Moments/Centre of Mass
Mark Scheme 3

Level	IGCSE
Subject	Physics
Exam Board	CIE
Topic	General Physics
Sub-Topic	Moments/ Centre of Mass
Paper Type	Alternative to Practical
Booklet	Mark Scheme 3

Time Allowed: 53 minutes

Score: /44

Percentage: /100

1 **(a** rule balanced <u>and</u> pivot at centre of mass [1]

  (b) EITHER take readings from 50.2 cm mark
      OR add mass/weight/load
      OR place pivot at 50.2 cm mark [1]

  (c)   cm, cm [1]

    (ii) clockwise 77.5 (or 78) (N cm)
        anticlockwise 78 (N cm)

  (d) EITHER repeats
      OR estimate between two best positions that almost balance but tip opposite sides o.w.t.t.e
      OR suitable method to locate centre of mass **Q** [1]

                                                        [Total: 5]

2 **(a** 50–250 g (or 0.05–0.25 kg) correct unit required [1]

  (b) Centre of mass marked close to centre of cylinder [1]
      Clear indication of how centre of mass is placed above the 90.0 cm mark [1]

  (c) Rule unlikely to exactly balance/ difficult to balance
      OR rule could slide on pivot
      OR mass could slide
      OR centre of mass of rule not at 50.0 cm mark
      OR rule not uniform1

      Do <u>not</u> accept comments about poor/careless technique [1]

  (d) Repeat readings (wtte) [1]
      OR a reference to finding exact position of centre of mass of metre rule
      OR a reference to dealing with centre of mass of rule not being at 50.0 cm mark

  (e) Good/ fine/ reasonable/ same to 3 significant figures
      OR Within limits of experimental accuracy (wtte)
      OR Too many significant figures in experimental result [1]

                                                          [Total: 6]

3 **(a)** Three straight lines in correct positions   [1]
         All lines continuous, straight, neat and thin   [1]

    (b) a = 4.2 – 4.4 (cm) no ecf   [1]
         Well-judged position in triangle   [1]
         Line correctly drawn   [1]

    (c) Viewing line directly in front of card (owtte)   [1]

                                                                     [Total: 6]

4 **(a** 100, 200, 300, 400, 500   [1]

    (b) Graph:
         Axes labelled (label and unit)   [1]
         Scales suitable   [1]
         All plots correct to nearest ½ small square   [1]
         Continuous, straight, well-judged best fit line   [1]
         Thin line, neat plots   [1]

    (c) F correct from graph scale to ½ small square – <u>must see unit of N</u>   [1]
         Clear how obtained   [1]

    (d) Weight/mass/force of rule owtte   [1]

                                                                     [Total: 9]

5 **(a** graph:
         axes: the right way round, labelled x and y with unit cm   [1]
         scale: both 10 small squares = 2 cm
                   (either or both 20 small squares = 5 cm also acceptable)   [1]
         plots: all correct to ½ small square   [1]
         line: well-judged, best-fit, straight, thin, continuous line   [1]

    (b) correct triangle method using at least ½ candidate's line, with method clearly indicated
         on graph   [1]
         G = 0.94 – 1.00, no ecf   [1]

    (c) 1.0/(candidate's G) calculation correct, 2 or 3 significant figures and unit N   [1]

    (d)   (where rule) balances on pivot o.w.t.t.e.   [1]

        (ii) take readings from 49.7 OR
              adjust rule by adding weight until it balances at 50.0 cm mark   [1]

                                                                       [Total: 9]

6 **(a** x = 1.9 (cm), 19 (mm) 0.019 (m), y = 2.1 (cm), 21 (mm), 0.021 (m)

(b) unit in **(a)** seen at least once and correct, matching both figures [1]
evidence of x and y values from **(a)** × 10 [1]
m_1 = 124 OR 0.124 accept more sig. figs. [1]
unit seen, g or kg to match figures [1]

(c) $m_2 + m_3$ = 99.4 (g) [1]

(d) two from:
modelling clay remaining on knife/rule/fingers/lost in <u>cutting</u>
more difficult to balance with smaller pieces
more readings so more inaccuracies
rounding errors in extra calculations
difficult to find centre of misshapen cube
modelling clay might not have uniform density [2]

(e) mark centre of bottom of cube OR take readings at either side of cube [1]

[Total: 9]