1. [4 marks] Let $A = \{2, 6, 7\}$, $B = \{3, 6, 9\}$ and $C = \{7, 8, 9\}$.

a) Find $(A \cup B) \cap (B \cup C)$.

$A \cup B = \{2, 3, 6, 7, 9\}$

$B \cup C = \{3, 6, 7, 8, 9\}$

$(A \cup B) \cap (B \cup C) = \{3, 6, 7, 9\}$

b) Write out all the subsets of A that contain exactly two elements.

$\{2, 6\}$, $\{2, 7\}$, $\{6, 7\}$

2. [2 marks] A four-sided die (with numbers 1,2,3,4 on its sides) is rolled twice. We record the total of the two numbers that are rolled. Write out the sample space of this experiment.

Smallest total = $1 + 1 = 2$

largest total = $4 + 4 = 8$

$S = \{2, 3, 4, 5, 6, 7, 8\}$

3. [3 marks] Find the number of elements in $(A \cup B)'$ given:
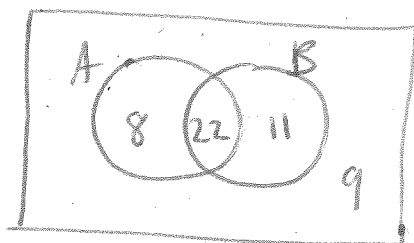$n(U) = 50, n(A) = 30, n(B) = 33$ and $n(A \cap B) = 22$.

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$n(A \cup B) = 30 + 33 - 22$

$n(A \cup B) = 41$

$n((A \cup B)') = 50 - 41 = 9$

OR Use a Venn diagram:

$n((A \cup B)') = 9$

4. [3 marks] Nine people apply for a job and six of them are experienced. How many ways are there to:

a) Seat the **inexperienced** applicants in a row on the day of the interviews?

[6 experienced ; 3 inexperienced]

$P(3,3)$ or $3 \times 2 \times 1$ = 6

b) Seat the **experienced** applicants in a row on the day of the interviews?

$P(6,6)$ or $6 \times 5 \times 4 \times 3 \times 2 \times 1$ = 720

c) Select four of the nine applicants and seat them in a row on the day of the interviews?

$P(9,4)$ or $C(9,4) \times (4 \times 3 \times 2 \times 1)$ = 3024
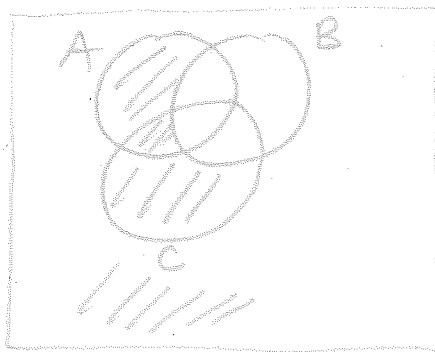
or $9 \times 8 \times 7 \times 6$

5. [3 marks] A full house in poker consists of three cards of one denomination and two cards of a different denomination, for example 77733. How many possible full house hands can be chosen from a standard deck of cards?

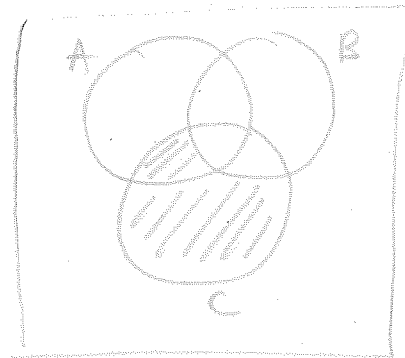$\boxed{13} \times \boxed{C(4,3)} \times \boxed{12} \times \boxed{C(4,2)}$

Select denomination of triple   Select suits for triple   Select denomination of pair   Select suits for pair

= $13 \times 4 \times 12 \times 6$

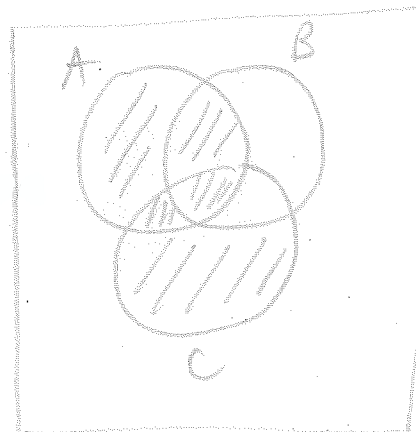= 3744

6. [3 marks] Draw a Venn diagram and shade in $A \cup (B' \cap C)$.

B'

$B' \wedge C$

$A \cup (B' \wedge C)$

7. [4 marks] An experiment has four possible outcomes: A, B, C and D. Write down the probability distribution if: $Pr(A) = 0.13, Pr(B) = 0.21$, and C is five times as likely as D.

Outcome	Probability
A	0.13
B	0.21
C	5x
D	x

$\leftarrow$ Let $Pr(D) = x$
So $Pr(C) = 5x$

$$0.13 + 0.21 + 5x + x = 1$$
$$0.34 + 6x = 1$$
$$6x = 0.66$$
$$x = 0.11$$

Outcome	Probability
A	0.13
B	0.21
C	0.55
D	0.11

8. [3 marks] Draw a Venn diagram for the following situation.

Out of 70 students:
23 like to run
25 like to bike
32 like to swim
7 like to run and bike
8 like to run and swim
9 like to bike and swim
6 like to run, bike and swim

Let R = likes to run
B = " bike
S = " swim

7 - 6
9 - 6

8 - 6

23 - 1 - 6 - 2

25 - 1 - 6 - 3

32 - 2 - 6 - 3

70 - 14 - 1 - 15
- 2 - 6 - 3 - 21