Sampling Methods

- Examine first 50 pages in 20 most recent issues,
  - Convenience Sample

- Put the issues in a random order and examine every 10th page until 1000 have been examined
  - Systematic sample

- Assign a unique number to each page, use a computer to randomly select 1000 of those #'s
  - Simple random sample

- Randomly select 4 issues, examine every page in those issues
  - cluster random sample (all pages from some)

- Examine 20 randomly selected pages from each of the 50 issues
  - Stratfied random sample (some from all)

Experimental Design
- Randomized Block
  - Subjects divided into groups on some other variable (like gender) before being randomly assigned OR treatments are randomly assigned to each block

Experimental Design
- Matched pairs
  - subjects are in both exp. + control groups OR put into pairs w/ another subject

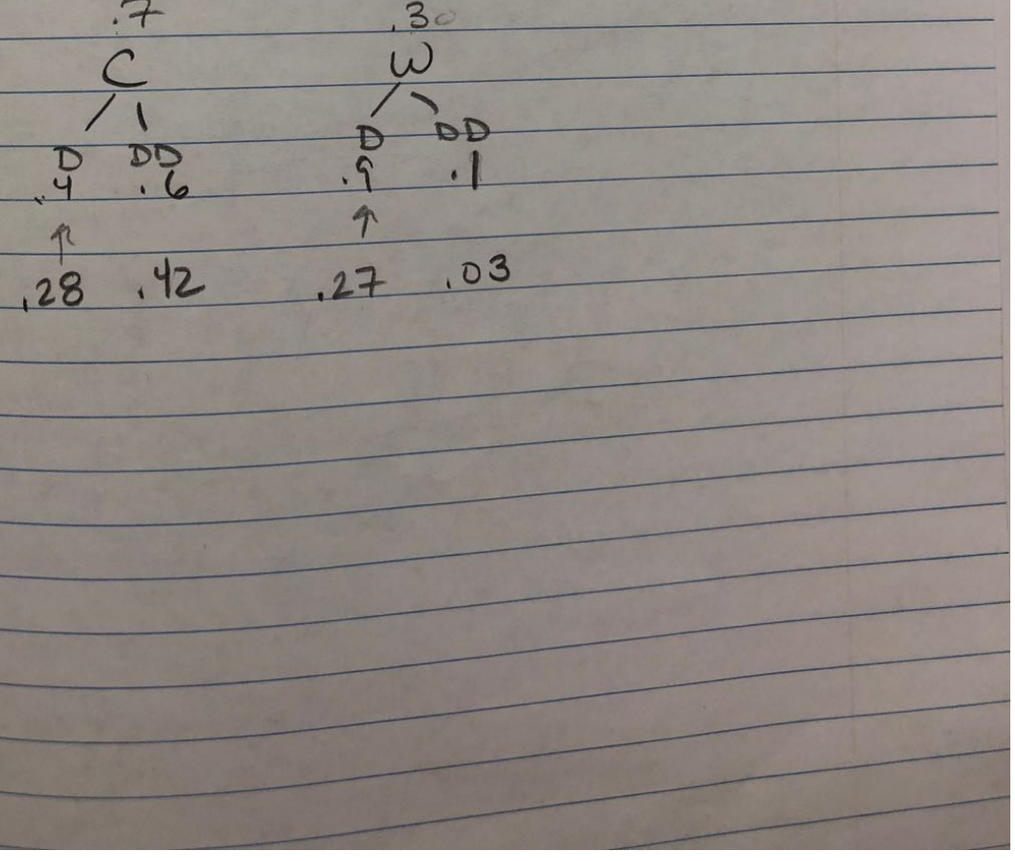
Probability Rules

Target Ex. $0.95 \qquad 1-(0.95)^{10}$

1 2 3 4 5 6 7 8 9 10

.05

Cake Ex $\frac{30}{100} \cdot \frac{9}{10} = \frac{27}{100}$



Expected Value

① - X is a discrete random variable. The table below defines a probability distribution for X.

What is the expected value of X?

x	P(X=x)
-40	0.12
-30	0.04
-20	0.05
-10	0.17
0	0.62

- Step 1:
  Multiply each value by its probability

x	P(X=x)	x · P(X=x)
-40	0.12	-4.8
-30	0.04	-1.2
-20	0.05	-1
-10	0.17	-1.7
0	0.62	0

- Step 2:
  Add results from step 1:

(-4.8)+(-1.2)+(-1)+(-1.7)+(0)= -8.7

Expected Value (EV)

② Coffee cups

+2% chance of getting fined

10,000 − 100,000 = −90,000

↑ Savings of cups − ↑ fine

	x	$P(X=x)$	$x \cdot P(X=x)$
fined	−90,000	.12	−10,800
not fined	10,000	.88	8,800
			−2000 EV

③ Sum of 2 fair 6-sided dice is 7

2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9
5	6	7	8	9	10
6	7	8	9	10	11
7	8	9	10	11	12

④

x	$P(X=x)$	$x \cdot P(X=x)$
−200	.25	−50
−100	.25	−25
0	.25	0
100	.25	25
		−50 EV

⑤ Cell Phone insurance

Breaks = -300 + 800 = 500

	x (cost)	P(X=x)	x · P(X=x)
Breaks	500	.20	100
Doesn't Break	-300	.80	-240
			-140 EV

⑥ Clothing Promotion

Discount = 300 · .60 = 180

	x	P(X=x)	x · P(X=x)
Heads	180	.50	90
Tails	300	.50	150
			240 EV

⑦ Poker Tournament

Win = -10,000 + 500,000 = 490,000

	x	P(X=x)	x · P(X=x)
Win	490,000	.005	2450
Lose	-10,000	.995	-9950
			-7500 EV

⑧ Train in France

Fine = 5 + 300 = 305

	x	P(X=x)	x · P(X=x)
Fine	305	.05	15.25
No Fine	5	.95	4.75
			20 EV

(9)

x	$P(X=x)$	$x \cdot P(X=x)$
0	.35	0
10	.25	2.5
20	.4	8
		10.5 EV

(10) Cellphone Insurance #2

Breaks = $-200 + 1000 = 800$

	x	$P(X=x)$	$x \cdot P(X=x)$
Breaks	800	.10	80
Doesn't Break	-200	.90	-180
			-100 EV

(11)

x	$P(X=x)$	$x \cdot P(X=x)$
-7	0.2	-1.4
-3	0.1	-.3
3	0.4	1.2
7	0.3	2.1
		1.6 EV

Standard Deviation of a Discrete Random Variable

- Flood Insurance

	No Flood	Flood
X = profit	$200	-$99,800
P(X)	0.999	0.001

$\mu_x = \$100$ Calculate σ_x

$$Var(X) = \sigma_x^2$$

$$= (x_1 - \mu_x)^2 p_1 + (x_2 - \mu_x)^2 p_2 + \ldots +$$

$$= \Sigma (x_i - \mu_x)^2 p_i$$

$$\sigma_x = \sqrt{Var(x)}$$

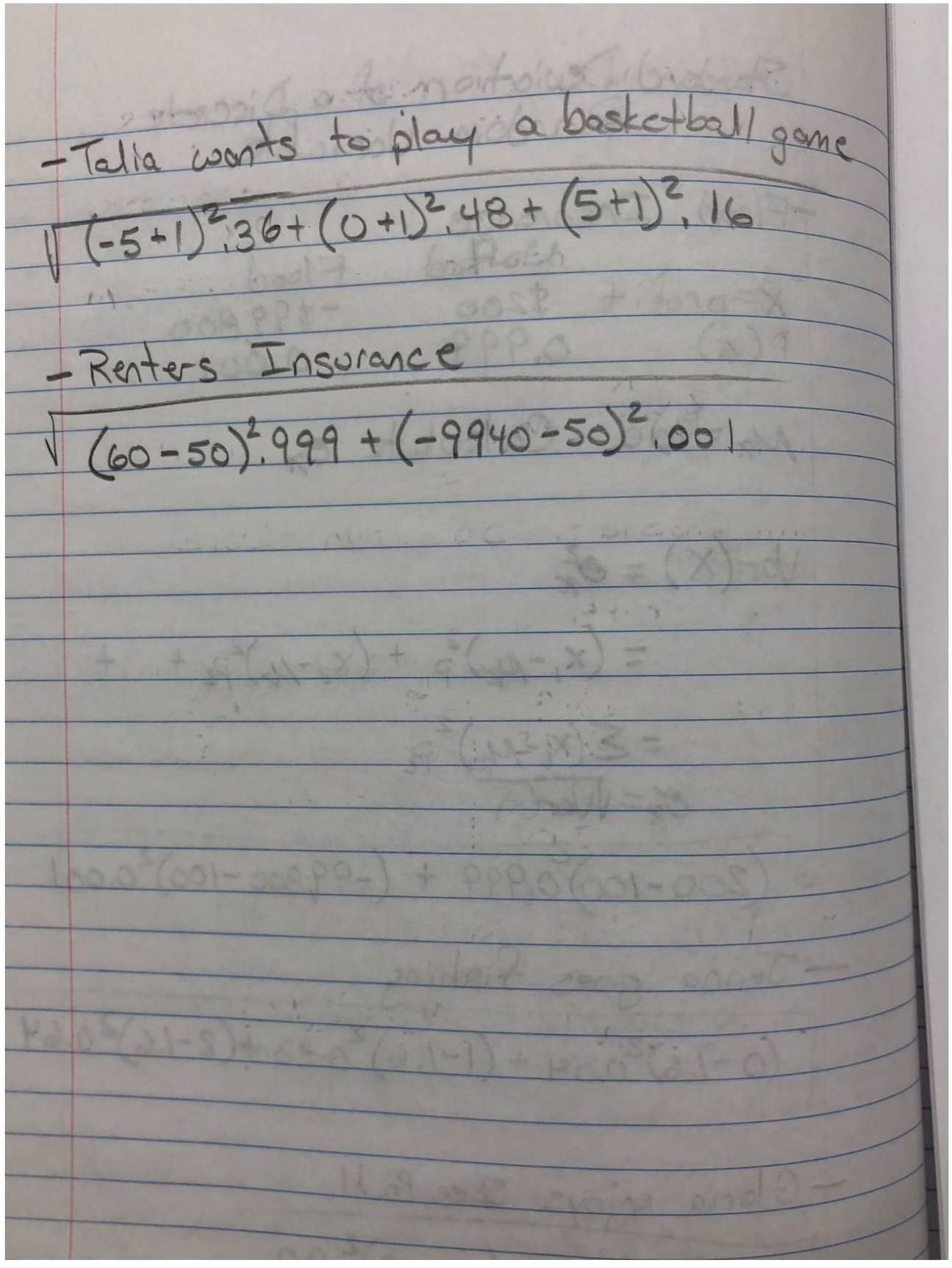
$$\sigma_x = \sqrt{(200-100)^2 0.999 + (-99{,}800-100)^2 0.001}$$

- Jenna goes fishing

$$\sqrt{(0-1.6)^2 0.04 + (1-1.6)^2 0.32 + (2-1.6)^2 0.64}$$

- Gloria enjoys Skee Ball

$$\sqrt{(100-19)^2 .10 + (10-19)^2 .90}$$


- Talia wants to play a basketball game
$\sqrt{(-5+1)^2 .36 + (0+1)^2 .48 + (5+1)^2 .16}$
- Renters Insurance
$\sqrt{(60-50)^2 .999 + (-9940-50)^2 .001}$

Probability in Normal Curves

- use normalcdf in calculator

[2nd] [vars] normalcdf [lower, upper, μ, σ]

Transforming Random Variables

- Mr. Gupta's 3 question Quiz

$Y = 10x + 5$

$\mu_y = 10(\mu_x) + 5$	$\sigma_y = 10(\sigma_x)$
$10(1.95) + 5$	$= 10(.8)$
$19.50 + 5$	$= 8$
24.50	

- Nikola plays horseshoes

$\mu_y = 3(\mu_x)$ $\quad$ $\sigma_y = 3(\sigma_x)$

$3(.3)$ $\quad$ $3(.56)$

$.9$

* Must say independent

Combining Random Variables

- Factory w/ 3-step process $\mu=10$ $\theta=5$

- Calculate variance for each step

$$\theta^2_{X+Y+Z} = \theta^2_X + \theta^2_Y + \theta^2_Z$$
$$= 5^2 + 5^2 + 5^2$$
$$= 25 + 25 + 25$$
$$= 75$$

- S.D. $= \sqrt{\text{Variance}} = \sqrt{75}$

- Find mean of T

$\mu_L + \mu_C = \mu_T$

- Calculate SD of 4 cookies

$V = (0.25)^2 + (0.25)^2 + (0.25)^2 + (0.25)^2$

$V = .25$

$\theta = \sqrt{.25} = .5$

- Andy + Jim (1, .5)

Find SD of D $(D = A - J)$

$V = 1^2 + .5^2$

$= 1.25$

$SD(\theta) = \sqrt{1.25} =$

SS_09_RandomVariables

Combining Normal Random Variables

- Heights of men & women

① $D = M - W$

$\mu_D = \mu_M - \mu_W$

$= 172 - 162$

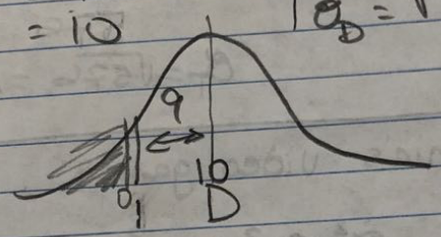
$= 10$

② $\sigma_D^2 = \sigma_M^2 + \sigma_W^2$ (Variance)

$= (7.2)^2 + (5.4)^2$

$= 81$

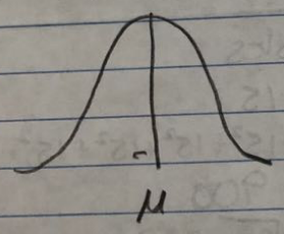
$\sigma_D = \sqrt{81} = 9$ (SD)



③ normalcdf (-99999, 0, 10, 9)

lower upper μ SD

- Company produces candles & access



	μ	σ
Candle	500	15
stand	200	8
	700	17

normalcdf (-9999, 683, 700, 17)

- Notions & exams 2 students

$\mu = 41$ σ 9

$D = S_1 - S_2$

$= 41 - 41$

$= 0$

$\sigma^2 = 9^2 + 9^2$

$= 162$

$\sigma = \sqrt{162}$

normalcdf (-10, 10, 0, $\sqrt{162}$)

$P(|D| > 15)$

$2 \times (15, 9999, 0, \sqrt{162})$

cont

Combining Normal Random Variables

- Breakfast cereal

$\mu_F = 370$ $\quad \sigma_F = 24$
$\mu_R = 170$ $\quad \sigma_R = 7$

$\mu = 370 + 170$ $\quad \sigma^2 = 24^2 + 7^2$
540 $\quad \sigma^2 = 625$
$\sigma = 25$

Ali faster

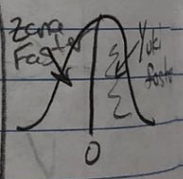
- Ali + Bruno run 400m dash

$\mu_A = 59$ $\quad \sigma_A = 4.8$
$\mu_B = 50$ $\quad \sigma_B = 3.6$

$A - B = 59 - 50$ $\quad \sigma^2 = 4.8^2 + 3.6^2$
9 $\quad \sigma^2 = 36$
$\sigma = 6$

Normalcdf(-99999, 0, 9, 6)

Yuki + Zana S...
$\mu_Y = 80$ σ_Y...
$\mu_Z = 85$ σ_Z...
$Y - Z = 5$ σ...



- Car manuf. value + seal

$\mu_V = 50$ $\quad \sigma_V = .3$
$\mu_S = 51$ $\quad \sigma_V = .4$

$S - V = 51 - 50$ $\quad \sigma^2 = .3^2 + .4^2$
$-1 \quad 1 \quad 3$ $\quad \sigma^2 = .25$
$\sigma = .5$

ncdf(0, 2, 1, 0.5)

SS_09_RandomVariables

- Carnival ride for 4 passengers

$\mu_W = 65 \quad \sigma = 12$

$\mu_W^T = \mu_W^1 + \mu_W^2 + \mu_W^3 + \mu_W^4$
$= 65 + 65 + 65 + 65$
$= 260$

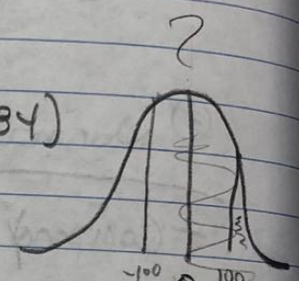
$\sigma_T^2 = \sigma_1^2 + \sigma_2^2 + \sigma_3^2 + \sigma_4^2$
$12^2 + 12^2 + 12^2 + 12^2$
576
$\sigma_T = \sqrt{576} = 24$

- Angelita + Cynthia's video games

$D = A - C$
$900 - 800$
$\mu = 100$
A wins

$\sigma^2 = 96^2 + 72^2$
$(9216 + 5184)$
$\sigma = \sqrt{14400}$
$\sigma = 120$

normalcdf(0,99999, 100, 120)



- Company produces apples

$\mu = 175$
$\mu_W = 175 \times 4$
$= 700$

$\sigma = 15$
$\sigma_T^2 = 15^2 + 15^2 + 15^2 + 15^2$
900
$\sigma = \sqrt{900} = 30$

- Sam + Taylor's car wash

$D = S - T$
$20 - 18$
2
$-10 \quad 10$

$\sigma_S = 6.4 \quad \sigma_T = 4.8$

$\sigma_T^2 = 6.4^2 + 4.8^2$
$\sigma_T^2 = 64$
$\sigma_T = \sqrt{64} = 8$

Binomial Variable - Coin flip

- Made up of <u>independent</u> trials
  - flipping coins is ind.
  - picking ppl is not, unless sample size is less than 10% of population
- each trial can be classified as a success or failure
- fixed # of trials
- probability of success on each trial is constant

Not Binomial - pulling cards from deck w/o replacement

Binomial Probability Formula

- online retailer, next-day shipping
  - 95% get package - get 20 orders SRS

$$P(X=19) = (0.95)(0.95)\ldots(0.95)(0.05)$$

$$(0.95)^{19}(0.05)$$

Binomial coefficient $\binom{20}{19}$ ← arrangements, ← successes

---

- Heather's 60% Heads coin
  - flip 5 times
  - get exactly 3 heads

$$\binom{5}{3}(.6)^3(.4)^2$$

Calculating binomial probability

- Aja's favorite cereal
  - 1 in 4 contain prize
  - buys 5 boxes
  - cdf (less than or =)

$P(X \leq 1)$ wins at most 1 prize

calc binomcdf (5, 0.25, 1)
(trials, prob, x value)

- Heather's coin 60% heads
  - exactly 3 (binompdf)

$P(X = 3)$ 5 flips

binompdf (5, .60, 3)

- Marta Basketball 90% make
  - greater than or =

$P(X \geq 2)$ 3 shots

$(3-2)$

$P(X \leq 1)$ binomcdf (3, .9, 1) = 0.028

$P(X \geq 2) = 1 - P(X \leq 1)$
$= 1 - 0.028$
$= 0.972$

- Layla's coin 60% 5 flips

$P(X > 3)$ * if $\geq$, $P(x < \#)$

$P(x < 3)$ $1 - P(x < 3)$

Mean and Standard Deviation of a Binomial Random Variable

—Condy machine

1,000 pieces — p = 30% blue

SRS of n = 15 pieces — X = # of blue

Find μ_x + σ_x

$\mu_x = np$

$\mu_x = 15(.3)$

$= 4.5$

$\sigma_x = \sqrt{np(1-p)}$

$= \sqrt{15(.3)(1-.30)}$

$= \sqrt{3.15}$

$= 1.775$

Geometric Random Variables

- Not a fixed # of trials
- How many trials until success?

Finding Probability of GRV

- Jeremiah 3-point shot 25% makes shot

$P(M = 3^{rd} \text{ attempt}) = \overset{\text{miss}}{\frac{3}{4}} \cdot \overset{\text{miss}}{\frac{3}{4}} \cdot \overset{\text{make}}{\frac{1}{4}} = \frac{9}{64}$

Cumulative Geometric Probability (greater than value)

- Emelia @ DMV SUV's = 12%

V = # of vehicles she registers in a day until she registers an SUV

P(E registers more than 4 before an SUV)

$P(V > 4) = P(V=5) + P(V=6) + P(V=7) + \ldots$

$\updownarrow$

$P(V \text{ not} \leq 4) = P(\text{first 4 cars not SUV}) = (1-.12)^4$

$= 0.5997$

Cumulative Geometric Probability (less than a value)

- Lilyana cake decorating 10% orders over phone

Let C = # of cake orders until a phone order

Find $P(C<5) = P(C=1) + P(C=2) + P(C=3) + P(C=4)$

$(.1) + (0.9 \cdot 0.1) + (0.9)^2(0.1) + (0.9)^3(0.1)$

$= 1 - P(\text{No telephone in 4 orders}) = 1 - (0.9)^4$

Calculator Methods

- Keep picking cards until a king, replace if not $\overset{M}{K}$

- $P(\text{pick } 5) = \text{geometpdf}\left(\overset{P(\text{king})}{\frac{1}{13}}, 5\right) = 0.0558$

- $P(X<10) = P(X \leq 9) = P(X=1) + \ldots + P(X=9)$

  $\text{geometcdf}\left(\frac{1}{13}, 9\right) = 0.5134$

- $P(X>12) = 1 - P(X \leq 12)$

  $1 - \text{geometcdf}\left(\frac{1}{13}, 12\right) = 0.3827$

Calculating Percentiles

- percentile: % of the data that is below the amt in question

: % of the data that is at or below the amt in quest.

Expected Value with Empirical Probabilities

① Birthday Die

Die Value	Freq.	Rel. Freq.	Rel V. Freq
1	90	$^{90}/_{500}$ = .18	.18
2	110	$^{110}/_{500}$ = .22	.44
3	95	$^{95}/_{500}$ = .19	.57
4	70	$^{70}/_{500}$ = .14	.56
5	75	$^{75}/_{500}$ = .15	.75
6	60	$^{60}/_{500}$ = .12	.72
	500 total		3.22 EV

$20 \cdot 3.22 = 64.4$ $\frac{②\ 110}{⑥\ 60} = 1.83$

② Frisbee

Distance	Throws	Rel. Freq.	D · RF
10	4	.04	.4
20	21	.21	4.2
30	32	.32	9.6
40	35	.35	14
50	8	.08	4
	100		32.2 EV

$50 \cdot 32.2 = 1610$ $\frac{40+}{50}\ \frac{35}{8} = 4.4$

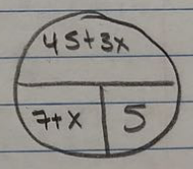
③ Salesman Sam

# of Clients (x)	Days	RF	x·RF
1	153	.3825	.3825
2	110	.275	.55
3	77	.1925	.5775
4	39	.0975	.39
5	21	.0525	.2625
	400 tot		2.1625 EV

$5 \cdot 2.1625 = 10.8 \sim 11$ ② ⑤ $= \frac{110}{21} = 5.23$

④ Divya

Pieces in Set	Sets	Tot Pieces
3	x	3x
5	5	25
10	2	20



$5(7+x) = 45+3x$

$35+5x = 45+3x$

$-3x \quad -35$

$2x = 10$

$x = 5$

⑤ Alma's Lawn Care

Acres	Customers		A·C		175
1	4		4		- 4
2	6		12		-12
3	[x]	31 10	3x	30	-45
4	[y]	21	4y	84	114
5	9		45		
	50		175		

$x+y=31$ $\quad 3x+4y=114$

$y=31-x$ $\quad 3x+4(31-x)=114$

$3x+124-4x=114$

$-x+124=114$

$-124\ \ -124$

$-x=-10$

$x=10$

⑥ Rohit the Runner

Distance	Runs	RF	D·RF
1	6	.12	.12
2	13	.26	.52
3	31	.62	1.86
	50		2.5 EV

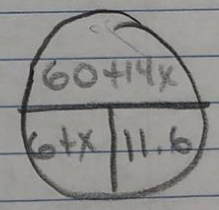
⑦ Daniela Tennis

Sets Won	Matches	S.M
0	[x] 2	0
1	4	4
2	[y] 4	2y
	10	12

$2y = 8$
$y = 4$

⑧ Easter Eggs

Eggs Found	Hunts	E.H
8	2	16
11	4	44
14	[x]	14x
	6+x	



$60+14x = 11.6(6+x)$
$60+14x = 69.6+11.6x$
$2.4x \quad 9.6$

⑨ Rohit's Races Total = 3450

Length	Races	Rel. Freq	Rel Freq. Length
100	3	$3/16 = .1875$	18.75
200	X	$x/16$	$200/16\ x$
400	2	$2/16 = 0.125$	50
800	Y	$y/16$	$800y/16$
	16	1.00	431.25

$$EV = \frac{3450}{8} = 431.25$$

$3+x+2+y=16$

$x+y+5=16$

$x+y=11$

$$18.75+\frac{200}{16}x+50+\frac{800}{16}y=431.25$$

$$\frac{200}{16}x+\frac{800}{16}y+68.75=431.25$$

$$16\left(\frac{200x}{16}+\frac{800}{16}y=362.5\right)$$

$200x+800y=5800$

$-200x-200y=-2200$

$600y=3600$

$\frac{600y}{600}=\frac{3600}{600}$

$y=6$

$x=5$

(10) Hector's Paintings

Area	Survey Resp	A·S
10	3	30
20	5	100
30	11	330
40	11	440
Tot	30	900

$900/30 = 30$

(11) Chef Jeff

Chick	Orders	
3	30 [x]	3x
6	20	120
8	50 [y]	8y
Tot	100	610

$610/100 = 6.1$

$x + 20 + y = 100$ $\quad 3x + 120 + 8y = 610$

$x + y = 80$ $\quad 3x + 8y = 490$

$3x + 8y = 490$

$3(x + y) = 80$

$3x + 8y = 490$

$-3x - 3y = -240$

$5y = 250$

$y = 50$

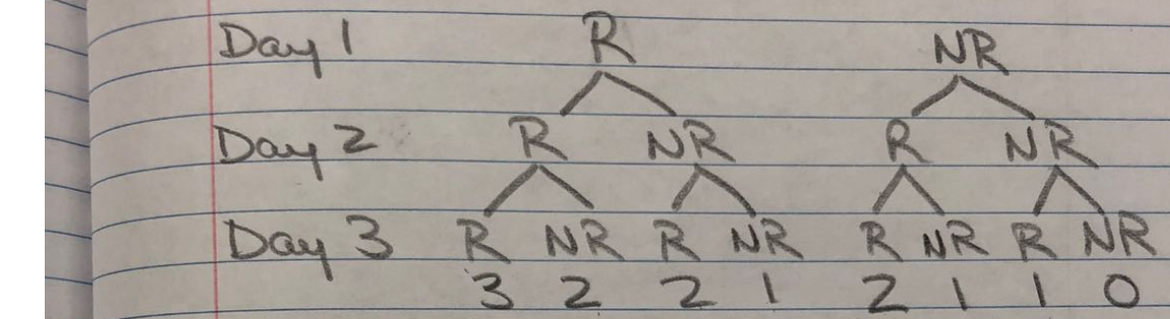
Expected Value w/ Calculated Probs.

① Artifacts

Side 1	A	N
Side 2	A N	A N
Side 3	A N A N	A N A N
Side 4	A N A N A N A N	A N A N A N A N
	4 3 3 2 3 2 2 1	3 2 2 1 2 1 1 0

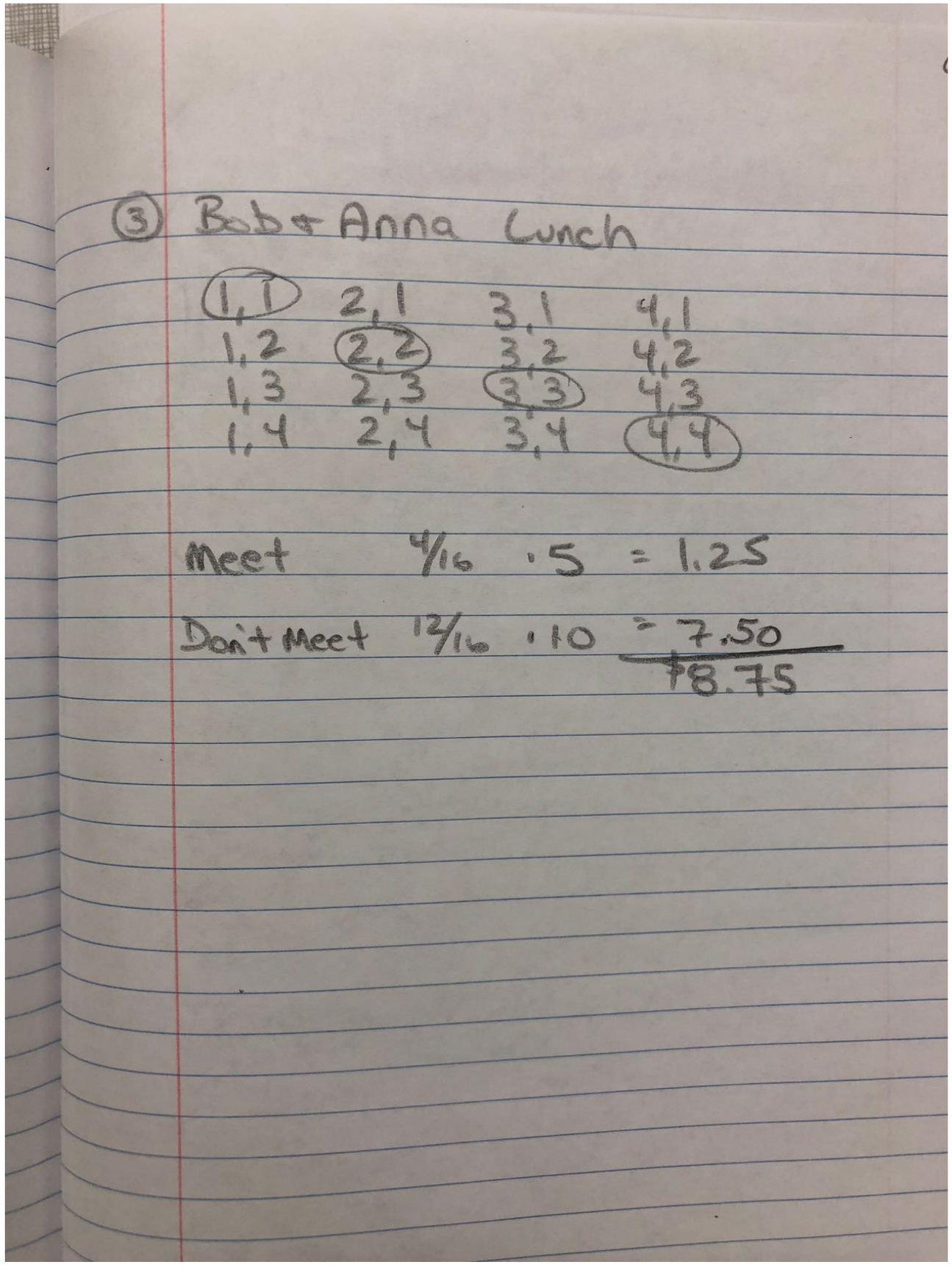
Artif			Value	
0	1	1/16	0	0
1	4	4/16	100	25
2	6	6/16	250	93.75
3	4	4/16	500	125
4	1	1/16	1000	62.50
				306.25 ✓

② Car Dealership Rain

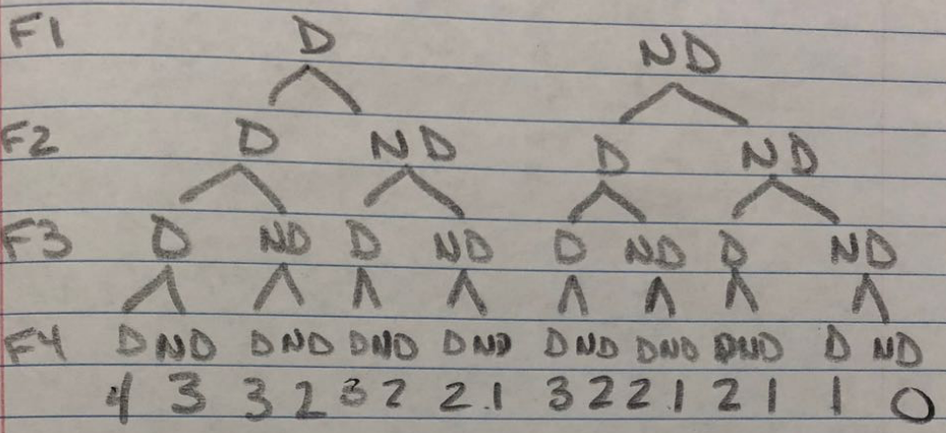


Rainy Days			Revenue		
0	1	1/8	3000	=	375
1	3	3/8	1800	=	675
2	3	3/8	1300	=	487.5
3	1	1/8	800	=	100
					1637.50

SS_09_RandomVariables

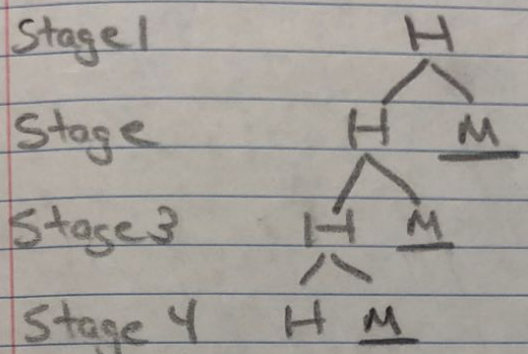


① Fireworks



Duds			Value	
0	1	1/16	1000	62.50
1	4	4/16	700	175.00
2	6	6/16	500	187.50
3	4	4/16	100	25.00
4	1	1/16	0	0

(5) Rory the Irish Gunman



Stage	Prob.	Amt	
1	.6	0	0
2	.6·.5=.3	100	30
3	.3·.4=.12	300	36
4	.12·.3=0.36	1000	36

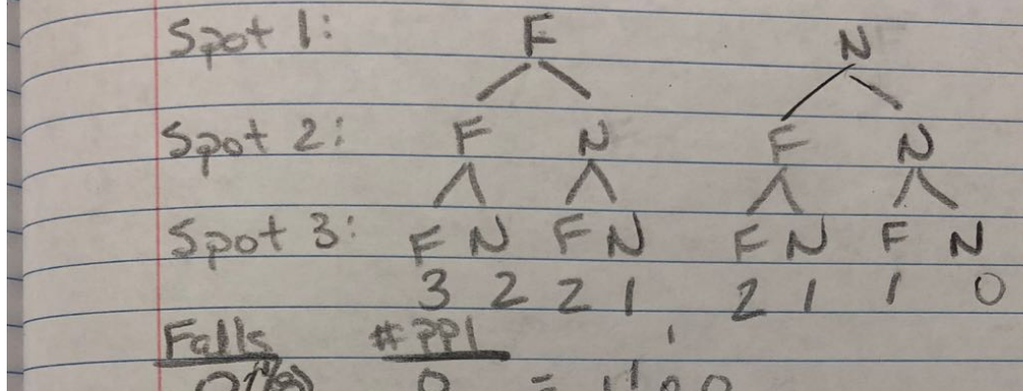
(6) Vlad + Olga Roll Dice

2	(3)	4	5	(6)	7
(3)	4	5	(6)	7	8
4	5	(6)	7	8	(9)
5	(6)	7	8	(9)	10
(6)	7	8	(9)	10	11
7	8	(9)	10	11	(12)

Div by 3: $\frac{12}{36} = \frac{1}{3} \cdot 6 = 2$

Not Div By 3: $\frac{24}{36} = \frac{2}{3} \cdot -3 = -2$

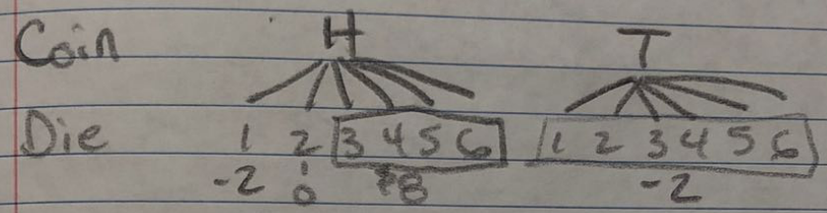
(7) Clumsy Carl



Falls	#PPL	
0 (1/8)	0	= 110.0
1 (3/8)	500	= 187.5
2 (4/8)	800	= 300.0
3 (1/8)	900	= 112.5
		600.0

⑧ Jorge @ Casino

Flip Coin & Roll 1 die



Prize	
$-2 \cdot 7/12$	-1.17
$0 \cdot 1/12$	0
$8 \cdot 4/12$	2.67

⑨ Pooja & Amit Card Game

Outcome	
Face	$(3/13) \cdot 6 = 1.38$
Ace	$(1/13) \cdot 4 = .31$
Other	$(9/13) \cdot -2 = -1.38$

(10) Cecilia + Layla Game

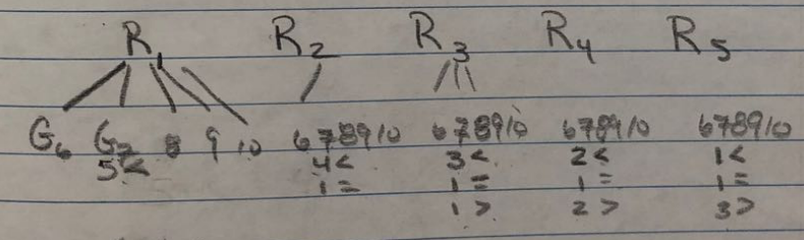
R1, R2, R3 G1, G2, G3, G4, G5, G6, G7

Red R  2 3

Green 1 2 3 4 5 6 7 1 2 3 4 5 6 7 1 2 3 4 5 6 7

Outcome			
O-O	(8/21)	$10	3.81
O-E	(6/21)	0	0
Other	(7/21)	-8	-2.67

Vera + Alexey - Markers



>12	6/25	$5	1.2
=12	4/25	0	0
<12	15/25	-6	-3.6

-2.4

Making Decisions w/ Expected Values

① Mohammed + His Startup Companies

Small Comp.
5 @ 40%
$10,000,000 if succ.
-1,000,000 if unsuc.

$.40^5 = .01 \cdot 10 = .1$
$1-.01 = .99 \cdot -1 = -.99$
$EV_{sm} = -.89$

Large Comp.
3 @ 30%
$15m if succ.
$5m if unsucc.

$.30^3 = .027 \cdot 15 = .405$
$1-.027 = .973 \cdot -5 = -4.865$
-4.46

② Samuel the Ent.

Small
4 @ 90% -
$10m if suc.
-3m if unsuc.
$.90^4 = .6561 \cdot 10 = 6.561$
$1-.6561 = .3439 \cdot -3 = -1.0317$
$5.5m

Large
2 @ 20%
20m if suc.
- 2M if unsuc
$.2^2 = .04 \cdot 20 = .8$
$1-.04 = .96 \cdot -2 = -1.92$
-1M

③ You + Friend Coin game

Game 1

$2^4 = 16$

- HHHH
- HHHT
- HHTH
- HHTT
- HTHH
- HTHT
- HTTH
- HTTT –
- THHH
- THHT
- THTH
- THTT –
- TTHH
- TTHT –
- TTTH –
- TTTT –

$\leq 2 = \$1$ $11/16 = .6875$

> 2

$> 2 = \$3$ $5/16 = .9375$

$= +1.25$

$9/16 = 1/4 \cdot 5 = 1.56$

$12/4 \cdot -2 = -1.38$

$.185$

Game 2

$1/64 \cdot 150 = 2.34$

$63/64 - 2 = -1.97$

$= .38$

$1/32 \cdot 100 = 3.125$

$31/32 \cdot -4 = -3.875$

$-.75$

④ Minneapolis

Car Result	Stoplight		Stop Sign	
Major Acc	15	16.875	19	
Minor Acc	24	18	31	
No Acc	761	0	750	
Total	800	34.88	800	
4000 cars	75·	67,500	95·	66,500
	120	72,000	155	31,000

⑤ Chicago Intersection

Light	Sign
$170 \cdot 600 = 102{,}000$	$220 \cdot 750 = 165{,}000$
$200 \cdot 400 = 80{,}000$	$270 \cdot 500 = 135{,}000$

Diego Batting Cage

⑥

Slow Ball	Fast Ball
$.95^{10}$	3@, 60
$25 if succ	$60 if succ.
-5 if unsucc	-10 if unsucc.
$.95^{10} = 14{,}968$	$.60^3 = 0.216 \cdot 60 = 12.96$
$= -2{,}006$	$.784 \cdot -10 = -7.84$
$12.96 \sim 13$	5.12
	~ 5

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⑦ Fruit stand

$246 \cdot .75 = 184.50$	$100 \cdot .95 = 95$
$40 \cdot .80 \quad 32 =$	$152 \cdot .60 = 91.20$
216.50	186.20

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⑧ Bus Tkts

$8 \cdot 35 \cdot 20 = 167$	$7 \cdot 3 \cdot 40 = 292$
$1 \cdot 65 \cdot 5 = 8.25$	$2 \cdot 7 \cdot 15 \quad 40.50$
175.25	332.50

(9) $7.2 \cdot 50 = 360$
$2.8 \cdot 10 = 28$
388

$6.5 \cdot 70 = 455$
$3.5 \cdot 30 = 105$
560

(10) $61 \cdot 3 = 183$
$62.8 \cdot 3 = 188.40$
371.40

$43.8 \cdot 4.00 = 175.20$
$100.2 \cdot 2.50 = 250.50$
425.70

(11) 6 @ 60mph @ 90%
$50 if succ
-50 if unsuc

$.90^6 \cdot 50 = 26.572$
$.468 \cdot -50 = -23.427$
3.14
~3

3 @ 90mph @ 70%
40 if succ
-10 if unsuc

$.343 \cdot 40 = 13.72$
$(.657 \cdot -10) = -6.57$
~7
7.15

(12) RPS

L = Paper
P = Rock

L = Rock
P = Sc. .30

(13) Tate's Virus

Virus	Purchased	No Purch
Pikacho	100 — 25 = 25	200 · .25 = 50
Trojan	100 — 15	100 · .15 = 15
ADA	400 · .10 = 40 + 100 = 140	400 · .10 = 40
	9 140	105
	(30 + 25) = 55	(150)

(14) Dina's Ice Cream

	Choc.	Vanilla
	(61/100 · 500) = 305 × 2 = 610	.16 · 500 = 80 × 3 = 240
	(12/100 · 500) = 60 × 2 = 120	.73 · 500 = 365 × 1 = 365
	730	605

(15) Marvin's Moped

	Light	No Light
Morn	2000 · .10 = 200	2000 · .10 = 200
Dusk	4000 · .15 = 600	4000 · .15 = 600
Night	—	2000 · .20 = 400
	800 + 150 = 950	1200

(16) Ming Fishing

	Large Lure	Small Lure
Tr	330 × 4 = 1320	90 × 2 = 180
SF	80 × 2 = 160	650 × .5 = 325
	1480	505

(17) Deniz RPS

	Rock	Paper
Rock	.50 —	.50 1000 = 500
Paper	.20 −1000 = −200	.20 —
Sciss	.30 +1000 = 300	.30 − 1000 = −300
	−200	200

(18) Francisco Arcade

3 @ 30% $50
$.30^3 \cdot .48 = 1.296$
$= 7.94\%$

4 @ 80% 27.8528
− 1.1808
26.672

(19) Felipe the Fisherman

	Large Lure	Small Lure
NP	$60 \cdot 5 = 300$	$66 \times 3 = 198$
W	$72 \cdot 3 = 216$	$162 \times 1 = 162$
	516	360

(20) Jeremy Health Ins.

	Low Ded.	High Ded.
0	0	0
700	100	140
3000	75	150
5000	75	150
10,000	50	100
	6300	5540

(21) Sam Squirrel Monkey

Paint	Siding
Red	Red
	Green
	White
Green	R
	G
	W
W	R
	G
	W

18 total
-3 same
15 Not same

$3/18 \cdot 1000 = 166.67$
$5/18 \cdot -100 = -83.33$
83.33

(22) Omar's Fruit Shop

Apples		Bananas	
302 · .25 =	75.50	46 · .40 =	18.40
45 · .45	20.25	310 · .30 =	93.00
	95.75		111.40