

**QUIS I**

(One hour is allowed for this paper)

SURNAME (block capitals)

CHRISTIAN NAME(S)

DATE

APPLICATION FOR POST AS

TESTED AT

Have you taken a QUIS test before?

YES/NO (Delete as appropriate)

If YES, please state:

Approximate date: \_\_\_\_\_

Place: \_\_\_\_\_

Organisation \_\_\_\_\_

**Please do not open this booklet until told by the Supervisor**

1	2	3	4	5	6	7	8	9	10	TOTAL

**Problem 1 : (ADD INSTRUCTIONS)**

Box No:        1        2        3

Initially:

3	5	7
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Place 12 in box 1 and 15 in box 3  
(Minimum number of instructions = 3)

**SOLUTION**

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**Use opposite page for rough work**

**Problem 2 : (ADD INSTRUCTIONS)**

Box No:            1    2    3

Initially:

10	15	20
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Place 55 in box 2 and 60 in box 3  
(Minimum number of instructions = 3)

**SOLUTION**

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Use opposite page for rough work

In subsequent examples you may use instructions of the following type:

SUBTRACT:        2 - 1 → 2

**Note:** The first and third box numbers mentioned in a subtract instruction **must** be the same, e.g., the result of the subtraction Box 2 - Box 1 **must** be placed in Box 2, also

$$\begin{array}{r} 3 - 1 \rightarrow 3 \\ - \quad - \end{array}$$

or  $\begin{array}{r} 1 - 3 \rightarrow 1 \\ - \quad - \end{array}$

**Problem 3 : (ADD AND SUBTRACT INSTRUCTIONS)**

Box No:            1    2    3

Initially:

a	b	0
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Box 3 is known to be empty.

Place b in box 1 and a in box 2  
(Minimum number of instructions = 4)

**SOLUTION**

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Use opposite page for rough work

**Problem 4 : (ADD AND SUBTRACT INSTRUCTIONS)**

Box No:      1      2      3

Initially:

a	b	c
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Place  $a + 2b - 3c$  in box 3  
(Minimum number of instructions = 4)

**SOLUTION**

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Use opposite page for rough work

**Problem 5 : (ADD AND SUBTRACT INSTRUCTIONS)**

Box No:	1	2	3
Initially:	x	y	?

Write a **single** sequence of instructions such that if box 3 contains x it will be replaced by y, and if it contains y it will be replaced by x.

(Minimum number of instructions = 2)

**SOLUTION**

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Use opposite page for rough work

In subsequent problems you may use instructions of the following type:

MULTIPLY:  $1 \times 2 \rightarrow 3$

**NOTE:** As for addition, the box numbers may be used in any combination. Any two or all three box numbers may be the same, e.g:

$$2 \times 1 \rightarrow 1$$

$$1 \times 1 \rightarrow 1$$

**Problem 6 : (ADD, SUBTRACT AND MULTIPLY INSTRUCTIONS)**

Box No:

1    2

Initially:

x	y
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Place  $x^5$  in box 1

(Minimum number of instructions = 3)

**SOLUTION**

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Use opposite page for rough work

In subsequent problems you may use instructions of the following type:

DIVIDE:  $2 \div 1 \rightarrow 2$

NOTES: When using DIVIDE instructions:

1. As in subtraction, the **first** and **third** box numbers must be the same.
2. Fractions disappear leaving only a whole number in the result box, e.g., 7 divided by 3 gives 2; 3 divided by 7 gives 0. (Any fraction of 1 becomes 0).
3. If a box is divided by itself the result is 1, unless the box originally contained zero. **Division by zero is not allowed.**

**Problem 7 : (ALL TYPES OF INSTRUCTION)**

Box No:                      1    2

Initially:

?	?
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Boxes 1 and 2 each contain odd whole numbers  
Place half the sum of these two numbers in box 1.  
(Minimum number of instructions = 4)

**SOLUTION**

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Use opposite page for rough work

**Problem 8 : (ALL TYPES OF INSTRUCTION)**

Box No:

1    2    3    4

Initially:

60	x	0	0
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**x** is a number of minutes

Place the number of complete hours in box 3  
and the number of minutes left over in box 4  
(Minimum number of instructions = 5)

**SOLUTION**

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Use opposite page for rough work

**Problem 9 : (ALL TYPES OF INSTRUCTION)**

Box No:            1        2        3

Initially:

x	0	0
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x is a number of car wheels

Place the number of cars this would equip  
(at 4 wheels per car) in box 2 and the number  
of wheels left over in box 3.  
(Minimum number of instructions = 7)

**SOLUTION**

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Use of opposite page for rough work

**Problem 10 : (ALL TYPES OF INSTRUCTION)**

Box No:

1    2    3

Initially:

?	?	?
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**Initially**, one of boxes 1 and 2 contains 8 and the other contains 9. The contents of box 3 are unknown.

Write a **single** sequence of instructions such that **whichever** of the two possible initial conditions is true, box 3 will finally contain 9.

(Minimum number of instructions = 2)

**SOLUTION**

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No model solutions known to exist
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Possible solutions shown on next page
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Answer 5 is non optimum as result is negative instead of positive

Answer 9 is non optimum as 8 steps used instead of 7.

1	Box	1	2	3	6	Box	1	2	
	Initial Value	3	5	7		Initial Value	x	y	
	Target Value	12	-	15		Target Value	$x^5$	-	
	Steps	3				Steps	3		
	$2 + 3 \rightarrow 1$	12	5	7		$1 * 1 \rightarrow 2$	x	$x^2$	
	$2 + 2 \rightarrow 3$	12	5	10		$2 * 2 \rightarrow 2$	x	$x^4$	
	$2 + 3 \rightarrow 3$	12	5	15		$1 * 2 \rightarrow 1$	$x^5$	$x^4$	
2	Box	1	2	3	7	Box	1	2	
	Initial Value	10	15	20		Initial Value	Oddx	Oddy	
	Target Value	-	55	60		Target Value	$(x+y) \text{Div} 2$	-	
	Steps	3				Steps	4		
	$3 + 3 \rightarrow 1$	40	15	20		$1 + 2 \rightarrow 1$	x+y	y	
	$1 + 2 \rightarrow 2$	40	55	20		$2 \text{ Div } 2 \rightarrow 2$	x+y	1	
	$1 + 3 \rightarrow 3$	40	55	60		$2 + 2 \rightarrow 2$	x+y	2	
						$1 \text{ Div } 2 \rightarrow 2$	$x+y) \text{ Div } 2$		
3	Box	1	2	3	8	Box	1	2	3
	Initial Value	a	b	0		Initial Value	60	x mins	0
	Target Value	b	a	-		Target Value	-	-	Hrs
	Steps	4				Steps	5		Mins
	$2 + 3 \rightarrow 3$	a	b	b		$2 + 3 \rightarrow 3$	60	x	x
	$3 - 1 \rightarrow 3$	a	b	b-a		$3 \text{ Div } 1 \rightarrow 3$	60	x	Hr
	$1 + 3 \rightarrow 1$	b	b	b-a		$1 * 3 \rightarrow 1$	$60 * \text{Hr}$	x	Hr
	$2 - 3 \rightarrow 2$	b	a	b-a		$4 + 2 \rightarrow 4$	$60 * \text{Hr}$	x	Hr
						$4 - 1 \rightarrow 4$	$60 * \text{Hr}$	x	Hr
4	Box	1	2	3	9	Box	1	2	3
	Initial Value	a	b	c		Initial Value	Wh	0	0
	Target Value	-	-	$a+2b-3c$		Target Value	-	Cars	Sp
	Steps	4				Steps	7		
	$2 - 3 \rightarrow 2$	a	b-c	c		Ans Exceeds minimum steps			
	$2 + 2 \rightarrow 2$	a	$2(b-c)$	c		$1 + 3 \rightarrow 3$	Wh	0	Wh
	$2 - 3 \rightarrow 2$	a	$2b-3c$	c		$1 + 1 \rightarrow 1$	$2\text{Wh}$	0	Wh
	$1 + 2 \rightarrow 3$	a	$2b-3c$	$a+2b-3c$		$1 \text{ Div } 3 \rightarrow 1$	2	0	Wh
5	Box	1	2	3		$1 + 1 \rightarrow 1$	4	0	Wh
	Initial Value	x	y	z		$2 + 3 \rightarrow 2$	4	Wh	Wh
	Target Value	-	-	x if $z = y$ y if $z = x$		$2 \text{ Div } 1 \rightarrow 2$	4	Car	Wh
	Steps	2				$1 * 2 \rightarrow 1$	4Car	Car	Wh
	Ans wrong sign					$3 - 1 \rightarrow 3$	4Car	Car	Sp
	$3 - 1 \rightarrow 3$	x	y	x-x	10	Box	1	2	3
	$3 - 2 \rightarrow 3$	x	y	-y		Initial Value	x	y	z
	or					Target Value	-	-	9
	$3 - 1 \rightarrow 3$	x	y	y-x		Steps	2		
	$3 - 2 \rightarrow 3$	x	y	-x		x=8 or 9, y is other digit			
						$1 \text{ Div } 2 \rightarrow 1$	0 or 1	9 or 8	-
						$1 + 2 \rightarrow 3$	0 or 1	9 or 8	9