## **Carlingford High School**



# **Mathematics Standard 2**

## Year 12 Assessment Task 3 - 2019

STUDENT NUMBER:	

#### General Instructions

- Working time 50 minutes
- Write using black pen, pencils may be used for diagrams
- Calculators approved by NESA may be used
- A reference sheet is provided at the back of this paper
- For questions in Section II, show all relevant mathematical reasoning and/or calculations

TOPIC	MARKS	
Network concepts Questions: 1-3, 14-18	/19	
Simultaneous linear equations Questions: 4 – 6, 11 – 13	/15	
Bivariate data Questions: 7, 8-10	/16	
TOTAL	/50	%

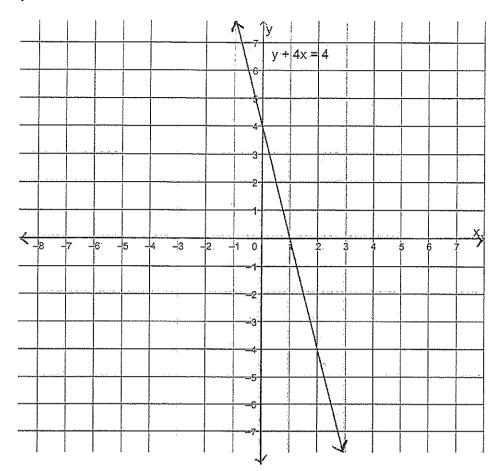
	1						
1.	Wh	ich of the following graphs contains a loop?					
	A	B B					
	С						
2.	Two	graphs, labelled Graph 1 and Graph 2, are shown below.					
		Graph 1 Graph 2					
	The	sum of the degrees of the vertices of Graph 1 is:					
	Α	two less than the sum of the degrees of the vertices of Graph 2.					
	В	B one less than the sum of the degrees of the vertices of Graph 2.					
	С	equal to the sum of the degrees of the vertices of Graph 2.					
	D	one more than the sum of the degrees of the vertices of Graph 2.					
3.	Whi	ch of the following walks is a cycle?  B  C  A  D					
	А	ABAD					
	В	ABCD					
	С	ABDA					
	D	ABCDA					

	Que	estions 4 and 5 refer to the following diagram.	
	A STATES OF THE LAND OF THE LA	y 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	THE RESIDENCE ASSESSMENT ASSESSME
4.	Wh	at is the gradient of the line?	
	Α	3	
	В	$\frac{1}{3}$	
	С	$\frac{1}{3}$	
	D	-6	
5.	Wha	at is the equation of the line?	
	А	$y = x + \frac{1}{3}$	
	В	$y = \frac{1}{3}x + 2$	
	С	$y = \frac{1}{3}x - 6$	
	D	y = 3x - 6	
6.	The	equation $\mathcal{C}=3n+150$ models the costs for a sandwich shop. What could the 150 represent?	
	Α	Number of sandwiches sold	
	В	The cost per sandwich	
	С	Fixed daily cost	
	D	Number of sandwiches made	
7.	Whi	ch of the following graphs shows a strong positive correlation?	
	Α	B	
	С		

### Section II 43 marks Attempt Questions 8 - 19. Answer the questions in the spaces provided. Sufficient spaces are provided for typical responses. Your responses should include relevant mathematical reasoning and/or calculations. Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which question you are answering. The number of emails received per day by 35 people is displayed below. 8. Emails per Day by Age Average Emails per Day 40 30 20 10 0 0 12 24 36 60 72 48 Age (a) Identify the independent variable in this situation. (b) Using the line of best fit, find the number of emails received by a person aged: 30 years old (i) 1 6 years old 1 (ii) Which of the predictions from part (c) is more reliable? Why? 2 (c) (d) Does it make sense to interpret the vertical intercept in the context of the data? Why? 1

9.	9. Given the following data:										
		x	5	10	14	15	24	27	32	33	
		у	10	11	12	14	15	17	20	20	
	(a)	Use you	ur calculato	or to find th	ne correlatio	n coefficien	t of the data	a, correct to	2 decimal <sub>l</sub>	olaces.	1
	(b)	Explain	the meani	ing of the c	orrelation co	pefficient.					2
	(c)	Use you 2 decim	r calculato al places.	or to find th	e equation o	of the least-	squares reg	ression line	for the data	a, correct to	2
10.					connecting se the equat			in cm, and v	vaist measu	irement	
	(a)	the wais	t of a pers	on with a h	ip measure	ment of 178	3cm				2
	(b)	the hip r	measurem	ent of a pe	rson with a v	waist of 60c	m, correct t	o two decim	nal places.		2

11. The graph of y + 4x = 4 is shown below.



(i) Graph y = x - 6 on the grid provided above.

2

(ii) What is the point of intersection of y + 4x = 4 and y = x - 6?

2

12. A student was asked to solve the following simultaneous equations:

$$y = 2x - 1$$
 and  $x - 3y + 7 = 0$ .

After graphing the equations, the student found the point of intersection to be (2,3). Is the student correct? Support your answer with calculations.

13.	cost	is plannii : her \$10	ng a fund raisin per person. Thi	g dance. e cost of	She can hi each ticke	re a hall for \$4 t is \$20.	-00 and a band for \$	600. Refreshments will	
	(a)	Write a	n equation for t	he cost s	\$C of runn	ing the dance t	for $n$ people.		1
	// )				<u> </u>	- VMATERIAL - U-12/A			
	(b)	Write ai	n equation for t	he rever	tue $\$R$ if $n$	people attend	led the dance.		1
	(c)	Graph b	oth equations (	on the sa	me set of	axes below.			2
	` '	•							_
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The state of the s			50		100	150	•		
	(d)	How mai	ny tickets must	be sold t	to break ev	ren?	· · · · · · · · · · · · · · · · · · ·		1
	(e)	How mu	ch profit will be	made if	350 peopl	e attend the d	ance?		2
			<b>-</b>		ooo poop.				-
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			·····						

14. Here is a table of vertices A, B, C and D, and the edge weights between these vertices.

	А	В	С	D
Α	-	2	4	-
В	2	-	3	
С	4	3	-	1
D	-	<u>-</u>	1	_

Draw a weighted network to represent this information.

15. Complete the table of vertex degrees for the network shown.

Vertex	1	2	3	4	5	6
Degree						

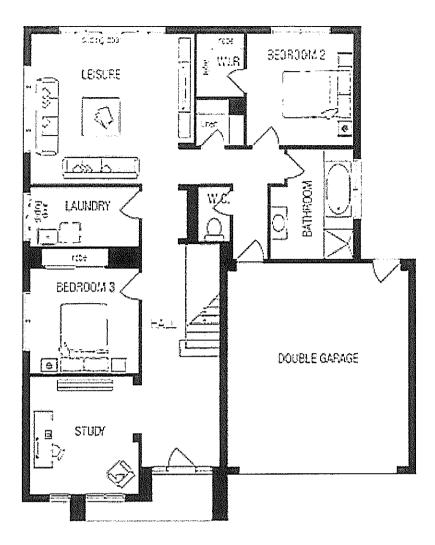
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16.	(a)	State the number of edges in a minimum spanning tree of a network with 10 vertices.	1
	(b)	The following diagram shows a weighted network diagram.  A 6 B 18 C 15	
		Draw the minimum spanning tree for the network above using Kruskal's or Prim's algorithm.	2
	(c)	Explain why edge EG is not included in the minimum spanning tree.	1
	(d)	What is the total weight of the minimum spanning tree?	1

17.	below.	2
	2 <b>b</b> 3 <b>d</b> 7	
	a 5 4 2 f	
	3 G 4 E 5	
	, t	
	•	
	•	
	(ii) Hence, what is the shortest path from vertex a to vertex f, and what is its length?	2
***************************************		



Draw a network diagram to model the possible movement inside the house. Use vertices to represent the rooms and edges to represent the doorways that connect the rooms. Make the hall be a vertex.

Section II extra writing space						
If you use this space, clearly indicate which question you are answering.						

## **Carlingford High School**



# **Mathematics Standard 2**

### Year 12 Assessment Task 3 – 2019

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TOPIC	MARKS		
Network concepts Questions: 1 – 3, 14–18 V L	/19		
Simultaneous linear equations  Questions: 4 – 6, 11 – 13 — > M L	/15	V	
Bivariate data Questions: 7, (8 - 10)	/16		
TOTAL	/50	%	

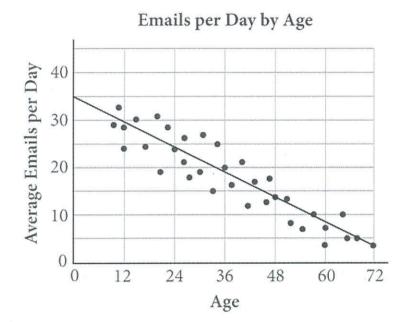
1.	\A/hi	ch of the following graphs contains a loop?	T	
1.	VVIII	ch of the following graphs contains a loop?		
	Α	B		
	С	D D		
2.	Two	graphs, labelled Graph 1 and Graph 2, are shown below.		
A CONTRACTOR OF THE PROPERTY O		Graph 1 Graph 2		
	The	sum of the degrees of the vertices of Graph 1 is:		
	Α	two less than the sum of the degrees of the vertices of Graph 2.		
	В	one less than the sum of the degrees of the vertices of Graph 2.		
	equal to the sum of the degrees of the vertices of Graph 2.			
	D one more than the sum of the degrees of the vertices of Graph 2.			
3.	Whi	ch of the following walks is a cycle?  B C A D		
	А	ABAD		
	В	ABCD		
	C.	ABDA		
	(D)	ABCDA		

	Questions 4 and 5 refer to the following diagram.	
4.	What is the gradient of the line?	
	A 3	
	$B = -\frac{1}{2}$	
	$ \begin{array}{c c} B & -\frac{1}{3} \\ \hline C & \frac{1}{3} \end{array} $	
	D -6	
5.	What is the equation of the line?	
	$A  y = x + \frac{1}{3}$	
	$y = \frac{1}{3}x + 2$	
	$C  y = \frac{1}{3}x - 6$	
	D  y = 3x - 6	
6.	The equation $C=3n+150$ models the costs for a sandwich shop. What could the 150 represent?	
	A Number of sandwiches sold	
	B The cost per sandwich	
	C Fixed daily cost	
	D Number of sandwiches made	
7.	Which of the following graphs shows a strong positive correlation?	
	A B	
	C	

### Section II 43 marks

### Attempt Questions 8 - 19.

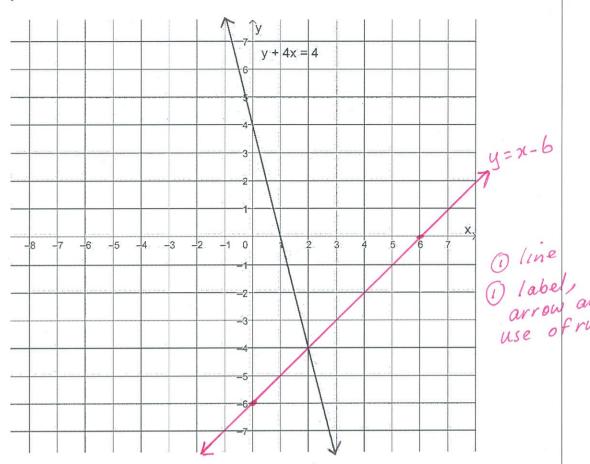
- Answer the questions in the spaces provided. Sufficient spaces are provided for typical responses.
- Your responses should include relevant mathematical reasoning and/or calculations.
- Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which question you are answering.
- 8. The number of emails received per day by 35 people is displayed below.



(a)	Identify the independent variable in this situation.	1
	Age	
(b)	Using the line of best fit, find the number of emails received by a person aged:	
	(i) 30 years old 22 (accept 22-23)	1
	(ii) 6 years old 32 (accept 32-33)	1
(c)	Which of the predictions from part (c) is more reliable? Why?	2
	30 years old, as it is within the Scatterplot	
(d)	Does it make sense to interpret the vertical intercept in the context of the data? Why?	1
	No as 6 years old would not receive	
	35 emails per day. (must have reason).	

۷.	Give	en the f	ollowing da	ta:					***************************************	
		$\overline{x}$	5	10	14	15	24	27	32	33
		у	10	11	12	14	15	17	20	20
	(a)	Use yo	our calculate	or to find the						olaces. 1
	(b)	Explai	n the mean			58····				2
			The bet	ing of the co re is ween	a str He X	ong pand	ositive y var	corr iables	elatio	'n
	(c)	, ,	our calculati mai places.	or to find the		of the least-		ression line	for the data	a, correct to 2
í C	1	-		e of best fit $^{\prime}H-2.1$ . Us				in cm, and	waist measu	rement
	(a)	the wa	aist of a per	son with a h	ip measure	ement of 17	3cm			2
				W a	- 0·7 <i>H</i>	- 2 · /				
				•		×178	- 2.1	<b>(</b> /)		
							-			
		ļ		i.	= 122	.5 ()				
	(b)	the hi	p measurer	nent of a pe	rson with a	waist of 60	cm			2
				W	= 0 ,	7 H - 2.	1			
	•			60	= 0.	7 H - 2	.1			
				D 62.	1 = 0	.7 H				
		accep	rounding	62.	$\frac{1}{7} = F$	l				
	1	ung		88.7	1 = 1	4				
		<u></u>								

The graph of y + 4x = 4 is shown below. 11



(i) Graph y = x - 6 on the grid provided above.

2 1

2

(ii) What is the point of intersection of y + 4x = 4 and y = x - 6?

A student was asked to solve the following simultaneous equations:

$$y = 2x - 1$$
 and  $x - 3y + 7 = 0$ .

After graphing the equations, the student found the point of intersection to be (2, 3). Is the student correct? Support your answer with calculations.

$$y = 2x - 1$$

$$3 = 2(2) - 1$$

$$3 = 4 - 1$$

$$x - 3y + 7 = 0$$

.. student is correct as point passes through

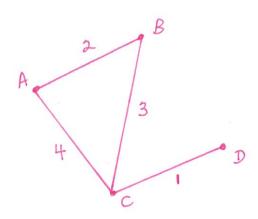
both lines.

Sue is planning a fund raising dance. She can hire a hall for \$400 and a band for \$600. Refreshments will 13. cost her \$10 per person. The cost of each ticket is \$20. Write an equation for the cost C of running the dance for n people. 1 C = 10n + 1000 Write an equation for the revenue R if n people attended the dance. (b) 1 R = 20 n Graph both equations on the same set of axes below. (c) R= 201 3000 7 C= 10n + 1000 2500 1) each line 2000 1500 1000 500 50 100 150 How many tickets must be sold to break even? 1 (d) 100 tickets How much profit will be made if 350 people attend the dance? (e)  $R = 20 \times 350$  C = 10(350) + 1000= 4500 (Teither R er c only = 7000 ... profit = 7000 - 4500 = \$2500 (1)

14 Here is a table of vertices A, B, C and D, and the edge weights between these vertices.

	Α	В	С	D
Α	22	2	4	-
В	2	-	3	-
С	4	3	-	1
D	-	-	1	-

Draw a weighted network to represent this information.

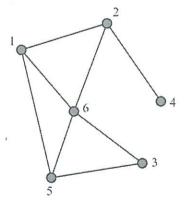


- leach mistake

15 Complete the table of vertex degrees for the network shown.

Vertex	1	2	3	4	5	6
Degree	3	3	2	ı	3	4





2

2

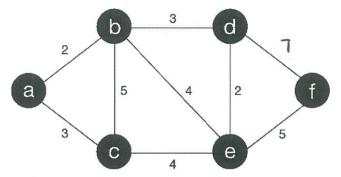
16	(a)	State the number of edges in a minimum spanning tree of a network with 10 vertices.	1
10	(4)	State the number of eages in a minimum spanning tree of a network with 10 vertices.	-
		9	
	(b)	The following diagram shows a weighted network diagram.	
	1-7		
		A 6 B 18 C	
		8 17	
		13 E	
40		20 9	
		F 7 G	
32		16	
		H 12	
		11 10	
		Draw the minimum spanning tree for the network above using <b>Kruskal's</b> or <b>Prim's</b> algorithm.	2
		A B	
		D E	
		F	
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		J.	
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		Y Commence of the Commence of	
		3	
¥*			
	(c)	Explain why edge EG is not included in the minimum spanning tree.	1
		It will form a cycle	
	(d)	What is the total weight of the minimum spanning tree?	1
	( )		
		5+6+7+8+10+11+13+14+15 = 89	

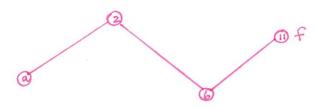
g	(i)	Using Dijkstra's algorithm,	draw the shortest path	from vertex <b>a</b> to vertex <b>f</b>	for the network diagram
		helow			

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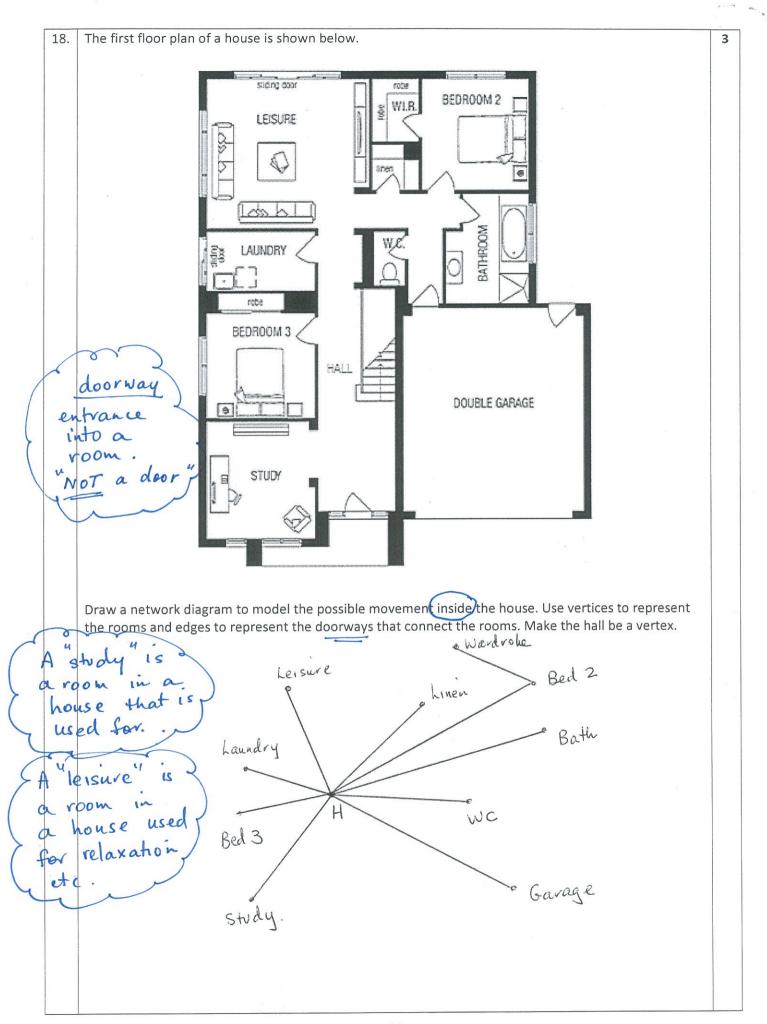
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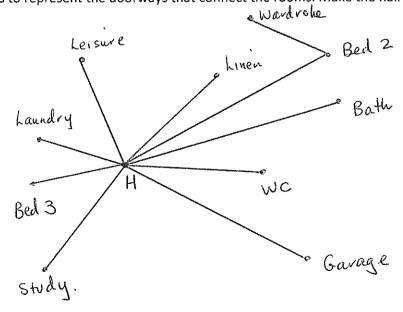


(ii) Hence, what is the shortest path from vertex a to vertex f, and what is its length?

① 
$$abef = 2 + 4 + 5$$



Draw a network diagram to model the possible movement inside the house. Use vertices to represent the rooms and edges to represent the doorways that connect the rooms. Make the hall be a vertex.



Section II extra writing space
If you use this space, clearly indicate which question you are answering.