

G51APS, Algorithmic Problem Solving
Coursework 1, 2012/2013
Invariants

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1 Invariants

Qu.1.

(a) (1 mark) $n \bmod 11$.

(b) (1 mark) $11 \times m - 5 \times n$.

$$\begin{aligned} & (11 \times m - 5 \times n)[m, n := m+5, n+11] \\ = & \{ \text{assignment rule} \} \\ & 11 \times (m+5) - 5 \times (n+11) \\ = & \{ \text{arithmetic} \} \\ & 11 \times m + 55 - 5 \times n - 55 \\ = & \{ \text{arithmetic} \} \\ & 11 \times m - 5 \times n . \end{aligned}$$

Qu.2.

Assignment	Expression	Invariant?
$m := m+9$	$m \bmod 3$	yes
$m := m+3$	$m \bmod 9$	no, $0 \bmod 9 \neq 3 \bmod 9$
$m, n := m+6, n+4$	$2m < 3n$	yes
$m, n := m+2, n+1$	$2m < 3n$	no, $2 \times 4 < 3 \times 3 \not\equiv 2 \times 6 < 3 \times 4$