Multiplication and Division

Factors, multiples and mental multiplication

Objectives

Day 1

Revise factors.

Use factors to aid mental multiplication.

Day 2

Multiply three numbers, recognising where commutativity can simplify a calculation, e.g. $2 \times 6 \times 5 = 6 \times 10$.

Multiplication and Division

Factors, multiples and mental multiplication

Starters

Day 1

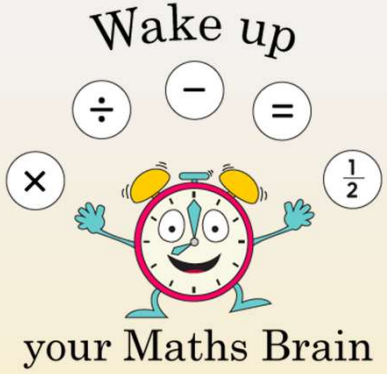
7 times table (pre-requisite skills)

Day 2

11 times table (pre-requisite skills)

Multiplication and Division

Factors, multiples and mental multiplication

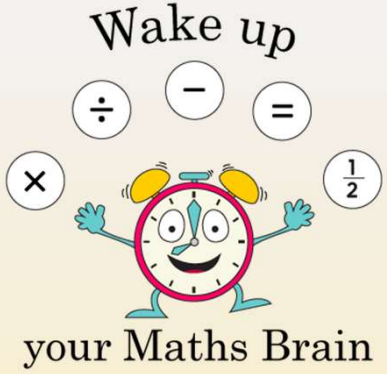


Starter

7 times table

Multiplication and Division

Factors, multiples and mental multiplication



Starter

11 times table

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Day 1

Revise factors.

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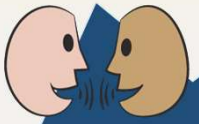
Day 1: Revise factors; Use factors to aid mental multiplication.

20 x 36



List ALL the pairs of factors of 20, i.e. the pairs of numbers that multiply together to make 20.

How could we work out the answer?

We can multiply 36 by 2, then by 10 (or vice versa). Do this to work out the answer – you are using the factors of 20!

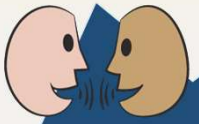
How else could we multiply by 20?

Multiply 36 by 4 (doubling twice) and then by 5. Do you get the same answer?

Which way did you find quicker or made more sense?

Day 1: Revise factors; Use factors to aid mental multiplication.

14 × 52



List ALL the pairs of factors of 14, i.e. the pairs of numbers that multiply together to make 14.

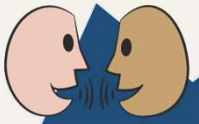
Use a pair of factors of 14 to work out the answer (7 x 52 then…).

Now use partitioning, i.e. (10 × 52) + (4 × 52). Do you get the same answer?

Which way did you find quicker or made more sense?

Day 1: Revise factors; Use factors to aid mental multiplication.

24 × 25



List ALL the pairs of factors of 24, i.e. the pairs of numbers that multiply together to make 24.

I'm going to choose a pair of children to help us work out the answer.

Would you have worked out the answer in the same way?

Investigation:
Adult Sheet

Race to 200

Children apply knowledge of factors within the 2, 3, 4, 5, 9 and 10x tables.

Skills practised:

- Recognising or deriving multiples of 2, 3, 4, 5, 9 and 10
- Choosing methods for mental addition

***Conjecture**: Larger numbers have greater 'factor sums'.*

What to do:

Children work in pairs or threes.

1. The first player chooses and crosses off one of the green numbers from the game board:

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

e.g. **18**...
Now, write down all the numbers that 18 is a multiple of: 1, 18, 2, 9, 3, 6.
Finally, add together all of those numbers to create a 'factor sum':

1 + 18 + 2 + 9 + 3 + 6 = **39**

39 is player 1's score for that round. The winner is the first player to reach a total of 200!
If both/all three players reach 200 in the same round, the winner is the player closest to 200, so be careful which number you pick as the game nears its end.
How might you keep track of people's scores?

2. Will the biggest number always have the highest 'factor sum'?

CHALLENGE: Write something you notice about the grey numbers. Do you think it would be helpful to have these numbers in the game? Explain your ideas.

HINT: If you find a number with a high 'factor sum', double that number will also have the same list of factors.

Aims:

- To use the link between multiplication and division
- To choose strategies for efficient mental addition

Minimum number of calculations expected

20

Investigation:
Child Sheet

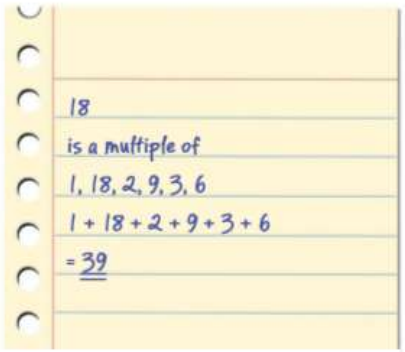
Race to 200

1. Player 1 chooses and crosses off one of the green numbers from the game board:

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

Write down all the numbers that your number is a multiple of.
Finally, add together all of those numbers to create a 'factor sum'.

This number is player 1's score for that round.



2. Player 2 takes a turn.
The winner is the first player to reach a total of 200!
If both/all three players reach 200 in the same round, the winner is the player closest to 200, so be careful which number you pick as the game nears its end.

How might you keep track of people's scores?

3. Will the biggest number always have the highest 'factor sum'?

Challenge

Write something you notice about the grey numbers. Do you think it would be helpful to have these numbers in the game? Explain your ideas.

Using factors

Sheet 1

1. Write all the pairs of factors of 12.
   Choose a pair to help you to work out 12 × 31.

2. Write all the pairs of factors of 16.
   Choose a pair to help you to work out 16 × 25.

3. Write all the pairs of factors of 30.
   Choose a pair to help you to work out 30 × 42.

4. Write all the pairs of factors of 18.
   Choose a pair to help you to work out 18 × 31.

5. Use factor pairs to quickly find 6 x 123.

Using factors

Sheet 1

1. Write all the pairs of factors of 12.
   Choose a pair to help you to work out 12 × 31.

2. Write all the pairs of factors of 16.
   Choose a pair to help you to work out 16 × 25.

Challenge 1

Choose 3 of the questions and for each one show how you can use a second pair of factors to find and check the answer.

Challenge 2

1. Kristina says '1005 must be a multiple of 15 because it is a multiple of 5 and a multiple
2. If you do decide that 1005 is a multiple of 15, use factor pairs and inverse operations s.

Multiplication and Division

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Objectives

Day 2

Multiply three numbers, recognising where commutativity can simplify a calculation, e.g. 2 × 6 × 5 = 6 × 10.

Day 2: **Multiply three numbers, recognising where commutativity can simplify a calculation, e.g. 2 × 6 × 5 = 6 × 10.**

2 + 7 + 8

How would you work this out?

We can add in any order, so we could add 2 and 8 to make 10, then add the 7 on!

Multiplication can be done in any order, just like addition, to arrive at the same answer.
Work out 1 × 2 × 3 and 3 × 1 × 2.

We call this property **'commutativity'.**

Day 2: **Multiply three numbers, recognising where commutativity can simplify a calculation, e.g. 2 × 6 × 5 = 6 × 10.**

4 × 7 × 5

How could we change the order of this multiplication to help simplify the calculation?

e.g. 4 × 5 × 7, i.e. working out 20 × 7.

7 × 2 × 8

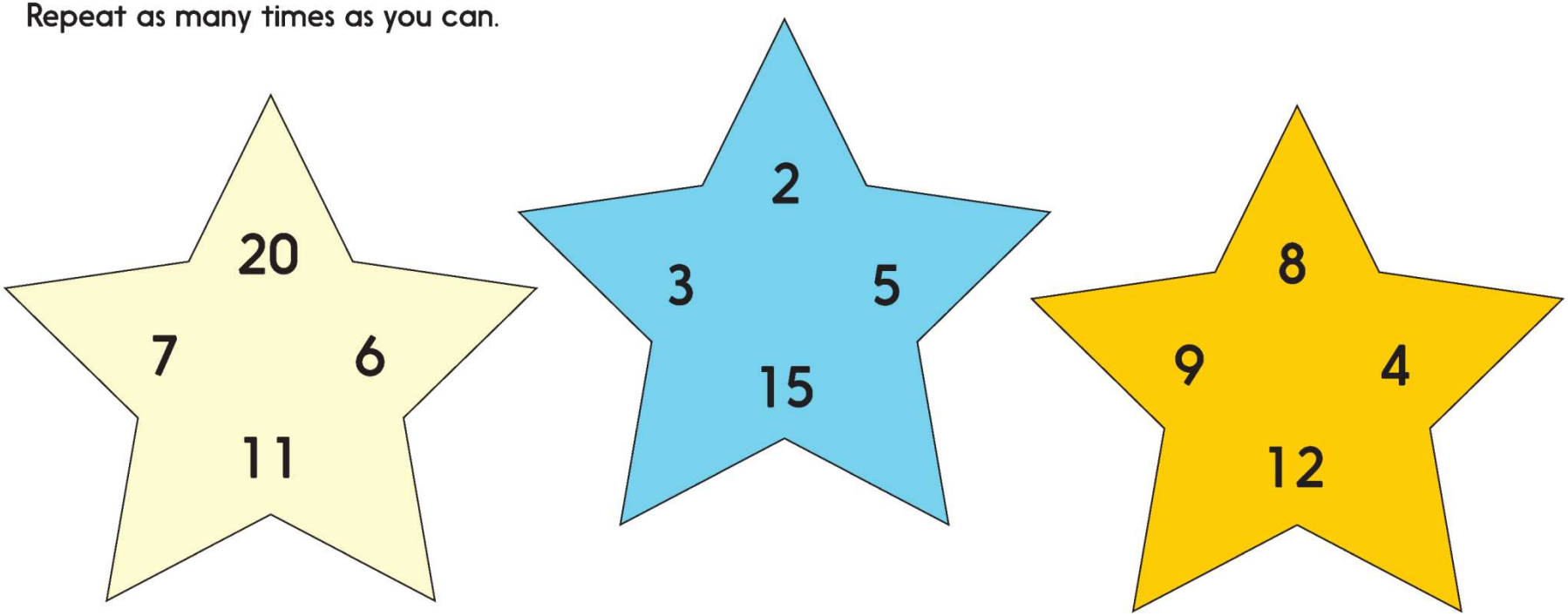
How could we change the order of this multiplication to help simplify the calculation?

7 × 8 × 2 is probably a simpler order to work with because the second step involves finding 56 × 2, rather than 14 × 8.

Multiplying three numbers together

Sheet 1

Choose one number from each of the 3 stars.
Decide the easiest order to multiply them together.
Repeat as many times as you can.



Challenge

Find the missing numbers:

□ x 7 x 6 = 420

8 x 11 x □ = 440

3 x □ x 5 = 135

Multiplication and Division

Factors, multiples and mental multiplication

Well Done! You've completed this unit.

Objectives

Day 1

Revise factors.

Use factors to aid mental multiplication.

Day 2

Multiply three numbers, recognising where commutativity can simplify a calculation, e.g. 2 × 6 × 5 = 6 × 10.

Problem solving and reasoning questions

Find three different multiplication facts that you can multiply by 10 to give an answer of 400.

Use doubling to help you help solve:

23 x 4 18 x 8 141 x 4

How could you use the factors of 12 to help multiply a number by 12?

Try this to find:

16 x 12 23 x 12 34 x 12

Use and explain a mental method to find:

8 x 13 7 x 16 12 x 13

Problem solving and reasoning: Answers

Find three different multiplication facts that you can multiply by 10 to give an answer of 400. Any of 1 × 40, 2 × 20, 4 × 10, 5 × 8. i.e. the factor pairs of 40.

Use doubling to help you help solve:
23 x 4 18 x 8 141 x 4
23 × 2 = 46; 46 × 2 = **92**
18 × 2 = 36; 36 × 2 = 72; 72 × 2 = **144** (Or 9 × 8 = 72; 2 × 72 = **144)**
141 × 2 = 282; 282 × 2 =**564** Errors may occur when children are working mentally but do not jot down the part completed solutions; some errors also possible when doubling if double the 1s digit is greater than 10, e.g. 46 × 2 = 82 or 812.

How could you use the factors of 12 to help multiply a number by 12? Multiply by 3, then by 2, then by 2 again – this could be in any order
Try this to find:
16 x 12 = 192 23 x 12 = 276 34 x 12 = 408

Use and explain a mental method to find: 8 x 13 7 x 16 12 x 13
8 x 13 = 104, e.g. double 13 three times.
7 x 16 = 112, e.g. 7 x 8 = 56, then double 56.
12 x 13 = 156, e.g. 3 x 13 = 39, then double twice.
Other methods are possible. The important thing is a) getting the right answer and b) children being able to explain their strategy.