ICM Midterm Review 2017

1. $> \frac{1}{2}$ would be **772**

2. A.

A	B	C	D
15	16	12	11

B wins

B.
A: $4(15)+3(12)+2(17)+1(10) = 140$
B: $4(16)+3(15)+2(0)+1(23) = 132$
C: $4(12)+3(21)+2(15)+1(6) = 147$
D: $4(11)+3(6)+2(22)+1(15) = 121$

C wins

C.

A	B
15	16
+12	
+11	
38	16

A wins

D.

A	B	C	D
15	16	12	11
15 →	16	23	
	31	23	

B wins

E.

A	B	C	D
15	15	10	6
12	6	12	11
	10	11	
27	31	33	17

C wins

3.

A to B		A to C		B to C	
9	13	5	17	18	4

B wins

4.

coalition	wt		critical
A	3		—
B	4		—
C	3		—
D	1		—
AB	9	winning	A, B
AC	8		A, C
AD	6		—
BC	7		—
BD	5		—
CD	4		—
ABC	12		A
ABD	10		AB
ACD	9	winning	A, C
BCD	8		B, C, D
ABCD	13		none

Banzhaf

A	$\frac{5}{12}$
B	$\frac{3}{12} = \frac{1}{4}$
C	$\frac{3}{12} = \frac{1}{4}$
D	$\frac{1}{12}$

*see other page for Shapley-Shubik

5. total = 1825

SD = $\frac{1825}{20}$ = 91.25

	SQ	LQ
Sen	4.3836	4
Jun	4.6575	4 + 1
Soph	5.2055	5
Fr	5.7534	5 + 1
		18

MD = 84

Hamilton	Jeff.
4	4
5	5
5	5
6	6
20	20

6. total = 40

SD $\frac{40}{75} = \frac{8}{15}$ $.5\overline{3}$

	SQ
M	15
J	39.375
C	20.625

Webster
15
39
21

7.

	auto 20000 A	boat cabin 198500 B	C
total bids	210000	216000	192000
FS	70000	72000	64000
item − FS	−50000	126500	−64000
	126500		
	−114000		

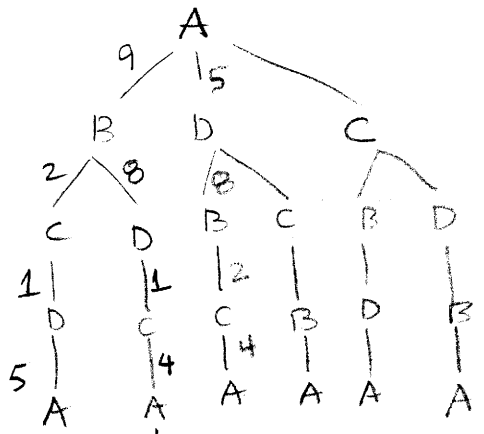
Surplus $12500 ÷ 3 = 4166.67 cash to each person

Final Summary: Andrew: gets auto & 54166.67 cash
Billy Joe: gets boat & cabin, pays $122,333.33
Carmelo: gets $68166.67

8. A D C B E A
8 + 12 + 14 + 9 + 10

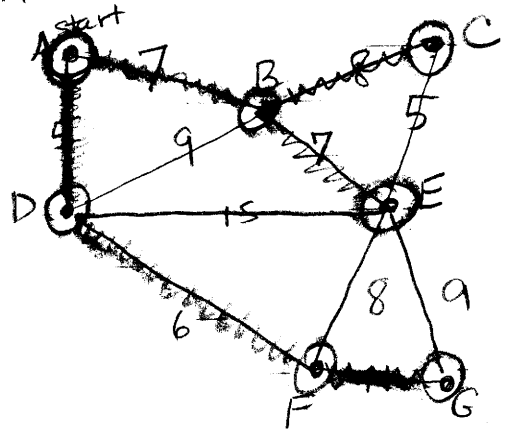
ADCBEA 53

9. if start at A:



ABCDA 17
ABDCA 22
ADBCA 19
ADCBA 17
ACBDA 19
ACDBA 22

10.



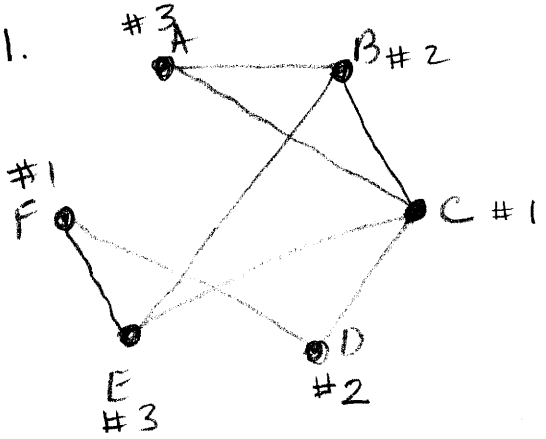
AB 7
AD 5
AB 7
ADB 14
ADE 19
ADF 11
ABC 15
ABE 14
ADE 19
ADF 11

ABC
ABE 14
ADE 19
ADF 19
ADFG 22
ABC 15
ABEC 19
ABEG 23
ADFG 22

ABEG 23
ADFG 22

ADFG 22

11.



3 tanks

12. A.
1 simple
2 pseudograph
3 simple
4 directed
5 directed
6 pseudograph

B. circuit : #3
path : #2
neither ! #1

C. circuit

D.
B 5
R 7
W 3
Y 9

E. 12

F.

vertex	in	out
A	2	2
B	3	1
C	2	2
D	1	3
E	2	2

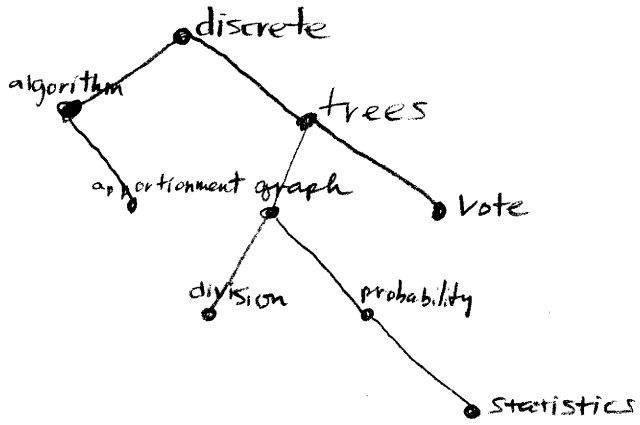
G

	A	B	C	D	E
A	0	1	0	0	1
B	1	0	0	0	0
C	1	0	0	1	0
D	0	0	0	0	1
E	0	1	1	0	0

13. see graph

chr. # = 4

14.



15. A. F
B. A, C, E, H
C. A, D
D. F
E. D, B, F
F. A, D, C, E
PLR G. F B A D C E G I H
LRP H. A C E D B H I G F
LPR I. A B C D E F G H I
} omit Fall 2017

16. ${}_{10}C_3 = \boxed{120}$

17. $2 \cdot 5 \cdot 3 = \boxed{30}$

18. A. ${}_{40}C_5$ $\boxed{658008}$ B. ${}_{40}P_5$ $\boxed{78,960,960}$

19. $\underline{26}\ \underline{25}\ \underline{24}\ \underline{10}\ \underline{9}\ \underline{8}\ \underline{23} = \boxed{258336000}$

20. A. $\frac{4}{52} = \frac{1}{13}$
B. $\frac{26}{52} = \frac{1}{2}$
C. $\frac{1}{52}$
D. $\frac{12}{52} = \frac{3}{13}$
E. $\frac{12}{52} = \frac{3}{13}$
F. $\frac{2}{52} = \frac{1}{26}$

21. A. $\frac{1}{2}(200) = 100$

B. $\frac{1}{6}(200) = 33.\overline{3}$

22. A. $\frac{300}{1500} = \frac{1}{5}$

B. $\frac{1}{6}$

C. $300:1200 = 1:4$

D. $1200:300 = 4:1$

23. A. $\frac{150}{200} = \frac{3}{4}$

B. $\frac{150}{225} = \frac{2}{3}$

C. $\frac{100}{300} = \frac{1}{3}$

24. $p(D|H) = \frac{p(D \cap H)}{p(H)} = \frac{.2}{.3} = \boxed{\frac{2}{3}}$

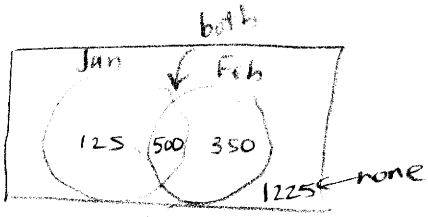
25. A. $p(\text{gray or yellow}) = p(\text{gray}) + p(\text{yellow}) = \frac{15}{48} + \frac{1}{48} = \frac{16}{48} = \frac{1}{3}$

B. $p(\text{green and white}) = p(\text{green}) \cdot p(\text{white}) = \frac{3}{48} \cdot \frac{20}{47} = \boxed{\frac{5}{188}}$

C. $p(\text{red \& red}) = \frac{6}{48} \cdot \frac{5}{47} = \boxed{\frac{5}{376}}$

D. $p(\text{green \& white}) = \frac{3}{48} \cdot \frac{20}{48} = \boxed{\frac{5}{192}}$

26.



$p(\text{Jan or Feb}) = \frac{625}{2200} + \frac{850}{2200} - \frac{500}{2200} = \frac{975}{2200} = \boxed{\frac{39}{88}}$

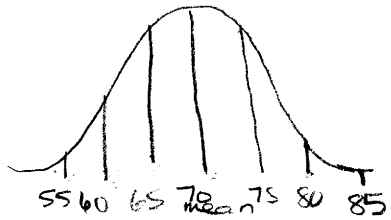
27. $\frac{1}{52} \cdot \frac{1}{51} \cdot \frac{3}{50} = \frac{3}{132600} = \boxed{\frac{1}{44200}}$

28. A. binompdf (5, .13, 3) = .017
B. 1 − binomcdf (5, .13, 1) = .129
C. binomcdf (5, .13, 2) = .982
D. binomcdf (5, .13, 2) = .982
E. 150(.13) = 19.5

29. A. geometpdf (.80, 4) = .0064
B. geometpdf (.20, 5) = .08192
C. geometcdf (.80, 3) = .992
D. $\frac{1}{.2} = 5$

30. A. 175 • normalcdf (70, 999999, 50, 12) = 8.363
B. 175 • normalcdf (−999999, 40, 50, 12) = 35.407
C. 175 • normalcdf (25, 55, 50, 12) = 112.512
D. invnorm (.95, 50, 12) = 69.738

31.



A. 68%
B. $\frac{1}{2}(95\%) = 47.5\%$
C. 60–70 has 47.5% 70–85 has $\frac{1}{2}(99.7\%)$ (49.85) = 97.35%
D. $\frac{1}{2}(.3) = .15\%$
E. $\frac{1}{2}(5) = 2.5\%$
F. 95%(3000) = 2850
G. below 55 = .15% (47.5)
above 60 = 50% + $\frac{1}{2}(95\%)$ = 97.5% = 97.65%
100 − 97.65 = 2.35 2.35%(3000) = 70.5

Omit Fall 2017

31.

min	132
Q1	160
med	168
Q3	178
max	206

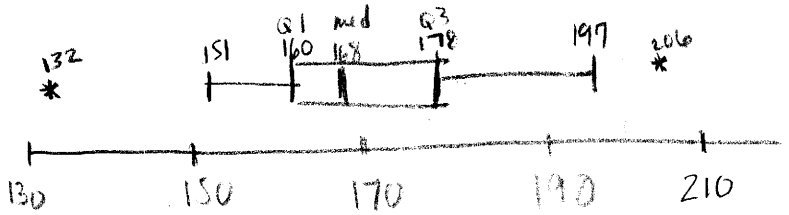
IQR = 178 − 160 = 18

1.5(18) = 27

160 − 27 = 133

178 + 27 = 205

132 & 206 are outliers



32. (pop)

A. mean = 85

B. med = 87.5

C. mode = 90

D. st dev = 10.561 (pop SD) 10.770 sample SD

E.

75 → 95 | 18 scores

64 → 106 | 25 scores

33. A.

stem	leaf
7	9
8	34
9	1135778
10	15
11	1

B. sample 8.936

C. Q1 = 87.5

Q3 = 99.5

IQR = 12

Q1 − 12 = 75.5

Q3 + 12 = 111.5

no outliers

34. z-score = $\frac{60-68}{10} = -.8 \Rightarrow 21.19$

21.19 % shorter
78.81 % taller

35. pop: students at HSHS
Sample: 572 freshmen who carry calculators

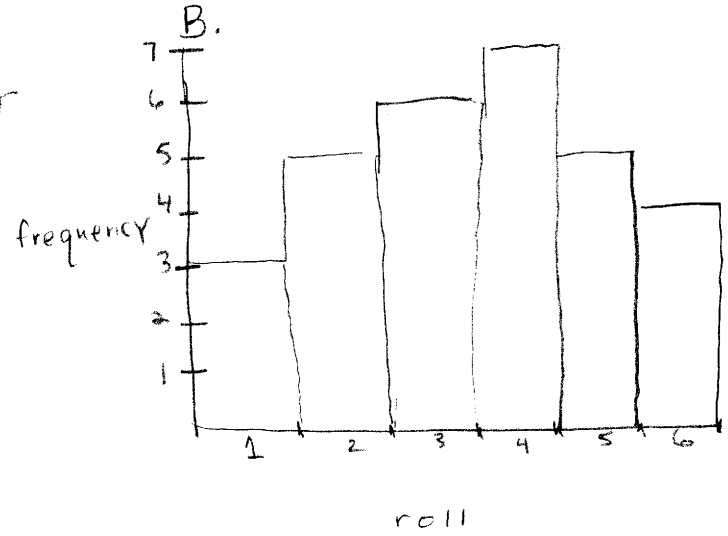
36. A. mean = 16.92
B. med = 17
C. mode = 17
D. 50 people

37. A. 30 students
B. 22
C. 8 − 5 = 3

38. A.

roll	frequency
1	3
2	5
3	6
4	7
5	5
6	4

B.



C. mean = 3.6
D. med = 4
E. mode = 4
F. midrange = $\frac{1+6}{2} = 3.5$

39. A symmetric
B skewed right
C skewed right
D skewed right
E skewed left
F symmetric

#4 Shapley Shubik

Sequential Coalitions: 4 Players

[P1,P2,P3,P4]	[P2,P1,P3,P4]	[P3,P1,P2,P4]	[P4,P1,P2,P3]
[P1,P2,P4,P3]	[P2,P1,P4,P3]	[P3,P1,P4,P2]	[P4,P1,P3,P2]
[P1,P3,P2,P4]	[P2,P3,P1,P4]	[P3,P2,P1,P4]	[P4,P2,P1,P3]
[P1,P3,P4,P2]	[P2,P3,P4,P1]	[P3,P2,P4,P1]	[P4,P2,P3,P1]
[P1,P4,P2,P3]	[P2,P4,P1,P3]	[P3,P4,P1,P2]	[P4,P3,P1,P2]
[P1,P4,P3,P2]	[P2,P4,P3,P1]	[P3,P4,P2,P1]	[P4,P3,P2,P1]

$P_1 = 5 \quad P_2 = 4 \quad P_3 = 3 \quad P_4 = 1$

quota = 8

Distribution

$A = P_1 = \frac{10}{24} = 41.7\%$

$B = P_2 = \frac{6}{24} = 25\%$

$C = P_3 = \frac{6}{24} = 25\%$

$D = P_4 = \frac{2}{24} = 8.3\%$