TRINITY COLLEGE

Year 12 Mathematics Application
Test 2 2017

Section 1 Calculator Free

Sequences and Networks

STUDENT'S NAME _____

DATE: Thursday 30th March **TIME:** 15 minutes **MARKS**: 15

INSTRUCTIONS:

Standard Items: Pens, pencils, drawing templates, eraser

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

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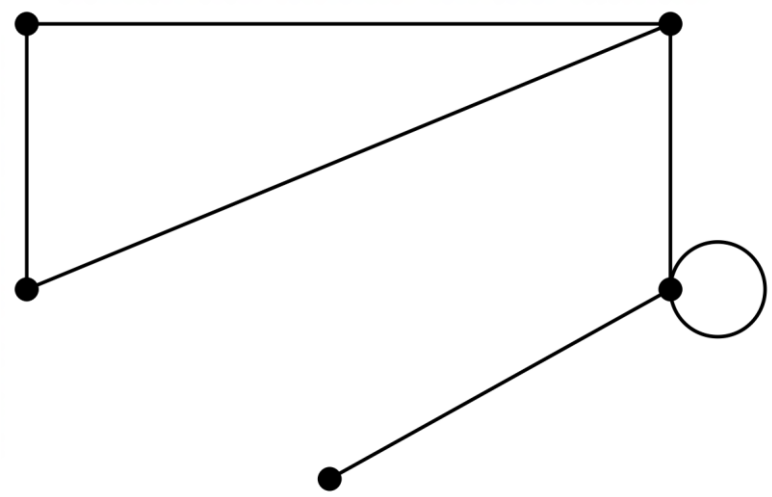
1. (5 marks)



Identify and label each of the following components of the above network.

(a) any loop(s) [1]

(b) any bridge(s) [2]

(c) any cycle(s) [2]

2. (3 marks)

Draw a connected planar graph such that it satisfies the following criteria. The network must have 4 vertices, 5 edges (including one bridge) and 3 faces.

3. (4 marks)

Given the arithmetic sequence 4, 1, -2, -5, -8…

(a) Identify the first term. [1]

(b) Identify the common difference [1]

(c) State the simplified general rule [2]

4. (3 marks)

A geometric progression has a third term of 6 and fifth term of 54. Determine the:

(a) Common ratio [2]

(b) First term [1]

TRINITY COLLEGE

Year 12 Mathematics Applications
Test 2 2017

Section 2 Calculator Assumed

Sequences and Networks

STUDENT'S NAME _____

DATE: Thursday 30th March **TIME:** 35 minutes **MARKS**: 35

INSTRUCTIONS:

Standard Items: Pens, pencils, drawing templates, eraser

Special Items: Three calculators, notes on one side of a single A4 page (these notes to be handed in with this assessment)

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

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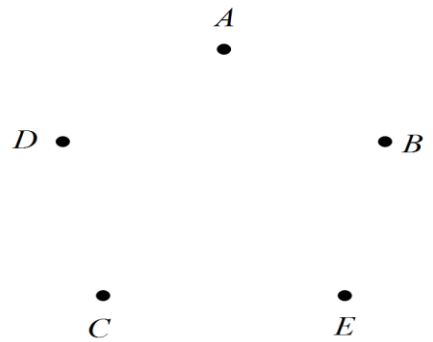
5. (4 marks)

To:

From:	A	B	C	D	E
A	0	2	1	2	0
B	2	2	0	1	0
C	1	0	0	3	1
D	1	1	3	1	0
E	0	1	1	0	0

Draw the directed network corresponding to the above adjacency matrix



6. (7 marks)

A runner is attempting to complete a 24-hour race to raise money for charity. In the first hour, the runner travels 6 km, in the second hour travels 5.7 km and in the third hour 5.415 km.

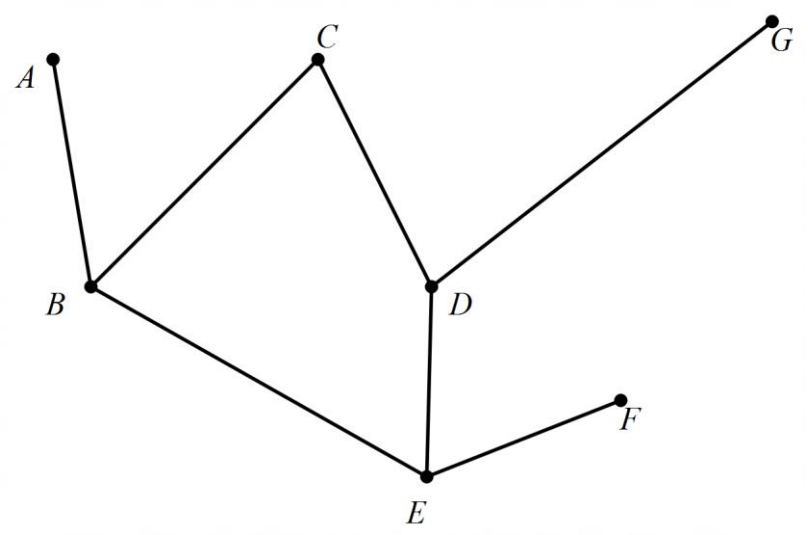
(a) Show that there is a geometric relationship between the distances run and that the common ratio is 0.95. [2]

(b) Write a recursive rule for the distance travelled each hour. [2]

(c) How far, to the nearest metre, will the runner travel during the 10^{th} hour? [1]

(d) How far will the runner travel in the last 3 hours? [2]

7. (6 marks)



(a) Given the above network determine the degree of each of the vertices below.

(i) A [1]

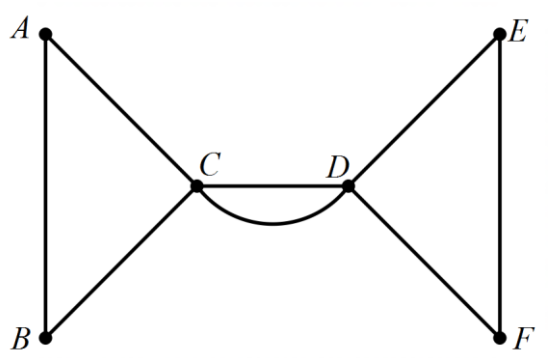
(ii) D [1]

(b) Redraw the network so that it is obviously bipartite and hence state the two groups of vertices [4]

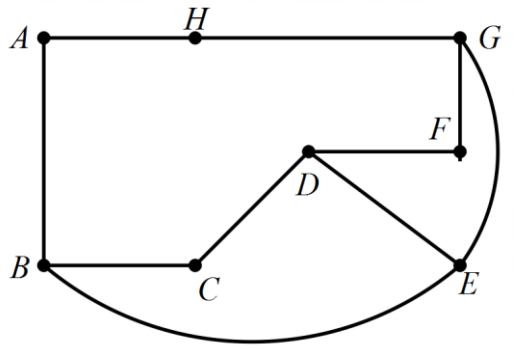
8. (6 marks)

Classify the following networks as Eulerian, semi-Eulerian, Hamiltonian, semi-Hamiltonian or none of the previous terms.

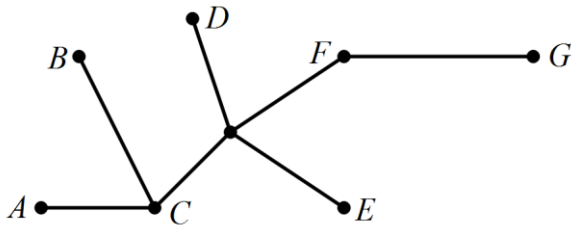
(a) [2]



(b) [2]



(c) [2]



9. (5 marks)

A crayfish farm increases its population by a constant percentage every month before a constant amount of crayfish are taken out to be sold. The first order linear recurrence relation for this is:

$$C_n = 1.15C_{n-1} - 70,\ C_0 = 750$$

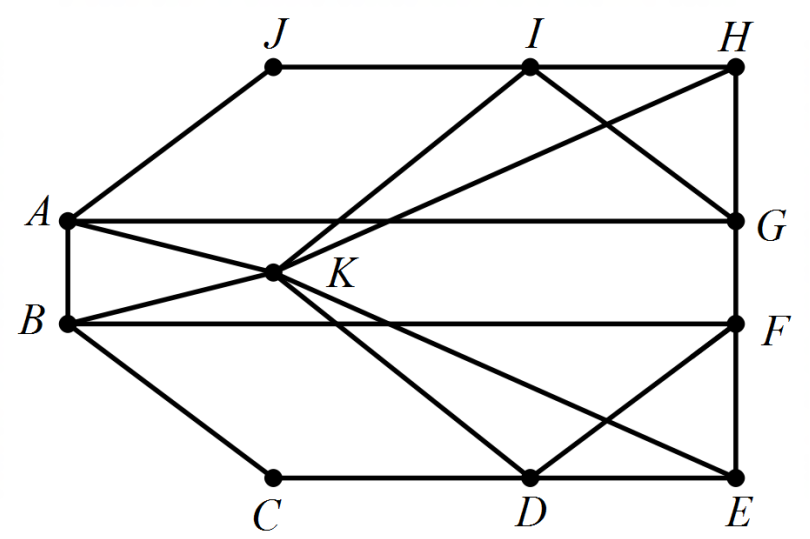
(a) By what percentage does the population increase each month? [1]

(b) How many crayfish will be in the farm after 7 months? [1]

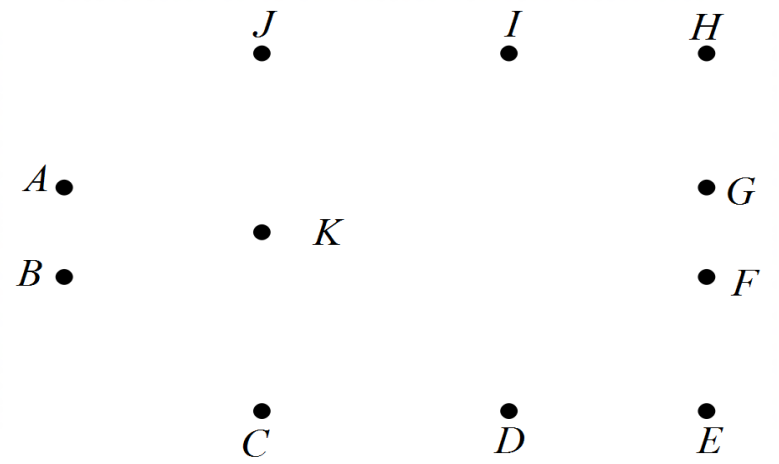
(c) The amount of crayfish at 7 months is close to capacity for the farm and it is decided that the population should be stabilised. How many crayfish must be taken out every month to maintain a stable population of that given in part (b)? [1]

(d) State the new first order linear recurrence relation, where C_0 is the population at 7 months. [2]

10. (7 marks)



(a) Redraw the network above so that it is planar. [2]



(b) Use Euler's formula to verify that part (a) is correct. [1]

(c) Given that a Hamiltonian cycle is possible state a path that satisfies this. [2]

(d) Is it possible to add a single edge to this network to make it Eulerian whilst continuing to be planar? If so add it to your network in part (a). [2]