

Name: \_\_\_\_\_ Section: (day/time) \_\_\_\_\_

AMS5 - MIDTERM  
Tuesday May 4th, 2010

A Normal Table is on the last page of this exam.

You must explain all answers and/or show working for full credit.

There are some **bonus questions**. You can get full marks on this exam without answering these questions. If you do give correct answers, you will get extra marks. You cannot score more than 100% on the exam, however.

You are reminded of the University's policy on Academic Misconduct.

1. (*2 marks*) There are 52 cards in a deck and 13 of them are hearts.
  - (a) Four cards are dealt, one at a time, off the top of a well-shuffled deck. What is the chance that a heart turns up on the fourth card, but not before? Explain briefly.
  
  
  
  
  
  
  
  
  
  
  - (b) A deck of cards is shuffled. You have to deal one card at a time until a heart turns up. You have dealt 3 cards and still have not seen a heart. What is the chance of getting a heart on the 4th card? Explain briefly.
  
  
  
  
  
  
  
  
  
  
2. (*6 marks*) Read the news report "Ambidextrous children 'more likely to be hyperactive' " printed at the end of this exam paper.
  - (a) Does this describe a controlled experiment or an observational study? Why?

[CONTINUED]

- (b) The 8,000 children were part of a “longitudinal study”, that is, data is recorded about the same children over time. We are not told how the children were initially selected. Would it affect the outcome of the study if the sample were biased, for example if it contained too many children from well-off families or too many girls? Explain your answer.
- (c) What is the causal link between handedness and hyperactivity discussed in the article?
- (d) Does the research prove this causal link? Explain briefly.
- (e) The article says that
- “Mixed handed children aged seven and eight were twice as likely as their right handed peers to have difficulties with language”
- i. Which two conditional probabilities are being discussed here?
  
  
  
  
  
  
  
  
  
  
  - ii. What is the relationship given in the article between these two conditional probabilities?
- (f) **[BONUS]** (*2 marks*) If you are told that a randomly chosen seven year old has language difficulties, are they more or less likely to be right handed or ambidextrous? How much more/less likely? [Hint: either manipulate conditional probabilities (hard) or consider 1000 kids and count (easier)]

[CONTINUED]

3. (5 marks) A small airline flies planes with seats for 4 passengers. Experience shows that for this airline, someone with a ticket will no-show 15% of the time.

(a) If the airline sells 4 tickets for a particular flight, what is the chance that the plane will not be full?

(b) If the airline sells 5 tickets, what is the chance that

i. someone will be “bumped”?

ii. the flight will not be full?

A large airline flies planes with 200 seats, and they have a no-show rate of 2%.

(c) If they sell 200 tickets for a particular flight, what is the chance that the plane will be full?

(d) If they sell 206 tickets, what is the chance that there will be at least one empty seat?

[**BONUS**](1 mark) What is the chance that the Eyjafjallajökull volcano grounds all the planes and no one flies anywhere?

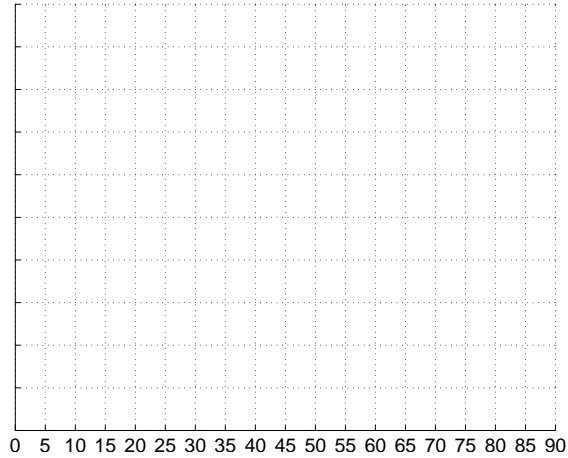
[TURN OVER]

4. (8 marks) The distribution by age in an unknown country is given in the table below. The class intervals include the left endpoint, but not the right one. The interval for 65 and over can be ended at 85.

Age	percentage	percent-per-year
0-5	7	
5-15	14	
15-20	7	
20-30	14	
30-35	7	
35-45	15	
45-55	14	
55-65	10	
65 and over	12	

- (a) Complete the table.
- (b) Sketch the histogram on the graph on page 5. Label the axes.
- (c) Are there more 21 year olds or more 61 year olds?
- (d) What is the **median** age?

[CONTINUED]



- (e) Is the mean likely to be less than, greater than or close to the median? Explain your answer.
- (f) Does the histogram appear to follow the normal curve? Explain briefly.
- (g) The SD of age is approximately 24 years. What proportion of the data lies within 2 SD of the mean?
5. (2 marks) At the end of this exam is the first page of a letter from UCSC Chancellor George R. Blumenthal to UC President Mark Yudof. This letter was part of a discussion about reducing the UC's budget shortfall by reducing expenditure on staff and faculty. Read the letter, paying particular attention to the section under the heading "Summary of Employee Comments".
- (a) How many comments were received overall?
- (b) How many respondents chose Option II? Explain your answer.

[TURN OVER]

6. (3 marks) A die will be rolled 20 times. The sum

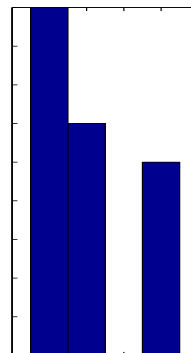
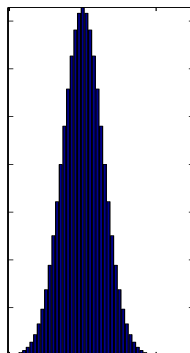
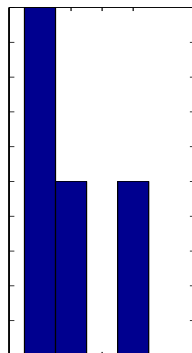
number of ones rolled + number of sixes rolled

will be around \_\_\_\_\_, give or take \_\_\_\_\_ or so. Show your working in the space below.

7. (3 marks) Twenty draws are made at random with replacement from the box 

1	1	2	4
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. One of the graphs below is the probability histogram for the average of the draws. Another is the histogram for the numbers drawn, and the third is the histogram for the contents of the box. Which is which? Explain.



[TURN OVER]

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July 1, 2009

President Mark G. Yudof  
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*Via e-mail: [president@ucop.edu](mailto:president@ucop.edu)*

Dear Mark:

Re: Comments on Proposed Furlough/Salary Reduction Plan Options

Thank you for the opportunity to comment on the proposed Furlough/Salary Reduction Plan Options. The Santa Cruz campus solicited comments from Senate faculty, non-represented academic and staff employees, and managers and supervisors, and received over 650 comments in the brief turnaround time provided. While we received a wide variety of comments and suggestions, this letter articulates the most prevalent and key points expressed by the campus community. In addition, I have enclosed the comments received for your review and consideration.

As you will see in the following summary of comments, there were five specific areas in which both academic and staff employees articulated common viewpoints:

- 1) Option II was the preferred selection by an overwhelming margin;
- 2) Retirement, service credit, and leave accruals should not be negatively impacted;
- 3) Salary reductions should be graduated or progressive;
- 4) Specific sunset clause needed for whatever plan is chosen; and
- 5) Extramurally funded employees should not be included in any plan.

### Summary of Employee Comments

We received over 300 comments from the academic members of the Santa Cruz campus, including comments from the Chair of the Santa Cruz Division of the Academic Senate and the Senate Committee on Planning and Budget. In addition, some 350 comments were received from our managers, supervisors and non-represented staff employees.

Of those who responded with a specific option selection, 84% of academic respondents and 88% of staff respondents chose Option II: 21 Unpaid Days Plan. The main reason conveyed by academics for this

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## Ambidextrous children 'more likely to be hyperactive'

**Children who write with both hands are more likely to struggle in school and have hyperactivity disorder symptoms, research suggests.**

A study by scientists from Imperial College London found ambidextrous children were twice as likely to struggle as their classmates.

They were also more likely to have difficulties with language.

Experts told Paediatrics journal the differences might be down to the brain's wiring.

But they said much more work was needed to explore this.

Lead researcher Dr Alina Rodriguez said: "Mixed-handedness is intriguing - we don't know why some people prefer to make use of both hands when most people use only one."

### Ambidextrous

Around one in every 100 people is ambidextrous, or mixed-handed.

The study looked at nearly 8,000 children from Northern Finland, of whom 87 were mixed-handed.

Mixed-handed children aged seven and eight were twice as likely as their right-handed peers to have difficulties with language and to perform poorly in school.

When they reached 15 or 16, mixed-handed adolescents were also at twice the risk of having symptoms of Attention Deficit Hyperactivity Disorder (ADHD).

And they tended to have more severe symptoms of ADHD than their right-handed schoolmates.

They also reported having greater difficulties with language than those who were left or right-handed.

This is in line with earlier studies that have linked mixed-handedness with dyslexia.

### Hard-wired

Experts know that handedness is linked to the brain's left and right halves or hemispheres.

Research has shown that where a person's natural preference is for using their right hand, the left hemisphere of their brain is more dominant, which is where the centre for language lies.

Scientists have suggested that ADHD could be linked to having a weaker function in the right hemisphere of the brain.

Dr Rodriguez said it was possible that brain differences might explain the findings.



Mixed-handedness has also been linked to dyslexia

**“ Our results should not be taken to mean that all children who are mixed-handed will have problems at school or develop ADHD ”**

Dr Alina Rodriguez

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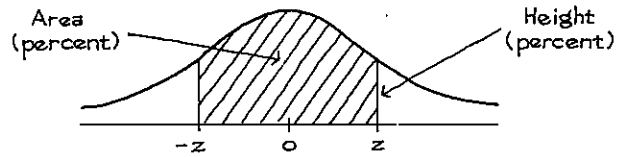
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- EU moves to ease curbs on flights
- Flight doubts over new ash cloud
- Testicle was 'cut off by mistake'
- Iceland volcano in maps
- Volcano cloud as it happened: 19 April
- Microsoft debuts 'fix it' program



# Tables



A NORMAL TABLE

<i>z</i>	<i>Height</i>	<i>Area</i>	<i>z</i>	<i>Height</i>	<i>Area</i>	<i>z</i>	<i>Height</i>	<i>Area</i>
0.00	39.89	0	1.50	12.95	86.64	3.00	0.443	99.730
0.05	39.84	3.99	1.55	12.00	87.89	3.05	0.381	99.771
0.10	39.69	7.97	1.60	11.09	89.04	3.10	0.327	99.806
0.15	39.45	11.92	1.65	10.23	90.11	3.15	0.279	99.837
0.20	39.10	15.85	1.70	9.40	91.09	3.20	0.238	99.863
0.25	38.67	19.74	1.75	8.63	91.99	3.25	0.203	99.885
0.30	38.14	23.58	1.80	7.90	92.81	3.30	0.172	99.903
0.35	37.52	27.37	1.85	7.21	93.57	3.35	0.146	99.919
0.40	36.83	31.08	1.90	6.56	94.26	3.40	0.123	99.933
0.45	36.05	34.73	1.95	5.96	94.88	3.45	0.104	99.944
0.50	35.21	38.29	2.00	5.40	95.45	3.50	0.087	99.953
0.55	34.29	41.77	2.05	4.88	95.96	3.55	0.073	99.961
0.60	33.32	45.15	2.10	4.40	96.43	3.60	0.061	99.968
0.65	32.30	48.43	2.15	3.96	96.84	3.65	0.051	99.974
0.70	31.23	51.61	2.20	3.55	97.22	3.70	0.042	99.978
0.75	30.11	54.67	2.25	3.17	97.56	3.75	0.035	99.982
0.80	28.97	57.63	2.30	2.83	97.86	3.80	0.029	99.986
0.85	27.80	60.47	2.35	2.52	98.12	3.85	0.024	99.988
0.90	26.61	63.19	2.40	2.24	98.36	3.90	0.020	99.990
0.95	25.41	65.79	2.45	1.98	98.57	3.95	0.016	99.992
1.00	24.20	68.27	2.50	1.75	98.76	4.00	0.013	99.9937
1.05	22.99	70.63	2.55	1.54	98.92	4.05	0.011	99.9949
1.10	21.79	72.87	2.60	1.36	99.07	4.10	0.009	99.9959
1.15	20.59	74.99	2.65	1.19	99.20	4.15	0.007	99.9967
1.20	19.42	76.99	2.70	1.04	99.31	4.20	0.006	99.9973
1.25	18.26	78.87	2.75	0.91	99.40	4.25	0.005	99.9979
1.30	17.14	80.64	2.80	0.79	99.49	4.30	0.004	99.9983
1.35	16.04	82.30	2.85	0.69	99.56	4.35	0.003	99.9986
1.40	14.97	83.85	2.90	0.60	99.63	4.40	0.002	99.9989
1.45	13.94	85.29	2.95	0.51	99.68	4.45	0.002	99.9991