




## Administrivia: Final Grades



- ▶ All grades are posted *except* Homework 6, Lab 6, and a few attendance points
- ▶ **Final letter grade cutoffs are 90.0/80.0/70.0/60.0 strict**
  - ▶ When Harika posts HW6 grades, e-mail her *immediately* if there's a problem
  - ▶ You're welcome to come by my office to review your final exam (I keep the exams)
  - ▶ No "fishing for points" – too late for grade changes for Homework 1–5 and Exams 1–2
  - ▶ No special favors, ever

## Administrivia: Final Exam




- ▶ **Friday, December 12, 12:00–2:30 p.m.**
- ▶ Allowed one double-sided 8½×11" cheat sheet 
  - ▶ Write anything you want on it
  - ▶ Turn it in with your exam
- ▶ Comprehensive – Material from Exams 1 & 2 (70%):
  - ▶ Review study guides
  - ▶ Review the exams themselves – expect similar questions
- ▶ New topics since Exam 2 (30%): floating-point, heap memory, caching/memory hierarchy
  - ▶ Review in-class activities – there *will* be questions like those on the activity sheets
  - ▶ Review the assigned reading, especially on cache memory
  - ▶ Study guide for this material will be posted

I'M ON A BOAT	NO MONEY NO PROBLEMS	IMOGEN'S SPARKS	CALL ME MAYBE
\$100	\$100	\$100	\$100
\$200	\$200	\$200	\$200
\$300	\$300	\$300	\$300
\$400	\$400	\$400	\$400
\$500	\$500	\$500	\$500

### 1-\$100

THIS IS THE NUMBER OF BITS IN THE IEEE 754 DOUBLE-PRECISION REPRESENTATION OF A FLOATING-POINT NUMBER.


What is 64?



### 1-\$200

THIS IS THE MASM DATA TYPE USED TO DEFINE SINGLE-PRECISION FLOATING-POINT NUMBERS.

What is REAL4?



## 1-\$300

THIS INSTRUCTION LOADS A FLOATING-POINT VALUE FROM MEMORY, PUSHING IT ONTO THE FLOATING-POINT STACK AT ST(0)

What is FLD?



## 1-\$400

IF A .DATA SECTION CONTAINS

**TOO REAL4 2.0**

**TREE REAL4 3.0**

THIS IS THE VALUE IN ST(0) AFTER EXECUTING

**FLD TOO**

**FLD TREE**

**FSUB**

What is -1.0?



## 1-\$500

WHEN INTERPRETED AS A SINGLE-PRECISION FLOATING-POINT NUMBER, THE 32 BITS

**B F C 0 0 0 0 h**  
1011 1111 1100 0000 0000 0000 0000 b

REPRESENT THIS VALUE.

What is -1.5?



## 2-\$100

THIS PRINCIPLE STATES THAT INSTRUCTIONS EXECUTED WITHIN A SHORT PERIOD OF TIME TEND TO BE CLOSE TOGETHER IN MEMORY, AND DATA THAT ARE ACCESSED WITHIN A SHORT PERIOD OF TIME ALSO TEND TO BE CLOSE TOGETHER IN MEMORY.

What is the Principle of Locality?



## 2-\$200

THIS IS AN ORGANIZATION OF STORAGE DEVICES THAT TAKES ADVANTAGE OF THE CHARACTERISTICS OF DIFFERENT STORAGE TECHNOLOGIES TO IMPROVE THE OVERALL PERFORMANCE OF A COMPUTER SYSTEM.

What is a memory hierarchy?



## 2-\$300

IF A 2-WAY SET ASSOCIATIVE CACHE HAS 8 ENTRIES, THIS IS THE NUMBER OF ENTRIES IN WHICH A PARTICULAR BLOCK OF MEMORY MAY BE STORED.

What is 2?

(Every 2 rows forms a set, and each block must be stored in one particular set)



## 2-\$400

IF MEMORY ADDRESSES ARE 32 BITS,  
AND A CACHE HAS 64-BYTE CACHE LINES,  
THIS MANY BITS OF A MEMORY ADDRESS  
WILL BE USED TO IDENTIFY THE BLOCK NUMBER.

What is 26?

( $64 = 2^6$ , so the low 6 bits identify the offset within a block,  
and the upper  $32 - 6 = 26$  bits identify the block number)



## 2-\$500

IN A 2-WAY SET ASSOCIATIVE CACHE,  
IF 26 BITS OF A MEMORY ADDRESS ARE USED TO  
IDENTIFY THE BLOCK NUMBER,  
THIS MANY BITS ARE USED FOR THE TAG.

What is 25?

(The lowest 1 bit identifies the set in the cache; the remaining  $26 - 1 = 25$  are the tag)



## 3-\$100

THIS IS A MEMORY POOL FOR A SPECIFIC PROCESS.  
FROM WHICH MEMORY CAN BE ALLOCATED  
DYNAMICALLY. ITS SIZE IS NOT FIXED AND  
IS GENERALLY LARGER THAN THE STACK.

What is the heap?



## 3-\$200

THIS WIN32 API FUNCTION IS USED TO  
ALLOCATE MEMORY ON THE HEAP.

What is HeapAlloc?



## 3-\$300

IF HEAPALLOC IS UNABLE TO ALLOCATE  
MEMORY, IT RETURNS THIS VALUE

What is 0?



## 3-\$400

X86 PROCESSORS BOOT IN THIS MODE,  
WHICH USES 20-BIT MEMORY ADDRESSES

What is real-address mode?



### 3 - \$500

ALTHOUGH YOUR PROGRAM'S DATA BEGINS AT  
MEMORY ADDRESS 00405000H,  
THAT IS NOT A PHYSICAL MEMORY ADDRESS;  
IT IS THIS TYPE OF MEMORY ADDRESS.

What is a virtual address?



### 4 - \$100

THIS INSTRUCTION POPS A DWORD OFF OF THE  
STACK, THEN JUMPS TO THE INSTRUCTION AT THAT  
MEMORY ADDRESS

What is RET?



### 4 - \$200

IN THIS CALLING CONVENTION,  
THE CALLER  
IS RESPONSIBLE FOR REMOVING  
ARGUMENTS FROM THE STACK

What is the C calling convention?



### 4 - \$300

AFTER A STACK FRAME HAS BEEN CREATED,  
THE FIRST ARGUMENT TO A FUNCTION WILL BE  
FOUND AT THE MEMORY ADDRESS  
EBP + THIS VALUE

What is 8?



### 4 - \$400

IF THE VERY FIRST INSTRUCTION IN A PROCEDURE IS  
`MOV EAX, [EBP+8],`  
YOU PROBABLY MADE A MISTAKE. BEFOREHAND,  
YOU SHOULD HAVE INSERTED THIS INSTRUCTION.

What is ENTER?



### 4 - \$500

THE INSTRUCTION  
`RET 8`  
INCREASES ESP BY THIS AMOUNT, *IN TOTAL*

What is 12?

(First, it pops a 4-byte return address. Then, it removes 8 bytes of arguments.)

