

thm\_2Ewords\_2Edimword\_\_12  
(TMSzkShi43Q1mxQjYWdBJpFcR4V18k34ixS)

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**Definition 1** We define  $c\_2Emin\_2E\_3D\_3D\_3E$  to be  $\lambda P \in 2.\lambda Q \in 2.inj\_o (p P \Rightarrow p Q)$  of type  $\iota$ .

Let  $ty\_2Enum\_2Enum : \iota$  be given. Assume the following.

$$nonempty\ ty\_2Enum\_2Enum \tag{1}$$

**Definition 2** We define  $c\_2Emin\_2E\_3D$  to be  $\lambda A.\lambda x \in A.\lambda y \in A.inj\_o (x = y)$  of type  $\iota \Rightarrow \iota$ .

**Definition 3** We define  $c\_2Ebool\_2E\_2T$  to be  $(ap (ap (c\_2Emin\_2E\_3D (2^2)) (\lambda V0x \in 2.V0x)) (\lambda V1x \in 2.V1x))$

**Definition 4** We define  $c\_2Ebool\_2E\_21$  to be  $\lambda A.^{27a} : \iota.(\lambda V0P \in (2^{A-27a}).(ap (ap (c\_2Emin\_2E\_3D (2^{A-27a})))$

**Definition 5** We define  $c\_2Ebool\_2E\_2F$  to be  $(ap (c\_2Ebool\_2E\_21 2) (\lambda V0t \in 2.V0t))$ .

**Definition 6** We define  $c\_2Ebool\_2E\_27E$  to be  $(\lambda V0t \in 2.(ap (ap c\_2Emin\_2E\_3D\_3D\_3E V0t) c\_2Ebool\_2E\_2F))$

**Definition 7** We define  $c\_2Ebool\_2E\_2F\_5C$  to be  $(\lambda V0t1 \in 2.(\lambda V1t2 \in 2.(ap (c\_2Ebool\_2E\_21 2) (\lambda V2t \in 2.V2t)))$

Let  $c\_2Enum\_2EREP\_num : \iota$  be given. Assume the following.

$$c\_2Enum\_2EREP\_num \in (\omega^{ty\_2Enum\_2Enum}) \tag{2}$$

Let  $c\_2Enum\_2ESUC\_REP : \iota$  be given. Assume the following.

$$c\_2Enum\_2ESUC\_REP \in (\omega^{\omega}) \tag{3}$$

Let  $c\_2Enum\_2EABS\_num : \iota$  be given. Assume the following.

$$c\_2Enum\_2EABS\_num \in (ty\_2Enum\_2Enum^{\omega}) \tag{4}$$

**Definition 8** We define  $c\_2Enum\_2ESUC$  to be  $\lambda V0m \in ty\_2Enum\_2Enum.(ap c\_2Enum\_2EABS\_num (ap c\_2Enum\_2EREP\_num m))$

**Definition 9** We define  $c\_2Emin\_2E\_40$  to be  $\lambda A.\lambda P \in 2^A.$ **if**  $(\exists x \in A.p (ap P x))$  **then**  $(the (\lambda x.x \in A \wedge p (ap P x)))$  of type  $\iota \Rightarrow \iota$ .

**Definition 10** We define  $c\_Ebool\_2E\_3F$  to be  $\lambda A\_27a : \iota. (\lambda V0P \in (2^{A\_27a}). (ap\ V0P\ (ap\ (c\_Emin\_2E\_40$

**Definition 11** We define  $c\_Eprim\_rec\_2E\_3C$  to be  $\lambda V0m \in ty\_2Enum\_2Enum. \lambda V1n \in ty\_2Enum\_2Enum$

**Definition 12** We define  $c\_Earithmetic\_2E\_3E$  to be  $\lambda V0m \in ty\_2Enum\_2Enum. \lambda V1n \in ty\_2Enum\_2Enum$

**Definition 13** We define  $c\_Ebool\_2E\_5C\_2F$  to be  $(\lambda V0t1 \in 2. (\lambda V1t2 \in 2. (ap\ (c\_Ebool\_2E\_21\ 2)\ (\lambda V2t \in$

**Definition 14** We define  $c\_Earithmetic\_2E\_3E\_3D$  to be  $\lambda V0m \in ty\_2Enum\_2Enum. \lambda V1n \in ty\_2Enum\_2Enum$

**Definition 15** We define  $c\_Earithmetic\_2E\_3C\_3D$  to be  $\lambda V0m \in ty\_2Enum\_2Enum. \lambda V1n \in ty\_2Enum\_2Enum$

Let  $c\_Earithmetic\_2EEXP : \iota$  be given. Assume the following.

$$c\_Earithmetic\_2EEXP \in ((ty\_2Enum\_2Enum^{ty\_2Enum\_2Enum})^{ty\_2Enum\_2Enum})^{ty\_2Enum\_2Enum} \quad (5)$$

Let  $c\_Earithmetic\_2E\_2D : \iota$  be given. Assume the following.

$$c\_Earithmetic\_2E\_2D \in ((ty\_2Enum\_2Enum^{ty\_2Enum\_2Enum})^{ty\_2Enum\_2Enum})^{ty\_2Enum\_2Enum} \quad (6)$$

**Definition 16** We define  $c\_Enumeral\_2EiZ$  to be  $\lambda V0x \in ty\_2Enum\_2Enum. V0x$ .

Let  $c\_Enum\_2EZERO\_REP : \iota$  be given. Assume the following.

$$c\_Enum\_2EZERO\_REP \in \omega \quad (7)$$

**Definition 17** We define  $c\_Enum\_2E0$  to be  $(ap\ c\_Enum\_2EABS\_num\ c\_Enum\_2EZERO\_REP)$ .

Let  $c\_Earithmetic\_2E\_2B : \iota$  be given. Assume the following.

$$c\_Earithmetic\_2E\_2B \in ((ty\_2Enum\_2Enum^{ty\_2Enum\_2Enum})^{ty\_2Enum\_2Enum})^{ty\_2Enum\_2Enum} \quad (8)$$

Let  $c\_Earithmetic\_2EEVEN : \iota$  be given. Assume the following.

$$c\_Earithmetic\_2EEVEN \in (2^{ty\_2Enum\_2Enum}) \quad (9)$$

Let  $c\_Enumeral\_2Eonecount : \iota$  be given. Assume the following.

$$c\_Enumeral\_2Eonecount \in ((ty\_2Enum\_2Enum^{ty\_2Enum\_2Enum})^{ty\_2Enum\_2Enum})^{ty\_2Enum\_2Enum} \quad (10)$$

Let  $c\_Enumeral\_2Exactlog : \iota$  be given. Assume the following.

$$c\_Enumeral\_2Exactlog \in (ty\_2Enum\_2Enum^{ty\_2Enum\_2Enum}) \quad (11)$$

**Definition 18** We define  $c\_Ebool\_2ECOND$  to be  $\lambda A\_27a : \iota. (\lambda V0t \in 2. (\lambda V1t1 \in A\_27a. (\lambda V2t2 \in A\_27a. ($

**Definition 19** We define  $c\_Eprim\_rec\_2EPRE$  to be  $\lambda V0m \in ty\_2Enum\_2Enum. (ap\ (ap\ (ap\ (c\_Ebool\_2E$

**Definition 20** We define  $c\_Earithmetic\_2EZERO$  to be  $c\_Enum\_2E0$ .

**Definition 21** We define  $c\_Earithmetic\_EBIT2$  to be  $\lambda V0n \in ty\_Enum\_Enum.(ap (ap c\_Earithmetic$

**Definition 22** We define  $c\_Earithmetic\_ENUMERAL$  to be  $\lambda V0x \in ty\_Enum\_Enum.V0x$ .

Let  $c\_Earithmetic\_EDIV : \iota$  be given. Assume the following.

$$c\_Earithmetic\_EDIV \in ((ty\_Enum\_Enum^{ty\_Enum\_Enum})^{ty\_Enum\_Enum}) \quad (12)$$

**Definition 23** We define  $c\_Earithmetic\_EDIV2$  to be  $\lambda V0n \in ty\_Enum\_Enum.(ap (ap c\_Earithmetic$

Let  $c\_Enumeral\_Eteexp\_help : \iota$  be given. Assume the following.

$$c\_Enumeral\_Eteexp\_help \in ((ty\_Enum\_Enum^{ty\_Enum\_Enum})^{ty\_Enum\_Enum}) \quad (13)$$

Let  $c\_Earithmetic\_EODD : \iota$  be given. Assume the following.

$$c\_Earithmetic\_EODD \in (2^{ty\_Enum\_Enum}) \quad (14)$$

**Definition 24** We define  $c\_Ebool\_ELET$  to be  $\lambda A.27a : \iota.\lambda A.27b : \iota.(\lambda V0f \in (A.27b^{A.27a}).(\lambda V1x \in A.27$

Let  $c\_Earithmetic\_E\_2A : \iota$  be given. Assume the following.

$$c\_Earithmetic\_E\_2A \in ((ty\_Enum\_Enum^{ty\_Enum\_Enum})^{ty\_Enum\_Enum}) \quad (15)$$

**Definition 25** We define  $c\_Enumeral\_Einternal\_mult$  to be  $c\_Earithmetic\_E\_2A$ .

Let  $ty\_Ebool\_Eitself : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A0.nonempty A0 \Rightarrow nonempty (ty\_Ebool\_Eitself A0) \quad (16)$$

Let  $c\_Ewords\_Edimword : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A.27a.nonempty A.27a \Rightarrow c\_Ewords\_Edimword A.27a \in (ty\_Enum\_Enum^{(ty\_Ebool\_Eitself A.27a)}) \quad (17)$$

**Definition 26** We define  $c\_Earithmetic\_EBIT1$  to be  $\lambda V0n \in ty\_Enum\_Enum.(ap (ap c\_Earithmetic$

Let  $c\_Ebool\_Ethe\_value : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A.27a.nonempty A.27a \Rightarrow c\_Ebool\_Ethe\_value A.27a \in (ty\_Ebool\_Eitself A.27a) \quad (18)$$

Let  $ty\_Eone\_Eone : \iota$  be given. Assume the following.

$$nonempty ty\_Eone\_Eone \quad (19)$$

Let  $ty\_EfcP\_Ebit1 : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A0.nonempty A0 \Rightarrow nonempty (ty\_EfcP\_Ebit1 A0) \quad (20)$$

Let  $ty\_2EfcP\_2Ebit0 : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow nonempty\ (ty\_2EfcP\_2Ebit0\ A0) \quad (21)$$

Let  $c\_2Ewords\_2EINT\_MIN : \iota \Rightarrow \iota$  be given. Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow c\_2Ewords\_2EINT\_MIN\ A\_27a \in (ty\_2Enum\_2Enum^{(ty\_2Ebool\_2Eitself\ A\_27a)}) \quad (22)$$

Assume the following.

$$(\forall V0t1 \in 2. (\forall V1t2 \in 2. (((p\ V0t1) \Rightarrow (p\ V1t2)) \Rightarrow (((p\ V1t2) \Rightarrow (p\ V0t1)) \Rightarrow ((p\ V0t1) \Leftrightarrow (p\ V1t2)))))) \quad (23)$$

Assume the following.

$$(\forall V0t \in 2. (False \Rightarrow (p\ V0t))) \quad (24)$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow (\forall V0x \in A\_27a. ((V0x = V0x) \Leftrightarrow True)) \quad (25)$$

Assume the following.

$$(\forall V0t \in 2. (((True \Leftrightarrow (p\ V0t)) \Leftrightarrow (p\ V0t)) \wedge (((p\ V0t) \Leftrightarrow True) \Leftrightarrow (p\ V0t)) \wedge (((False \Leftrightarrow (p\ V0t)) \Leftrightarrow \neg(p\ V0t)) \wedge (((p\ V0t) \Leftrightarrow False) \Leftrightarrow \neg(p\ V0t)))))) \quad (26)$$

Assume the following.

$$\forall A\_27a.nonempty\ A\_27a \Rightarrow (\forall V0t1 \in A\_27a. (\forall V1t2 \in A\_27a. (((ap\ (ap\ (ap\ (c\_2Ebool\_2ECOND\ A\_27a)\ c\_2Ebool\_2ET)\ V0t1)\ V1t2) = V0t1) \wedge ((ap\ (ap\ (ap\ (c\_2Ebool\_2ECOND\ A\_27a)\ c\_2Ebool\_2EF)\ V0t1)\ V1t2) = V1t2)))))) \quad (27)$$

Assume the following.

$$(((ap\ c\_2Enum\_2ESUC\ c\_2Earithmetic\_2EZERO) = (ap\ c\_2Earithmetic\_2EBIT1\ c\_2Earithmetic\_2EZERO)) \wedge ((\forall V0n \in ty\_2Enum\_2Enum. ((ap\ c\_2Enum\_2ESUC\ (ap\ c\_2Earithmetic\_2EBIT1\ V0n)) = (ap\ c\_2Earithmetic\_2EBIT2\ V0n))) \wedge (\forall V1n \in ty\_2Enum\_2Enum. ((ap\ c\_2Enum\_2ESUC\ (ap\ c\_2Earithmetic\_2EBIT2\ V1n)) = (ap\ c\_2Earithmetic\_2EBIT1\ (ap\ c\_2Enum\_2ESUC\ V1n))))))) \quad (28)$$

Assume the following.

$$\begin{aligned}
& ((\forall V0n \in ty\_2Enum\_2Enum.((ap (ap c\_2Earithmetic\_2E\_2B \\
& \quad c\_2Enum\_2E0) V0n) = V0n)) \wedge ((\forall V1n \in ty\_2Enum\_2Enum.((ap \\
& \quad (ap c\_2Earithmetic\_2E\_2B V1n) c\_2Enum\_2E0) = V1n)) \wedge ((\forall V2n \in \\
& \quad ty\_2Enum\_2Enum.(\forall V3m \in ty\_2Enum\_2Enum.((ap (ap c\_2Earithmetic\_2E\_2B \\
& \quad (ap c\_2Earithmetic\_2ENUMERAL V2n)) (ap c\_2Earithmetic\_2ENUMERAL \\
& \quad V3m)) = (ap c\_2Earithmetic\_2ENUMERAL (ap c\_2Enumeral\_2EiZ (ap \\
& \quad (ap c\_2Earithmetic\_2E\_2B V2n) V3m)))))) \wedge ((\forall V4n \in ty\_2Enum\_2Enum. \\
& \quad ((ap (ap c\_2Earithmetic\_2E\_2A c\_2Enum\_2E0) V4n) = c\_2Enum\_2E0)) \wedge \\
& \quad ((\forall V5n \in ty\_2Enum\_2Enum.((ap (ap c\_2Earithmetic\_2E\_2A \\
& \quad V5n) c\_2Enum\_2E0) = c\_2Enum\_2E0)) \wedge ((\forall V6n \in ty\_2Enum\_2Enum. \\
& \quad (\forall V7m \in ty\_2Enum\_2Enum.((ap (ap c\_2Earithmetic\_2E\_2A ( \\
& \quad ap c\_2Earithmetic\_2ENUMERAL V6n)) (ap c\_2Earithmetic\_2ENUMERAL \\
& \quad V7m)) = (ap c\_2Earithmetic\_2ENUMERAL (ap (ap c\_2Earithmetic\_2E\_2A \\
& \quad V6n) V7m)))))) \wedge ((\forall V8n \in ty\_2Enum\_2Enum.((ap (ap c\_2Earithmetic\_2E\_2D \\
& \quad c\_2Enum\_2E0) V8n) = c\_2Enum\_2E0)) \wedge ((\forall V9n \in ty\_2Enum\_2Enum. \\
& \quad ((ap (ap c\_2Earithmetic\_2E\_2D V9n) c\_2Enum\_2E0) = V9n)) \wedge ((\forall V10n \in \\
& \quad ty\_2Enum\_2Enum.(\forall V11m \in ty\_2Enum\_2Enum.((ap (ap c\_2Earithmetic\_2E\_2D \\
& \quad (ap c\_2Earithmetic\_2ENUMERAL V10n)) (ap c\_2Earithmetic\_2ENUMERAL \\
& \quad V11m)) = (ap c\_2Earithmetic\_2ENUMERAL (ap (ap c\_2Earithmetic\_2E\_2D \\
& \quad V10n) V11m)))))) \wedge ((\forall V12n \in ty\_2Enum\_2Enum.((ap (ap c\_2Earithmetic\_2EEXP \\
& \quad c\_2Enum\_2E0) (ap c\_2Earithmetic\_2ENUMERAL (ap c\_2Earithmetic\_2EBIT1 \\
& \quad V12n))) = c\_2Enum\_2E0)) \wedge ((\forall V13n \in ty\_2Enum\_2Enum.((ap \\
& \quad (ap c\_2Earithmetic\_2EEXP c\_2Enum\_2E0) (ap c\_2Earithmetic\_2ENUMERAL \\
& \quad (ap c\_2Earithmetic\_2EBIT2 V13n))) = c\_2Enum\_2E0)) \wedge ((\forall V14n \in \\
& \quad ty\_2Enum\_2Enum.((ap (ap c\_2Earithmetic\_2EEXP V14n) c\_2Enum\_2E0) = \\
& \quad (ap c\_2Earithmetic\_2ENUMERAL (ap c\_2Earithmetic\_2EBIT1 c\_2Earithmetic\_2EZERO)))))) \wedge \\
& \quad ((\forall V15n \in ty\_2Enum\_2Enum.(\forall V16m \in ty\_2Enum\_2Enum. \\
& \quad ((ap (ap c\_2Earithmetic\_2EEXP (ap c\_2Earithmetic\_2ENUMERAL V15n)) \\
& \quad (ap c\_2Earithmetic\_2ENUMERAL V16m)) = (ap c\_2Earithmetic\_2ENUMERAL \\
& \quad (ap (ap c\_2Earithmetic\_2EEXP V15n) V16m)))))) \wedge ((ap c\_2Enum\_2ESUC \\
& \quad c\_2Enum\_2E0) = (ap c\_2Earithmetic\_2ENUMERAL (ap c\_2Earithmetic\_2EBIT1 \\
& \quad c\_2Earithmetic\_2EZERO))) \wedge ((\forall V17n \in ty\_2Enum\_2Enum. ( \\
& \quad (ap c\_2Enum\_2ESUC (ap c\_2Earithmetic\_2ENUMERAL V17n)) = (ap c\_2Earithmetic\_2ENUMERAL \\
& \quad (ap c\_2Enum\_2ESUC V17n)))))) \wedge ((ap c\_2Eprim\_rec\_2EPRE c\_2Enum\_2E0) = \\
& \quad c\_2Enum\_2E0) \wedge ((\forall V18n \in ty\_2Enum\_2Enum.((ap c\_2Eprim\_rec\_2EPRE \\
& \quad (ap c\_2Earithmetic\_2ENUMERAL V18n)) = (ap c\_2Earithmetic\_2ENUMERAL \\
& \quad (ap c\_2Eprim\_rec\_2EPRE V18n)))))) \wedge ((\forall V19n \in ty\_2Enum\_2Enum. \\
& \quad (((ap c\_2Earithmetic\_2ENUMERAL V19n) = c\_2Enum\_2E0) \Leftrightarrow (V19n = c\_2Earithmetic\_2EZERO))) \wedge \\
& \quad ((\forall V20n \in ty\_2Enum\_2Enum.((c\_2Enum\_2E0 = (ap c\_2Earithmetic\_2ENUMERAL \\
& \quad V20n)) \Leftrightarrow (V20n = c\_2Earithmetic\_2EZERO))) \wedge ((\forall V21n \in ty\_2Enum\_2Enum. \\
& \quad (\forall V22m \in ty\_2Enum\_2Enum.(((ap c\_2Earithmetic\_2ENUMERAL \\
& \quad V21n) = (ap c\_2Earithmetic\_2ENUMERAL V22m)) \Leftrightarrow (V21n = V22m)))))) \wedge \\
& \quad ((\forall V23n \in ty\_2Enum\_2Enum.((p (ap (ap c\_2Eprim\_rec\_2E\_3C \\
& \quad V23n) c\_2Enum\_2E0)) \Leftrightarrow False)) \wedge ((\forall V24n \in ty\_2Enum\_2Enum. \\
& \quad ((p (ap (ap c\_2Eprim\_rec\_2E\_3C c\_2Enum\_2E0) (ap c\_2Earithmetic\_2ENUMERAL \\
& \quad V24n))) \Leftrightarrow (p (ap (ap c\_2Eprim\_rec\_2E\_3C c\_2Earithmetic\_2EZERO) \\
& \quad V24n)))))) \wedge ((\forall V25n \in ty\_2Enum\_2Enum.(\forall V26m \in ty\_2Enum\_2Enum. \\
& \quad ((p (ap (ap c\_2Eprim\_rec\_2E\_3C (ap c\_2Earithmetic\_2ENUMERAL \\
& \quad V25n)) (ap c\_2Earithmetic\_2ENUMERAL V26m))) \Leftrightarrow (p (ap (ap c\_2Eprim\_rec\_2E\_3C \\
& \quad V25n) V26m)))))) \wedge ((\forall V27n \in ty\_2Enum\_2Enum.((p (ap (ap c\_2Earithmetic\_2E\_3E \\
& \quad c\_2Enum\_2E0) V27n)) \Leftrightarrow False)) \wedge ((\forall V28n \in ty\_2Enum\_2Enum. \\
& \quad ((p (ap (ap c\_2Earithmetic\_2E\_3E (ap c\_2Earithmetic\_2ENUMERAL \\
& \quad V28n)) c\_2Enum\_2E0)) \Leftrightarrow (p (ap (ap c\_2Eprim\_rec\_2E\_3C c\_2Earithmetic\_2EZERO) \\
& \quad V28n)))))) \wedge ((\forall V29n \in ty\_2Enum\_2Enum.(\forall V30m \in ty\_2Enum\_2Enum. \\
& \quad ((p (ap (ap c\_2Earithmetic\_2E\_3E (ap c\_2Earithmetic\_2ENUMERAL \\
& \quad V29n)) (ap c\_2Earithmetic\_2ENUMERAL V30m))) \Leftrightarrow (p (ap (ap c\_2Eprim\_rec\_2E\_3C \\
& \quad V30m) V29n)))))) \wedge ((\forall V31n \in ty\_2Enum\_2Enum.((p (ap (ap c\_2Earithmetic\_2E\_3C\_3D \\
& \quad c\_2Enum\_2E0) V31n)) \Leftrightarrow True)) \wedge ((\forall V32n \in ty\_2Enum\_2Enum. \\
& \quad ((p (ap (ap c\_2Earithmetic\_2E\_3C\_3D (ap c\_2Earithmetic\_2ENUMERAL
\end{aligned}$$

Assume the following.

$$\begin{aligned}
& (\forall V0n \in ty\_2Enum\_2Enum. (\forall V1m \in ty\_2Enum\_2Enum. ( \\
& ((c\_2Earithmic\_2EZERO = (ap c\_2Earithmic\_2EBIT1 V0n)) \Leftrightarrow False) \wedge \\
& (((ap c\_2Earithmic\_2EBIT1 V0n) = c\_2Earithmic\_2EZERO) \Leftrightarrow \\
& False) \wedge (((c\_2Earithmic\_2EZERO = (ap c\_2Earithmic\_2EBIT2 \\
& V0n)) \Leftrightarrow False) \wedge (((ap c\_2Earithmic\_2EBIT2 V0n) = c\_2Earithmic\_2EZERO) \Leftrightarrow \\
& False) \wedge (((ap c\_2Earithmic\_2EBIT1 V0n) = (ap c\_2Earithmic\_2EBIT2 \\
& V1m)) \Leftrightarrow False) \wedge (((ap c\_2Earithmic\_2EBIT2 V0n) = (ap c\_2Earithmic\_2EBIT1 \\
& V1m)) \Leftrightarrow False) \wedge (((ap c\_2Earithmic\_2EBIT1 V0n) = (ap c\_2Earithmic\_2EBIT1 \\
& V1m)) \Leftrightarrow (V0n = V1m)) \wedge (((ap c\_2Earithmic\_2EBIT2 V0n) = (ap c\_2Earithmic\_2EBIT2 \\
& V1m)) \Leftrightarrow (V0n = V1m))))))))) \\
& \tag{30}
\end{aligned}$$

Assume the following.

$$\begin{aligned}
& (((ap c\_2Eprim\_rec\_2EPRE c\_2Earithmic\_2EZERO) = c\_2Earithmic\_2EZERO) \wedge \\
& (((ap c\_2Eprim\_rec\_2EPRE (ap c\_2Earithmic\_2EBIT1 c\_2Earithmic\_2EZERO)) = \\
& c\_2Earithmic\_2EZERO) \wedge ((\forall V0n \in ty\_2Enum\_2Enum. ((ap \\
& c\_2Eprim\_rec\_2EPRE (ap c\_2Earithmic\_2EBIT1 (ap c\_2Earithmic\_2EBIT1 \\
& V0n))) = (ap c\_2Earithmic\_2EBIT2 (ap c\_2Eprim\_rec\_2EPRE (ap \\
& c\_2Earithmic\_2EBIT1 V0n)))))) \wedge ((\forall V1n \in ty\_2Enum\_2Enum. \\
& ((ap c\_2Eprim\_rec\_2EPRE (ap c\_2Earithmic\_2EBIT1 (ap c\_2Earithmic\_2EBIT2 \\
& V1n))) = (ap c\_2Earithmic\_2EBIT2 (ap c\_2Earithmic\_2EBIT1 \\
& V1n)))) \wedge ((\forall V2n \in ty\_2Enum\_2Enum. ((ap c\_2Eprim\_rec\_2EPRE \\
& (ap c\_2Earithmic\_2EBIT2 V2n)) = (ap c\_2Earithmic\_2EBIT1 V2n))))))))) \\
& \tag{31}
\end{aligned}$$

Assume the following.

$$\begin{aligned}
& (\forall V0n \in ty\_2Enum\_2Enum. ((p (ap c\_2Earithmic\_2EVEN c\_2Earithmic\_2EZERO)) \wedge \\
& ((p (ap c\_2Earithmic\_2EVEN (ap c\_2Earithmic\_2EBIT2 V0n))) \wedge \\
& ((\neg(p (ap c\_2Earithmic\_2EVEN (ap c\_2Earithmic\_2EBIT1 V0n)))) \wedge \\
& ((\neg(p (ap c\_2Earithmic\_2EODD c\_2Earithmic\_2EZERO)) \wedge (( \\
& \neg(p (ap c\_2Earithmic\_2EODD (ap c\_2Earithmic\_2EBIT2 V0n)))) \wedge \\
& (p (ap c\_2Earithmic\_2EODD (ap c\_2Earithmic\_2EBIT1 V0n))))))))) \\
& \tag{32}
\end{aligned}$$

Assume the following.

$$\begin{aligned}
& (\forall V0acc \in ty\_2Enum\_2Enum. (\forall V1n \in ty\_2Enum\_2Enum. \\
& (((ap (ap c\_2Enumeral\_2Eexp\_help c\_2Earithmic\_2EZERO) V0acc) = \\
& (ap c\_2Earithmic\_2EBIT2 V0acc)) \wedge (((ap (ap c\_2Enumeral\_2Eexp\_help \\
& (ap c\_2Earithmic\_2EBIT1 V1n)) V0acc) = (ap (ap c\_2Enumeral\_2Eexp\_help \\
& (ap c\_2Eprim\_rec\_2EPRE (ap c\_2Earithmic\_2EBIT1 V1n)) (ap \\
& c\_2Earithmic\_2EBIT1 V0acc))) \wedge ((ap (ap c\_2Enumeral\_2Eexp\_help \\
& (ap c\_2Earithmic\_2EBIT2 V1n)) V0acc) = (ap (ap c\_2Enumeral\_2Eexp\_help \\
& (ap c\_2Earithmic\_2EBIT1 V1n)) (ap c\_2Earithmic\_2EBIT1 V0acc)))))) \\
& \tag{33}
\end{aligned}$$

Assume the following.

$$\begin{aligned}
& ((\forall V0x \in ty\_2Enum\_2Enum.((ap (ap c\_2Enumeral\_2Eonecount \\
& c\_2Earithmetic\_2EZERO) V0x) = V0x)) \wedge ((\forall V1n \in ty\_2Enum\_2Enum. \\
& (\forall V2x \in ty\_2Enum\_2Enum.((ap (ap c\_2Enumeral\_2Eonecount \\
& (ap c\_2Earithmetic\_2EBIT1 V1n)) V2x) = (ap (ap c\_2Enumeral\_2Eonecount \\
& V1n) (ap c\_2Enum\_2ESUC V2x)))))) \wedge ((\forall V3n \in ty\_2Enum\_2Enum. \\
& (\forall V4x \in ty\_2Enum\_2Enum.((ap (ap c\_2Enumeral\_2Eonecount \\
& (ap c\_2Earithmetic\_2EBIT2 V3n)) V4x) = c\_2Earithmetic\_2EZERO))))))
\end{aligned} \tag{34}$$

Assume the following.

$$\begin{aligned}
& (((ap c\_2Enumeral\_2Exactlog c\_2Earithmetic\_2EZERO) = c\_2Earithmetic\_2EZERO) \wedge \\
& ((\forall V0n \in ty\_2Enum\_2Enum.((ap c\_2Enumeral\_2Exactlog ( \\
& ap c\_2Earithmetic\_2EBIT1 V0n)) = c\_2Earithmetic\_2EZERO)) \wedge ((\forall V1n \in \\
& ty\_2Enum\_2Enum.((ap c\_2Enumeral\_2Exactlog (ap c\_2Earithmetic\_2EBIT2 \\
& V1n)) = (ap (ap (c\_2Ebool\_2ELET ty\_2Enum\_2Enum ty\_2Enum\_2Enum) \\
& (\lambda V2x \in ty\_2Enum\_2Enum.(ap (ap (ap (c\_2Ebool\_2ECOND ty\_2Enum\_2Enum) \\
& (ap (ap (c\_2Emin\_2E\_3D ty\_2Enum\_2Enum) V2x) c\_2Earithmetic\_2EZERO)) \\
& c\_2Earithmetic\_2EZERO) (ap c\_2Earithmetic\_2EBIT1 V2x)))) (ap \\
& (ap c\_2Enumeral\_2Eonecount V1n) c\_2Earithmetic\_2EZERO))))))
\end{aligned} \tag{35}$$

Assume the following.

$$(\forall V0x \in ty\_2Enum\_2Enum.((ap c\_2Earithmetic\_2EDIV2 (ap c\_2Earithmetic\_2EBIT1 V0x)) = V0x)) \tag{36}$$

Assume the following.

$$\begin{aligned}
& (\forall V0n \in ty\_2Enum\_2Enum. (\forall V1x \in ty\_2Enum\_2Enum. ( \\
& \forall V2y \in ty\_2Enum\_2Enum. (((ap (ap c\_2Earithmic\_2E\_2A c\_2Earithmic\_2EZERO) \\
& V0n) = c\_2Earithmic\_2EZERO) \wedge (((ap (ap c\_2Earithmic\_2E\_2A \\
& V0n) c\_2Earithmic\_2EZERO) = c\_2Earithmic\_2EZERO) \wedge ((ap \\
& (ap c\_2Earithmic\_2E\_2A (ap c\_2Earithmic\_2EBIT1 V1x)) (ap \\
& c\_2Earithmic\_2EBIT1 V2y)) = (ap (ap c\_2Enumeral\_2Einternal\_mult \\
& (ap c\_2Earithmic\_2EBIT1 V1x)) (ap c\_2Earithmic\_2EBIT1 V2y)))) \wedge \\
& (((ap (ap c\_2Earithmic\_2E\_2A (ap c\_2Earithmic\_2EBIT1 V1x)) \\
& (ap c\_2Earithmic\_2EBIT2 V2y)) = (ap (ap (c\_2Ebool\_2ELET ty\_2Enum\_2Enum \\
& ty\_2Enum\_2Enum) (\lambda V3n \in ty\_2Enum\_2Enum. (ap (ap (ap (c\_2Ebool\_2ECOND \\
& ty\_2Enum\_2Enum) (ap c\_2Earithmic\_2EODD V3n)) (ap (ap c\_2Enumeral\_2Eexp\_help \\
& (ap c\_2Earithmic\_2EDIV2 V3n)) (ap c\_2Eprim\_rec\_2EPRE (ap c\_2Earithmic\_2EBIT1 \\
& V1x)))) (ap (ap c\_2Enumeral\_2Einternal\_mult (ap c\_2Earithmic\_2EBIT1 \\
& V1x)) (ap c\_2Earithmic\_2EBIT2 V2y)))))) (ap c\_2Enumeral\_2Eexactlog \\
& (ap c\_2Earithmic\_2EBIT2 V2y)))) \wedge (((ap (ap c\_2Earithmic\_2E\_2A \\
& (ap c\_2Earithmic\_2EBIT2 V1x)) (ap c\_2Earithmic\_2EBIT1 V2y)) = \\
& (ap (ap (c\_2Ebool\_2ELET ty\_2Enum\_2Enum ty\_2Enum\_2Enum) (\lambda V4m \in \\
& ty\_2Enum\_2Enum. (ap (ap (ap (c\_2Ebool\_2ECOND ty\_2Enum\_2Enum) \\
& (ap c\_2Earithmic\_2EODD V4m)) (ap (ap c\_2Enumeral\_2Eexp\_help \\
& (ap c\_2Earithmic\_2EDIV2 V4m)) (ap c\_2Eprim\_rec\_2EPRE (ap c\_2Earithmic\_2EBIT1 \\
& V2y)))) (ap (ap c\_2Enumeral\_2Einternal\_mult (ap c\_2Earithmic\_2EBIT2 \\
& V1x)) (ap c\_2Earithmic\_2EBIT1 V2y)))))) (ap c\_2Enumeral\_2Eexactlog \\
& (ap c\_2Earithmic\_2EBIT2 V1x)))) \wedge ((ap (ap c\_2Earithmic\_2E\_2A \\
& (ap c\_2Earithmic\_2EBIT2 V1x)) (ap c\_2Earithmic\_2EBIT2 V2y)) = \\
& (ap (ap (c\_2Ebool\_2ELET ty\_2Enum\_2Enum ty\_2Enum\_2Enum) (\lambda V5m \in \\
& ty\_2Enum\_2Enum. (ap (ap (c\_2Ebool\_2ELET ty\_2Enum\_2Enum ty\_2Enum\_2Enum) \\
& (\lambda V6n \in ty\_2Enum\_2Enum. (ap (ap (ap (c\_2Ebool\_2ECOND ty\_2Enum\_2Enum) \\
& (ap c\_2Earithmic\_2EODD V5m)) (ap (ap c\_2Enumeral\_2Eexp\_help \\
& (ap c\_2Earithmic\_2EDIV2 V5m)) (ap c\_2Eprim\_rec\_2EPRE (ap c\_2Earithmic\_2EBIT2 \\
& V2y)))) (ap (ap (ap (c\_2Ebool\_2ECOND ty\_2Enum\_2Enum) (ap c\_2Earithmic\_2EODD \\
& V6n)) (ap (ap c\_2Enumeral\_2Eexp\_help (ap c\_2Earithmic\_2EDIV2 \\
& V6n)) (ap c\_2Eprim\_rec\_2EPRE (ap c\_2Earithmic\_2EBIT2 V1x)))) \\
& (ap (ap c\_2Enumeral\_2Einternal\_mult (ap c\_2Earithmic\_2EBIT2 \\
& V1x)) (ap c\_2Earithmic\_2EBIT2 V2y)))))) (ap c\_2Enumeral\_2Eexactlog \\
& (ap c\_2Earithmic\_2EBIT2 V2y)))) (ap c\_2Enumeral\_2Eexactlog \\
& (ap c\_2Earithmic\_2EBIT2 V1x))))))))) (37)
\end{aligned}$$

Assume the following.

$$\begin{aligned}
& \forall A\_27a. nonempty A\_27a \Rightarrow ((ap (c\_2Ewords\_2Edimword A\_27a) \\
& (c\_2Ebool\_2Ethe\_value A\_27a)) = (ap (ap c\_2Earithmic\_2E\_2A \\
& (ap c\_2Earithmic\_2ENUMERAL (ap c\_2Earithmic\_2EBIT2 c\_2Earithmic\_2EZERO))) \\
& (ap (c\_2Ewords\_2EINT\_MIN A\_27a) (c\_2Ebool\_2Ethe\_value A\_27a)))) (38)
\end{aligned}$$



Assume the following.

$$\begin{aligned}
& ((ap (c\_2Ewords\_2EINT\_MIN (ty\_2Efc\_2Ebit0 (ty\_2Efc\_2Ebit0 \\
& \quad (ty\_2Efc\_2Ebit1 ty\_2Eone\_2Eone)))) (c\_2Ebool\_2Ethe\_value \\
& \quad (ty\_2Efc\_2Ebit0 (ty\_2Efc\_2Ebit0 (ty\_2Efc\_2Ebit1 ty\_2Eone\_2Eone)))))) = \\
& (ap c\_2Earithmetic\_2ENUMERAL (ap c\_2Earithmetic\_2EBIT2 (ap c\_2Earithmetic\_2EBIT1 \\
& \quad (ap c\_2Earithmetic\_2EBIT1 (ap c\_2Earithmetic\_2EBIT1 (ap c\_2Earithmetic\_2EBIT1 \\
& \quad (ap c\_2Earithmetic\_2EBIT1 (ap c\_2Earithmetic\_2EBIT1 (ap c\_2Earithmetic\_2EBIT1 \\
& \quad (ap c\_2Earithmetic\_2EBIT1 (ap c\_2Earithmetic\_2EBIT1 (ap c\_2Earithmetic\_2EBIT1 \\
& \quad c\_2Earithmetic\_2EZERO))))))))))))) \\
& \hspace{20em} (39)
\end{aligned}$$

**Theorem 1**

$$\begin{aligned}
& ((ap (c\_2Ewords\_2Edimword (ty\_2Efc\_2Ebit0 (ty\_2Efc\_2Ebit0 \\
& \quad (ty\_2Efc\_2Ebit1 ty\_2Eone\_2Eone)))) (c\_2Ebool\_2Ethe\_value \\
& \quad (ty\_2Efc\_2Ebit0 (ty\_2Efc\_2Ebit0 (ty\_2Efc\_2Ebit1 ty\_2Eone\_2Eone)))))) = \\
& (ap c\_2Earithmetic\_2ENUMERAL (ap c\_2Earithmetic\_2EBIT2 (ap c\_2Earithmetic\_2EBIT1 \\
& \quad (ap c\_2Earithmetic\_2EBIT1 (ap c\_2Earithmetic\_2EBIT1 (ap c\_2Earithmetic\_2EBIT1 \\
& \quad (ap c\_2Earithmetic\_2EBIT1 (ap c\_2Earithmetic\_2EBIT1 (ap c\_2Earithmetic\_2EBIT1 \\
& \quad (ap c\_2Earithmetic\_2EBIT1 (ap c\_2Earithmetic\_2EBIT1 (ap c\_2Earithmetic\_2EBIT1 \\
& \quad (ap c\_2Earithmetic\_2EBIT1 c\_2Earithmetic\_2EZERO)))))))))))))
\end{aligned}$$