SOME POWERS OF 2

2^{10}	1,024
2^{11}	2,048
2^{12}	4,096
2^{13}	8,192
2^{14}	16,384
2^{15}	32,768

UNIX SYSTEM CALL PROTOTYPES FOR SOME COMMON SYSTEM CALLS:

```
int   fork (void);

int   pipe (int pipe_array[2]);

int   execl (char* path, char* argv0, … , NULL);

int   execlp (char* name, char* argv0, … , NULL);

int   dup (int channel);

int   open (char * path, int mode, int permissions);
```

Where mode must be one of : O_RDONLY, O_WRONLY, or O_RDWR (other flags could also be OR'd in if needed), and permissions only matter if the open includes the O_CREAT flag and is both creating and opening a new file.

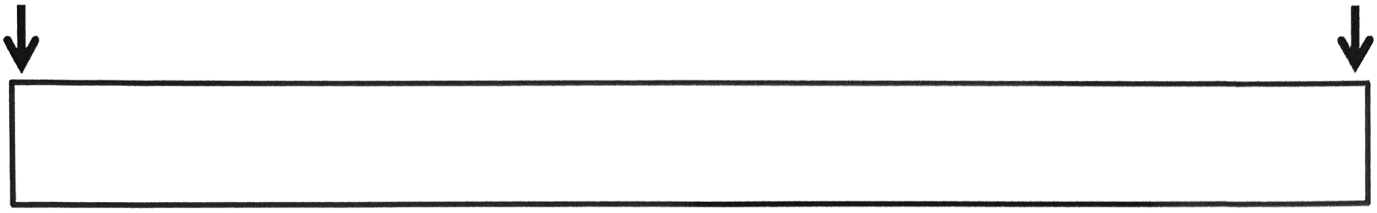
```
int   close (int channel);

int   read (int channel, char * buffer, int byte_count);

int   write (int channel, char * buffer, int byte_count);

int   wait (int * status);

int   exit (int exit_number);

int   sigaction(int signum, struct sigaction * new, struct sigaction * old);
```

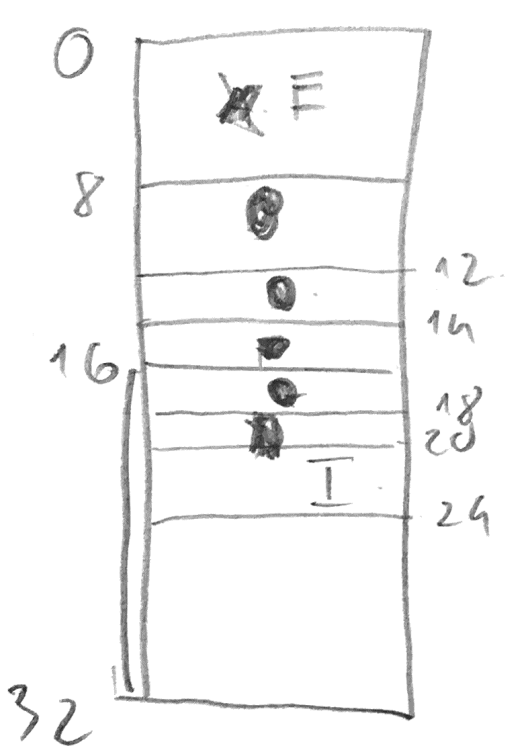
PTHREAD ROUTINES:

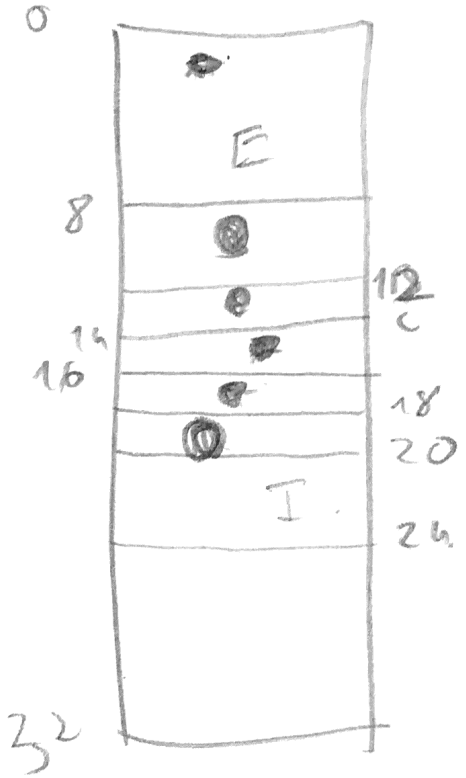
```
int pthread_mutex_init(pthread_mutex_t *mutex,
            const pthread_mutexattr_t * attr);
int pthread_mutex_lock(pthread_mutex_t *mutex);

int pthread_mutex_unlock(pthread_mutex_t *mutex);

int pthread_cond_init(pthread_cond_t * cond,
            const pthread_condattr_t * attr);

int pthread_cond_wait(pthread_cond_t * cond,
            pthread_mutex_t * mutex);

int pthread_cond_signal(pthread_cond_t *cond);
int pthread_cond_broadcast(pthread_cond_t *cond);

int pthread_create(pthread_t * thread_id,
            const pthread_attr_t * attr,
            void *(*start_routine)(void*), void * arg);

int pthread_join(pthread_t thread_id, void **value_ptr);
```

HELP SHEET FOR PROBLEM #1:

Address 0 Address 32K-1







2K	
4K	
8K	
16K	
32K	**0**

Scratch Memory Grid

ω	2	3	1	3	2	4	3	2	4	5	1	6	7	5	6	7	4	5	6	7	2	1	
1	2	3	1	3	2	4	3	2	4	5	1	6	7	5	6	7	4	5	6	7	2	1	
2		2	3	1	3	3	4	4	2	4	5	5	5	7	7	6	6	6	5	6	7	2	
3			2	2	1	2	2	3	3	2	4	4	6	6	5	5	5	4	4	5	6	2	
4						1	1	1	1	1	2	2	4	4	4	4	7	7	7	4	5	6	
5										3	3	1	2	2	2	2	2	2	2	2	4	5	
6												3	1	1	1	1	1	1	1	1	1	4	
7													3	3	3	3	3	3	3	3	3	3	
c1																							
c2																							
c3				1	1	1	2	2	3	3	3	3	3	4	4	5	5	5	6	6	6	6	16
c4					1	1	1	2	2	2	2	2	2	2	3	3	3	4	4	4	4	4	12
c5											1	1	1	1	1	1	2	2	2	3	3	3	9
c6																					1	1	8
c7																						1	7
∞																							