NAME _____ **INDEX NUMBER** _____

SCHOOL_____ **DATE**_____

GRAPHICAL DETERMINATION OF LAWS

KCSE 1989 – 2012 Form 3 Mathematics		Working Space
1.	**1990 Q24 P1** The intensity **I** of a lamp was measured for various values of voltage **V** across it and the results tabulated as shown. **V** (volts): 11.2, 14.1, 15.8, 17.8, 20.0, 22.4 **I**(Lux): 281.8, 501.2, 562.3, 707.9, 891.2, 1122.0 It is believed that V and I conform to a law of the form $\mathbf{I} = k\mathbf{V}^n$ where k and n are constants . Draw a suitable linear graph and determine the values of k and n (8marks)	
2.	**1991 Q23 P1** In a experiment the volume *V* of a certain mass of a gas was measured at different pressures P, the temperature being constant. The results being obtained were as shown in the table below. P (N/cm^2): 1.4, 1.75, 2.1, 2.8, 3.5 V (litres): 2.6, 2.0, 1.75, 1.3, 1.02 The relationship between P, and V is known to be of the form $P = \frac{K}{V}$ where k is a constant. By plotting P against $\frac{I}{V}$ estimate the value of k.	

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	(6marks)	Working Space
3.	**1992 Q23 P2** The relationship between the variables x and y is known to be of the form $y = kx^n$ where k and n are constants. For some fixed values of x, values of y were obtained experimentally. The corresponding values of *x* and log *y* are given in that the table below; Log *x* = 0.301 0.699 1.00 1.301 Log *y* = 1.398 0.602 0.00 1.398 (a) Draw the graph of log *y* against log *x* (4 marks) (b) Use your graph to estimate the values of k and n (4 marks)	
4.	**1994 Q24 P2** Two variables t and r are believed to obey a law of the form $t = \frac{a}{\sqrt{r}} + b$ The table below shows the results obtained from an experiment involving t and r. R: 2, 5, 8, 11, 14 t: 5.2, 10.3, 14.0, 17.2, 19.8 By plotting a suitable straight line graph on the grid provided, determine the values of a and b. (8marks)	

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		Working Space
5.	**1995 Q20 P1** The table shows the height metres of an object thrown vertically upwards varies with the time t seconds The relationship between s and t is represented by the equations $s = at^2 + bt + 10$ where b are constants. t: 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 s: | 45.1 | | | | | | | | | | (a) (i) Using the information in the table, determine the values of a and b (ii) Complete the table (1 mark) (b) (i) Draw a graph to represent the relationship between s and t (3 marks) (ii) Using the graph determine the velocity of the object when t = 5 Seconds (2 marks)	
6	**1996 Q17 P1** The data given below represents the average monthly expenditure, E in K £, on food in a certain village. The expenditure varies with number of dependants, D in the family. Dependants: 3 | 7 | 12 | 25 | 32 Expenditure E (K£): -210 | 250 | 305 | 440 | 500 (a)Using the grid provided, plot E against D and draw the line of the best fit (2 marks) (b) Find the gradient and the E- intercept of the graph (3 marks) (c) Write down an equation connecting E and D (1 mark) (d) Estimate the cost of feeding a family with 9 dependants (2 marks)	

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		Working Space
7	**1996 Q24 P2** Data collected from an experiment involving two variables x and y was recorded as shown in the below. The variables are known to satisfy a relation of the form $y = ax^3 + b$ where and b are constants. a) For each value of in the table above, write down the value of x^3 . (2marks) b) (i) By drawing a suitable straight line graph, estimate the values of a and b . (5marks) (ii) write down the relationship connecting y and x	

X	1.1	1.2	1.3	1.4	1.5	1.6
Y	-0.3	0.5	1.4	2.5	3.8	5.2

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		Working Space
8	**1998 Q21 P2** Two variables R and V are known to satisfy a relation $R = kV^n$, where k and n are constants. The table below shows data collected from an experiment involving the two variables R and V. (a) Complete the table of log V and R given below, by giving the value to 2 decimal places. (b) On the grid provided draw a suitable straight line graph to represent the relation $R= kV^n$ (c) (i) the gradient of the line (ii) a relationship connecting R and V.	
9	**2002 Q24 P1** Two quantities P and r are connected by the equation $p = kr^n$. The table of values of P and r is given below. a) State a liner equation connecting P and r. b) Using the scale 2cm to represent 0.1 units on both axes, draw a suitable line graph on the grid provided. Hence estimate the values of K and n. (8mks)	Working Space

V	3	4	5	6	7	8
R	27	48	75	108	147	192

Log V	0.48	0.60	0.70	0.78	0.85	0.90
Log R	1.43	1.88	2.03	1.80	2.28	

P	1.2	1.5	2.0	2.5	3.5	4.5
r	1.58	2.25	3.39	4.74	7.86	11.5

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10	**2002 Q16 P2** The equation of a circle is given by $x^2 + 4x + y^2 - 5 = 0$. Find the radius and the center of the circle.	
11	**2006 Q10** The points which coordinates (5,5) and (-3,-1) are the ends of a diameter of a circle centre A Determine: (a) the coordinates of A (1 mark) (b) The equation of the circle, expressing it in form $x^2 + y^2 + ax + by + c = 0$ where a, b, and c are constants (3 marks)	
12	**2007 Q16** Find the radius and the coordinate of the centre of the circle whose equation is $2x^2 + 2y^2 - 3x + 2y + ½ = 0$ (4 marks)	
13	**2007 Q23** The table below shows the values of the length X (in metres) of a pendulum and the corresponding values of the period T (in seconds) of its oscillations obtained in an experiment. X (metres) | 0.4 | 1.0 | 1.2 | 1.4 | 1.6 T (seconds) | 1.25 | 2.01 | 2.19 | 2.37 | 2.53 (a) Construct a table of values of log X and corresponding values of log T, correcting each value to 2 decimal places (2 marks) (b) Given that the relation between the values of log X and log T approximate to a linear law of the form m log X + log a where a and b are constants Use the axes on the grid provided to draw the line of best fit for the graph of log T against log X (2 marks)	

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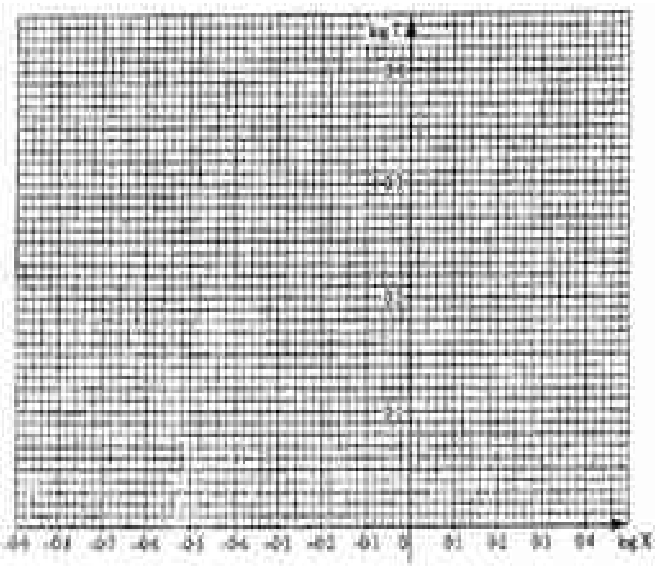
		Working Space
	 (ii) Use the graph to estimate the values of a and b (3 marks) (c)Find, to decimal places the length of the pendulum whose period is 1 second (3 marks)	
14	**2008 Q11 P2** The equation of a circle is given by $4x^2 + 4y^2 - 8x + 20y - 7 = 0$. Determine the coordinates of the centre of the circle. (3mks)	
15	**2009 Q24** A solution was gently heated, its temperature readings taken at intervals of 1 minute and recorded as shown in the table below	

Time (Min)	0	1	2	3	4	5
Temperature (°C)	4	5.2	8.4	14.3	16.8	17.5

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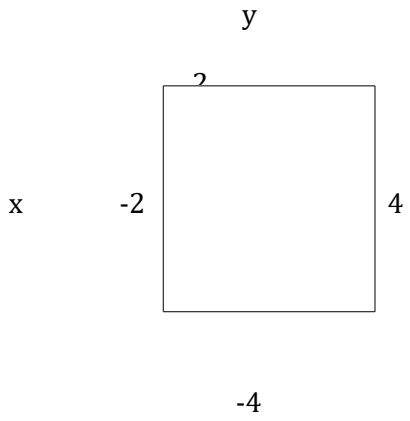
		Working Space
	(a) Draw the time temperature graph on the grid provided (b) Use the graph to find the average rate of change in temperature between t = 1.8 and t = 3.4 (2 marks)	
16	**2010 Q16 P2** The circle shown below cuts the x-axis at (-2,0) and (4,0). It also cuts y-axis at (0,2) and (0,-4).  Determine the: a) i) Coordinates of the centre; (1 mark) ii) radius of the circle. (1 mark) b) Equation of the circle in the form $x^2 + y^2 + x + by = c$ where a, b and c are constants (2 marks)	
17	**2011 Q15 P2** The equation of a circle centre (ab) is $x^2 + y^2 - 6x - 10y + 30 = 0$. Find the values of a and b	

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	(3marks)	

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