Descriptions of SHA-256, SHA-384, and SHA-512

Contents

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1. Introduction

An n-bit *hash* is a map from arbitrary length messages to n-bit *hash values*. An n-bit *cryptographic hash* is an n-bit hash which is *one-way*[1] and *collision-resistant*.[2] Such functions are important cryptographic primitives used for such things as digital signatures and password protection.

Current popular hashes produce hash values of length $n = 128$ (MD4 and MD5) and $n = 160$ (SHA-1), and therefore can provide no more than 64 or 80 bits of security, respectively, against collision attacks. Since the goal of the new Advanced Encryption Standard (AES) is to offer, at its three cryptovariable sizes, 128, 192, and 256 bits of security, there is a need for companion hash algorithms which provide similar levels of enhanced security.

SHA-256, described in Chapter 2 of this paper, is a 256-bit hash and is meant to provide 128 bits of security against collision attacks. SHA-512, in Chapter 3, is a 512-bit hash, and is meant to provide 256 bits of security against collision attacks. To obtain a 384-bit hash value (192-bits of security) will require truncating the SHA-512 output as described in Chapter 4.

[1] Given a hash value, it should require work equivalent to about 2^n hash computations find any message that hashes to that value.

[2] Finding any two messages which hash to the same value should require work equivalent to about $2^{n/2}$ hash computations.

2. SHA-256

2.1. Overview

SHA-256 operates in the manner of MD4, MD5, and SHA-1: The message to be hashed is first

(1) padded with its length in such a way that the result is a multiple of 512 bits long, and then

(2) parsed into 512-bit *message blocks* $M^{(1)}, M^{(2)}, \ldots, M^{(N)}$.

The message blocks are processed one at a time: Beginning with a fixed initial hash value $H^{(0)}$, sequentially compute

$$H^{(i)} = H^{(i-1)} + C_{M^{(i)}}(H^{(i-1)}),$$

where C is the SHA-256 *compression function* and $+$ means word-wise mod 2^{32} addition. $H^{(N)}$ is the **hash** of M.

2.2. Description of SHA-256

The SHA-256 compression function operates on a 512-bit *message block* and a 256-bit *intermediate hash value*. It is essentially a 256-bit block cipher algorithm which encrypts the intermediate hash value using the message block as key. Hence there are two main components to describe: (1) the SHA-256 compression function, and (2) the SHA-256 message schedule.
We will use the following notation:

$\oplus$	bitwise XOR
$\wedge$	bitwise AND
$\vee$	bitwise OR
$\neg$	bitwise complement
$+$	mod 2^{32} addition
R^n	right shift by n bits
S^n	right rotation by n bits

Table 1: Notation

All of these operators act on 32-bit words.

The **initial hash value** $H^{(0)}$ is the following sequence of 32-bit words (which are obtained by taking the fractional parts of the square roots of the first eight primes):

$$
\begin{aligned}
H_1^{(0)} &= \texttt{6a09e667} \\
H_2^{(0)} &= \texttt{bb67ae85} \\
H_3^{(0)} &= \texttt{3c6ef372} \\
H_4^{(0)} &= \texttt{a54ff53a} \\
H_5^{(0)} &= \texttt{510e527f} \\
H_6^{(0)} &= \texttt{9b05688c} \\
H_7^{(0)} &= \texttt{1f83d9ab} \\
H_8^{(0)} &= \texttt{5be0cd19}
\end{aligned}
$$

Preprocessing

Computation of the hash of a message begins by preparing the message:

1. Pad the message in the usual way: Suppose the length of the message M, in bits, is ℓ. Append the bit "1" to the end of the message, and then k zero bits, where k is the smallest non-negative solution to the equation $\ell + 1 + k \equiv 448 \bmod 512$. To this append the 64-bit block which is equal to the number ℓ written in binary. For example, the (8-bit ASCII) message "abc" has length $8 \cdot 3 = 24$ so it is padded with a one, then $448 - (24 + 1) = 423$ zero bits, and then its length to become the 512-bit padded message

$$\texttt{01100001 01100010 01100011 1}\ \underbrace{00\cdots0}_{423}\ \underbrace{00\cdots011000}_{64}.$$

   The length of the padded message should now be a multiple of 512 bits.

2. Parse the message into N 512-bit blocks $M^{(1)}, M^{(2)}, \ldots, M^{(N)}$. The first 32 bits of message block i are denoted $M_0^{(i)}$, the next 32 bits are $M_1^{(i)}$, and so on up to $M_{15}^{(i)}$. We use the big-endian convention throughout, so within each 32-bit word, the left-most bit is stored in the most significant bit position.

Main loop

The hash computation proceeds as follows:

For $i = 1$ to N (N = number of blocks in the padded message)
{

• Initialize registers a, b, c, d, e, f, g, h with the $(i-1)^{\text{st}}$ intermediate hash value (= the initial hash value when $i = 1$) •

$a \leftarrow H_1^{(i-1)}$

$b \leftarrow H_2^{(i-1)}$

$\vdots$

$h \leftarrow H_8^{(i-1)}$

• Apply the **SHA-256 compression function** to update registers $a, b, \ldots, h$ •

For $j = 0$ to 63

{

Compute $Ch(e, f, g)$, $Maj(a, b, c)$, $\Sigma_0(a)$, $\Sigma_1(e)$, and W_j (see Definitions below)

$T_1 \leftarrow h + \Sigma_1(e) + Ch(e, f, g) + K_j + W_j$

$T_2 \leftarrow \Sigma_0(a) + Maj(a, b, c)$

$h \leftarrow g$

$g \leftarrow f$

$f \leftarrow e$

$e \leftarrow d + T_1$

$d \leftarrow c$

$c \leftarrow b$

$b \leftarrow a$

$a \leftarrow T_1 + T_2$

}

• Compute the i^{th} **intermediate hash value** $H^{(i)}$ •

$H_1^{(i)} \leftarrow a + H_1^{(i-1)}$

$H_2^{(i)} \leftarrow b + H_2^{(i-1)}$

$\vdots$

$H_8^{(i)} \leftarrow h + H_8^{(i-1)}$

}

$H^{(N)} = (H_1^{(N)}, H_2^{(N)}, \ldots, H_8^{(N)})$ is the **hash** of M.

Definitions

Six logical functions are used in SHA-256. Each of these functions operates on 32-bit words and produces a 32-bit word as output. Each function is defined as follows:

$$
\begin{aligned}
Ch(x, y, z) &= (x \wedge y) \oplus (\neg x \wedge z) \\
Maj(x, y, z) &= (x \wedge y) \oplus (x \wedge z) \oplus (y \wedge z) \\
\Sigma_0(x) &= S^2(x) \oplus S^{13}(x) \oplus S^{22}(x) \\
\Sigma_1(x) &= S^6(x) \oplus S^{11}(x) \oplus S^{25}(x) \\
\sigma_0(x) &= S^7(x) \oplus S^{18}(x) \oplus R^3(x) \\
\sigma_1(x) &= S^{17}(x) \oplus S^{19}(x) \oplus R^{10}(x)
\end{aligned}
$$

Expanded message blocks $W_0, W_1, \ldots, W_{63}$ are computed as follows via the **SHA-256 message schedule**:

$W_j = M_j^{(i)}$ for $j = 0, 1, \ldots, 15$, and
For $j = 16$ to 63
{

$$W_j \leftarrow \sigma_1(W_{j-2}) + W_{j-7} + \sigma_0(W_{j-15}) + W_{j-16}$$

}

Definitions, continued

A sequence of constant words, $K_0, \ldots, K_{63}$, is used in SHA-256. In hex, these are given by

```
428a2f98 71374491 b5c0fbcf e9b5dba5 3956c25b 59f111f1 923f82a4 ab1c5ed5
d807aa98 12835b01 243185be 550c7dc3 72be5d74 80deb1fe 9bdc06a7 c19bf174
e49b69c1 efbe4786 0fc19dc6 240ca1cc 2de92c6f 4a7484aa 5cb0a9dc 76f988da
983e5152 a831c66d b00327c8 bf597fc7 c6e00bf3 d5a79147 06ca6351 14292967
27b70a85 2e1b2138 4d2c6dfc 53380d13 650a7354 766a0abb 81c2c92e 92722c85
a2bfe8a1 a81a664b c24b8b70 c76c51a3 d192e819 d6990624 f40e3585 106aa070
19a4c116 1e376c08 2748774c 34b0bcb5 391c0cb3 4ed8aa4a 5b9cca4f 682e6ff3
748f82ee 78a5636f 84c87814 8cc70208 90befffa a4506ceb bef9a3f7 c67178f2
```

These are the first thirty-two bits of the fractional parts of the cube roots of the first sixty-four primes.

2.3. Diagrams

The SHA-256 compression function is pictured below:

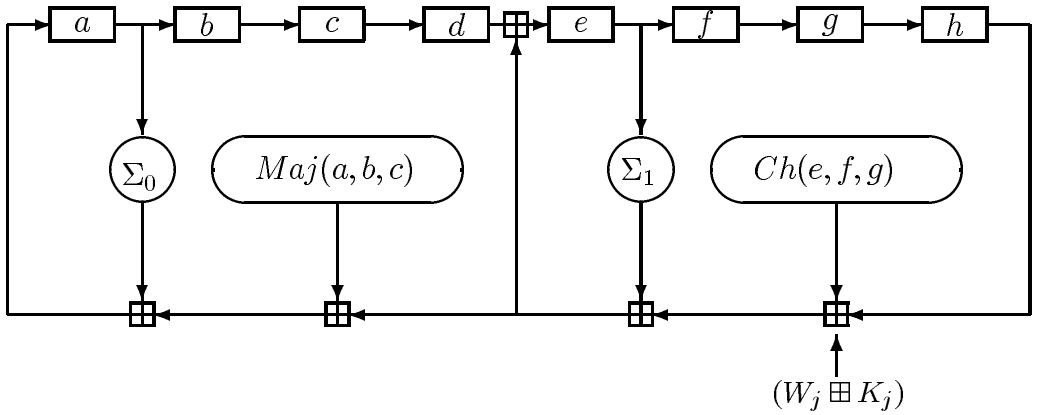

Figure 1: j^{th} internal step of the SHA-256 compression function C

where the symbol $\boxplus$ denotes mod 2^{32} addition.

The message schedule can be drawn as follows:

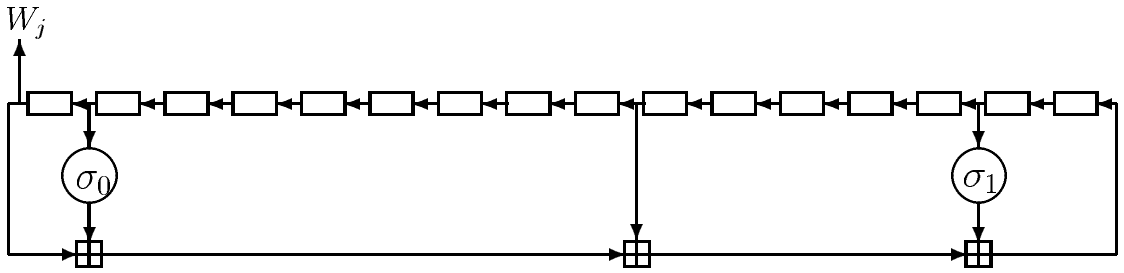

Figure 2: SHA-256 message schedule

The registers here are loaded with $W_0, W_1, \ldots, W_{15}$.

2.4. Sample hash computations

Page 11 shows the result of hashing the 24-bit message "`abc`". After padding the message becomes (in hexadecimal)

`61626380 00000000 00000000 00000000 00000000 00000000 00000000 00000000`
`00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000018`,

and the hash value is

`ba7816bf 8f01cfea 414140de 5dae2223 b00361a3 96177a9c b410ff61 f20015ad`.

Pages 12 and 15 show the result of hashing the 448-bit message

"`abcdbcdecdefdefgefghfghighijhijkijkljklmklmnlmnomnopnopq`"

which, after padding, becomes the 2-block message

`61626364 62636465 63646566 64656667 65666768 66676869 6768696a 68696a6b`
`696a6b6c 6a6b6c6d 6b6c6d6e 6c6d6e6f 6d6e6f70 6e6f7071 80000000 00000000`
`00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000`
`00000000 00000000 00000000 00000000 00000000 00000000 00000000 000001c0`.

The hash value for this message is

`248d6a61 d20638b8 e5c02693 0c3e6039 a33ce459 64ff2167 f6ecedd4 19db06c1`.

Hash of "abc"

	a	b	c	d	e	f	g	h
init:	6a09e667	bb67ae85	3c6ef372	a54ff53a	510e527f	9b05688c	1f83d9ab	5be0cd19
t = 0	5d6aebcd	6a09e667	bb67ae85	3c6ef372	fa2a4622	510e527f	9b05688c	1f83d9ab
t = 1	5a6ad9ad	5d6aebcd	6a09e667	bb67ae85	78ce7989	fa2a4622	510e527f	9b05688c
t = 2	c8c347a7	5a6ad9ad	5d6aebcd	6a09e667	f92939eb	78ce7989	fa2a4622	510e527f
t = 3	d550f666	c8c347a7	5a6ad9ad	5d6aebcd	24e00850	f92939eb	78ce7989	fa2a4622
t = 4	04409a6a	d550f666	c8c347a7	5a6ad9ad	43ada245	24e00850	f92939eb	78ce7989
t = 5	2b4209f5	04409a6a	d550f666	c8c347a7	714260ad	43ada245	24e00850	f92939eb
t = 6	e5030380	2b4209f5	04409a6a	d550f666	9b27a401	714260ad	43ada245	24e00850
t = 7	85a07b5f	e5030380	2b4209f5	04409a6a	0c657a79	9b27a401	714260ad	43ada245
t = 8	8e04ecb9	85a07b5f	e5030380	2b4209f5	32ca2d8c	0c657a79	9b27a401	714260ad
t = 9	8c87346b	8e04ecb9	85a07b5f	e5030380	1cc92596	32ca2d8c	0c657a79	9b27a401
t = 10	4798a3f4	8c87346b	8e04ecb9	85a07b5f	436b23e8	1cc92596	32ca2d8c	0c657a79
t = 11	f71fc5a9	4798a3f4	8c87346b	8e04ecb9	816fd6e9	436b23e8	1cc92596	32ca2d8c
t = 12	87912990	f71fc5a9	4798a3f4	8c87346b	1e578218	816fd6e9	436b23e8	1cc92596
t = 13	d932eb16	87912990	f71fc5a9	4798a3f4	745a48de	1e578218	816fd6e9	436b23e8
t = 14	c0645fde	d932eb16	87912990	f71fc5a9	0b92f20c	745a48de	1e578218	816fd6e9
t = 15	b0fa238e	c0645fde	d932eb16	87912990	07590dcd	0b92f20c	745a48de	1e578218
t = 16	21da9a9b	b0fa238e	c0645fde	d932eb16	8034229c	07590dcd	0b92f20c	745a48de
t = 17	c2fbd9d1	21da9a9b	b0fa238e	c0645fde	846ee454	8034229c	07590dcd	0b92f20c
t = 18	fe777bbf	c2fbd9d1	21da9a9b	b0fa238e	cc899961	846ee454	8034229c	07590dcd
t = 19	e1f20c33	fe777bbf	c2fbd9d1	21da9a9b	b0638179	cc899961	846ee454	8034229c
t = 20	9dc68b63	e1f20c33	fe777bbf	c2fbd9d1	8ada8930	b0638179	cc899961	846ee454
t = 21	c2606d6d	9dc68b63	e1f20c33	fe777bbf	e1257970	8ada8930	b0638179	cc899961
t = 22	a7a3623f	c2606d6d	9dc68b63	e1f20c33	49f5114a	e1257970	8ada8930	b0638179
t = 23	c5d53d8d	a7a3623f	c2606d6d	9dc68b63	aa47c347	49f5114a	e1257970	8ada8930
t = 24	1c2c2838	c5d53d8d	a7a3623f	c2606d6d	2823ef91	aa47c347	49f5114a	e1257970
t = 25	cde8037d	1c2c2838	c5d53d8d	a7a3623f	14383d8e	2823ef91	aa47c347	49f5114a
t = 26	b62ec4bc	cde8037d	1c2c2838	c5d53d8d	c74c6516	14383d8e	2823ef91	aa47c347
t = 27	77d37528	b62ec4bc	cde8037d	1c2c2838	edffbff8	c74c6516	14383d8e	2823ef91
t = 28	363482c9	77d37528	b62ec4bc	cde8037d	6112a3b7	edffbff8	c74c6516	14383d8e
t = 29	a0060b30	363482c9	77d37528	b62ec4bc	ade79437	6112a3b7	edffbff8	c74c6516
t = 30	ea992a22	a0060b30	363482c9	77d37528	0109ab3a	ade79437	6112a3b7	edffbff8
t = 31	73b33bf5	ea992a22	a0060b30	363482c9	ba591112	0109ab3a	ade79437	6112a3b7

Hash of "abc", cont'd

	a	b	c	d	e	f	g	h
t = 32	98e12507	73b33bf5	ea992a22	a0060b30	9cd9f5f6	ba591112	0109ab3a	ade79437
t = 33	fe604df5	98e12507	73b33bf5	ea992a22	59249dd3	9cd9f5f6	ba591112	0109ab3a
t = 34	a9a7738c	fe604df5	98e12507	73b33bf5	085f3833	59249dd3	9cd9f5f6	ba591112
t = 35	65a0cfe4	a9a7738c	fe604df5	98e12507	f4b002d6	085f3833	59249dd3	9cd9f5f6
t = 36	41a65cb1	65a0cfe4	a9a7738c	fe604df5	0772a26b	f4b002d6	085f3833	59249dd3
t = 37	34df1604	41a65cb1	65a0cfe4	a9a7738c	a507a53d	0772a26b	f4b002d6	085f3833
t = 38	6dc57a8a	34df1604	41a65cb1	65a0cfe4	f0781bc8	a507a53d	0772a26b	f4b002d6
t = 39	79ea687a	6dc57a8a	34df1604	41a65cb1	1efbc0a0	f0781bc8	a507a53d	0772a26b
t = 40	d6670766	79ea687a	6dc57a8a	34df1604	26352d63	1efbc0a0	f0781bc8	a507a53d
t = 41	df46652f	d6670766	79ea687a	6dc57a8a	838b2711	26352d63	1efbc0a0	f0781bc8
t = 42	17aa0dfe	df46652f	d6670766	79ea687a	decd4715	838b2711	26352d63	1efbc0a0
t = 43	9d4baf93	17aa0dfe	df46652f	d6670766	fda24c2e	decd4715	838b2711	26352d63
t = 44	26628815	9d4baf93	17aa0dfe	df46652f	a80f11f0	fda24c2e	decd4715	838b2711
t = 45	72ab4b91	26628815	9d4baf93	17aa0dfe	b7755da1	a80f11f0	fda24c2e	decd4715
t = 46	a14c14b0	72ab4b91	26628815	9d4baf93	d57b94a9	b7755da1	a80f11f0	fda24c2e
t = 47	4172328d	a14c14b0	72ab4b91	26628815	fecf0bc6	d57b94a9	b7755da1	a80f11f0
t = 48	05757ceb	4172328d	a14c14b0	72ab4b91	bd714038	fecf0bc6	d57b94a9	b7755da1
t = 49	f11bfaa8	05757ceb	4172328d	a14c14b0	6e5c390c	bd714038	fecf0bc6	d57b94a9
t = 50	7a0508a1	f11bfaa8	05757ceb	4172328d	52f1ccf7	6e5c390c	bd714038	fecf0bc6
t = 51	886e7a22	7a0508a1	f11bfaa8	05757ceb	49231c1e	52f1ccf7	6e5c390c	bd714038
t = 52	101fd28f	886e7a22	7a0508a1	f11bfaa8	529e7d00	49231c1e	52f1ccf7	6e5c390c
t = 53	f5702fdb	101fd28f	886e7a22	7a0508a1	9f4787c3	529e7d00	49231c1e	52f1ccf7
t = 54	3ec45cdb	f5702fdb	101fd28f	886e7a22	e50e1b4f	9f4787c3	529e7d00	49231c1e
t = 55	38cc9913	3ec45cdb	f5702fdb	101fd28f	54cb266b	e50e1b4f	9f4787c3	529e7d00
t = 56	fcd1887b	38cc9913	3ec45cdb	f5702fdb	9b5e906c	54cb266b	e50e1b4f	9f4787c3
t = 57	c062d46f	fcd1887b	38cc9913	3ec45cdb	7e44008e	9b5e906c	54cb266b	e50e1b4f
t = 58	ffb70472	c062d46f	fcd1887b	38cc9913	6d83bfc6	7e44008e	9b5e906c	54cb266b
t = 59	b6ae8fff	ffb70472	c062d46f	fcd1887b	b21bad3d	6d83bfc6	7e44008e	9b5e906c
t = 60	b85e2ce9	b6ae8fff	ffb70472	c062d46f	961f4894	b21bad3d	6d83bfc6	7e44008e
t = 61	04d24d6c	b85e2ce9	b6ae8fff	ffb70472	948d25b6	961f4894	b21bad3d	6d83bfc6
t = 62	d39a2165	04d24d6c	b85e2ce9	b6ae8fff	fb121210	948d25b6	961f4894	b21bad3d
t = 63	506e3058	d39a2165	04d24d6c	b85e2ce9	5ef50f24	fb121210	948d25b6	961f4894

Block 1 has been processed. The values of {Hi} are

H1 = 6a09e667 + 506e3058 = ba7816bf
H2 = bb67ae85 + d39a2165 = 8f01cfea
H3 = 3c6ef372 + 04d24d6c = 414140de
H4 = a54ff53a + b85e2ce9 = 5dae2223
H5 = 510e527f + 5ef50f24 = b00361a3
H6 = 9b05688c + fb121210 = 96177a9c
H7 = 1f83d9ab + 948d25b6 = b410ff61
H8 = 5be0cd19 + 961f4894 = f20015ad.

The message digest is

ba7816bf 8f01cfea 414140de 5dae2223 b00361a3 96177a9c b410ff61 f20015ad.

Hash of "abcdbcdecdefdefgefghfghighijhijkijkljklmklmnlmnomnopnopq" (block 1)

	a	b	c	d	e	f	g	h
init:	6a09e667	bb67ae85	3c6ef372	a54ff53a	510e527f	9b05688c	1f83d9ab	5be0cd19
t = 0	5d6aebb1	6a09e667	bb67ae85	3c6ef372	fa2a4606	510e527f	9b05688c	1f83d9ab
t = 1	2f2d5fcf	5d6aebb1	6a09e667	bb67ae85	4eb1cfce	fa2a4606	510e527f	9b05688c
t = 2	97651825	2f2d5fcf	5d6aebb1	6a09e667	62d5c49e	4eb1cfce	fa2a4606	510e527f
t = 3	4a8d64d5	97651825	2f2d5fcf	5d6aebb1	6494841b	62d5c49e	4eb1cfce	fa2a4606
t = 4	f921c212	4a8d64d5	97651825	2f2d5fcf	05c4f88a	6494841b	62d5c49e	4eb1cfce
t = 5	55c8ef48	f921c212	4a8d64d5	97651825	7ff91c94	05c4f88a	6494841b	62d5c49e
t = 6	485835b7	55c8ef48	f921c212	4a8d64d5	39a5b2ca	7ff91c94	05c4f88a	6494841b
t = 7	d237e6db	485835b7	55c8ef48	f921c212	a401d211	39a5b2ca	7ff91c94	05c4f88a
t = 8	359f2bce	d237e6db	485835b7	55c8ef48	c09ffec4	a401d211	39a5b2ca	7ff91c94
t = 9	3a474b2b	359f2bce	d237e6db	485835b7	9037b3b8	c09ffec4	a401d211	39a5b2ca
t = 10	b8e2b4cb	3a474b2b	359f2bce	d237e6db	443ed29e	9037b3b8	c09ffec4	a401d211
t = 11	1762215c	b8e2b4cb	3a474b2b	359f2bce	ee1c97a8	443ed29e	9037b3b8	c09ffec4
t = 12	101a4861	1762215c	b8e2b4cb	3a474b2b	839a0fc9	ee1c97a8	443ed29e	9037b3b8
t = 13	d68e6457	101a4861	1762215c	b8e2b4cb	9243f8af	839a0fc9	ee1c97a8	443ed29e
t = 14	dd16cbb3	d68e6457	101a4861	1762215c	9162aded	9243f8af	839a0fc9	ee1c97a8
t = 15	c3486194	dd16cbb3	d68e6457	101a4861	1496a54f	9162aded	9243f8af	839a0fc9
t = 16	b9dcacb1	c3486194	dd16cbb3	d68e6457	d4f64250	1496a54f	9162aded	9243f8af
t = 17	046a193e	b9dcacb1	c3486194	dd16cbb3	885370b6	d4f64250	1496a54f	9162aded
t = 18	f402f058	046a193e	b9dcacb1	c3486194	6f433549	885370b6	d4f64250	1496a54f
t = 19	2139187b	f402f058	046a193e	b9dcacb1	7c304206	6f433549	885370b6	d4f64250
t = 20	d70ac17d	2139187b	f402f058	046a193e	7cc6b262	7c304206	6f433549	885370b6
t = 21	1b2b66b8	d70ac17d	2139187b	f402f058	d560b028	7cc6b262	7c304206	6f433549
t = 22	ae2e2d4f	1b2b66b8	d70ac17d	2139187b	f074fc95	d560b028	7cc6b262	7c304206
t = 23	59fce6b9	ae2e2d4f	1b2b66b8	d70ac17d	a2c7d51d	f074fc95	d560b028	7cc6b262
t = 24	4a885065	59fce6b9	ae2e2d4f	1b2b66b8	763597fb	a2c7d51d	f074fc95	d560b028
t = 25	573221da	4a885065	59fce6b9	ae2e2d4f	36e74eb4	763597fb	a2c7d51d	f074fc95
t = 26	128661da	573221da	4a885065	59fce6b9	1162d575	36e74eb4	763597fb	a2c7d51d
t = 27	73f858af	128661da	573221da	4a885065	e77c797f	1162d575	36e74eb4	763597fb
t = 28	74bcf468	73f858af	128661da	573221da	72abaecd	e77c797f	1162d575	36e74eb4
t = 29	df7151a0	74bcf468	73f858af	128661da	7629c961	72abaecd	e77c797f	1162d575
t = 30	eb43f3ed	df7151a0	74bcf468	73f858af	0635d880	7629c961	72abaecd	e77c797f
t = 31	5581ab07	eb43f3ed	df7151a0	74bcf468	df980085	0635d880	7629c961	72abaecd

Hash of "abcdbcdecdefdefgefghfghighijhijkijkljklmklmnlmnomnopnopq" (block 1, cont'd)

	a	b	c	d	e	f	g	h
t = 32	9fc905c8	5581ab07	eb43f3ed	df7151a0	a94d2af1	df980085	0635d880	7629c961
t = 33	9ce5a62f	9fc905c8	5581ab07	eb43f3ed	6ef3b6bd	a94d2af1	df980085	0635d880
t = 34	1df8e885	9ce5a62f	9fc905c8	5581ab07	2a9e048e	6ef3b6bd	a94d2af1	df980085
t = 35	0786dce8	1df8e885	9ce5a62f	9fc905c8	de2a21d1	2a9e048e	6ef3b6bd	a94d2af1
t = 36	2c55d3a6	0786dce8	1df8e885	9ce5a62f	b067c1af	de2a21d1	2a9e048e	6ef3b6bd
t = 37	a985b4be	2c55d3a6	0786dce8	1df8e885	f72bf353	b067c1af	de2a21d1	2a9e048e
t = 38	91ac9d5d	a985b4be	2c55d3a6	0786dce8	68d8d590	f72bf353	b067c1af	de2a21d1
t = 39	7e4d30b8	91ac9d5d	a985b4be	2c55d3a6	9f5b9b6d	68d8d590	f72bf353	b067c1af
t = 40	7e056794	7e4d30b8	91ac9d5d	a985b4be	423b26c0	9f5b9b6d	68d8d590	f72bf353
t = 41	508a16ab	7e056794	7e4d30b8	91ac9d5d	45459d97	423b26c0	9f5b9b6d	68d8d590
t = 42	b62c7013	508a16ab	7e056794	7e4d30b8	80a92a00	45459d97	423b26c0	9f5b9b6d
t = 43	167361de	b62c7013	508a16ab	7e056794	41dd3844	80a92a00	45459d97	423b26c0
t = 44	de71e2f2	167361de	b62c7013	508a16ab	ff61c636	41dd3844	80a92a00	45459d97
t = 45	18f0d19d	de71e2f2	167361de	b62c7013	6b88472c	ff61c636	41dd3844	80a92a00
t = 46	165be9cd	18f0d19d	de71e2f2	167361de	a483f080	6b88472c	ff61c636	41dd3844
t = 47	13d82741	165be9cd	18f0d19d	de71e2f2	a7802a4d	a483f080	6b88472c	ff61c636
t = 48	017b9d99	13d82741	165be9cd	18f0d19d	aeb10b60	a7802a4d	a483f080	6b88472c
t = 49	543c99a1	017b9d99	13d82741	165be9cd	16f134b6	aeb10b60	a7802a4d	a483f080
t = 50	758ca97a	543c99a1	017b9d99	13d82741	100cf2ea	16f134b6	aeb10b60	a7802a4d
t = 51	81c1cde0	758ca97a	543c99a1	017b9d99	5c47eb7b	100cf2ea	16f134b6	aeb10b60
t = 52	b8d55619	81c1cde0	758ca97a	543c99a1	1c806a61	5c47eb7b	100cf2ea	16f134b6
t = 53	1d6de87a	b8d55619	81c1cde0	758ca97a	3443bed4	1c806a61	5c47eb7b	100cf2ea
t = 54	f907b313	1d6de87a	b8d55619	81c1cde0	61a41711	3443bed4	1c806a61	5c47eb7b
t = 55	9e57c4a0	f907b313	1d6de87a	b8d55619	eec13548	61a41711	3443bed4	1c806a61
t = 56	71629856	9e57c4a0	f907b313	1d6de87a	2f6c8c4e	eec13548	61a41711	3443bed4
t = 57	7c015a2c	71629856	9e57c4a0	f907b313	cb9d3dd0	2f6c8c4e	eec13548	61a41711
t = 58	921fccb6	7c015a2c	71629856	9e57c4a0	43d8a034	cb9d3dd0	2f6c8c4e	eec13548
t = 59	e18f259a	921fccb6	7c015a2c	71629856	51e15869	43d8a034	cb9d3dd0	2f6c8c4e
t = 60	bcfce922	e18f259a	921fccb6	7c015a2c	962d8621	51e15869	43d8a034	cb9d3dd0
t = 61	f6f443f8	bcfce922	e18f259a	921fccb6	acc75916	962d8621	51e15869	43d8a034
t = 62	86126910	f6f443f8	bcfce922	e18f259a	2fc08f85	acc75916	962d8621	51e15869
t = 63	1bdc6f6f	86126910	f6f443f8	bcfce922	25d2430a	2fc08f85	acc75916	962d8621

Block 1 has been processed. The values of {Hi} are

H1 = 6a09e667 + 1bdc6f6f = 85e655d6
H2 = bb67ae85 + 86126910 = 417a1795
H3 = 3c6ef372 + f6f443f8 = 3363376a
H4 = a54ff53a + bcfce922 = 624cde5c
H5 = 510e527f + 25d2430a = 76e09589
H6 = 9b05688c + 2fc08f85 = cac5f811
H7 = 1f83d9ab + acc75916 = cc4b32c1
H8 = 5be0cd19 + 962d8621 = f20e533a.

Hash of "abcdbcdecdefdefgefghfghighijhijkijkljklmklmnlmnomnopnopq" (block 2)

	a	b	c	d	e	f	g	h
init:	85e655d6	417a1795	3363376a	624cde5c	76e09589	cac5f811	cc4b32c1	f20e533a
t = 0	7c20c838	85e655d6	417a1795	3363376a	4670ae6e	76e09589	cac5f811	cc4b32c1
t = 1	7c3c0f86	7c20c838	85e655d6	417a1795	8c51be64	4670ae6e	76e09589	cac5f811
t = 2	fd1eebdc	7c3c0f86	7c20c838	85e655d6	af71b9ea	8c51be64	4670ae6e	76e09589
t = 3	f268faa9	fd1eebdc	7c3c0f86	7c20c838	e20362ef	af71b9ea	8c51be64	4670ae6e
t = 4	185a5d79	f268faa9	fd1eebdc	7c3c0f86	8dff3001	e20362ef	af71b9ea	8c51be64
t = 5	3eeb6c06	185a5d79	f268faa9	fd1eebdc	fe20cda6	8dff3001	e20362ef	af71b9ea
t = 6	89bba3f1	3eeb6c06	185a5d79	f268faa9	0a34df03	fe20cda6	8dff3001	e20362ef
t = 7	bf9a93a0	89bba3f1	3eeb6c06	185a5d79	059abdd1	0a34df03	fe20cda6	8dff3001
t = 8	2c096744	bf9a93a0	89bba3f1	3eeb6c06	abfa465b	059abdd1	0a34df03	fe20cda6
t = 9	2d964e86	2c096744	bf9a93a0	89bba3f1	aa27ed82	abfa465b	059abdd1	0a34df03
t = 10	5b35025b	2d964e86	2c096744	bf9a93a0	10e77723	aa27ed82	abfa465b	059abdd1
t = 11	5eb4ec40	5b35025b	2d964e86	2c096744	e11b4548	10e77723	aa27ed82	abfa465b
t = 12	35ee996d	5eb4ec40	5b35025b	2d964e86	5c24e2a2	e11b4548	10e77723	aa27ed82
t = 13	d74080fa	35ee996d	5eb4ec40	5b35025b	68aa893f	5c24e2a2	e11b4548	10e77723
t = 14	0cea5cbc	d74080fa	35ee996d	5eb4ec40	60356548	68aa893f	5c24e2a2	e11b4548
t = 15	16a8cc79	0cea5cbc	d74080fa	35ee996d	0fcb1f6f	60356548	68aa893f	5c24e2a2
t = 16	f16f634e	16a8cc79	0cea5cbc	d74080fa	8b21cdc1	0fcb1f6f	60356548	68aa893f
t = 17	23dcb6c2	f16f634e	16a8cc79	0cea5cbc	ca9182d3	8b21cdc1	0fcb1f6f	60356548
t = 18	dcff40fd	23dcb6c2	f16f634e	16a8cc79	69bf7b95	ca9182d3	8b21cdc1	0fcb1f6f
t = 19	76f1a2bc	dcff40fd	23dcb6c2	f16f634e	0dc84bb1	69bf7b95	ca9182d3	8b21cdc1
t = 20	20aad899	76f1a2bc	dcff40fd	23dcb6c2	cc4769f2	0dc84bb1	69bf7b95	ca9182d3
t = 21	d44dc81a	20aad899	76f1a2bc	dcff40fd	5bace62d	cc4769f2	0dc84bb1	69bf7b95
t = 22	f13ae55b	d44dc81a	20aad899	76f1a2bc	966aa287	5bace62d	cc4769f2	0dc84bb1
t = 23	a4195b91	f13ae55b	d44dc81a	20aad899	eddbd6ed	966aa287	5bace62d	cc4769f2
t = 24	4984fa79	a4195b91	f13ae55b	d44dc81a	a530d939	eddbd6ed	966aa287	5bace62d
t = 25	aa6cb982	4984fa79	a4195b91	f13ae55b	0b5eeea4	a530d939	eddbd6ed	966aa287
t = 26	9450fbbc	aa6cb982	4984fa79	a4195b91	09166dda	0b5eeea4	a530d939	eddbd6ed
t = 27	0d936bab	9450fbbc	aa6cb982	4984fa79	6e495d4b	09166dda	0b5eeea4	a530d939
t = 28	d958b529	0d936bab	9450fbbc	aa6cb982	c2fa99b1	6e495d4b	09166dda	0b5eeea4
t = 29	1cfa5eb0	d958b529	0d936bab	9450fbbc	6c49db9f	c2fa99b1	6e495d4b	09166dda
t = 30	02ef3a5f	1cfa5eb0	d958b529	0d936bab	5da10665	6c49db9f	c2fa99b1	6e495d4b
t = 31	b0eab1c5	02ef3a5f	1cfa5eb0	d958b529	f6d93952	5da10665	6c49db9f	c2fa99b1

Hash of "abcdbcdecdefdefgefghfghighijhijkijkljklmklmnlmnomnopnopq" (block 2, cont'd)

	a	b	c	d	e	f	g	h
t = 32	0bfba73c	b0eab1c5	02ef3a5f	1cfa5eb0	8b99e3a9	f6d93952	5da10665	6c49db9f
t = 33	4bd1df96	0bfba73c	b0eab1c5	02ef3a5f	905e44ac	8b99e3a9	f6d93952	5da10665
t = 34	9907f1b6	4bd1df96	0bfba73c	b0eab1c5	66c3043d	905e44ac	8b99e3a9	f6d93952
t = 35	ecde4e0d	9907f1b6	4bd1df96	0bfba73c	5dc119e6	66c3043d	905e44ac	8b99e3a9
t = 36	2f11c939	ecde4e0d	9907f1b6	4bd1df96	fed4ce1d	5dc119e6	66c3043d	905e44ac
t = 37	d949682b	2f11c939	ecde4e0d	9907f1b6	32d99008	fed4ce1d	5dc119e6	66c3043d
t = 38	adca7a96	d949682b	2f11c939	ecde4e0d	c6cce4ff	32d99008	fed4ce1d	5dc119e6
t = 39	221b8a5a	adca7a96	d949682b	2f11c939	0b82c5eb	c6cce4ff	32d99008	fed4ce1d
t = 40	12d97845	221b8a5a	adca7a96	d949682b	e4213ca2	0b82c5eb	c6cce4ff	32d99008
t = 41	2c794876	12d97845	221b8a5a	adca7a96	ff6759ba	e4213ca2	0b82c5eb	c6cce4ff
t = 42	8300fca2	2c794876	12d97845	221b8a5a	e0e3457c	ff6759ba	e4213ca2	0b82c5eb
t = 43	f2ad6322	8300fca2	2c794876	12d97845	cc48c7f3	e0e3457c	ff6759ba	e4213ca2
t = 44	0f154e11	f2ad6322	8300fca2	2c794876	6f9517cb	cc48c7f3	e0e3457c	ff6759ba
t = 45	104a7db4	0f154e11	f2ad6322	8300fca2	5348e8f6	6f9517cb	cc48c7f3	e0e3457c
t = 46	0b3303a7	104a7db4	0f154e11	f2ad6322	bbe1c39a	5348e8f6	6f9517cb	cc48c7f3
t = 47	d7354d5b	0b3303a7	104a7db4	0f154e11	aad55b6b	bbe1c39a	5348e8f6	6f9517cb
t = 48	b736d7a6	d7354d5b	0b3303a7	104a7db4	68f25260	aad55b6b	bbe1c39a	5348e8f6
t = 49	2748e5ec	b736d7a6	d7354d5b	0b3303a7	d4b58576	68f25260	aad55b6b	bbe1c39a
t = 50	d8aabcf9	2748e5ec	b736d7a6	d7354d5b	27844711	d4b58576	68f25260	aad55b6b
t = 51	1a6bcf6a	d8aabcf9	2748e5ec	b736d7a6	ff5e99d0	27844711	d4b58576	68f25260
t = 52	4eca6fa0	1a6bcf6a	d8aabcf9	2748e5ec	989ed071	ff5e99d0	27844711	d4b58576
t = 53	ec02560a	4eca6fa0	1a6bcf6a	d8aabcf9	7151df8e	989ed071	ff5e99d0	27844711
t = 54	d9f0c115	ec02560a	4eca6fa0	1a6bcf6a	624150c4	7151df8e	989ed071	ff5e99d0
t = 55	92952710	d9f0c115	ec02560a	4eca6fa0	226806d6	624150c4	7151df8e	989ed071
t = 56	20d4d0e4	92952710	d9f0c115	ec02560a	4e515a4d	226806d6	624150c4	7151df8e
t = 57	4348eb1f	20d4d0e4	92952710	d9f0c115	c21eddf9	4e515a4d	226806d6	624150c4
t = 58	286fe5f0	4348eb1f	20d4d0e4	92952710	54076664	c21eddf9	4e515a4d	226806d6
t = 59	1c4cddd9	286fe5f0	4348eb1f	20d4d0e4	f487a853	54076664	c21eddf9	4e515a4d
t = 60	a9f181dd	1c4cddd9	286fe5f0	4348eb1f	27ccb387	f487a853	54076664	c21eddf9
t = 61	b25cef29	a9f181dd	1c4cddd9	286fe5f0	2aa1bb13	27ccb387	f487a853	54076664
t = 62	908c2123	b25cef29	a9f181dd	1c4cddd9	9a392956	2aa1bb13	27ccb387	f487a853
t = 63	9ea7148b	908c2123	b25cef29	a9f181dd	2c5c4ed0	9a392956	2aa1bb13	27ccb387

Block 2 has been processed. The values of {Hi} are

H1 = 85e655d6 + 9ea7148b = 248d6a61
H2 = 417a1795 + 908c2123 = d20638b8
H3 = 3363376a + b25cef29 = e5c02693
H4 = 624cde5c + a9f181dd = 0c3e6039
H5 = 76e09589 + 2c5c4ed0 = a33ce459
H6 = cac5f811 + 9a392956 = 64ff2167
H7 = cc4b32c1 + 2aa1bb13 = f6ecedd4
H8 = f20e533a + 27ccb387 = 19db06c1.

The message digest is

248d6a61 d20638b8 e5c02693 0c3e6039 a33ce459 64ff2167 f6ecedd4 19db06c1.

3. SHA-512

3.1. Overview

SHA-512 is a variant of SHA-256 which operates on eight 64-bit words. The message to be hashed is first

(1) padded with its length in such a way that the result is a multiple of 1024 bits long, and then

(2) parsed into 1024-bit *message blocks* $M^{(1)}, M^{(2)}, \ldots, M^{(N)}$.

The message blocks are processed one at a time: Beginning with a fixed initial hash value $H^{(0)}$, sequentially compute

$$H^{(i)} = H^{(i-1)} + C_{M^{(i)}}(H^{(i-1)}),$$

where C is the SHA-512 *compression function* and $+$ means word-wise mod 2^{64} addition. $H^{(N)}$ is the **hash** of M.

3.2. Description of SHA-512

The SHA-512 compression function operates on a 1024-bit *message block* and a 512-bit *intermediate hash value*. It is essentially a 512-bit block cipher algorithm which encrypts the intermediate hash value using the message block as key. Hence there are two main components to describe: (1) the SHA-512 compression function, and (2) the SHA-512 message schedule.
We will use the following notation:

$\oplus$	bitwise XOR
$\wedge$	bitwise AND
$\vee$	bitwise OR
$\neg$	bitwise complement
$+$	mod 2^{64} addition
R^n	right shift by n bits
S^n	right rotation by n bits

Table 2: Notation

For SHA-512, all of these operators act on 64-bit words.

The **initial hash value** $H^{(0)}$ is the following sequence of 64-bit words (which are obtained by taking the fractional parts of the square roots of the first eight primes):

$$
\begin{aligned}
H_1^{(0)} &= \texttt{6a09e667f3bcc908} \\
H_2^{(0)} &= \texttt{bb67ae8584caa73b} \\
H_3^{(0)} &= \texttt{3c6ef372fe94f82b} \\
H_4^{(0)} &= \texttt{a54ff53a5f1d36f1} \\
H_5^{(0)} &= \texttt{510e527fade682d1} \\
H_6^{(0)} &= \texttt{9b05688c2b3e6c1f} \\
H_7^{(0)} &= \texttt{1f83d9abfb41bd6b} \\
H_8^{(0)} &= \texttt{5be0cd19137e2179}
\end{aligned}
$$

Preprocessing

Computation of the hash of a message begins by preparing the message:

1. Pad the message in the usual way: Suppose the length of the message M, in bits, is ℓ. Append the bit "1" to the end of the message, and then k zero bits, where k is the smallest non-negative solution to the equation $\ell + 1 + k \equiv 896 \bmod 1024$. To this append the 128-bit block which is equal to the number ℓ written in binary. For example, the (8-bit ASCII) message "abc" has length $8 \cdot 3 = 24$ so it is padded with a one, then $896 - (24 + 1) = 871$ zero bits, and then its length to become the 1024-bit padded message

$$\texttt{01100001 01100010 01100011 1}\ \underbrace{00\cdots0}_{871}\ \underbrace{00\cdots0011000}_{128}.$$

   The length of the padded message should now be a multiple of 1024 bits.

2. Parse the message into N 1024-bit blocks $M^{(1)}, M^{(2)}, \ldots, M^{(N)}$. The first 64 bits of message block i are denoted $M_0^{(i)}$, the next 64 bits are $M_1^{(i)}$, and so on up to $M_{15}^{(i)}$. We use the big-endian convention throughout, so within each 64-bit word, the left-most bit is stored in the most significant bit position.

Main loop

The hash computation proceeds as follows:

For $i = 1$ to N (N = number of blocks in the padded message)
{

• Initialize registers a, b, c, d, e, f, g, h with the $(i-1)^{\text{st}}$ intermediate hash value (= the initial hash value when $i = 1$) •

$a \leftarrow H_1^{(i-1)}$
$b \leftarrow H_2^{(i-1)}$
$\vdots$
$h \leftarrow H_8^{(i-1)}$

• Apply the **SHA-512 compression function** to update registers $a, b, \ldots, h$ •

For $j = 0$ to 79
{

Compute $Ch(e, f, g)$, $Maj(a, b, c)$, $\Sigma_0(a)$, $\Sigma_1(e)$, and W_j (see Definitions below)

$T_1 \leftarrow h + \Sigma_1(e) + Ch(e, f, g) + K_j + W_j$
$T_2 \leftarrow \Sigma_0(a) + Maj(a, b, c)$
$h \leftarrow g$
$g \leftarrow f$
$f \leftarrow e$
$e \leftarrow d + T_1$
$d \leftarrow c$
$c \leftarrow b$
$b \leftarrow a$
$a \leftarrow T_1 + T_2$

}

• Compute the i^{th} **intermediate hash value** $H^{(i)}$ •

$H_1^{(i)} \leftarrow a + H_1^{(i-1)}$
$H_2^{(i)} \leftarrow b + H_2^{(i-1)}$
$\vdots$
$H_8^{(i)} \leftarrow h + H_8^{(i-1)}$

}

$H^{(N)} = (H_1^{(N)}, H_2^{(N)}, \ldots, H_8^{(N)})$ is the **hash** of M.

Definitions

Six logical functions are used in SHA-512. Each of these functions operates on 64-bit words and produces a 64-bit word as output. Each function is defined as follows:

$$
\begin{aligned}
Ch(x,y,z) &= (x \wedge y) \oplus (\neg x \wedge z) \\
Maj(x,y,z) &= (x \wedge y) \oplus (x \wedge z) \oplus (y \wedge z) \\
\Sigma_0(x) &= S^{28}(x) \oplus S^{34}(x) \oplus S^{39}(x) \\
\Sigma_1(x) &= S^{14}(x) \oplus S^{18}(x) \oplus S^{41}(x) \\
\sigma_0(x) &= S^{1}(x) \oplus S^{8}(x) \oplus R^{7}(x) \\
\sigma_1(x) &= S^{19}(x) \oplus S^{61}(x) \oplus R^{6}(x)
\end{aligned}
$$

Expanded message blocks $W_0, W_1, \ldots, W_{79}$ are computed as follows via the **SHA-512 message schedule**:

$W_j = M_j^{(i)}$ for $j = 0, 1, \ldots, 15$, and
For $j = 16$ to 79
{

$$W_j \leftarrow \sigma_1(W_{j-2}) + W_{j-7} + \sigma_0(W_{j-15}) + W_{j-16}$$

}

Definitions, continued

A sequence of constant words, $K_0, \ldots, K_{79}$, is used in SHA-512. In hex, these are given by

```
428a2f98d728ae22 7137449123ef65cd b5c0fbcfec4d3b2f e9b5dba58189dbbc
3956c25bf348b538 59f111f1b605d019 923f82a4af194f9b ab1c5ed5da6d8118
d807aa98a3030242 12835b0145706fbe 243185be4ee4b28c 550c7dc3d5ffb4e2
72be5d74f27b896f 80deb1fe3b1696b1 9bdc06a725c71235 c19bf174cf692694
e49b69c19ef14ad2 efbe4786384f25e3 0fc19dc68b8cd5b5 240ca1cc77ac9c65
2de92c6f592b0275 4a7484aa6ea6e483 5cb0a9dcbd41fbd4 76f988da831153b5
983e5152ee66dfab a831c66d2db43210 b00327c898fb213f bf597fc7beef0ee4
c6e00bf33da88fc2 d5a79147930aa725 06ca6351e003826f 142929670a0e6e70
27b70a8546d22ffc 2e1b21385c26c926 4d2c6dfc5ac42aed 53380d139d95b3df
650a73548baf63de 766a0abb3c77b2a8 81c2c92e47edaee6 92722c851482353b
a2bfe8a14cf10364 a81a664bbc423001 c24b8b70d0f89791 c76c51a30654be30
d192e819d6ef5218 d69906245565a910 f40e35855771202a 106aa07032bbd1b8
19a4c116b8d2d0c8 1e376c085141ab53 2748774cdf8eeb99 34b0bcb5e19b48a8
391c0cb3c5c95a63 4ed8aa4ae3418acb 5b9cca4f7763e373 682e6ff3d6b2b8a3
748f82ee5defb2fc 78a5636f43172f60 84c87814a1f0ab72 8cc702081a6439ec
90befffa23631e28 a4506cebde82bde9 bef9a3f7b2c67915 c67178f2e372532b
ca273eceea26619c d186b8c721c0c207 eada7dd6cde0eb1e f57d4f7fee6ed178
06f067aa72176fba 0a637dc5a2c898a6 113f9804bef90dae 1b710b35131c471b
28db77f523047d84 32caab7b40c72493 3c9ebe0a15c9bebc 431d67c49c100d4c
4cc5d4becb3e42b6 597f299cfc657e2a 5fcb6fab3ad6faec 6c44198c4a475817.
```

These are the first sixty-four bits of the fractional parts of the cube roots of the first eighty primes.

3.3. Diagrams

The SHA-512 compression function is pictured below:

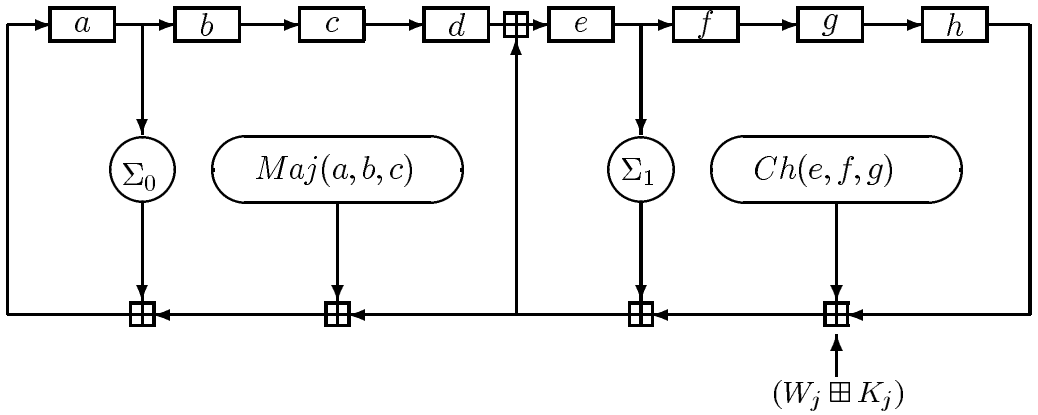

Figure 3: j^{th} internal step of the SHA-512 compression function C

where the symbol $\boxplus$ denotes mod 2^{64} addition.

The message schedule can be drawn as follows:

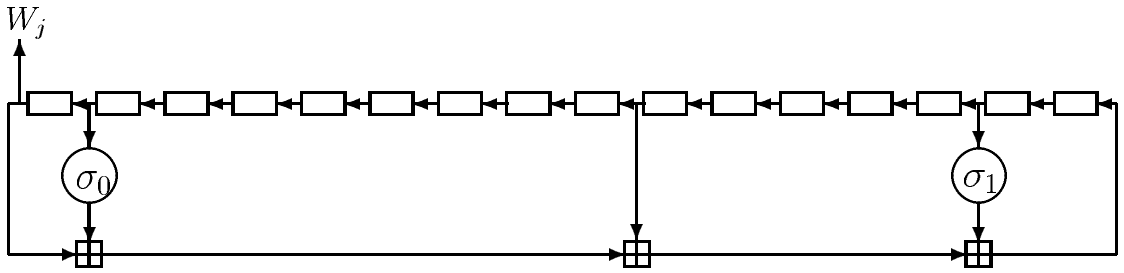

Figure 4: SHA-512 message schedule

The registers here are loaded with $W_0, W_1, \ldots, W_{15}$.

3.4. Sample hash computations

Page 27 shows the result of hashing the 24-bit message "abc". After padding the message becomes (in hexadecimal)

61626380 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000018,

and the hash value is

ddaf35a193617aba cc417349ae204131 12e6fa4e89a97ea2 0a9eeee64b55d39a
2192992a274fc1a8 36ba3c23a3feebbd 454d4423643ce80e 2a9ac94fa54ca49f.

Pages 31–35 show the result of hashing the 896-bit message

"abcdefghbcdefghicdefghijdefghijkefghijklfghijklmghijklmn
hijklmnoijklmnopjklmnopqklmnopqrlmnopqrsmnopqrstnopqrstu"

(with no line break after the first n) which, after padding, becomes the 2-block message

61626364 65666768 62636465 66676869 63646566 6768696a 64656667 68696a6b
65666768 696a6b6c 66676869 6a6b6c6d 6768696a 6b6c6d6e 68696a6b 6c6d6e6f
696a6b6c 6d6e6f70 6a6b6c6d 6e6f7071 6b6c6d6e 6f707172 6c6d6e6f 70717273
6d6e6f70 71727374 6e6f7071 72737475 80000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000380.

The hash value for this message is

8e959b75dae313da 8cf4f72814fc143f 8f7779c6eb9f7fa1 7299aeadb6889018
501d289e4900f7e4 331b99dec4b5433a c7d329eeb6dd2654 5e96e55b874be909.

Hash of “abc”

	a / e	b / f	c / g	d / h
init	6a09e667f3bcc908	bb67ae8584caa73b	3c6ef372fe94f82b	a54ff53a5f1d36f1
	510e527fade682d1	9b05688c2b3e6c1f	1f83d9abfb41bd6b	5be0cd19137e2179
t = 0	f6afceb8bcfcddf5	6a09e667f3bcc908	bb67ae8584caa73b	3c6ef372fe94f82b
	58cb02347ab51f91	510e527fade682d1	9b05688c2b3e6c1f	1f83d9abfb41bd6b
t = 1	1320f8c9fb872cc0	f6afceb8bcfcddf5	6a09e667f3bcc908	bb67ae8584caa73b
	c3d4ebfd48650ffa	58cb02347ab51f91	510e527fade682d1	9b05688c2b3e6c1f
t = 2	ebcffc07203d91f3	1320f8c9fb872cc0	f6afceb8bcfcddf5	6a09e667f3bcc908
	dfa9b239f2697812	c3d4ebfd48650ffa	58cb02347ab51f91	510e527fade682d1
t = 3	5a83cb3e80050e82	ebcffc07203d91f3	1320f8c9fb872cc0	f6afceb8bcfcddf5
	0b47b4bb1928990e	dfa9b239f2697812	c3d4ebfd48650ffa	58cb02347ab51f91
t = 4	b680953951604860	5a83cb3e80050e82	ebcffc07203d91f3	1320f8c9fb872cc0
	745aca4a342ed2e2	0b47b4bb1928990e	dfa9b239f2697812	c3d4ebfd48650ffa
t = 5	af573b02403e89cd	b680953951604860	5a83cb3e80050e82	ebcffc07203d91f3
	96f60209b6dc35ba	745aca4a342ed2e2	0b47b4bb1928990e	dfa9b239f2697812
t = 6	c4875b0c7abc076b	af573b02403e89cd	b680953951604860	5a83cb3e80050e82
	5a6c781f54dcc00c	96f60209b6dc35ba	745aca4a342ed2e2	0b47b4bb1928990e
t = 7	8093d195e0054fa3	c4875b0c7abc076b	af573b02403e89cd	b680953951604860
	86f67263a0f0ec0a	5a6c781f54dcc00c	96f60209b6dc35ba	745aca4a342ed2e2
t = 8	f1eca5544cb89225	8093d195e0054fa3	c4875b0c7abc076b	af573b02403e89cd
	d0403c398fc40002	86f67263a0f0ec0a	5a6c781f54dcc00c	96f60209b6dc35ba
t = 9	81782d4a5db48f03	f1eca5544cb89225	8093d195e0054fa3	c4875b0c7abc076b
	00091f460be46c52	d0403c398fc40002	86f67263a0f0ec0a	5a6c781f54dcc00c
t = 10	69854c4aa0f25b59	81782d4a5db48f03	f1eca5544cb89225	8093d195e0054fa3
	d375471bde1ba3f4	00091f460be46c52	d0403c398fc40002	86f67263a0f0ec0a
t = 11	db0a9963f80c2eaa	69854c4aa0f25b59	81782d4a5db48f03	f1eca5544cb89225
	475975b91a7a462c	d375471bde1ba3f4	00091f460be46c52	d0403c398fc40002
t = 12	5e41214388186c14	db0a9963f80c2eaa	69854c4aa0f25b59	81782d4a5db48f03
	cdf3bff2883fc9d9	475975b91a7a462c	d375471bde1ba3f4	00091f460be46c52
t = 13	44249631255d2ca0	5e41214388186c14	db0a9963f80c2eaa	69854c4aa0f25b59
	860acf9effba6f61	cdf3bff2883fc9d9	475975b91a7a462c	d375471bde1ba3f4
t = 14	fa967eed85a08028	44249631255d2ca0	5e41214388186c14	db0a9963f80c2eaa
	874bfe5f6aae9f2f	860acf9effba6f61	cdf3bff2883fc9d9	475975b91a7a462c
t = 15	0ae07c86b1181c75	fa967eed85a08028	44249631255d2ca0	5e41214388186c14
	a77b7c035dd4c161	874bfe5f6aae9f2f	860acf9effba6f61	cdf3bff2883fc9d9
t = 16	caf81a425d800537	0ae07c86b1181c75	fa967eed85a08028	44249631255d2ca0
	2deecc6b39d64d78	a77b7c035dd4c161	874bfe5f6aae9f2f	860acf9effba6f61
t = 17	4725be249ad19e6b	caf81a425d800537	0ae07c86b1181c75	fa967eed85a08028
	f47e8353f8047455	2deecc6b39d64d78	a77b7c035dd4c161	874bfe5f6aae9f2f
t = 18	3c4b4104168e3edb	4725be249ad19e6b	caf81a425d800537	0ae07c86b1181c75
	29695fd88d81dbd0	f47e8353f8047455	2deecc6b39d64d78	a77b7c035dd4c161
t = 19	9a3fb4d38ab6cf06	3c4b4104168e3edb	4725be249ad19e6b	caf81a425d800537
	f14998dd5f70767e	29695fd88d81dbd0	f47e8353f8047455	2deecc6b39d64d78
t = 20	8dc5ae65569d3855	9a3fb4d38ab6cf06	3c4b4104168e3edb	4725be249ad19e6b
	4bb9e66d1145bfdc	f14998dd5f70767e	29695fd88d81dbd0	f47e8353f8047455
t = 21	da34d6673d452dcf	8dc5ae65569d3855	9a3fb4d38ab6cf06	3c4b4104168e3edb
	8e30ff09ad488753	4bb9e66d1145bfdc	f14998dd5f70767e	29695fd88d81dbd0
t = 22	3e2644567b709a78	da34d6673d452dcf	8dc5ae65569d3855	9a3fb4d38ab6cf06
	0ac2b11da8f571c6	8e30ff09ad488753	4bb9e66d1145bfdc	f14998dd5f70767e
t = 23	4f6877b58fe55484	3e2644567b709a78	da34d6673d452dcf	8dc5ae65569d3855
	c66005f87db55233	0ac2b11da8f571c6	8e30ff09ad488753	4bb9e66d1145bfdc

	a / e	b / f	c / g	d / h
t = 24	9aff71163fa3a940	4f6877b58fe55484	3e2644567b709a78	da34d6673d452dcf
	d3ecf13769180e6f	c66005f87db55233	0ac2b11da8f571c6	8e30ff09ad488753
t = 25	0bc5f791f8e6816b	9aff71163fa3a940	4f6877b58fe55484	3e2644567b709a78
	6ddf1fd7edcce336	d3ecf13769180e6f	c66005f87db55233	0ac2b11da8f571c6
t = 26	884c3bc27bc4f941	0bc5f791f8e6816b	9aff71163fa3a940	4f6877b58fe55484
	e6e48c9a8e948365	6ddf1fd7edcce336	d3ecf13769180e6f	c66005f87db55233
t = 27	eab4a9e5771b8d09	884c3bc27bc4f941	0bc5f791f8e6816b	9aff71163fa3a940
	09068a4e255a0dac	e6e48c9a8e948365	6ddf1fd7edcce336	d3ecf13769180e6f
t = 28	e62349090f47d30a	eab4a9e5771b8d09	884c3bc27bc4f941	0bc5f791f8e6816b
	0fcdf99710f21584	09068a4e255a0dac	e6e48c9a8e948365	6ddf1fd7edcce336
t = 29	74bf40f869094c63	e62349090f47d30a	eab4a9e5771b8d09	884c3bc27bc4f941
	f0aec2fe1437f085	0fcdf99710f21584	09068a4e255a0dac	e6e48c9a8e948365
t = 30	4c4fbbb75f1873a6	74bf40f869094c63	e62349090f47d30a	eab4a9e5771b8d09
	73e025d91b9efea3	f0aec2fe1437f085	0fcdf99710f21584	09068a4e255a0dac
t = 31	ff4d3f1f0d46a736	4c4fbbb75f1873a6	74bf40f869094c63	e62349090f47d30a
	3cd388e119e8162e	73e025d91b9efea3	f0aec2fe1437f085	0fcdf99710f21584
t = 32	a0509015ca08c8d4	ff4d3f1f0d46a736	4c4fbbb75f1873a6	74bf40f869094c63
	e1034573654a106f	3cd388e119e8162e	73e025d91b9efea3	f0aec2fe1437f085
t = 33	60d4e6995ed91fe6	a0509015ca08c8d4	ff4d3f1f0d46a736	4c4fbbb75f1873a6
	efabbd8bf47c041a	e1034573654a106f	3cd388e119e8162e	73e025d91b9efea3
t = 34	2c59ec7743632621	60d4e6995ed91fe6	a0509015ca08c8d4	ff4d3f1f0d46a736
	0fbae670fa780fd3	efabbd8bf47c041a	e1034573654a106f	3cd388e119e8162e
t = 35	1a081afc59fdbc2c	2c59ec7743632621	60d4e6995ed91fe6	a0509015ca08c8d4
	f098082f502b44cd	0fbae670fa780fd3	efabbd8bf47c041a	e1034573654a106f
t = 36	88df85b0bbe77514	1a081afc59fdbc2c	2c59ec7743632621	60d4e6995ed91fe6
	8fbfd0162bbf4675	f098082f502b44cd	0fbae670fa780fd3	efabbd8bf47c041a
t = 37	002bb8e4cd989567	88df85b0bbe77514	1a081afc59fdbc2c	2c59ec7743632621
	66adcfa249ac7bbd	8fbfd0162bbf4675	f098082f502b44cd	0fbae670fa780fd3
t = 38	b3bb8542b3376de5	002bb8e4cd989567	88df85b0bbe77514	1a081afc59fdbc2c
	b49596c20feba7de	66adcfa249ac7bbd	8fbfd0162bbf4675	f098082f502b44cd
t = 39	8e01e125b855d225	b3bb8542b3376de5	002bb8e4cd989567	88df85b0bbe77514
	0c710a47ba6a567b	b49596c20feba7de	66adcfa249ac7bbd	8fbfd0162bbf4675
t = 40	b01521dd6a6be12c	8e01e125b855d225	b3bb8542b3376de5	002bb8e4cd989567
	169008b3a4bb170b	0c710a47ba6a567b	b49596c20feba7de	66adcfa249ac7bbd
t = 41	e96f89dd48cbd851	b01521dd6a6be12c	8e01e125b855d225	b3bb8542b3376de5
	f0996439e7b50cb1	169008b3a4bb170b	0c710a47ba6a567b	b49596c20feba7de
t = 42	bc05ba8de5d3c480	e96f89dd48cbd851	b01521dd6a6be12c	8e01e125b855d225
	639cb938e14dc190	f0996439e7b50cb1	169008b3a4bb170b	0c710a47ba6a567b
t = 43	35d7e7f41defcbd5	bc05ba8de5d3c480	e96f89dd48cbd851	b01521dd6a6be12c
	cc5100997f5710f2	639cb938e14dc190	f0996439e7b50cb1	169008b3a4bb170b
t = 44	c47c9d5c7ea8a234	35d7e7f41defcbd5	bc05ba8de5d3c480	e96f89dd48cbd851
	858d832ae0e8911c	cc5100997f5710f2	639cb938e14dc190	f0996439e7b50cb1
t = 45	021fbadbabab5ac6	c47c9d5c7ea8a234	35d7e7f41defcbd5	bc05ba8de5d3c480
	e95c2a57572d64d9	858d832ae0e8911c	cc5100997f5710f2	639cb938e14dc190
t = 46	f61e672694de2d67	021fbadbabab5ac6	c47c9d5c7ea8a234	35d7e7f41defcbd5
	c6bc35740d8daa9a	e95c2a57572d64d9	858d832ae0e8911c	cc5100997f5710f2
t = 47	6b69fc1bb482feac	f61e672694de2d67	021fbadbabab5ac6	c47c9d5c7ea8a234
	35264334c03ac8ad	c6bc35740d8daa9a	e95c2a57572d64d9	858d832ae0e8911c

	a / e	b / f	c / g	d / h
t = 48	571f323d96b3a047	6b69fc1bb482feac	f61e672694de2d67	021fbadbabab5ac6
	271580ed6c3e5650	35264334c03ac8ad	c6bc35740d8daa9a	e95c2a57572d64d9
t = 49	ca9bd862c5050918	571f323d96b3a047	6b69fc1bb482feac	f61e672694de2d67
	dfe091dab182e645	271580ed6c3e5650	35264334c03ac8ad	c6bc35740d8daa9a
t = 50	813a43dd2c502043	ca9bd862c5050918	571f323d96b3a047	6b69fc1bb482feac
	07a0d8ef821c5e1a	dfe091dab182e645	271580ed6c3e5650	35264334c03ac8ad
t = 51	d43f83727325dd77	813a43dd2c502043	ca9bd862c5050918	571f323d96b3a047
	483f80a82eaee23e	07a0d8ef821c5e1a	dfe091dab182e645	271580ed6c3e5650
t = 52	03df11b32d42e203	d43f83727325dd77	813a43dd2c502043	ca9bd862c5050918
	504f94e40591cffa	483f80a82eaee23e	07a0d8ef821c5e1a	dfe091dab182e645
t = 53	d63f68037ddf06aa	03df11b32d42e203	d43f83727325dd77	813a43dd2c502043
	a6781efe1aa1ce02	504f94e40591cffa	483f80a82eaee23e	07a0d8ef821c5e1a
t = 54	f650857b5babda4d	d63f68037ddf06aa	03df11b32d42e203	d43f83727325dd77
	9ccfb31a86df0f86	a6781efe1aa1ce02	504f94e40591cffa	483f80a82eaee23e
t = 55	63b460e42748817e	f650857b5babda4d	d63f68037ddf06aa	03df11b32d42e203
	c6b4dd2a9931c509	9ccfb31a86df0f86	a6781efe1aa1ce02	504f94e40591cffa
t = 56	7a52912943d52b05	63b460e42748817e	f650857b5babda4d	d63f68037ddf06aa
	d2e89bbd91e00be0	c6b4dd2a9931c509	9ccfb31a86df0f86	a6781efe1aa1ce02
t = 57	4b81c3aec976ea4b	7a52912943d52b05	63b460e42748817e	f650857b5babda4d
	70505988124351ac	d2e89bbd91e00be0	c6b4dd2a9931c509	9ccfb31a86df0f86
t = 58	581ecb3355dcd9b8	4b81c3aec976ea4b	7a52912943d52b05	63b460e42748817e
	6a3c9b0f71c8bf36	70505988124351ac	d2e89bbd91e00be0	c6b4dd2a9931c509
t = 59	2c074484ef1eac8c	581ecb3355dcd9b8	4b81c3aec976ea4b	7a52912943d52b05
	4797cde4ed370692	6a3c9b0f71c8bf36	70505988124351ac	d2e89bbd91e00be0
t = 60	3857dfd2fc37d3ba	2c074484ef1eac8c	581ecb3355dcd9b8	4b81c3aec976ea4b
	a6af4e9c9f807e51	4797cde4ed370692	6a3c9b0f71c8bf36	70505988124351ac
t = 61	cfcd928c5424e2b6	3857dfd2fc37d3ba	2c074484ef1eac8c	581ecb3355dcd9b8
	09aee5bda1644de5	a6af4e9c9f807e51	4797cde4ed370692	6a3c9b0f71c8bf36
t = 62	a81dedbb9f19e643	cfcd928c5424e2b6	3857dfd2fc37d3ba	2c074484ef1eac8c
	84058865d60a05fa	09aee5bda1644de5	a6af4e9c9f807e51	4797cde4ed370692
t = 63	ab44e86276478d85	a81dedbb9f19e643	cfcd928c5424e2b6	3857dfd2fc37d3ba
	cd881ee59ca6bc53	84058865d60a05fa	09aee5bda1644de5	a6af4e9c9f807e51
t = 64	5a806d7e9821a501	ab44e86276478d85	a81dedbb9f19e643	cfcd928c5424e2b6
	aa84b086688a5c45	cd881ee59ca6bc53	84058865d60a05fa	09aee5bda1644de5
t = 65	eeb9c21bb0102598	5a806d7e9821a501	ab44e86276478d85	a81dedbb9f19e643
	3b5fed0d6a1f96e1	aa84b086688a5c45	cd881ee59ca6bc53	84058865d60a05fa
t = 66	46c4210ab2cc155d	eeb9c21bb0102598	5a806d7e9821a501	ab44e86276478d85
	29fab5a7bff53366	3b5fed0d6a1f96e1	aa84b086688a5c45	cd881ee59ca6bc53
t = 67	54ba35cf56a0340e	46c4210ab2cc155d	eeb9c21bb0102598	5a806d7e9821a501
	1c66f46d95690bcf	29fab5a7bff53366	3b5fed0d6a1f96e1	aa84b086688a5c45
t = 68	181839d609c79748	54ba35cf56a0340e	46c4210ab2cc155d	eeb9c21bb0102598
	0ada78ba2d446140	1c66f46d95690bcf	29fab5a7bff53366	3b5fed0d6a1f96e1
t = 69	fb6aaae5d0b6a447	181839d609c79748	54ba35cf56a0340e	46c4210ab2cc155d
	e3711cb6564d112d	0ada78ba2d446140	1c66f46d95690bcf	29fab5a7bff53366
t = 70	7652c579cb60f19c	fb6aaae5d0b6a447	181839d609c79748	54ba35cf56a0340e
	aff62c9665ff80fa	e3711cb6564d112d	0ada78ba2d446140	1c66f46d95690bcf
t = 71	f15e9664b2803575	7652c579cb60f19c	fb6aaae5d0b6a447	181839d609c79748
	947c3dfafee570ef	aff62c9665ff80fa	e3711cb6564d112d	0ada78ba2d446140

```
            a / e            b / f            c / g            d / h

t = 72  358406d165aee9ab  f15e9664b2803575  7652c579cb60f19c  fb6aaae5d0b6a447
        8c7b5fd91a794ca0  947c3dfafee570ef  aff62c9665ff80fa  e3711cb6564d112d
t = 73  20878dcd29cdfaf5  358406d165aee9ab  f15e9664b2803575  7652c579cb60f19c
        054d3536539948d0  8c7b5fd91a794ca0  947c3dfafee570ef  aff62c9665ff80fa
t = 74  33d48dabb5521de2  20878dcd29cdfaf5  358406d165aee9ab  f15e9664b2803575
        2ba18245b50de4cf  054d3536539948d0  8c7b5fd91a794ca0  947c3dfafee570ef
t = 75  c8960e6be864b916  33d48dabb5521de2  20878dcd29cdfaf5  358406d165aee9ab
        995019a6ff3ba3de  2ba18245b50de4cf  054d3536539948d0  8c7b5fd91a794ca0
t = 76  654ef9abec389ca9  c8960e6be864b916  33d48dabb5521de2  20878dcd29cdfaf5
        ceb9fc3691ce8326  995019a6ff3ba3de  2ba18245b50de4cf  054d3536539948d0
t = 77  d67806db8b148677  654ef9abec389ca9  c8960e6be864b916  33d48dabb5521de2
        25c96a7768fb2aa3  ceb9fc3691ce8326  995019a6ff3ba3de  2ba18245b50de4cf
t = 78  10d9c4c4295599f6  d67806db8b148677  654ef9abec389ca9  c8960e6be864b916
        9bb4d39778c07f9e  25c96a7768fb2aa3  ceb9fc3691ce8326  995019a6ff3ba3de
t = 79  73a54f399fa4b1b2  10d9c4c4295599f6  d67806db8b148677  654ef9abec389ca9
        d08446aa79693ed7  9bb4d39778c07f9e  25c96a7768fb2aa3  ceb9fc3691ce8326

Block 1 has been processed. The values of {Hi} are

H1 = 6a09e667f3bcc908 + 73a54f399fa4b1b2 = ddaf35a193617aba
H2 = bb67ae8584caa73b + 10d9c4c4295599f6 = cc417349ae204131
H3 = 3c6ef372fe94f82b + d67806db8b148677 = 12e6fa4e89a97ea2
H4 = a54ff53a5f1d36f1 + 654ef9abec389ca9 = 0a9eeee64b55d39a
H5 = 510e527fade682d1 + d08446aa79693ed7 = 2192992a274fc1a8
H6 = 9b05688c2b3e6c1f + 9bb4d39778c07f9e = 36ba3c23a3feebbd
H7 = 1f83d9abfb41bd6b + 25c96a7768fb2aa3 = 454d4423643ce80e
H8 = 5be0cd19137e2179 + ceb9fc3691ce8326 = 2a9ac94fa54ca49f.

The message digest is

    ddaf35a193617aba cc417349ae204131 12e6fa4e89a97ea2 0a9eeee64b55d39a
    2192992a274fc1a8 36ba3c23a3feebbd 454d4423643ce80e 2a9ac94fa54ca49f.
```

Hash of "abcdefghbcdefghicdefghijdefghijkefghijklfghijklmghijklmn hijklmnoijklmnopjklmnopqklmnopqrlmnopqrsmnopqrstnopqrstu" (block 1)

	a / e	b / f	c / g	d / h
init	6a09e667f3bcc908	bb67ae8584caa73b	3c6ef372fe94f82b	a54ff53a5f1d36f1
	510e527fade682d1	9b05688c2b3e6c1f	1f83d9abfb41bd6b	5be0cd19137e2179
t = 0	f6afce9d2263455d	6a09e667f3bcc908	bb67ae8584caa73b	3c6ef372fe94f82b
	58cb0218e01b86f9	510e527fade682d1	9b05688c2b3e6c1f	1f83d9abfb41bd6b
t = 1	0b7056a534ae5f62	f6afce9d2263455d	6a09e667f3bcc908	bb67ae8584caa73b
	f8c7198fe39e4c8c	58cb0218e01b86f9	510e527fade682d1	9b05688c2b3e6c1f
t = 2	2ca82233760c9942	0b7056a534ae5f62	f6afce9d2263455d	6a09e667f3bcc908
	303eccccd65953de	f8c7198fe39e4c8c	58cb0218e01b86f9	510e527fade682d1
t = 3	a023f17ce52cda7b	2ca82233760c9942	0b7056a534ae5f62	f6afce9d2263455d
	ffdee5eedcc9ca42	303eccccd65953de	f8c7198fe39e4c8c	58cb0218e01b86f9
t = 4	8f0a67d9d591a1a7	a023f17ce52cda7b	2ca82233760c9942	0b7056a534ae5f62
	cb4cfbb166505f2f	ffdee5eedcc9ca42	303eccccd65953de	f8c7198fe39e4c8c
t = 5	b466267371acc493	8f0a67d9d591a1a7	a023f17ce52cda7b	2ca82233760c9942
	73d6c84c54d399ee	cb4cfbb166505f2f	ffdee5eedcc9ca42	303eccccd65953de
t = 6	658269f1a312fccd	b466267371acc493	8f0a67d9d591a1a7	a023f17ce52cda7b
	cdc40314975fb275	73d6c84c54d399ee	cb4cfbb166505f2f	ffdee5eedcc9ca42
t = 7	65e3519c5b88181b	658269f1a312fccd	b466267371acc493	8f0a67d9d591a1a7
	a657850ab3970c5a	cdc40314975fb275	73d6c84c54d399ee	cb4cfbb166505f2f
t = 8	56604fbb4b6393ec	65e3519c5b88181b	658269f1a312fccd	b466267371acc493
	e8b3be22fbe64df7	a657850ab3970c5a	cdc40314975fb275	73d6c84c54d399ee
t = 9	c4562769a37d02c0	56604fbb4b6393ec	65e3519c5b88181b	658269f1a312fccd
	0062e70a1ef705c1	e8b3be22fbe64df7	a657850ab3970c5a	cdc40314975fb275
t = 10	27c0b4c9186e1736	c4562769a37d02c0	56604fbb4b6393ec	65e3519c5b88181b
	bc9740477a18ae2d	0062e70a1ef705c1	e8b3be22fbe64df7	a657850ab3970c5a
t = 11	f17f52fb02f4eb74	27c0b4c9186e1736	c4562769a37d02c0	56604fbb4b6393ec
	be58522cb9590ee1	bc9740477a18ae2d	0062e70a1ef705c1	e8b3be22fbe64df7
t = 12	f2c245ac903d4a35	f17f52fb02f4eb74	27c0b4c9186e1736	c4562769a37d02c0
	49d5fa3a16dcd502	be58522cb9590ee1	bc9740477a18ae2d	0062e70a1ef705c1
t = 13	9b04175ea8090daa	f2c245ac903d4a35	f17f52fb02f4eb74	27c0b4c9186e1736
	ec9c5e98ff98760d	49d5fa3a16dcd502	be58522cb9590ee1	bc9740477a18ae2d
t = 14	481b8a6ee5e07031	9b04175ea8090daa	f2c245ac903d4a35	f17f52fb02f4eb74
	e4d35b613a5ac420	ec9c5e98ff98760d	49d5fa3a16dcd502	be58522cb9590ee1
t = 15	9356ac3ec3e51459	481b8a6ee5e07031	9b04175ea8090daa	f2c245ac903d4a35
	701f17d27582443b	e4d35b613a5ac420	ec9c5e98ff98760d	49d5fa3a16dcd502
t = 16	b889ed34abd7aa37	9356ac3ec3e51459	481b8a6ee5e07031	9b04175ea8090daa
	1d05d9ba779a1a78	701f17d27582443b	e4d35b613a5ac420	ec9c5e98ff98760d
t = 17	bf537b1f3edc7381	b889ed34abd7aa37	9356ac3ec3e51459	481b8a6ee5e07031
	c362ff9cf932951d	1d05d9ba779a1a78	701f17d27582443b	e4d35b613a5ac420
t = 18	d4e44d54e8242ad8	bf537b1f3edc7381	b889ed34abd7aa37	9356ac3ec3e51459
	459e4e6888919f36	c362ff9cf932951d	1d05d9ba779a1a78	701f17d27582443b
t = 19	05f3fba454e5de3d	d4e44d54e8242ad8	bf537b1f3edc7381	b889ed34abd7aa37
	caed4b5fa322b984	459e4e6888919f36	c362ff9cf932951d	1d05d9ba779a1a78
t = 20	cdb73772dc0248bf	05f3fba454e5de3d	d4e44d54e8242ad8	bf537b1f3edc7381
	dc8049afa6acd502	caed4b5fa322b984	459e4e6888919f36	c362ff9cf932951d
t = 21	1d47a3268ff677ed	cdb73772dc0248bf	05f3fba454e5de3d	d4e44d54e8242ad8
	8407818e9b28cc12	dc8049afa6acd502	caed4b5fa322b984	459e4e6888919f36
t = 22	af4e23eb622d0df4	1d47a3268ff677ed	cdb73772dc0248bf	05f3fba454e5de3d
	64b5ae5424598428	8407818e9b28cc12	dc8049afa6acd502	caed4b5fa322b984
t = 23	be50606778de14a6	af4e23eb622d0df4	1d47a3268ff677ed	cdb73772dc0248bf
	0a5d727cc92e7adb	64b5ae5424598428	8407818e9b28cc12	dc8049afa6acd502

	a / e	b / f	c / g	d / h
t = 24	821e44f6678ac478	be50606778de14a6	af4e23eb622d0df4	1d47a3268ff677ed
	f367e596d0a038a5	0a5d727cc92e7adb	64b5ae5424598428	8407818e9b28cc12
t = 25	0c852b1359a77c18	821e44f6678ac478	be50606778de14a6	af4e23eb622d0df4
	6dec8a3396a80c3f	f367e596d0a038a5	0a5d727cc92e7adb	64b5ae5424598428
t = 26	ebb574fad4b7a7e4	0c852b1359a77c18	821e44f6678ac478	be50606778de14a6
	a241e7efc1eb6ff9	6dec8a3396a80c3f	f367e596d0a038a5	0a5d727cc92e7adb
t = 27	a092821c3cdf08da	ebb574fad4b7a7e4	0c852b1359a77c18	821e44f6678ac478
	c84e849917a7c08e	a241e7efc1eb6ff9	6dec8a3396a80c3f	f367e596d0a038a5
t = 28	82ba2e1a2df2a4f1	a092821c3cdf08da	ebb574fad4b7a7e4	0c852b1359a77c18
	61845f6924789851	c84e849917a7c08e	a241e7efc1eb6ff9	6dec8a3396a80c3f
t = 29	1959ad991c63d06a	82ba2e1a2df2a4f1	a092821c3cdf08da	ebb574fad4b7a7e4
	231faf24910a891a	61845f6924789851	c84e849917a7c08e	a241e7efc1eb6ff9
t = 30	9b32d4cacd9a625b	1959ad991c63d06a	82ba2e1a2df2a4f1	a092821c3cdf08da
	533066919d608799	231faf24910a891a	61845f6924789851	c84e849917a7c08e
t = 31	dc55339f4d841965	9b32d4cacd9a625b	1959ad991c63d06a	82ba2e1a2df2a4f1
	e2517f359998a58d	533066919d608799	231faf24910a891a	61845f6924789851
t = 32	fdebb1283b12514f	dc55339f4d841965	9b32d4cacd9a625b	1959ad991c63d06a
	b1989170a183c661	e2517f359998a58d	533066919d608799	231faf24910a891a
t = 33	b44c7975a83e3334	fdebb1283b12514f	dc55339f4d841965	9b32d4cacd9a625b
	009ad175b8d588a4	b1989170a183c661	e2517f359998a58d	533066919d608799
t = 34	0bac61bfc53d18b7	b44c7975a83e3334	fdebb1283b12514f	dc55339f4d841965
	a7d5416d690557b8	009ad175b8d588a4	b1989170a183c661	e2517f359998a58d
t = 35	392893c22e75856a	0bac61bfc53d18b7	b44c7975a83e3334	fdebb1283b12514f
	7a7c9eb7bc813248	a7d5416d690557b8	009ad175b8d588a4	b1989170a183c661
t = 36	824408631432e09b	392893c22e75856a	0bac61bfc53d18b7	b44c7975a83e3334
	5e696a9fda56d6bf	7a7c9eb7bc813248	a7d5416d690557b8	009ad175b8d588a4
t = 37	a64162f151a8c1cb	824408631432e09b	392893c22e75856a	0bac61bfc53d18b7
	0f57062401dc680b	5e696a9fda56d6bf	7a7c9eb7bc813248	a7d5416d690557b8
t = 38	922537abad1e95a1	a64162f151a8c1cb	824408631432e09b	392893c22e75856a
	4f4c193d435ff721	0f57062401dc680b	5e696a9fda56d6bf	7a7c9eb7bc813248
t = 39	b80591f6fbfadcde	922537abad1e95a1	a64162f151a8c1cb	824408631432e09b
	00f4407c0f37237e	4f4c193d435ff721	0f57062401dc680b	5e696a9fda56d6bf
t = 40	08f151f4b8d0fa2e	b80591f6fbfadcde	922537abad1e95a1	a64162f151a8c1cb
	ec8b96fe402094cd	00f4407c0f37237e	4f4c193d435ff721	0f57062401dc680b
t = 41	12b5fcc2b68f65c0	08f151f4b8d0fa2e	b80591f6fbfadcde	922537abad1e95a1
	d688101dfd24a148	ec8b96fe402094cd	00f4407c0f37237e	4f4c193d435ff721
t = 42	a71bf5bd64289948	12b5fcc2b68f65c0	08f151f4b8d0fa2e	b80591f6fbfadcde
	e052bfb7a6945939	d688101dfd24a148	ec8b96fe402094cd	00f4407c0f37237e
t = 43	890c2cd670c4aea3	a71bf5bd64289948	12b5fcc2b68f65c0	08f151f4b8d0fa2e
	dd13e4edeeff00e7	e052bfb7a6945939	d688101dfd24a148	ec8b96fe402094cd
t = 44	ca61990b43297ffc	890c2cd670c4aea3	a71bf5bd64289948	12b5fcc2b68f65c0
	139aa55c51d9ee5f	dd13e4edeeff00e7	e052bfb7a6945939	d688101dfd24a148
t = 45	7196e8fa538ba4bf	ca61990b43297ffc	890c2cd670c4aea3	a71bf5bd64289948
	046735513cdd14d3	139aa55c51d9ee5f	dd13e4edeeff00e7	e052bfb7a6945939
t = 46	1f0720944dbeb6a4	7196e8fa538ba4bf	ca61990b43297ffc	890c2cd670c4aea3
	a41eb7e5a27588e3	046735513cdd14d3	139aa55c51d9ee5f	dd13e4edeeff00e7
t = 47	d6d4f8608b8ab199	1f0720944dbeb6a4	7196e8fa538ba4bf	ca61990b43297ffc
	24b9c216f915da60	a41eb7e5a27588e3	046735513cdd14d3	139aa55c51d9ee5f

	a / e	b / f	c / g	d / h
t = 48	88761eb67845978e	d6d4f8608b8ab199	1f0720944dbeb6a4	7196e8fa538ba4bf
	9fe22e39448d50ed	24b9c216f915da60	a41eb7e5a27588e3	046735513cdd14d3
t = 49	7d40e6be47d85702	88761eb67845978e	d6d4f8608b8ab199	1f0720944dbeb6a4
	d9c900e01968c33e	9fe22e39448d50ed	24b9c216f915da60	a41eb7e5a27588e3
t = 50	7d0d988df5768598	7d40e6be47d85702	88761eb67845978e	d6d4f8608b8ab199
	2ec2e522a7c7d12c	d9c900e01968c33e	9fe22e39448d50ed	24b9c216f915da60
t = 51	48a8b60575b37f31	7d0d988df5768598	7d40e6be47d85702	88761eb67845978e
	7059f9bc8c88a373	2ec2e522a7c7d12c	d9c900e01968c33e	9fe22e39448d50ed
t = 52	6bc425af294bbf79	48a8b60575b37f31	7d0d988df5768598	7d40e6be47d85702
	6a8143b1716ee33d	7059f9bc8c88a373	2ec2e522a7c7d12c	d9c900e01968c33e
t = 53	307a456158ee8849	6bc425af294bbf79	48a8b60575b37f31	7d0d988df5768598
	4372e85c16ee4440	6a8143b1716ee33d	7059f9bc8c88a373	2ec2e522a7c7d12c
t = 54	af36382c8fd716be	307a456158ee8849	6bc425af294bbf79	48a8b60575b37f31
	a8f8b0033187a916	4372e85c16ee4440	6a8143b1716ee33d	7059f9bc8c88a373
t = 55	810ebee951c64ca1	af36382c8fd716be	307a456158ee8849	6bc425af294bbf79
	16a64f5997b9cca6	a8f8b0033187a916	4372e85c16ee4440	6a8143b1716ee33d
t = 56	2dd7659f1b4d13cd	810ebee951c64ca1	af36382c8fd716be	307a456158ee8849
	5da6793bb7286a4b	16a64f5997b9cca6	a8f8b0033187a916	4372e85c16ee4440
t = 57	5ac712acff4b98be	2dd7659f1b4d13cd	810ebee951c64ca1	af36382c8fd716be
	91f6395b301adbfd	5da6793bb7286a4b	16a64f5997b9cca6	a8f8b0033187a916
t = 58	c1af358833cb03c0	5ac712acff4b98be	2dd7659f1b4d13cd	810ebee951c64ca1
	d4883c0c21dda190	91f6395b301adbfd	5da6793bb7286a4b	16a64f5997b9cca6
t = 59	88a306074d388c7d	c1af358833cb03c0	5ac712acff4b98be	2dd7659f1b4d13cd
	9fc52468b897f9c8	d4883c0c21dda190	91f6395b301adbfd	5da6793bb7286a4b
t = 60	f11bfd0cf67d3040	88a306074d388c7d	c1af358833cb03c0	5ac712acff4b98be
	47efb6407f74d318	9fc52468b897f9c8	d4883c0c21dda190	91f6395b301adbfd
t = 61	1f065e7828ed4e1b	f11bfd0cf67d3040	88a306074d388c7d	c1af358833cb03c0
	7481899904a4ce23	47efb6407f74d318	9fc52468b897f9c8	d4883c0c21dda190
t = 62	aebde39f2bc42ec1	1f065e7828ed4e1b	f11bfd0cf67d3040	88a306074d388c7d
	62ab526ff177a988	7481899904a4ce23	47efb6407f74d318	9fc52468b897f9c8
t = 63	d35a94706e3e5df2	aebde39f2bc42ec1	1f065e7828ed4e1b	f11bfd0cf67d3040
	53f92b648d5d815c	62ab526ff177a988	7481899904a4ce23	47efb6407f74d318
t = 64	d72d727c53e09ab9	d35a94706e3e5df2	aebde39f2bc42ec1	1f065e7828ed4e1b
	10746426ba9824f4	53f92b648d5d815c	62ab526ff177a988	7481899904a4ce23
t = 65	3a7235e5a4051d94	d72d727c53e09ab9	d35a94706e3e5df2	aebde39f2bc42ec1
	afe455daec5c2b00	10746426ba9824f4	53f92b648d5d815c	62ab526ff177a988
t = 66	f7f510fe73ef7e76	3a7235e5a4051d94	d72d727c53e09ab9	d35a94706e3e5df2
	f1202c0bb7c4583f	afe455daec5c2b00	10746426ba9824f4	53f92b648d5d815c
t = 67	23c2acfb393523e9	f7f510fe73ef7e76	3a7235e5a4051d94	d72d727c53e09ab9
	a0bc2a61044ac12e	f1202c0bb7c4583f	afe455daec5c2b00	10746426ba9824f4
t = 68	0307d241a1ed7121	23c2acfb393523e9	f7f510fe73ef7e76	3a7235e5a4051d94
	fad5f38f1e0aea12	a0bc2a61044ac12e	f1202c0bb7c4583f	afe455daec5c2b00
t = 69	191814d82f0a16fb	0307d241a1ed7121	23c2acfb393523e9	f7f510fe73ef7e76
	39d325086e66e200	fad5f38f1e0aea12	a0bc2a61044ac12e	f1202c0bb7c4583f
t = 70	0a1ed41b6da18c01	191814d82f0a16fb	0307d241a1ed7121	23c2acfb393523e9
	b3d3521e166e5df1	39d325086e66e200	fad5f38f1e0aea12	a0bc2a61044ac12e
t = 71	8a3f07db93f6c827	0a1ed41b6da18c01	191814d82f0a16fb	0307d241a1ed7121
	6b370074be040ed7	b3d3521e166e5df1	39d325086e66e200	fad5f38f1e0aea12

```
            a / e            b / f            c / g            d / h

t = 72  002744d87ef80d28  8a3f07db93f6c827  0a1ed41b6da18c01  191814d82f0a16fb
        8c5a245de2d72fe6  6b370074be040ed7  b3d3521e166e5df1  39d325086e66e200
t = 73  778dc7880a4a2aa0  002744d87ef80d28  8a3f07db93f6c827  0a1ed41b6da18c01
        45a375b466e5e342  8c5a245de2d72fe6  6b370074be040ed7  b3d3521e166e5df1
t = 74  a3f11de5ede05b11  778dc7880a4a2aa0  002744d87ef80d28  8a3f07db93f6c827
        f5bbf52f1ab7cc05  45a375b466e5e342  8c5a245de2d72fe6  6b370074be040ed7
t = 75  629c8ae6ecd8af4b  a3f11de5ede05b11  778dc7880a4a2aa0  002744d87ef80d28
        5a8fe5919d3cf136  f5bbf52f1ab7cc05  45a375b466e5e342  8c5a245de2d72fe6
t = 76  c9a8c1e2d063ce94  629c8ae6ecd8af4b  a3f11de5ede05b11  778dc7880a4a2aa0
        aacd089bfae8faf9  5a8fe5919d3cf136  f5bbf52f1ab7cc05  45a375b466e5e342
t = 77  c517cba6a09bb26a  c9a8c1e2d063ce94  629c8ae6ecd8af4b  a3f11de5ede05b11
        e1682bd33c8f8e23  aacd089bfae8faf9  5a8fe5919d3cf136  f5bbf52f1ab7cc05
t = 78  11e3570e06e3b74e  c517cba6a09bb26a  c9a8c1e2d063ce94  629c8ae6ecd8af4b
        075aabbade34fd01  e1682bd33c8f8e23  aacd089bfae8faf9  5a8fe5919d3cf136
t = 79  d90f1b1237b3a561  11e3570e06e3b74e  c517cba6a09bb26a  c9a8c1e2d063ce94
        867983f69d3a3ad1  075aabbade34fd01  e1682bd33c8f8e23  aacd089bfae8faf9

Block 1 has been processed. The values of {Hi} are

H1 = 6a09e667f3bcc908 + d90f1b1237b3a561 = 4319017a2b706e69
H2 = bb67ae8584caa73b + 11e3570e06e3b74e = cd4b05938bae5e89
H3 = 3c6ef372fe94f82b + c517cba6a09bb26a = 0186bf199f30aa95
H4 = a54ff53a5f1d36f1 + c9a8c1e2d063ce94 = 6ef8b71d2f810585
H5 = 510e527fade682d1 + 867983f69d3a3ad1 = d787d6764b20bda2
H6 = 9b05688c2b3e6c1f + 075aabbade34fd01 = a260144709736920
H7 = 1f83d9abfb41bd6b + e1682bd33c8f8e23 = 00ec057f37d14b8e
H8 = 5be0cd19137e2179 + aacd089bfae8faf9 = 06add5b50e671c72.
```

Hash of "abcdefghbcdefghicdefghijdefghijkefghijklfghijklmghijklmn hijklmnoijklmnopjklmnopqklmnopqrlmnopqrsmnopqrstnopqrstu" (block 2)

	a / e	b / f	c / g	d / h
init	4319017a2b706e69	cd4b05938bae5e89	0186bf199f30aa95	6ef8b71d2f810585
	d787d6764b20bda2	a260144709736920	00ec057f37d14b8e	06add5b50e671c72
t = 0	b8fdb92bdfb187e8	4319017a2b706e69	cd4b05938bae5e89	0186bf199f30aa95
	1d5f4d5ad031b8e6	d787d6764b20bda2	a260144709736920	00ec057f37d14b8e
t = 1	6eb90718369c5cd7	b8fdb92bdfb187e8	4319017a2b706e69	cd4b05938bae5e89
	4b9b4877d987b0fe	1d5f4d5ad031b8e6	d787d6764b20bda2	a260144709736920
t = 2	c83451f2335d5144	6eb90718369c5cd7	b8fdb92bdfb187e8	4319017a2b706e69
	d6b67350e0781e99	4b9b4877d987b0fe	1d5f4d5ad031b8e6	d787d6764b20bda2
t = 3	28ec1deb2a9ee6e3	c83451f2335d5144	6eb90718369c5cd7	b8fdb92bdfb187e8
	25e3136be5999b8c	d6b67350e0781e99	4b9b4877d987b0fe	1d5f4d5ad031b8e6
t = 4	806abd86c0479e5b	28ec1deb2a9ee6e3	c83451f2335d5144	6eb90718369c5cd7
	1b8f7670eab1cf89	25e3136be5999b8c	d6b67350e0781e99	4b9b4877d987b0fe
t = 5	234788f8a54aed38	806abd86c0479e5b	28ec1deb2a9ee6e3	c83451f2335d5144
	4fabe51c67d5d156	1b8f7670eab1cf89	25e3136be5999b8c	d6b67350e0781e99
t = 6	01264f18257b5e2c	234788f8a54aed38	806abd86c0479e5b	28ec1deb2a9ee6e3
	1c3506096b99de50	4fabe51c67d5d156	1b8f7670eab1cf89	25e3136be5999b8c
t = 7	5b14f38104dde991	01264f18257b5e2c	234788f8a54aed38	806abd86c0479e5b
	13f8bfdc4001c362	1c3506096b99de50	4fabe51c67d5d156	1b8f7670eab1cf89
t = 8	f522574a41b2aac6	5b14f38104dde991	01264f18257b5e2c	234788f8a54aed38
	63a5f09617622ed2	13f8bfdc4001c362	1c3506096b99de50	4fabe51c67d5d156
t = 9	6ec258b855afae5a	f522574a41b2aac6	5b14f38104dde991	01264f18257b5e2c
	211e271d92770b36	63a5f09617622ed2	13f8bfdc4001c362	1c3506096b99de50
t = 10	9364214ba48b416c	6ec258b855afae5a	f522574a41b2aac6	5b14f38104dde991
	d64dcb6ec0fe5bac	211e271d92770b36	63a5f09617622ed2	13f8bfdc4001c362
t = 11	082ba62147ecbbd5	9364214ba48b416c	6ec258b855afae5a	f522574a41b2aac6
	34fe78473b61266e	d64dcb6ec0fe5bac	211e271d92770b36	63a5f09617622ed2
t = 12	5790f6ba82bba809	082ba62147ecbbd5	9364214ba48b416c	6ec258b855afae5a
	d491e309141dcaa3	34fe78473b61266e	d64dcb6ec0fe5bac	211e271d92770b36
t = 13	a6b8aefd086d33ce	5790f6ba82bba809	082ba62147ecbbd5	9364214ba48b416c
	044943c2992cc0f0	d491e309141dcaa3	34fe78473b61266e	d64dcb6ec0fe5bac
t = 14	bf2324a9a363abe7	a6b8aefd086d33ce	5790f6ba82bba809	082ba62147ecbbd5
	0cf5f4bde5977c54	044943c2992cc0f0	d491e309141dcaa3	34fe78473b61266e
t = 15	00e8e32076a61aff	bf2324a9a363abe7	a6b8aefd086d33ce	5790f6ba82bba809
	43bf4eb269a2650c	0cf5f4bde5977c54	044943c2992cc0f0	d491e309141dcaa3
t = 16	f0376dff66fff4a7	00e8e32076a61aff	bf2324a9a363abe7	a6b8aefd086d33ce
	69fa5896969e85b8	43bf4eb269a2650c	0cf5f4bde5977c54	044943c2992cc0f0
t = 17	2fad194272cda857	f0376dff66fff4a7	00e8e32076a61aff	bf2324a9a363abe7
	ddb519d663b7b6ec	69fa5896969e85b8	43bf4eb269a2650c	0cf5f4bde5977c54
t = 18	9ae56936e95325ac	2fad194272cda857	f0376dff66fff4a7	00e8e32076a61aff
	04ceb04676619057	ddb519d663b7b6ec	69fa5896969e85b8	43bf4eb269a2650c
t = 19	d94ccb853f53433b	9ae56936e95325ac	2fad194272cda857	f0376dff66fff4a7
	dcdc0f45813fb5a2	04ceb04676619057	ddb519d663b7b6ec	69fa5896969e85b8
t = 20	837f8075d2945995	d94ccb853f53433b	9ae56936e95325ac	2fad194272cda857
	272b5f79a91419d8	dcdc0f45813fb5a2	04ceb04676619057	ddb519d663b7b6ec
t = 21	786bde689f7aa62d	837f8075d2945995	d94ccb853f53433b	9ae56936e95325ac
	566586e69ad3f487	272b5f79a91419d8	dcdc0f45813fb5a2	04ceb04676619057
t = 22	276457f01812aa6f	786bde689f7aa62d	837f8075d2945995	d94ccb853f53433b
	e78fb8b0dfbbc62f	566586e69ad3f487	272b5f79a91419d8	dcdc0f45813fb5a2
t = 23	0de519f5d6c2c298	276457f01812aa6f	786bde689f7aa62d	837f8075d2945995
	5ca3e5cd1a30b954	e78fb8b0dfbbc62f	566586e69ad3f487	272b5f79a91419d8

	a / e	b / f	c / g	d / h
t = 24	54314dff825e2b22	0de519f5d6c2c298	276457f01812aa6f	786bde689f7aa62d
	b81a51e0c96ccf77	5ca3e5cd1a30b954	e78fb8b0dfbbc62f	566586e69ad3f487
t = 25	5d3f98dd7b29c363	54314dff825e2b22	0de519f5d6c2c298	276457f01812aa6f
	95d49494f5a0d14a	b81a51e0c96ccf77	5ca3e5cd1a30b954	e78fb8b0dfbbc62f
t = 26	5e9da426aa7d4a58	5d3f98dd7b29c363	54314dff825e2b22	0de519f5d6c2c298
	d22cccad2e391cd4	95d49494f5a0d14a	b81a51e0c96ccf77	5ca3e5cd1a30b954
t = 27	3b62dd973298ea43	5e9da426aa7d4a58	5d3f98dd7b29c363	54314dff825e2b22
	aceb5d06101e514e	d22cccad2e391cd4	95d49494f5a0d14a	b81a51e0c96ccf77
t = 28	fd258ff809b2253d	3b62dd973298ea43	5e9da426aa7d4a58	5d3f98dd7b29c363
	26c991e85352da6f	aceb5d06101e514e	d22cccad2e391cd4	95d49494f5a0d14a
t = 29	b462a20846af417d	fd258ff809b2253d	3b62dd973298ea43	5e9da426aa7d4a58
	291eee54c034c326	26c991e85352da6f	aceb5d06101e514e	d22cccad2e391cd4
t = 30	d5471e3dc7171224	b462a20846af417d	fd258ff809b2253d	3b62dd973298ea43
	0aaf99c59e7fadbd	291eee54c034c326	26c991e85352da6f	aceb5d06101e514e
t = 31	9ace856ba1290e6e	d5471e3dc7171224	b462a20846af417d	fd258ff809b2253d
	658f0bea63804d05	0aaf99c59e7fadbd	291eee54c034c326	26c991e85352da6f
t = 32	80a0d154506b37c4	9ace856ba1290e6e	d5471e3dc7171224	b462a20846af417d
	bbe6e3b3bb7fefab	658f0bea63804d05	0aaf99c59e7fadbd	291eee54c034c326
t = 33	fb90a8a76dea1bfe	80a0d154506b37c4	9ace856ba1290e6e	d5471e3dc7171224
	65234d5b5049e665	bbe6e3b3bb7fefab	658f0bea63804d05	0aaf99c59e7fadbd
t = 34	f517b690d940a294	fb90a8a76dea1bfe	80a0d154506b37c4	9ace856ba1290e6e
	e4dd663f44d313bc	65234d5b5049e665	bbe6e3b3bb7fefab	658f0bea63804d05
t = 35	b70883992932880d	f517b690d940a294	fb90a8a76dea1bfe	80a0d154506b37c4
	dc5dd7c12b1cb6e3	e4dd663f44d313bc	65234d5b5049e665	bbe6e3b3bb7fefab
t = 36	b2a2be77b0fcf3bf	b70883992932880d	f517b690d940a294	fb90a8a76dea1bfe
	50fca57291e19874	dc5dd7c12b1cb6e3	e4dd663f44d313bc	65234d5b5049e665
t = 37	8575839b0f08472b	b2a2be77b0fcf3bf	b70883992932880d	f517b690d940a294
	bd7176bd099bb2f2	50fca57291e19874	dc5dd7c12b1cb6e3	e4dd663f44d313bc
t = 38	4405d2765de0adfc	8575839b0f08472b	b2a2be77b0fcf3bf	b70883992932880d
	7ca4916f2cd8db10	bd7176bd099bb2f2	50fca57291e19874	dc5dd7c12b1cb6e3
t = 39	eec6fca5aa657661	4405d2765de0adfc	8575839b0f08472b	b2a2be77b0fcf3bf
	7be0b7e70bdabe53	7ca4916f2cd8db10	bd7176bd099bb2f2	50fca57291e19874
t = 40	bb3fcd7585b59e32	eec6fca5aa657661	4405d2765de0adfc	8575839b0f08472b
	2201c7cbd34e31fe	7be0b7e70bdabe53	7ca4916f2cd8db10	bd7176bd099bb2f2
t = 41	0e109efc47927341	bb3fcd7585b59e32	eec6fca5aa657661	4405d2765de0adfc
	d43e5686506fa05d	2201c7cbd34e31fe	7be0b7e70bdabe53	7ca4916f2cd8db10
t = 42	55c0dba83bcdc6e0	0e109efc47927341	bb3fcd7585b59e32	eec6fca5aa657661
	5b634502f1671535	d43e5686506fa05d	2201c7cbd34e31fe	7be0b7e70bdabe53
t = 43	f5756f847bfaef67	55c0dba83bcdc6e0	0e109efc47927341	bb3fcd7585b59e32
	e2d307fd94f4818a	5b634502f1671535	d43e5686506fa05d	2201c7cbd34e31fe
t = 44	f1438c9cf271c06e	f5756f847bfaef67	55c0dba83bcdc6e0	0e109efc47927341
	ad8ac1ed966b2dc6	e2d307fd94f4818a	5b634502f1671535	d43e5686506fa05d
t = 45	a7dcaffdbefb9d4a	f1438c9cf271c06e	f5756f847bfaef67	55c0dba83bcdc6e0
	9e46e9f915099c34	ad8ac1ed966b2dc6	e2d307fd94f4818a	5b634502f1671535
t = 46	985ba373680b8e94	a7dcaffdbefb9d4a	f1438c9cf271c06e	f5756f847bfaef67
	7d4c0abc676b1a8b	9e46e9f915099c34	ad8ac1ed966b2dc6	e2d307fd94f4818a
t = 47	807f45784852303f	985ba373680b8e94	a7dcaffdbefb9d4a	f1438c9cf271c06e
	082ee70d3f352aac	7d4c0abc676b1a8b	9e46e9f915099c34	ad8ac1ed966b2dc6

	a / e	b / f	c / g	d / h
t = 48	d9c523173b1a1e05	807f45784852303f	985ba373680b8e94	a7dcaffdbefb9d4a
	e301dca32c44ca05	082ee70d3f352aac	7d4c0abc676b1a8b	9e46e9f915099c34
t = 49	b6df019ca515cafb	d9c523173b1a1e05	807f45784852303f	985ba373680b8e94
	754b3a461a665640	e301dca32c44ca05	082ee70d3f352aac	7d4c0abc676b1a8b
t = 50	427a642921b2e645	b6df019ca515cafb	d9c523173b1a1e05	807f45784852303f
	08a30fefe981f2ec	754b3a461a665640	e301dca32c44ca05	082ee70d3f352aac
t = 51	7aab58dbe1b9df7b	427a642921b2e645	b6df019ca515cafb	d9c523173b1a1e05
	2749c52d0b3d1225	08a30fefe981f2ec	754b3a461a665640	e301dca32c44ca05
t = 52	974ddd552aec16ce	7aab58dbe1b9df7b	427a642921b2e645	b6df019ca515cafb
	a9e6cbfb416a591f	2749c52d0b3d1225	08a30fefe981f2ec	754b3a461a665640
t = 53	55e0b99d4404f6ca	974ddd552aec16ce	7aab58dbe1b9df7b	427a642921b2e645
	6c24ad697b41b1b9	a9e6cbfb416a591f	2749c52d0b3d1225	08a30fefe981f2ec
t = 54	901f632579ee1eee	55e0b99d4404f6ca	974ddd552aec16ce	7aab58dbe1b9df7b
	4ee99476db1bb7a9	6c24ad697b41b1b9	a9e6cbfb416a591f	2749c52d0b3d1225
t = 55	f90db9f292a60463	901f632579ee1eee	55e0b99d4404f6ca	974ddd552aec16ce
	5401644992a1f8b8	4ee99476db1bb7a9	6c24ad697b41b1b9	a9e6cbfb416a591f
t = 56	9b906a7df1007357	f90db9f292a60463	901f632579ee1eee	55e0b99d4404f6ca
	f5e402ee21db8915	5401644992a1f8b8	4ee99476db1bb7a9	6c24ad697b41b1b9
t = 57	71a0a998fb48c0fc	9b906a7df1007357	f90db9f292a60463	901f632579ee1eee
	96bece755cd203cb	f5e402ee21db8915	5401644992a1f8b8	4ee99476db1bb7a9
t = 58	c25e798e50752535	71a0a998fb48c0fc	9b906a7df1007357	f90db9f292a60463
	9d548440d8e110f2	96bece755cd203cb	f5e402ee21db8915	5401644992a1f8b8
t = 59	1ce4f2591812e6ae	c25e798e50752535	71a0a998fb48c0fc	9b906a7df1007357
	b27252537a83cf27	9d548440d8e110f2	96bece755cd203cb	f5e402ee21db8915
t = 60	c1700e250dc6ffed	1ce4f2591812e6ae	c25e798e50752535	71a0a998fb48c0fc
	970088839126bda5	b27252537a83cf27	9d548440d8e110f2	96bece755cd203cb
t = 61	f8e6924412fd0c64	c1700e250dc6ffed	1ce4f2591812e6ae	c25e798e50752535
	d50cf4f73910e3ee	970088839126bda5	b27252537a83cf27	9d548440d8e110f2
t = 62	d53e0a39eee47528	f8e6924412fd0c64	c1700e250dc6ffed	1ce4f2591812e6ae
	1b6d7234ace15d7d	d50cf4f73910e3ee	970088839126bda5	b27252537a83cf27
t = 63	3960545ab926c0d5	d53e0a39eee47528	f8e6924412fd0c64	c1700e250dc6ffed
	9eabb5618b4fcd13	1b6d7234ace15d7d	d50cf4f73910e3ee	970088839126bda5
t = 64	b2c164d71abb92fe	3960545ab926c0d5	d53e0a39eee47528	f8e6924412fd0c64
	f1736fbbfb6ebe72	9eabb5618b4fcd13	1b6d7234ace15d7d	d50cf4f73910e3ee
t = 65	4d979e985b067e75	b2c164d71abb92fe	3960545ab926c0d5	d53e0a39eee47528
	d1fb300f35992350	f1736fbbfb6ebe72	9eabb5618b4fcd13	1b6d7234ace15d7d
t = 66	59d0238ce137abd7	4d979e985b067e75	b2c164d71abb92fe	3960545ab926c0d5
	5f3c64b7546e2cec	d1fb300f35992350	f1736fbbfb6ebe72	9eabb5618b4fcd13
t = 67	bf8d9453b9876b0a	59d0238ce137abd7	4d979e985b067e75	b2c164d71abb92fe
	6c27893a31b0e07e	5f3c64b7546e2cec	d1fb300f35992350	f1736fbbfb6ebe72
t = 68	c45dd4a2d2fea059	bf8d9453b9876b0a	59d0238ce137abd7	4d979e985b067e75
	48253e21b26d8cf9	6c27893a31b0e07e	5f3c64b7546e2cec	d1fb300f35992350
t = 69	e08471946c17b0b6	c45dd4a2d2fea059	bf8d9453b9876b0a	59d0238ce137abd7
	714e2adf4e23ff24	48253e21b26d8cf9	6c27893a31b0e07e	5f3c64b7546e2cec
t = 70	b4838c1c28fee7bc	e08471946c17b0b6	c45dd4a2d2fea059	bf8d9453b9876b0a
	371f12f333f7e5b9	714e2adf4e23ff24	48253e21b26d8cf9	6c27893a31b0e07e
t = 71	851cf60a77f6e6d1	b4838c1c28fee7bc	e08471946c17b0b6	c45dd4a2d2fea059
	a2a475deac0e8b42	371f12f333f7e5b9	714e2adf4e23ff24	48253e21b26d8cf9

```
            a / e            b / f            c / g            d / h

t = 72  f53d23c50249af2d  851cf60a77f6e6d1  b4838c1c28fee7bc  e08471946c17b0b6
        1e99cae9d4cf0409  a2a475deac0e8b42  371f12f333f7e5b9  714e2adf4e23ff24
t = 73  b81e85d427045550  f53d23c50249af2d  851cf60a77f6e6d1  b4838c1c28fee7bc
        f5794711faa60f63  1e99cae9d4cf0409  a2a475deac0e8b42  371f12f333f7e5b9
t = 74  ae70c7d11ea84a83  b81e85d427045550  f53d23c50249af2d  851cf60a77f6e6d1
        dc0d633411c289b2  f5794711faa60f63  1e99cae9d4cf0409  a2a475deac0e8b42
t = 75  5c54592e13c76135  ae70c7d11ea84a83  b81e85d427045550  f53d23c50249af2d
        1620dd5479e94b9b  dc0d633411c289b2  f5794711faa60f63  1e99cae9d4cf0409
t = 76  03a0f79087078a93  5c54592e13c76135  ae70c7d11ea84a83  b81e85d427045550
        57e90fa678e4cc97  1620dd5479e94b9b  dc0d633411c289b2  f5794711faa60f63
t = 77  8df0baad4c6ed50c  03a0f79087078a93  5c54592e13c76135  ae70c7d11ea84a83
        c6e7246f7f0bdac6  57e90fa678e4cc97  1620dd5479e94b9b  dc0d633411c289b2
t = 78  bfa9f194894db5b6  8df0baad4c6ed50c  03a0f79087078a93  5c54592e13c76135
        90bb8597bb41da1a  c6e7246f7f0bdac6  57e90fa678e4cc97  1620dd5479e94b9b
t = 79  4b7c99fbaf72a571  bfa9f194894db5b6  8df0baad4c6ed50c  03a0f79087078a93
        78955227fde03a42  90bb8597bb41da1a  c6e7246f7f0bdac6  57e90fa678e4cc97


Block 2 has been processed. The values of {Hi} are

H1 = 4319017a2b706e69 + 4b7c99fbaf72a571 = 8e959b75dae313da
H2 = cd4b05938bae5e89 + bfa9f194894db5b6 = 8cf4f72814fc143f
H3 = 0186bf199f30aa95 + 8df0baad4c6ed50c = 8f7779c6eb9f7fa1
H4 = 6ef8b71d2f810585 + 03a0f79087078a93 = 7299aeadb6889018
H5 = d787d6764b20bda2 + 78955227fde03a42 = 501d289e4900f7e4
H6 = a260144709736920 + 90bb8597bb41da1a = 331b99dec4b5433a
H7 = 00ec057f37d14b8e + c6e7246f7f0bdac6 = c7d329eeb6dd2654
H8 = 06add5b50e671c72 + 57e90fa678e4cc97 = 5e96e55b874be909.

The message digest is

    8e959b75dae313da 8cf4f72814fc143f 8f7779c6eb9f7fa1 7299aeadb6889018
    501d289e4900f7e4 331b99dec4b5433a c7d329eeb6dd2654 5e96e55b874be909.
```

4. SHA-384

SHA-384 is defined in the exact same manner as SHA-512 with the following two exceptions:

(1) the **initial hash value** $H^{(0)}$ is based on the fractional parts of the square roots of the ninth through sixteenth primes:

$$\begin{aligned}
H_1^{(0)} &= \texttt{cbbb9d5dc1059ed8} \\
H_2^{(0)} &= \texttt{629a292a367cd507} \\
H_3^{(0)} &= \texttt{9159015a3070dd17} \\
H_4^{(0)} &= \texttt{152fecd8f70e5939} \\
H_5^{(0)} &= \texttt{67332667ffc00b31} \\
H_6^{(0)} &= \texttt{8eb44a8768581511} \\
H_7^{(0)} &= \texttt{db0c2e0d64f98fa7} \\
H_8^{(0)} &= \texttt{47b5481dbefa4fa4}
\end{aligned}$$

(2) The final 384-bit hash is obtained by truncating the SHA-512-based hash output to its left-most 384 bits.

Hence the hash of "abc" is

cb00753f45a35e8b b5a03d699ac65007 272c32ab0eded163 1a8b605a43ff5bed
8086072ba1e7cc23 58baeca134c825a7.

and the hash of

"abcdefghbcdefghicdefghijdefghijkefghijklfghijklmghijklmn
hijklmnoijklmnopjklmnopqklmnopqrlmnopqrsmnopqrstnopqrstu"

(with no line break after the first n) is

09330c33f71147e8 3d192fc782cd1b47 53111b173b3b05d2 2fa08086e3b0f712
fcc7c71a557e2db9 66c3e9fa91746039.

Hash of "abc"

	a / e	b / f	c / g	d / h
init	cbbb9d5dc1059ed8	629a292a367cd507	9159015a3070dd17	152fecd8f70e5939
	67332667ffc00b31	8eb44a8768581511	db0c2e0d64f98fa7	47b5481dbefa4fa4
t = 0	470994ad30873f88	cbbb9d5dc1059ed8	629a292a367cd507	9159015a3070dd17
	bd03f724be6075f9	67332667ffc00b31	8eb44a8768581511	db0c2e0d64f98fa7
t = 1	2e91230306a12ae0	470994ad30873f88	cbbb9d5dc1059ed8	629a292a367cd507
	5e1b4e1695372b9e	bd03f724be6075f9	67332667ffc00b31	8eb44a8768581511
t = 2	eebe5d379be707ad	2e91230306a12ae0	470994ad30873f88	cbbb9d5dc1059ed8
	54074a65aef34336	5e1b4e1695372b9e	bd03f724be6075f9	67332667ffc00b31
t = 3	e308483153e15ad6	eebe5d379be707ad	2e91230306a12ae0	470994ad30873f88
	086c5b2d36a89178	54074a65aef34336	5e1b4e1695372b9e	bd03f724be6075f9
t = 4	3a7a023c593d8479	e308483153e15ad6	eebe5d379be707ad	2e91230306a12ae0
	8aa1144850633794	086c5b2d36a89178	54074a65aef34336	5e1b4e1695372b9e
t = 5	333199a85f92b052	3a7a023c593d8479	e308483153e15ad6	eebe5d379be707ad
	7a6316f0ef047ce7	8aa1144850633794	086c5b2d36a89178	54074a65aef34336
t = 6	76f0741213dd2ef6	333199a85f92b052	3a7a023c593d8479	e308483153e15ad6
	74063cba385f0675	7a6316f0ef047ce7	8aa1144850633794	086c5b2d36a89178
t = 7	02f2a04d3aab1629	76f0741213dd2ef6	333199a85f92b052	3a7a023c593d8479
	1688b9bf14980fc0	74063cba385f0675	7a6316f0ef047ce7	8aa1144850633794
t = 8	73e5b2a1704a0349	02f2a04d3aab1629	76f0741213dd2ef6	333199a85f92b052
	fd00139f705907d0	1688b9bf14980fc0	74063cba385f0675	7a6316f0ef047ce7
t = 9	bf3f67ba12882648	73e5b2a1704a0349	02f2a04d3aab1629	76f0741213dd2ef6
	652e311d4f0a4257	fd00139f705907d0	1688b9bf14980fc0	74063cba385f0675
t = 10	33254508bb2ea48d	bf3f67ba12882648	73e5b2a1704a0349	02f2a04d3aab1629
	9e18991c4f39f0ba	652e311d4f0a4257	fd00139f705907d0	1688b9bf14980fc0
t = 11	c1fdb2a0205ea0e5	33254508bb2ea48d	bf3f67ba12882648	73e5b2a1704a0349
	04732e8bc4044582	9e18991c4f39f0ba	652e311d4f0a4257	fd00139f705907d0
t = 12	185f9ff038a50f39	c1fdb2a0205ea0e5	33254508bb2ea48d	bf3f67ba12882648
	8b4acfc4d2b8afe6	04732e8bc4044582	9e18991c4f39f0ba	652e311d4f0a4257
t = 13	e5f06744c0d7563a	185f9ff038a50f39	c1fdb2a0205ea0e5	33254508bb2ea48d
	2fa93d1ce9523015	8b4acfc4d2b8afe6	04732e8bc4044582	9e18991c4f39f0ba
t = 14	7e32dc0e9f414783	e5f06744c0d7563a	185f9ff038a50f39	c1fdb2a0205ea0e5
	3a9950aaa5e75884	2fa93d1ce9523015	8b4acfc4d2b8afe6	04732e8bc4044582
t = 15	1eab6159ae87ef6d	7e32dc0e9f414783	e5f06744c0d7563a	185f9ff038a50f39
	153b895cfbc436c5	3a9950aaa5e75884	2fa93d1ce9523015	8b4acfc4d2b8afe6
t = 16	33ef2cebbf1739aa	1eab6159ae87ef6d	7e32dc0e9f414783	e5f06744c0d7563a
	9d1a64baf1d366aa	153b895cfbc436c5	3a9950aaa5e75884	2fa93d1ce9523015
t = 17	7df1b65f1b87d6ca	33ef2cebbf1739aa	1eab6159ae87ef6d	7e32dc0e9f414783
	5b6e369d36e8e181	9d1a64baf1d366aa	153b895cfbc436c5	3a9950aaa5e75884
t = 18	63a24014a34bb0f6	7df1b65f1b87d6ca	33ef2cebbf1739aa	1eab6159ae87ef6d
	e13e610eae680d85	5b6e369d36e8e181	9d1a64baf1d366aa	153b895cfbc436c5
t = 19	f1aabd313309509b	63a24014a34bb0f6	7df1b65f1b87d6ca	33ef2cebbf1739aa
	674385f0d87db94f	e13e610eae680d85	5b6e369d36e8e181	9d1a64baf1d366aa
t = 20	9ba737ae88a72c64	f1aabd313309509b	63a24014a34bb0f6	7df1b65f1b87d6ca
	3fc2614c43906c0f	674385f0d87db94f	e13e610eae680d85	5b6e369d36e8e181
t = 21	042c2dc9a5bf558a	9ba737ae88a72c64	f1aabd313309509b	63a24014a34bb0f6
	19316bebc88e01f2	3fc2614c43906c0f	674385f0d87db94f	e13e610eae680d85
t = 22	7799c75acc748c0f	042c2dc9a5bf558a	9ba737ae88a72c64	f1aabd313309509b
	a7bbd65bf64f58c8	19316bebc88e01f2	3fc2614c43906c0f	674385f0d87db94f
t = 23	ccf99a80f92bf002	7799c75acc748c0f	042c2dc9a5bf558a	9ba737ae88a72c64
	e52a24fae4e8fc9b	a7bbd65bf64f58c8	19316bebc88e01f2	3fc2614c43906c0f

	a / e	b / f	c / g	d / h
t = 24	ae993474363efe68	ccf99a80f92bf002	7799c75acc748c0f	042c2dc9a5bf558a
	587f308d58681928	e52a24fae4e8fc9b	a7bbd65bf64f58c8	19316bebc88e01f2
t = 25	335063d1a2aec92f	ae993474363efe68	ccf99a80f92bf002	7799c75acc748c0f
	c2d6d65e38c6ea79	587f308d58681928	e52a24fae4e8fc9b	a7bbd65bf64f58c8
t = 26	53a78b0cca01ba37	335063d1a2aec92f	ae993474363efe68	ccf99a80f92bf002
	3b65a26c3c92c8f3	c2d6d65e38c6ea79	587f308d58681928	e52a24fae4e8fc9b
t = 27	ab7ffa529f622930	53a78b0cca01ba37	335063d1a2aec92f	ae993474363efe68
	b9d8a2f2762901ea	3b65a26c3c92c8f3	c2d6d65e38c6ea79	587f308d58681928
t = 28	e428bb43afe3d63e	ab7ffa529f622930	53a78b0cca01ba37	335063d1a2aec92f
	6a8527525f898726	b9d8a2f2762901ea	3b65a26c3c92c8f3	c2d6d65e38c6ea79
t = 29	bbed541a5128088c	e428bb43afe3d63e	ab7ffa529f622930	53a78b0cca01ba37
	7973aadbde294be9	6a8527525f898726	b9d8a2f2762901ea	3b65a26c3c92c8f3
t = 30	4c5c38df7ec8baf4	bbed541a5128088c	e428bb43afe3d63e	ab7ffa529f622930
	422ceea0200e9ee4	7973aadbde294be9	6a8527525f898726	b9d8a2f2762901ea
t = 31	4ba456ec244033ed	4c5c38df7ec8baf4	bbed541a5128088c	e428bb43afe3d63e
	7cf40857056d86b0	422ceea0200e9ee4	7973aadbde294be9	6a8527525f898726
t = 32	aa4a6ab2ac5f5dd8	4ba456ec244033ed	4c5c38df7ec8baf4	bbed541a5128088c
	ad2b1ecfb5bfc556	7cf40857056d86b0	422ceea0200e9ee4	7973aadbde294be9
t = 33	9cb941f2ced774b3	aa4a6ab2ac5f5dd8	4ba456ec244033ed	4c5c38df7ec8baf4
	029f66c7b4569bf0	ad2b1ecfb5bfc556	7cf40857056d86b0	422ceea0200e9ee4
t = 34	39265f358594de27	9cb941f2ced774b3	aa4a6ab2ac5f5dd8	4ba456ec244033ed
	3f7b1c260c82e54f	029f66c7b4569bf0	ad2b1ecfb5bfc556	7cf40857056d86b0
t = 35	09cca487d39b02a1	39265f358594de27	9cb941f2ced774b3	aa4a6ab2ac5f5dd8
	4a22b37b58a5b1b0	3f7b1c260c82e54f	029f66c7b4569bf0	ad2b1ecfb5bfc556
t = 36	d48d97ce438cf4f0	09cca487d39b02a1	39265f358594de27	9cb941f2ced774b3
	a239e00b8baa0410	4a22b37b58a5b1b0	3f7b1c260c82e54f	029f66c7b4569bf0
t = 37	d6f41e25a8b634d6	d48d97ce438cf4f0	09cca487d39b02a1	39265f358594de27
	25755cb8179dd0b0	a239e00b8baa0410	4a22b37b58a5b1b0	3f7b1c260c82e54f
t = 38	54078334358573b4	d6f41e25a8b634d6	d48d97ce438cf4f0	09cca487d39b02a1
	0e419fb0802b0efc	25755cb8179dd0b0	a239e00b8baa0410	4a22b37b58a5b1b0
t = 39	db24f9a03f4fff6b	54078334358573b4	d6f41e25a8b634d6	d48d97ce438cf4f0
	d30e99b4b394b090	0e419fb0802b0efc	25755cb8179dd0b0	a239e00b8baa0410
t = 40	3604c53a845efc37	db24f9a03f4fff6b	54078334358573b4	d6f41e25a8b634d6
	791b2b4af7338b99	d30e99b4b394b090	0e419fb0802b0efc	25755cb8179dd0b0
t = 41	f41b1c0eee89bdc6	3604c53a845efc37	db24f9a03f4fff6b	54078334358573b4
	e319b77d9e4e87f9	791b2b4af7338b99	d30e99b4b394b090	0e419fb0802b0efc
t = 42	36644ae374632e3a	f41b1c0eee89bdc6	3604c53a845efc37	db24f9a03f4fff6b
	458250878a3972b2	e319b77d9e4e87f9	791b2b4af7338b99	d30e99b4b394b090
t = 43	88806f6ae9fcd65b	36644ae374632e3a	f41b1c0eee89bdc6	3604c53a845efc37
	cfde2e6ea54fa576	458250878a3972b2	e319b77d9e4e87f9	791b2b4af7338b99
t = 44	51dcaa36995c301d	88806f6ae9fcd65b	36644ae374632e3a	f41b1c0eee89bdc6
	e37f778353998050	cfde2e6ea54fa576	458250878a3972b2	e319b77d9e4e87f9
t = 45	ef5e3885a2f238df	51dcaa36995c301d	88806f6ae9fcd65b	36644ae374632e3a
	740e347f24e18fda	e37f778353998050	cfde2e6ea54fa576	458250878a3972b2
t = 46	eb3753f4283f4818	ef5e3885a2f238df	51dcaa36995c301d	88806f6ae9fcd65b
	0ae48cf840bb8be9	740e347f24e18fda	e37f778353998050	cfde2e6ea54fa576
t = 47	a6998d63a5d09e04	eb3753f4283f4818	ef5e3885a2f238df	51dcaa36995c301d
	e21095012ee0b72a	0ae48cf840bb8be9	740e347f24e18fda	e37f778353998050

	a / e	b / f	c / g	d / h
t = 48	d3698fb64df175b0	a6998d63a5d09e04	eb3753f4283f4818	ef5e3885a2f238df
	c2f0b90ffce80739	e21095012ee0b72a	0ae48cf840bb8be9	740e347f24e18fda
t = 49	317a3b295b991914	d3698fb64df175b0	a6998d63a5d09e04	eb3753f4283f4818
	1cadff2e6cb5aa4d	c2f0b90ffce80739	e21095012ee0b72a	0ae48cf840bb8be9
t = 50	0941da08148ba463	317a3b295b991914	d3698fb64df175b0	a6998d63a5d09e04
	833eb9a4bb5a073e	1cadff2e6cb5aa4d	c2f0b90ffce80739	e21095012ee0b72a
t = 51	494ac238d68c3d0b	0941da08148ba463	317a3b295b991914	d3698fb64df175b0
	80c8fc138e645028	833eb9a4bb5a073e	1cadff2e6cb5aa4d	c2f0b90ffce80739
t = 52	c87e9168db9e97de	494ac238d68c3d0b	0941da08148ba463	317a3b295b991914
	65cf7f6a829aca04	80c8fc138e645028	833eb9a4bb5a073e	1cadff2e6cb5aa4d
t = 53	edb4448879391dbb	c87e9168db9e97de	494ac238d68c3d0b	0941da08148ba463
	7729c85475dd318f	65cf7f6a829aca04	80c8fc138e645028	833eb9a4bb5a073e
t = 54	073775c2456dc7db	edb4448879391dbb	c87e9168db9e97de	494ac238d68c3d0b
	a9cca0b6266b1d77	7729c85475dd318f	65cf7f6a829aca04	80c8fc138e645028
t = 55	54de8857b24afaf7	073775c2456dc7db	edb4448879391dbb	c87e9168db9e97de
	8de51cff2ae4b068	a9cca0b6266b1d77	7729c85475dd318f	65cf7f6a829aca04
t = 56	8a9cdd80f7f09c05	54de8857b24afaf7	073775c2456dc7db	edb4448879391dbb
	a60ba5e9ebaeb96a	8de51cff2ae4b068	a9cca0b6266b1d77	7729c85475dd318f
t = 57	3eeb22a7524d8d7f	8a9cdd80f7f09c05	54de8857b24afaf7	073775c2456dc7db
	e2e6830b139df58f	a60ba5e9ebaeb96a	8de51cff2ae4b068	a9cca0b6266b1d77
t = 58	0ed77c9cde8883d3	3eeb22a7524d8d7f	8a9cdd80f7f09c05	54de8857b24afaf7
	38413a2052387a9e	e2e6830b139df58f	a60ba5e9ebaeb96a	8de51cff2ae4b068
t = 59	e64e4135f9d30dbc	0ed77c9cde8883d3	3eeb22a7524d8d7f	8a9cdd80f7f09c05
	45b640454c75c349	38413a2052387a9e	e2e6830b139df58f	a60ba5e9ebaeb96a
t = 60	1ca93a293d544328	e64e4135f9d30dbc	0ed77c9cde8883d3	3eeb22a7524d8d7f
	efbef83a35c0319e	45b640454c75c349	38413a2052387a9e	e2e6830b139df58f
t = 61	3dc764f89e54043a	1ca93a293d544328	e64e4135f9d30dbc	0ed77c9cde8883d3
	a57784945550cf94	efbef83a35c0319e	45b640454c75c349	38413a2052387a9e
t = 62	56fb5883f1c87a05	3dc764f89e54043a	1ca93a293d544328	e64e4135f9d30dbc
	f5198a41eb80e022	a57784945550cf94	efbef83a35c0319e	45b640454c75c349
t = 63	24a1124262a331c7	56fb5883f1c87a05	3dc764f89e54043a	1ca93a293d544328
	06edacae6e7b54ad	f5198a41eb80e022	a57784945550cf94	efbef83a35c0319e
t = 64	eb85d19201c89694	24a1124262a331c7	56fb5883f1c87a05	3dc764f89e54043a
	9ced24983eec8723	06edacae6e7b54ad	f5198a41eb80e022	a57784945550cf94
t = 65	cc981ab3a59c1db4	eb85d19201c89694	24a1124262a331c7	56fb5883f1c87a05
	eac5516336bc8882	9ced24983eec8723	06edacae6e7b54ad	f5198a41eb80e022
t = 66	ceef5d997e148b44	cc981ab3a59c1db4	eb85d19201c89694	24a1124262a331c7
	617bbf70bb165212	eac5516336bc8882	9ced24983eec8723	06edacae6e7b54ad
t = 67	689edf608a8e3f14	ceef5d997e148b44	cc981ab3a59c1db4	eb85d19201c89694
	3280d88472c100fd	617bbf70bb165212	eac5516336bc8882	9ced24983eec8723
t = 68	1e6e0255ab88079f	689edf608a8e3f14	ceef5d997e148b44	cc981ab3a59c1db4
	f2001138439902b1	3280d88472c100fd	617bbf70bb165212	eac5516336bc8882
t = 69	8c5d3b7fdad66e70	1e6e0255ab88079f	689edf608a8e3f14	ceef5d997e148b44
	90d18ec8b69f0345	f2001138439902b1	3280d88472c100fd	617bbf70bb165212
t = 70	32e5ed8655871e9b	8c5d3b7fdad66e70	1e6e0255ab88079f	689edf608a8e3f14
	51105f6241313777	90d18ec8b69f0345	f2001138439902b1	3280d88472c100fd
t = 71	bcd5061679be7336	32e5ed8655871e9b	8c5d3b7fdad66e70	1e6e0255ab88079f
	454b99f654443ad0	51105f6241313777	90d18ec8b69f0345	f2001138439902b1

```
            a / e            b / f            c / g            d / h

t = 72  e7d913b6678e78ef  bcd5061679be7336  32e5ed8655871e9b  8c5d3b7fdad66e70
        1ff613b5aa63776e  454b99f654443ad0  51105f6241313777  90d18ec8b69f0345
t = 73  e6b8cb8dfa3475ab  e7d913b6678e78ef  bcd5061679be7336  32e5ed8655871e9b
        2e75f34303d39bb0  1ff613b5aa63776e  454b99f654443ad0  51105f6241313777
t = 74  fdd4a30e168c4ae5  e6b8cb8dfa3475ab  e7d913b6678e78ef  bcd5061679be7336
        83a35dbe2a64fc26  2e75f34303d39bb0  1ff613b5aa63776e  454b99f654443ad0
t = 75  12aeb6268dfa3e14  fdd4a30e168c4ae5  e6b8cb8dfa3475ab  e7d913b6678e78ef
        f660943b276786f7  83a35dbe2a64fc26  2e75f34303d39bb0  1ff613b5aa63776e
t = 76  055b73814cf102b4  12aeb6268dfa3e14  fdd4a30e168c4ae5  e6b8cb8dfa3475ab
        c4b149710f5d6a71  f660943b276786f7  83a35dbe2a64fc26  2e75f34303d39bb0
t = 77  95d33150de6df44c  055b73814cf102b4  12aeb6268dfa3e14  fdd4a30e168c4ae5
        c7f7bff08ebf0d30  c4b149710f5d6a71  f660943b276786f7  83a35dbe2a64fc26
t = 78  5306143f64497b00  95d33150de6df44c  055b73814cf102b4  12aeb6268dfa3e14
        ca06a219cc701096  c7f7bff08ebf0d30  c4b149710f5d6a71  f660943b276786f7
t = 79  ff44d7e1849dbfb3  5306143f64497b00  95d33150de6df44c  055b73814cf102b4
        1952e0c3a227c0f2  ca06a219cc701096  c7f7bff08ebf0d30  c4b149710f5d6a71

Block 1 has been processed. The values of {Hi} are

H1 = cbbb9d5dc1059ed8 + ff44d7e1849dbfb3 = cb00753f45a35e8b
H2 = 629a292a367cd507 + 5306143f64497b00 = b5a03d699ac65007
H3 = 9159015a3070dd17 + 95d33150de6df44c = 272c32ab0eded163
H4 = 152fecd8f70e5939 + 055b73814cf102b4 = 1a8b605a43ff5bed
H5 = 67332667ffc00b31 + 1952e0c3a227c0f2 = 8086072ba1e7cc23
H6 = 8eb44a8768581511 + ca06a219cc701096 = 58baeca134c825a7
H7 = db0c2e0d64f98fa7 + c7f7bff08ebf0d30 = a303edfdf3b89cd7
H8 = 47b5481dbefa4fa4 + c4b149710f5d6a71 = 0c66918ece57ba15.

The message digest is

    cb00753f45a35e8b b5a03d699ac65007 272c32ab0eded163 1a8b605a43ff5bed
    8086072ba1e7cc23 58baeca134c825a7.
```

Hash of "abcdefghbcdefghicdefghijdefghijkefghijklfghijklmghijklmn hijklmnoijklmnopjklmnopqklmnopqrlmnopqrsmnopqrstnopqrstu" (block 1)

	a / e	b / f	c / g	d / h
init	cbbb9d5dc1059ed8	629a292a367cd507	9159015a3070dd17	152fecd8f70e5939
	67332667ffc00b31	8eb44a8768581511	db0c2e0d64f98fa7	47b5481dbefa4fa4
t = 0	4709949195eda6f0	cbbb9d5dc1059ed8	629a292a367cd507	9159015a3070dd17
	bd03f70923c6dd61	67332667ffc00b31	8eb44a8768581511	db0c2e0d64f98fa7
t = 1	78d3f8bc03a38303	4709949195eda6f0	cbbb9d5dc1059ed8	629a292a367cd507
	ae067f071cd18a36	bd03f70923c6dd61	67332667ffc00b31	8eb44a8768581511
t = 2	ed59d30beff95306	78d3f8bc03a38303	4709949195eda6f0	cbbb9d5dc1059ed8
	c180c7a74ed5cf1f	ae067f071cd18a36	bd03f70923c6dd61	67332667ffc00b31
t = 3	8e7fe2aba3168f2b	ed59d30beff95306	78d3f8bc03a38303	4709949195eda6f0
	d92d19667920b327	c180c7a74ed5cf1f	ae067f071cd18a36	bd03f70923c6dd61
t = 4	1174f9b374a9263a	8e7fe2aba3168f2b	ed59d30beff95306	78d3f8bc03a38303
	dd371f2d13661c52	d92d19667920b327	c180c7a74ed5cf1f	ae067f071cd18a36
t = 5	27aaafb7fbef806b	1174f9b374a9263a	8e7fe2aba3168f2b	ed59d30beff95306
	21af3c6430a9af9c	dd371f2d13661c52	d92d19667920b327	c180c7a74ed5cf1f
t = 6	b352d03a0bd34d65	27aaafb7fbef806b	1174f9b374a9263a	8e7fe2aba3168f2b
	69397de9a30e1473	21af3c6430a9af9c	dd371f2d13661c52	d92d19667920b327
t = 7	412db7f990563d7c	b352d03a0bd34d65	27aaafb7fbef806b	1174f9b374a9263a
	5062fd5924e2b62e	69397de9a30e1473	21af3c6430a9af9c	dd371f2d13661c52
t = 8	0f79040546e6edf7	412db7f990563d7c	b352d03a0bd34d65	27aaafb7fbef806b
	6b6c511b25a6bdbc	5062fd5924e2b62e	69397de9a30e1473	21af3c6430a9af9c
t = 9	ebf02410f67b8ee7	0f79040546e6edf7	412db7f990563d7c	b352d03a0bd34d65
	dac695b91543ae80	6b6c511b25a6bdbc	5062fd5924e2b62e	69397de9a30e1473
t = 10	97aa05d89b8dbe6d	ebf02410f67b8ee7	0f79040546e6edf7	412db7f990563d7c
	83b8b72646c0b598	dac695b91543ae80	6b6c511b25a6bdbc	5062fd5924e2b62e
t = 11	23d0a36b692118eb	97aa05d89b8dbe6d	ebf02410f67b8ee7	0f79040546e6edf7
	a5f6c5155e221e8c	83b8b72646c0b598	dac695b91543ae80	6b6c511b25a6bdbc
t = 12	e1041368d2fca1a2	23d0a36b692118eb	97aa05d89b8dbe6d	ebf02410f67b8ee7
	ae01675bfb003180	a5f6c5155e221e8c	83b8b72646c0b598	dac695b91543ae80
t = 13	45bd6f69efec540d	e1041368d2fca1a2	23d0a36b692118eb	97aa05d89b8dbe6d
	c35cc50c1cf7ef98	ae01675bfb003180	a5f6c5155e221e8c	83b8b72646c0b598
t = 14	c237fa23abb9bc16	45bd6f69efec540d	e1041368d2fca1a2	23d0a36b692118eb
	a16c4f134b28923e	c35cc50c1cf7ef98	ae01675bfb003180	a5f6c5155e221e8c
t = 15	b4092df1c0f81853	c237fa23abb9bc16	45bd6f69efec540d	e1041368d2fca1a2
	008178e17fa649f2	a16c4f134b28923e	c35cc50c1cf7ef98	ae01675bfb003180
t = 16	21e5c91d11809c13	b4092df1c0f81853	c237fa23abb9bc16	45bd6f69efec540d
	a26dfa04ed8c9b63	008178e17fa649f2	a16c4f134b28923e	c35cc50c1cf7ef98
t = 17	2c957137cd4304a5	21e5c91d11809c13	b4092df1c0f81853	c237fa23abb9bc16
	6be210614b10949b	a26dfa04ed8c9b63	008178e17fa649f2	a16c4f134b28923e
t = 18	2180e61afe322bc7	2c957137cd4304a5	21e5c91d11809c13	b4092df1c0f81853
	76396996200065f7	6be210614b10949b	a26dfa04ed8c9b63	008178e17fa649f2
t = 19	f2911c11c96e5ff5	2180e61afe322bc7	2c957137cd4304a5	21e5c91d11809c13
	1bc2160f4f3711dc	76396996200065f7	6be210614b10949b	a26dfa04ed8c9b63
t = 20	5eab10b19a5143a8	f2911c11c96e5ff5	2180e61afe322bc7	2c957137cd4304a5
	98d2b19d201f2bb6	1bc2160f4f3711dc	76396996200065f7	6be210614b10949b
t = 21	29c5348d87cd5590	5eab10b19a5143a8	f2911c11c96e5ff5	2180e61afe322bc7
	4324c8caccf7753c	98d2b19d201f2bb6	1bc2160f4f3711dc	76396996200065f7
t = 22	33c6b4a0166b7c9c	29c5348d87cd5590	5eab10b19a5143a8	f2911c11c96e5ff5
	d49cef5bd2dec121	4324c8caccf7753c	98d2b19d201f2bb6	1bc2160f4f3711dc
t = 23	1db4ee606d2a7a96	33c6b4a0166b7c9c	29c5348d87cd5590	5eab10b19a5143a8
	b17d15b397521ab3	d49cef5bd2dec121	4324c8caccf7753c	98d2b19d201f2bb6

	a / e	b / f	c / g	d / h
t = 24	5cef5b2f00142660	1db4ee606d2a7a96	33c6b4a0166b7c9c	29c5348d87cd5590
	789e540f22e13932	b17d15b397521ab3	d49cef5bd2dec121	4324c8caccf7753c
t = 25	ff74f4a162435903	5cef5b2f00142660	1db4ee606d2a7a96	33c6b4a0166b7c9c
	6c0be33dcc6e7572	789e540f22e13932	b17d15b397521ab3	d49cef5bd2dec121
t = 26	41740b736e9676a9	ff74f4a162435903	5cef5b2f00142660	1db4ee606d2a7a96
	d8e401251592da6c	6c0be33dcc6e7572	789e540f22e13932	b17d15b397521ab3
t = 27	931059fe9279ff1d	41740b736e9676a9	ff74f4a162435903	5cef5b2f00142660
	7f31116887eea596	d8e401251592da6c	6c0be33dcc6e7572	789e540f22e13932
t = 28	356d08d982e2ead4	931059fe9279ff1d	41740b736e9676a9	ff74f4a162435903
	40c28c34b1bbe906	7f31116887eea596	d8e401251592da6c	6c0be33dcc6e7572
t = 29	89dc825e7235c74b	356d08d982e2ead4	931059fe9279ff1d	41740b736e9676a9
	7a499ae05da50bf2	40c28c34b1bbe906	7f31116887eea596	d8e401251592da6c
t = 30	97901f333e662fdc	89dc825e7235c74b	356d08d982e2ead4	931059fe9279ff1d
	4472b2e331ddfab4	7a499ae05da50bf2	40c28c34b1bbe906	7f31116887eea596
t = 31	69c8f40eb38b6022	97901f333e662fdc	89dc825e7235c74b	356d08d982e2ead4
	177589502dd39aa2	4472b2e331ddfab4	7a499ae05da50bf2	40c28c34b1bbe906
t = 32	4920943ffe52b207	69c8f40eb38b6022	97901f333e662fdc	89dc825e7235c74b
	6b813a0d0cdf4991	177589502dd39aa2	4472b2e331ddfab4	7a499ae05da50bf2
t = 33	b4cb0df332d108ab	4920943ffe52b207	69c8f40eb38b6022	97901f333e662fdc
	8fe3d28097f18618	6b813a0d0cdf4991	177589502dd39aa2	4472b2e331ddfab4
t = 34	e7748fbf744a5240	b4cb0df332d108ab	4920943ffe52b207	69c8f40eb38b6022
	0d7ab03208f1d7a5	8fe3d28097f18618	6b813a0d0cdf4991	177589502dd39aa2
t = 35	7416ca18d9e265e0	e7748fbf744a5240	b4cb0df332d108ab	4920943ffe52b207
	11200c2d47c082f8	0d7ab03208f1d7a5	8fe3d28097f18618	6b813a0d0cdf4991
t = 36	75476f5456e82f9c	7416ca18d9e265e0	e7748fbf744a5240	b4cb0df332d108ab
	3024702447f76224	11200c2d47c082f8	0d7ab03208f1d7a5	8fe3d28097f18618
t = 37	f638a568b53a2f8f	75476f5456e82f9c	7416ca18d9e265e0	e7748fbf744a5240
	6217c1c02153302c	3024702447f76224	11200c2d47c082f8	0d7ab03208f1d7a5
t = 38	c418f6f90602c79a	f638a568b53a2f8f	75476f5456e82f9c	7416ca18d9e265e0
	87f0901c227adbb3	6217c1c02153302c	3024702447f76224	11200c2d47c082f8
t = 39	4f1f4f21df3dcf43	c418f6f90602c79a	f638a568b53a2f8f	75476f5456e82f9c
	fb7c63fcddf4a1c2	87f0901c227adbb3	6217c1c02153302c	3024702447f76224
t = 40	13eb82e4b98d0e67	4f1f4f21df3dcf43	c418f6f90602c79a	f638a568b53a2f8f
	fb6c0e54d48d4f2d	fb7c63fcddf4a1c2	87f0901c227adbb3	6217c1c02153302c
t = 41	820e75046567bace	13eb82e4b98d0e67	4f1f4f21df3dcf43	c418f6f90602c79a
	b16a9397472f0123	fb6c0e54d48d4f2d	fb7c63fcddf4a1c2	87f0901c227adbb3
t = 42	741fa5dc290dd02c	820e75046567bace	13eb82e4b98d0e67	4f1f4f21df3dcf43
	ed40c88214823792	b16a9397472f0123	fb6c0e54d48d4f2d	fb7c63fcddf4a1c2
t = 43	a4809bf6da6aa8bd	741fa5dc290dd02c	820e75046567bace	13eb82e4b98d0e67
	bec3d7e88c855194	ed40c88214823792	b16a9397472f0123	fb6c0e54d48d4f2d
t = 44	d70b1aa4c800979c	a4809bf6da6aa8bd	741fa5dc290dd02c	820e75046567bace
	4962f310bdbd54b0	bec3d7e88c855194	ed40c88214823792	b16a9397472f0123
t = 45	9a195492cfdb4745	d70b1aa4c800979c	a4809bf6da6aa8bd	741fa5dc290dd02c
	2c82d09cf05cf687	4962f310bdbd54b0	bec3d7e88c855194	ed40c88214823792
t = 46	b7e68364f07f017e	9a195492cfdb4745	d70b1aa4c800979c	a4809bf6da6aa8bd
	2a1ffb84031b1b6c	2c82d09cf05cf687	4962f310bdbd54b0	bec3d7e88c855194
t = 47	0e574b8e0b35e452	b7e68364f07f017e	9a195492cfdb4745	d70b1aa4c800979c
	29bdab29ee472a23	2a1ffb84031b1b6c	2c82d09cf05cf687	4962f310bdbd54b0

	a / e	b / f	c / g	d / h
t = 48	c176009cf82fa842	0e574b8e0b35e452	b7e68364f07f017e	9a195492cfdb4745
	cca47fbe31b335f4	29bdab29ee472a23	2a1ffb84031b1b6c	2c82d09cf05cf687
t = 49	5d4f78c7a9bdbed2	c176009cf82fa842	0e574b8e0b35e452	b7e68364f07f017e
	eaf198615e99ffdc	cca47fbe31b335f4	29bdab29ee472a23	2a1ffb84031b1b6c
t = 50	51ab3be828d8d13c	5d4f78c7a9bdbed2	c176009cf82fa842	0e574b8e0b35e452
	bd527cd188fb59ae	eaf198615e99ffdc	cca47fbe31b335f4	29bdab29ee472a23
t = 51	4d639ef80d0f6d3e	51ab3be828d8d13c	5d4f78c7a9bdbed2	c176009cf82fa842
	b2611b90f90d732f	bd527cd188fb59ae	eaf198615e99ffdc	cca47fbe31b335f4
t = 52	bba9c9efe0fbc6c8	4d639ef80d0f6d3e	51ab3be828d8d13c	5d4f78c7a9bdbed2
	fc0579337591a2c9	b2611b90f90d732f	bd527cd188fb59ae	eaf198615e99ffdc
t = 53	3405d7cad2e8a689	bba9c9efe0fbc6c8	4d639ef80d0f6d3e	51ab3be828d8d13c
	0f6649f64ec8e109	fc0579337591a2c9	b2611b90f90d732f	bd527cd188fb59ae
t = 54	ea54d908505798b3	3405d7cad2e8a689	bba9c9efe0fbc6c8	4d639ef80d0f6d3e
	ef48a48999108077	0f6649f64ec8e109	fc0579337591a2c9	b2611b90f90d732f
t = 55	be31d1c0ccc143bc	ea54d908505798b3	3405d7cad2e8a689	bba9c9efe0fbc6c8
	4fc2d4cad0c91afc	ef48a48999108077	0f6649f64ec8e109	fc0579337591a2c9
t = 56	285a76d23f6a0073	be31d1c0ccc143bc	ea54d908505798b3	3405d7cad2e8a689
	a730855599b738a3	4fc2d4cad0c91afc	ef48a48999108077	0f6649f64ec8e109
t = 57	a714ceff14bebc24	285a76d23f6a0073	be31d1c0ccc143bc	ea54d908505798b3
	53c581dae1831d80	a730855599b738a3	4fc2d4cad0c91afc	ef48a48999108077
t = 58	697ca14913a50a26	a714ceff14bebc24	285a76d23f6a0073	be31d1c0ccc143bc
	34d39344354aacd2	53c581dae1831d80	a730855599b738a3	4fc2d4cad0c91afc
t = 59	3a38fa3775d7007c	697ca14913a50a26	a714ceff14bebc24	285a76d23f6a0073
	e26f3a21e9a27691	34d39344354aacd2	53c581dae1831d80	a730855599b738a3
t = 60	44ea14d8e450c844	3a38fa3775d7007c	697ca14913a50a26	a714ceff14bebc24
	5319374fb88dd485	e26f3a21e9a27691	34d39344354aacd2	53c581dae1831d80
t = 61	0928b75c925f91e2	44ea14d8e450c844	3a38fa3775d7007c	697ca14913a50a26
	79f4be3c5a372911	5319374fb88dd485	e26f3a21e9a27691	34d39344354aacd2
t = 62	6db5469fa19c0e27	0928b75c925f91e2	44ea14d8e450c844	3a38fa3775d7007c
	16beec0fec168e79	79f4be3c5a372911	5319374fb88dd485	e26f3a21e9a27691
t = 63	384e3159898a7362	6db5469fa19c0e27	0928b75c925f91e2	44ea14d8e450c844
	55fa3ad1102298a8	16beec0fec168e79	79f4be3c5a372911	5319374fb88dd485
t = 64	483c64d3fdebf828	384e3159898a7362	6db5469fa19c0e27	0928b75c925f91e2
	1a238431921ea75e	55fa3ad1102298a8	16beec0fec168e79	79f4be3c5a372911
t = 65	c9464988a1939bcf	483c64d3fdebf828	384e3159898a7362	6db5469fa19c0e27
	e3f3f08ac90f86cd	1a238431921ea75e	55fa3ad1102298a8	16beec0fec168e79
t = 66	98bc93bca795059c	c9464988a1939bcf	483c64d3fdebf828	384e3159898a7362
	9e04fb49a5fd91de	e3f3f08ac90f86cd	1a238431921ea75e	55fa3ad1102298a8
t = 67	b6fc101ad1d74e20	98bc93bca795059c	c9464988a1939bcf	483c64d3fdebf828
	fd13cd3620f6c1f4	9e04fb49a5fd91de	e3f3f08ac90f86cd	1a238431921ea75e
t = 68	fac26e6e4da4705d	b6fc101ad1d74e20	98bc93bca795059c	c9464988a1939bcf
	0d60228aa6e55b6e	fd13cd3620f6c1f4	9e04fb49a5fd91de	e3f3f08ac90f86cd
t = 69	2a630c58cc27fcaa	fac26e6e4da4705d	b6fc101ad1d74e20	98bc93bca795059c
	a2f7f27a3ec25aba	0d60228aa6e55b6e	fd13cd3620f6c1f4	9e04fb49a5fd91de
t = 70	159a02d4faee11b4	2a630c58cc27fcaa	fac26e6e4da4705d	b6fc101ad1d74e20
	b2860fc55bdedaa6	a2f7f27a3ec25aba	0d60228aa6e55b6e	fd13cd3620f6c1f4
t = 71	9d38bdb9df22b557	159a02d4faee11b4	2a630c58cc27fcaa	fac26e6e4da4705d
	dfc37c68af65f8bc	b2860fc55bdedaa6	a2f7f27a3ec25aba	0d60228aa6e55b6e

```
            a / e            b / f            c / g            d / h

t = 72  d42c3a57cfa78513  9d38bdb9df22b557  159a02d4faee11b4  2a630c58cc27fcaa
        bb56dea6a325ba32  dfc37c68af65f8bc  b2860fc55bdedaa6  a2f7f27a3ec25aba
t = 73  abab4b0ca75a17c7  d42c3a57cfa78513  9d38bdb9df22b557  159a02d4faee11b4
        9ac71d1c037a8bbd  bb56dea6a325ba32  dfc37c68af65f8bc  b2860fc55bdedaa6
t = 74  500f7b61186f6c2e  abab4b0ca75a17c7  d42c3a57cfa78513  9d38bdb9df22b557
        8347f5736531b3ec  9ac71d1c037a8bbd  bb56dea6a325ba32  dfc37c68af65f8bc
t = 75  4abe0af6a67db2fe  500f7b61186f6c2e  abab4b0ca75a17c7  d42c3a57cfa78513
        14e986342ddced0f  8347f5736531b3ec  9ac71d1c037a8bbd  bb56dea6a325ba32
t = 76  e1053fc85f9e56be  4abe0af6a67db2fe  500f7b61186f6c2e  abab4b0ca75a17c7
        4779767cc2ec5321  14e986342ddced0f  8347f5736531b3ec  9ac71d1c037a8bbd
t = 77  7001201948fb3d71  e1053fc85f9e56be  4abe0af6a67db2fe  500f7b61186f6c2e
        5cdf6c58fc052572  4779767cc2ec5321  14e986342ddced0f  8347f5736531b3ec
t = 78  88146da76ff6f23a  7001201948fb3d71  e1053fc85f9e56be  4abe0af6a67db2fe
        8901cffe7a74db98  5cdf6c58fc052572  4779767cc2ec5321  14e986342ddced0f
t = 79  5ec3802b9ecfef33  88146da76ff6f23a  7001201948fb3d71  e1053fc85f9e56be
        5f2eead69efb4233  8901cffe7a74db98  5cdf6c58fc052572  4779767cc2ec5321

Block 1 has been processed. The values of {Hi} are

H1 = cbbb9d5dc1059ed8 + 5ec3802b9ecfef33 = 2a7f1d895fd58e0b
H2 = 629a292a367cd507 + 88146da76ff6f23a = eaae96d1a673c741
H3 = 9159015a3070dd17 + 7001201948fb3d71 = 015a2173796c1a88
H4 = 152fecd8f70e5939 + e1053fc85f9e56be = f6352ca156acaff7
H5 = 67332667ffc00b31 + 5f2eead69efb4233 = c662113e9ebb4d64
H6 = 8eb44a8768581511 + 8901cffe7a74db98 = 17b61a85e2ccf0a9
H7 = db0c2e0d64f98fa7 + 5cdf6c58fc052572 = 37eb9a6660feb519
H8 = 47b5481dbefa4fa4 + 4779767cc2ec5321 = 8f2ebe9a81e6a2c5.
```

Hash of "abcdefghbcdefghicdefghijdefghijkefghijklfghijklmghijklmn hijklmnoijklmnopjklmnopqklmnopqrlmnopqrsmnopqrstnopqrstu" (block 2)

	a / e	b / f	c / g	d / h
init	2a7f1d895fd58e0b	eaae96d1a673c741	015a2173796c1a88	f6352ca156acaff7
	c662113e9ebb4d64	17b61a85e2ccf0a9	37eb9a6660feb519	8f2ebe9a81e6a2c5
t = 0	657a3c2ca9639d40	2a7f1d895fd58e0b	eaae96d1a673c741	015a2173796c1a88
	791f2ad0055fdd62	c662113e9ebb4d64	17b61a85e2ccf0a9	37eb9a6660feb519
t = 1	2a4ad5d9b9fd6d86	657a3c2ca9639d40	2a7f1d895fd58e0b	eaae96d1a673c741
	dbf2e656b5be3f14	791f2ad0055fdd62	c662113e9ebb4d64	17b61a85e2ccf0a9
t = 2	f0aa6758653d1664	2a4ad5d9b9fd6d86	657a3c2ca9639d40	2a7f1d895fd58e0b
	6e0466c82f4fd35d	dbf2e656b5be3f14	791f2ad0055fdd62	c662113e9ebb4d64
t = 3	43a76f011a73d317	f0aa6758653d1664	2a4ad5d9b9fd6d86	657a3c2ca9639d40
	1367bd36d15e8b40	6e0466c82f4fd35d	dbf2e656b5be3f14	791f2ad0055fdd62
t = 4	d802c2dfd7cc48f6	43a76f011a73d317	f0aa6758653d1664	2a4ad5d9b9fd6d86
	f73d759b839a2a21	1367bd36d15e8b40	6e0466c82f4fd35d	dbf2e656b5be3f14
t = 5	481208e5e8314602	d802c2dfd7cc48f6	43a76f011a73d317	f0aa6758653d1664
	6b2271a46f14c843	f73d759b839a2a21	1367bd36d15e8b40	6e0466c82f4fd35d
t = 6	af9f8112df35cf33	481208e5e8314602	d802c2dfd7cc48f6	43a76f011a73d317
	257f4a7d524d7b0b	6b2271a46f14c843	f73d759b839a2a21	1367bd36d15e8b40
t = 7	6730781342d1131b	af9f8112df35cf33	481208e5e8314602	d802c2dfd7cc48f6
	81957ad408cec995	257f4a7d524d7b0b	6b2271a46f14c843	f73d759b839a2a21
t = 8	82e64c677356a82e	6730781342d1131b	af9f8112df35cf33	481208e5e8314602
	10b62fdce4ebaa51	81957ad408cec995	257f4a7d524d7b0b	6b2271a46f14c843
t = 9	203578820a8f27d0	82e64c677356a82e	6730781342d1131b	af9f8112df35cf33
	9937b3a0cb9248a1	10b62fdce4ebaa51	81957ad408cec995	257f4a7d524d7b0b
t = 10	0bac2a84c29a1e2b	203578820a8f27d0	82e64c677356a82e	6730781342d1131b
	6ad288dab3de0d53	9937b3a0cb9248a1	10b62fdce4ebaa51	81957ad408cec995
t = 11	dd3ff8a140485c25	0bac2a84c29a1e2b	203578820a8f27d0	82e64c677356a82e
	3149b728123c465e	6ad288dab3de0d53	9937b3a0cb9248a1	10b62fdce4ebaa51
t = 12	e826239f830c5346	dd3ff8a140485c25	0bac2a84c29a1e2b	203578820a8f27d0
	4bb7b199c4ced186	3149b728123c465e	6ad288dab3de0d53	9937b3a0cb9248a1
t = 13	32215ce49aae40f8	e826239f830c5346	dd3ff8a140485c25	0bac2a84c29a1e2b
	9a2872c72d790d49	4bb7b199c4ced186	3149b728123c465e	6ad288dab3de0d53
t = 14	859533bac457f94e	32215ce49aae40f8	e826239f830c5346	dd3ff8a140485c25
	539f225d25ebeb4c	9a2872c72d790d49	4bb7b199c4ced186	3149b728123c465e
t = 15	a88704d9962849f3	859533bac457f94e	32215ce49aae40f8	e826239f830c5346
	63bf0472ef24f7a5	539f225d25ebeb4c	9a2872c72d790d49	4bb7b199c4ced186
t = 16	3aa5c566a6cfad1c	a88704d9962849f3	859533bac457f94e	32215ce49aae40f8
	ce23f6380ead33c2	63bf0472ef24f7a5	539f225d25ebeb4c	9a2872c72d790d49
t = 17	2e9c483a7c08c9c1	3aa5c566a6cfad1c	a88704d9962849f3	859533bac457f94e
	b033f945f3e6b4a2	ce23f6380ead33c2	63bf0472ef24f7a5	539f225d25ebeb4c
t = 18	5a68585ae0835231	2e9c483a7c08c9c1	3aa5c566a6cfad1c	a88704d9962849f3
	8a0187a9ce93d875	b033f945f3e6b4a2	ce23f6380ead33c2	63bf0472ef24f7a5
t = 19	cf9cd481e6407ced	5a68585ae0835231	2e9c483a7c08c9c1	3aa5c566a6cfad1c
	37a29fa30531bac7	8a0187a9ce93d875	b033f945f3e6b4a2	ce23f6380ead33c2
t = 20	3f463f864f6474d9	cf9cd481e6407ced	5a68585ae0835231	2e9c483a7c08c9c1
	0cf45bb3c07e847d	37a29fa30531bac7	8a0187a9ce93d875	b033f945f3e6b4a2
t = 21	cea26288dff931a5	3f463f864f6474d9	cf9cd481e6407ced	5a68585ae0835231
	34f1b5f46bf48a73	0cf45bb3c07e847d	37a29fa30531bac7	8a0187a9ce93d875
t = 22	89634cd0f4f6c08a	cea26288dff931a5	3f463f864f6474d9	cf9cd481e6407ced
	3a728a543405a8e4	34f1b5f46bf48a73	0cf45bb3c07e847d	37a29fa30531bac7
t = 23	625fa38464e5c880	89634cd0f4f6c08a	cea26288dff931a5	3f463f864f6474d9
	cee1b47a49b2fc42	3a728a543405a8e4	34f1b5f46bf48a73	0cf45bb3c07e847d

	a / e	b / f	c / g	d / h
t = 24	7dd21453a15a3b92	625fa38464e5c880	89634cd0f4f6c08a	cea26288dff931a5
	9308bfa1be1f800b	cee1b47a49b2fc42	3a728a543405a8e4	34f1b5f46bf48a73
t = 25	3d76277bc8cb0601	7dd21453a15a3b92	625fa38464e5c880	89634cd0f4f6c08a
	480e017f5d1f0b1e	9308bfa1be1f800b	cee1b47a49b2fc42	3a728a543405a8e4
t = 26	c8d904196f5a1f54	3d76277bc8cb0601	7dd21453a15a3b92	625fa38464e5c880
	4bd2f1f6e940c332	480e017f5d1f0b1e	9308bfa1be1f800b	cee1b47a49b2fc42
t = 27	b033139b58b6e423	c8d904196f5a1f54	3d76277bc8cb0601	7dd21453a15a3b92
	f816ec1cbe0adafb	4bd2f1f6e940c332	480e017f5d1f0b1e	9308bfa1be1f800b
t = 28	097768182cb65f57	b033139b58b6e423	c8d904196f5a1f54	3d76277bc8cb0601
	62e3de54dcd8f974	f816ec1cbe0adafb	4bd2f1f6e940c332	480e017f5d1f0b1e
t = 29	3196649ab5f5cc39	097768182cb65f57	b033139b58b6e423	c8d904196f5a1f54
	f6887de116d0bd8f	62e3de54dcd8f974	f816ec1cbe0adafb	4bd2f1f6e940c332
t = 30	f78d3d221d16965f	3196649ab5f5cc39	097768182cb65f57	b033139b58b6e423
	c7e4859c2858ed3c	f6887de116d0bd8f	62e3de54dcd8f974	f816ec1cbe0adafb
t = 31	f58e9876b4984b51	f78d3d221d16965f	3196649ab5f5cc39	097768182cb65f57
	621352b394b8ca02	c7e4859c2858ed3c	f6887de116d0bd8f	62e3de54dcd8f974
t = 32	38fbf0e726e04f78	f58e9876b4984b51	f78d3d221d16965f	3196649ab5f5cc39
	4319856f17a0a430	621352b394b8ca02	c7e4859c2858ed3c	f6887de116d0bd8f
t = 33	f4be0b32a57597a2	38fbf0e726e04f78	f58e9876b4984b51	f78d3d221d16965f
	c6d392a3b4eb0ed8	4319856f17a0a430	621352b394b8ca02	c7e4859c2858ed3c
t = 34	f8a6b3fe2e4f0634	f4be0b32a57597a2	38fbf0e726e04f78	f58e9876b4984b51
	602663c0f34eff33	c6d392a3b4eb0ed8	4319856f17a0a430	621352b394b8ca02
t = 35	9bc3871be8046113	f8a6b3fe2e4f0634	f4be0b32a57597a2	38fbf0e726e04f78
	05542ecd9883c6ba	602663c0f34eff33	c6d392a3b4eb0ed8	4319856f17a0a430
t = 36	f1bd2d46be619585	9bc3871be8046113	f8a6b3fe2e4f0634	f4be0b32a57597a2
	e47b9933bafdc655	05542ecd9883c6ba	602663c0f34eff33	c6d392a3b4eb0ed8
t = 37	24c84b58d119affe	f1bd2d46be619585	9bc3871be8046113	f8a6b3fe2e4f0634
	5ae0b1175beb5d2b	e47b9933bafdc655	05542ecd9883c6ba	602663c0f34eff33
t = 38	ec6d3abc2b291fd3	24c84b58d119affe	f1bd2d46be619585	9bc3871be8046113
	9ecc381d277748a3	5ae0b1175beb5d2b	e47b9933bafdc655	05542ecd9883c6ba
t = 39	e266c1f77d5ee90e	ec6d3abc2b291fd3	24c84b58d119affe	f1bd2d46be619585
	d92f34c110296b32	9ecc381d277748a3	5ae0b1175beb5d2b	e47b9933bafdc655
t = 40	5adbaa463642b570	e266c1f77d5ee90e	ec6d3abc2b291fd3	24c84b58d119affe
	83e8f410f859388e	d92f34c110296b32	9ecc381d277748a3	5ae0b1175beb5d2b
t = 41	50fdb7bb2e499a34	5adbaa463642b570	e266c1f77d5ee90e	ec6d3abc2b291fd3
	257ed8ea645e933a	83e8f410f859388e	d92f34c110296b32	9ecc381d277748a3
t = 42	06514212bb7fa152	50fdb7bb2e499a34	5adbaa463642b570	e266c1f77d5ee90e
	466781db35181abe	257ed8ea645e933a	83e8f410f859388e	d92f34c110296b32
t = 43	673ed5a55ff2b07d	06514212bb7fa152	50fdb7bb2e499a34	5adbaa463642b570
	ba78f3545e7914f0	466781db35181abe	257ed8ea645e933a	83e8f410f859388e
t = 44	125e2e5118393e2b	673ed5a55ff2b07d	06514212bb7fa152	50fdb7bb2e499a34
	4453b23a3e13b090	ba78f3545e7914f0	466781db35181abe	257ed8ea645e933a
t = 45	07ee813df5910cec	125e2e5118393e2b	673ed5a55ff2b07d	06514212bb7fa152
	eae013a0510d23cc	4453b23a3e13b090	ba78f3545e7914f0	466781db35181abe
t = 46	0a0508f0a1d719c3	07ee813df5910cec	125e2e5118393e2b	673ed5a55ff2b07d
	a93815eb58891016	eae013a0510d23cc	4453b23a3e13b090	ba78f3545e7914f0
t = 47	0fc8f3b3efcb1b96	0a0508f0a1d719c3	07ee813df5910cec	125e2e5118393e2b
	a071cc73b966e801	a93815eb58891016	eae013a0510d23cc	4453b23a3e13b090

	a / e	b / f	c / g	d / h
t = 48	02aa5b28199f304a	0fc8f3b3efcb1b96	0a0508f0a1d719c3	07ee813df5910cec
	a49f1e14f8a2be7a	a071cc73b966e801	a93815eb58891016	eae013a0510d23cc
t = 49	9223e1b34382f104	02aa5b28199f304a	0fc8f3b3efcb1b96	0a0508f0a1d719c3
	bfe2106e512a7331	a49f1e14f8a2be7a	a071cc73b966e801	a93815eb58891016
t = 50	e01a1e47ee8d5656	9223e1b34382f104	02aa5b28199f304a	0fc8f3b3efcb1b96
	592b899b35469a78	bfe2106e512a7331	a49f1e14f8a2be7a	a071cc73b966e801
t = 51	fa7b17aad857c2f4	e01a1e47ee8d5656	9223e1b34382f104	02aa5b28199f304a
	eb6e85e4682c1671	592b899b35469a78	bfe2106e512a7331	a49f1e14f8a2be7a
t = 52	0c523b7a3c84ab77	fa7b17aad857c2f4	e01a1e47ee8d5656	9223e1b34382f104
	b5e80e871ac0c005	eb6e85e4682c1671	592b899b35469a78	bfe2106e512a7331
t = 53	c773d8b69da1fde2	0c523b7a3c84ab77	fa7b17aad857c2f4	e01a1e47ee8d5656
	be2b0602fc6f8f65	b5e80e871ac0c005	eb6e85e4682c1671	592b899b35469a78
t = 54	c6b1bc79a4f23679	c773d8b69da1fde2	0c523b7a3c84ab77	fa7b17aad857c2f4
	c80bdc57f38a05e4	be2b0602fc6f8f65	b5e80e871ac0c005	eb6e85e4682c1671
t = 55	bef9bb0fe467fd60	c6b1bc79a4f23679	c773d8b69da1fde2	0c523b7a3c84ab77
	1dab0bd116e434e5	c80bdc57f38a05e4	be2b0602fc6f8f65	b5e80e871ac0c005
t = 56	8e3db3e380ec7f22	bef9bb0fe467fd60	c6b1bc79a4f23679	c773d8b69da1fde2
	32ef50751734ffee	1dab0bd116e434e5	c80bdc57f38a05e4	be2b0602fc6f8f65
t = 57	1003ec42412c7b7d	8e3db3e380ec7f22	bef9bb0fe467fd60	c6b1bc79a4f23679
	1ec0d46f349fd058	32ef50751734ffee	1dab0bd116e434e5	c80bdc57f38a05e4
t = 58	375facc76291f85e	1003ec42412c7b7d	8e3db3e380ec7f22	bef9bb0fe467fd60
	59c8bc0488f9768b	1ec0d46f349fd058	32ef50751734ffee	1dab0bd116e434e5
t = 59	bd113d92e0354fb9	375facc76291f85e	1003ec42412c7b7d	8e3db3e380ec7f22
	e66c73db3fad397d	59c8bc0488f9768b	1ec0d46f349fd058	32ef50751734ffee
t = 60	2f61d4fd8e36d9d4	bd113d92e0354fb9	375facc76291f85e	1003ec42412c7b7d
	e9f21933e1c02948	e66c73db3fad397d	59c8bc0488f9768b	1ec0d46f349fd058
t = 61	1b1ad88b92701ae2	2f61d4fd8e36d9d4	bd113d92e0354fb9	375facc76291f85e
	6fd0c1719bcac335	e9f21933e1c02948	e66c73db3fad397d	59c8bc0488f9768b
t = 62	93d09fc06a19c5da	1b1ad88b92701ae2	2f61d4fd8e36d9d4	bd113d92e0354fb9
	b765273f571a571e	6fd0c1719bcac335	e9f21933e1c02948	e66c73db3fad397d
t = 63	04bea2ce99cc3bf6	93d09fc06a19c5da	1b1ad88b92701ae2	2f61d4fd8e36d9d4
	6ab0e443c2f63714	b765273f571a571e	6fd0c1719bcac335	e9f21933e1c02948
t = 64	02ebfc0a13492f52	04bea2ce99cc3bf6	93d09fc06a19c5da	1b1ad88b92701ae2
	77300c52e05af415	6ab0e443c2f63714	b765273f571a571e	6fd0c1719bcac335
t = 65	1bf525abce8d6f04	02ebfc0a13492f52	04bea2ce99cc3bf6	93d09fc06a19c5da
	8faf12c33bb371b9	77300c52e05af415	6ab0e443c2f63714	b765273f571a571e
t = 66	b6a36a3431547328	1bf525abce8d6f04	02ebfc0a13492f52	04bea2ce99cc3bf6
	fa8bb40b4e08100f	8faf12c33bb371b9	77300c52e05af415	6ab0e443c2f63714
t = 67	ffdaf83202af0d72	b6a36a3431547328	1bf525abce8d6f04	02ebfc0a13492f52
	8045a82f723a9b4e	fa8bb40b4e08100f	8faf12c33bb371b9	77300c52e05af415
t = 68	12737373d2985232	ffdaf83202af0d72	b6a36a3431547328	1bf525abce8d6f04
	870dbce23bad8988	8045a82f723a9b4e	fa8bb40b4e08100f	8faf12c33bb371b9
t = 69	6189f68162b256b5	12737373d2985232	ffdaf83202af0d72	b6a36a3431547328
	8c059af157146580	870dbce23bad8988	8045a82f723a9b4e	fa8bb40b4e08100f
t = 70	20b0a9a1d21c482d	6189f68162b256b5	12737373d2985232	ffdaf83202af0d72
	f22b874c96785ec8	8c059af157146580	870dbce23bad8988	8045a82f723a9b4e
t = 71	ef6d863c2127b394	20b0a9a1d21c482d	6189f68162b256b5	12737373d2985232
	b7aee28337d69dab	f22b874c96785ec8	8c059af157146580	870dbce23bad8988

```
            a / e            b / f            c / g            d / h

t = 72  d3efe8b442689074  ef6d863c2127b394  20b0a9a1d21c482d  6189f68162b256b5
        22491ab9cdecb6b0  b7aee28337d69dab  f22b874c96785ec8  8c059af157146580
t = 73  4694354944a9f487  d3efe8b442689074  ef6d863c2127b394  20b0a9a1d21c482d
        659890a5818d0c50  22491ab9cdecb6b0  b7aee28337d69dab  f22b874c96785ec8
t = 74  b93c2403773dd08c  4694354944a9f487  d3efe8b442689074  ef6d863c2127b394
        88c2c2ac52c4f679  659890a5818d0c50  22491ab9cdecb6b0  b7aee28337d69dab
t = 75  025848e3ab6b69d3  b93c2403773dd08c  4694354944a9f487  d3efe8b442689074
        750da3d4e16a1b64  88c2c2ac52c4f679  659890a5818d0c50  22491ab9cdecb6b0
t = 76  396b53e58d04471b  025848e3ab6b69d3  b93c2403773dd08c  4694354944a9f487
        700486bf252cba75  750da3d4e16a1b64  88c2c2ac52c4f679  659890a5818d0c50
t = 77  51b6f9a3c1ceeb4a  396b53e58d04471b  025848e3ab6b69d3  b93c2403773dd08c
        e6b3850de8ae6230  700486bf252cba75  750da3d4e16a1b64  88c2c2ac52c4f679
t = 78  526a98f5dc595406  51b6f9a3c1ceeb4a  396b53e58d04471b  025848e3ab6b69d3
        4f0dcf74aea76f90  e6b3850de8ae6230  700486bf252cba75  750da3d4e16a1b64
t = 79  deb3eeaa973bb9dd  526a98f5dc595406  51b6f9a3c1ceeb4a  396b53e58d04471b
        3665b5dbb6c2e055  4f0dcf74aea76f90  e6b3850de8ae6230  700486bf252cba75

Block 2 has been processed. The values of {Hi} are

H1 = 2a7f1d895fd58e0b + deb3eeaa973bb9dd = 09330c33f71147e8
H2 = eaae96d1a673c741 + 526a98f5dc595406 = 3d192fc782cd1b47
H3 = 015a2173796c1a88 + 51b6f9a3c1ceeb4a = 53111b173b3b05d2
H4 = f6352ca156acaff7 + 396b53e58d04471b = 2fa08086e3b0f712
H5 = c662113e9ebb4d64 + 3665b5dbb6c2e055 = fcc7c71a557e2db9
H6 = 17b61a85e2ccf0a9 + 4f0dcf74aea76f90 = 66c3e9fa91746039
H7 = 37eb9a6660feb519 + e6b3850de8ae6230 = 1e9f1f7449ad1749
H8 = 8f2ebe9a81e6a2c5 + 700486bf252cba75 = ff334559a7135d3a.

The message digest is

    09330c33f71147e8 3d192fc782cd1b47 53111b173b3b05d2 2fa08086e3b0f712
    fcc7c71a557e2db9 66c3e9fa91746039.
```