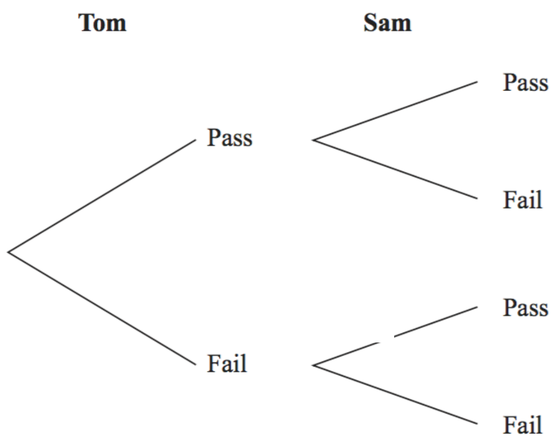
Section A

Show all work and write all answers in the spaces provided. Maximum marks will be given for correct answers. Where an answer is wrong, some marks may be given for correct method, provided the answer is supported by written work. Answers can be expressed as fractions (reduced OR non-reduced) or decimals

1. The probability that Tom will pass a driving test is 0.8. The probability that Sam will pass the same driving test is 0.60.

(6 marks)

a. Complete the probability tree diagram below. **(2M)**



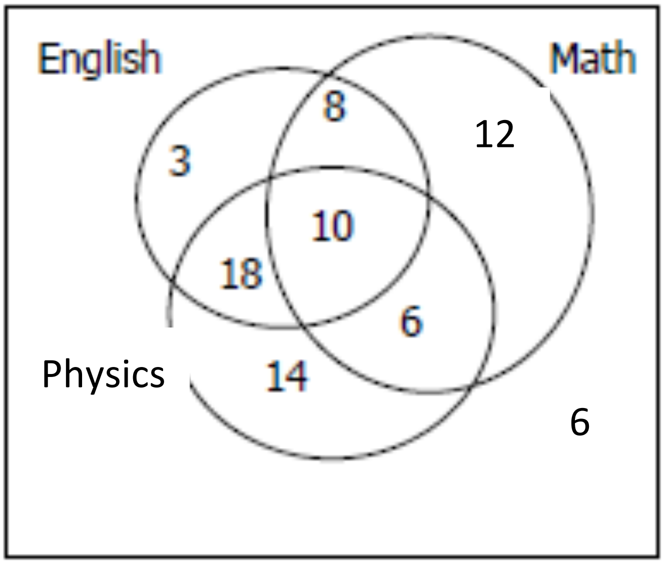
b. Determine the probability that both Tom and Sam will pass the driving test. **(1M)**

c. Determine the probability that only one of them passes the driving test. **(2M)**

d. How probable is it that Sam passes the driving test, given that Tom doesn't. **(1M)**

2. First year IB students at Juan Fine International School were surveyed about which courses they liked. The Venn diagram given at the right shows the results of the survey. Use the diagram to find the following:

(8 marks)



a. How many students were surveyed? **(1M)**

b. How many students like Math or English, **only**? **(1M)**

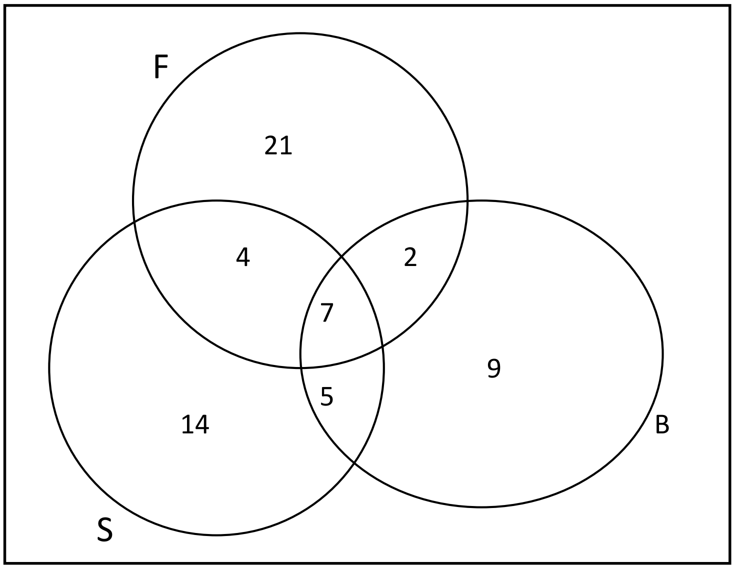
c. P(like either Math or English, but not both) **(2M)**

d. P(Like Physics | do not like English) **(2M)**

e. P(like English | like either Math or Physics) **(2M)**

3. A group of 70 students were asked if they played field hockey (F), basketball (B) or soccer (S). The diagram below displays the results. Use the diagram to determine the following probabilities.

(9 marks)



a. A randomly selected student plays **none** of the three sports? **(1M)**

b. A randomly selected student plays field hockey? **(1M)**

c. Two randomly selected students play field hockey? **(2M)**

d. A randomly selected student plays only 1 sport? **(1M)**

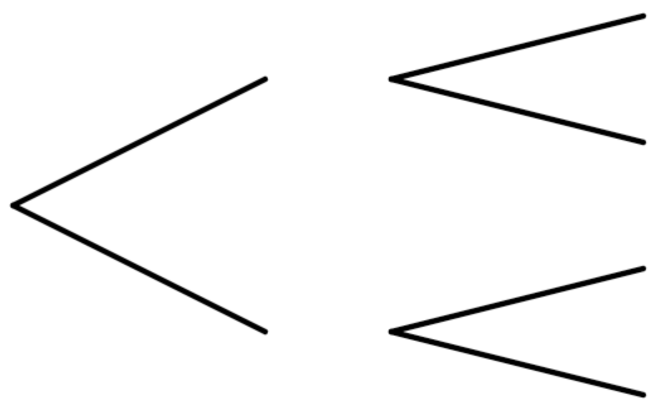
e. A randomly selected student plays field hockey **given that** they play soccer or basketball? **(2M)**

f. A randomly selected student plays basketball **given that** they don't play soccer? **(2M)**

4. This probability "experiment" consists of two boxes containing marbles. In the "experiment", you will be making two "draws". Box X contains 3 red and 2 white marbles. Box Y contains 1 red and 4 white marbles. You first randomly select a marble from Box X, record its color. **You then take this marble and put it into Box Y**. Finally, in your second draw, a marble is then randomly chosen from Box Y.

(10 marks)

a. Prepare a tree diagram to help you work out the following probability questions. **(4M)**



b. How probable is it that you have selected two marbles of the same colour? **(2M)**

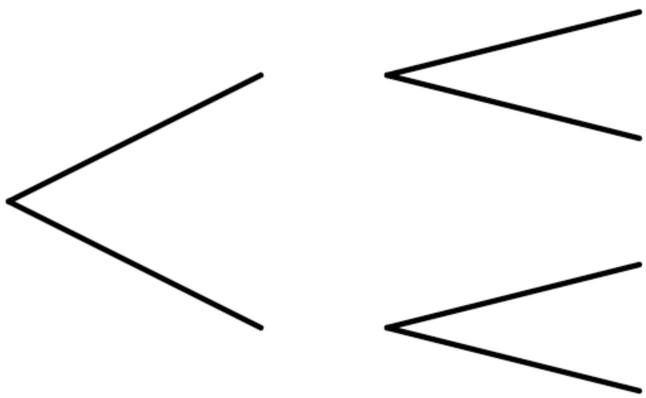
c. What is the probability that the marble chosen from box Y is red? **(2M)**

d. If the marble from Box Y is red, what is the probability that the marble removed from Box X was white? **(2M)**

5. There is a 40% chance of heavy snow and a 60% chance of light snow. If there is a heavy snow then there is a 75% chance that the school closes. If there is a light snow there is only a 30% chance that the school closes.

(9 marks)

a. Create a tree diagram for this problem. **(3M)**



Answer the following probability questions using your tree diagram:

b. How probable is it that the school closes? **(2M)**

c. How probable is it that there is heavy snow and school remains open? **(1M)**

d. How probable is it that there is light snow, given that the school remains open? **(2M)**

e. How probable is it that if school closes, then there is light snow? **(1M)**

Section B

Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for correct method, provided this is shown by your written work. You are therefore advised to show all working.

6. Sara estimates that she has a 70% chance of passing Science and a 90% chance of passing Math. Initially, let's assume that {passing Science} and {passing Math} are **independent** events.

(10 marks)

a. Explain what it means when we say that the events are independent. **(1M)**

b. Draw a tree diagram wherein EVENT #1 is Science and EVENT #2 is Math. **(3M)**

c. What is the probability that she does pass **both** courses? **(1M)**

d. What is the probability that Sara will pass only one of these two subjects? **(2M)**

Now let's change these events to being **dependent** events

e. What does the concept of "dependent events" mean? **(1M)**

f. Since these events are now dependent, it is known that P(pass Math | fail Science) = 97%. What is the probability of **failing both courses**? **(2M)**

7. Mr. S knows that part of working through probability questions is the ability to count outcomes; both total outcomes as well as favourable outcomes. So Mr. S wants to select 3 captains for his JV basketball team. His team has 11 players.

(8 marks)

a. If the order in which the players were selected DOES MATTER, show calculations OR explain why there are 990 different possible outcomes for who the team captains are. **(1M)**

b. Since the selection order DOES MATTER, how probable is it that: **(6M)**

(i) Sam is one of the captains selected?

(ii) Sam and Jyeong Kyu are both selected?

(iii) either Jyeong Kyu or Amr are selected?

c. If the order in which the players were selected DID NOT MATTER, show calculations OR explain why there are now only 165 different possible outcomes for who the team captains are. **(1M)**

8. Hannah is going to play one badminton match and one tennis match. The probability that she will win the badminton match is 0.9. The probability that she will win the tennis match is 0.4. Initially, let's assume that the events are independent.

(8 marks)

a. Determine the probability that Hannah wins both matches. **(2M)**

b. Determine the probability that Hannah looses both matches. **(2M)**

Hannah now plays 3 badminton games. The probability of her winning remains the same, at p(win) = 0.9 and we will continue to assume that the outcomes & probabilities of the 3 badminton games are **independent**.

c. Determine the probability that Hannah wins all badminton three games. **(1M)**

d. Determine the probability that Hannah wins two badminton games. **(1M)**

Now, in sports, there are times when the results of one game are however **dependent** upon the previous results. Now assume that the probability of winning after losing the previous game **decreases by 0.10**.

e. Now, determine the **new** probability that Hannah wins two badminton games. **(1M)**

The complement of an event is simply the idea that the event in question does not happen. So the complement of the event of **winning** a game in badminton (use the symbol W) is **not winning** a game in badminton (use the symbol W'). Mathematically, P(W) = 1 – P(W').

f. Given this definition above, is the following mathematical statement true or false:
P(Hannah loses all three games) = 1 – P(wins all three games)? Explain your reasoning. **(1M)**