1: You roll one die and flip one coin. Determine the probability of

a) rolling 6 or getting heads $\frac{1}{6}+\frac{1}{2}-\frac{1}{6}\times\frac{1}{2}=\frac{7}{12}$

b) rolling an even number or getting heads $\frac{1}{2}+\frac{1}{2}-\frac{1}{2}\times\frac{1}{2}=\frac{3}{4}$

c) rolling a number greater than 2 or getting tails $\frac{4}{6}+\frac{1}{2}-\frac{4}{6}\times\frac{1}{2}=\frac{5}{6}$.

2: You roll two dice. What is the probability of getting

a) a pair or a sum of 8?

b) a 3 or a sum of 9?

c) a sum of 7 or a sum of 11?

a) $\frac{6}{36}+\frac{5}{36}-\frac{1}{36}=\frac{5}{18}$

b) $\frac{1\times 6}{36}+\frac{6\times 1}{36}-\frac{1}{36}+\frac{4}{36}-\frac{2}{36}$ $=\frac{13}{36}$

one 3, one 3, two 3, 36, 9, 3&6, 6&3

c). mutually exclusive. $\frac{6}{36}+\frac{2}{36}=\frac{8}{36}=\frac{2}{9}$

3: You draw a card from a standard deck. What is the probability that the card is

a) a jack or a heart?

b) a face card or an ace?

c) a spade or a heart?

a). $\frac{4}{52}+\frac{13}{52}-\frac{1}{52}=\frac{16}{52}=\frac{4}{13}$ ✓

b) $\frac{12}{52}+\frac{4}{52}=\frac{16}{52}=\frac{4}{13}$ ✓

c) $\frac{13}{52}+\frac{13}{52}=\frac{26}{52}=\frac{1}{2}$ ✓

4: which events in question 1, 2, 3 are mutually exclusive events? 2c) 3b)c)

5: Create a scenario dealing with the rolling of two dice that will be

a) mutually exclusive rolling a 6 or sum of 3

b) not mutually exclusive rolling a 5 or sum of 6.

c) mutually exclusive and have a probability of $\frac{1}{4}$. rolling a sum of 5 or a sum of 6.

d) not mutually exclusive and have a probability of $\frac{11}{36}$

rolling a sum of 6 or difference of 2

1 4
4 1
2 3
3 2

1 5
5 1
2 4
4 2
3 3

$\frac{9}{36}=\frac{1}{4}$ ✓

1 5
5 1
2 4
4 2
3 3

1 3
3 1
2 4
4 2
3 5
5 3
4 6
6 4

$\frac{5}{36}+\frac{8}{36}-\frac{2}{36}=\frac{11}{36}$ ✓

6: A newspaper surveyed 150 people about a change in its format. Of the people surveyed, 87 people like the change, 81 men participated in the survey, and 24 of those men like the change. One of the people who took the survey will win a year's subscription to the paper. What is the probability that the winner will be

a) someone who likes the change in format? 87/150 ✓

b) a man who does not like the change? $\frac{57}{150}$ ✓

c) a woman who likes the change? $\frac{63}{150}$ ✓

men 81: like 24, x 57

women 69: like 63, x 6

You have three toonies and two loonies in your pocket. You pull one coin out and then pull out another (without replacing the first).

a) Create a tree diagram to represent the probability of each outcome.

b) Show that the total of all the probabilities is 1.

$\frac{3}{5}$ T — $\frac{2}{4}$ T, $\frac{2}{4}$ L

$\frac{2}{5}$ L — $\frac{3}{4}$ T, $\frac{1}{4}$ L

$P(TT) = P(T) \times P(T|T) = \frac{3}{5} \times \frac{2}{4} = 0.3.$

c) Show using combinations that question 1 part (b) is correct.

2: Determine the probability of drawing two cards from a deck (without replacement) and getting the same suit using

a) conditional probability $P(2\text{spades}) = P(\text{spade}) \times P(\text{spade}|\text{spade}) = \frac{13}{52} \times \frac{12}{51} = \frac{1}{17}$

b) combinations $\frac{4C_1 \times 13C_2}{52C_2} = \frac{4}{17}$

4 suits ∴ $4 \times \frac{1}{17} = \frac{4}{17}$

3: When Hannah wakes up on time, there is a 10% chance she will miss the bus for school. If she oversleeps, there is a 50% chance she will miss the bus. On average, Hannah oversleeps one morning a week.

a) What is the probability that Hannah will wake up late and miss the bus?

b) What is the probability that Hannah will miss the bus?

$P(\text{oversleep}) = \frac{1}{5}$

$P(\text{wake up}) = \frac{4}{5}$

$P(\text{miss bus} | \text{wake up}) = \frac{1}{10}$

$P(\text{miss the bus} | \text{oversleep}) = \frac{1}{2}$

$\frac{4}{5}$ wake up — $\frac{1}{10}$ miss bus, $\frac{9}{10}$ on time

$\frac{1}{5}$ oversleep — $\frac{1}{2}$ miss time, $\frac{1}{2}$ on time

a) $\frac{1}{5} \times \frac{1}{2} = \frac{1}{10}.$

b) $\frac{4}{5} \times \frac{1}{10} + \frac{1}{5} \times \frac{1}{2} = \frac{9}{50}.$

4: Several studies have been conducted on the effectiveness and safety of the H1N1 influenza vaccine. One study found that in a group that received the actual medication, the drug was 87% effective. In a group that received a placebo, there was a 10% effective rate. If the study used 400 people to receive the placebo and 600 people to get the actual drug, determine the probability that any person in the study will

a) receive the drug and not get sick

b) not get sick

$P(\text{effective} | \text{actual}) = 87\%$

$P(+ | \text{placebo}) = 10\%$

$P(\text{placebo}) = \frac{400}{1000} = 40\%$

$P(\text{actual med}) = 60\%$

40% placebo — 10% +, 90% −

60% actual drug — 87% +, 13% −

a) $60\% \times 87\%$

b) $40\% \times 10\% + 60\% \times 87\% = 0.562$

5: In the game of Pig, players repeatedly roll a die to accumulate points. For every roll, a player adds that value to his or her point total. The catch is that if you roll 1, you lose all of your points. Players can roll as many times as they wish and quit whenever they want. The object is to be the person who quits with the highest point total.

Determine the probability of not rolling 1 until

i) the first roll $\frac{1}{6}$

ii) the second roll $\frac{5}{6} \times \frac{1}{6}$

iii) the fourth roll $(\frac{5}{6})^3 \times \frac{1}{6}$

iv) the sixth roll $(\frac{5}{6})^5 (\frac{1}{6})$

6: In your school, of all the students who take both Data Management and English, 90% pass Data Management, 85% pass English, and 82% pass both.

a) Determine the probability that if someone takes both Data Management and English, they will fail both.

D E: 8, 82, 3; 7

b) Are passing English and passing Data Management independent events? Explain.

$P(A \text{ and } B) \neq P(A)P(B)$

$82\% \neq 90\% \times 85\%$

∴ dependent.