

1. O que é um arquivo fonte?

- A. um arquivo de texto que contém instruções de linguagem de programação.
- B. um subdiretório que contém os programas.
- C. um arquivo que contém dados para um programa.
- D. um documento que contém os requisitos para um projeto.

Resposta: A)

2. O que é um registrador?

- A. parte do sistema de computador que mantém o controle dos parâmetros do sistema.
- B. uma parte do processador que possui um padrão de bits.
- C. parte do processador que contém o seu número de série único.
- D. parte do bus de sistema que contém dados.

Resposta: B)

3. Qual o caracter que, na linguagem assembly do SPIM, inicia um comentário?

- A. #
- B. \$
- C. //
- D. \*

Resposta: A)

4. Quantos bits há em cada instrução de máquina MIPS?

- A. 8
- B. 16
- C. 32
- D. instruções diferentes possuem diferentes comprimentos.

Resposta: C)

5. Quando você abre um arquivo de origem a partir do menu Arquivo do SPIM, quais as duas coisas que acontecem?

- A. O arquivo está carregado na memória e começa a execução.
- B. SPIM é iniciado e o arquivo é aberto no editor.
- C. O arquivo é montado em instruções de máquina, e as instruções de máquina são carregados na memória do SPIM.
- D. O programa é executado e os resultados são salvos em disco.

Resposta: B)

6. O que é o contador de programa?

- A. um registrador que mantém a conta do número de erros durante a execução de um programa.
- B. uma parte do processador que contém o endereço da primeira palavra de dados.
- C. uma variável na montadora que os números das linhas do arquivo de origem.

D. parte do processador que contém o endereço da próxima instrução de máquina para ser obtida.

Resposta: D)

7. Ao pressionar a tecla F10 para executar uma instrução, quanto será adicionado ao contador de programa?

- A. 1
- B. 2
- C. 4
- D. 8

Resposta: C)

8. O que é uma diretiva, tal como a diretiva .text?

- A. uma instrução em linguagem assembly que resulta em uma instrução em linguagem de máquina.
- B. uma das opções de menu do sistema SPIM.
- C. uma instrução em linguagem de máquina que faz com que uma operação sobre os dados ocorra.
- D. uma declaração que diz o montador algo sobre o que o programador quer, mas não corresponde diretamente a uma instrução de máquina.

Resposta: D)

9. O que é um endereço simbólico?

- A. um local de memória que contém dados simbólicos.
- B. um byte na memória que contém o endereço de dados.
- C. símbolo dado como argumento para uma directiva.
- D. um nome usado no código-fonte em linguagem assembly para um local na memória.

Resposta: D)

10. Em qual endereço o simulador SPIM coloca a primeira instrução de máquina quando ele está sendo executado com a opção Bare Machine ligada?

- A. 0x00000000
- B. 0x00400000
- C. 0x10000000
- D. 0xFFFFFFFF

Resposta: B)

11. Algumas instruções de máquina possuem uma constante como um dos operandos. Como é chamado tal operando?

- A. operando imediato
- B. operando embutido
- C. operando binário
- D. operando de máquina

Resposta: A)

12. Como é chamada uma operação lógica executada entre bits de cada coluna dos operandos para produzir um bit de resultado para cada coluna?

- A. operação lógica
- B. operação bitwise
- C. operação binária
- D. operação coluna

Resposta: B)

13. Quando uma operação é de fato executada, como estão os operandos na ALU?

- A. Pelo menos um operando deve ser de 32 bit.
- B. Cada operando pode ser de qualquer tamanho.
- C. Ambos operandos devem que vir de registradores.
- D. Cada um dos registradores deve possuir 32 bit.

Resposta: D)

14. Dezesesseis bits de dados de uma instrução de ori são usados como um operando imediato. Durante execução, o que deve ser feito primeiro?

- A. Os dados são estendidos em zero à direita por 16 bits.
- B. Os dados são estendidos em zero à esquerda por 16 bits.
- C. Nada precisa ser feito.
- D. Apenas 16 bits são usados pelo outro operando.

Resposta: B)

15. Qual o nome para um padrão de bits copiados em um registrador?

- A. load.
- B. filled.
- C. stuffed.
- D. fixed.

Resposta: D)

16. Qual das instruções seguintes armazenam no registrador \$5 um padrão de bits que representa positivo 48?

- A. ori \$5,\$0,0x48
- B. ori \$5,\$5,0x48
- C. ori \$5,\$0,48
- D. ori \$0,\$5,0x48

Resposta: C)

17. A instrução de ori pode armazenar o complemento de dois de um número em um registrador?

- A. Não.
- B. Sim.

Resposta: A)

18. Qual das instruções seguintes limpa todos os bits no registrador \$8 com exceção do byte de baixa ordem que fica inalterado?

- A. ori \$8,\$8,0xFF
- B. ori \$8,\$0,0x00FF
- C. xori \$8,\$8,0xFF
- D. andi \$8,\$8,0xFF

Resposta: D)

19. Qual é o resultado de um ou exclusivo de padrão sobre ele mesmo?

- A. Todos os bits em zero.
- B. Todos os bits em um.
- C. O padrão original utilizado.
- D. O resultado é o contrário do original.

Resposta: A)

20. Todas as instruções de máquina têm os mesmos campos?

- A. Não. Diferentes de instruções de máquina possuem campos diferentes.
- B. Não. Cada instrução de máquina é completamente diferente de qualquer outra.
- C. Sim. Todas as instruções de máquina têm os mesmos campos na mesma ordem.
- D. Sim. Todas as instruções de máquina têm os mesmos campos, mas eles podem estar em ordens diferentes.

Resposta: A)

## Programa 1

**Text Segment**

| Bkpt | Address    | Code       | Basic                              | Source |
|------|------------|------------|------------------------------------|--------|
|      | 0x00400000 | 0x34100002 | ori \$t0, \$zero, 2 # a = 2        |        |
|      | 0x00400004 | 0x34110003 | ori \$t1, \$zero, 3 # b = 3        |        |
|      | 0x00400008 | 0x34120004 | ori \$t2, \$zero, 4 # c = 4        |        |
|      | 0x0040000c | 0x34130005 | ori \$t3, \$zero, 5 # d = 5        |        |
|      | 0x00400010 | 0x02114020 | add \$t0, \$t0, \$t1 # t0 = a + b  |        |
|      | 0x00400014 | 0x0113a022 | sub \$t0, \$t0, \$t2 # t0 = t0 - c |        |
|      | 0x00400018 | 0x0113a022 | sub \$t4, \$t0, \$t3 # x = t0 - d  |        |
|      | 0x0040001c | 0x02114022 | sub \$t0, \$t0, \$t1 # t0 = a - b  |        |
|      | 0x00400020 | 0x0114a820 | add \$t5, \$t0, \$t4 # y = t0 + x  |        |
|      | 0x00400024 | 0x02958e22 | sub \$t1, \$t4, \$t5 # b = x - y   |        |

**Data Segment**

| Address    | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10010000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010020 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010040 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010060 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010080 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100a0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100c0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100e0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010100 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010120 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010140 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |

**Registers**

| Name        | Number    | Value             |
|-------------|-----------|-------------------|
| \$zero      | 0         | 0x00000000        |
| \$at        | 1         | 0x00000000        |
| \$v0        | 2         | 0x00000000        |
| \$v1        | 3         | 0x00000000        |
| \$a0        | 4         | 0x00000000        |
| \$a1        | 5         | 0x00000000        |
| \$a2        | 6         | 0x00000000        |
| \$a3        | 7         | 0x00000000        |
| \$a4        | 8         | 0xffffffff        |
| \$t1        | 9         | 0x00000000        |
| \$t2        | 10        | 0x00000000        |
| \$t3        | 11        | 0x00000000        |
| \$t4        | 12        | 0x00000000        |
| \$t5        | 13        | 0x00000000        |
| \$t6        | 14        | 0x00000000        |
| \$t7        | 15        | 0x00000000        |
| \$s0        | 16        | 0x00000002        |
| <b>\$s1</b> | <b>17</b> | <b>0x00000001</b> |
| \$s2        | 18        | 0x00000004        |
| \$s3        | 19        | 0x00000005        |
| \$s4        | 20        | 0xffffffff        |
| \$s5        | 21        | 0xffffffff        |
| \$s6        | 22        | 0xffffffff        |
| \$s7        | 23        | 0x00000000        |
| \$s8        | 24        | 0x00000000        |
| \$s9        | 25        | 0x00000000        |
| \$k0        | 26        | 0x00000000        |
| \$k1        | 27        | 0x00000000        |
| \$gp        | 28        | 0x10008000        |
| \$sp        | 29        | 0x7ffffcfc        |
| \$fp        | 30        | 0x00000000        |
| \$ra        | 31        | 0x00000000        |
| pc          |           | 0x00400028        |
| hi          |           | 0x00000000        |
| lo          |           | 0x00000000        |

**Mars Messages**

program is finished running (dropped off bottom) --

program is finished running (dropped off bottom) --

## Programa 2

**Text Segment**

| Bkpt | Address    | Code       | Basic                               | Source |
|------|------------|------------|-------------------------------------|--------|
|      | 0x00400000 | 0x34140001 | ori \$t0, \$zero, 1 # x = 1         |        |
|      | 0x00400004 | 0x02944020 | add \$t0, \$t0, \$t0 # t0 = x + x   |        |
|      | 0x00400008 | 0x01084020 | add \$t0, \$t0, \$t0 # t0 = t0 + t0 |        |
|      | 0x0040000c | 0x01144020 | add \$t0, \$t0, \$t0 # t0 = t0 + t0 |        |
|      | 0x00400010 | 0x2115000f | addi \$t1, \$t0, 15 # y = t0 + 15   |        |

**Data Segment**

| Address    | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10010000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010020 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010040 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010060 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010080 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100a0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100c0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100e0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010100 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010120 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010140 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |

**Registers**

| Name        | Number    | Value             |
|-------------|-----------|-------------------|
| \$zero      | 0         | 0x00000000        |
| \$at        | 1         | 0x00000000        |
| \$v0        | 2         | 0x00000000        |
| \$v1        | 3         | 0x00000000        |
| \$a0        | 4         | 0x00000000        |
| \$a1        | 5         | 0x00000000        |
| \$a2        | 6         | 0x00000000        |
| \$a3        | 7         | 0x00000000        |
| \$t0        | 8         | 0x00000005        |
| \$t1        | 9         | 0x00000000        |
| \$t2        | 10        | 0x00000000        |
| \$t3        | 11        | 0x00000000        |
| \$t4        | 12        | 0x00000000        |
| \$t5        | 13        | 0x00000000        |
| \$t6        | 14        | 0x00000000        |
| \$t7        | 15        | 0x00000000        |
| \$s0        | 16        | 0x00000000        |
| \$s1        | 17        | 0x00000000        |
| \$s2        | 18        | 0x00000000        |
| \$s3        | 19        | 0x00000000        |
| \$s4        | 20        | 0x00000001        |
| <b>\$s5</b> | <b>21</b> | <b>0x00000014</b> |
| \$s6        | 22        | 0x00000000        |
| \$s7        | 23        | 0x00000000        |
| \$s8        | 24        | 0x00000000        |
| \$s9        | 25        | 0x00000000        |
| \$k0        | 26        | 0x00000000        |
| \$k1        | 27        | 0x00000000        |
| \$gp        | 28        | 0x10008000        |
| \$sp        | 29        | 0x7ffffcfc        |
| \$fp        | 30        | 0x00000000        |
| \$ra        | 31        | 0x00000000        |
| pc          |           | 0x00400014        |
| hi          |           | 0x00000000        |
| lo          |           | 0x00000000        |

**Mars Messages**

program is finished running (dropped off bottom) --

program is finished running (dropped off bottom) --

## Programa 3

C:\Users\1137910\Downloads\Relatório8 - LAC\mps3.asm - MARS 4.5

File Edit Run Settings Tools Help

Run speed at max (no interaction)

**Edit Execute**

**Text Segment**

| Bkpt | Address    | Code       | Basic             | Source  |
|------|------------|------------|-------------------|---|
|      | 0x00400014 | 0x01094020 | add \$0,\$0,\$0   | 24: add \$t0, \$t0, \$t0 # t0 = t0 + t0 = 16x             |
|      | 0x00400018 | 0x01144022 | sub \$0,\$0,\$0   | 25: sub \$t0, \$t0, \$t0 # t0 = t0 - x = 15x              |
|      | 0x0040001c | 0x02b54020 | add \$9,\$21,\$21 | 28: add \$t1, \$a5, \$a5 # t1 = y + y = 2y                |
|      | 0x00400020 | 0x01355020 | add \$10,\$9,\$21 | 29: add \$t2, \$t1, \$a5 # t2 = t1 + y = 3y               |
|      | 0x00400024 | 0x01294020 | add \$9,\$9,\$9   | 30: add \$t1, \$t1, \$t1 # t1 = t1 + t1 = 4y              |
|      | 0x00400028 | 0x01294020 | add \$9,\$9,\$9   | 31: add \$t1, \$t1, \$t1 # t1 = t1 + t1 = 8y              |
|      | 0x0040002c | 0x01294020 | add \$9,\$9,\$9   | 32: add \$t1, \$t1, \$t1 # t1 = t1 + t1 = 16y             |
|      | 0x00400030 | 0x01294020 | add \$9,\$9,\$9   | 33: add \$t1, \$t1, \$t1 # t1 = t1 + t1 = 32y             |
|      | 0x00400034 | 0x01294020 | add \$9,\$9,\$9   | 34: add \$t1, \$t1, \$t1 # t1 = t1 + t1 = 64y             |
|      | 0x00400038 | 0x012a4020 | add \$9,\$9,\$10  | 35: add \$t1, \$t1, \$t2 # t1 = t1 + t2 = 67y             |
|      | 0x0040003c | 0x01094020 | add \$0,\$0,\$9   | 38: add \$t0, \$t0, \$t1 # t0 = t0 + t1 = 15x + 67y       |
|      | 0x00400040 | 0x01084020 | add \$0,\$0,\$0   | 39: add \$t0, \$t0, \$t0 # t0 = t0 + t0 = (15x + 67y) * 2 |
|      | 0x00400044 | 0x0108b020 | add \$22,\$0,\$0  | 40: add \$a6, \$t0, \$t0 # a6 = t0 + t0 = (15x + 67y) * 4 |

**Data Segment**

| Address    | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10010000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010020 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010040 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010060 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010080 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100a0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100c0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100e0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010100 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010120 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010140 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |

**Registers**

| Name   | Number | Value      |
|--------|--------|------------|
| \$zero | 0      | 0x00000000 |
| \$at   | 1      | 0x00000000 |
| \$v0   | 2      | 0x00000000 |
| \$v1   | 3      | 0x00000000 |
| \$a0   | 4      | 0x00000000 |
| \$a1   | 5      | 0x00000000 |
| \$a2   | 6      | 0x00000000 |
| \$a3   | 7      | 0x00000000 |
| \$t0   | 8      | 0x00000272 |
| \$t1   | 9      | 0x0000010c |
| \$t2   | 10     | 0x0000000e |
| \$t3   | 11     | 0x00000000 |
| \$t4   | 12     | 0x00000000 |
| \$t5   | 13     | 0x00000000 |
| \$t6   | 14     | 0x00000000 |
| \$t7   | 15     | 0x00000000 |
| \$s0   | 16     | 0x00000000 |
| \$s1   | 17     | 0x00000000 |
| \$s2   | 18     | 0x00000000 |
| \$s3   | 19     | 0x00000000 |
| \$s4   | 20     | 0x00000003 |
| \$s5   | 21     | 0x00000004 |
| \$s6   | 22     | 0x00000044 |
| \$s7   | 23     | 0x00000000 |
| \$s8   | 24     | 0x00000000 |
| \$s9   | 25     | 0x00000000 |
| \$k0   | 26     | 0x00000000 |
| \$k1   | 27     | 0x00000000 |
| \$gp   | 28     | 0x10008000 |
| \$fp   | 29     | 0x7fffffc0 |
| \$ra   | 30     | 0x00000000 |
| \$pc   | 31     | 0x00000048 |
| \$lo   |        | 0x00000000 |
| \$hi   |        | 0x00000000 |

**Mars Messages** Run IO

Clear

-- program is finished running (dropped off bottom) --

-- program is finished running (dropped off bottom) --

## Programa 4

C:\Users\1137910\Downloads\Relatório8 - LAC\mps4.asm - MARS 4.5

File Edit Run Settings Tools Help

Run speed at max (no interaction)

**Edit Execute**

**Text Segment**

| Bkpt | Address    | Code       | Basic                   | Source  |
|------|------------|------------|-------------------------|---|
|      | 0x00400000 | 0x34140003 | ori \$20,\$0,0x00000003 | 19: ori \$a4, \$zero, 3 # x = 3                     |
|      | 0x00400004 | 0x34150004 | ori \$21,\$0,0x00000004 | 20: ori \$a5, \$zero, 4 # y = 4                     |
|      | 0x00400008 | 0x02944020 | add \$0,\$0,\$0         | 23: add \$t0, \$a4, \$a4 # t0 = x + x = 2x          |
|      | 0x0040000c | 0x000840c0 | sll \$0,\$0,3           | 24: sll \$t0, \$t0, 3                               |
|      | 0x00400010 | 0x01144022 | sub \$0,\$0,\$0         | 25: sub \$t0, \$t0, \$a4 # t0 = t0 - x = 15x        |
|      | 0x00400014 | 0x02b54020 | add \$9,\$21,\$21       | 28: add \$t1, \$a5, \$a5 # t1 = y + y = 2y          |
|      | 0x00400018 | 0x01355020 | add \$10,\$9,\$21       | 29: add \$t2, \$t1, \$a5 # t2 = t1 + y = 3y         |
|      | 0x0040001c | 0x00094940 | sll \$9,\$9,0x00000005  | 30: sll \$t1, \$t1, 5                               |
|      | 0x00400020 | 0x012a4020 | add \$9,\$9,\$10        | 31: add \$t1, \$t1, \$t2 # t1 = t1 + t2 = 67y       |
|      | 0x00400024 | 0x01094020 | add \$0,\$0,\$9         | 34: add \$t0, \$t0, \$t1 # t0 = t0 + t1 = 15x + 67y |
|      | 0x00400028 | 0x0008b000 | sll \$22,\$0,0x00000002 | 35: sll \$a6, \$t0, 2                               |

**Data Segment**

| Address    | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10010000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010020 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010040 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010060 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010080 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100a0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100c0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100e0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010100 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010120 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010140 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |

**Registers**

| Name   | Number | Value      |
|--------|--------|------------|
| \$zero | 0      | 0x00000000 |
| \$at   | 1      | 0x00000000 |
| \$v0   | 2      | 0x00000000 |
| \$v1   | 3      | 0x00000000 |
| \$a0   | 4      | 0x00000000 |
| \$a1   | 5      | 0x00000000 |
| \$a2   | 6      | 0x00000000 |
| \$a3   | 7      | 0x00000000 |
| \$t0   | 8      | 0x00000139 |
| \$t1   | 9      | 0x0000010c |
| \$t2   | 10     | 0x0000000e |
| \$t3   | 11     | 0x00000000 |
| \$t4   | 12     | 0x00000000 |
| \$t5   | 13     | 0x00000000 |
| \$t6   | 14     | 0x00000000 |
| \$t7   | 15     | 0x00000000 |
| \$s0   | 16     | 0x00000000 |
| \$s1   | 17     | 0x00000000 |
| \$s2   | 18     | 0x00000000 |
| \$s3   | 19     | 0x00000000 |
| \$s4   | 20     | 0x00000003 |
| \$s5   | 21     | 0x00000004 |
| \$s6   | 22     | 0x00000044 |
| \$s7   | 23     | 0x00000000 |
| \$s8   | 24     | 0x00000000 |
| \$s9   | 25     | 0x00000000 |
| \$k0   | 26     | 0x00000000 |
| \$k1   | 27     | 0x00000000 |
| \$gp   | 28     | 0x10008000 |
| \$fp   | 29     | 0x7fffffc0 |
| \$ra   | 30     | 0x00000000 |
| \$pc   | 31     | 0x0000002e |
| \$lo   |        | 0x00000000 |
| \$hi   |        | 0x00000000 |

**Mars Messages** Run IO

Clear

-- program is finished running (dropped off bottom) --

-- program is finished running (dropped off bottom) --

## Programa 5

**Text Segment**

| Bkpt | Address    | Code                    | Basic                      | Source                   |
|------|------------|-------------------------|----------------------------|--------------------------|
|      | 0x00400000 | ori \$20,\$0,0x0000186a | 17: ori \$a4,\$zero,0x186a | # x = 0x0000186a         |
|      | 0x00400004 | ori \$20,\$0,0x00000004 | 18: ori \$a4,\$4,4         | # x = 0x00000004         |
|      | 0x00400008 | ori \$21,\$0,0x000030d4 | 19: ori \$a5,\$zero,0x30d4 | # y = 0x000030d4         |
|      | 0x0040000c | ori \$21,\$0,0x00000004 | 20: ori \$a5,\$5,4         | # y = 0x00000004         |
|      | 0x00400010 | add \$a6,\$a4,\$a5      | 23: add \$a6,\$a4,\$a5     | # z = x + y = 0x000493e0 |

**Data Segment**

| Address    | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10010000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010020 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010040 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010060 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010080 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100a0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100c0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100e0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010100 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010120 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010140 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |

**Registers**

| Name   | Number | Value      |
|--------|--------|------------|
| \$zero | 0      | 0x00000000 |
| \$at   | 1      | 0x00000000 |
| \$v0   | 2      | 0x00000000 |
| \$v1   | 3      | 0x00000000 |
| \$a0   | 4      | 0x00000000 |
| \$a1   | 5      | 0x00000000 |
| \$a2   | 6      | 0x00000000 |
| \$a3   | 7      | 0x00000000 |
| \$t0   | 8      | 0x00000000 |
| \$t1   | 9      | 0x00000000 |
| \$t2   | 10     | 0x00000000 |
| \$t3   | 11     | 0x00000000 |
| \$t4   | 12     | 0x00000000 |
| \$t5   | 13     | 0x00000000 |
| \$t6   | 14     | 0x00000000 |
| \$t7   | 15     | 0x00000000 |
| \$s0   | 16     | 0x00000000 |
| \$s1   | 17     | 0x00000000 |
| \$s2   | 18     | 0x00000000 |
| \$s3   | 19     | 0x00000000 |
| \$s4   | 20     | 0x00000000 |
| \$s5   | 21     | 0x00000000 |
| \$s6   | 22     | 0x000493e0 |
| \$s7   | 23     | 0x00000000 |
| \$s8   | 24     | 0x00000000 |
| \$s9   | 25     | 0x00000000 |
| \$k0   | 26     | 0x00000000 |
| \$k1   | 27     | 0x00000000 |
| \$gp   | 28     | 0x10008000 |
| \$fp   | 29     | 0x7ffffcfc |
| \$ra   | 30     | 0x00000000 |
| \$pc   | 31     | 0x00000014 |
| \$lo   |        | 0x00000000 |

**Mars Messages**

```

-- program is finished running (dropped off bottom) --
-- program is finished running (dropped off bottom) --
  
```

## Programa 6

**Text Segment**

| Bkpt | Address    | Code                    | Basic                      | Source                    |
|------|------------|-------------------------|----------------------------|---------------------------|
|      | 0x00400000 | ori \$20,\$0,0x00000111 | 18: ori \$a4,\$zero,0x0111 | # x = 0x00000111          |
|      | 0x00400004 | ori \$20,\$0,0x00000010 | 19: ori \$a4,\$4,16        | # x = 0x01110000          |
|      | 0x00400008 | ori \$21,\$0,0x00000111 | 20: ori \$a4,\$4,0x1111    | # x = 0x01111111          |
|      | 0x0040000c | ori \$21,\$0,0x0000493e | 23: ori \$a5,\$zero,0x493e | # y = 0x0000493e          |
|      | 0x00400010 | ori \$21,\$0,0x00000004 | 24: ori \$a5,\$5,4         | # y = 0x00000004          |
|      | 0x00400014 | ori \$21,\$0,0x00000002 | 27: ori \$t0,\$a5,2        | # t0 = y * 4 = 0x00124f80 |
|      | 0x00400018 | sub \$a6,\$a4,\$t0      | 30: sub \$a6,\$a4,\$t0     | # z = x - 4y = 0x7fEDB07F |

**Data Segment**

| Address    | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10010000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010020 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010040 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010060 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010080 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100a0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100c0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100e0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010100 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010120 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010140 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |

**Registers**

| Name   | Number | Value      |
|--------|--------|------------|
| \$zero | 0      | 0x00000000 |
| \$at   | 1      | 0x00000000 |
| \$v0   | 2      | 0x00000000 |
| \$v1   | 3      | 0x00000000 |
| \$a0   | 4      | 0x00000000 |
| \$a1   | 5      | 0x00000000 |
| \$a2   | 6      | 0x00000000 |
| \$a3   | 7      | 0x00000000 |
| \$t0   | 8      | 0x00124f80 |
| \$t1   | 9      | 0x00000000 |
| \$t2   | 10     | 0x00000000 |
| \$t3   | 11     | 0x00000000 |
| \$t4   | 12     | 0x00000000 |
| \$t5   | 13     | 0x00000000 |
| \$t6   | 14     | 0x00000000 |
| \$t7   | 15     | 0x00000000 |
| \$s0   | 16     | 0x00000000 |
| \$s1   | 17     | 0x00000000 |
| \$s2   | 18     | 0x00000000 |
| \$s3   | 19     | 0x00000000 |
| \$s4   | 20     | 0x01111111 |
| \$s5   | 21     | 0x0000493e |
| \$s6   | 22     | 0x000493e0 |
| \$s7   | 23     | 0x00000000 |
| \$s8   | 24     | 0x00000000 |
| \$s9   | 25     | 0x00000000 |
| \$k0   | 26     | 0x00000000 |
| \$k1   | 27     | 0x00000000 |
| \$gp   | 28     | 0x10008000 |
| \$fp   | 29     | 0x7ffffcfc |
| \$ra   | 30     | 0x00000000 |
| \$pc   | 31     | 0x0000001e |
| \$lo   |        | 0x00000000 |

**Mars Messages**

```

-- program is finished running (dropped off bottom) --
-- program is finished running (dropped off bottom) --
  
```

## Programa 7

**Text Segment**

| Bkpt | Address    | Code                       | Basic                   | Source  |
|------|------------|----------------------------|-------------------------|---|
|      | 0x00400000 | ori \$t0, \$0, 0x00000001  | 12: ori \$t0, \$0, 0x01 | # \$t0 = \$0   0x00000001 = 00000000000000000000000000000000... |
|      | 0x00400004 | ori \$t1, \$0, 0x00000001  | 13: ori \$t1, \$0, 1    | # \$t1 = \$0 << 1 = 00000000000000000000000000000000...         |
|      | 0x00400008 | ori \$t2, \$0, 0x00000001  | 14: ori \$t2, \$0, 1    | # \$t2 = \$0 << 2 = 00000000000000000000000000000000...         |
|      | 0x0040000c | ori \$t3, \$0, 0x00000001  | 15: ori \$t3, \$0, 1    | # \$t3 = \$0 << 4 = 00000000000000000000000000000000...         |
|      | 0x00400010 | ori \$t4, \$0, 0x00000001  | 16: ori \$t4, \$0, 1    | # \$t4 = \$0 << 8 = 00000000000000000000000000000000...         |
|      | 0x00400014 | ori \$t5, \$0, 0x00000001  | 17: ori \$t5, \$0, 1    | # \$t5 = \$0 << 16 = 00000000000000000000000000000000...        |
|      | 0x00400018 | ori \$t6, \$0, 0x00000001  | 18: ori \$t6, \$0, 1    | # \$t6 = \$0 << 32 = 00000000000000000000000000000000...        |
|      | 0x0040001c | ori \$t7, \$0, 0x00000001  | 19: ori \$t7, \$0, 1    | # \$t7 = \$0 << 64 = 00000000000000000000000000000000...        |
|      | 0x00400020 | ori \$t8, \$0, 0x00000001  | 20: ori \$t8, \$0, 1    | # \$t8 = \$0 << 128 = 00000000000000000000000000000000...       |
|      | 0x00400024 | ori \$t9, \$0, 0x00000001  | 21: ori \$t9, \$0, 1    | # \$t9 = \$0 << 256 = 00000000000000000000000000000000...       |
|      | 0x00400028 | ori \$t10, \$0, 0x00000001 | 22: ori \$t10, \$0, 1   | # \$t10 = \$0 << 512 = 00000000000000000000000000000000...      |

**Data Segment**

| Address    | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10010000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010020 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010040 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010060 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010080 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100a0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100c0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100e0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010100 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010120 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010140 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |

**Registers**

| Name   | Number | Value      |
|--------|--------|------------|
| \$zero | 0      | 0x00000000 |
| \$at   | 1      | 0x00000000 |
| \$v0   | 2      | 0x00000000 |
| \$v1   | 3      | 0x00000000 |
| \$a0   | 4      | 0x00000000 |
| \$a1   | 5      | 0x00000000 |
| \$a2   | 6      | 0x00000000 |
| \$a3   | 7      | 0x00000000 |
| \$t0   | 8      | 0xffffffff |
| \$t1   | 9      | 0xffffffff |
| \$t2   | 10     | 0xffffffff |
| \$t3   | 11     | 0x00000000 |
| \$t4   | 12     | 0x00000000 |
| \$t5   | 13     | 0x00000000 |
| \$t6   | 14     | 0x00000000 |
| \$t7   | 15     | 0x00000000 |
| \$t8   | 16     | 0x00000000 |
| \$t9   | 17     | 0x00000000 |
| \$s0   | 18     | 0x00000000 |
| \$s1   | 19     | 0x00000000 |
| \$s2   | 20     | 0x00000000 |
| \$s3   | 21     | 0x00000000 |
| \$s4   | 22     | 0x00000000 |
| \$s5   | 23     | 0x00000000 |
| \$s6   | 24     | 0x00000000 |
| \$s7   | 25     | 0x00000000 |
| \$s8   | 26     | 0x00000000 |
| \$s9   | 27     | 0x00000000 |
| \$k0   | 28     | 0x00000000 |
| \$k1   | 29     | 0x00000000 |
| \$gp   | 30     | 0x00000000 |
| \$fp   | 31     | 0x00000000 |
| \$ra   | 32     | 0x00000000 |
| \$pc   | 33     | 0x00000000 |
| \$hi   | 34     | 0x00000000 |
| \$lo   | 35     | 0x00000000 |

**Mars Messages**

Run IO

Clear

program is finished running (dropped off bottom)

## Programa 8

**Text Segment**

| Bkpt | Address    | Code                        | Basic                        | Source                              |
|------|------------|-----------------------------|------------------------------|-------------------------------------|
|      | 0x00400000 | ori \$t0, \$0, 0x000001234  | 16: ori \$t0, \$zero, 0x1234 | # \$t0 = \$0   0x1234 = 0x000001234 |
|      | 0x00400004 | ori \$t1, \$0, 0x000000010  | 17: ori \$t1, \$0, 16        | # \$t1 = \$0 << 16 = 0x12340000     |
|      | 0x00400008 | ori \$t2, \$0, 0x000005678  | 18: ori \$t2, \$0, 0x5678    | # \$t2 = \$0   0x5678 = 0x12345678  |
|      | 0x0040000c | ori \$t3, \$0, 0x000000018  | 21: ori \$t3, \$0, 24        | # \$t3 = \$0 >> 24 = 0x00000012     |
|      | 0x00400010 | ori \$t4, \$0, 0x0000000ff  | 22: ori \$t4, \$0, 0x00ff    | # \$t4 = \$0 >> 8 = 0x00000012      |
|      | 0x00400014 | ori \$t5, \$0, 0x000000010  | 25: ori \$t5, \$0, 16        | # \$t5 = \$0 >> 16 = 0x000001234    |
|      | 0x00400018 | ori \$t6, \$0, 0x0000000ff  | 26: ori \$t6, \$0, 0x00ff    | # \$t6 = \$0 >> 8 = 0x00000034      |
|      | 0x0040001c | ori \$t7, \$0, 0x0000000ff  | 29: ori \$t7, \$0, 8         | # \$t7 = \$0 >> 8 = 0x00123456      |
|      | 0x00400020 | ori \$t8, \$0, 0x0000000ff  | 30: ori \$t8, \$0, 0x00ff    | # \$t8 = \$0 >> 8 = 0x00000056      |
|      | 0x00400024 | ori \$t9, \$0, 0x0000000ff  | 33: ori \$t9, \$0, 0         | # \$t9 = \$0 >> 0 = 0x12345678      |
|      | 0x00400028 | ori \$t10, \$0, 0x0000000ff | 34: ori \$t10, \$0, 0x00ff   | # \$t10 = \$0 >> 0 = 0x00000078     |

**Data Segment**

| Address    | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10010000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010020 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010040 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010060 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010080 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100a0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100c0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x100100e0 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010100 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010120 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |
| 0x10010140 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000  | 0x00000000  | 0x00000000  | 0x00000000  |

**Registers**

| Name   | Number | Value      |
|--------|--------|------------|
| \$zero | 0      | 0x00000000 |
| \$at   | 1      | 0x00000000 |
| \$v0   | 2      | 0x00000000 |
| \$v1   | 3      | 0x00000000 |
| \$a0   | 4      | 0x00000000 |
| \$a1   | 5      | 0x00000000 |
| \$a2   | 6      | 0x00000000 |
| \$a3   | 7      | 0x00000000 |
| \$t0   | 8      | 0x12345678 |
| \$t1   | 9      | 0x00000012 |
| \$t2   | 10     | 0x00000034 |
| \$t3   | 11     | 0x00000056 |
| \$t4   | 12     | 0x00000078 |
| \$t5   | 13     | 0x12345678 |
| \$t6   | 14     | 0x0000002e |
| \$t7   | 15     | 0x00000000 |
| \$t8   | 16     | 0x00000000 |
| \$t9   | 17     | 0x00000000 |
| \$s0   | 18     | 0x00000000 |
| \$s1   | 19     | 0x00000000 |
| \$s2   | 20     | 0x00000000 |
| \$s3   | 21     | 0x00000000 |
| \$s4   | 22     | 0x00000000 |
| \$s5   | 23     | 0x00000000 |
| \$s6   | 24     | 0x00000000 |
| \$s7   | 25     | 0x00000000 |
| \$s8   | 26     | 0x00000000 |
| \$s9   | 27     | 0x00000000 |
| \$k0   | 28     | 0x00000000 |
| \$k1   | 29     | 0x00000000 |
| \$gp   | 30     | 0x00000000 |
| \$fp   | 31     | 0x00000000 |
| \$ra   | 32     | 0x00000000 |
| \$pc   | 33     | 0x0000002e |
| \$hi   | 34     | 0x00000000 |
| \$lo   | 35     | 0x00000000 |

**Mars Messages**

Run IO

Clear

program is finished running (dropped off bottom)