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a)

Compulsory miss → Also known as "Cold" miss. These occur when first access.
Capacity miss → These occur when accesses are much larger than cache capacity.
Conflict miss → These occur when some accesses are mapped same locations.

b)

Larger block size → compulsory miss → increases other misses
Larger cache capacity → capacity miss → increases hit time
Higher associativity → conflict miss → decreases compulsory, increases capacity

Q2

	A	B	C	D	B	C	D	A	C	D	miss rate
a) Access:	M	M	M	M	H	M	M	M	M	M	%90
b) Access:	M	M	M	M	H_c	H_v	H_v	M	M	M	%70

Q3

```
for (i=1000; i!=0; i--)
    c[i] = a[i] + b[i];
```

a)

```
Loop: lw   $s2, 0($s1)   → 1000
      lw   $s3, 0($t0)   → 1000
      NOP                → 1000
      add  $s2, $s2, $s3 → 1000
      sw   $s2, 0($t1)   → 1000
      addi $t0, $t0, -4  → 1000
      addi $t1, $t1, -4  → 1000
      addi $s1, $s1, -4  → 1000
      NOP                → 1000
      bne  $s1, $0, Loop → 1999
                           (1000 + 999 flush)
```

} = 10999

b)

```
Loop: lw   $s2, 0($s1)   → 1000
      lw   $s3, 0($t0)   → 1000
      addi $t0, $t0, -4  → 1000
      add  $s2, $s2, $s3 → 1000
      sw   $s2, 0($t1)   → 1000
      addi $s1, $s1, -4  → 1000
      addi $t1, $t1, -4  → 1000
      bne  $s1, $0, Loop → 1999
```

} = 8999

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Q3

c)

```
Loop: lw $s2, 0($s1)        ---> 500
      lw $s3, 0($t0)        ---> 500
      NOP                   ---> 500
NOP ---> add $s2, $s2, $s3  ---> 500
      sw $s2, 0($t1)        ---> 500
      lw $s2, 4($s1)        ---> 500
      lw $s3, 4($t0)        ---> 500
      NOP                   ---> 500
NOP ---> add $s2, $s2, $s3  ---> 500
      sw $s2, 4($t1)        ---> 500
      addi $t0, $t0, -8     ---> 500
      addi $t1, $t1, -8     ---> 500
      addi $s1, $s1, -8     ---> 500
      NOP                   ---> 500
NOP ---> bne $s1, $0, Loop  ---> 999
```

7999

d)

```
Loop: lw $s2, 0($s1)   ---> 500
      lw $s3, 0($t0)   ---> 500
      addi $t0, $t0, -8 ---> 500
      add $s2, $s2, $s3 ---> 500
      sw $s2, 0($t1)   ---> 500
      lw $s2, 4($s1)   ---> 500
      lw $s3, -4($t0)  ---> 500
      addi $s1, $s1, -8 ---> 500
      add $s2, $s2, $s3 ---> 500
      sw $s2, 4($t1)   ---> 500
      addi $t1, $t1, -8 ---> 500
      bne $s1, $0, Loop ---> 999
```

6499

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Q4)

```
int A = { 3, 5, 7, 9, 11 }
int B = { 3, 4, 5, 6, 7 }
int counter = 0
for (int i=0; i<5; i++)
    if(A[i] > B[i])
        counter++;
```

	For 0	if	For 1	if	For 2	if	For 3	if	For 4	if	For 5
Result:	T	N	T	T	T	T	T	T	T	T	N
a) Prediction	T	T	T	T	T	T	T	T	T	T	T
Total: 9/11											
b) Prediction	N	N	N	N	N	N	N	N	N	N	N
Total: 2/11											
c) Prediction	T	T	N	T	T	T	T	T	T	T	T
Total: 8/11											
d) Prediction	T_0	T_1	T_0	T_1	T_1	T_1	T_1	T_1	T_1	T_1	T_1
Total: 9/11											