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Greg Byrd Lynn Byrd and Chris Pearce
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1 Integers

Exercise 1.1 Using negative numbers

1 Hassan is comparing the temperatures in five cities, on the same day.
He recorded them in degrees Celsius (°C).
Write the temperatures in order, starting with the highest.

−5 5 −4 3 −1

2 Anders recorded the temperature in his greenhouse, in degrees Celsius, at five different times on the same day.

Time	09 00	11 00	13 00	16 00	19 00
Temperature (°C)	−8	−5	2	1	−3

a What time was the lowest temperature?
b What time was the highest temperature?
c What was the difference in temperature between 11 00 and 16 00?

3 What temperature is halfway between each pair?
a 6 °C and −2 °C **b** −12 °C and −4 °C

4 At 08 00, the temperature in Harsha's garden was −5 °C.
During the day the temperature rose by 8 degrees and then, by 22 00, it fell by 3 degrees.
What was the final temperature?

5 Sasha writes the height of a point that is 50 metres below sea level as −50 metres.
a How does she write a height that is 200 metres lower than that?
b How does she write a height that is 200 metres higher than that?

6 Albert notices that his freezer is getting colder by 4 degrees every minute.
The temperature now is 6 °C.
What will the temperature be in 5 minutes?

7 Work these out.
a −2 + 6 **b** −10 + 3 **c** −5 + 5
d −3 + 13 **e** −6 + 5 + 3

8 Find the solutions.
a 2 − 6 **b** 5 − 12 **c** −6 − 3
d −9 − 2 **e** −3 − 6 − 6

9 Complete these calculations.
a −3 + 2 − 4 = ☐ **b** 3 − 5 + 6 = ☐
c 8 + 3 − 12 = ☐ **d** −7 + 5 − 3 + 2 = ☐

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Exercise 1.2 Adding and subtracting negative numbers

1 Work out the following additions.
a $4 + 7$ **b** $4 + -7$ **c** $-4 + 7$ **d** $-4 + -7$

2 Work out these subtractions.
a $8 - 12$ **b** $3 - -4$ **c** $-5 - -7$ **d** $-6 - -3$

3 Find the solutions.
a $3 - 10$ **b** $5 + -6$ **c** $8 + -5$ **d** $-4 - -5$

4 Find the missing numbers.
a $4 - \square = -3$ **b** $-2 + \square = 5$ **c** $\square + -5 = 2$ **d** $\square - 5 = -3$

5 The difference between two temperatures is 8 degrees.
One temperature is 3 °C.
What is the other temperature?

There are two possible answers.
Try to find both of them.

6 Xavier is thinking of two numbers.

The sum of my two numbers is 4.
One of my numbers is –6.

What is Xavier's other number?

7 Copy and complete this addition table.

The two entries show that $3 + -2 = 1$ and $-3 + 1 = -2$. You must fill in the rest.

+	4	1	−2
3			1
−1			
−3		−2	

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Exercise 1.3 Multiples

1 Write down the first five multiples of each number.
a 9 **b** 12 **c** 20

2 **a** Find the fourth multiple of 6.
b Find the sixth multiple of 4.

3 From the numbers in the box, find a multiple of:
a 8 **b** 10 **c** 11 **d** 13.

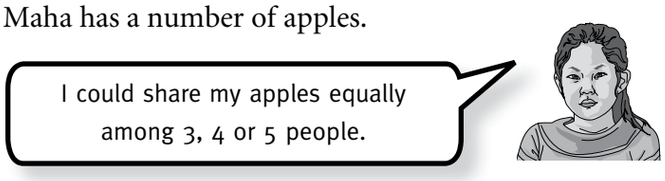
20	26	32	38	44

4 Find a number between 40 and 50 that is:
a a multiple of 7 **b** a multiple of 12 **c** a multiple of 14.

5 The 16th multiple of 7 is 112.
a What is the 17th multiple of 7? **b** What is the 15th multiple of 7?

6 Find the lowest common multiple of the numbers in each pair.
a 3 and 5 **b** 6 and 8 **c** 10 and 15 **d** 4 and 7

7 Maha has a number of apples.



What is the smallest number of apples Maha could have?

8 **a** What is the third multiple of 167?
b What are the sixth and ninth multiples of 167?

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Exercise 1.4 Factors and tests for divisibility

1 Two of the factors of 24 are 1 and 24.
Find all the other factors.

2 Find all the factors of each of these numbers.
a 8 **b** 12 **c** 21 **d** 17 **e** 40

3 3 6 16 26 36 46

Which numbers in the box have 3 as a factor?

4 There are two numbers between 30 and 40 that have just two factors.
What are they?

5 Find the four factors of 91.

6 Find the common factors of each pair of numbers.
a 12 and 15 **b** 20 and 30 **c** 8 and 24 **d** 15 and 32

7 Find a number that has exactly:
a 3 factors **b** 5 factors.

8 2571 5427 6622 8568

Which numbers in the box are multiples of:
a 3 **b** 9?

9 2884 2885 2886 2887 2888

From the list of numbers in the box, find the multiples of:
a 4 **b** 5 **c** 6 **d** 8 **e** 10.

10 What is the smallest number that has 2, 3, 4, 5 and 6 as factors?

11 Find the number less than 100 that has the largest number of factors.

Exercise 1.5 Prime numbers

1 How many prime numbers are less than 20?

2 What is the 15th prime number, if they are listed in order?

3 List all the prime numbers between 80 and 90.

4 Explain why a prime number cannot be a square number.

5 Are these statements true or false?
a All primes are odd numbers.
b It is impossible to find three consecutive odd numbers that are all primes.
c There is only one prime number between 90 and 100.

6 **a** Write 25 as the sum of three different prime numbers.
b How many ways are there to do this?

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7 Find the prime factors of each number.
a 12 **b** 27 **c** 28 **d** 30

Prime factors are factors that are prime numbers.

8 Write each of these numbers as a product of primes.
a 21 **b** 22 **c** 35 **d** 51 **e** 65

9 Why can two prime numbers only have one common factor?

Exercise 1.6 Squares and square roots

1 Find the value of each number.
a 5^2 **b** 9^2 **c** 11^2 **d** 18^2

2 There is one square number between 200 and 250.
What is it?

3 Find two square numbers that add up to each of these numbers.
a 80 **b** 90 **c** 100

4 Look at the pattern in the box.
a Check that it is correct.
b Write down the next two lines in the pattern.
c Use the pattern to work out $51^2 - 49^2$.

$4^2 - 2^2 = 2 \times 6$
$5^2 - 3^2 = 2 \times 8$
$6^2 - 4^2 = 2 \times 10$

5 The difference between two square numbers is 19.
What are the two square numbers?

6 The sum of two square numbers is 15^2.
What are the square numbers?

7 There are nine square numbers less than 100.
Which one has the largest number of factors?

8 Find the value of each number.

a $\sqrt{9}$ **b** $\sqrt{36}$ **c** $\sqrt{169}$ **d** $\sqrt{400}$ **e** $\sqrt{256}$

9 Is $\sqrt{9+16}$ the same as $\sqrt{9} + \sqrt{16}$?
Give a reason for your answer.

10 The square root of Eve's age is two more than the square root of Jamil's age.
If Jamil is 9 years old, how old is Eve?

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2 Sequences, expressions and formulae

Exercise 2.1 Generating sequences (1)

1 For each of these infinite sequences, write down:
i the term-to-term rule
ii the next two terms
iii the tenth term.
a 12, 14, 16, 18, … **b** 5, 8, 11, 14, … **c** 46, 42, 38, 34, …

2 Write down the first three terms of each of these sequences.

	First term	Term-to-term rule
a	4	Add 3.
b	30	Subtract 5.
c	15	Add 3 and then subtract 4.
d	10	Multiply by 2 and then add 1.
e	2	Divide by 2 and then add 10.
f	12	Multiply by 2, then divide by 4 and then multiply by 2.

3 Copy these finite sequences.
Fill in the missing terms that go in the boxes.
a 6, 9, ☐, 15, ☐, 21, 24 **b** 3, 10, 17, ☐, ☐, 38, ☐
c 45, ☐, ☐, 27, 21, ☐, 9 **d** ☐, ☐, 17, 14, ☐, ☐, ☐

4 Write down whether each of these sequences is finite or infinite.
a 5, 10, 15, 20 **b** 3, 5, 7, 9, … **c** 585, 575, 565, 555

5 Anders and Tanesha are looking at this number sequence.
3, 6, 17, 42, 87, 158, …, …
Is either of them correct?
Explain your answer.

I think the term-to-term rule is: 'Add 3.'

I think the term-to-term rule is: 'Multiply by 2.'

6 The second term of a sequence is 10.
The term-to-term rule is: 'Multiply by 4 then subtract 2.'
What is the first term of the sequence?

7 The fourth term of a sequence is 18.
The term-to-term rule is: 'Subtract 3 then multiply by 3.'
What is the first term of the sequence?

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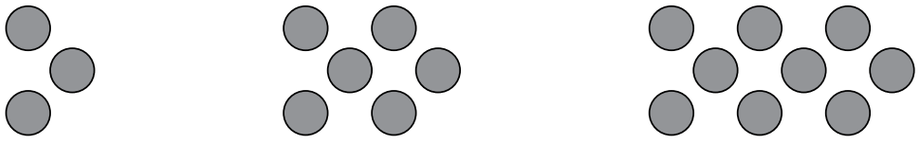
Exercise 2.2 Generating sequences (2)

1 This pattern is made from dots.

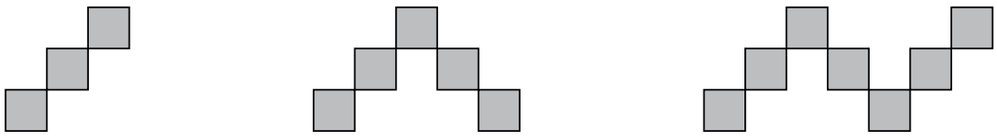
Pattern 1 Pattern 2 Pattern 3



a Draw the next two patterns in the sequence.
b Write down the number sequence of the dots.
c Write down the term-to-term rule.
d Explain how the sequence is formed.

2 This pattern is made from squares.

Pattern 1 Pattern 2 Pattern 3



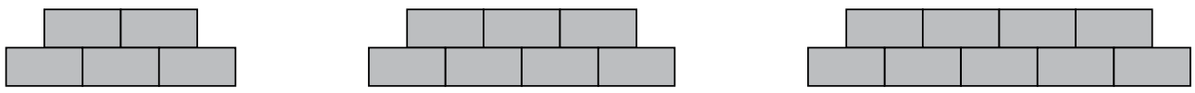
a Draw the next two patterns in the sequence.
b Copy and complete the table to show the number of squares in each pattern.

Pattern number	1	2	3	4	5
Number of squares	3	5			

c Write down the term-to-term rule.
d How many squares will there be in:
i Pattern 8 **ii** Pattern 15?

3 This pattern is made from blocks.

Pattern 1 Pattern 2 Pattern 3



a Draw the next two patterns in the sequence.
b Copy and complete the table to show the number of blocks in each pattern.

Pattern number	1	2	3	4	5
Number of blocks					

c Write down the term-to-term rule.
d How many blocks will there be in:
i Pattern 10 **ii** Pattern 20?

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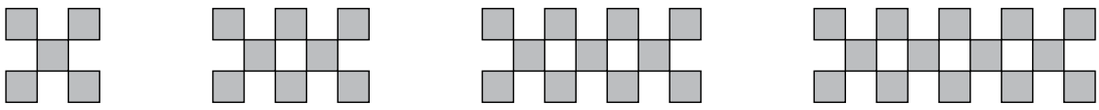
4 Sesane is using dots to draw a sequence of patterns.
She has spilt coffee over the first and third patterns in her sequence!

Pattern 1 Pattern 2 Pattern 3 Pattern 4

a Draw the first and the third patterns of Sesane's sequence.
b How many dots will there be in Pattern 6?

5 Alicia and Oditi are looking at this sequence of patterns made from squares.

Pattern 1 Pattern 2 Pattern 3 Pattern 4



5 squares 8 squares 11 squares 14 squares

I think there are 23 squares in Pattern 20 because the pattern is going up in threes, and 20 + 3 = 23.

I think there are 62 squares in Pattern 20 because if I multiply the pattern number by 3 and add 2 I always get the number of squares. 20 × 3 + 2 = 62.

Who is correct? Explain your answer.

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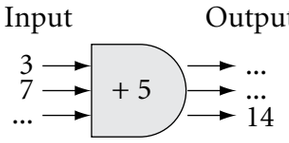
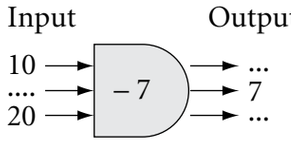
Exercise 2.3 Representing simple functions

1 Copy these function machines and find the missing inputs and outputs.

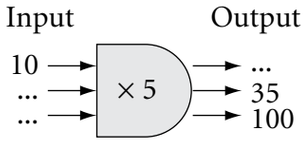
a



b

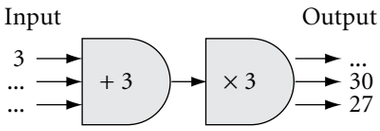


c

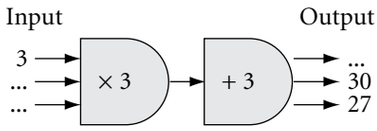


2 Copy these function machines and find the missing inputs and outputs.

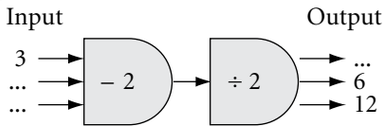
a



b

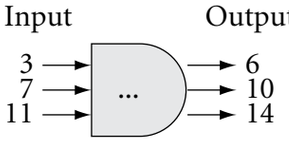


c

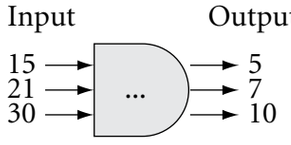


3 Work out the rule to complete these function machines.

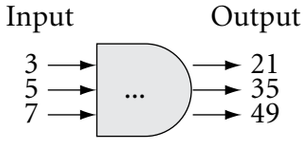
a



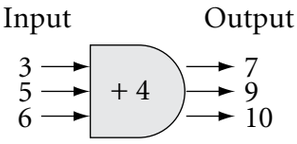
b

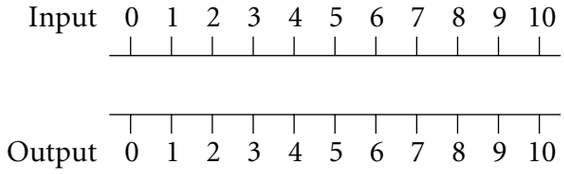


c

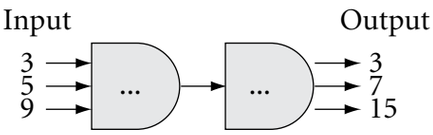


4 Copy and complete the mapping diagram below for this function machine.





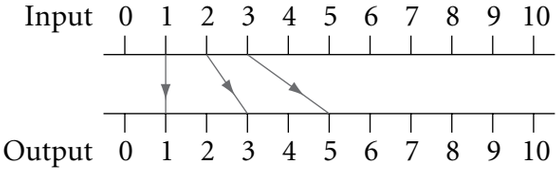
5 Jake and Hassan look at this function machine.

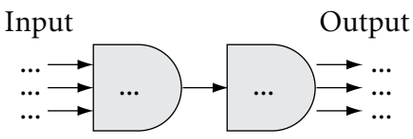


Test the input numbers in each of their functions to see if either of them is correct.

Jake says: 'I think the function is multiply by 2 then take away 3.'
Hassan says: 'I think the function is multiply by 3 then take away 3.'
Who is correct? Explain your answer.

6 Razi draws this mapping diagram and function machine of the same function.





Fill in the missing numbers and write the rule in the function machine.

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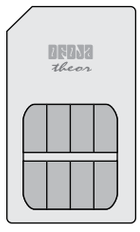
Exercise 2.4 Constructing expressions

In each part of the question Shen starts with t toys.

1 Shen has a box that contains t toys.
Write an expression for the total number of toys he has in the box when:
a he puts in 4 more **b** he takes 2 out
c he adds 5 **d** he takes out half of them.

2 Dafydd has a bag with s sweets in it.
Write an expression for someone who has a bag with:
a 2 more sweets than Dafydd **b** 3 times as many sweets as Dafydd
c 6 fewer sweets than Dafydd **d** half as many sweets as Dafydd.

3 Write down an expression for the answer to each of these.
a Ali has x paintings. He buys 2 more.
How many paintings does he now have?
b Hamza has t free SMS's on his mobile phone each month.
So far this month he has used 15 SMS's.
How many free SMS's does he have left?
c Ibrahim is i years old and Tareq is t years old.
What is the total of their ages?
d Aya can store v video clips on one memory card.
How many video clips can he store on 2 memory cards?
e Rania is given \$$d$ for her birthday.
She spends a quarter of the money on make-up.
How much does she spend on make-up?



4 Nesreen thinks of a number, n.
Write an expression for the number Nesreen gets each time.
a She multiplies the number by 6. **b** She multiplies the number by 5 then adds 1.
c She multiplies the number by 7 then subtracts 2. **d** She divides the number by 4.
e She divides the number by 2 then adds 10. **f** She divides the number by 5 then subtracts 3.

5 The cost of an adult meal in a fast food restaurant is \$$a$.
The cost of a child's meal in the same restaurant is \$$c$.
Write an expression for the total cost of meals for each group.
a 1 adult and 1 child **b** 1 adult and 3 children
c 4 adults and 1 child **d** 4 adults and 5 children

6 Fatima thinks of a number, n.
Write an expression for the number Fatima gets each time.
a She adds 2 to the number and then multiplies by 3.
b She adds 2 to the number and then divides by 3.
c She subtracts 5 from the number and then multiplies by 4.
d She subtracts 5 from the number and then divides by 4.

Remember to use brackets if an addition or a subtraction must be done before a multiplication or a division.

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