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LAB : 2

Q1) Write an ALP to do addition of three floating point numbers using 8087 instruction set.

Test case data: x = 3.5 y = 5.0 z = 2.2

Code)

```
data segment
a dd 2.0
b dd 2.0
c dd 2.0
d dd ?
data ends

code segment

assume cs:code , ds:data
start:
mov ax, data
mov ds, ax
finit
fld a
fld b
fld c
fadd
fadd
fst d
int 03h
code ends
end start
```

Valid ST(0) 2	im=1	ie=0
Valid ST(1) 2	dm=1	de=0
Valid ST(2) 2	zm=1	ze=0
Empty ST(3)	om=1	oe=0
Empty ST(4)	um=1	ue=0
Empty ST(5)	pm=1	pe=0
Empty ST(6)	iem=0	ir=0
Empty ST(?)	pc=3	cc=1
	rc=0	st=5
	ic=0	

[I=80486 IPTR=00000 OPCODE=000 OPTR=00000 Z=[↑][↓]	
Valid ST(0) 4	im=1 ie=0
Valid ST(1) 2	dm=1 de=0
Empty ST(2)	zm=1 ze=0
Empty ST(3)	om=1 oe=0
Empty ST(4)	um=1 ue=0
Empty ST(5)	pm=1 pe=0
Empty ST(6)	iem=0 ir=0
Empty ST(?)	pc=3 cc=1
	rc=0 st=6
	ic=0

[I=80486 IPTR=00000 OPCODE=000 OPTR=00000 Z=[↑][↓]	
Valid ST(0) 6	im=1 ie=0
Empty ST(1)	dm=1 de=0
Empty ST(2)	zm=1 ze=0
Empty ST(3)	om=1 oe=0
Empty ST(4)	um=1 ue=0
Empty ST(5)	pm=1 pe=0
Empty ST(6)	iem=0 ir=0
Empty ST(?)	pc=3 cc=1
	rc=0 st=7
	ic=0

[I=Dump Z=[↑][↓]	
ds:0000 00 00 00 40 00 00 00 40 0 e e ^	
ds:0008 00 00 00 40 00 00 00 00 0 e 2	
ds:0010 B8 AD 44 8E D8 9B DB E3 1 iDA+C 1	
ds:0018 9B D9 06 00 00 9B D9 06 C ♦ C ♦ v1	

Q2) Write an ALP to find area of a circle using 8087 instruction set.

Test case data: Pi = 3.1472 radius = 5.0

Code)

```
data segment  
pi dd 3.1472  
r dd 5.0  
res dd ?  
data ends
```

```
code segment
```

```
assume cs:code , ds:data
```

```
start:  
mov ax, data  
mov ds, ax  
finit  
fld pi  
fld r  
fld r  
fmul  
fmul  
fst res  
int 03h  
code ends  
end start
```

Valid ST(0) 5	im=1	ie=0
Valid ST(1) 5	dm=1	de=0
Valid ST(2) 3.1472001075744629	zm=1	ze=0
Empty ST(3)	om=1	oe=0
Empty ST(4)	um=1	ue=0
Empty ST(5)	pm=1	pe=0
Empty ST(6)	iem=0	ir=0
Empty ST(7)	pc=3	cc=1
	rc=0	st=5
	ic=0	

FL J=80486 IPTR=000000 UPUCODE=000 UPTR=000000 Z=[TJL]	
Valid ST(0) 25	im=1 ie=0
Valid ST(1) 3.1472001075744629	dm=1 de=0
Empty ST(2)	zm=1 ze=0
Empty ST(3)	om=1 oe=0
Empty ST(4)	um=1 ue=0
Empty ST(5)	pm=1 pe=0
Empty ST(6)	iem=0 ir=0
Empty ST(7)	pc=3 cc=1
	rc=0 st=6
	ic=0

FL J=80486 IPTR=000000 UPUCODE=000 UPTR=000000 Z=[TJL]	
Valid ST(0) 78.680002689361572	im=1 ie=0
Empty ST(1)	dm=1 de=0
Empty ST(2)	zm=1 ze=0
Empty ST(3)	om=1 oe=0
Empty ST(4)	um=1 ue=0
Empty ST(5)	pm=1 pe=0
Empty ST(6)	iem=0 ir=0
Empty ST(7)	pc=3 cc=1
	rc=0 st=7
	ic=0

FL J=Dump	Z=[TJL]
ds:0000 BA 6B 49 40 00 00 A0 40 kI@ á@	
ds:0008 00 00 00 00 00 00 00 00	
ds:0010 B8 AD 44 8E D8 9B DB E3 7 iD@+C@	
ds:0018 9B D9 06 00 00 9B D9 06 C@+ C@+	

Q3) Write an ALP to find the volume of sphere using 8087 instruction set.

Test case data: Pi = 3.1472 radius = 5.0

Code)

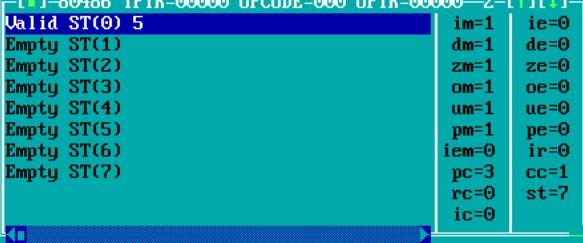
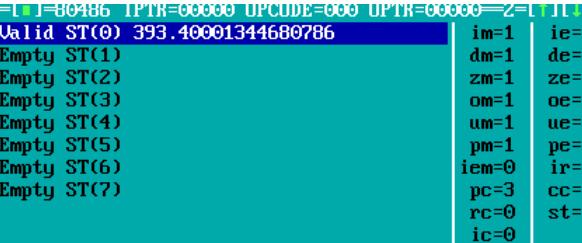
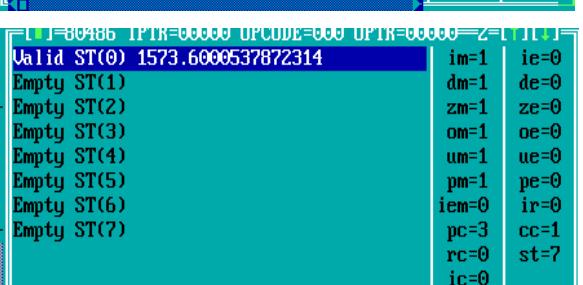
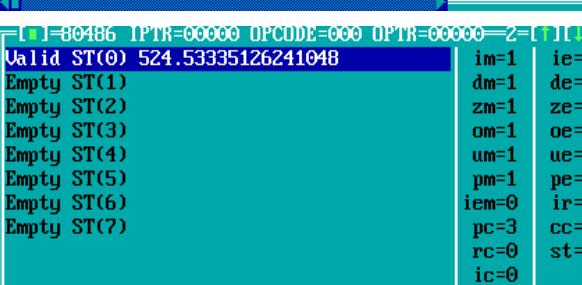
```
data segment
pi dd 3.1472
r dd 5.0
c dd 4.0
c2 dd 3.0
res dd ?
data ends
```

```
code segment
```

```

assume cs:code , ds:data
start:
    mov ax, data
    mov ds, ax
    finit
    fld r
    fmul r
    fmul pi
    fmul c
    fdiv c2
    fst res
    int 03h
    code ends
end start

```

Dump
ds:0000 BA 6B 49 40 00 00 A0 40 ||kI@ áe
ds:0008 00 00 80 40 00 00 40 40 Çe ee
ds:0010 00 00 00 00 00 00 00 00
ds:0018 00 00 00 00 00 00 00 00

4. Write an ALP to find $c = \sqrt{a^2 + b^2}$.

Test case data: a = 5.0 b = 3.0

Code)

```
data segment
a dd 5.0
b dd 3.0
res dd ?
data ends
```

```
code segment
```

```
assume cs:code , ds:data
start:
mov ax, data
mov ds, ax
finit
fld a
fmul a
fld b
fmul b
fadd
fsqrt
fst res
int 03h
code ends
end start
```

Valid ST(0) 5	im=1	ie=0
Empty ST(1)	dm=1	de=0
Empty ST(2)	zm=1	ze=0
Empty ST(3)	om=1	oe=0
Empty ST(4)	um=1	ue=0

[]=80486 IPTR=00000 OPCODE=000 OPTR=00000=2=[↑][↓]	
Valid ST(0) 25	im=1 ie=0
Empty ST(1)	dm=1 de=0
Empty ST(2)	zm=1 ze=0
Empty ST(3)	om=1 oe=0
[]=80486 IPTR=00000 OPCODE=000 OPTR=00000=2=[↑][↓]	
Valid ST(0) 3	im=1 ie=0
Valid ST(1) 25	dm=1 de=0
Empty ST(2)	zm=1 ze=0
Empty ST(3)	om=1 oe=0
[]=80486 IPTR=00000 OPCODE=000 OPTR=00000=2=[↑][↓]=	
Valid ST(0) 9	im=1 ie=0
Valid ST(1) 25	dm=1 de=0
Empty ST(2)	zm=1 ze=0
Empty ST(3)	om=1 oe=0
[]=80486 IPTR=00000 OPCODE=000 OPTR=00000=2=[↑][↓]=	
Valid ST(0) 34	im=1 ie=0
Empty ST(1)	dm=1 de=0
Empty ST(2)	zm=1 ze=0
Empty ST(3)	om=1 oe=0
Empty ST(4)	um=1 ue=0
[]=80486 IPTR=00000 OPCODE=000 OPTR=00000=2=[↑][↓]=	
Valid ST(0) 5.8309518948453005	im=1 ie=0
Empty ST(1)	dm=1 de=0
Empty ST(2)	zm=1 ze=0
Empty ST(3)	om=1 oe=0
Empty ST(4)	um=1 ue=0
[]=Dump=3=[↑][↓]	
ds:0000 00 00 A0 40 00 00 40 40 á@ 00	▲
ds:0008 00 00 00 00 00 00 00 00	▼
ds:0010 B8 AD 44 8E D8 9B DB E3 iDA+C	■
ds:0018 9B D9 06 00 00 9B D8 0E C J C	▼

i).

Convert 89.625 to IEEE single precision.

$$89.625 \rightarrow 1.011001101 \times 2^6$$

Sign bit → 0

$$\begin{array}{c} 1-011001101 \times 2^6 \\ \boxed{0} \quad \text{EXP.} \quad \text{M.} \\ \hline \end{array}$$

Hex :- 42B34000H

ii)

Convert 89.625 to IEEE double precision format

$$89.625 \rightarrow 1.011001101 \times 2^6$$

Sign bit → 0

$$1.011001101 \times 2^6 \leftarrow 252-32-$$

$$\text{Exponent} = 6 + 1023 = 1029 \rightarrow \boxed{0100000000101}$$

$$\begin{array}{c} 1-011001101 \times 2^6 \\ \boxed{0} \quad \text{E} \quad \text{M.} \\ \hline \end{array}$$

$$\boxed{0 \quad 1000000001010 \quad 011001101 \dots 0}$$

$$\text{Hex :- } 402056680000000000H$$

iii) Convert -56.625 to IEEE 754 single precision

56-625 → 00111000-101
101-1001101 ← 230.08

Sign bit \rightarrow 1

$$\text{Normalized :- } 1.1100101 \times 2^5$$

$$\text{Exponent} = 5 + 127$$

1	1000 0100	1100010108... 1000
S	A E	M tonnes

Hex: C2628000H

iv) Convert -56.625 to IEEE double precision

-56-628 → 00111000-101 - 1

Sign bit \rightarrow 1 - PSO1 = 8501 + 3 = 8504

Normalized :- $1.110001 \Phi 1 \times 2^5$

$$\text{Exponent} = 5 + 1023 = 1028$$

18118188:88888 21

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1 100 0000 0100 11000 1010 ... 0

S E

M

Help:- CO[HC#F]ooooooooooooOH