Question 1

[3 marks]

Express each of the following as the product of consecutive factors, fully simplifying your answer.

a.





C.



Question 2

[3 marks]

Find the integer *n* if ${}^{n}P_{n-7} = 720$.

 $\frac{n!}{4!} = \frac{n!}{n-(n-7)!} = \frac{n!}{7!} = 720.$ $n! = 720 \times 7! \quad n! = 10! \quad n = 10$

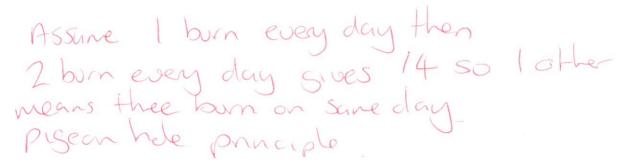
Question 3

Show that:

[3 marks]

 $n = \frac{n!}{(n-r)!(n-(n-r)!)} = \frac{n!}{(n-r)!r!} = n = n$

A class has 15 students. Explain why there must be at least 3 students who are born on the same day of the week.



Question 5

Let $\mathbf{u} = -\mathbf{i} + 2\mathbf{j}$ $\mathbf{v} = -2\mathbf{i} - \mathbf{j}$ and $\mathbf{w} = 3\mathbf{i} + 9\mathbf{j}$

[10 marks]

(a) Show that \mathbf{u} and \mathbf{v} are perpendicular.

U.V = -1x-2+2x-1 = 2-2=0. : Scalar product = 0 : perpendicular.

(b) Find the acute angle between u and w.

 $\frac{a.b}{|a||b|} = \cos \theta \qquad \frac{u.w}{|a||b|} = \frac{3 + 18}{15 \times 300} = \frac{15}{15 \times 300} = \frac{15}{15 \times 300} = \frac{15}{15 \times 300} = \frac{1}{15 \times 300} = \frac{1}{15$

(c) Find the vector projection of w onto v.

 $\hat{V} = \frac{-2i - 5}{\sqrt{5}} \qquad (\omega.\hat{V})\hat{V}$ $= (\frac{-6}{\sqrt{5}} + \frac{-9}{\sqrt{5}})\frac{-2i}{\sqrt{5}} - \frac{1}{\sqrt{5}}$ $= -\frac{15}{\sqrt{5}} \left(-\frac{2i}{\sqrt{5}} - \frac{1}{\sqrt{5}}\right) = 6i + 3i$

(d) w is the vector projection of $\lambda(2i+j)$ onto w. Find λ .

 $\frac{3}{50} = \frac{1}{50} + \frac{3}{50} = \frac{12}{50} + \frac{1}{50} = \frac{3}{50} = \frac{3}{50}$

Question 6

[2 marks]

Circle the entries in Pascal's Triangle below that show:

- a. $\begin{pmatrix} 7 \\ 4 \end{pmatrix}$
- b. ³C₂

Question 7

[2 marks]

In a group of students there are 15 who play basketball and 17 who play netball. If 8 students played both sports, how many play at least one spot?

Section	Two:	:	Calcu	lator	Assumed
Time Allowed		35 minutes			

Mark 29	
Name:	

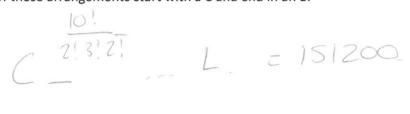
Question 8

[6 marks]

How many ways can the letters of the word MATHEMATICAL be arranged in a row?

12! = 19958400-

How many of these arrangements start with a C and end in an L?



How many of these arrangements start or end with a C or L?



Question 9

[7 marks]

The year 11 student leaders consisting of 3 girls and 4 boys are to be arranged in a line for a photo.

(a) How many possible arrangements are there?



(b) How many arrangements are there if all the girls are next to each other?

(c) How many arrangements are there if all the girls are next to each other and all the boys are next to each other?



(d) How many arrangements if no two girls or no two boys are next to each other?



How many positive integers less than 1000 are:

(a) divisible by 2?

499.

(b) divisible by 3?

333

(c) divisible by 2 and 3?

and 3?

(d) divisible by 2 or 3?

499+333-166=666.

(e) have 3 digits and divisible by 2 and 3?

2100 2. 49. 3 33 2e3 = 66. 2w3 = 66.

1. 666-66=600

A committee of 6 students is to be formed from 10 Year 10 students and 11 Year 11 students. How many different committees can be formed if:

(a) there is no restriction on who is on the committee

C6 = 54 264

(b) the committee consists of only year 11 students



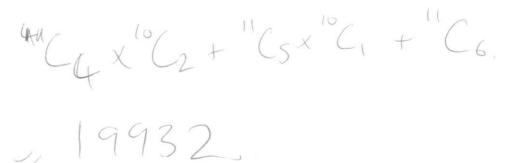
(c) the committee has 3 year 10 students and 3 year 11 students



(d) the committee has at least 1 year 10 student?



(e) the committee has at least 4 year 11 students?



Daniel needs to create a four digit password using the letters A, B, C, D, E and the digits 1, 2, 3, 4.

(a) How many passwords can be created if the characters can be repeated?

(b) How many passwords can be created if the password has two letters followed by two digits the letters can be repeated but digits can only be used once?

If no character is repeated.

(c) How many passwords can be created?

(d) How many passwords can be created if the password contains either only letters or only numbers?

(e) How many password have two letters followed by two digits?

(f) How many passwords have both letters and digits?

