Name: _____

Class: _____

Due Date: _____

Orange High School

Standard Mathematics 2 Year 12

Task 3 Assignment

2021

Section One

Outcomes Assessed MS12-5: makes informed decisions about financial situations, including annuities and loan repayments MS2-12-8: solves problems using networks to model decision-making in practical problems MS12-10: uses mathematical argument and reasoning to evaluate conclusions, communicating a position clearly to others and justifying a response		
Weighting	**25%**	**Due:** This assignment is due to your classroom teacher in class, Thursday 20th May (Term 2 Week 5).
Penalties as per assessment booklet Failure to submit the assignment within the negotiated timeframe may result in an N-award in Standard Mathematics.		

Year 12 Standard Mathematics Assignment

Nature of the task

This assignment requires you to apply what you have learnt in class about the units of Network Concepts and Annuities. This assignment will be conducted in the following two sections:

Section One: This part requires you to answer the questions within the booklet. Answering the questions will assist students in studying for the In-Class component. This section will be worth 20% of Task 3 marks.

Section Two: This will be a one period in-class component. Questions may be similar to Section One, however questions will not be limited to those questions This section will be worth 80% of Task 3 marks.

Submission

Section One: Please complete all questions and working in the booklet provided. Booklet to be handed in at the end of the period of your in-class part. This will be used as a resource for section two.

Section Two: Will be conducted in-class.

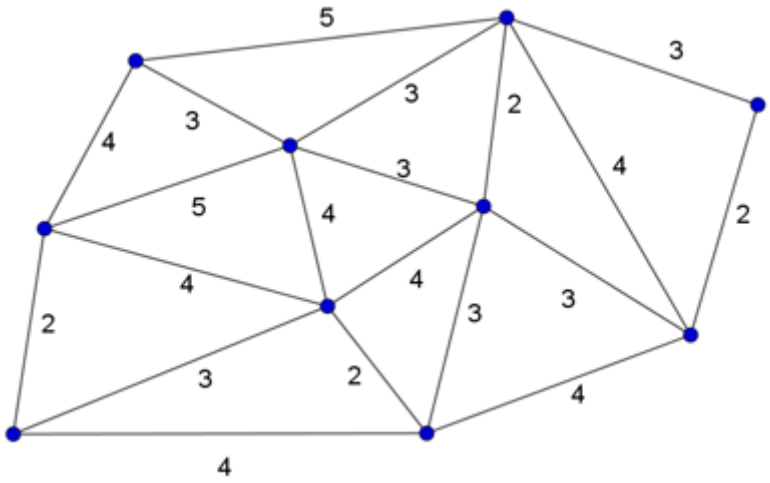
(21 marks)

1. Draw a network with the given specifications. (2 marks)

a) Exactly six vertices and six edges.

b) Exactly four vertices and seven edges.

2. For the network below, answer the following questions.



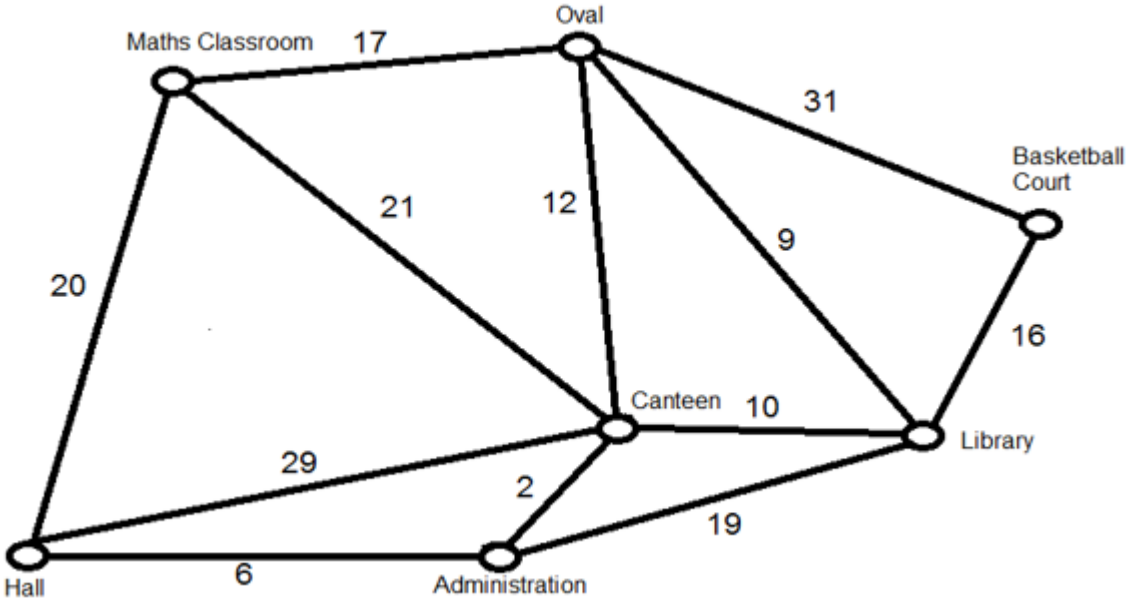
a) Draw a minimum spanning tree. (1 mark)

b) Calculate the length of the minimum spanning tree. (1 mark)

_____

_____

3. A student created a network to represent their school. The vertices represent a location in the school and each edge represents the distance to that location (1 mark)



What is the shortest path from the student's Maths Classroom to the Basketball Court? Provide calculations to justify your answer.

_____

_____

_____

4. You are planning to go for a drive around the local area visiting the following cities and towns: Orange, Bathurst, Blayney, Cowra, Forbes, Parkes, Dubbo, Wellington, Mudgee and Molong.

a) Using Google Maps, complete the weighted table with quickest time between these locations. (1 mark)

	Orange	Bathurst	Blayney	Cowra	Forbes	Parkes	Dubbo	Wellington	Mudgee	Molong
Orange	-			-			-	-	-	
Bathurst		-		-	-	-	-	-		-
Blayney			-		-	-	-	-	-	-
Cowra	-	-		-		-	-	-	-	-
Forbes		-	-		-		-	-	-	-
Parkes		-	-	-		-		-	-	-
Dubbo	-	-	-	-	-		-		-	-
Wellington	-	-	-	-	-	-	-	-		
Mudgee	-		-	-	-	-	-		-	-
Molong		-	-	-	-	-	-		-	-

b) Using the completed table, draw a network diagram. (2 marks)

c) Using your network, is it traversable? If so, write the possible sequence. If not, why is it not possible? (1 mark)

_____

_____

_____

_____

d) Two friends are planning to meet you in Orange for lunch at Midday. Tom lives in Forbes and must travel via Parkes to pick up a parcel. David lives in Mudgee and knows there are road works between Orange and Bathurst slowing that road down by 30 minutes. Which friend has to leave the earliest and how much earlier must they leave? (2 marks)

_____

_____

_____

_____

_____

_____

5. Using the future value table, answer the following questions.

Table of future value interest factors					
	Interest rate per period				
Period	1%	2%	3%	4%	5%
1	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0100	2.0200	2.0300	2.0400	2.0500
3	3.0301	3.0604	3.0909	3.1216	3.1525

a) Calculate the future value of an annuity of $1200 per year for three years at 5% p.a. (1 mark)

_____

_____

b) Calculate the future value of an annuity of $1000 compounded biannually for one year at 8% p.a. (1 mark)

_____

_____

6. Using the present value table below, answer the following questions. The rate is represented as a decimal. (1 mark)

	Interest Rate					
Period	**0.0060**	**0.0065**	**0.0070**	**0.0075**	**0.0080**	**0.0085**
45	39.33406	38.90738	38.48712	38.07318	37.66545	37.26383
46	40.09350	39.64965	39.21263	38.78231	38.35859	37.94133
47	40.84841	40.38714	39.93310	39.48617	39.04622	38.61311
48	41.59882	41.11986	40.64856	40.18478	39.72839	39.27924
49	42.34475	41.84785	41.35905	40.87820	40.40515	39.93975
50	43.08623	42.57113	42.06459	41.56645	41.07653	40.59470

Determine the monthly repayment for a car loan of $8000 at 9% p.a. for four years.

_____

_____

_____

_____

7. An investment is modelled by the recurrence relation $V_{n+1} = V_n \text{ x } 1.011 + 650$ where V_n is the balance of the investment after *n* payments and $V_0 = 54\,600$.

What is the balance of the loan after three payments? (1 mark)

_____

_____

_____

_____

8. Mary borrows $35 000 to buy a new car. Interest will be charged at 12% per annum, compounding monthly. Mary will repay the loan with monthly payments of $950. A recurrence relation that models the value of Mary's loan after *n* months, is V_n, is shown below.

$$V_{n+1} = V_n \times 1.012 - 950 \text{ and } V_0 = 35\,000$$

a) Find the value of the loan after 1 month, V_1. (1 mark)

_____

_____

_____

_____

b) How much interest did Mary pay with the first payment of $950? (1 mark)

_____

_____

_____

_____

c) By how much has the balance of the loan been reduced by the first payment? (1 mark)

_____

_____

_____

_____

9. Jeremy borrowed $300 000 to buy an apartment. The interest rate is 6% per annum, compounded monthly. The repayments were set by the bank at $2200 per month for 20 years.
The loan balance sheet shows the interest charged and the balance owing for the first month.

Month	*Principal at the start of the month*	*Monthly interest*	*Monthly repayment*	*Balance at end of month*
1	$300 000	$1500	$2200	$299 300
2	$299 300	***A***	$2200	***B***

a) What is the total amount that is to be paid for this loan over 20 years? (1 mark)

_____

_____

_____

_____

b) Find the values of A and B. (2 marks)

_____

_____

_____

_____

_____

_____