Chapter 5

1. C

2. *Listed in "Answers to Selected Problems"*

3.
   a. 256 x 1024 = 2^8 x 2^{10} = 2^{18}. → 18 address lines
   b. 2 = 2^1, 1 megabyte = 2^{20} , (2^1)*(2^{20})=2^{21} → 21 address lines
   c. *Listed in "Answers to Selected Problems"*

4.
   a. Memory
   b. Memory
   c. IR
   d. PC
   e. Fetch Phase
   f. *Listed in "Answers to Selected Problems"*
   g. ALU
   h. ACC

5. Execute

6. *Listed in "Answers to Selected Problems"*

7. Fetch

8. Execute

9. 4 bytes in a word so
   b. 8

10. *Try yourself*

11.
   a. 1
   b. 2
   c. 2
   d. *Listed in "Answers to Selected Problems"*

12. Consider the partial view of a 32-bit memory and decimal addresses for an ARM processor shown below: a.

Address 111	Address 110	Address 109	Address 108
Address 107	Address 106	Address 105	Address 104
Address 103	Address 102	Address 101	Address 100
Address 99	Address 98	Address 97	Address 96

b. 1
0
5
c. 2
d. 1

18.

a. *Listed in "Answers to Selected Problems"*

b. 102
c. 104
d. 108

19. B

22. D

23. *Listed in "Answers to Selected Problems"*

25. 22000000
+128 * 4066C →2033600
+4 * 7 → 1C → 2403361C

26. 22001234_{16}
$- 22000000_{16}$
$00001234_{16} = (4660_{10})$
$\div 00000080_{16} = (128_{10})$
00000024_{16} Q = 36_{10}
R = 52_{10}
52 ÷ 4 = 13 ← Bit number
20000024_{16} ← Word Address

27. *The correct answer is:* B & D

Chapter 6

1. *Listed in "Answers to Selected Problems"*

2.

a.
```
LDR     r0,x
LDR     r1,y
UDIV    r0,r0,r1
STR     r0,z
```
b.
```
LDR     r0,x
LDR     r1,y
SDIV    r0,r0,r1
STR     r0,z
```

4. There can be multiple answers for this

a.
```
LSR     R0, R0, #1
ORR     R0, R0, R1, LSL #31
LSR     R1, R1, #1
```
b.
```
LSR     R0, R0, #1
ORR     R0, R0, R1, LSL #31
ASR     R1, R1, #1
```

c. *Try yourself*

5.

a. 2
b. 2
c. 4
d. 4

6.

a.
```
short int red, blue[10];
long int purple;
blue[purple] = red;
```
b.
```
unsigned long int green;
```

c. *Try yourself*

c.
```
unsigned char white, black;
white = black % 5;
```
d.
```
long long int yellow, orange;
yellow = orange << 1;
```

8.

a. *Listed in "Answers to Selected Problems*	b.
	``LDR R0, p32
	ADR R1, a32
	SUB R0, R0, R1```

	LDR R1, =4
	SDIV R0, R0, R1
	ADD R0, R0, #5
	STRR0, k32

c.
ADR R0, a64
LDR R1, k32
ADD R0, R0, R1, LSL #3
ADD R0, R0, #4
STR R0, p32
	d.
	Try yourself

e. *Listed in "Answers to Selected Problems*	f.
	ADR R0, a32
	LDR R1, k32
	ADD R0, R0, R1, LSL #2
	LDR R1, p32
	SUB R0, R0, R1
	LDR R1, =4
	SDIV R0, R0, R1
	STRR0, k32

g.
ADR R1, R1, a16
LDR R0, k32
SUB R0, R0, #1
LDRH R0, [R1, R0, LSL #1]
ADD R0, R0, #1
STRH R0, [R1, R0, LSL#1]
	h. *Try yourself*

i. LDRSB R0, s8 MOV R1, R0, ASR #31 STRD R0, R1, s64	j. *Try yourself*

k. *Try yourself*	l.
	LDRH R0, u16
	LDR R1, =10
	UDIV R0, R0, R1
	STRH R0, u16

Chapter 7

1.
```
        LDR   R0, =0
        LDR   R1, =0
top:    CMP   R1, #100
        BGE   done
        ADD   R0, R0, R1
        ADD   R1, R1, #1
        B     top
done:
```

2.

a. *Listed in "Answers to Selected Problems*

b.
```
        LDR   R0, y
        LDR   R1, =13
        MUL   R0, R0, R1
        LDR   R1, =3
        UDIV  R0, R0, R1
        STR   R0, x
```

c.
```
        LDR   R0, =0
        LDR   R1, =0
Top:    CMP   R1, #999
        BHI   Done
        ADD   R0, R0, R1
        LSL   R1, R1, #1
        B     Top
Done:   STR   R0, x
```

d. *Try yourself*

3.

a.
```
        LDRH  R0 ,a
        CMP   R0, #0
        BLS   EndIf
        CMP   R0, #99
        BHI   EndIf
Then:   LDRH  R0, b
        LSL   R0, R0,#2
        STRH  R0, b
EndIf:
```

b.
```
        LDR   R0, a
        CMP   R0, #100
        BGT   Then
        CMP   R0, #50
        BGE   EndIf
Then:   LDR   R1, b
        AND   R0, R0, R1
        STR   R0, a
EndIf:
```

c. *Try yourself*

4.

a. *Try yourself*	b.
	LDRH R0, a
	LDRH R1, b
	CMP R0, R1
	ITE EQ
	LDREQ R0, =0
	SUBNE R0, R0, R1
	STRH R0, c

c. *Try yourself*	d. *Try yourself*

5.

a.
LDR R0, x
LDR R1, y
LDR R2, z
CMP R0, R1
BGE L1
CMP R1, R2
BGE L1
LDR R0, =6
L1: STR R0, z
	b. Listed in "Solutions to Selected Problems"

c. *Try yourself*	d.
	LDRB R0, ch
	CMP R0, #97 ; #97 → 'a'
	BLT L1
	CMP R0, #122 ; #122 → 'z'
	BGT L1
	SUB R0, R0, #97
	ADD R0, R0, #65 ; #65 → 'A'
	STRB R0, ch
	L1:

e.
LDR R0, y
LDR R1, =5
SDIV R0, R0, R1
STR R0, x	

6.

a.
LDR R0, a
LDR R1, =125
BL f1
STR R0, x
	b. Listed in "Answers to Selected Problems"

c. ADR R0, c	d. Add: ADD R0, R0, R1

BL f3	BX LR
e. *Listed in "Answers to Selected Problems"*	f. *Try yourself*

g. GetAndClear:
LDR R1, [R0]
LDR R2, =0
STR R2, [R0]
MOV R0, R1
BX LR
	h.
	LDR R0, u32
	LDR R1, s32
	CMP R0, #10
	ITE HI
	SUBHI R1, R1, #1
	ADDLS R1, R1, #1
	STR R1, s32

i. *Try yourself*	j. *Try yourself*

k. *Try yourself*	l. Swap:
	LDR R2, [R0]
	LDR R3, [R1]
	STR R3, [R0]
	STR R2, [R1]
	BX LR

m.	

Chapter 8

1. *Listed in "Answers to Selected Problems"*
2. C
3. C
4. *Listed in "Answers to Selected Problems"*

7. A, B, C, D
8. B & C
10. A, C, D, E
11. C
12. *Listed in "Answers to Selected Problems"*
13. False
14. *Listed in "Answers to Selected Problems"*

15. *Listed in "Answers to Selected Problems"*

16. B

17.
    a. Lower
    b. Higher

18. R0 through R3, LR