Name:_____

Weekly Review 10

- **1.** The straight line, *L*, has equation 2y 27x 9 = 0.
 - (a) Find the gradient of *L*.

(2)

Sarah wishes to draw the tangent to $f(x) = x^4$ parallel to *L*.

(b) Write down f'(x).

(1)

(c) (i) Find the *x*-coordinate of the point at which the tangent must be drawn.

(ii) Write down the value of f(x) at this point.

(3)

(Total 6 marks)

2. A dog food manufacturer has to cut production costs. She wishes to use as little aluminium as possible in the construction of cylindrical cans. In the following diagram, h represents the height of the can in cm, and x represents the radius of the base of the can in cm.



diagram not to scale

The volume of the dog food cans is 600 cm^3 .

(a) Show that
$$h = \frac{600}{\pi x^2}$$
.

(2)

(b) (i) Find an expression for the curved surface area of the can, in terms of *x*. Simplify your answer.

(ii) Hence write down an expression for A, the total surface area of the can, in terms of x.

(4)

(c) Differentiate *A* in terms of *x*.

(3)

(d) Find the value of x that makes A a minimum.

(e) Calculate the minimum total surface area of the dog food can.

(2) (Total 14 marks)

(3)

3. In an environmental study of plant diversity around a lake, a biologist collected data about the number of different plant species (*y*) that were growing at different distances (*x*) in metres from the lake shore.

Distance (<i>x</i>)	2	5	8	10	13	17	23	35	40
Plant species (y)	35	34	30	29	24	19	15	13	8

(a) Draw a scatter diagram to show the data. Use a scale of 2 cm to represent 10 metres on the x-axis and 2 cm to represent 10 plant species on the y-axis. (graph paper is back side)

(4)

(b) Using your scatter diagram, describe the correlation between the number of different plant species and the distance from the lake shore.

(1)

- (c) Use your graphic display calculator to write down
 - (i) \overline{x} , the mean of the distances from the lake shore;
 - (ii) \overline{y} , the mean number of plant species.

(2)

(d) Plot the point $(\overline{x}, \overline{y})$ on your scatter diagram. Label this point M.

(2)

- (e) Write down the equation of the regression line y on x for the above data.
 (f) Draw the regression line y on x on your scatter diagram.
 (2)
 (g) Estimate the number of plant species growing 30 metres from the lake shore.
 (2)
 (1)
 (2)
 (1)
 (2)
- **4.** The weights of 90 students in a school were recorded. The information is displayed in the following table.

Weight (kg)	Number of students
$40 \le w < 50$	7
$50 \le w < 60$	28
$60 \le w < 70$	35
$70 \le w < 80$	20

- (a) Write down the mid interval value for the interval $50 \le w < 60$.
- (b) Use your graphic display calculator to find an estimate for
 - (i) the mean weight;
 - (ii) the standard deviation.
- (c) Find the weight that is 3 standard deviations below the mean.

(2) (Total 6 marks)

(1)

(3)

5. The same 100 students are also asked how many meals on average they have per day. The data collected is organized in the following table.

_	3 or fewer meals per day	4 or 5 meals per day	More than 5 meals per day	Total
Male	15	25	15	55
Female	12	20	13	45
Total	27	45	28	100

A χ^2 test is carried out at the 5 % level of significance.

(a) Write down the null hypothesis, H_0 , for this test.

Decide whether H_{0} must be accepted. Justify your answer.

(1) (b) Write down the number of degrees of freedom for this test. (1) (c) Write down the critical value for this test. (1) (d) Show that the expected number of females that have more than 5 meals per day is 13, correct to the nearest integer. (2) (e) Use your graphic display calculator to find the χ^2_{calc} for this data.

(2)

(2) (Total 9 marks)

(f)

6. The straight line, L_1 , has equation $y = -\frac{1}{2}x - 2$.

(a) Write down the *y* intercept of L_1 .

(b) Write down the gradient of L_1 .

(1)

(1)

The line L_2 is perpendicular to L_1 and passes through the point (3, 7).

(c) Write down the gradient of the line L_2 .

(1)

(d) Find the equation of L_2 . Give your answer in the form ax + by + d = 0 where $a, b, d \in \mathbb{Z}$. (3) (Total 6 marks)

- 7. A rectangular cuboid has the following dimensions.
 - Width 0.50 metres (DG) Height 1.80 metres (DC)

Length

0.80 metres (AD)

diagram not to scale

- (a) Calculate the length of AG.
- (b) Calculate the length of AF.

(c) Find the size of the angle between AF and AG.

ingle between AF and AG.

(2) (Total 6 marks)



(2)

(2)