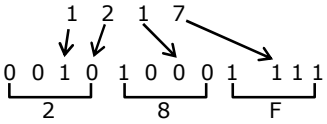
Answer Keys

1	A	**2**	A	**3**	B	**4**	D	**5**	B	**6**		**7**	C
8	C	**9**	A	**10**		**11**	C	**12**	B	**13**	A	**14**	C
15	C	**16**	D	**17**	B	**18**	B	**19**	A	**20**		**21**	
22	C	**23**	D	**24**	B	**25**	D	**26**	B	**27**	A	**28**	D
29	D	**30**	A	**31**	B	**32**	C	**33**	A	**34**	B	**35**	A
36	C	**37***	B/C	**38**	D	**39**	B	**40**	C	**41**	C	**42**	B
43	B	**44***	A/B	**45**		**46**	B	**47**		**48**	C	**49**	C
50	B	**51**	C	**52**	C	**53**	C	**54**		**55***	A/D	**56**	B
57	D	**58**		**59**	C	**60**	D						

Explanations:-

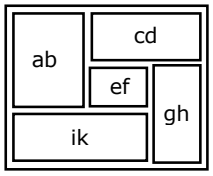
4. $(x, y) \in R$ but $(y, x) \notin R$

   $\therefore$ R is not symmetric. It is also not antisymmetric

5. 

   $(1217)_8 = (028F)_{16}$

7. $\dfrac{256 \times 8K}{32K \times 1} = 64$

8. 

22. $c * c = b$

    $c * c * c = b * c = d$

    $c * c * c * c = d * c = a$

    $c * c * c * c * c = a * c = c$

    $\therefore$ c is generator

    Similar $d * d = b$

    $d * d * d = b * d = c$

    $d * d * d * d = c * d = a$

    $d * d * d * d * d = a * d = d$

    $\therefore$ d is another generator

25. $\int_0^{\frac{\pi}{4}} \frac{1-\tan x}{1+\tan x}\,dx$

$$I = \int_0^{\frac{\pi}{4}} \frac{\cos x - \sin x}{\cos x + \sin x}\,dx$$

Let $\cos x + \sin x = t$

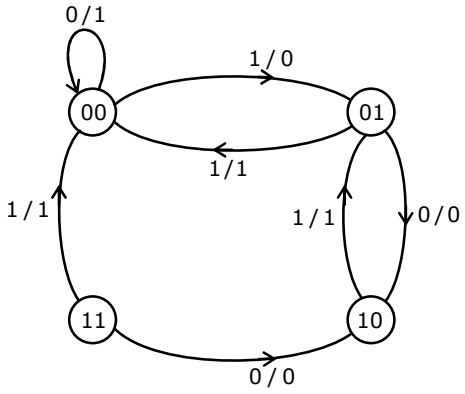
$\therefore \; (-\sin x + \cos x)\,dx = dt$

$$\therefore \; I = \int_0^{\frac{\pi}{4}} \frac{dt}{t} = \ell n t \Big]_0^{\pi/4}$$

$$= \ell n\left(\cos x + \sin x\right)\Big]_0^{\pi/4}$$

$$= \ell n\sqrt{2} = \frac{1}{2}\ell n 2$$

27.



28.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
I_1	F	F	D	E	W											
I_2			F	D	D	D	E	E	W	W						
I_3				F	F		D		E		W	W	W			
I_4						F		D	D	E	E			W	W	

S1 = Fetch(F)

S2 = Decode(D)

S3 = Execute(E)

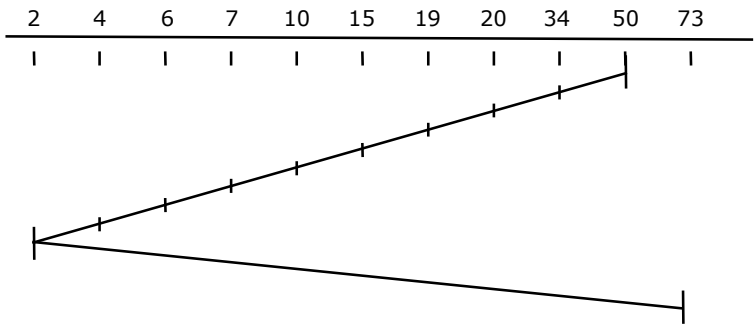
S4 = Write back(W)

$15 \times 2 = 30$ (for i = 1 & i = 2)

29. Total 4 sets are there in the cache and each set contains 4 blocks

set0	~~0~~ 48
	~~4~~ 32
	8
	~~216~~ 92
set1	1
	133
	73
	129
set2	
set3	~~255~~ 155
	3
	159
	63

31.



Total 119 moves

35. Applying Master's theorem

36.

0	1	2	3	4	5	6	7	8	9
		12	13	2	3	23	5	18	15

$12 \bmod 10 = 2$; $18 \bmod 10 = 8$

$13 \bmod 10 = 3$; $2 \bmod 10 = 2(\text{collision})$

$(2+1) \bmod 10 = 3(\text{ collision })(\text{using linear probing})$

$(3+1) \bmod 10 = 4$. Like this continue.

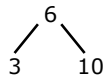
37. Maximum height of any AVT tree with n nodes $\square$ $1.44 \log n$

$n = 7, h_{max} \square 1.44 \log 7 \approx 4$

40. $L_1 \cap L_2 = \{a^n b^n c / n \geq 0\}$, which is context free but not regular

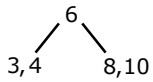
44.

$6 \rightarrow$

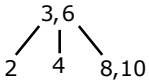


One split

$8,4 \rightarrow$

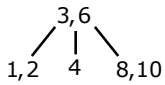


$2 \rightarrow$



One more split

$1 \rightarrow$



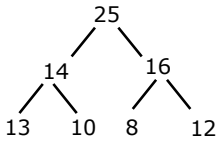
51. Sector number is $(400 \times 20 \times 63) + (16 \times 63) + 29 = 505037$

57. 10^3ms .....10^6bits

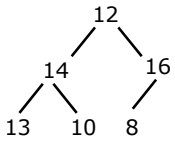
$\therefore 50$ " ..... $\frac{1000}{50} = 20$bits

$\therefore$ Minimum number of bits required is 5

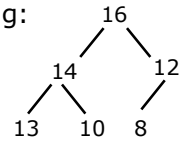
60.



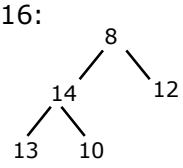
Delete 25 : Replace it by 12



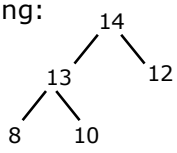
After heapifying:



Delete 16:



After heapifying:



$\equiv \{14,13,12,8,10\}$