Cambridge International Examinations
Cambridge International Advanced Level

FURTHER MATHEMATICS **9231/23**

Paper 2 **May/June 2014**

3 hours

Additional Materials: Answer Booklet/Paper
Graph Paper
List of Formulae (MF10)

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
Where a numerical value is necessary, take the acceleration due to gravity to be $10 \, \text{m s}^{-2}$.
The use of a calculator is expected, where appropriate.
Results obtained solely from a graphic calculator, without supporting working or reasoning, will not receive credit.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **5** printed pages and **3** blank pages.

CAMBRIDGE
International Examinations

[Turn over

1   *T mall mt*   *ad   a ual ad ad a ma*   *ad   ctly Ty*
     a mg a tagt l t am dc   *t a mt tal tabl T d*
       ad t d   –   *clld dctly t*   *T cct ttut*
      bt t   –

     (i)   *tat t d*   *at t cll* $\dfrac{\pi \quad \theta}{\pi \quad \theta}$

     (ii) *G tat t magtud t mul xcd by*   *dug t cll*   –   *d t*
           alu

2   *A atcl   ma   kg m a ac a ccl t ct*   *ad adu   mt At tm*
     t atcl at t t   *At tm   cd agl*   *tat t adal cmt*
      t acclat   *at tm   cd a magtud* π θm

     Fd

     (i)   *t alu*   *t ta cmt t acclat*   *t ual t*

     (ii) *t magtud t ultat c actg*   —

3   *A atcl   ma   attacd t d a lgt xtbl tg lgt*   *T t*
     d t tg attacd t a xd t   *t atcl agg ulbum t t*
     tg tcal t g a   *tal mul magtud*   *t tg mak a agl*
     t t dad tcal at   *t t*

     (i)   *tat*   — π c θ

     (ii) *It g tat* $\overset{\alpha}{}\pi$ θ *a t ctat Jut*   *yg yu a dcb*
           t mt   *ac t llg ca*
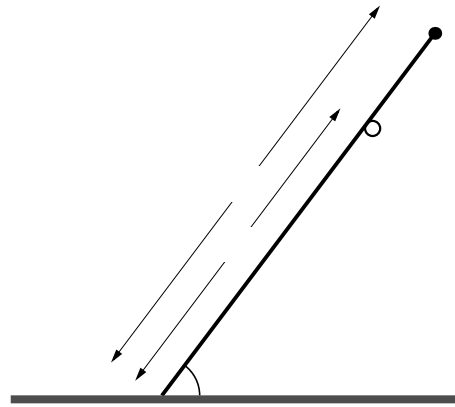
           (a)

           (b)
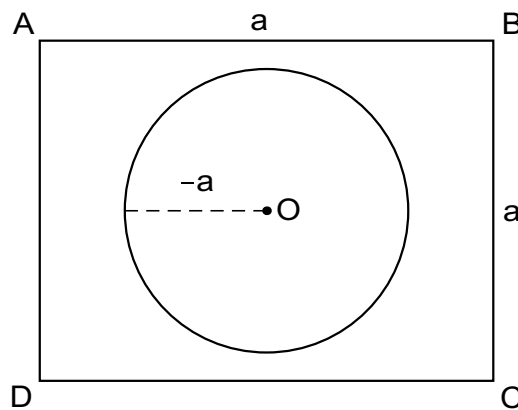
4

A um d   a ma   ad lgt   T d t ulbum a mt g   t
t d   tg a ug t   al la T dtac   ad t agl bt   ad
t tal   c   – A atcl ma   –   attacd t t d at   dagam
Fd t mal act at   ad dduc tat   —

T cct ct bt t d ad t la   tat   ———————

5

A um ctagula lama   c   ad   a ma   A um
ccula lama adu   –   a ma   –   T t lama a xd tgt t am la
t t ct ccdg at t t   dagam A atcl   ma   –   attacd at
T ytm   t tat abut a xd mt tal ax tug   ad dcula t t
la   tat t mmt ta   t ytm abut t ax   ——

$$\mu \geqslant \quad \leqslant$$

T ytm lad m t t   tal ad   bl   Fd t m   — t
gatt agula d t ub   ut mt gg t alu   cct t dcmal lac

4

6   *Emly at a atcula cmay a b*   *kg u ac day m am t m T*
   ty t duc abc t cmay dcd t t   *duc xtm ad all mly t k*
   t u ac day at ay tm bt am ad m F a adm aml mly
   t umb u abc t ya b   *ad t ya at t tduct xtm*
   a g t llg tabl

Emly								
B								
At								

   a ad aml   *tt t tt at t gcac ll t t ulat ma umb*
   u abc a dcad ll   *g t tduct xtm*

7   *Jam t a dcu atdly*   *a attmt t ac a uccul t A t cutd a*
   uccul t dtac acd mt F ac t t bablty tat Jam
   uccul   *– ddtly all t t Fd t bablty tat Jam tak*

   (i) *xactly t t ac t t uccul t*

   (ii) *m ta t t ac t t uccul t*

   I d t ualy a cmtt a dcut mut t mt t at mt x
   attmt a uccul t acd ut t a tak Fd t bablty tat
   Jam ual t cmtt

   Cl at dcut F ac t   *t bablty tat ll ac a t*
   mt   *– ddtly all t t Fd t bablty tat xactly Jam ad*
   Cl ual t cmtt

8   *A adm aml tak m t adult ul*   *at a t ad clad by aggu ad*
   d ty ca T ult a   *g t llg tabl*

	Hatcback	Etat	Ctbl
d ya			
Bt ad ya			
O ya			

   Tt at t gcac ll t   *d ty ca d*   *dt aggu*

9   *T ctuu adm aabl*   *a dtbut uct F g by*

                   z

          Fπ θ   —   —

   Fd t alu   *c P*   *π*   *θ*

   T adm aabl   *dd by*   *l*   *Fd t dtbut uct*

   Fd t bablty dty uct   *ad ktc t ga*

10 *T lgt a adm aml gt a c*   *ta c a maud cm a ll*

Aumg tat lgt a   *mally dtbutd*

(i) *tt at t gcac ll t t ulat ma lgt   t c gat ta cm*

(ii) *calculat a cdc tal t*   *ulat ma lgt   t c*

11 *A ly*   one *t llg t altat*

EITHE

A atcl   ma   udd m a xd t by a l   gt latc tg atual lgt ad ag ulbum T atcl ulld tcally d t a t t lgt t tg   — T atcl lad m t t   t ad ac t gatt gt t lgt t tg   —

(i) *tat t mdulu latcty t tg*   *–*

(ii) *tat   m ml amc mt abut t ulbum t ad tat t d t mt*

(iii) *Fd t tm at la t d*   *t ual t al t maxmum alu*

O

F a adm aml b   *at a alu*   π   θ*t uat t g l ad t uat t g l*   *a*

ad

ctly   *ad   a ctat T duct mmt c*   *lat cct t aml*

(i) *Tt at t gcac ll t t dc t clat bt t aabl*

(ii) *G tat*   *d t alu*   *ad*

(iii) *G tat t um t*   *alu t aml data   d t alu*   *ad ktc t t g l t am dagam*

F ac t a alu   π   θ *t aml at aabl*   *cdd*

(iv) *tat t cct*   *t uat t g l*   *ad d t alu t duct mmt clat cct bt*   *ad   utyg yu a*

B A   PAGE

7

B A   PAGE

8

B A PAGE