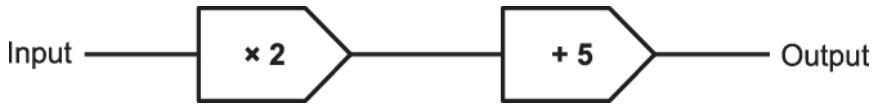
1(a). A function is represented by the following function machine.



(i) A number is input into the machine.
The output is used as a new input.
The second output is 11.

Work out the number that was the **first input**.

(i) _____ [2]

(ii) A number is input into the machine.
The output given is the same number.

Work out the number.

(ii) _____ [3]

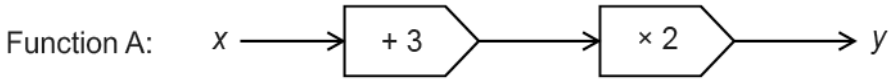
(b). Another function machine is shown below.

If the Input is 3, the Output is 5.
If the Input is 7, the Output is 25.

Use this information to fill in the two boxes.

[3]

2(a). Here is a function.

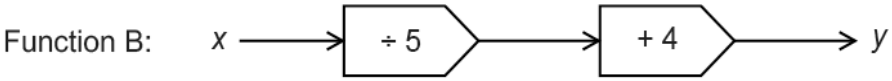


Complete the table of values for **function A**.

x	y
−5	
	11

[2]

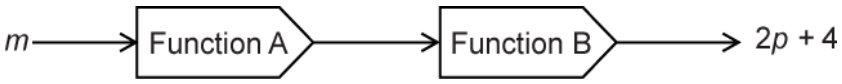
(b). Here is another function.



Find the inverse function of **function B**.

[2]

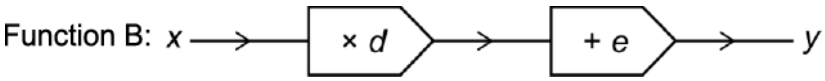
(c). Here is a composite function.



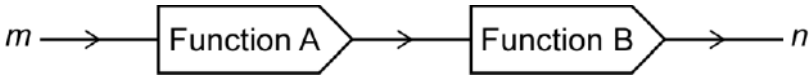
Find an expression for m in terms of p.
Give your answer in its simplest form.

$m =$ _____ **[4]**

3. Here is a function.



The diagram below shows a composite function.



When $m = 4$, $n = 53$.
When $m = 9$, $n = 128$.

Find the values of d and e.

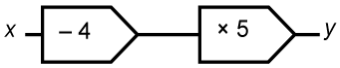
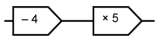
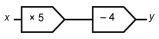
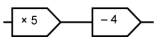
$d =$ _____

$e =$ _____ **[4]**

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Part marks and guidance	
1	a	i	–1	2	**M1** for use of – 5 and ÷ 2 **soi** Or **M1** for answer 3	
		ii	–5	3	**M1** for $2x + 5$ **M1** for $x =$ *their* '$2x + 5$' and solve	
	b		5, 10	3	**M1** for $3a + b = 5$ and $7a + b = 25$ **M1** for attempt to solve Or **M1** input increases by 4; output increases by 20 **M1** so one box must have × 5 for the arithmetic sequence	Condone $\frac{x^2+1}{2}$ across the two boxes for 3 marks
			Total	8		
2	a		x | y –5 | –4 2.5 | 11	2 2 AO1.3a	**B1** for one correct **Examiner's Comment** Part (a) was well answered with nearly all candidates able to complete the table correctly. Hardly any working out was shown, although just a few arithmetic errors were made. In part (b) the vast majority of candidates knew that the inverses – 4 and × 5 were required, but a substantial number gave them in the wrong order within a flow diagram or spoilt their algebraic answer by poor notation such as $y = x – 4$ × Many candidates found part (c) difficult and only a small minority produced a fully correct answer. The question	

Question			Answer/Indicative content	Marks	Part marks and guidance	
					required candidates to apply the order of operations in composite functions and to express this algebraically. Those who worked backwards from the output of $2p + 4$ tended to be more successful, but most started with the input m and frequently quickly went wrong through poor algebraic notation such as $2m + 3$ instead of $2(m + 3)$. Using this latter method, some failed to use the output of function A as the input for function B, for example $2(m + 3) + m/5 + 4 = 2p + 4$. Expressions such as $m + 3 \times 2 \div 5 + 4 = 2p + 4$ were also common. Weaker candidates simply rearranged $m = 2p + 4$ to make p the subject.	

Question			Answer/Indicative content	Marks	Part marks and guidance		
	b		$y = 5\ (x - 4)$ oe or  	2 1 AO1.1 1 AO1.3a	M1 for correct operations in correct order but poor notation eg $y = x - 4 \times 5$ or $5(x - 4)$ oe  (as minimum allow –4 , × 5 if intent clear) or for correct operations in reverse order eg implied by $y = 5x - 4$  	For 2 marks and M1 condone x and y transposed in algebraic expression or transposed in flow diagram. M0 for wrong order and poor notation  Mark right-to-left flow diagrams in a similar way Condone correct flow diagram followed by incorrect algebra or vice-versa	
	c		$5p - 3$ as final answer	4 1 AO1.3b 3 AO3.1b	M1 for $2p + 4 - 4$ soi M1 for *their* $2p \times 5$ soi M1 for *their* $10p \div 2$ M1 for *their* $5p - 3$ Maximum 3 marks if answer incorrect Alternative method:	Output of function A is $10p$ implies first M1M1 Use of function A	

Question			Answer/Indicative content	Marks	Part marks and guidance		
					M1 for $2(m + 3)$ soi M1 for $\frac{their\ 2(m+3)}{5} + 4$ soi M1 for *their* $\frac{2(m+3)}{5} + 4 = 2p + 4$ or better M1FT for rearranging *their* equation to isolate m Maximum 3 marks if answer incorrect	Use of function B with output of A Equating their output of B with $2p + 4$ *Their* equation must be of form $\frac{am+b}{5} + 4 = 2p + 4$ oe where $a \neq 0$ and $b \neq 0$, leading to $(m =) \frac{10p - b}{a}$ and then simplified if possible Accept another letter used consistently for m or p but not m and p interchanged	
			Total	8			

Question			Answer/Indicative content	Marks	Part marks and guidance	
3			3 2	4	**B1** for 17 or 42 **M2** for (128 – 53) ÷ (42 – 17) **oe** or 3 Or **M1** for 128 – 53 or 42 – 17 or 75 or 25	Alternative: **B1** for $17d + e = 53$ **B1** for $42d + e = 128$ **M1** for a subtraction with at most one error e.g. $25d = 75$
			Total	4		