# A2.2 Multiples

## objectives

- Count on and back in steps of constant size.
- Recall multiplication facts to 10 × 10 and derive associated division facts.
- Recognise multiples.
- Solve problems and investigate in number.

## starter

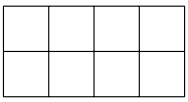
**Vocabulary**
product

**Resources**
two dice
mini-whiteboards

Tell the class that they are going to play a bingo game that will help them to remember multiplication and division facts. Write these 20 numbers in a list across the board (or prepare them on an OHT).

9, 12, 15, 16, 18, 20, 21, 24, 25, 28, 30, 32, 35, 36, 40, 42, 48, 49, 56, 64

Ask pupils to sketch a 4 by 2 grid on their whiteboards.



Ask them to choose any numbers from the list and write one number in each box of their grid. Each number must be different.

Say that you are going to roll two dice but you will add 2 to each number rolled, so that the smallest number will be 3 and the largest will be 8. You will then call out the two numbers. If the product of the two numbers is on a player's board, the player can cross out the number. The first player to get a row of four crossed out numbers calls out 'Bingo!' and wins the game.

Play the game once or twice. Keep a record of the products for checking purposes. As the winner reads out their line of numbers for checking, ask, for example:

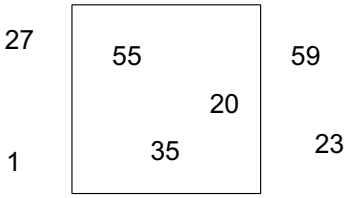
**Q Fifty-six was the product of which two numbers?**

## main activity

**Vocabulary**
even
multiple

**Resources**
OHT A2.2a and A2.2b
copies of OHT A2.2a
dice
counters in two colours
OHP 'counters', e.g. bolts/washers in two shapes, about 1 cm in diameter
0 to 9 digit cards
ITP *Number grid* (optional)

Draw a large square box on the board. Ask pupils to suggest some numbers below 60. If they are multiples of 5, write them in the box. If not, write them outside.




Once there are at least three numbers in the box, ask:

**Q What is my rule for putting numbers in the box?**

Continue asking for numbers and placing them in or out of the box until pupils recognise the rule. Repeat this activity with multiples of 10, multiples of 2, and multiples of 11. This time invite pupils who think that they know what the rule is to come to the board and write another number in the box.

Use pupils' explanations to remind them of and refine their ideas of a multiple.

- Multiples of 2 are numbers that divide exactly by 2. They include the numbers in the two times table.
- The rule to generate the sequence of multiples of 2 is 'add 2'.
- Multiples of a number will appear as equal jumps along a number line.

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Use **OHT A2.2a**, a dice and 'counters'. Play a multiples game with the whole class divided into two teams. The rules are:

- Take turns to roll the dice (1 counts as 7).
- You then have a choice. Suppose you roll 5. You can:
  - either cover a multiple of 5 with one of your counters;
  - or remove one of the other player's counters from a multiple of 5.
- The winner is the first to get three counters in a line, horizontally, vertically or diagonally.

After each roll of the dice, ask:

**Q What multiples of your dice number can you see on the board?**

**Q If you cover a number, what would be the best one to choose? Why?**

**Q If you remove one of the other team's counters, which would be the best one to choose? Why?**

Allow time for groups within a team to discuss the questions.

Play the game once, then discuss strategies with the whole class. For example:

**Q Is it better to cover a number in the corner of the board or a number in the centre? Why?**

**Q Is it better to remove a counter at the centre or a counter in a corner? Why?**

**Q Which numbers are easier to cover? Why?**
**Which are more difficult to cover? Why?**

**Q Why is it better to try to cluster the numbers you are covering?**

You could, if you wish, give out a copy of **OHT A2.2a**, a dice and counters to groups of four pupils and get the groups to play the game.

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Ask pupils to work in pairs. Each pair should use one pack of digit cards from 0 to 9. Ask the pairs to use all ten cards to create five different numbers, each of which is a multiple of 3. The numbers can have any number of digits. (There are lots of possibilities. One example is 12, 30, 45, 69, 78.)

Then ask them to make five multiples of 7. (Again, there are various possibilities. One example is 7, 21, 49, 56, 308.)

A further challenge, if there is time, is to make five multiples of 18 (e.g. 18, 36, 54, 72, 90).

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You may wish to support this activity by using the ITP *Number grid*, downloaded from www.standards.dfes.gov.uk/numeracy.

Count in multiples of 9 to 90. Ask:

**Q** **What is the next multiple of nine?** (99) **And the next?** (108)
**How did you work it out?** (add nine to the previous multiple)

Work through the test questions on **OHT A2.2b**.

## other tasks

**Springboard 7**
Unit 9

**Unit 9 section 2: Multiples of numbers**



## plenary

**Vocabulary**
palindrome
reverse

**Resources**
mini-whiteboards
OHP calculator

**Q** **What happens when you reverse multiples? Do all multiples of 3 stay multiples of 3 when you reverse them?**

Ask the class to suggest a few multiples of 3. Confirm that they will still be multiples of 3 when reversed. If necessary, use an OHP calculator to check.

**Q** **Can you tell me an even number that stays even when you reverse it?** (e.g. 46, 82, 208)

Point out that if numbers like 02 are allowed, multiples of 10 also fit the rule.

**Q** **Do all even numbers stay even when you reverse them?** (no – for example, when 16 is reversed it becomes 61, which is odd)

**Q** **Can you suggest a multiple of 5 that stays a multiple of five when you reverse it?** (5, 55, 515, 525, …)

**Q** **What happens when you reverse multiples of 9? Do they stay as multiples of 9?**

For larger multiples, use an OHP calculator to confirm suggestions.

### Remember

- Multiples of 7 are numbers that divide exactly by 7. They include the numbers in the seven times table.
- The rule to generate the sequence of multiples of 7 from 0 is ‘add 7’.

# A2.3 Factors and primes

## objectives

- Recall multiplication facts to 10 × 10 and derive associated division facts.
- Recognise and use factors and primes to 20.
- Solve problems and investigate in number.

## starter

**Vocabulary**
addition
multiplication

**Resources**
watch with a second hand
mini-whiteboards

Ask pupils to draw a 4 by 4 addition grid in their exercise books or on whiteboards, and to write the numbers from 2 to 9 in any order along two sides.

| + | 4 | 8 | 5 | 3 |
|---|---|---|---|---|
| 6 | | | | |
| 2 | | | | |
| 9 | | | | |
| 7 | | | | |

Ask them to fill in their grid as quickly as they can when you say 'Go!' Allow a minute or two and then say 'Stop!' Ask them to count how many squares of the grid they were able to complete in the time.

Repeat with a multiplication grid.

| × | 9 | 6 | 3 | 8 |
|---|---|---|---|---|
| 2 | | | | |
| 7 | | | | |
| 5 | | | | |
| 4 | | | | |

## main activity

**Vocabulary**
factor
prime factor
divisible

**Resources**
OHT A2.3a
calculators
OHP calculator

Tell the class that 12 can be divided exactly by 3. We say that 3 is a *factor* of 12, and that 12 is a *multiple* of 3.

**Q Are there any other factors of 12? What other numbers will divide exactly into 12?**

Draw out that other factors of 12 are 1, 2, 4, 6 and 12. Explain that factors always occur in pairs. The factor pairs for 12 are 1 × 12, 2 × 6 and 3 × 4.

Use **OHT A2.3a**. In the column for 12, shade all the factors of 12: 1, 2, 3, 4, 6 and 12. Then shade all the factors of 6 (1, 2, 3 and 6).

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

**Q What do you notice about the factors of 6?** (they are also factors of 12)

Shade all the factors for 3 (1 and 3).

**Q What do you notice about the factors of 3?** (they are also factors of 6 and of 12)

Now complete the chart with the class by shading all the factors of every other number from 1 to 12.

**Q What factor do all the numbers have in common?** (1)

**Q Which numbers have 2 as a factor?** (the even numbers)

**Q Which numbers have only one pair of factors?** (2, 3, 5, 7 and 11)

Explain to the class that these numbers are called *prime numbers*. A prime number has only two factors: 1 and itself. 1 is not a prime number.

**Q Can you think of some more prime numbers less than 20?** (13, 17, 19)

Refer again to **OHT A2.3a**.

**Q Which numbers have an odd number of different factors?** (1, 4 and 9)
**What is special about these numbers?** (they are square numbers)

**Q What are the next two square numbers after 12?** (16, 25)

Ask pupils in pairs to test 16 and 25 to find out the number of different factors (1, 2, 4, 8 and 16, and 1, 5 and 25 respectively). Confirm that these two square numbers also have an odd number of different factors.

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Ask the class to help you to list on the board the prime numbers less than 20:

2, 3, 5, 7, 11, 13, 17, 19

Write on the board:

$\square \times \square \times \square = 231$

Tell the class that each box contains a different prime number. Explain that each of these prime numbers is a factor of 231, so it divides exactly into 231.

**Q Could one of the prime factors be 2?**

Establish that, since 231 is odd, 2 is not a factor. Ask the class to use their calculators to investigate the possibilities.

Systematic working through the list should help pupils to discover that 3 is one of the prime factors. Dividing 231 by 3 gives 77, which pupils should recognise as the product of 7 and 11. Confirm on a calculator that $3 \times 7 \times 11 = 231$.

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Refer again to **OHT A2.3a**. Write on the board:

$156 \div 12 = 13$

Get pupils to check this with their calculators. Say that this means that 156 divides exactly by 12; 12 is a factor of 156, and 156 is a multiple of 12.

**Q Is 2 a factor of 156?**

Establish that 156 is even, so 2 is a factor of 156.

**Q Is 3 a factor of 156?**

Confirm with calculators that 156 ÷ 3 = 52, so 3 is a factor of 156.

Say that, so far, we know that 1, 2, 3 and 12 are factors of 156. Point to the column for 12 on OHT A2.3a. Ask:

**Q Are the other factors of 12 also factors of 156?**

Ask pupils to use their calculators to confirm that 4 and 6 are also factors of 156. Stress that what they have discovered is that, since 12 is a factor of 156, all the factors of 12 are also factors of 156.

## other tasks

**Springboard 7**
Unit 9

**Unit 9 section 4: Factors**



## plenary

**Resources**
mini-whiteboards
calculators

Tell the class that you are thinking of a number. Say:

**Q I multiply my number by 15 and the product is 210. What is my number?**

Remind them that *product* refers to multiplication. Ask pupils to write on their whiteboards a number sentence or equation that represents the question. Collect responses and write on the board:

□ × 15 = 210

**Q We know that 15 is one factor of 210. How could we find its partner?**

Draw out that 210 is a multiple of 15. It is also a multiple of the unknown number. Establish that □ × 15 = 210 means that □ = 210 ÷ 15.

Ask pupils to use their calculators to find the answer. Check the answer by confirming that 14 × 15 = 210.

### Remember

- A number that divides exactly into another number is called a factor of that number. The number 10 has four factors, 1, 2, 5 and 10.
- Factors occur in pairs. The factor pairs for 10 are 1 × 10 and 2 × 5.
- Prime numbers have only two factors, themselves and 1. Examples of prime numbers are 2, 3, 11 and 19. 1 is not a prime number.