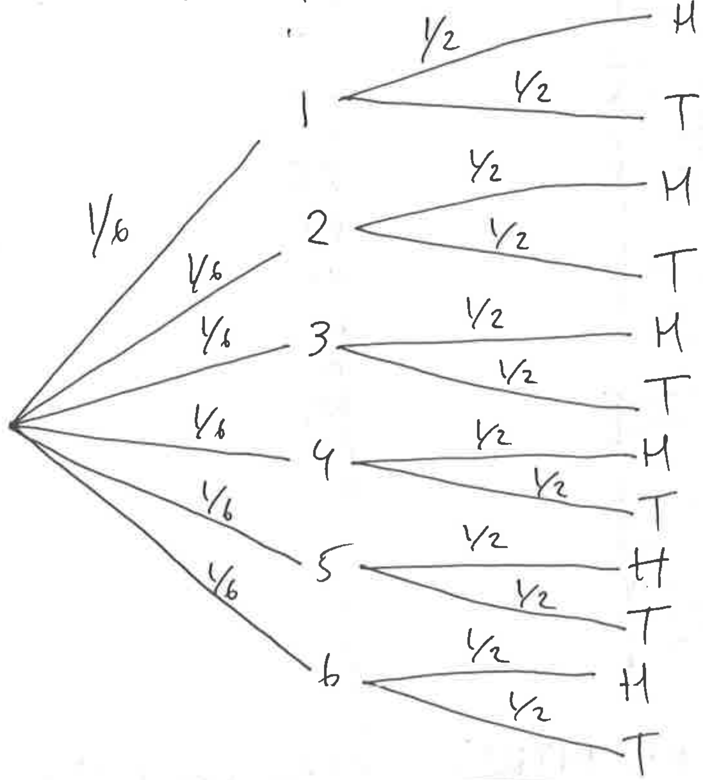
HW 2 2870 solutions :

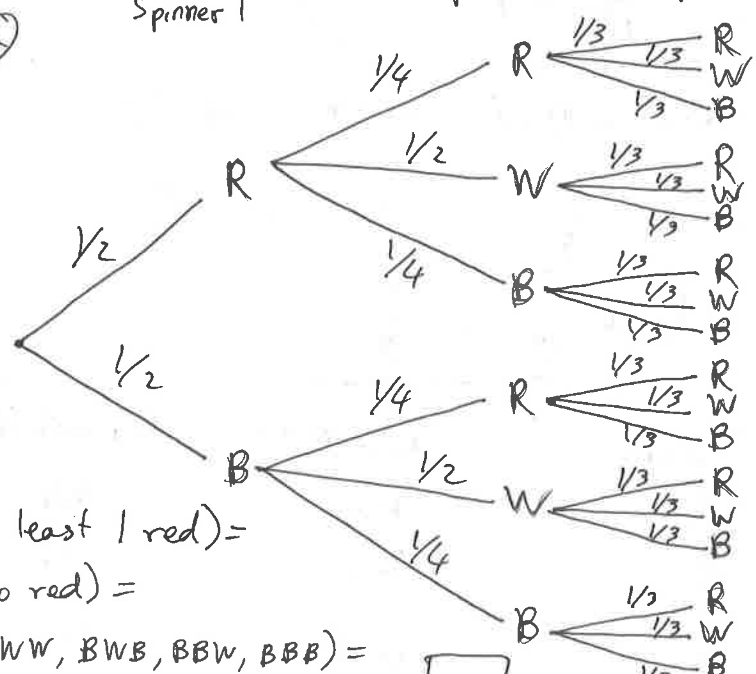
Section 28.1 :

(2)



Outcomes	Probabilities
1 H	$\frac{1}{12}$
1 T	$\frac{1}{12}$
2 H	$\frac{1}{12}$
2 T	$\frac{1}{12}$
3 H	$\frac{1}{12}$
3 T	$\frac{1}{12}$
4 H	$\frac{1}{12}$
4 T	$\frac{1}{12}$
5 H	$\frac{1}{12}$
5 T	$1/12$
6 H	$1/12$
6 T	$1/12$.

(7) (a)



Outcomes	Probabilities.
RRR	$1/2 \times 1/3 \times 1/4 = 1/24$
RRW	$1/24$
RRB	$1/24$
RWR	$1/2 \times 1/2 \times 1/3 = 1/12$
RWW	$1/12$
RWB	$1/12$
RBR	$1/24$
RBW	$1/24$
RBB	$1/24$
BRR	$1/24$
BRW	$1/24$
BRB	$1/24$
BWR	$1/12$
BWW	$1/12$
BWB	$1/12$
BBR	$1/24$
BBW	$1/24$
BBB	$1/24$.

answer for (b)

(c) P(at least 1 red) =

$= 1 - P(\text{no red}) =$

$= 1 - P(BWW, BWB, BBW, BBB) =$

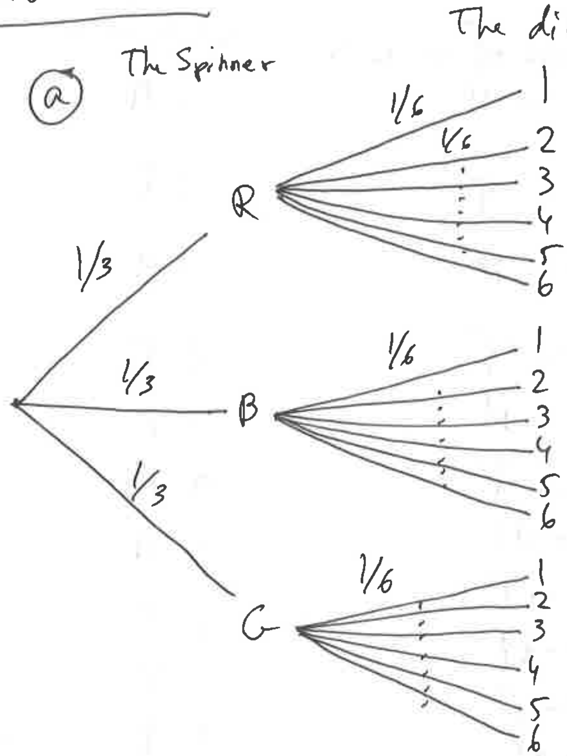
$= 1 - \left(\frac{1}{12} + \frac{1}{12} + \frac{1}{24} + \frac{1}{24}\right) = \frac{9}{12} = \boxed{\frac{3}{4}.}$

(d) $P(\text{at least 1 Black}) = 1 - P(\text{no black}) =$

$= 1 - P(RRR, RRW, RWR, RWW) = 1 - \left(\frac{1}{24} + \frac{1}{24} + \frac{1}{12} + \frac{1}{12}\right) = \boxed{\frac{3}{4}}$

Section 28.2:

(2) (a)



Outcomes	Probabilities
R1	$\frac{1}{3} \cdot \frac{1}{6} = \frac{1}{18}$
R2	1/18
R3	1/18
R4	1/18
R5	1/18
R6	1/18
B1	
B2	
B3	
B4	
B5	
B6	
G1	
G2	
G3	
G4	
G5	
G6	

(b) $P(R6 \text{ or } R2) = P(R6) + P(R2) - P(R6 \text{ and } R2) =$

$= \frac{1}{18} + \frac{1}{18} - 0 = \frac{2}{18} = \frac{1}{9}.$

(c) $P(R \text{ or } G) = P(R) + P(G) - P(R \text{ and } G) =$

$= \frac{1}{3} + \frac{1}{3} - 0 = \frac{2}{3}.$

(d) $P(R3 \text{ or } G3) = \frac{1}{18} + \frac{1}{18} = \frac{1}{9}.$

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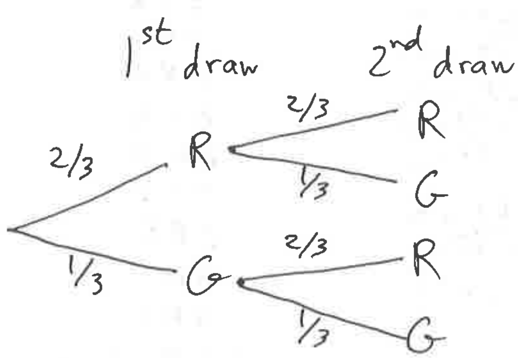
(3) (a)



Outcomes	Probabilities
RR	4/9
RG	2/9
GR	2/9
GG	1/9

(b) $P(RR) = \boxed{4/9}$

(c) $P(\text{both the same color}) = P(RR) + P(GG) =$
$= 4/9 + 1/9 = \boxed{\frac{5}{9}}$

(d) $P(RR \text{ or both the same color}) = P(RR) + P(GG) = \boxed{5/9}$

(e) $P(\text{different colors or both green}) = P(RG) + P(GR) + P(GG) =$
$= \frac{2}{9} + \frac{2}{9} + \frac{1}{9} = \boxed{\frac{5}{9}}$

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(10) (a) $P(\text{sum}=5 \text{ or sum}=6) = P(14, 41, 23, 32, 15, 51, 24, 42, 33) =$
$= 9 \cdot \frac{1}{36} = \frac{9}{36} = \boxed{\frac{1}{4}}$

(b) $P(\text{sum}=14) = \boxed{0}$ (not possible)

(c) $P(\text{sum} \geq 9) = P(45, 54, 36, 63, 46, 64, 55, 56, 65, 66) =$
$= 10 \cdot \frac{1}{36} = \frac{10}{36} = \boxed{\frac{5}{18}}$

(g) $P(\text{sum} \neq 7) = 1 - P(\text{sum}=7) = 1 - P(16, 61, 25, 52, 34, 43) =$
$= 1 - 6 \cdot \frac{1}{36} = \frac{30}{36} = \boxed{\frac{5}{6}}$

(j) $P(4 \text{ on red die } \underline{\text{and}} \text{ 6 on white die}) = P(46) = \boxed{\frac{1}{36}}$

(k) $P(4 \text{ on red } \underline{\text{or}} \text{ 6 on white}) = P(4) + P(6) - P(46) =$
$= \frac{1}{6} + \frac{1}{6} - \frac{1}{36} = \boxed{\frac{11}{36}}$

Section 28.3:

(1) (a) Disjoint events: Rolling a sum of 3 with two dice and Rolling at least one 5 with two dice.

(b) Independent events: 1st child is female and 2nd child is male.

(6) (a) indep. (b) not. indep. (c) not. indep. (d) indep.

(e) indep. (f) not. indep. (~~the~~ daughter probably caught it from the son). (g) not. indep. (h) not. indep.

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(7) Outcomes are: 11 12 13 14 21 22 23 24 31 32 33 34 41 42 43 44 } each have probability $\frac{1}{16}$.

(a) $P(\text{sum} = 3 \text{ \underline{and} one } 2) = P(12) + P(21) = \frac{1}{16} + \frac{1}{16} = \frac{2}{16} = \boxed{\frac{1}{8}}$.

(b) $P(\text{sum} = 10) = \boxed{0}$ – not possible since the largest sum is $4+4=8$.

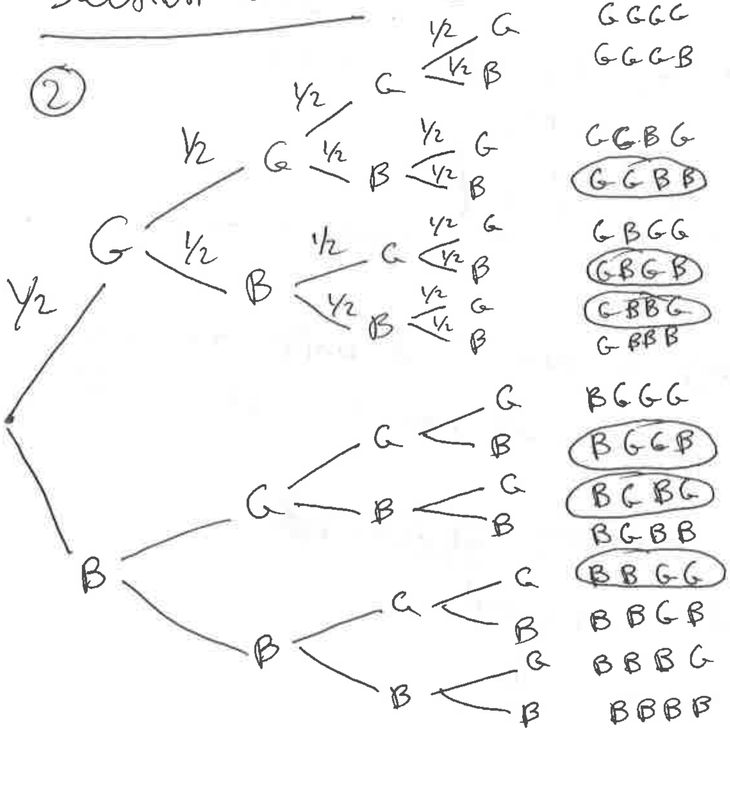
(c) $P(\text{sum} = 3 \text{ \underline{or} exactly one } 4) =$

$= P(\underbrace{12, 21}_{\text{sum}=3}, \underbrace{14, 24, 34, 41, 42, 43}_{\text{exactly one } 4}) = \frac{8}{16} = \boxed{\frac{1}{2}}$.

(d) $P(\text{two 3s \underline{and} sum of } 6) = P(33) = \boxed{\frac{1}{16}}$

Section 28.4: (a)

(2)



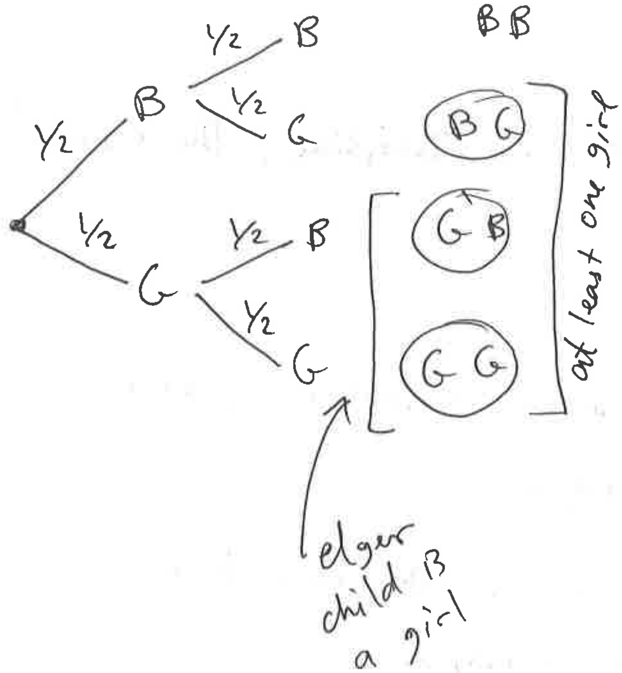
15 outcomes have at least one girl in it. 6 outcomes have 2 boys and 2 girls, so

$P(2B \,\&\, 2G \mid \text{at least one } G) = \frac{6}{15}$.

If we do not know that one of the children is a girl then we need to consider all 16 outcomes and

$P(2B \,\&\, 2G) = \frac{6}{16}$.

8



$P(GG \mid$ ~~at~~ least one girl$) =$

$= \frac{1}{3}$.

$P(GG \mid$ the ~~elder~~ child is a girl$) =$

$= \frac{1}{2}$.

9

	Cab was Green	Cab was Blue	Totals
Witness says Green	680	30	710
Witness says Blue	170	$\underline{120}$	$\underline{290}$
Totals	850	150	1000.

$P(\text{Cab was blue} \mid \text{Witness said Blue}) = \frac{120}{290}$

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11 a

	High-income	Low-income	Totals
Support vouchers	30	160	190.
Oppose vouchers	50	160	210
Totals	80	320	400

b $P(\text{oppose vouchers} \mid \text{High-income}) = \frac{50}{80}$

c $P(\text{High-income} \mid \text{oppose vouchers}) = \frac{50}{210}$

d $P(\text{High-income or oppose vouchers}) =$

$= \frac{30+50+160}{400} = \frac{240}{400}$

Section 29.1: 1

The first "statistics" refers to the discipline, the second to the numbers studied.

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2 a ~~[illegible]~~
Percent of games won, average weight of players, total number of points scored,...

b Average age, class average on the last test, number of students in the class, ...
~~[illegible]~~ number of students ...

c Percent female, average age, average on the last test,...

---

3 a Statistics do not give you exact predictions. They give expected values

b One score is not a statistic, and even if it was it does not tell one with absolute certainly that one will score 52% on subsequent tests.

c Unemployment rate applies to the whole population and using it ~~[illegible]~~ as a base for expectations for a specific group, especially, the one that is not representative of the population, might not work.

d 64% applies to the whole population. But sample statistics might be significantly different, especially, if considering small samples.

Section 29.2: ①

You would not, for example, stand outside the fine arts building and survey students leaving the building. You might instead randomly select phone numbers from the student telephone directory (simple random). The population is the entire student body.

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③ He is using systematic sampling. He could also number eggs in all cartons (1-12 in carton 1, 13-24 in carton 2, ... 709-720 in the last carton) and use the random number table to select a random sample. But this would be time-consuming and systematic sampling would provide good enough information anyways. The population is the entire shipment of eggs.

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④ Probably a mix of convenience sampling (depending on how the polling sites are selected) and cluster sampling (because only some sites are used).

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⑤ ⓐ If the stereotype of fraternities (that excessive drinking is widespread) is true, this sample would be biased. If samples are ~~picked~~ selected randomly the samples would not be biased.

ⓑ Stratified (random) sampling.

ⓒ Stratified (random) sampling. If the two groups have about the same number of people, this sample would be all right. If not, the larger group would be under represented.

ⓓ Looks like stratified random sampling, with a mix or cluster sampling. If there are more than 5 major religious groups. If there are more than 5 groups, the choice of 5 groups could bias the sample. Also if the group sizes are very different some groups might be under- or over-represented.

ⓔ Convenience sampling. There could be a bias for several reasons: do students patronize the student center because alcohol is served there? What time of day would the polling be done? ...

7 (a) If an important decision that affects only a few people is to be made, all the people should be polled. For example, a family is trying to decide on a vacation place, everyone in the family should be asked.

(b) Any assembly-line product, or particularly troublesome parts of an assembly line.

(c) If you want to know how people in a 15-block neighborhood feel about a new mall being planned, you could randomly pick 3 out of 15 blocks and then interview all residents of those blocks.

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8 (a) 27% refers to all people, and so it is a population parameter.

(b) 85% refers to students polled in a sample, so 85% is a sample statistic.

(c) One fourth grade class makes up the population referred to, so this is a population parameter.

(d) Surveys do not usually reach 100% of the population, nor they get a 100% return, so this is a sample statistic.

(e) It is reasonable to expect that all the prices of the homes sold were examined. So this would be a population parameter.

(f) "The marathon" appears to refer to one particular race, so the 3% is a population parameter.