Multiplying and dividing strategies

Doubling and halving

We are learning to simplify multiplications by doubling and halving numbers.

Exercise 1: doubling and halving

What to do

Use the strategy of doubling and halving to rewrite these multiplications as simpler problems, then answer the problem.

1)	4×18	(2)	5×16	(3)	3×16
4)	3×24	(5)	4×32	(6)	5×48
7)	55×4	(8)	28×5	(9)	68×5
10)	20×34	(11)	36×5	(12)	26×4
13)	14×8	(14)	18×40	(15)	40×25
16)	16×25	(17)	360×50	(18)	24×50
19)	50×14	(20)	25×16	(21)	68×50
22)	28×500	(23)	34×500	(24)	286×5000

Exercise 2

What to do

Some of these problems are made easier by using doubling and halving, others are not. Which are made easier using this strategy?

1)	2×24	(2)	8×54	(3)	7×21
4)	4×24	(5)	5×64	(6)	6×27
7)	8×25	(8)	5×125	(9)	9×42

10)   Explain when the strategy of doubling and halving is useful to simplify a multiplication

Exercise 3: Doubling and halving, tripling and thirding and more

What to do

Use the strategy of doubling and halving, tripling and thirding etc (whichever is the most convenient) to rewrite these multiplications as simpler problems, then answer the problem.

1)	3×27	(2)	40×15	(3)	36×3

4) 4×16 (5) 25×32 (6) 9×33

7) 250×48 (8) 20×98 (9) 12×33
10)   Which of the problems in exercise 1 are quicker to do using tripling and thirding etc?
11)   If you know $45 \times 18 = 810$, how many other facts do you know through using doubling and halving, tripling and thirding and so on. Record your answers on a mind map.

Exercise 4
What to do
These problems use the strategy of doubling and halving, tripling and thirding etc. Find the missing number that goes in the box

1) $15 \times 8 = 30 \times \square$ (2) $24 \times 12 = 48 \times \square$ (3) $36 \times 5 = \square \times 10$

4) $45 \times \square = 90 \times 9$ (5) $48 \times \square = 12 \times 12$ (6) $\square \times 16 = 8 \times 8$

7) $23 \times \square = 46 \times 10$ (8) $65 \times 12 = \square \times 6$ (9) $35 \times 14 = 70 \times \square$

These problems only use the strategy of doubling and halving, Find the missing number that goes in the box and the circle

10) $16 \times \square = \bigcirc \times 10$ (11) $\square \times 7 = 100 \times \bigcirc$ (12) $25 \times \square = \bigcirc \times 50$

Exercise 5
What to do
These decimal problems use the strategy of doubling and halving, tripling and thirding etc. to rewrite these multiplications as simpler problems, then answer the problem.

1) 0.5×16 (2) 0.1×160 (3) 0.25×16

4) 0.3×150 (5) 1.8×4 (6) 0.5×38

7) 4×1.6 (8) 6×3.5 (9) 3×2.4

10) 5×15.6 (11) 0.4×0.16 (12) 0.8×7.5

13) 3.2×20 (14) 30×0.29 (15) 200×0.32
16)   Explain when the doubling and halving strategy is useful if working with decimals

Exercise 6
What to do
Write out the number sentence that you will use to solve each word problem. Next, record another number sentence that shows how you are using doubling & halving or trebling & thirding and use this to solve the problem.

1)   18 students each take 5 pairs of socks to camp. How many pairs of socks are there altogether?
2)   In the class library there are 6 shelves with 24 books on each shelf. How many books are there in the class library?

3)   Ms Hope, the Year 10 dean has bought 120 loaves of bread for school camp. If each loaf of bread has 20 slices how many slices of bread are there in total?

4)   Farmer Blue has piglets kept in pens. If there are 3 piglets in each of 24 pens how many piglets are there altogether?

5)   18 dogs each have a litter of 15 puppies. How many puppies altogether?

6)   Marge is making a bracelet with 6 strands of 25 beads each. How many beads are there on the bracelet?

7)   At the Happy Math café there are 15 tables and each table seats 6 people. How many people can eat at the café altogether?

8)   If there are 5 trays of chocolates with 14 chocolates in each tray how many chocolates are there altogether?

9)   Paul drinks 2244mL of milk every day for 5 days. How much milk is this?

10)   Allie has 15 packets of biscuits. If there are 22 biscuits in each packet how many biscuits does she have altogether?

Exercise 7

Things to think about. Your answers to these questions will be discussed with your teacher and the rest of your group next session.

1)   If a number being doubled is □, can you use the box symbol in a sentence to show what double the number look like?

2)   If a number being halved is □, can you use the box symbol in a sentence to show what half the number look like?

3)   If a number being doubled is x, can you use the box symbol in a sentence to show what double the number look like?

4)   If a number being halved is x, can you use the box symbol in a sentence to show what half the number look like?

Exercise 8

Two numbers x and y are to be multiplied using the doubling and halving strategy. x is to be doubled and y is to be halved.

1)   Show this as a symbol sentence

2)   Using your symbol sentence, explain why doubling and halving always gives the same answer as the original problem

Exercise 9

Factors of numbers can be found by doubling and halving, tripling and thirding etc. Use this strategy to list all of the factors of these numbers

1)	16	(2)	20	(3)	40
4)	24	(5)	30	(6)	36
7)	44	(8)	56	(9)	60
10)	52	(11)	64	(12)	84
13)	27	(14)	51	(15)	45
16)	130	(17)	124	(18)	123
19)	300	(20)	215	(21)	141

Doubling and halving
Answers

Exercise 1

1)	8×9=72	(2)	10×8=80	(3)	6×8=48	(4)	6×12=72
5)	2×64=128	(6)	10×24=240	(7)	2×110=220	(8)	14×10=140
9)	10×34=340	(10)	10×68=680	(11)	18×10=180	(12)	52×2=104
13)	56×2=112	(14)	36×20=720	(15)	10×100=1000	(16)	4×100=400
17)	180×100=18000	(18)	12×100=1200	(19)	100×7=700	(20)	100×4=400
21)	34×100=3400	(22)	14×1000=14000	(23)	17×1000=17000	(24)	143×10000=1430000

Exercise 2

1)	✔4 × 12	(2)	✘	(3)	✘	(4)	✔8 × 12
5)	✔10 × 32	(6)	✘	(7)	✔4 × 50	(8)	✘
9)	✘						

10)   Your explanation will be discussed by your teacher during next lesson

Exercise 3

1)	9×9=81	(2)	20×30=600	(3)	12×9=108	(4)	8×8=64
5)	100×8=800	(6)	3×99=297	(7)	1000×12=12000	(8)	10×196=1960
9)	4×99=396						

10)   The problems you choose that are easier may be different to those others choose. Check your answers with others, and discuss any differences you have, explaining why you think it is easier (or not easier) using tripling and thirding etc

11)   This should be a mindmap of other linked facts. Compare yours to those of other members of your group. Check you have all the multiplications and divisions that others have.

Exercise 4

1)	☐=4	(2)	☐=6	(3)	☐=18	(4)	☐=18
5)	☐=3	(6)	☐=4	(7)	☐=20	(8)	☐=130
9)	☐=7	(10)	☐=5 ⬤=8	(11)	☐=200 ⬤=14	(12)	☐=100 ⬤=50

Exercise 5

1)	1×8=8	(2)	1×16=16	(3)	1×4=4	(4)	3×15=45
5)	0.9×8=7.2	(6)	1×19=19	(7)	8×0.8=6.4	(8)	3×7=21
9)	9×0.8=7.2	(10)	10×7.8=78	(11)	0.8×0.08=0.064	(12)	0.2×30=6
13)	6.4×10=64	(14)	10×0.87=8.7	(15)	100×0.64=64		
(16)							

Exercise 6

1)	18×5➜9×10=90	(2)	6×24➜12×12=144	(3)	120×20➜240×10=2400
4)	3×24➜9×8=72	(5)	18×15➜9×30=270	(6)	6×25➜3×50=150
7)	15×6➜30×3=90	(8)	5×14➜10×7=70	(9)	2244×5➜1122×10=11220ml
10)	15×22➜30×11=330					

Exercise 7

1)　　2□　　　　　　　　(2)　　□/2 or ½□　　　　　(3)　　2x

4)　　$\dfrac{x}{2}$ or ½x or x ÷ 2

Exercise 8

1)　　2x × $\dfrac{y}{2}$　　or 2x × ½ y　　　　　　(2)　　2x × ½ y = 2 × ½ × x × y = x × y

Exercise 9

1)　　16,8,4,2,1　　　　　　(2)　　20,10,5 & 4,1　　　　(3)　　40,20,10,5 & 8,4,2,1

4)　　24,12,6,3 & 8,4,2,1　　(5)　　30,15 & 10,5,3,1　　(6)　　36,18,9 & 12,4 & 6,1

7)　　44,22,11 & 4,2,1　　　(8)　　56,28,14,7 & 8,4,2,1

(9)　　60,30,20,15,12,10,6,5,4,3,2,1　　　　　　　　　10)　　52,26,13,4,2,1

(11)　64,32,16,8,4,2,1,　　　(12)　84,42,21,28,14,12,7,6,3,4,2,1

13)　　27,9,3,1　　　　　　　(14)　51,17,3,1　　　　(15)　45,15,5,9,3,1

16)　　130,65,26,5,2,1　　　　(17)　124,62,31,4,2,1　(18)　123,41,3,1

19)　　1 × 300, 2 × 150, 4 × 75, 12 × 25, 60 × 5, 30 × 10, 15 × 20, 3 × 100

20)　　5 × 43　　　　　　　　(21)　　3 × 47

120 x 20　　　　240 × 10　　2400

24 × 3 8 × 9　　　　　　　　72

18 × 15　　　　9 × 30　　　　　　　　270

6 × 25 3 × 50　　　　　　150

15 × 6 30 × 3　　　　　　90

5 × 14 10 × 7　　　　　　70

2244 × 5　　　　1122 × 10　11220ml (11.22L)

15 × 22　　　　5 × 66　　　　　　　　10 × 33