Maths Apps Unit 3 (page 1) Jenna Hogan 2017

1. Bivariate data

- Two-way frequency tables
  - Explanatory variable eg. Gender
  - Response variable eg. Transport to school

(The explanatory variable is the variable used to explain or predict a difference in the response variable)

	Bus	Car	Train	Other	Totals
Male	26	47	32	19	124
Female	35	70	45	24	174

	Bus	Car	Train	Other	Totals
Male	21%	38%	26%	15%	100%
Female	20%	40%	26%	14%	100%

Genral Rule:

- If the explanatory variable uses the rows to show its different categories use row percentages (based on row total)
- If the explanatory variable uses the columns to show its different categories use column percentages (based on column total)

2. Bivariate data - further analysis

- Form: linear or non linear
- Direction: Positive or negative
- Strength: Strong, moderate, weak

(examples page 42, Unit 3 MathsApps TextBook)

Calc: • linear regression [Stats]

- predicted value
- correlation coefficient (r)
- coefficient of determination (r^2)

3. Sequences

Repeatedly:

- adding/taking # +3/-2
- multiplying/dividing # ×3/÷2

Recursive Rule/Formula

4. Sequences - some specific types

- Arithmetic sequences (AP) (Linear graph)

Constant first difference pattern/gradient

Diff: +4 = 7, 11, 15, 19, 23...

$T_{n+1} = T_n + \text{diff}(d)$, T_1 = 1st term (a)

- Geometric sequences (GP) (Exponential graph)

Multiplying previous term by constant amoun

Ratio: 3 = 5, 15, 45, 135, 405...

$T_{n+1} = \text{ratio}(r) \times T_n$, T_1 = 1st term (a)

- AP - jumps eg.

$T_{n+1} = T_n + 7,\ T_1 = 25$

$T_2 = T_1 + 7 = 32$

$T_{100} = T_1 + 99(7) = 25 + 693 = 718$

$- T_n = a + (n-1)d$

- GP - jumps

$T_n = a \times r^{n-1}$ or:

Calc: sequences

- Sequences can show growth + decay
- First order linear recurrence relations

$T_{n+1} = b \times T_n + c$

Eg. $T_{n+1} = 1.2 \times T_n - 50,\ T_1 = 400$

$T_2 = 1.2 \times T_1 - 50 = 430$

$T_3 = 1.2 \times T_2 - 50 = 466$

$T_4 = 1.2 \times T_3 - 50 = 509.2$

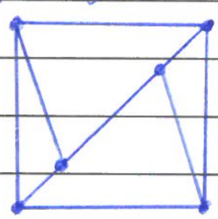
5. Networks

Euler's Rule

vertices + faces = edges + 2

$v + f = e + 2$

eg. Edges?



$v + f = e + 2$

$6 + 5 = e + 2$

$11 - 2 = e$

$9 = e$

∴ 9 edges on this network

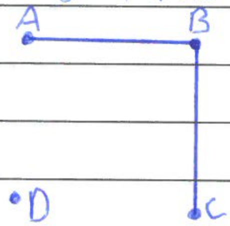
5. Network cont. Vocab

- Loop - any edge that starts and ends at same vertex
- Multiple Edges - if two or more edges connect the same two vertices, then the edges are said to be multiple edges
- Weighted Graph/Network - when each edge is numbered showing a particular value
- Directed Graph/Diagraph - has directed edges (arrows)
- Undirected Graph - no direct edges (no arrows)
- Simple Graph/Network - undirected, unweighted, no loops, no multiple edges
- Simple Directed Graph - simple, arrow
- Simple Weighted Graph - simple, weighted

WALKS:

- Closed - starts + finishes at same vertex
- Open - doesn't finish at starting vertex
- Path - a walk, no repeated use edge or vertex
- Open Path - starting + finish vertices different
- Closed Path - finishes at starting vertex
- Trail - no repeated use of an edge
- Closed Trail - ends at vertex it started from
- Length of Walk, Path, Trail - # of edges travelled

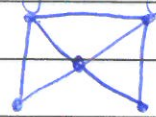
VERTICES



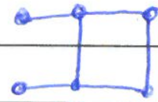
- Connected: B+C
- Adjacent: A+B
- Unconnected: A+D
- Complete Graph - every vertex is connected to every one by single edge
- Bridge - in connected network, any edge which, when removed, leaves the network disconnected
- Connections with directed networks - with directed networks we instead talk about the "strength" of the connections

- Traversability - can it be drawn without taking the pen off the paper and without going over the same edge twice (can go through vertices)?

Traversable:



Not Traversable:



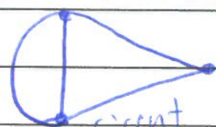
- Planar graphs - can be drawn with its edges only intersecting at vertices

Eulerian circuit - a connected graph, travels every edge once and only once, repeated vertices permitted

eg.

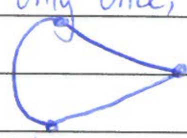
Semi-Eulerian trail - a connected graph, open trail, every edge only once, must have two odd vertices

eg.



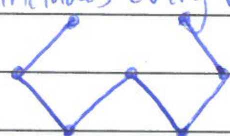
Hamiltonian circuit - every vertex in a graph only once, exception of start/finish

eg.



(closed path)

Semi Hamiltonian trail - open path that includes every vertex in graph once



(open path)

Eulerian - no odd vertices

Semi-Eulerian - 2 odd vertices

6. Shortest path

find shortest path