

# Improving California's 1% Manual Tally Procedures

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## Outline

- Motivation
- California's Tallying Process
- Methodology
- Findings
  - Security
  - Transparency
  - Efficiency

## Checking the Math

- If we can't get the access and oversight support we need, what then? Audit.
- By “audit”, we compare two sets of software-independent records
  - 38 states keep independent records
  - Only 17 actually count them

## High-Level: What to Audit?

- Post-election auditing lit. has exploded
- Brennan Center / Samuelson Clinic convened a blue ribbon panel
- Examined:
  - Fixed-percentage audits
  - Margin-dependent audits (tiered and non-)
  - Polling audits
- Margin-dependent audits with a floor.

# Low-Level: How to Audit?

- CA has had manual tallies since 1965.
- Very little is prescribed by election law
  - Tally must compare ballots in 1% of precincts
  - Must be randomly chosen and completed before the canvass is over (28 cal. days)
  - Must include all types of ballots
- We set out with a group of researchers to improve the security, efficiency and transparency of CA's manual count.

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-	-	39	58	77	96	115	134	153	172	191	210	-	-	-	-	-	-	-
1	20	40	59	78	97	116	135	154	173	192	211	-	-	-	-	-	-	-
2	21	41	60	79	98	117	136	155	174	193	212	-	-	-	-	-	-	-
3	22	42	61	80	99	118	137	156	175	194	213	-	-	-	-	-	-	-
4	23	43	62	81	100	119	138	157	176	195	214	-	-	-	-	-	-	-
5	24	44	63	82	101	120	139	158	177	196	215	-	-	-	-	-	-	-
6	25	45	64	83	102	121	140	159	178	197	216	-	-	-	-	-	-	-
7	26	46	65	84	103	122	141	160	179	198	217	-	-	-	-	-	-	-
8	27	47	66	85	104	123	142	161	180	199	218	-	-	-	-	-	-	-
9	28	48	67	86	105	124	143	162	181	200	219	-	-	-	-	-	-	-
10	29	49	68	87	106	125	144	163	182	201	220	-	-	-	-	-	-	-
11	30	50	69	88	107	126	145	164	183	202	221	-	-	-	-	-	-	-
12	31	51	70	89	108	127	146	165	184	203	222	-	-	-	-	-	-	-
13	32	52	71	90	109	128	147	166	185	204	223	-	-	-	-	-	-	-
14	33	53	72	91	110	129	148	167	186	205	224	-	-	-	-	-	-	-
15	34	54	73	92	111	130	149	168	187	206	225	-	-	-	-	-	-	-
16	35	55	74	93	112	131	150	169	188	207	226	-	-	-	-	-	-	-
17	36	56	75	94	113	132	151	170	189	208	227	-	-	-	-	-	-	-
18	37	57	76	95	114	133	152	171	190	209	228	-	-	-	-	-	-	-
19	38	58	77	96	115	134	153	172	191	210	229	-	-	-	-	-	-	-

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## **How Does the Tally Work?**

- Precincts chosen randomly
- Materials are retrieved, verified, sorted
- Typically four people perform tally:  
Caller, Witness and two Talliers
- Use a tally sheet and announce "10's"
- Hand tally is compared to electronic
- Discrepancies must be reconciled



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TALLY SHEET		TOTAL VOTE (In Figure)
TALLY AS ILLUSTRATED with indelible pencil (The Number of Votes Must be Written Out at FULL LENGTH in this column)		
had.....votes	NUMBER OF VOTES CAST FOR EACH CANDIDATE	
for.....	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	
	41 2 3 4 5 6 7 8 9 50 1 2 3 4 5 6 7 8 9 60 1 2 3 4 5 6 7 8 9 70 1 2 3 4 5 6 7 8 9 80	
	81 2 3 4 5 6 7 8 9 90 1 2 3 4 5 6 7 8 9 100 1 2 3 4 5 6 7 8 9 110 1 2 3 4 5 6 7 8 9 120	
	121 2 3 4 5 6 7 8 9 130 1 2 3 4 5 6 7 8 9 140 1 2 3 4 5 6 7 8 9 150 1 2 3 4 5 6 7 8 9 160	
	161 2 3 4 5 6 7 8 9 170 1 2 3 4 5 6 7 8 9 180 1 2 3 4 5 6 7 8 9 190 1 2 3 4 5 6 7 8 9 200	
	201 2 3 4 5 6 7 8 9 210 1 2 3 4 5 6 7 8 9 220 1 2 3 4 5 6 7 8 9 230 1 2 3 4 5 6 7 8 9 240	
	241 2 3 4 5 6 7 8 9 250 1 2 3 4 5 6 7 8 9 260 1 2 3 4 5 6 7 8 9 270 1 2 3 4 5 6 7 8 9 280	
	281 2 3 4 5 6 7 8 9 290 1 2 3 4 5 6 7 8 9 300 1 2 3 4 5 6 7 8 9 310 1 2 3 4 5 6 7 8 9 320	
	321 2 3 4 5 6 7 8 9 330 1 2 3 4 5 6 7 8 9 340 1 2 3 4 5 6 7 8 9 350 1 2 3 4 5 6 7 8 9 360	
	361 2 3 4 5 6 7 8 9 370 1 2 3 4 5 6 7 8 9 380 1 2 3 4 5 6 7 8 9 390 1 2 3 4 5 6 7 8 9 400	
	401 2 3 4 5 6 7 8 9 410 1 2 3 4 5 6 7 8 9 420 1 2 3 4 5 6 7 8 9 430 1 2 3 4 5 6 7 8 9 440	
	441 2 3 4 5 6 7 8 9 450 1 2 3 4 5 6 7 8 9 460 1 2 3 4 5 6 7 8 9 470 1 2 3 4 5 6 7 8 9 480	
	481 2 3 4 5 6 7 8 9 490 1 2 3 4 5 6 7 8 9 500 1 2 3 4 5 6 7 8 9 510 1 2 3 4 5 6 7 8 9 520	
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	
	41 2 3 4 5 6 7 8 9 50 1 2 3 4 5 6 7 8 9 60 1 2 3 4 5 6 7 8 9 70 1 2 3 4 5 6 7 8 9 80	
	81 2 3 4 5 6 7 8 9 90 1 2 3 4 5 6 7 8 9 100 1 2 3 4 5 6 7 8 9 110 1 2 3 4 5 6 7 8 9 120	
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	241 2 3 4 5 6 7 8 9 250 1 2 3 4 5 6 7 8 9 260 1 2 3 4 5 6 7 8 9 270 1 2 3 4 5 6 7 8 9 280	
	281 2 3 4 5 6 7 8 9 290 1 2 3 4 5 6 7 8 9 300 1 2 3 4 5 6 7 8 9 310 1 2 3 4 5 6 7 8 9 320	
	321 2 3 4 5 6 7 8 9 330 1 2 3 4 5 6 7 8 9 340 1 2 3 4 5 6 7 8 9 350 1 2 3 4 5 6 7 8 9 360	
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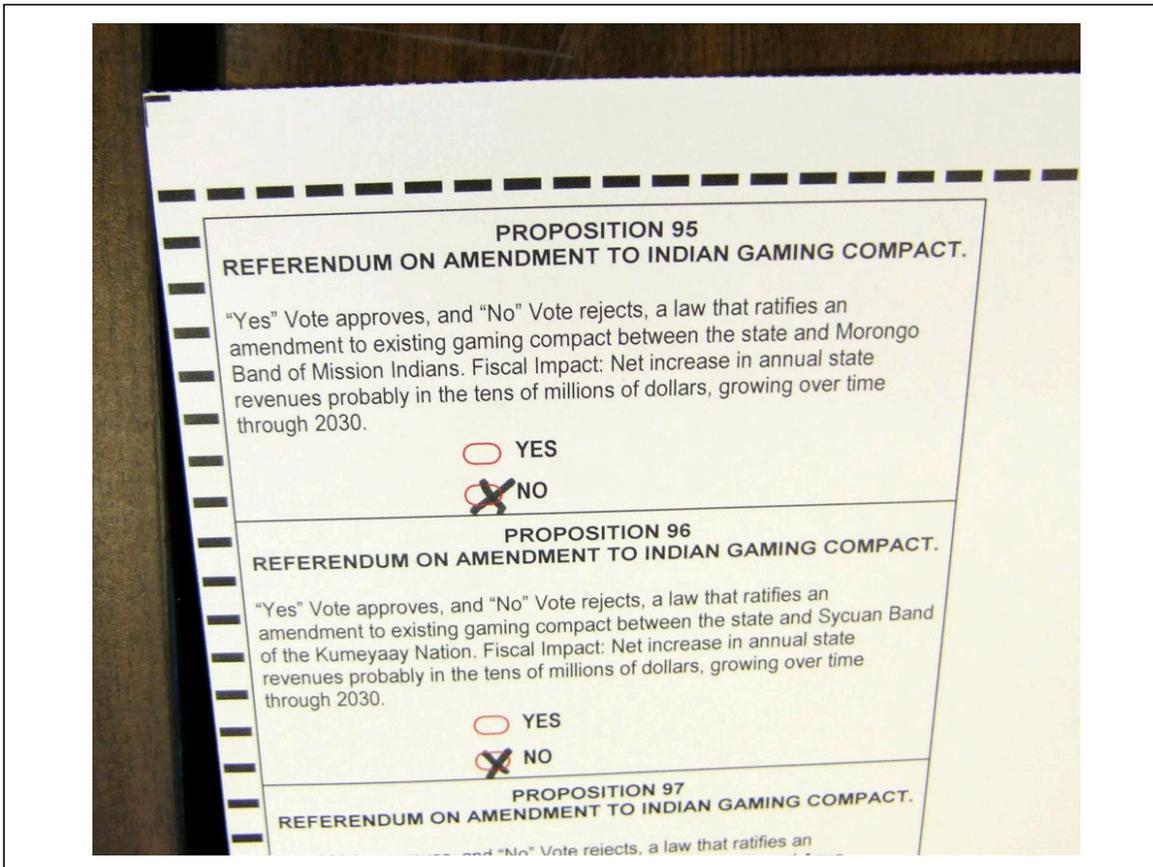
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# Methodology

- Examine existing procedures for the tally
- Worked with San Mateo in-depth
- Iteratively developed new procedures
- San Mateo used our interim procedures
- Observed tally process in San Mateo as well as Alameda and Marin.
- Revised and generalized procedures such that any CA county can use them.

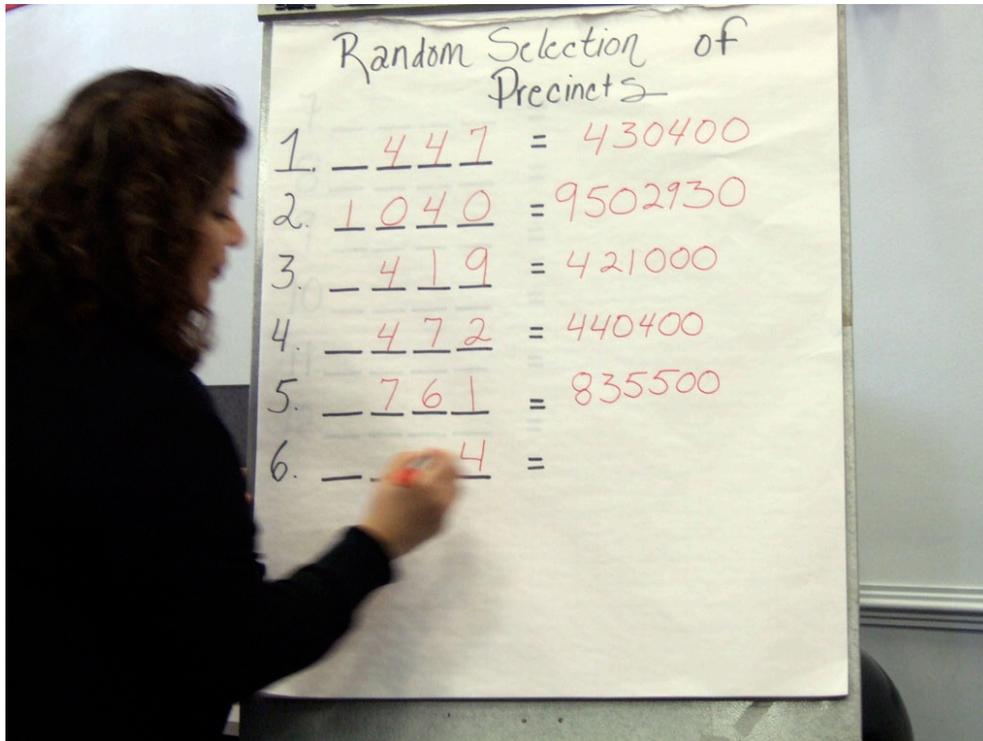
# Findings: Security

- Selection and tally must take place *after* ballots are counted
- Tally should take place soon after selection and seals verified
- Counting must be blind (not *too* blind)
- Certain procedures need expert review when revised
- Tally process should be resistant to insider attacks



## Findings: Security

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## **Findings: Transparency**

- Provide public notice of the tally
- Publish tally procedures
- Publish useful data, digital & hardcopy
- Ensure clear lines of communication for observers

## **Findings: Efficiency**

- Randomness w/ dice can be inefficient
- Electronic results need to be fine-grained
- Adverse effects of good team demeanor
- Pre-fill tally sheets
- Consider using RFIDs to ease pressure on chain-of-custody.

<http://www.josephhall.org/dicebins.php>

## Dice Binning Calculator for Post-Election Audits

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To increase the transparency of the 1% manual tally process, a few California counties have begun to use 10-sided dice to produce *publicly-verifiable* random numbers (See Cordero, Wagner and Dill 2006). Unfortunately, using 10-sided dice to 1) select from only a few precincts or 2) to select from many precincts can require a lot of re-rolling of the dice. To increase the efficiency of the process, Cordero et al. suggest "binning" the dice rolls so that each precinct has a *range* of corresponding values, of *equal width*, that allow a higher percentage of dice rolls to "hit". This calculator implements this idea. It can also output the binning data in a form that is easily pasteable into a spreadsheet. Please [click here for source code and licensing information](#).

### Settings

Number of dice:

Number of precincts:

(By default, it starts with 2 dice and 13 precincts.)

### Results

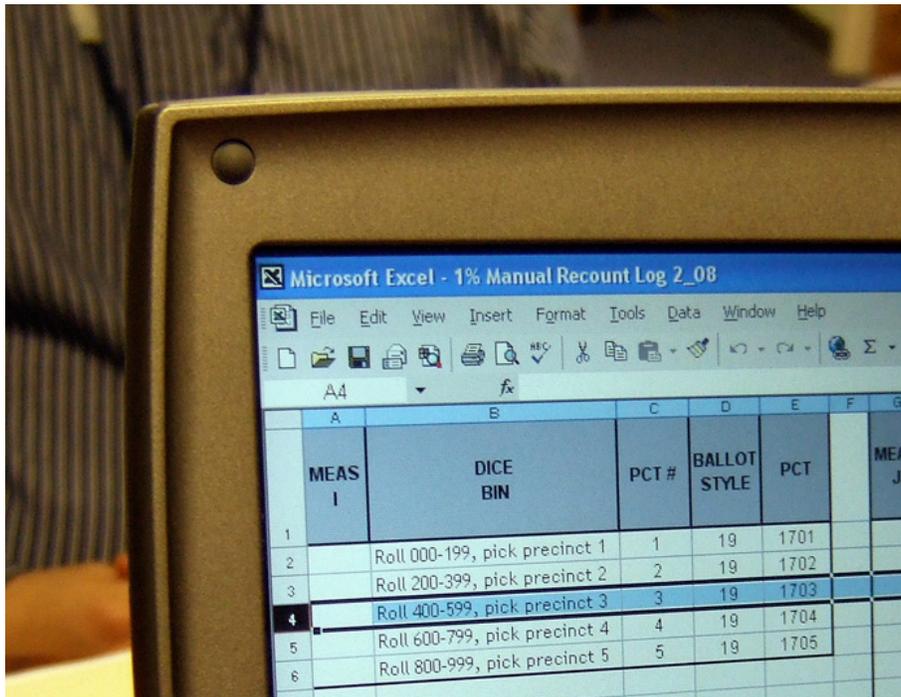
- Range is 100. (This is the quantity of random numbers 2 dice can produce.)
- Rounded interval is 7. (This is the number of random numbers per bin.)
- Interval modulus is 9 (9% of rolls). (This is the number of random numbers that will require a re-roll.)

[Paste these bins into a spreadsheet](#)

Roll 00-06, pick precinct 1  
Roll 07-13, pick precinct 2  
Roll 14-20, pick precinct 3

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The image shows a close-up of a computer monitor displaying a Microsoft Excel spreadsheet titled "Microsoft Excel - 1% Manual Recount Log 2\_08". The spreadsheet has a menu bar with "File", "Edit", "View", "Insert", "Format", "Tools", "Data", "Window", and "Help". Below the menu bar is a toolbar with various icons. The spreadsheet grid shows columns labeled A through G. Column A is labeled "MEAS I", column B is "DICE BIN", column C is "PCT #", column D is "BALLOT STYLE", column E is "PCT", and column F is "MEAS J". The data rows are as follows:

	A	B	C	D	E	F	G
1							
2		Roll 000-199, pick precinct 1	1	19	1701		
3		Roll 200-399, pick precinct 2	2	19	1702		
4		Roll 400-599, pick precinct 3	3	19	1703		
5		Roll 600-799, pick precinct 4	4	19	1704		
6		Roll 800-999, pick precinct 5	5	19	1705		

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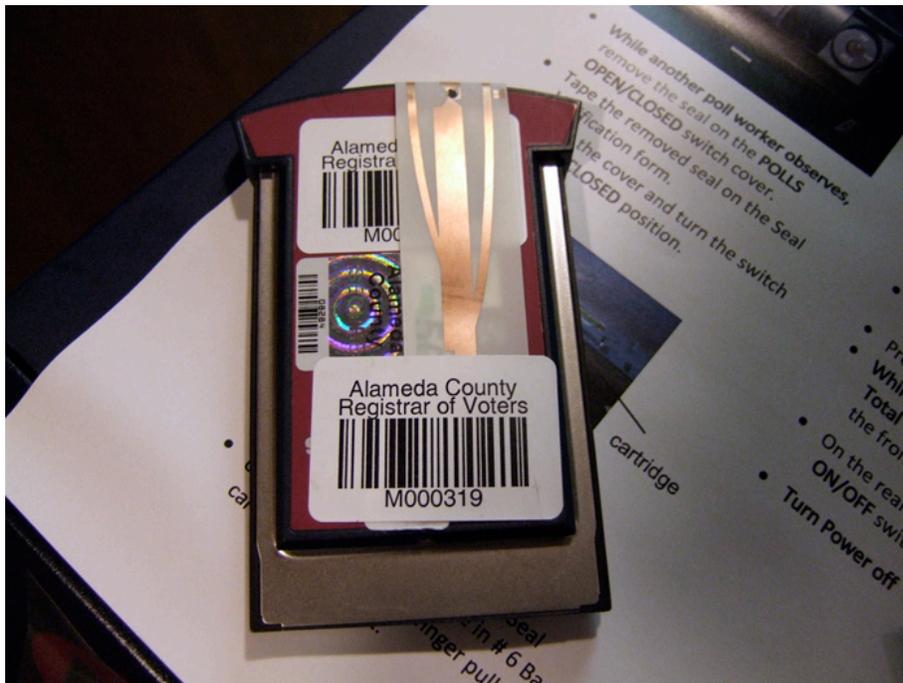
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## General Procedures for CA

[http://josephhall.org/procedures/  
ca\\_tally\\_procedures-2008.pdf](http://josephhall.org/procedures/ca_tally_procedures-2008.pdf)



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May your votes be cast and counted as you intended.

Questions?



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