Mathematics M1

Examiner's use only

Team Leader's use only

1

2

3

4

5

6

7

Past Paper

This resource was created and owned by Pearson Edexcel

6677

Centre No.					Pape	r Refer	ence			Surname	Initial(s)
Candidate No.			6	6	7	7	/	0	1	Signature	

Paper Reference(s)

6677/01

Edexcel GCE

Mechanics M1

Advanced/Advanced Subsidiary

Friday 6 June 2014 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination
Mathematical Formulae (Pink)Items included with question papers
Nil

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation or symbolic differentiation/integration, or have retrievable mathematical formulae stored in them.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature. Check that you have the correct question paper.

Answer ALL the questions.

You must write your answer to each question in the space following the question.

Whenever a numerical value of g is required, take g = 9.8 m s⁻² and give your answer to either two significant figures or three significant figures.

When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.

Full marks may be obtained for answers to ALL questions.

The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).

There are 7 questions in this question paper. The total mark for this paper is 75.

There are 28 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled. You should show sufficient working to make your methods clear to the Examiner. Answers without working may not gain full credit.

This publication may be reproduced only in accordance with Pearson Education Ltd copyright policy. ©2014 Pearson Education Ltd.

P43169A
W850/R6677/57570 5/5/1/1/1/



Turn over

Total



blank

6677 Leave

1.

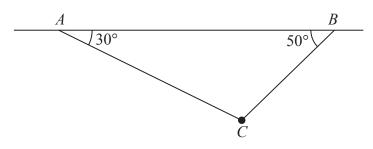


Figure 1

A particle of weight W newtons is attached at C to two light inextensible strings AC and BC. The other ends of the strings are attached to fixed points A and B on a horizontal ceiling. The particle hangs in equilibrium with AC and BC inclined to the horizontal at 30° and 50° respectively, as shown in Figure 1.

Given that the tension in BC is 6 N, find

(a) the tension in AC,

(3)

(b) the value of W.

(3)

0			00	•	4
Sui	mm	ıer	ZU	7	4

www.mystudybro.com was created and owned by Pearson Edexcel

apei	This resource was created and owned by Fearson Edexcer	'
		Le
)	1	bl
Question 1 continued	1	
		_
		_
		_
		-
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		Q
		-
	(Total 6 mark	,

Past Paper

This resource was created and owned by Pearson Edexcel

6677

Leave blank

2.

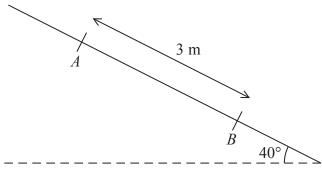


Figure 2

A rough plane is inclined at 40° to the horizontal. Two points A and B are 3 metres apart and lie on a line of greatest slope of the inclined plane, with A above B, as shown in Figure 2. A particle P of mass m kg is held at rest on the plane at A. The coefficient of friction between P and the plane is $\frac{1}{2}$. The particle is released.

(a) Find the acceleration of P down the plane.

(5)

(b) Find the speed of *P* at *B*.

(2)

Summer 2014

www.mystudybro.com

Julillier ZUI4	www.iiiyStudybiO.com	
Past Paper	This resource was created and owned by Pearson Edexcel	6677
		Leave

_
_

Summer 2014	www.mystudybro.com This resource was created and owned by Pearson Edexcel	Mathemati	
ast Paper	This resource was created and owned by Pearson Edexcel		667
Question 2 conti	inuad		Leave blank
Question 2 conti	mueu		

Summer	201	4
Past Paper		

ummer 2014 ast Paper	www.mystudybro.com This resource was created and owned by Pearson Edexcel	Mathematics M ²
ast i apoi	This resource was dreated and ewiled by Fedrach Edoxoci	Leave
Question 2 contin	nued	blank
&meseron = eonon		
		Q2

(Total 7 marks)

www.mystudybro.comThis resource was created and owned by Pearson Edexcel ■ Past Paper

6677

Leave

3.	A ball of mass 0.3 kg is released from rest at a point which is 2 m above horizontal ground. The ball moves freely under gravity. After striking the ground, the ball rebounds vertically and rises to a maximum height of 1.5 m above the ground, before falling to the ground again. The ball is modelled as a particle.						
	(a)	Find the speed of the ball at the instant before it strikes the ground for the first time. (2)					
	(b)	Find the speed of the ball at the instant after it rebounds from the ground for the first time.					
		(2)					
	(c)	Find the magnitude of the impulse on the ball in the first impact with the ground. (2)					
	(d)	Sketch, in the space provided, a velocity-time graph for the motion of the ball from the instant when it is released until the instant when it strikes the ground for the second time.					
		(3)					
	(e)	Find the time between the instant when the ball is released and the instant when it strikes the ground for the second time.					
		(4)					

S

mmer 2014 t Paper	www.mystudybro.com This resource was created and owned by Pearson Edexcel	Mathematics M ²
		Leave
		blank
Question 3 continued		



Summer	2014
Julillei	ZUI

■ Past Paper

www.mystudybro.comThis resource was created and owned by Pearson Edexcel

Question 3 continued	Leave blank

Summer	201	4
Past Paper		

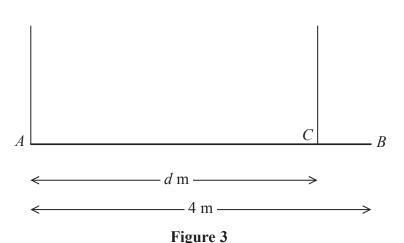
t Paper	This resource was created and owned by Pearson Edexcel	667
		Leave blank
Question 3 continue	d	
		Q3

Past Paper

This resource was created and owned by Pearson Edexcel

6677 Leave blank

4.



A beam AB has weight W newtons and length 4 m. The beam is held in equilibrium in a horizontal position by two vertical ropes attached to the beam. One rope is attached to A and the other rope is attached to the point C on the beam, where AC = d metres, as shown in Figure 3. The beam is modelled as a uniform rod and the ropes as light inextensible strings. The tension in the rope attached at C is double the tension in the rope attached at A.

(a) Find the value of d.

(6)

A small load of weight kW newtons is attached to the beam at B. The beam remains in equilibrium in a horizontal position. The load is modelled as a particle. The tension in the rope attached at C is now four times the tension in the rope attached at A.

(6)

S

mmer 2014 Paper	www.mystudybro.com This resource was created and owned by Pearson Edexcel	Mathematics M ² 667
·		Leave
0 4: 4 4:	1	blank
Question 4 contin	ued	

Mathematics M1

6677 Leave

ulliller ZVIT	www.mystudybro.com	Matricination
ast Paper	This resource was created and owned by Pearson Edexcel	

estion 4 continued	

e.	ım	m	۸r	20	1 /
Эl	ım	m	er	ZU	14

t Paper	This resource was created and owned by Pearson Edexcel	667
		Leave blank
Question 4 contin	nued	Dialik
_		
		Q4
	(Total 12 ms	arks)

www.mystudybro.comThis resource was created and owned by Pearson Edexcel

6677

Leave

5.	A particle P of mass 0.5 kg is moving under the action of a single force $(3\mathbf{i} - 2\mathbf{j})$ N.	
	(a) Show that the magnitude of the acceleration of P is $2\sqrt{13}$ m s ⁻² .	(4)
	At time $t = 0$, the velocity of P is $(\mathbf{i} + 3\mathbf{j})$ m s ⁻¹ .	
	(b) Find the velocity of P at time $t = 2$ seconds.	(3)
	Another particle Q moves with constant velocity $\mathbf{v} = (2\mathbf{i} - \mathbf{j}) \text{ m s}^{-1}$.	
	(c) Find the distance moved by Q in 2 seconds.	(2)
	(d) Show that at time $t = 3.5$ seconds both particles are moving in the same direction.	(3)
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_

16

S Pa

www.mystudybro.com This resource was created and owned by Pearson Edexcel Question 5 continued	Leave blank
Question 5 continued	
Question 5 continued	

Mathematics M1

Leave

ullillici 2014	www.mystudybro.com	Mathematics in
ast Paper	This resource was created and owned by Pearson Edexcel	66

Question 5 continued	blanl

e.	ım	m	۸r	20	1 /
Эl	ım	m	er	ZU	14

Mathematics M1

www.mystudybro.comThis resource was created and owned by Pearson Edexcel Past Paper Leave blank **Question 5 continued Q5** (Total 12 marks)

Past Paper

This resource was created and owned by Pearson Edexcel

Leave

blank

6.

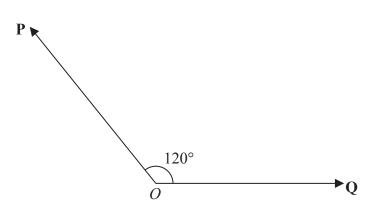


Figure 4

Two forces P and Q act on a particle at O. The angle between the lines of action of P and Q is 120° as shown in Figure 4. The force P has magnitude 20 N and the force Q has magnitude X newtons. The resultant of **P** and **Q** is the force **R**.

Given that the magnitude of \mathbf{R} is 3X newtons, find, giving your answers to 3 significant figures

(a) the value of X,

(5)

(b) the magnitude of (P - Q).

(4)

Summer 2014

www.mystudybro.com

Odiffici Zo 14	www.mystaaybro.com	matricinatios mi
Past Paper	This resource was created and owned by Pearson Edexcel	6677

	Leave
	blank
Question 6 continued	
	1

mmer 2014	www.mystudybro.com This resource was created and owned by Pearson Edexcel	Mathematic	
Paper	This resource was created and owned by Pearson Edexcel		667
			Leav
Question 6 contin	nuad		blanl
Question o contin	nueu		

Summer	201	4
Past Paper		

Summer 2014	www.mystudybro.com This resource was created and owned by Pearson Edexcel	Mathematics M1
ast Paper	This resource was created and owned by Fearson Edexcer	Leave
		blank
Question 6 contir	nued	
		Q6

(Total 9 marks)

Past Paper

This resource was created and owned by Pearson Edexcel

6677 Leave blank

7.

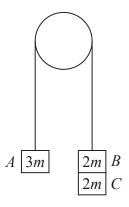


Figure 5

Three particles A, B and C have masses 3m, 2m and 2m respectively. Particle C is attached to particle B. Particles A and B are connected by a light inextensible string which passes over a smooth light fixed pulley. The system is held at rest with the string taut and the hanging parts of the string vertical, as shown in Figure 5. The system is released from rest and A moves upwards.

- (a) (i) Show that the acceleration of A is $\frac{g}{7}$
 - (ii) Find the tension in the string as A ascends.

(7)

At the instant when A is 0.7 m above its original position, C separates from B and falls away. In the subsequent motion, A does not reach the pulley.

(b) Find the speed of A at the instant when it is 0.7 m above its original position.

(2)

(c) Find the acceleration of A at the instant after C separates from B.

(4)

(d) Find the greatest height reached by A above its original position.

(3)

Summer 2014

www.mystudybro.com

Odiffici Zo i T	www.mystadybro.com	Matriciliatios Wil
Past Paper	This resource was created and owned by Pearson Edexcel	6677
		Leave

uestion 7 continued	

Mathematics M1

Leave

Odiffici ZUTT	www.mystaaybro.com	matricinatics in i
■ Past Paper	This resource was created and owned by Pearson Edexcel	6677

Question 7 continued	blanl

Sı Pa

ummer 2014	www.mystudybro.com	Mathematics M ²
ast Paper	www.mystudybro.com This resource was created and owned by Pearson Edexcel	667
		Leave
		blank
Question 7 contin	nued	

Sı	ım	m	۵r	20	1	/
- OI	1111	ш	er	ZU	, ,	_

Lb
l l
(Total 16 I