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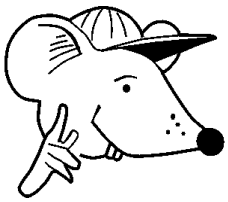
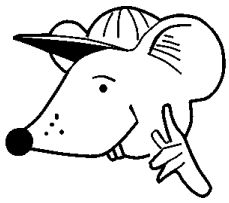


MATHEMATICS



N.S. Yr. 6 P.19

Recognise odd and even numbers.
Multiples and tests of divisibility.

Equipment

Paper, pencil, ruler, calculator

MathSphere

Concepts

Children should be able to carry out **tests of divisibility**, i.e. see quickly if a number is divisible by another. This work is covered in earlier modules.

Children should be able to put numbers on a Venn diagram.

Children should understand the following terms:

Multiple, digit, divisible, divisibility, factor

Children should be able to find the smallest common multiple of two numbers such as 10 and 15.

Children should be able to write a formula for the ***n***th even number and the ***n***th odd number.

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1. Choose from the following words to fill in the gaps in the sentences:

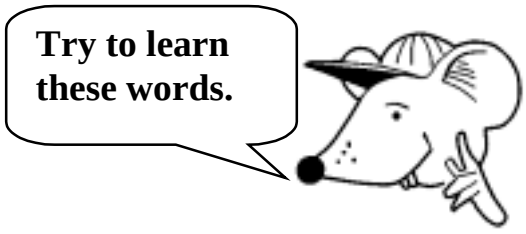
multiple, digits, divisible, divisibility, factors

a) The number 45 876 478 has eight _____ .

b) 3, 5 and 7 are _____ of 105.

c) 64 is _____ by 4.

d) 45 is a _____ of 9.



e) _____ is a test to see if one number divides exactly into another.

2. Choose a number at random. Make a chain of numbers by following this rule:

If the number is even, halve it.
If the number is odd, multiply it by 3 and add 1.

Eg. Choose **20** to start:

20 ⇨ 10 ⇨ 5 ⇨ 16 ⇨ 8 ⇨ ??????

What happens? Choose other numbers to start with and see what happens.

Which numbers give you very long chains?

3. Here is a formula for **even** numbers: **2n**

This means **2 multiplied by n.**
n is a whole number.

n	1	2	3	4	5	6	7	8	
2n	2	4	6	8	10	12	14	16	⇦ Even numbers

What do you have to do to convert the even numbers to odd numbers?
Can you write down a formula for odd numbers (Clue - begin with the even number formula!).

1. Choose a number at random. Make a chain of numbers by following this rule:

If the number is even, halve it and subtract 1.
If the number is odd, multiply it by 3 and add 1.

Eg. Choose **15** to start:

15 ⇨ 46 ⇨ 22 ⇨ 10 ⇨ 4 ⇨ ??????

What happens? Choose other numbers to start with and see what happens.

Which numbers give you very long chains?
Which numbers send you round in circles?
Do you get that **negative** feeling?

Write about what you have discovered.

2. Make a similar rule up yourself involving odd and even numbers.
To avoid getting into fractions do not divide odd numbers by two.

Look for interesting chains.

3. Here is a formula for multiples of three: **3n**

This means **3 multiplied by n.**
n is a whole number**.**

n	1	2	3	4	5	6	7	8	
3n	3	6	9	12	15	18	21	24	⇦ Multiples of 3.

Can you write formulae and make a table of numbers for each of the following:

a) 4 multiplied by n. **b)** 3 multiplied by n plus 2
c) 6 multiplied by n. **d)** 6 multiplied by n plus 7

1. a) Put a ring around the numbers that are multiples of **12**:

38, 72, 56, 96, 48, 12, 86, 36, 108

b) Put a ring around the numbers that are multiples of **7**:

91, 56, 47, 88, 98, 36, 12, 70, 100

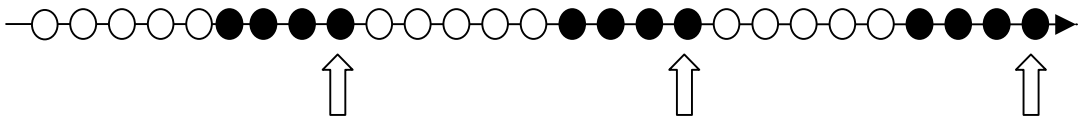
c) Put a ring around the numbers that are multiples of **50**:

60, 5, 150, 500, 65, 365, 900, 7 000

d) Put a ring around the numbers that are multiples of **18**
(Remember **18 = 2 × 9)**:

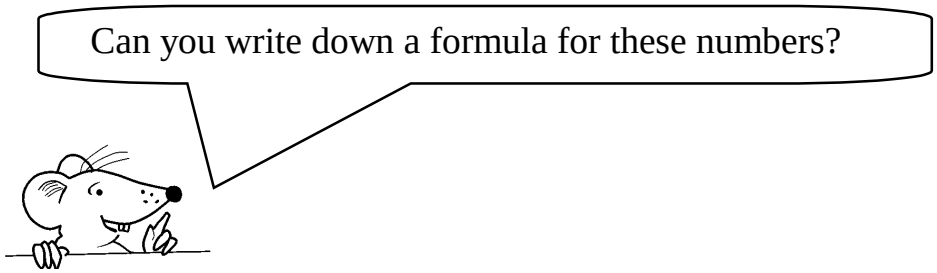
36, 180, 900, 60, 45, 348, 120, 76

2. Black and white counters are placed in a repeating pattern like this:



Imagine the pattern goes on for a long way.
What number counters are the last black ones in each group?
Write down the first 10 numbers in this sequence.

n	1	2	3	4	5	6	7	8	9	10
?	9	18								



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1. a) Put a ring around the numbers that are multiples of **15** **(**Remember **15 = 3 × 5)**:

30,	**120,**	**90,**	**78,**	**40,**	**15,**	**35,**	**60,**	**99**

b) Put a ring around the numbers that are multiples of **20**:

90,	**50,**	**600,**	**44,**	**38,**	**30,**	**4,**	**300**

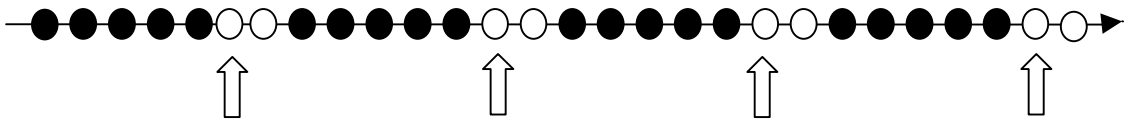
c) Put a ring around the numbers that are multiples of **25**:

75,	**80,**	**350,**	**5 000,**	**23 545,**	**75,**	**850**

d) Put a ring around the numbers that are multiples of **40** **(**Remember **40 = 5 × 8)**:

50,	**280,**	**760,**	**88,**	**380,**	**123,**	**900,**	**5 350**

2. Black and white counters are placed in a repeating pattern like this:



Imagine the pattern goes on for a long way.
What number counters are the first white ones in each group?
Write down the first 10 numbers in this sequence.

n	1	2	3	4	5	6	7	8	9	10
?	6	13								

Can you write down a formula for these numbers?

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1. Write down all the factors of these numbers:

a) 12 **b)** 25 **c)** 60 **d)** 56 **e)** 110

2. Write down the first six multiples of these numbers, beginning with the numbers themselves. The first one is done for you.

a) 7 **b)** 12 **c)** 15 **d)** 9 **e)** 14

Multiples of 7 are: **7, 14, 21, 28, 35, 42**

3. Sometimes we need to find the **smallest common multiple** of two numbers. This means the smallest number that they will both divide into exactly.

E.g. The lowest common multiple of **9** and **12** is **36.** This means that 36 is the smallest number that both 9 and 12 will divide into exactly.

We can find the lowest common multiple by writing multiples of one of the numbers and seeing which is the smallest that is divisible by the other.

E.g. Find the smallest common multiple of 9 and 15.

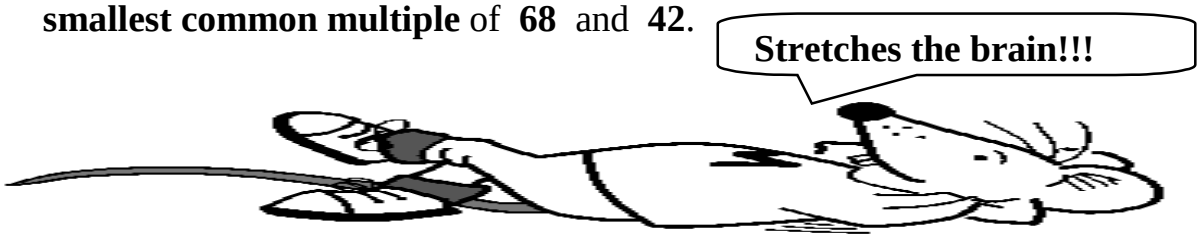
The multiples of 15 are: 15, 30, 45, 60, 75, 90.....

The smallest multiple of 15 that is divisible by 9 is obviously 45.
The smallest common multiple of 9 and 15 is therefore 45.

Use the same method to find the **smallest common multiple** of these pairs of numbers:

a) 8 and 12 **b)** 15 and 4 **c)** 9 and 6 **d)** 20 and 15

4. Use the same method (but possibly with a calculator) to find the **smallest common multiple** of **68** and **42**.



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1. Write down all the factors of these numbers:

a) 20 **b)** 32 **c)** 58 **d)** 49 **e)** 90

2. Write down the first six multiples of these numbers, beginning with the numbers themselves. The first one is done for you.

a) 9 **b)** 18 **c)** 21 **d)** 13 **e)** 22

Multiples of 9 are: **9, 18, 27, 36, 45, 54**

We can find the **smallest common multiple** using a more complicated method, but this method is better for larger numbers.

First we write down all the factors of the two numbers that are prime numbers. **These are called <u>prime factors</u>.** We may need to write them down more than once.

E.g. Find the **smallest common multiple** of **24** and **20**.

The <u>prime factors</u> of 24 are 2, 2, 2 and 3 because $2 \times 2 \times 2 \times 3 = 24$ and 2 and 3 are prime numbers.

The <u>prime factors</u> of 20 are 2, 2 and 5 because $2 \times 2 \times 5 = 20$ and 2 and 5 are prime numbers.

Now write down all the prime factors of one number (say 24) and write down any factors in the other number (20) that have not already been written down. Multiply them all together. Look carefully at this example:

Smallest common multiple of **24** and **20** = **2 × 2 × 2 × 3 × 5 = 120**

From 24 From 20

This may seem quite tricky, so **look at the next page for two more examples.**

E.g. Find the **smallest common multiple** of **18** and **60**.

The prime factors of 18 are 2, 3 and 3 because $2 \times 3 \times 3 = 18$ and 2 and 3 are prime numbers.

The prime factors of 60 are 2, 2, 3 and 5 because $2 \times 2 \times 3 \times 5 = 60$ and 2, 3 and 5 are prime numbers.

Now write down all the prime factors of one number (say 60) and write down any factors in the other number (18) that have not already been written down. Multiply them all together. Look carefully at this example:

Smallest common multiple of **18** and **60** = **2 × 2 × 3 × 5 × 3 = 180**

From 60 From 18

E.g. Find the **smallest common multiple** of **30** and **98**.

The prime factors of 30 are 2, 3 and 5 because $2 \times 3 \times 5 = 30$ and 2, 3 and 5 are prime numbers.

The prime factors of 98 are 2, 7 and 7 because $2 \times 7 \times 7 = 98$ and 2 and 7 are prime numbers.

Now write down all the prime factors of one number (say 30) and write down any factors in the other number (98) that have not already been written down. Multiply them all together. Look carefully at this example:

Smallest common multiple of **30** and **98** = **2 × 3 × 5 × 7 × 7 = 1470**

From 30 From 98

Now use this method to find the **smallest common multiple** of the following pairs of numbers:

1. a) 24 and 30 **b)** 15 and 20 **c)** 35 and 49 **d)** 50 and 60

1. Testing for divisibility by 7.

Here are two methods of seeing if a number is divisible by 7.

Method **A**.

When you have a four, five or six figure number, obtain the difference between the last three digits and the rest of the digits. If the difference is divisible by 7, then the starting number is also divisible by 7.

E.g. Is 34 582 divisible by 7?

Subtract 34 from 582: $582 - 34 = 548$

548 is not divisible by 7, so 34 582 is not divisible by 7.

Use this method to test if these numbers are divisible by 7:

a) 15 487 **b)** 186 732 **c)** 45 734 **d)** 88 788

Method **B**.

Remove the last digit. Multiply the remaining digits by 3 and add on the original last digit. If the new number is divisible by 7, then the starting number is also divisible by 7. Not a lot of use, but interesting!

E.g. Is 34 582 divisible by 7?

Remove the 2: 3 458
Multiply by 3: $3\,458 \times 3 = 10\,374$
Add on the 2: $10\,374 + 2 = 10\,376$

This can be repeated to give:

10 376 ⇨ 3117 ⇨ 940 ⇨ 282 ⇨ 86 ⇨ 30 ⇨ 9

9 is not divisible by 7, so neither was 34 582 !!!!

Try the numbers above in Method A using Method B. Which method do you prefer?

Answers

Page 3

1. a) digits b) factors c) divisible d)multiple e) divisibility

2. There is much to investigate here. Encourage children to write logical statements about their discoveries, such as 'The number 4 leads to a circle of numbers that goes round forever: 4 ⇨ 2 ⇨ 1 ⇨ 4

3. Add or subtract one. Formula for odd numbers: **2n + 1 (**or, less commonly, **2n – 1)**

Page 4

1. As before, there is much to investigate here. Encourage children to write logical statements about their discoveries.

3. a) 4n **b)** 3n + 2 **c)** 6n **d)** 6n + 7

Page 5

1. a) 72, 96, 48, 12, 36, 108 **b**) 91, 56, 98, 70

c) 150, 500, 900, 7 000 **d)** 36, 180, 900,

2.

n	1	2	3	4	5	6	7	8	9	10
?	9	18	**27**	**36**	**45**	**54**	**63**	**72**	**81**	**90**

Formula is **9n**

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1. a) 30, 120, 90, 15, 60 **b**) 600, 300

c) 75, 350, 5 000, 75, 850 **d)** 280, 760

2.

n	1	2	3	4	5	6	7	8	9	10
?	6	13	**20**	**27**	**34**	**41**	**48**	**55**	**62**	**69**

Formula is **7n – 1**

Page 7

1. a) 1, 2, 3, 4, 6, 12 **b)** 1, 5, 25

c) 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60

d) 1, 2, 4, 7, 8, 14, 28, 56

e) 1, 2, 5, 10, 11, 22, 110

2. a) 7, 14, 21, 28, 35, 42 **b)** 12, 24, 36, 48, 60, 72

c) 15, 30, 45, 60, 75, 90 **d)** 9, 18, 27, 36, 45, 54

e) 14, 28, 42, 56, 70, 84

3. a) 24 **b)** 60 **c)** 18 **d)** 60

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Page 8

1. a) 1, 2, 4, 5, 10, 20 **b)** 1, 2, 4, 8, 16, 32 **c)** 1, 2, 29, 58 **d)** 1, 7, 49
e) 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90

2. a) 9, 18, 27, 36, 45, 54 **b)** 18, 36, 54, 72, 90, 108
c) 21, 42, 63, 84, 105, 126 **d)** 13, 26, 39, 52, 65, 78
e) 22, 44, 66, 88, 110, 132

Page 9

1. a) 120 **b)** 60 **c)** 245 **d)** 300

Page 10

1. a) 15 487 No **b)** 186 732 Yes **c)** 45 734 No **d)** 88 788 Yes