



## Sequences

- Using symbols to represent numbers
- Increasing and decreasing sequences
- How to use a term-to-term rule
- How to use a position-to-term rule

Keywords

You should know

### explanation 1

**1** Each symbol stands for a number. What is each number?

<b>a</b> $\triangle + 3 = 5$	<b>b</b> $\star - 6 = 4$	<b>c</b> $\blacklozenge \times 2 = 8$	<b>d</b> $3 + \blacklozenge = 15$
<b>e</b> $9 - \heartsuit = 2$	<b>f</b> $5 \times \blacksquare = 55$	<b>g</b> $\blacktriangledown \div 3 = 4$	<b>h</b> $\diamond \div 10 = 3$
<b>i</b> $11 - \blacktriangleleft = 3$	<b>j</b> $14 + \clubsuit = 21$	<b>k</b> $\blacktriangleright + \blacktriangleright = 10$	<b>l</b> $\star + \star + \star = 60$

**2**  $\blacktriangle = 7$  and  $\bullet = 5$ . Find the value of these expressions.

<b>a</b> $\blacktriangle + 2$	<b>b</b> $2 \times \blacktriangle$	<b>c</b> $\blacktriangle - 4$	<b>d</b> $3 + \blacktriangle$
<b>e</b> $\bullet + 6$	<b>f</b> $10 - \bullet$	<b>g</b> $3 \times \bullet$	<b>h</b> $\bullet - 4$
<b>i</b> $\blacktriangle + \bullet$	<b>j</b> $\blacktriangle - \bullet$	<b>k</b> $\bullet \times \blacktriangle$	<b>l</b> $\blacktriangle \times \blacktriangle$
<b>m</b> $\bullet \times \bullet$	<b>n</b> $\bullet \div \bullet$	<b>o</b> $\blacktriangle \div \blacktriangle$	<b>p</b> $\blacktriangle + \bullet + 6$

**3**  $\star = 6$  and  $\spadesuit = 8$ . Find the value of these expressions.

<b>a</b> $\star + \star$	<b>b</b> $2 \times \star$	<b>c</b> $\spadesuit + \spadesuit$	<b>d</b> $2 \times \spadesuit$
<b>e</b> $\spadesuit + \spadesuit + \spadesuit$	<b>f</b> $3 \times \spadesuit$	<b>g</b> $\star + \star + \star$	<b>h</b> $3 \times \star$

**4** Repeat question 3 using  $\star = 10$  and  $\spadesuit = 4$ .

Write down anything that you notice about your answers.

**5**  $\star = 9$ . Find a quick way to work this out.

$$\star + \star + \star + \star + \star + \star + \star + \star + \star + \star + \star$$

Explain how you got your answer.

**6** ♥ = 20. Write the value of each of these.

- a** 4 more than ♥      **b** twice ♥      **c** 3 less than ♥  
**d** half of ♥      **e** ♥ less than 31      **f** ♥ more than 4  
**g** 5 times ♥      **h** ♥ more than ♥

**7** Repeat question 6, using ♥ = 24. Which of the answers is smaller when ♥ = 24 than when ♥ = 20?

**8** ★ + △ = 5. Write down three pairs of values of ★ and △.

**explanation 2**

**9** Copy and complete the table. One has been done for you.

	Start number	Change	Result
	3	Increase by 5	$3 + 5 = 8$
<b>a</b>	7	Increase by 11	
<b>b</b>	12		$12 + 6 = 18$
<b>c</b>		Increase by 10	$21 + 10 = 31$
<b>d</b>	▲		▲ + 5
<b>e</b>	♥	Increase by 8	
<b>f</b>	◀	Increase by 17	
<b>g</b>		Decrease by 4	$16 - 4 = 12$
<b>h</b>		Decrease by 20	□ - 20
<b>i</b>	►	Decrease by 36	
<b>j</b>	✱		✱ - 9
<b>k</b>		Double	$2 \times \blacksquare$
<b>l</b>	✕	Double	
<b>m</b>	▼	Treble	

**10** Each letter stands for a number. What is each number?

**a**  $a + 1 = 7$       **b**  $b - 2 = 12$       **c**  $c \times 3 = 21$       **d**  $5 + d = 14$   
**e**  $8 - e = 3$       **f**  $4 \times f = 32$       **g**  $g \div 3 = 11$       **h**  $h \div 10 = 8$   
**i**  $23 - i = 3$       **j**  $1 + j = 21$       **k**  $k + k = 54$       **l**  $l + l + l = 75$

**11**  $m = 12$  and  $n = 8$ . Find the value of these expressions.

**a**  $m + 3$       **b**  $n - 6$       **c**  $4 \times m$       **d**  $6 + n$   
**e**  $30 - m$       **f**  $24 \div n$       **g**  $m \div 3$       **h**  $m \times n$

**12** Copy and complete the table.

Start number	Change	Result
$n$	Increase by 5	$n + 5$
$k$	Increase by 47	
$p$	Decrease by 12	
$q$	Decrease by 20	
$w$	Double	
$r$		$r + 6$
$t$	Halve	
$m$		$m + n$

explanation 3a

explanation 3b

explanation 3c

**13** Write down the next two terms of each sequence. State whether the sequence is increasing or decreasing.

**a** 12, 14, 16, 18, ...      **b** 27, 24, 21, 18, ...      **c** 812, 712, 612, 512, ...  
**d** 24, 40, 56, 72, ...      **e** 318, 338, 358, 378, ...      **f** 79, 68, 57, 46, ...  
**g** 4, 8, 12, 16, ...      **h** 4, 8, 16, 32, ...      **i** 1, 10, 100, 1000, ...  
**\*j** 256, 128, 64, 32, ...      **\*k** 243, 81, 27, 9, ...      **\*l** 1, 1, 2, 3, 5, ...

**14** Copy and complete these sequences.

**a** 1, 6, 11, , 21,

**b** 4, 7, , 13, 16,

**c** 2, , 8, , 14, 17,

**d** 8, , 18, , 28,

**e** 40, 31, , 13,

**f** 52, , 44, , 36,

**\*g** 2.5, 3, , 4, ,

**\*h** 10, , 9, , 8, 7.5,

**\*i** 16, , 19, , , 23.5

**15** Copy and complete the table.

	Term	Term-to-term rule	First five terms
<b>a</b>	1st: 10	Add 4	
<b>b</b>	1st: 7	Double and then take away 5	
<b>c</b>	2nd: 21	Subtract 0.5	
<b>d</b>	2nd: 4	Divide by 2	
<b>e</b>	2nd: 13	Multiply by 3 and then add 1	
<b>f</b>	6th:		4, 9, 19, 39, 79
<b>g</b>	7th:		2.5, 5, 7.5, 10, 12.5

**16** Most babies grow taller 2.5 cm each month in their first six months. Ben's height was 53 cm at birth.

- a** Write a sequence that shows Ben's height each month until he is 6 months old.
- b** Would you expect the sequence to continue in the same way? Explain your answer.

**17** Here is a partly completed train timetable. Assume each journey takes the same time. Copy the timetable and fill in the missing times.

Exeter Central	14:14	15:33			
Pinhoe	14:19				
Whimple	14:26		16:26		
Feniton	14:31				
Honiton	14:37			17:07	
Axminster	14:48				18:18

- 18** Halley's Comet last appeared in 1986. The years of its previous appearances make a sequence. The difference between consecutive terms isn't fixed. It varies between 75 and 79 years.




**a** Copy and complete the table.

	79	77	79	77	78	75	76
Year							1531
	75	76	77	75	76	75	
Year					1910	1986	

**b** When will the comet next appear?

**explanation 4**

- 19** The number of dots in the pattern makes a sequence.

<b>Pattern</b>			
<b>Position</b>	1	2	3
<b>Term</b>	3	6	9

Copy and complete.

4th term =  $3 \times \square = \square$

10th term =  $3 \times \square = \square$

50th term =  $\square \times \square = \square$

$n$ th term =  $\square \times \square$

- 20** These are the position-to-term rules of some sequences. Write the first four terms of each sequence.

**a**  $n + 5$

**b**  $n + 10$

**c**  $n + 100$

**d**  $n - 1$

**e**  $2 \times n$

**f**  $5 \times n$

**g**  $10 \times n$

**h**  $11 \times n$

**i**  $n + 0.5$

**j**  $n + 2.5$

**k**  $n - 0.5$

**l**  $n + 9.5$

- 21** Copy and complete the tables.

<b>Even numbers</b>	<b>Position</b>	1	2	3	$n$
	<b>Term</b>				

<b>Odd numbers</b>	<b>Position</b>	1	2	3	$n$
	<b>Term</b>				