Math 1112: Unit8 solutions ©Taras Gula

page 4 : 1a impossible,b between possible and probable 😊 c. probable d. possible, but unlikely;
exercise 2 – for discussion 2a. amount of cheese is not known (i.e. is uncertain) but predictable based on knowledge of friends' fridge and cheese eating habits. i.e. sorta random b. that is random based on genetics and date of conception, which may not be exactly random, but is effectively random. c. types of pets: fish vs mammals? Dogs vs cats? There are many ways to classify pets, and it is not clear which is meant here, therefore not well-defined. Does my pet rock count? d. well-defined, but difficult to count every single one. CBC 'Nature of Things' did a special about this.

page 5 for discussion

page 7 in class exercise – various possibilities

page 8: 1 ¼ (coins) 2. 7/20 (balls in bag) 3. 12/24 (balls in bag) 4. 10/180 (balls in bag)
5. ½ difference is that in this scenario you get partial information (eg toss two coins, but one result is known ahead of time).

Page9-11: 1a 63/670 = 0.094 b 591/670 c 59/591 = 0.0998 d 4/79 = 0.051
e. P(diabetes in smokers) ≈ 10% while the P(diabetes in never smoked) = 5%. It is pretty clear that the rate is higher for those who ever smoked daily.
f. RR = 0.0998/0.051 = 1.96. Those who ever smoked daily are 1.96 times more likely to get diabetes.
2a 51/418 = 0.122 b 186/1580 = 0.1177 c Quebecers are only slightly more likely to consult an alternative health care provider.
d. If you look at the ratio of rate of consultation in Quebec (0.122) divided by rate of consultation in 'rest of Canada' (0.1177) you can see that Quebecers are just 1.036 times more likely to consult an alternative health care provider than residents of the rest of Canada.
e. when starting with lower rate the statement is more difficult to make. Those who reside in the rest of Canada are 0.9653 times as likely to consult an alternative health care provider.

3. Those that don't use their seatbelts are 11.64 times more likely to have high alcohol consumption.
4. Urban Canadians have a higher probability of being happy. (71.33% vs 61.70%) They are 1.156 times more likely to be happy – the difference is not very significant.

page 12: 1a. take 7% and divide by 2 making the risk of CVD in non-smokers 3.5%
1b

	CVD yes	CVD no	Total
Smoke yes	21	279	300
Smoke no	7	193	200
Total	28	472	500

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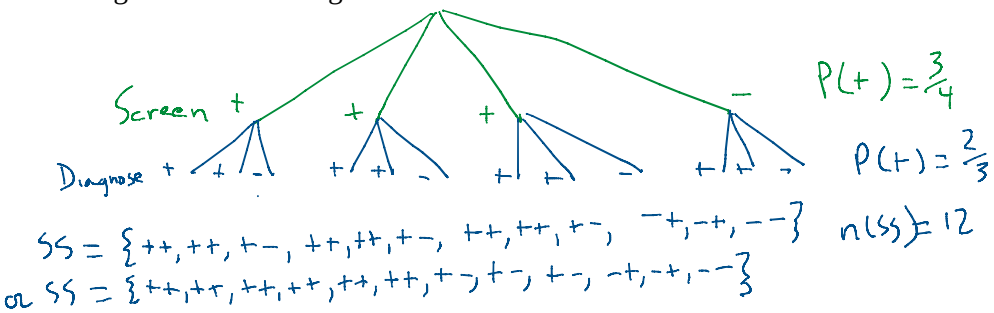
2a. the rate is the same i.e. 0.003 (0.3%, or 3/1000) of those who didn't eat candy obsessively were convicted of a violent crime.

candy eating	conviction yes	conviction no	Total
yes	1	349	350
no	9	2991	3000
Total	10	3340	3350

3. Many possible answers since the total is not given– please make sure we to take this up in class!

Page 13 1Aa tree diagram



1b

		Diagnosisstatus positive	Diagnosisstatus negative	Total
Screening status	positive	60	30	90
	negative	20	10	30
Total		80	40	120

P(both tests are positive) = 6/12
P(diagnosis is positive given that screening was positive) = 2/3
P(diagnosis is positive given that screening was negative) = 2/3
RR=1

c. the probability of being diagnosed positive is the same whether you were screened positive or negative as the assumption is that the screening and diagnosis are independent events like coin toss or choosing from bag one then from bag 2.

d. the difference is in the SS. For P(both positive) the SS is all individuals (in this case 120) whereas for 'given that the screening was negative' we're focusing on a narrower SS ={those who screened positive} n=90.

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When we get additional information that 70 of those who screened positive were diagnosed with disease the outside totals stay the same, but now we don't have screening and diagnosis as independent events (you get a different bag of marbles depending on whether you screen positive or negative)… let's see how that plays out.

		diagnosed		Total
		YES	NO	
screened	yes	70	20	90
	no	10	20	30
Total		80	40	120

P(both diagnosed as positive) = 7/12
P(diagnosis is positive given that screening was positive) = 70/90 = 0.77778
P(diagnosis is positive given that screening was negative) = 10/30 = 0.33333
Those that were screened positive are _2.33_ times more likely to get diagnosed positive

b This scenario is more realistic in that screening is predictive of disease… of course we would want numbers a lot closer to 100% for the first and 0% for the second probabilities above.

d randomness forms a basis for comparison… we need screening tests to be better than random, we use the idea of random (and its mathematical model) to provide a baseline to which our counts could be compared. We will get more into this in the stats courses in the next terms.

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1a

		Diabetes		Total
		YES	NO	
Ever smoked	yes	55.54	535.5	591
	no	7.4	71.6	79
Total		63	607	670

b Even though the first table tells us that 'ever smoked' group is twice as likely to have diabetes, it seems that this does not look 'too far' from the expected random distribution that we generated in 1a. The RR in this modeled random scenario = 1; Is it surprising how a slight shift in numbers changes the RR so much?

1a

		Passed		Total
		Yes	No	
Previously @ university	Yes	50	10	60
	No	20	20	40
Total		70	30	100

P(passing given previous university) = 5/6

2

		breast cancer diagnosis		Total
		Yes	No	
Mammography result	pos	9	89.1	98.1
	neg	1	900.9	902
Total		10	990	1000

P(Cancer diagnosis given mammography is positive) = 9/98.1 = 0.0917 = 9.17 % Surprised?