Review Questions for Final Exam

1. Write the following percents as decimal numbers:

a) 79.3% = _____
b) 326% = _____
c) 0.00869% = _____

2. Write the following decimal numbers as percents:

a) 28.73 = _____
b) 0.743 = _____

3. Evaluate the following using the correct order of operations:

a) $5[6(15-2^4)-(20-18)^3\div 2-52^0]$

b) $-3[8(12-3^2)]+(76-79)^3\div 3-21\div 3$

c) $-4[-3(29-3^3)+(47-50)^2\div 3]-64\div 4$

4. Evaluate the following using the correct order of operations:

a) $\dfrac{2[6\times 6\div 3]\div 2^2+(8-5)^3-40}{78-141\div(3-6)^2}$

b) $\dfrac{-27[10\times 3\div 15]\div 3^3-(24-27)^3+71}{341-213\div(4-6)^4}$

c) $\dfrac{-8[2\times 20\div 4]\div 2^3+(48-51)^3-61}{448-512\div(9-11)^3}$

5. Rewrite the number below with 2 different powers of ten

a) 872.416 x 10^4 = _____ = _____

b) 7219.168 x 10^{-5} = _____ = _____

c) 97123.75 x 10^{-6} = _____ = _____

6. Complete the following table, remember significant figure rules

Decimal Number	Scientific Notation
0.0000248	
3.18	
972841.0	
	6.87×10^{-6}
	1.84×10^{8}
	4.35×10^{-9}

7. Convert the following to a single power of 10

$$\frac{10^{14} \times 10^{-5}}{10^{-16} \times 10^{-9}}$$

8. Compute the following

$$\frac{26.3 \times 10^{-6} - 13.9 \times 10^{-8}}{8.7 \times 10^{7} + 14.5 \times 10^{4}}$$

9. Compute the following

$$\frac{1}{14 \times 10^{4}} + \frac{1}{20 \times 10^{8}} - \frac{1}{12 \times 10^{6}}$$

10. Convert the following to a single power of 10

$$\frac{\left(\frac{10^{2}}{10^{-9}}\right)^{-4}}{\left(\frac{10^{-8}}{10^{5}}\right)^{3}}$$

11. Using the attached Metric Prefix table, convert the following numbers to the suggested units, remember rules of significant figures:

a) 7.83×10^{7} ns = _____ Gs

b) 2.76×10^{-7} km = _____ inches

c) 6.18×10^{-4} GL/ng = _____ US gallons/pounds

12. Convert each of the numbers in different bases, to a decimal number (base 10)

Non-Decimal Number	Decimal Number (Base 10)
101101_2	
42613_8	
$D62B4_{16}$	

13. Convert the following number from Decimal to Hexadecimal, Binary and Octal in ANY order:

4647_{10}

14. Compute the following in the given base

a) $A58E31_{16} + 5F6C29_{16}$

b) $305147_8 + 521630_8$

c) $1100111_2 + 1011101_2$

d) $D73E9B_{16} - 4C8F26_{16}$

e) $521436_8 - 376154_8$

f) $1100111_2 - 1011011_2$

15. Multiply the following number in the given base

$1011101_2 \times 1110_2$

16. Divide the following number in the given base

$1011100_2 \div 110_2$

17. Compute the following subtraction problem using 1's complement method

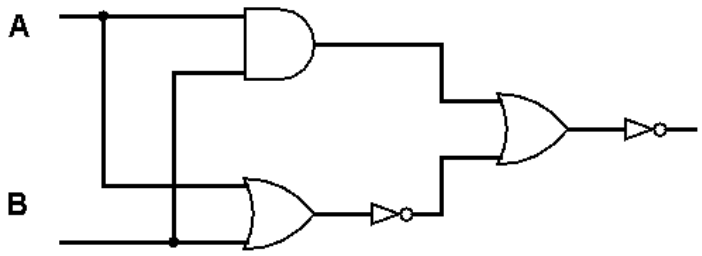
$$\begin{array}{r} 1\,1\,0\,1\,1\,0\,0_2 \\ -\ 1\,0\,1\,0\,1\,0\,1_2 \\ \hline \end{array}$$

18. Compute the following subtraction problem using 2's complement method

$$\begin{array}{r} 1\,1\,0\,1\,1\,1\,0_2 \\ -\ 1\,0\,0\,0\,1\,0\,1_2 \\ \hline \end{array}$$

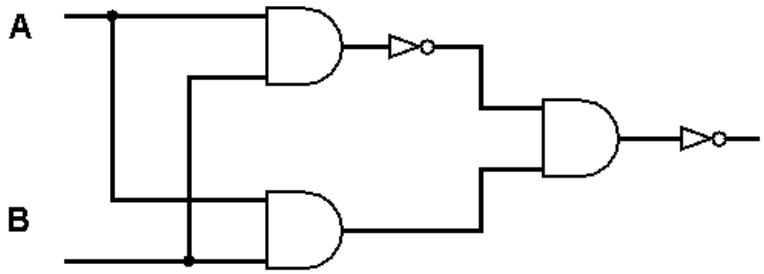
19. For the following logic diagrams
    i) write the appropriate Boolean algebra expression for the output
    ii) reduce as much as possible the final output expression algebraically using the reference table
    iii) create a corresponding truth table showing the 2 algebraic expressions are equivalent
    iv) draw and label the simplified logic diagram

a)



A	B	
0	0	
0	1	
1	0	
1	1	

b)

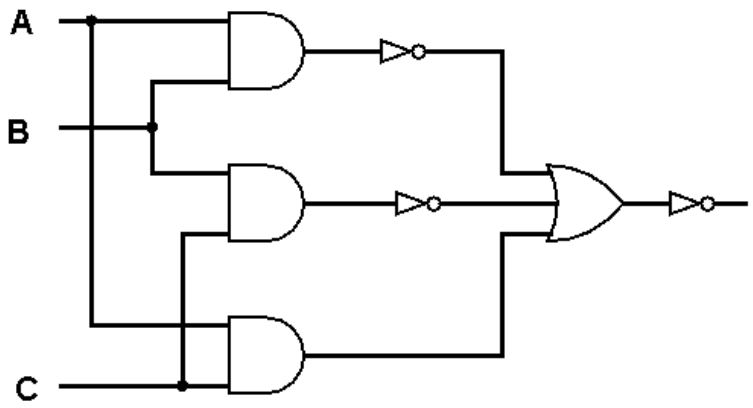


A	B	
0	0	
0	1	
1	0	
1	1	

20. For the following logic diagrams

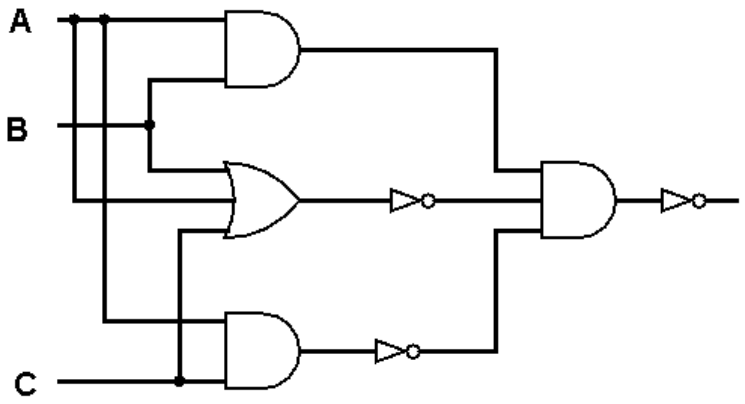
i) write the appropriate Boolean algebra expression for the output
ii) reduce as much as possible the final output expression algebraically using the reference table
iii) create a corresponding truth table showing the 2 algebraic expressions are equivalent
iv) draw and label the simplified logic diagram

a)



A	B	C	
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

b)



A	B	C	
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

21. Simplify the following Boolean expressions as much as possible using any theorem or postulate from the reference table

a) $\overline{A(B+\overline{CB})}$

b) $\overline{C(\overline{A+B}+C\overline{B})}$

c) $\overline{B(\overline{AC}+AB)}$

d) $\overline{B(\overline{C+A}+\overline{A}B)}$

e) $(A+\overline{B})(B+\overline{A}C)$

f) $(\overline{A}+B)(B\overline{C}+AB)$

g) $(B+\overline{C})(A+B\overline{C})$

h) $(\overline{A}+C)(B\overline{C}+AC)$

i) AC+A(A+BC)+A(AB+BC)+C(AB+ABC)

j) ABC+A(BC+AC)+B(AB+AC)

k) B(B+AC)+C(AC+ABC)+B(BC+ABC)

l) $\overline{(B\overline{C}+A)\oplus(AC)}$

m) $(\overline{A}C+B)(C+B)$

22. For the sample data, determine the following median, mode, mean, range, standard deviation, variance, number of classes and a histogram plot. Determine the skewness of the distribution. Calculate the z-score and determine if there are any outliers for the data set?

5.2, 2.9, 3.7, 4.9, 1.7, 3.9, 1.7, 2.4, 2.6, 3.2, 1.1, 4.3, 5.9

23. The quality control department sampled 25 800g bags of whole wheat flour. The flour mill claimed the following information about the bags of flour, $\bar{x}$ = 793 g and the s = 7.5 g.

a) If the shape of the distribution is not normal, what percentage of the bags of flour will lie between 783 g and 803 g? [Hint: find k first]

b) If we assume that the distribution of bags of flour is symmetrical and bell-shaped, then 95% of the bags of flour will have weights between what two values?

24. Two standard 6-sided die are rolled and a coin is tossed, find the probability that the die sum equals 5 and the coin toss shows a tail?

25. For 2 standard (6 sided) dice, determine the probability in which the sum of the 2 dice equals 6.

26. A group of 28 students in a computer technician program are enrolled in several courses. 11 are enrolled in a math class, 9 are enrolled in a networking class and 3 are enrolled in both type of classes. What is the probability that a student from the group selected at random either is enrolled in a math course or a networking course?

27. A dark gym bag contains 6 rubber balls, 9 basketballs, 4 soccer balls, 5 volleyballs.

a) If a ball is selected at random and removed from the bag, what is the probability that it is a soccer ball?

b) After removing the soccer ball, if a group of students want to play volleyball and need 3 volleyballs, what is the total probability they select 3 volleyballs at random and remove it from the bag? Note: Any other ball selected that is not a volleyball stays in the bag.

28. The following data is a discrete probability distribution of the arrival times (over a 4 hour period) of students at the student centre during the orientation week at a local college. Determine the expected (mean), variance and standard deviation of the student arrival times for the next few hours.

Arrival times per hour	**Probability**
98	0.21
164	0.38
279	0.31
350	0.10

Reference Sheets

Metric Symbol	Metric Prefix	Power of Ten with Respect to Base
E	**1 Exa_BaseUnit =**	10^{18} BaseUnit
P	**1 Peta_BaseUnit =**	10^{15} BaseUnit
T	**1 Tera_BaseUnit =**	10^{12} BaseUnit
G	**1 Giga_BaseUnit =**	10^{9} BaseUnit
M	**1 Mega_BaseUnit =**	10^{6} BaseUnit
k	**1 kilo_BaseUnit =**	10^{3} BaseUnit
h	**1 hecto_BaseUnit =**	10^{2} BaseUnit
dk/da	**1 deca_BaseUnit =**	10^{1} BaseUnit
	Base Unit (m, s, L, Hz, F, g, J, Pa, A, V, Ω...)	$10^{0} = 1$
d	**1 deci_BaseUnit =**	10^{-1} BaseUnit
c	**1 centi_BaseUnit =**	10^{-2} BaseUnit
m	**1 milli_BaseUnit =**	10^{-3} BaseUnit
μ	**1 micro_BaseUnit =**	10^{-6} BaseUnit
n	**1 nano_BaseUnit =**	10^{-9} BaseUnit
p	**1 pico_BaseUnit =**	10^{-12} BaseUnit
f	**1 femto_BaseUnit =**	10^{-15} BaseUnit
a	**1 atto_BaseUnit =**	10^{-18} BaseUnit

CNS Conversion		
	0	0000
	1	0001
	2	0010
	3	0011
	4	0100
	5	0101
	6	0110
	7	0111
	8	1000
	9	1001
10	A	1010
11	B	1011
12	C	1100
13	D	1101
14	E	1110
15	F	1111

Time
60 min = 1 h
60 s = 1 min
24 h = 1 day
365 day = 1 yr

Angles
π rad = 180°
1° = 60 min (60‘)
1‘ = 60 s (60”)

Temperature
°C = 5/9 (°F - 32)
K = °C + 273
°F = (9/5)°C+32
R = °F + 460

Imperial Conversion Units

Length
12 in = 1 ft
3 ft = 1 yd
5280 ft = 1 mi
1760 yd = 1 mi
1852 m = 1 nmi

Weight
16 oz = 1 lb
2000 lb = 1 ton

Capacity
3 tsp = 1 tbsp
1 fl. oz. = 2 tbsp
16 tbsp = 1 cup
2 cups = 1 US pt
2 US pt = 1 US qt
4 US qt = 1 US gal
1 cup = 8 fl. oz.

Metric – Imperial Conversion Units

Length
1 in = 2.54 cm
1 m = 39.37 in
1 mi = 1.609 km

Weight
1 lb = 453.6 g
1 kg = 2.205 lb
1 oz = 28.35 g

Capacity
1 US gal = 3.79 L
1 tsp = 4.93 mL
1 US pt = 0.473 L

Heat - Energy - Power Units
1 cal = 4.186 J
1 BTU = 1055 J
1 hp = 745.7 W

Area
1 hectare = 10000 m^2
1 acre = 4840 yd^2
1 hectare = 2.47 acres

A, B → AB **AND**	A, B → A+B **OR**	A, B → A⊕B **XOR**
A, B → $\overline{AB}$ **NAND**	A, B → $\overline{A+B}$ **NOR**	A, B → $\overline{A \oplus B}$ **XNOR**
A → $\overline{A}$ **NOT**	A → A **Buffer**	

Postulates					
1a	$\overline{1} = 0$	1b	$\overline{0} = 1$		
2a	$0 \cdot 0 = 0$	2b	$0 + 0 = 0$	2c	$0 \oplus 0 = 0$ $\quad \overline{0 \oplus 0} = 1$
3a	$1 \cdot 1 = 1$	3b	$1 + 1 = 1$	3c	$1 \oplus 1 = 0$ $\quad \overline{1 \oplus 1} = 1$
4a	$1 \cdot 0 = 0$	4b	$1 + 0 = 1$	4c	$0 \oplus 1 = 1$ $\quad \overline{0 \oplus 1} = 0$
Basic Theorems					
5a	$A \cdot 1 = A$ $\quad \overline{A} \cdot 1 = \overline{A}$	5b	$A + 1 = 1$ $\quad \overline{A} + 1 = 1$	5c	$A \oplus 1 = \overline{A}$ $\quad \overline{A \oplus 1} = A$
6a	$A \cdot A = A$ $\quad \overline{A} \cdot \overline{A} = \overline{A}$	6b	$A + A = A$ $\quad \overline{A} + \overline{A} = \overline{A}$	6c	$A \oplus 0 = A$ $\quad \overline{A \oplus 0} = \overline{A}$
7a	$A \cdot 0 = 0$	7b	$A + 0 = A$	7c	$A \oplus A = 0$ $\quad \overline{A \oplus A} = 1$
8a	$A \cdot \overline{A} = 0$	8b	$A + \overline{A} = 1$	8c	$A \oplus \overline{A} = 1$ $\quad \overline{A \oplus \overline{A}} = 0$
9a	$\overline{\overline{A}} = A$ (double negation)	9b	(double negation) $A = \overline{\overline{A}}$	9c	$\overline{A} \oplus \overline{A} = 0$ $\quad \overline{\overline{A} \oplus \overline{A}} = 1$
Commutative Properties					
10a	$AB = BA$	10b	$A + B = B + A$	10c	$A \oplus B = B \oplus A$
Associative Properties					
11a	$A(BC) = (AB)C$	11b	$A + (B + C) = (A + B) + C$	11c	$(A \oplus B) \oplus C = A \oplus (B \oplus C) = A \oplus B \oplus C$
Distributive Properties					
12a	$A(B + C) = AB + AC$	12b	$A + BC = (A + B)(A + C)$	12c 12d	$A(B \oplus C) = AB \oplus AC$ $(A \oplus B)(A \oplus C) = \overline{A}\,B\,C + A\,\overline{B}\,\overline{C}$
De Morgan's Theorem					
13a	$\overline{A}\,\overline{B}\,\overline{C} = \overline{A + B + C}$	13b	$\overline{A} + \overline{B} + \overline{C} = \overline{ABC}$		
Absorption Theorems					
14a	$A(A + B) = A$	14b	$A + AB = A$	14c 14d	$A \oplus (\overline{A}+B) = \overline{AB}$ $A(\overline{A} \oplus B) = AB$
15a	$A(\overline{A} + B) = AB$	15b	$A + \overline{A}B = A + B$	15c 15d	$A \oplus (\overline{A}B) = A+B$ $A \oplus (AB) = A\overline{B}$
Multiplying Out					
16a	$(A + B)(\overline{A} + C) = AC + \overline{A}B$	16b	$(A+B) \oplus (\overline{A}+C) = \overline{AC \oplus \overline{A}B}$		
Consensus Theorems					
17a	$AB + \overline{A}C + BC = AB + \overline{A}C$	17b	$(A+B)(\overline{A}+C)(B+C) = (A+B)(\overline{A}+C)$		
18a	$(A \oplus B)(\overline{A} \oplus C)(B \oplus C) = (A \oplus B)(\overline{A} \oplus C) = (A \oplus B)(B \oplus C) = (\overline{A} \oplus C)(B \oplus C)$				
Other					
19a	$\overline{A} \oplus \overline{B} \oplus \overline{C} = \overline{A \oplus B \oplus C}$	19b	$A \oplus B = A\overline{B} + \overline{A}B = (A+B)(\overline{A}+\overline{B})$	19c	$\overline{A \oplus B} = A\,B + \overline{A}\,\overline{B} = (\overline{A}+B)(A+\overline{B})$

Descriptive Statistics

$$\bar{x}=\frac{\sum x}{n}=\frac{x_1+x_2+x_3\ldots}{n} \qquad \mu=\frac{\sum x}{N}=\frac{x_1+x_2+x_3\ldots}{N}$$

$$\sigma=\sqrt{\frac{\sum (x-\mu)^2}{N}} \qquad s=\sqrt{\frac{\sum (x-\bar{x})^2}{n-1}} \qquad \sigma^2=\frac{\sum (x-\mu)^2}{N} \qquad s^2=\frac{\sum (x-\bar{x})^2}{n-1} \qquad \sigma=\sqrt{\sigma^2}$$

$$s=\sqrt{\frac{\sum x^2-\frac{(\sum x)^2}{n}}{n-1}} \qquad s^2=\frac{\sum x^2-\frac{(\sum x)^2}{n}}{n-1} \qquad sk=\frac{3(\bar{x}-median)}{s} \qquad z=\frac{x-\bar{x}}{s}$$

$$2^j \qquad i>\frac{Maximum\,Value-Minimum\,Value}{j}$$

Statistical Distributions

	% of Values Found in Intervals Around the Mean	
Interval	**Chebyshev's Theorem (any distribution)**	**Empirical Rule (Normal Distribution)**
μ±1σ, $\bar{x}$±1s	~ 0%	~ 68%
μ±2σ, $\bar{x}$±2s	~ 75%	~ 95%
μ±3σ, $\bar{x}$±3s	~ 88.89%	~ 99.7%

$$1-\frac{1}{k^2} \qquad \Delta=ks \qquad \Delta=k\sigma$$

Counting Rules

$${}_nC_r=\frac{n!}{(n-r)!\,r!} \qquad {}_nP_r=\frac{n!}{(n-r)!} \qquad Total\ Number\ of\ Arrangements=(m)(n)$$

Probability Rules

$$P(A)=\frac{Number\ of\ ways\ event\ A\ can\ occur}{Total\ number\ of\ possible\ outcomes\ (Sample\ space)}$$

$$P(A\text{ and }B)=P(A)\,P(B) \qquad P(A\text{ and }B)=P(A)\,P(B|A) \qquad P(\sim A)=1-P(A)$$

$$P(A\text{ or }B)=P(A\text{ or }B\text{ or }both)=P(A)+P(B)-P(A\text{ and }B) \qquad P(A\text{ or }B)=P(A)+P(B)$$

Discrete Probability Distribution

$$\mu=\sum[xP(x)] \qquad \sigma^2=\sum[(x-\mu)^2P(x)] \qquad \sigma=\sqrt{\sigma^2}$$

Answers:

1. a) 0.793
   b) 3.26
   c) 0.0000869

2. a) 2873%
   b) 74.3%

3. a) -55
   b) -88
   c) -4

4. a) -7/62.33
   b) 96/327.6875
   c) -98/512

5. a) 8724.16×10^{3} or 87.2416×10^{5} ...and many more
   b) 72191.684×10^{-6} or 721.9168×10^{-4} ...and many more
   c) 9712.375×10^{-5} or $971237.543 \times 10^{-7}$ ...and many more

6. 2.48×10^{-5}
   3.18×10^{0}
   9.728×10^{5}

   0.00000687
   184000000
   0.00000000435

7. 10^{34}

8. 3.0×10^{-13}

9. 7.1×10^{-6}

10. $1/10^{5}$

11. a) 7.83×10^{-11} Gs
    b) 1.09×10^{-2} inches
    c) 7.39×10^{16} US gallons/pounds

12. $101101_{2} = 45_{10}$
    $42613_{8} = 17803_{10}$
    $D62B4_{16} = 877236_{10}$

13. $4647_{10} = 1227_{16} = 11047_{8} = 1001000100111_{2}$

14. a) $104FA5A_{16}$
    b) 1026777_{8}
    c) 11000100_{2}

d) $8AAF75_{16}$
e) 123262_8
f) 1100_2

15. 10100010110_2

16. 1111_2

17. 10111_2

18. 101001_2

19. a) $\overline{AB+\overline{A+B}}=\overline{A}B+A\overline{B}$ = A⊕B

b) $\overline{(AB)(\overline{AB})}=1$ (open circuit...all inputs whether 1 or 0 will result in a 1 as output)

20. a) $\overline{\overline{AB}+\overline{BC}+AC}=0$ (closed circuit...all inputs whether 1 or 0 will result in a 0 as output)

b) $\overline{(\overline{AC})(\overline{A+B+C})(AB)}=1$ (open circuit...all inputs whether 1 or 0 will result in a 1 as output)

21. a) $\overline{A}$

b) $\overline{C}+B$

c) $\overline{B}$

d) $\overline{B}+A$

e) $\overline{A}\,\overline{B}\,C+AB$

f) $B(\overline{C}+A)$

g) $\overline{C}\,A+\overline{C}\,B+AB$

h) $\overline{A}\,B\,\overline{C}+AC$

i) A

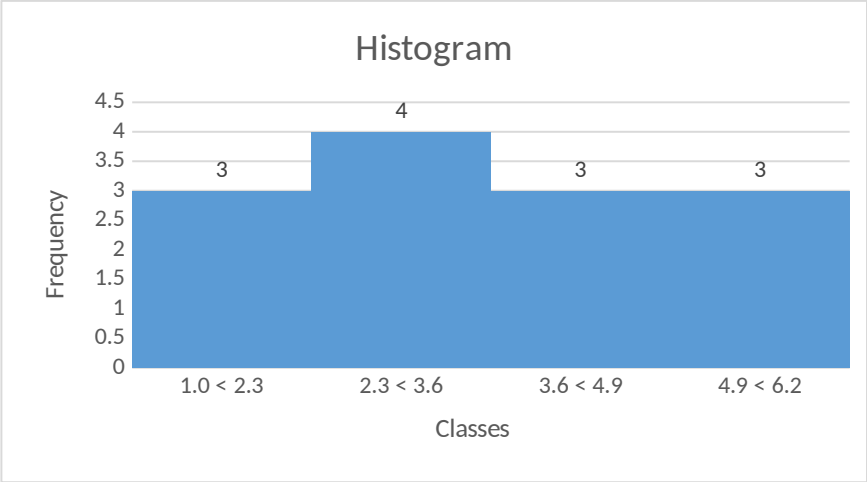
j) $AB+AC$

k) $AC+B$

l) $\overline{A}\,\overline{B}+C$

m) $\overline{B}\,CA$

22. mean = 3.346, median = 3.2, mode = 1.7, variance = 2.154, standard deviation = 1.467, range = 4.8, n = 13, right skewed...there are no outliers in the data set



23. a) 43.75%
b) range for ±2s = 778g to 808g

24. individual probability for selecting a tail in coin toss is 1/2
individual probability for 2 different dies adding up to 5 {(1,4), (4,1), (2,3), (3,2)} is 4/36
total probability of the 2 quantities is AND...(1/2)*(4/36) = 4/72

25. S = { (1,1)
(1,2),(2,1)
(1,3),(3,1),(2,2)
(1,4),(4,1),(2,3),(3,2)
(1,5),(5,1),(2,4),(4,2),(3,3)
(1,6),(6,1),(2,5),(5,2),(4,3),(3,4)
(2,6),(6,2),(3,5),(5,3),(4,4)
(3,6),(6,3),(4,5),(5,4)
(4,6),(6,4),(5,5)
(5,6),(6,5)
(6,6) }
probability that the sum of 2 die added will equal 6 is 5/36
recall how many distinct ways we can get 2 die to add to 6 {(1,5), (5,1), (2,4), (4,2), (3,3)}

26. Using the general rule of addition we obtain the following
P(math or networking or both) = P(math) + P(networking) – P(math and networking)
= (11/28) + (9/28) – (3/28) = 17/28

27. total number of balls in the gym bag is 24
a) probability to select a soccer ball is 4/24
b) to select 3 volleyballs after the soccer is removed from part (a), then we have the individual probabilities, (5/23) first volleyball, (4/22) second volleyball, (3/21) third volleyball….
Total probability = (5/23)*(4/22)*(3/21) = 60/10626

28. expected value (μ) = 204.39 arrivals
variance = 6842.74 arrivals^2
standard deviation = ± 82.72 arrivals

Expected future arrivals are 204.39 ± 82.72