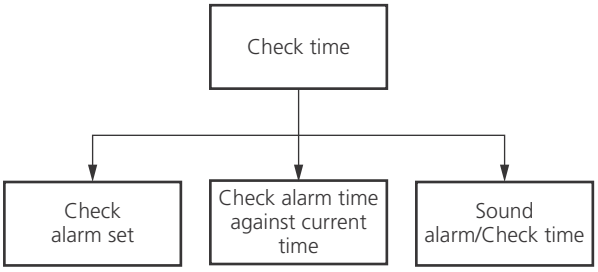
Answers to Chapter 9 questions

Activity 9.1

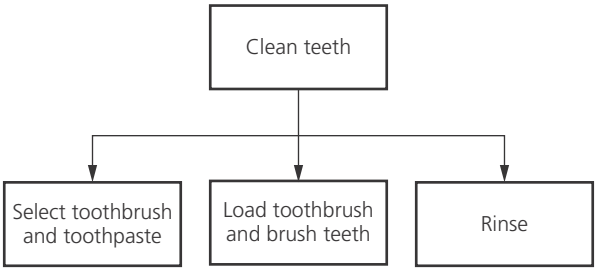
- Weather forecasting – large
- Social networking – large
- Engine management for car – small
- My calendar – small
- Supermarket – medium/large

Activity 9.2



Activity 9.3

There are many answers, as this is a complicated open-ended problem, for example:



Activity 9.4

Purpose: select the highest number
Output: 18 is largest

Activity 9.5

Data: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100
Expected result: 55

Activity 9.6

Data: 370, #, –99
Expected results: these values should be rejected.

Activity 9.7

Boundary data for 100 is 100, 101
Expected results: 101 is rejected, 100 is accepted.

Activity 9.8

a Normal data:

5, 5, 5, 5, 5, 5, 5, 5, 5, 5	Expected result 5
1, 2, 3, 4, 5, 6, 7, 8, 9, 10	Expected result 5.5

b Erroneous data: 30, #, –99 Expected results: these values should be rejected.

c Boundary data for 20 is 20, 21 Expected results: 21 is rejected, 20 is accepted.

Boundary data for 0 is –1, 0 Expected results: –1 is rejected, 0 is accepted.

Activity 9.9

1 (9 + 8 + 9 + 6 + 2 + 0 + 3(7 + 1 + 0 + 1 + 4 + 0))/10
= 7 remainder 3
Check digit = 10 – 3 = 7

2 (9 + 1 + 7 + 0 + 7 + 5 + 0 + 3(7 + 8 + 8 + 1 + 1 + 0))/10
= 10 remainder 4, not correct
(9 + 8 + 2 + 4 + 6 + 8 + 7 + 3(7 + 1 + 3 + 5 + 7 + 9))/10
= 14, correct

Activity 9.10

Students' answers will vary.

The system will not identify transposition of two odd or two even numbers.

Activity 9.11

Look at http://auto.howstuffworks.com/buying-selling/vin.htm

Activity 9.12

Limit check – checks against an upper or lower limit only.
Consistency check – checks that data in two or more fields correspond, for example if the data in the field Title is Mr the data in the field Gender should be male.

Activity 9.13

a Phone number – type check and length check

b Student's name – character check

c Part number – format check

Activity 9.14

A	B	C	X	Output
0	0	100		
1	4		4	
2	8		8	
3	19		19	
4		17	17	
5		3	3	
6			11	
7			6	
8		1	1	
9			13	
10			9	
				19 1

Activity 9.15

A	B	C	X	Output
0	0	100		
1	400		400	
2	800		800	
3			190	
4			170	
5			300	
6			110	
7			600	
8			150	
9			130	
10	900		900	
				900 100

Activity 9.16

Test data: –10, –20, –30, –5, –15, –10, –20, –40, –50, –60

A	B	C	X	Output
0	0	100		
1		–10	–10	
2		–20	–20	
3		–30	–30	
4			–5	
5			–15	
6			–10	
7			–20	
8		–40	–40	
9		–50	–50	
10		–60	–60	
				0 –60

There is an error as the largest number has not been identified.

Activity 9.17

```
A ← 0
INPUT X
B ← X
C ← X
REPEAT
  INPUT X
  IF X > B
    THEN B ← X
    ELSE
    IF X < C
      THEN C ← X
    ENDIF
  ENDIF
  A ← A + 1
UNTIL A = 9
OUTPUT B, C
```

Activity 9.18

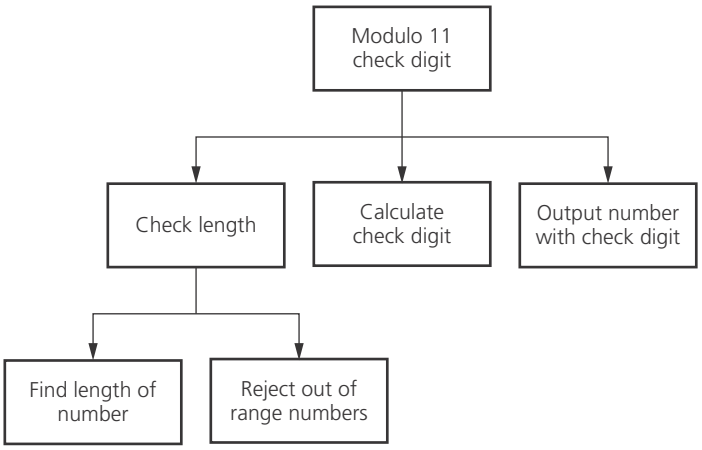
The weight of the child is not required; the tests are repeated. A more efficient solution would be

```
IF Age >= 5 OR Height >= 1
  THEN OUTPUT "OK"
  ELSE OUTPUT "You cannot ride"
ENDIF
```

End-of-chapter questions

1 Software
Data
Hardware
Communications
People

2



3 **a** Number of diners range check 2 to 12 inclusive, bill range check 10 to 500 inclusive
b Normal set 1: 4, $40 – expected result $10
Normal set 2: 6, $33 – expected result $5.50
c Abnormal data: 2.5, $5
fred, –$17
d Boundary data: 12, $500 – expected result $41.67

4 Validation is checking that data is reasonable; verification is checking that data has been copied accurately.

5 Name – validation using a presence check, as a name would be required
Date of birth – validation using a range check to check neither too old nor too young
Password – verification by double entry, validation using length, and character checks
Phone number – validation using length check and character check (digits and certain characters, for example + only)

6 **a** (9 + 8 + 3 + 0 + 8 + 8 + 3(7 + 0 + 4 + 9 + 3 + 2))/10
= 11 remainder 1
Check digit = 10 – 1 = 9
b (9 + 8 + 5 + 1 + 7 + 6 + 3 + 3(7 + 0 + 2 + 1 + 0 + 5))/10
= 8 remainder 4, therefore incorrect
(9 + 8 + 5 + 6 + 5 + 0 + 6 + 3(7 + 0 + 9 + 1 + 8 + 8))/10
= 13 remainder 8, therefore incorrect

7 a

Counter	Length	Breadth	Area	Accept	Reject	Output
0				0	0	
1	15	10	150	1		
2	20	17	340	2		
3	32	10			1	
4	30	35			2	
5	30	15	450	3		
6	30	28	840		3	
7	25	25	625		4	
8	20	15	300	4		
9	40	20			5	
10	12	10	120	5		
						5, 5

b Both length and breadth must be less than or equal to 30 cm; area must be less than or equal to 600 cm^2.

c The algorithm is not efficient as neither the weight nor the volume of the parcel are considered.

8 a

```
Counter ← 1                    is not required for a FOR ... NEXT loop
Total ← 0                      Total should be set to zero
Counter ← Counter + 1          is not required for a FOR ... NEXT loop
REPEAT
  PRINT "Enter a positive whole number"
  INPUT Number
UNTIL Number < 0               will reject all positive numbers
Total ← Total + Counter        will not total the numbers input
OUTPUT Total                   the total will be output many times
```

b The use of a `FOR ... NEXT` loop is effective but the `Total` should only be output once after the end of the loop.

c

```
Total ← 0
FOR Counter ← 1 TO 10
  REPEAT
    PRINT "Enter a positive whole number"
    INPUT Number
  UNTIL Number > 0
  Total ← Total + Number
NEXT
OUTPUT Total
```

d Test data 6, 7, 0, 1, –1, 11, 4, 3, 7, 7, 10, 12

Counter	Number	Total	Output
		0	
1	6	6	
2	7	13	
3	0		
	1	14	
4	–1		
	11	25	
5	4	29	
6	3	32	
7	7	39	
8	7	46	
9	10	56	
10	12	68	68

e Normal data 6, 7, 11, 4, 3, 7, 7, 10, 12
Erroneous data 0, –1
Extreme data 1 (1 is normal as well because it is accepted)

9 Length check, for example to check if an id number is exactly 8 characters long.
Range check, for example to check if a person's age is in the range 11 to 19

10 Several programmers can work on the development of the same software package.
It is easier to debug individual modules than a whole program.
It is easier to test individual modules than the whole program.

11 a Format check, length check

b Range check – user ID is a mixture of letters and numbers