At home materials
Learner Pack
Year 6 Weeks 1-4

Pack 4: Multiplication strategies

- Session A) Adjusting a factor by 1
- Session B) Monthly payments
- Session C) Adjusting a factor by 10
- Session D) Exploring calculation strategies

Pack 11: Division strategies

- Session A) Division and multiplication
- Session B) Halving strategies
- Session C) Division structures
- Session D) Models of division

Pack 10: Multiplication methods

- Session A) Short multiplication
- Session B) Models of multiplication
- Session C) 2-digit by 2-digit multiplication
- Session D) Long multiplication

Pack 12: Division methods

- Session A) Using knowledge of multiples
- Session B) Written division method
- Session C) Written long division method
- Session D) Division strategies



Timing

Each session is 30 minutes

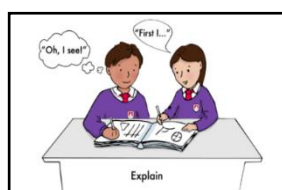
20 minute Talk Task and 10 minute independent activity

Session guidance

Get talking and grow your language.

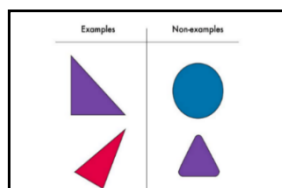
Use equipment, manipulatives, models and images to show and explain.

Challenge **yourself** to think mathematically. Use the Prompts for Thinking listed below to help build up habits in the way you think about mathematical situations.



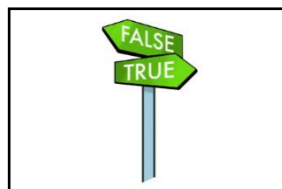
Reason it

Explain how you know. Focus on reasons rather than answers. What could you say, do, draw or write to help someone else understand?



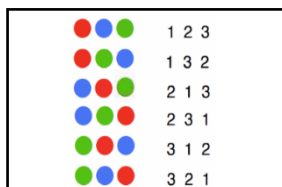
Generate examples and non-examples

What are the important features? What features are not important (e.g. colour)?



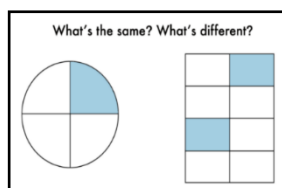
True or false?

If true, give examples to support your answer.
If false, give a counter example.



Find all possibilities

Have you found all the possible answers? How do you know? Did you work systematically?



What's the same? What's different?

Compare and contrast and look for connections.
How many different answers can you give?

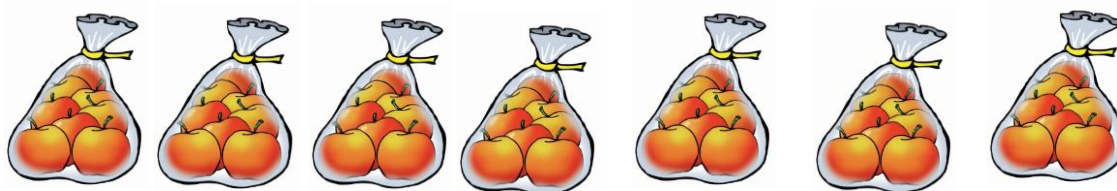


Always, sometimes or never true?

Give examples to show if the statement is always, sometimes or never true. How do you know?

Pack 4 Session A

Talk Task: Derived facts – adjusting a factor by 1



There are 8 apples in each bag.

$$8 \times 7 = 56$$

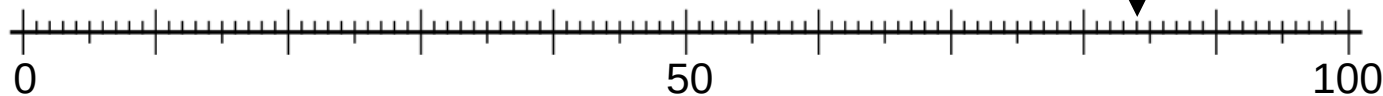
Take away a bag

Add a bag

Take one apple
out of every bag

Add one apple
to every bag

$$14 \times 6$$
$$84$$



$$14 \times 5$$

$$14 \times 7$$

$$13 \times 6$$

$$15 \times 6$$

14×5 is ____ less than 14×6

13×6 is ____ less than 14×6

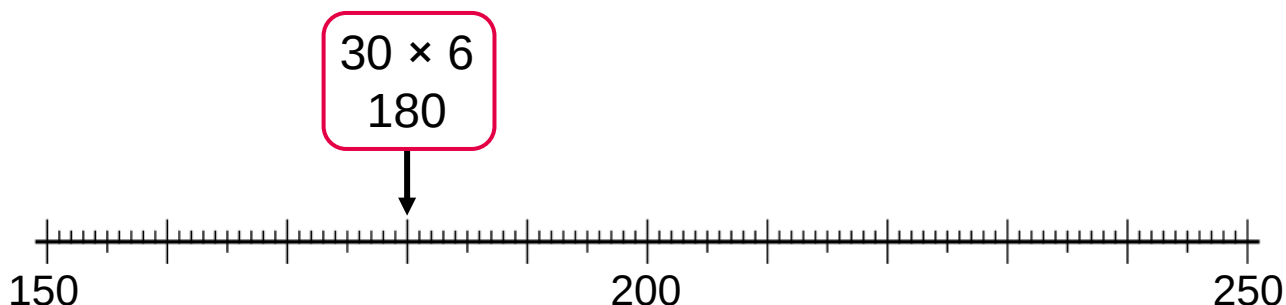
14×7 is ____ more than 14×6

15×6 is ____ more than 14×6

Pack 4 Session A

Activity: Derived facts – adjusting a factor by 1

- 1) Use the known fact to place the calculations onto the number line and complete the statements to describe the relationship.



31×6

29×6

30×7

30×5

29×6 is ____ less than 30×6

31×6 is ____ more than 30×6

30×5 is ____ less than 30×6

30×7 is ____ more than 30×6

- 2) Complete the calculations. What relationships do you notice..

$3 \times 5 + 3 = 3 \times \boxed{}$

$9 \times 2 = 20 - 2$

$4 \times 5 + 4 = 4 \times \boxed{}$

$9 \times 3 = \boxed{} - 3$

$5 \times 5 + 5 = 5 \times \boxed{}$

$9 \times 4 = 40 - \boxed{}$

$6 \times 5 + 6 = 6 \times \boxed{}$

$9 \times \boxed{} = 50 - 5$

$7 \times 5 + 7 = \boxed{}$

$9 \times 6 = \boxed{} - 6$

$9 \times 14 = 140 - \boxed{}$

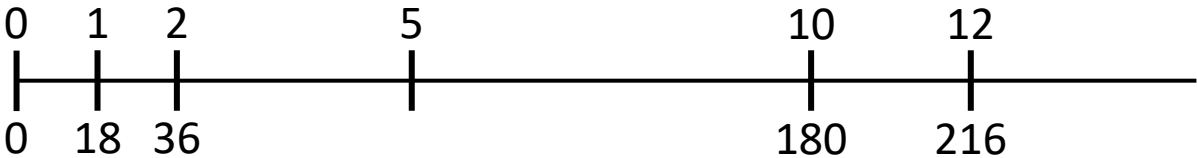
Pack 4 Session B

Talk Task: Monthly payments

My mobile phone costs £18 a month.

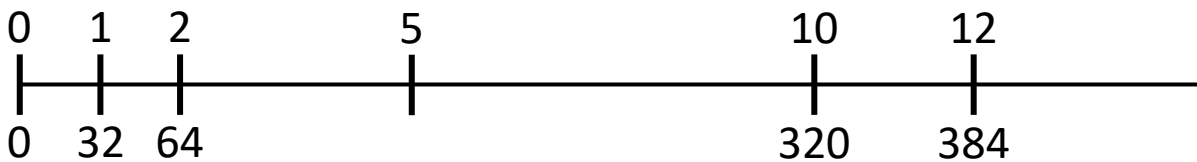


Month	1	2			5					10		12	
Cost	18	36								180			



I have a Saturday job and I earn £32.

Week	1	2			5					10		12	
Money	32	64								320			



Pack 4 Session B

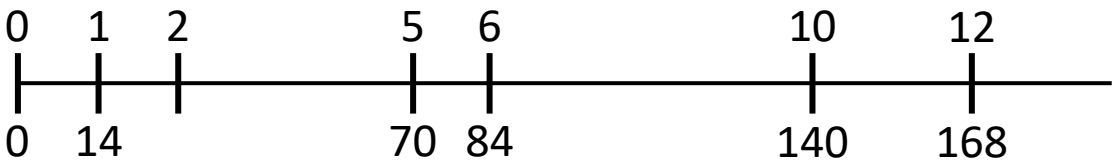
Activity: Monthly payments

For each situation, write as much information as you can about the cost across a year.

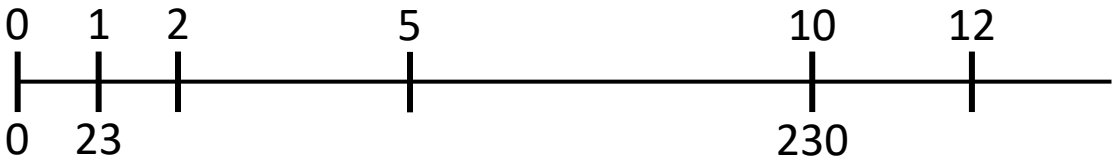
My contact lenses cost £14 each month.



Month	1	2			5					10		12
Cost	14									140		

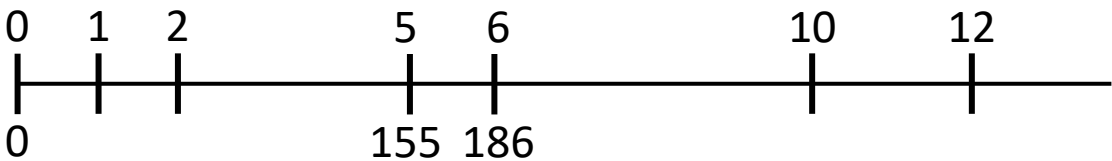


My mobile phone costs £23 each month.



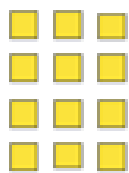
After 5 months I have paid £155

After 6 months I have paid £186

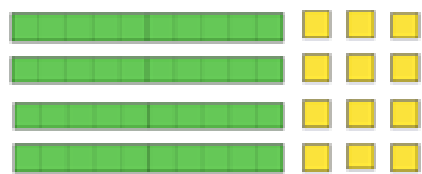


Pack 4 Session C

Talk Task: Derived facts – adjusting by a factor by 10

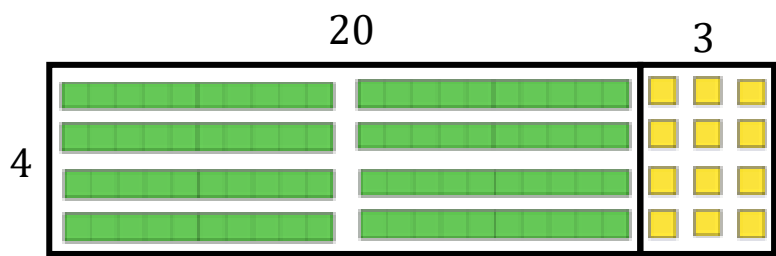


3×4



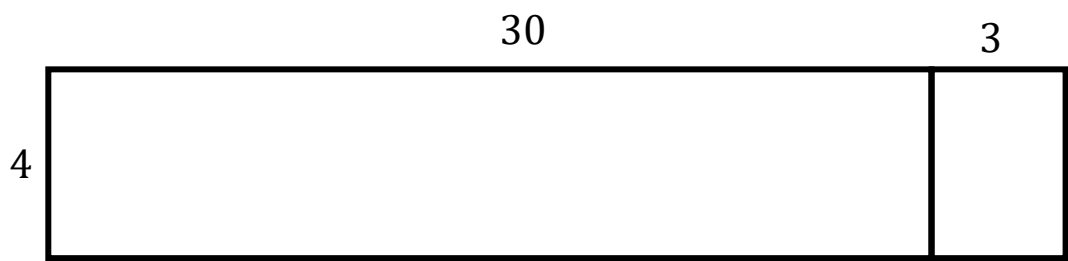
13×4

$10 \times 4 + 3 \times 4$



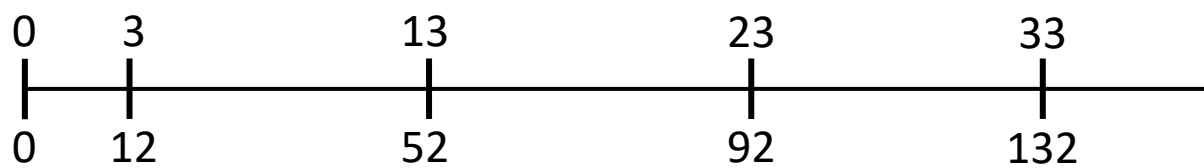
23×4

$20 \times 4 + 3 \times 4$



33×4

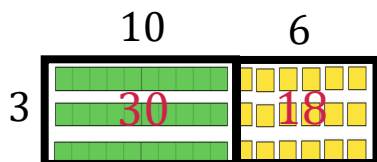
$30 \times 4 + 3 \times 4$



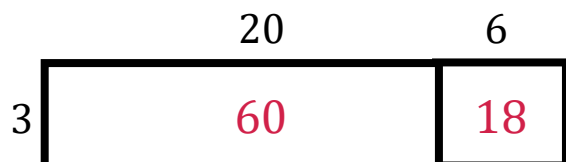
Pack 4 Session C

Activity: Derived facts – adjusting a factor by 10

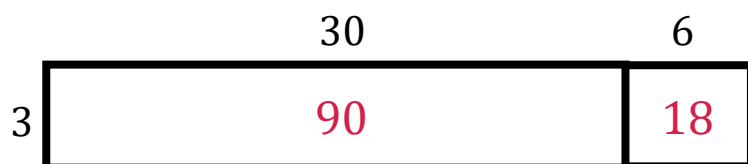
1) Label the area models and complete the calculations.



$$16 \times 3 = \boxed{} + 18 = \boxed{}$$



$$26 \times 3 = \boxed{} + 18 = \boxed{}$$



$$36 \times 3 = \boxed{} + 18 = \boxed{}$$

2) Draw models to represent multiplication calculations

Draw an array with Dienes to represent 24×3

Draw and label a rectangle to represent 29×4

3) Complete the statements.

14×5 is 50 more than $\boxed{} \times 5$

$\boxed{} \times 3$ is 30 less than 18×3

$16 \times \boxed{}$ is 40 more than 6×4

8×7 is 70 less than $\boxed{} \times 7$

Pack 4 Session D

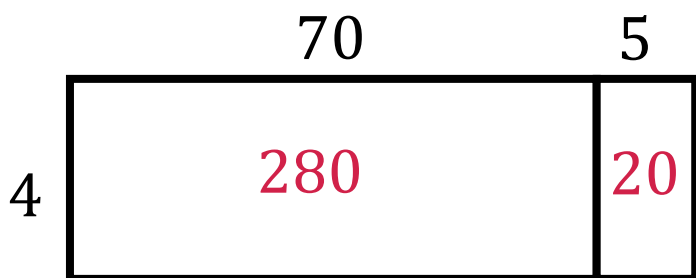
Talk Task: Exploring calculation strategies

$$75 \times 4 = 300$$

75	75	75	75
150		150	
300			

Double 75 is 150

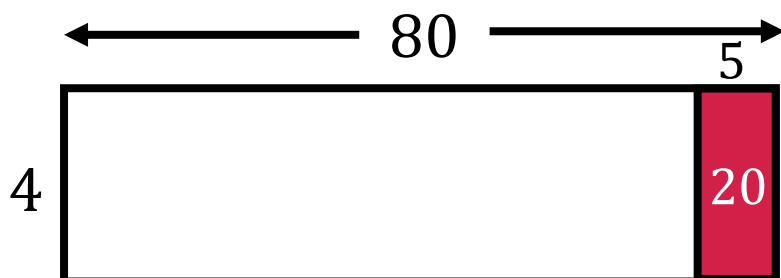
Double 150 is 300



$$(70 + 5) \times 4$$

$$70 \times 4 + 5 \times 4$$

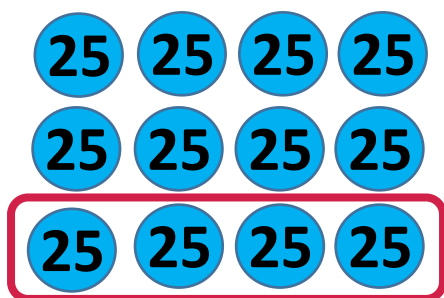
$$280 + 20$$



$$(80 - 5) \times 4$$

$$80 \times 4 - 5 \times 4$$

$$320 - 20$$



$$(3 \times 25) \times 4$$

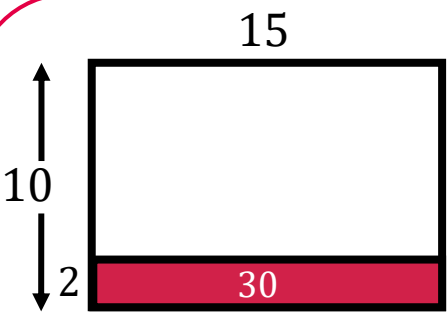
$$3 \times (25 \times 4)$$

$$3 \times 100$$

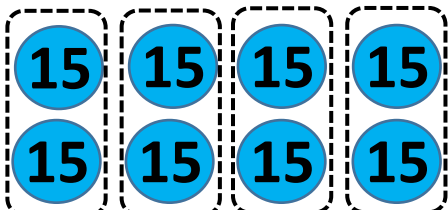
Pack 4 Session D

Activity: Exploring calculation strategies

1) Complete the calculations for two ways to calculate 15×8



An area model for 15×8 is shown. It consists of a large rectangle with a width of 15 and a height of 10. A smaller rectangle with a width of 15 and a height of 2 is attached to the bottom of the large rectangle, forming a total height of 12. The bottom rectangle is shaded red and labeled 30. The top rectangle is white. The total width is labeled 15, and the total height is labeled 10 and 2. Below the model, the calculation is given as:

$$15 \times 8 = 15 \times 10 - 15 \times \boxed{}$$
$$= \boxed{} - 30$$


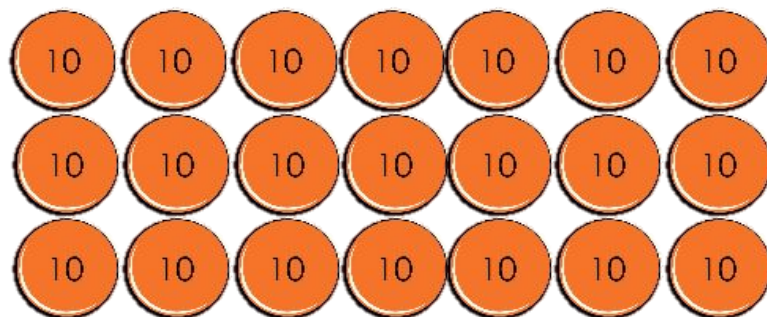
A model for 15×8 is shown using 8 circles, each containing the number 15. The circles are arranged in two rows of four. Each circle is enclosed in a dashed box. Below the model, the calculation is given as:

$$15 \times 8 = 15 \times 2 \times \boxed{}$$
$$= \boxed{} \times 4$$

2) Show with models and calculations three different ways to calculate 25×12

Pack 11 Session A

Talk Task: Division and multiplication



___ is a multiple of ___

___ is divisible by ___



How many numbers **divisible by seven** can you place on the line?

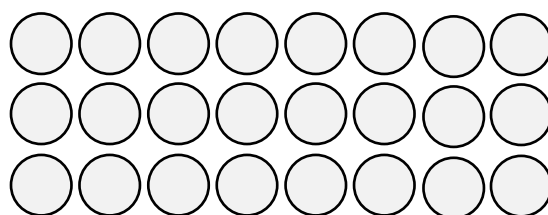
Pack 11 Session A

Activity: Division and multiplication

1) Copy and complete the calculations this array could represent as the value of each counter is changed.

a) Each counter has a value of 1

$$\begin{array}{l} 3 \times 8 = \square \\ \square \times 3 = 24 \\ 24 \div 8 = \square \\ \square \div 3 = 8 \end{array}$$



b) Each counter has a value of 10

$$\begin{array}{l} 30 \times 8 = \square \\ \square \times 30 = 240 \\ 240 \div 8 = \square \\ 240 \div \square = 8 \end{array}$$

$$\begin{array}{l} 3 \times 80 = \square \\ \square \times 3 = 240 \\ \square \div 3 = 80 \\ 240 \div \square = 3 \end{array}$$

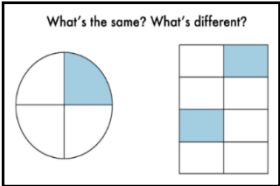
$$\begin{array}{l} 24 \times 10 = \square \\ \square \times 24 = 240 \\ \square \div 10 = 24 \\ 240 \div \square = 10 \end{array}$$

2) Use the fact that $4 \times 6 = 24$ to answer the following:

£240 is shared equally between 4 people. How much does each person get?	240 grams of sugar is split into bowls with 60 g in each. How many bowls of sugar are there?
Completing a level of a game gets you 60 points. You have 2400 points. How many levels have you completed?	I do 40 minutes of exercise every day. How many days until I have done 240 minutes?

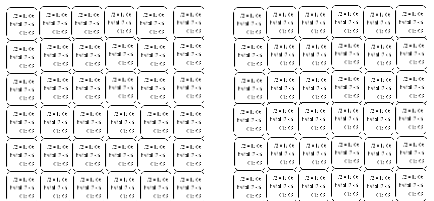
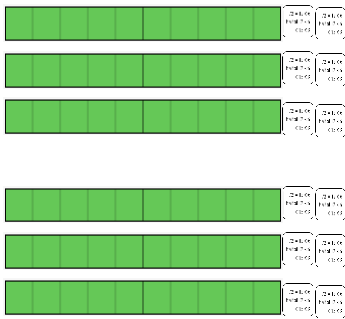
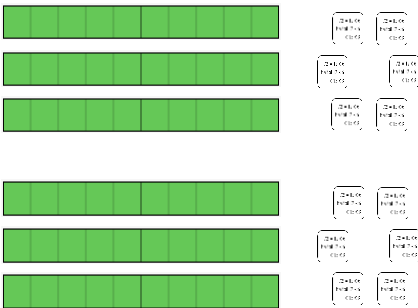
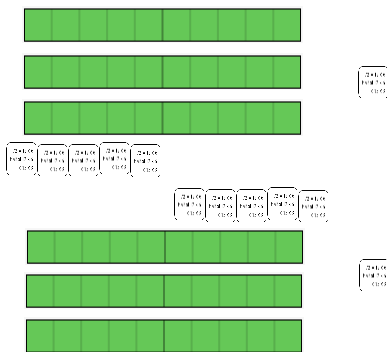
Pack 11 Session B

Talk Task: Halving strategies



Half of 72

$72 \div 2$



$72 = 12 \times 6$

Half of 12×6

is 12×3

$72 = 60 + 12$

Half of 60 is 30

Half of 12 is 6

$72 = 70 + 2$

Half of 70 is 35

Half of 2 is 1

$72 = 6 \times 12$

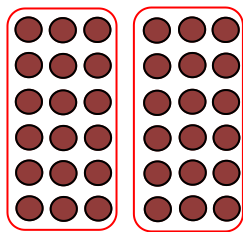
Half of 6×12

is 6×6

Pack 11 Session B

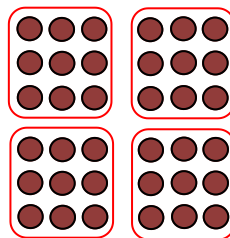
Activity: Halving strategies

- 1) The images show a halving strategy. Complete the boxes.



Two groups of

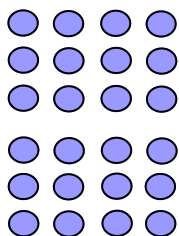
$$36 \div 2 = \text{$$



groups of 9

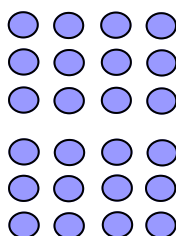
$$36 \div \text{$$

- 2) Complete the images to match the steps of the halving strategy.



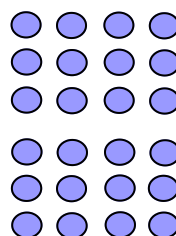
Half of 24 is 12

$$24 \div 2 = 12$$



Half of 12 is 6

$$24 \div 4 = 6$$



Half of 6 is 3

$$24 \div 8 = 3$$

- 3) Complete the strategy and show it works with another calculation.



To divide a number by 6, I
can halve and then divide by 3

Half of 48 is

24 divide by 3 is

$$48 \div \text{$$

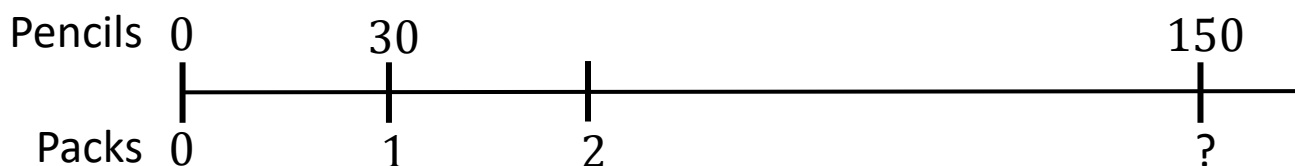
Pack 11 Session C

Talk Task: Division structures

$$150 \div 30$$



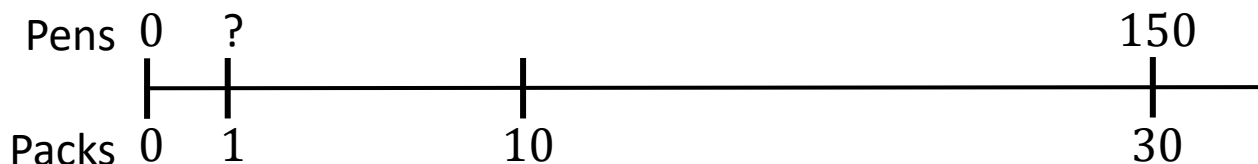
There are 30 pencils in each pack.
How many packs is 150 pencils?



___ groups of 30
is equal to 150



I have 30 packs of pens.
I have 150 pens.
How many pens in 1 pack?

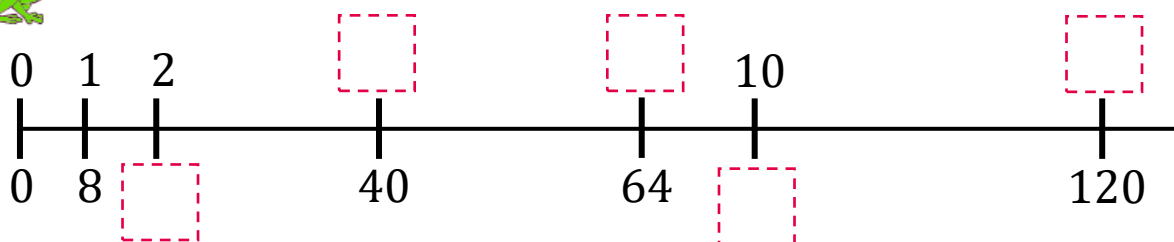


30 groups of ___
is equal to 150

Pack 11 Session C

Activity: Division structures

1) A frog travels 8 cm for each jump.



- How far has it travelled after 2 jumps? cm
- How many jumps does it take to travel 40 cm?
- How many jumps does it take to travel 64 cm?
- How far has it travelled after 10 jumps? cm
- How many jumps does it take to travel 120 cm?

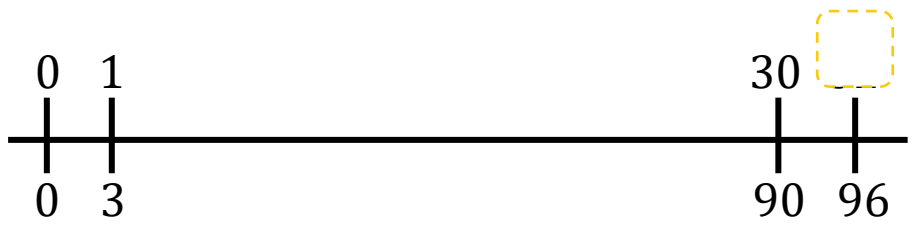
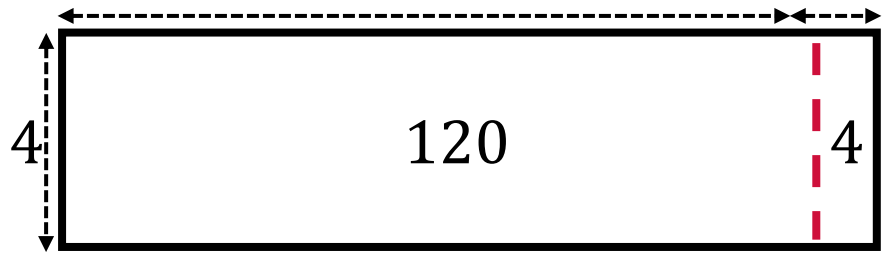
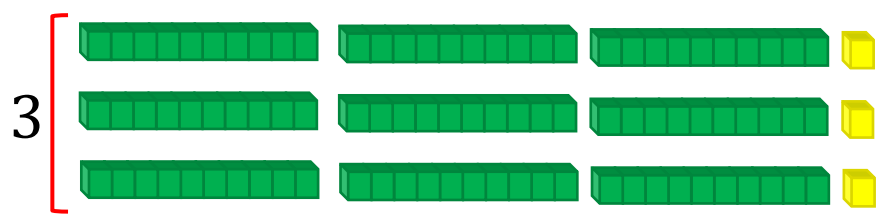
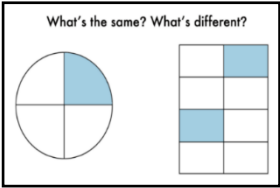
2) This frog has jumped 15 equal jumps and travelled 75 cm.



- How far how it travelled after 5 jumps? cm
- How far has it travelled after 10 jumps? cm
- How big is each jump? cm
- How far has it travelled after 3 jumps? cm

Pack 11 Session D

Talk Task: Models of division



$93 \div 3 = 31$

$96 \div 3 = 32$

$124 \div 4 = 31$

Pack 11 Session D

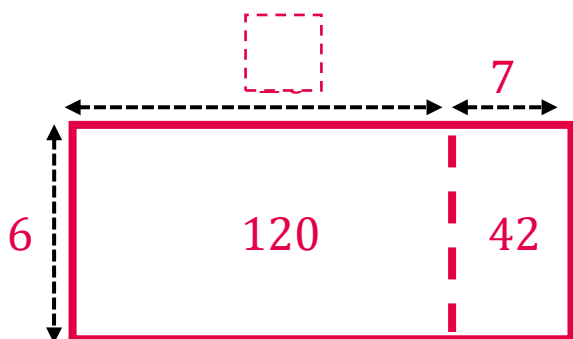
Activity: Models of division

1) Label the models and complete the calculations.



$$92 \div 4 = \square$$

$$\square \times 4 = 92$$



$$162 \div 6 = \square$$

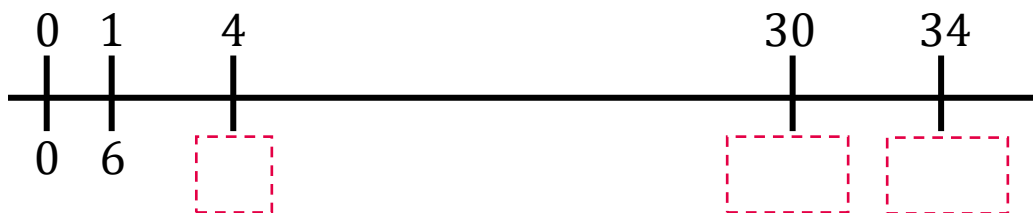
$$\square \times 4 = 162$$

2) Complete the calculations and label the number line.

a) $4 \times 6 = \square$ $\square \div 6 = 4$

b) $30 \times 6 = \square$ $\square \div 6 = 30$

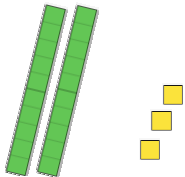
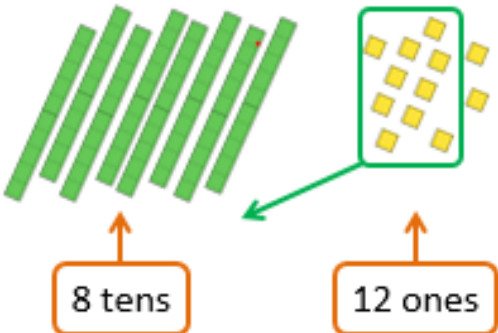
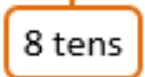
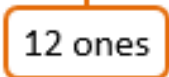
c) $34 \times 6 = \square$ $\square \div 6 = 34$

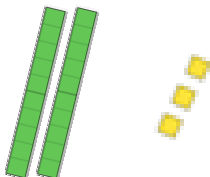


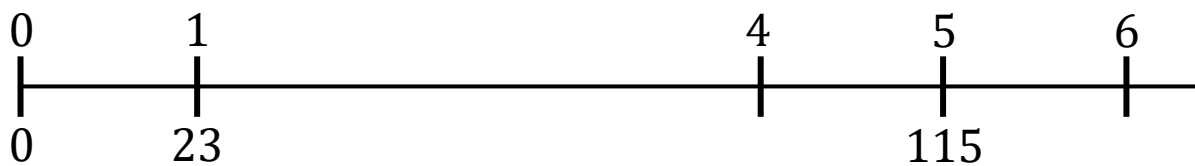
3) Draw a model to represent $72 \div 3 = 23$

Pack 10 Session A

Talk Task: Short multiplication

 $\begin{array}{r} \times \quad 4 \\ \hline \end{array}$   	$\begin{array}{r} 23 \\ \times \quad 4 \\ \hline \\ \hline \end{array}$
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 $\begin{array}{r} \times \quad 5 \\ \hline \end{array}$	$\begin{array}{r} 23 \\ \times \quad 5 \\ \hline 115 \\ \hline \end{array}$
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Pack 10 Session A

Activity: Short multiplication



1) What has gone wrong? Write the correct calculation under each error.

$$\begin{array}{r} 26 \\ \times 3 \\ \hline 618 \end{array}$$

$$\begin{array}{r} 45 \\ \times 4 \\ \hline 49 \end{array}$$

$$\begin{array}{r} 36 \\ \times 7 \\ \hline 212 \\ 4 \end{array}$$

2) Using the digits 3, 4 and 5, what products can you make?

$$\begin{array}{r} \square\square \\ \times \square \\ \hline \end{array}$$

$$\begin{array}{r} \square\square \\ \times \square \\ \hline \end{array}$$

$$\begin{array}{r} \square\square \\ \times \square \\ \hline \end{array}$$

$$\begin{array}{r} \square\square \\ \times \square \\ \hline \end{array}$$

$$\begin{array}{r} \square\square \\ \times \square \\ \hline \end{array}$$

$$\begin{array}{r} \square\square \\ \times \square \\ \hline \end{array}$$

● ● ●	1 2 3
● ● ●	1 3 2
● ● ●	2 1 3
● ● ●	2 3 1
● ● ●	3 1 2
● ● ●	3 2 1

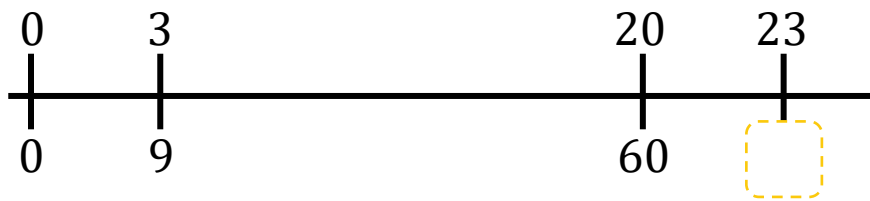
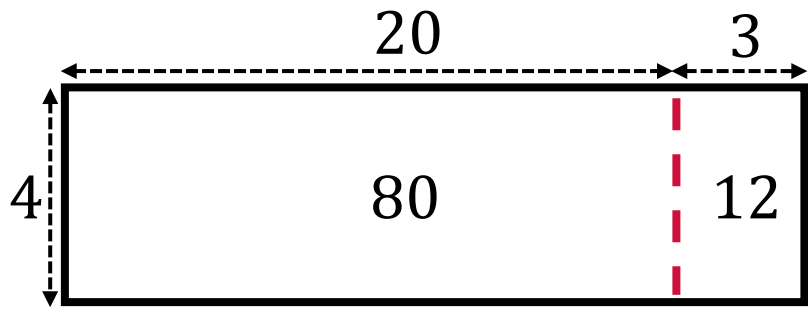
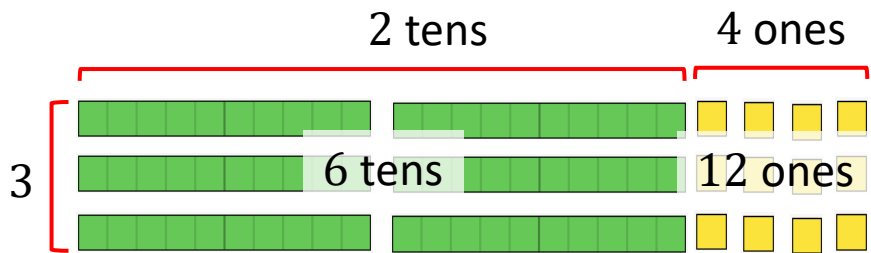
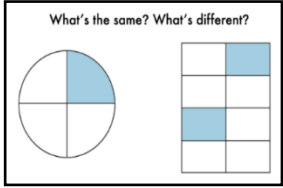
Find all 6 possibilities.

What do you notice about the products?

Why are there four multiples of 5?

Pack 10 Session B

Talk Task: Models of multiplication



$$\begin{array}{r} 23 \\ \times 4 \\ \hline 92 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 23 \\ \times 3 \\ \hline 69 \end{array}$$

$$\begin{array}{r} 24 \\ \times 3 \\ \hline 72 \\ \hline 1 \end{array}$$

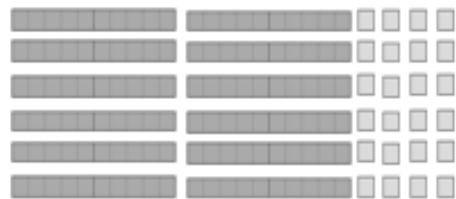
Pack 10 Session B

Activity: Models of multiplication

1) Complete each calculation and label or draw a diagram.

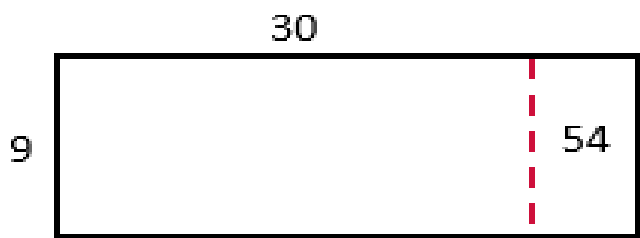
a)

$$\begin{array}{r} 24 \\ \times 6 \\ \hline \\ \hline \end{array}$$



b)

$$\begin{array}{r} 3 \\ \times 9 \\ \hline 4 \\ \hline 5 \end{array}$$



c)

$$\begin{array}{r} 47 \\ \times 4 \\ \hline \\ \hline \end{array}$$

2) Using the digits 4, 5 and 6, what products can you make?

$$\begin{array}{r} \\ \times \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \\ \times \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \\ \times \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \\ \times \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \\ \times \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \\ \times \\ \hline \\ \hline \end{array}$$

●	●	●	1 2 3
●	●	●	1 3 2
●	●	●	2 1 3
●	●	●	2 3 1
●	●	●	3 1 2
●	●	●	3 2 1

Where is the largest digit for the largest product?

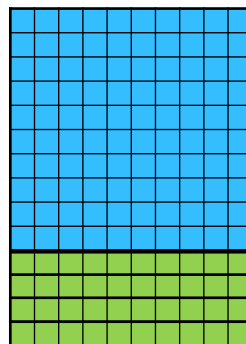
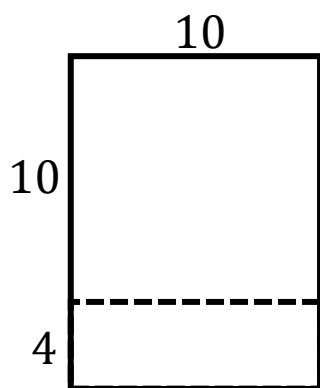
Where is the smallest digit for the smallest product?

Explore how to find the largest and smallest product with other digits.

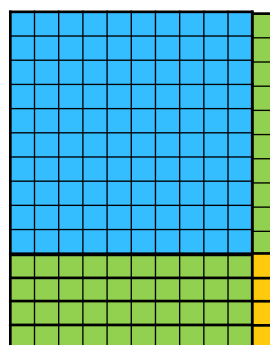
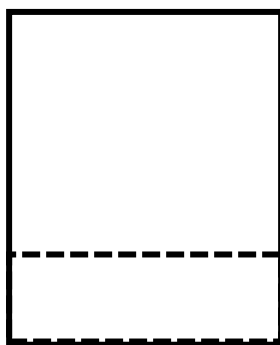
Pack 10 Session C

Talk Task: 2-digit by 2-digit multiplication

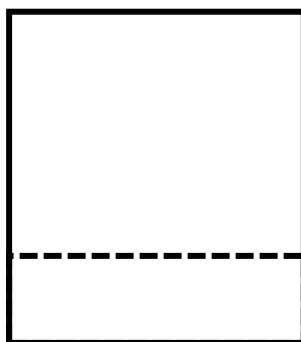
= 14×10



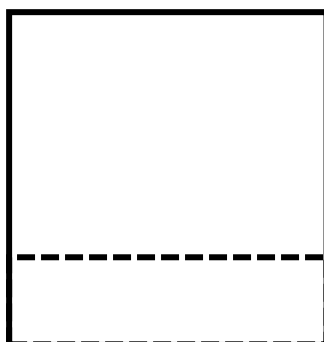
= 14×11



= 14×12



= 14×13

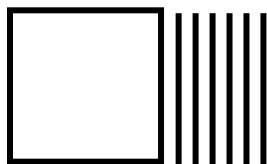


Pack 10 Session C

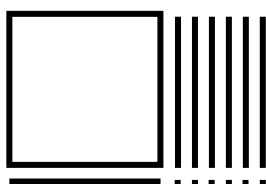
Activity: 2-digit by 2-digit multiplication

1) Complete the drawings and the calculations

$$\boxed{} \times 10 = 160$$



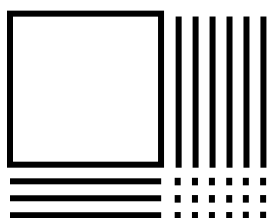
$$16 \times \boxed{} = 176$$



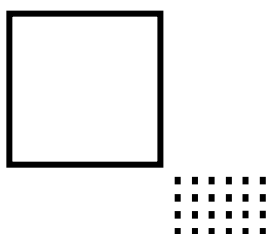
$$16 \times 12 = 192$$



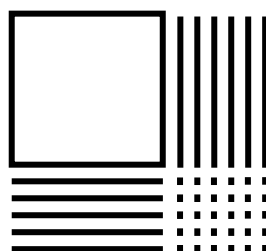
$$16 \times \boxed{} = 208$$



$$16 \times 14 = 224$$



$$16 \times 15 = \boxed{}$$



2) Complete the calculations

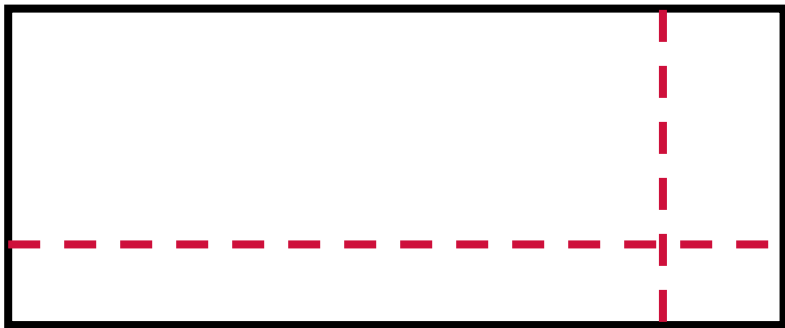
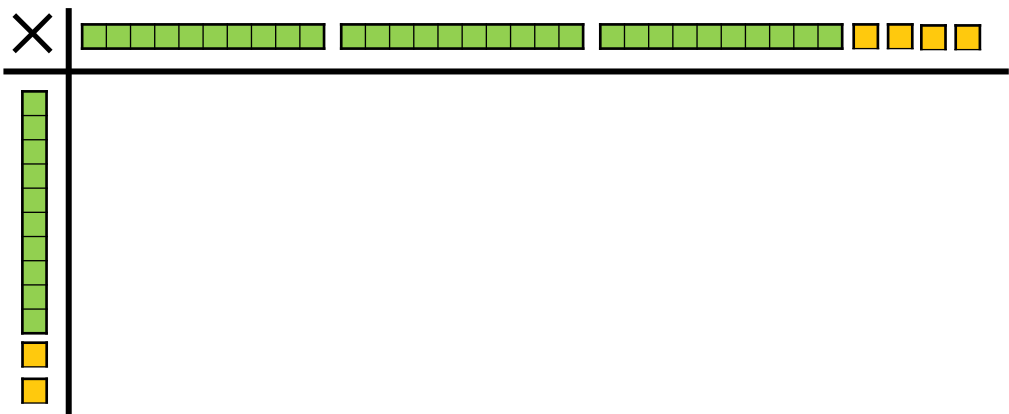
a) $24 \times 2 = \boxed{}$
 $24 \times 3 = \boxed{}$
 $24 \times 30 = \boxed{}$
 $24 \times 32 = \boxed{}$

b) $45 = 15 \times \boxed{}$
 $60 = 15 \times \boxed{}$
 $600 = 15 \times \boxed{}$
 $\boxed{} = 15 \times 43$

c) Choose one set of calculations and draw a diagram:

Pack 10 Session D

Talk Task: Long multiplication



$$\begin{array}{r} 34 \\ \times 12 \\ \hline 68 \\ 340 \\ \hline \end{array}$$

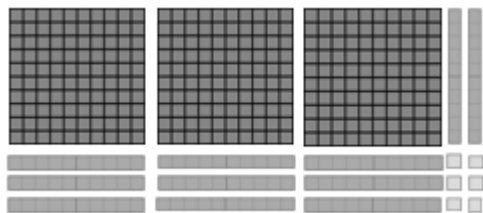
$$\begin{array}{r} 34 \\ \times 13 \\ \hline 340 \\ \hline \end{array}$$

$$\begin{array}{r} 34 \\ \times 22 \\ \hline 68 \\ \hline \end{array}$$

Pack 10 Session D

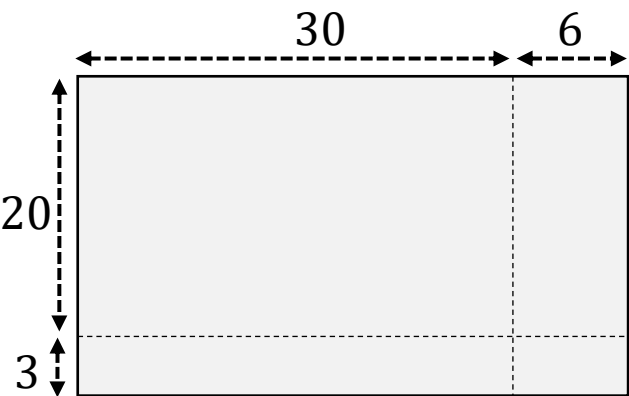
Activity: Long multiplication

1) Label the model and complete the calculation



	3	2
×	1	3

2) Label the model and complete the calculation



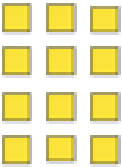
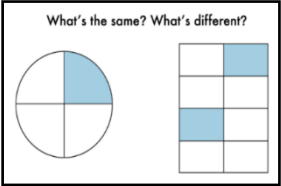
	3	6
×	2	3
		8
	2	0

3) Draw a model and complete the calculation

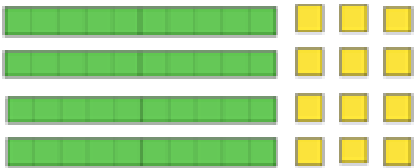
	3	6
×	2	9

Pack 12 Session A

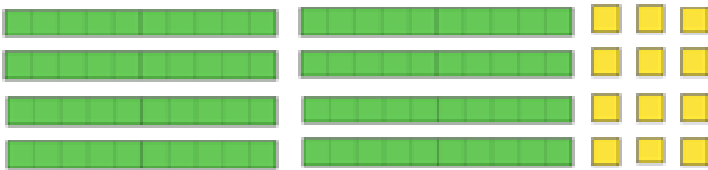
Talk Task: Using knowledge of multiples



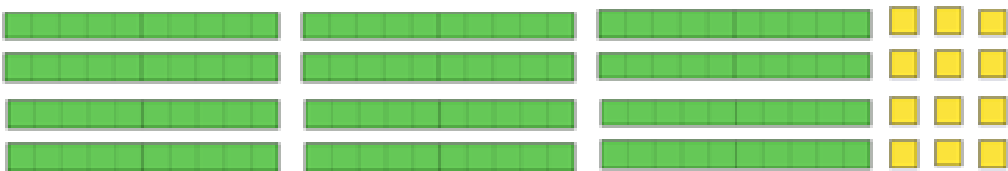
$$12 \div 4 = 3$$



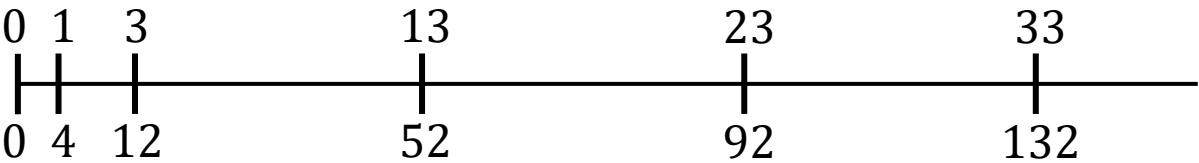
$$(40 + 12) \div 4 = 10 + 3$$



$$(80 + 12) \div 4 = 20 + 3$$



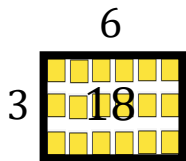
$$(120 + 12) \div 4 = 30 + 3$$



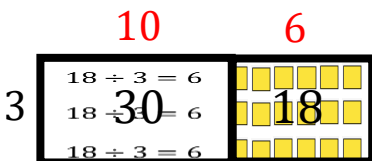
Pack 12 Session A

Activity: Using knowledge of multiples

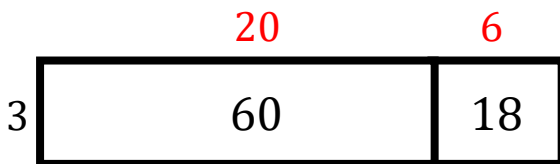
1) Label the area models and complete the calculations.



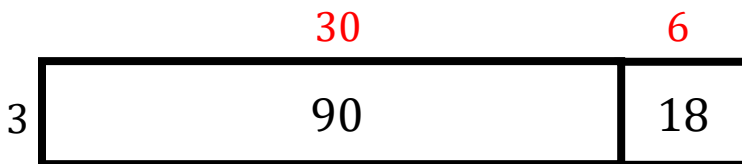
$$18 \div 3 = 6$$



$$48 \div 3 = \boxed{} + 6 = \boxed{}$$



$$78 \div 3 = \boxed{} + 6 = \boxed{}$$



$$108 \div 3 = \boxed{} + 6 = \boxed{}$$

3) Draw models to represent these calculations.

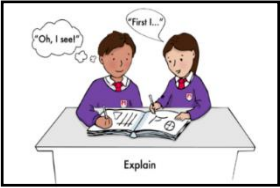
$$24 \div 3 = 8$$

$$54 \div 3 = 18$$

$$84 \div 3 = 28$$

Pack 12 Session B

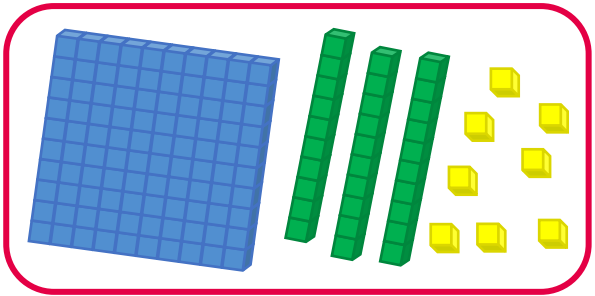
Talk Task: Written division method



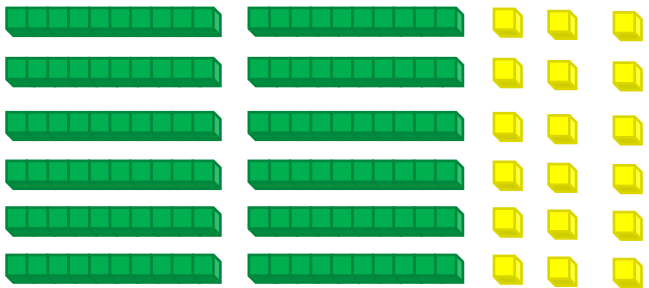
$$138 \div 6$$

Split 138 into 6 equal groups.

Split 138 into groups of 6.



$$\begin{array}{r} 6 \overline{) 138} \end{array}$$



Pack 12 Session B

Activity: Written division method

A lottery winning of £216 is shared equally between 8 people. $\begin{array}{r} 8 \overline{) 216} \end{array}$ Each person gets £	216 eggs are packed in boxes of 6. There are boxes.
Your journey was 108 miles. It was three times longer than my journey. My journey was miles.	A charity event sold four times as many adult tickets than child tickets. They sold 432 adult tickets. They sold child tickets.
A new bike costs £327. It is three times as much money as a new pair of trainers. The trainers cost £	In the canteen they serve 1 egg with 2 slices of toast. They have used 108 slices of bread. They have used eggs.



$$448 \div 14$$

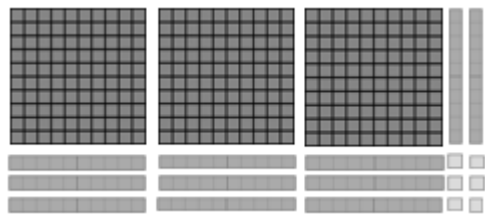


$$\begin{array}{r}
 32 \\
 14 \overline{) 448} \\
 \underline{- 42} \downarrow \\
 28 \\
 \underline{- 28} \\
 0
 \end{array}$$

Pack 12 Session C

Activity: Written long division method

- 1) Label the array that can be used to represent and complete the written division method.
- 416 ÷ 13



$$13 \overline{) 416}$$

- 2) The long division algorithm has been used to calculate:

3542 ÷ 14

Which multiple of 14 goes in each space?

Multiples of 14:

14	28	42
56	70	84
98	112	126

253

14 $\overline{) 3542}$

-

74

-

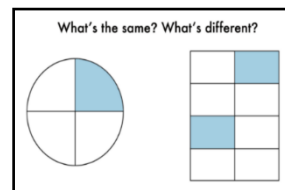
42

-

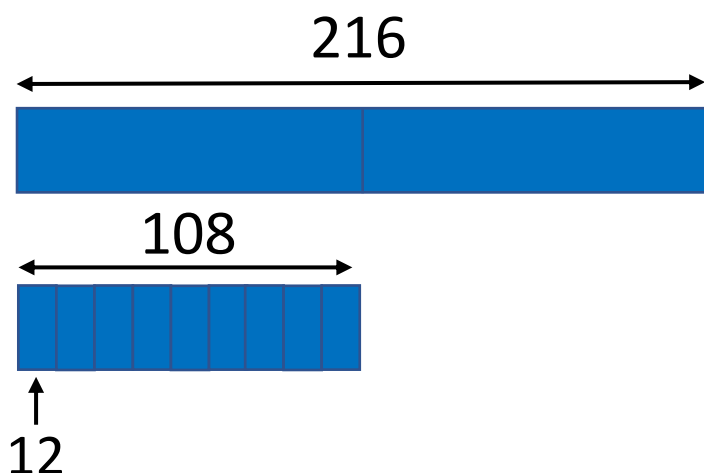
0

Pack 12 Session D

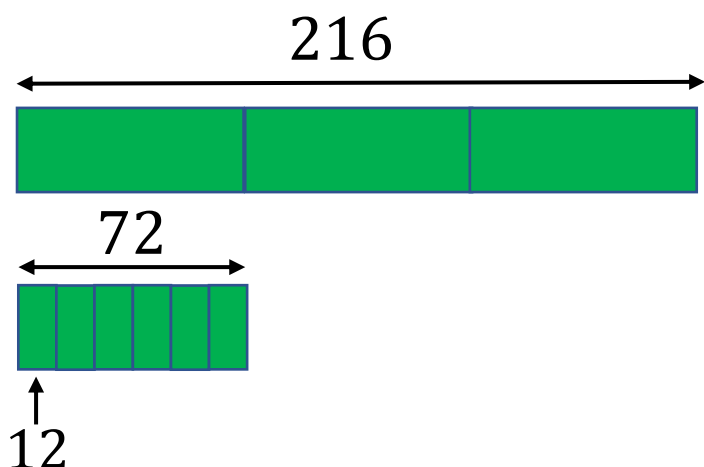
Talk Task: Division strategies



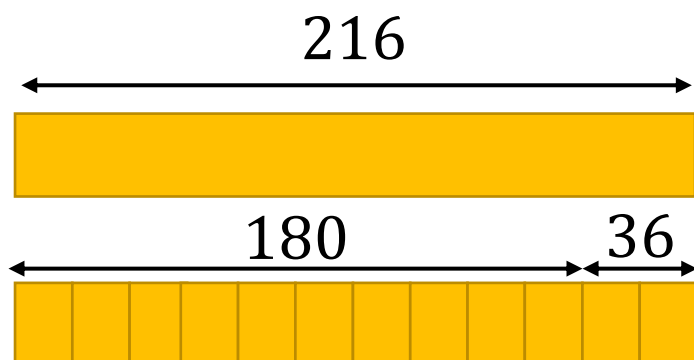
$$216 \div 18$$



I calculated
 $108 \div 9$



I know $18 = 3 \times 9$
so I divided by 3
and then by 9



12 equal parts

I partitioned 216
into multiple of 18
 $180 + 36$



Pack 12 Session D

Activity: Division strategies

I know $7 \times 40 = 280$

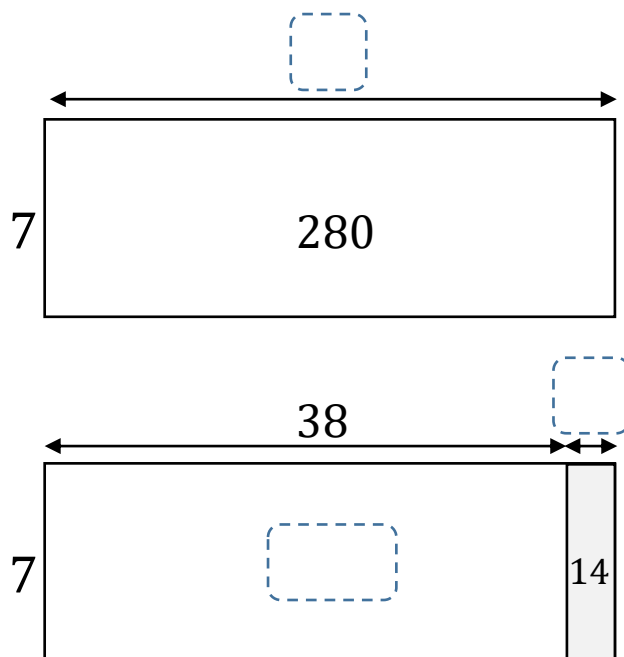
266 is 14 less

$$\dots$$
$$266 \div 7 = 38$$



Explain the missing step to show this is correct.

Label the models to represent the steps of this strategy.



Use a similar strategy to use $4 \times 80 = 320$ to work out $312 \div 4$

Draw a model to represent.