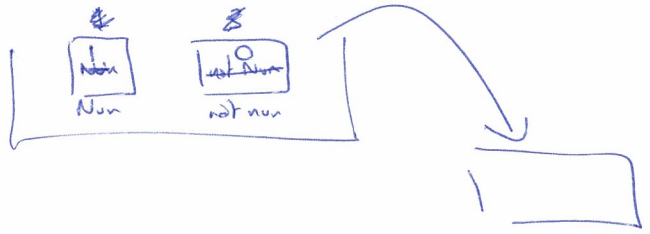
Model Solutions (for Exam code 1415; make appropriate changes for 2718).

1/

a).



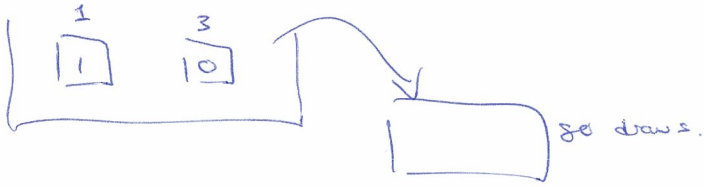
$$\% \text{ nouns} = \frac{28}{80} \times 100 = 35\%.$$

$$\text{SE on } \% = \frac{\text{SD box}}{\sqrt{\#\text{draws}}} \times 100 = \frac{\sqrt{\frac{28}{80} \times \frac{52}{80}}}{\sqrt{80}} \times 100 = 5.33$$

95% CI is 24.33 to 45.67.

True % is 25% so the 95% CI does not cover the true percentage.

b). H_0: the dealer is unbiased.



$$z = \frac{\text{obs} - \text{expected}}{\text{SE}} = \frac{28 - 20}{\sqrt{80}\sqrt{1/4 \times 3/4}} = 2.07.$$

$\Rightarrow$ p-value $< 5\%$.

We reject the null hypothesis at the 5% level and conclude that he does have a special spin.

c). 80 spins.

	obs	exp.
N	28	20
G	15	20
H	21	20
S	16	20

$$\chi^2 = \frac{(28-20)^2}{20} + \frac{(15-20)^2}{20} + \frac{(21-20)^2}{20} + \frac{(16-20)^2}{20}$$

$$= 5.3$$

3 DOF.

P is between 10% and 30% - not significant.

He does not conclude that his brother has a special spin.

d) In b) we reject the null hypothesis of unbiased Deidel

c) we do not reject H_0 of unbiased Deidel.

In b) the p-value was just below 5%

in c) we have more detailed information about the frequencies of G, H, S, so we should conclude that we do not have evidence of a special way of spinning the Deidel.

2, a) No - it will have a long right tail because some names are very popular, and some are just common words (ie not just names), and so will be present on very many web pages.

b) 17.5 is $\frac{17.5 - 14.95}{3.29} = 0.775$ SDs above mean on Live Search.

corresponding to $0.94 \times 0.775 \times 3.37$ units above the mean on Yahoo

or $16.93 + 0.94 \times 0.775 \times 3.37 = 19.385$.

for Prof Kotter.

10.5 is $\frac{10.5 - 14.95}{3.29} = -1.3526$ SD above mean

corresponding to

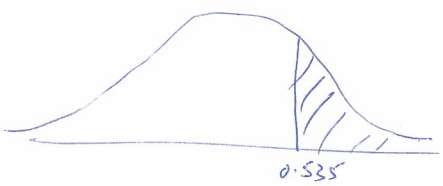
$16.93 - 0.94 \times 1.3526 \times 3.37 = 12.65$

c) RMS error is $\sqrt{1 - r^2} \times SD_y$

$= \sqrt{1 - 0.94^2} \times 3.37 = 1.15$

d) 17.5 on Live Search corresponds to 19.385 on Yahoo

20 is $\frac{20 - 19.385}{1.15}$ in standard units $= 0.535$



from table

$A \approx \frac{1}{2}(100 - 40) \approx 30\%$.

3/

a) Hypotheses are

(i) Receiving intercessory prayer was associated with uncomplicated recovery.

(ii) Being certain of receiving intercessory prayer was associated with uncomplicated recovery.

b) as will hypotheses.

(i) Receiving intercessory prayer has no effect on recovery from CABG surgery

(ii) Being certain of receiving intercessory prayer has no effect on recovery from CBAG surgery.

alt. hypotheses.

(i) Recieving IP reduces complications

(ii) Certainty of receiving IP reduces complications

c) Controlled study - patients randomly assigned to treatment / control : bb. patients were blind to treatment / control.

d) (i) Recieving IP has no effect on complications

(ii) Certainty of receiving IP raises the rate of complications.

e) No - the rates of such prayers should be comparable between the two groups (due to randomization).

f). 2 populations

1) size 604 . 315 had complications.

2) size 601 352 had complications

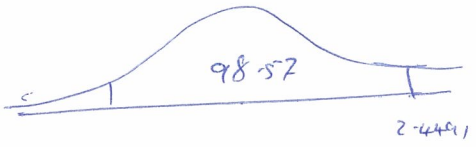
2-sample z-test. (work in %).

$$SE_1 = \sqrt{\frac{315}{604} \times \frac{604-315}{604}} \times \frac{100}{604} = 2.0326.$$

$$SE_2 = \sqrt{\frac{352}{601} - \frac{607-352}{607}} \times \frac{100}{601} = 2.$$

$$SE\ diff = 2.8582.$$

$$z = \frac{obs\ diff - exp\ diff}{SE\ diff} = \frac{7-0}{2.8582} = 2.4491.$$



$P = 1.43\%$ (or 0.7% if 1-sided).

Yes. there is a difference in the rate of complications between the two groups.

g) Because even though the populations are not independent (if a person is in one group, they cannot be in the other) + sampling is done without replacement, these cancel for the case of a RCDS trial.

4.

a) $\frac{1}{38}$.

b).

# wins	money	chance
0	0	$\frac{4!}{4!\,0!}\left(\frac{18}{38}\right)^0\left(\frac{20}{38}\right)^4 = 0.767$
1	500	$\frac{4!}{3!\,1!}\left(\frac{18}{38}\right)^1\left(\frac{20}{38}\right)^3 = 0.276$
2	1000	$\frac{4!}{2!\,2!}\left(\frac{18}{38}\right)^2\left(\frac{20}{38}\right)^2 = 0.373$
3	1500	$\frac{4!}{1!\,3!}\left(\frac{18}{38}\right)^3\left(\frac{20}{38}\right) = 0.224$
4	2000	$\frac{4!}{0!\,4!}\left(\frac{18}{38}\right)^4\left(\frac{20}{38}\right)^0 = 0.050.$

expected ~~money~~ money after one round $947

d) friend A's strategy.

Sotheyfriend B's strategy, you have to win many more times, so the chance of ~~you~~ winning $36,000 is much smaller.

5/

a) Most will answer 1/2.

Give marks for any reasonable explanation.

b) There are 3 ways of chosing a gold coin (coins 1, 2, or 3).

c)

~~There are 2 ways~~

In 2 of these cases (1, 2) the other coin is gold.

d). Hence p(other coin is gold | chosen gold) = $\frac{2}{3}$.