

Thursday 21 October 2021 – Afternoon

A Level Further Mathematics A

Y544/01 Discrete Mathematics

Printed Answer Booklet

Time allowed: 1 hour 30 minutes

You must have:

- Question Paper Y544/01 (inside this document)
- the Formulae Booklet for A Level Further Mathematics A
- a scientific or graphical calculator



Please write cle	arly in I	black in	k. Do n	ot writ	e in the barcodes.		
Centre number					Candidate number		
First name(s)							
Last name							

INSTRUCTIONS

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided in the Printed Answer Booklet. If you need extra space use the lined pages at the end of the Printed Answer Booklet. The question numbers must be clearly shown.
- Answer all the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.
- Give non-exact numerical answers correct to **3** significant figures unless a different degree of accuracy is specified in the question.
- The acceleration due to gravity is denoted by $gm\,s^{-2}$. When a numerical value is needed use g=9.8 unless a different value is specified in the question.

INFORMATION

- The total mark for this paper is **75**.
- The marks for each question are shown in brackets [].
- This document has 16 pages.

ADVICE

Read each question carefully before you start your answer.

1 (a)	Bag 1:
	Bag 2:
	Bag 3:
	Bag 4:
	Bag 5:
1(b)	
1(c)	

2(a)(i)						
2 (a)(ii)						
2(b)						
	1.					
	2					
	2.					
2(c)						
_(c)		J	K	L	M	N
	Indegree					
	Indegree Outdegree					
2(d)(i)						
2(d)(i)						
2(d)(ii)						

4

3(a)	
3 (b)	

3(c)	
3 (d)	

Graph	is not isomorphic to $K_{2,3}$
because	
Graph	is not isomorphic to K _{2,3}
because	
	because Graph

4(d)	SPARE COPY
4(a)	
4 (e)	
4(f)	
4 (g)	
4(h)	

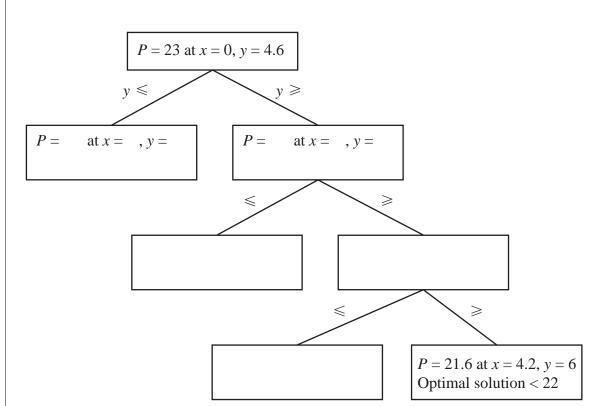
5 (a)					Beth		
				X	Y	Z	
			P	X	3	2	
		Alex	Q	4	0	-2	
			R	-3	-1	-3	
(i)	Stable when						
()							
(ii)	Unstable whe	en					
5(b)							
				X	Y	Z	
5(c)							
						(answer sp	pace continued on next page)

5(c)	(continued)
	For working, if required.
5(d)	

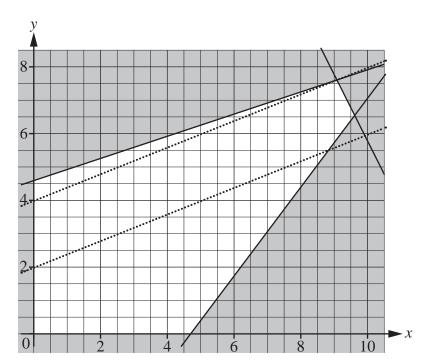
	P	x	у	S	t	и	RHS
	1	2	-5	0	0	0	0
	0	2	1	1	0	0	25.8
	0	-1	3	0	1	0	13.8
	0	4	-3	0	0	1	18.8
Maximise P =	=						

PMT

6(b)



For working, if required (there is another copy of this graph on the next page).



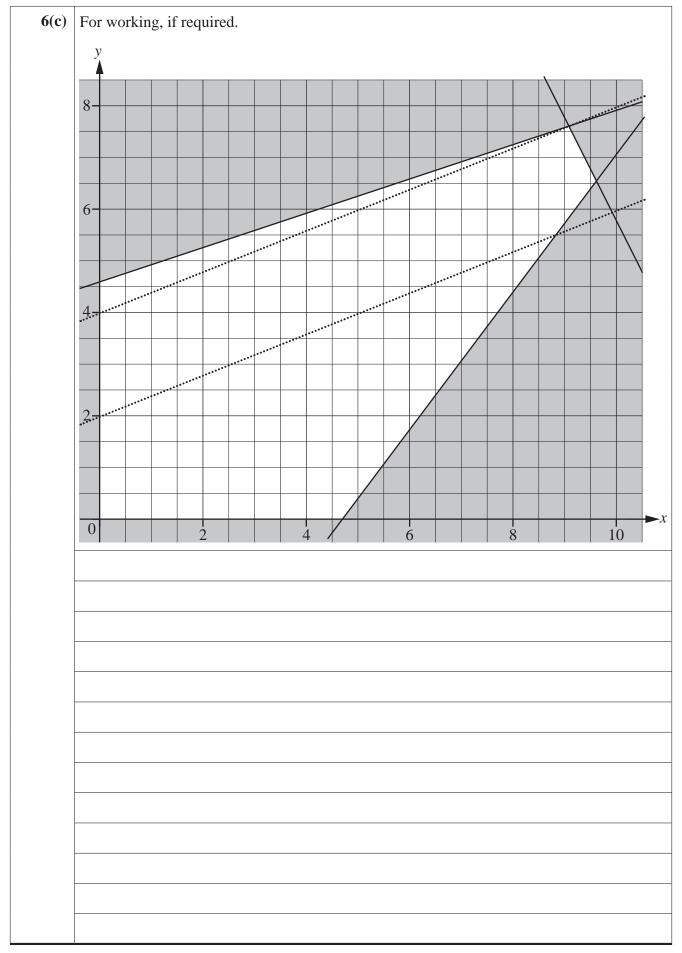
An optimal solution to the constrained problem is

P = when x = and y =

(answer space continued on next page)

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6(b)	(continued) For working, if required.
	y
	8
	6-
	6-
	6
	1.
	4,
	2
	\rightarrow x
	0 1 2 1 4 7 6 8 10 -10



7(a)(i)	BUBBLE SORT								
	Original list:	2.9	0.9	1.5	3.5	4.2	5.3	4.7	2.3
	After 1st pass:								
	After 2nd pass:								
7(a)(ii)	SHUTTLE SOR								
	Original list:	2.9	0.9	1.5	3.5	4.2	5.3	4.7	2.3
	After 1st pass:								
	After 2nd pass:								
7(b)									

7(c)(i)	Sorted list:	0.9	1.5	2.3	2.9	3.5	4.2	4.7	5.3		
7(c)(ii)							SPARE COPY				
	Total weight of	f minimuı	m spanniı	ng tree:							
- (.)(11)											
7(c)(iii)											

16 ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).



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