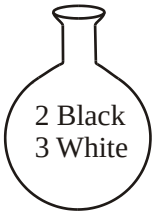
1. Two jars contain a number of coloured balls as indicated in the diagrams below.



Jar One

Jar Two

Two experiments are carried out.

First Experiment: A jar is first chosen at random and then a ball is drawn from that jar.

(a) Draw, **and label fully**, a tree diagram to show **all** possible outcomes of this experiment.

(2)

(b) What is the probability that a white ball is drawn?

(3)

Second Experiment: The ball drawn in the first experiment is not replaced. A second ball is then drawn from the same jar.

(c) What is the probability that both balls are white?

(2)
(Total 7 marks)

2. The propositions p, q and r are defined as follows:

p: this is a good course
q: the course is worth taking
r: the grading is lenient

(a) Write a symbolic statement for each of the following sentences.

(i) *If this is a good course, then it is worth taking.*

(ii) *Either the grading is lenient, or the course is not worth taking.*

(2)

(b) Write the following argument using *p*, *q*, *r* and logic symbols or connectives only.

If this is a good course, then it is worth taking. Either the grading is lenient, or the course is not worth taking. But the grading is not lenient. Therefore, this is not a good course.

(2)

(Total 4 marks)

3. The propositions *p* and *q* are defined as follows:

p: you have understood this topic

q: you will be able to do this question

(a) Write the following proposition in symbols using p, q and logical connectives only.

"You have understood this topic, or you will not be able to do this question."

(b) Explain, in words only, what the following symbolic proposition represents:

$(p \wedge \neg q) \Rightarrow \neg p$.

(Total 4 marks)

4. A group of 30 children are surveyed to find out which of the three sports cricket (*C*), basketball (*B*) or volleyball (*V*) they play. The results are as follows:

3 children do not play any of these sports
2 children play all three sports
6 play volleyball and basketball
3 play cricket and basketball
6 play cricket and volleyball
16 play basketball
12 play volleyball.

(a) Draw a Venn diagram to illustrate the relationship between the three sports played.

(1)

(b) On your Venn diagram indicate the number of children that belong to each region.

(3)

(c) How many children play only cricket?

(2)

(Total 6 marks)

5. Given that $h = \sqrt{l^2 - \frac{d^2}{4}}$,

(a) Calculate the **exact** value of h when $l = 0.03625$ and $d = 0.05$.

(2)

(b) Write down the answer to part (a) correct to three decimal places.

(1)

(c) Write down the answer to part (a) correct to three significant figures.

(1)

(d) Write down the answer to part (a) in the form $a \times 10^k$, where $1 \leq a < 10$, $k \in \mathbb{Z}$.

(2)

(Total 6 marks)

6. The total weight of 256 identical pencils is 4.24 kg. Calculate the weight of one pencil, in kg.

(a) Give your answer exactly.

(b) Give your answer correct to three significant figures.

(c) Write your answer to part (b) in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$.

(Total 8 marks)