

AQA Computer Science A-Level
4.12.2 Writing functional programs
Past Paper Questions

Additional Specimen Paper 2

Two functions have been defined:

$$\text{DOUBLE } (x) = 2 * x$$

$$\text{SQUARE } (x) = x * x$$

0 8 . **2** State the result of evaluating $\text{SQUARE} \circ \text{DOUBLE} (3)$.

[1 mark]

0 8 . **3** Explain the purpose of the `REDUCE` or `FOLD` function in a functional programming language.

[2 marks]

June 2017 Paper 2

0 6

In a functional programming language a function named `square` and three lists `a`, `b` and `c` are defined as follows.

```
square x = x * x
```

```
a = [1, 3, 5]
```

```
b = [1, 5, 10, 15]
```

```
c = [9, 7, 2]
```

0 6 . 2

Calculate the results of making the function calls listed in **Table 2** with the lists `a`, `b` and `c` above.

[3 marks]

Table 2

Function Call	Result
<code>map square a</code>	
<code>filter (<10) b</code>	
<code>fold (+) 0 c</code>	

0 6 . 3

`map` is an example of a higher-order function.

Explain what a higher-order function is.

[1 mark]

Specimen Paper 2

1 2

In a functional programming language, a recursively defined function named `map` and a function named `double` are defined as follows:

```
map f []      = []
map f (x:xs) = f x : map f xs

double x      = 2 * x
```

The function `map` has two parameters, a function `f`, and a list that is either empty (indicated as `[]`), or non-empty, in which case it is expressed as `(x:xs)` in which `x` is the head and `xs` is the tail, which is itself a list.

1 2

1

In **Table 6**, write the value(s) that are the head and tail of the list `[1, 2, 3, 4]`.

[1 mark]

Table 6

Head	
Tail	

The result of making the function call `double 3` is 6.

1 2 . 2 Calculate the result of making the function call listed in **Table 7**.

[1 mark]

Table 7

Function Call	Result
<code>map double [1, 2, 3, 4]</code>	

1 2 . 3 Explain how you arrived at your answer to question 1 2 . 2 and the recursive steps that you followed.

[3 marks]
