P2 STUDIES Mock 2013

1)

[Maximum mark: 19]

Forty families were surveyed about the places they went to on the weekend. The places were the circus (C), the museum (M) and the park (P).

16 families went to the circus
22 families went to the museum
14 families went to the park
4 families went to all three places
7 families went to both the circus and the museum, but not the park
3 families went to both the circus and the park, but not the museum
1 family went to the park only

(a) Draw a Venn diagram to represent the given information using sets labelled C, M and P. Complete the diagram to include the number of families represented in each region. *[4 marks]*

(b) Find the number of families who

(i) went to the circus only;

(ii) went to the museum and the park but not the circus;

(iii) did not go to any of the three places on the weekend. *[4 marks]*

(c) A family is chosen at random from the group of 40 families. Find the probability that the family went to

(i) the circus;

(ii) two or more places;

(iii) the park or the circus, but not the museum;

(iv) the museum, given that they also went to the circus. *[8 marks]*

Two families are chosen at random from the group of 40 families.

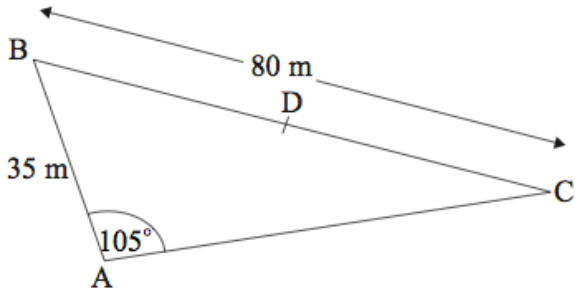
(d) Find the probability that both families went to the circus. *[3 marks]*

2)

[Maximum mark: 18]

A farmer has a triangular field, ABC, as shown in the diagram.
AB = 35 m, BC = 80 m and $B\hat{A}C = 105°$, and D is the midpoint of BC.

diagram not to scale



(a) Find the size of $B\hat{C}A$. *[3 marks]*

(b) Calculate the length of AD. *[5 marks]*

The farmer wants to build a fence around ABD.

(c) Calculate the total length of the fence. *[2 marks]*

(d) The farmer pays 802.50 USD for the fence. Find the cost per metre. *[2 marks]*

(e) Calculate the area of the triangle ABD. *[3 marks]*

(f) A layer of earth 3 cm thick is removed from ABD. Find the volume removed in cubic metres. *[3 marks]*

3)

[Maximum mark: 17]

Francesca is a chef in a restaurant. She cooks eight chickens and records their masses and cooking times. The mass m of each chicken, in kg, and its cooking time t, in minutes, are shown in the following table.

Mass m (kg)	Cooking time t (minutes)
1.5	62
1.6	75
1.8	82
1.9	83
2.0	86
2.1	87
2.1	91
2.3	98

(a) Draw a scatter diagram to show the relationship between the mass of a chicken and its cooking time. Use 2 cm to represent 0.5 kg on the horizontal axis and 1 cm to represent 10 minutes on the vertical axis. *[4 marks]*

(b) Write down for this set of data

(i) the mean mass, $\overline{m}$;

(ii) the mean cooking time, $\overline{t}$. *[2 marks]*

(c) Label the point $M(\overline{m}, \overline{t})$ on the scatter diagram. *[1 mark]*

(d) Draw the line of best fit on the scatter diagram. *[2 marks]*

(e) Using your line of best fit, estimate the cooking time, in minutes, for a 1.7 kg chicken. *[2 marks]*

(f) Write down the Pearson's product–moment correlation coefficient, r. *[2 marks]*

(g) Using your value for r, comment on the correlation. *[2 marks]*

The cooking time of an additional 2.0 kg chicken is recorded. If the mass and cooking time of this chicken is included in the data, the correlation is weak.

(h) (i) Explain how the cooking time of this additional chicken might differ from that of the other eight chickens.

(ii) Explain how a new line of best fit might differ from that drawn in part (d). *[2 marks]*

4)

[Maximum mark: 18]

Part A

A geometric sequence has 1024 as its first term and 128 as its fourth term.

(a) Show that the common ratio is $\frac{1}{2}$. *[2 marks]*

(b) Find the value of the eleventh term. *[2 marks]*

(c) Find the sum of the first eight terms. *[3 marks]*

(d) Find the number of terms in the sequence for which the **sum** first exceeds 2047.968. *[3 marks]*

Part B

Consider the arithmetic sequence $1, 4, 7, 10, 13, \ldots$

(a) Find the value of the eleventh term. *[2 marks]*

(b) The sum of the first n terms of this sequence is $\frac{n}{2}(3n-1)$.

(i) Find the sum of the first 100 terms in this arithmetic sequence.

(ii) The sum of the first n terms is 477.

(a) Show that $3n^2 - n - 954 = 0$.

(b) Using your graphic display calculator or otherwise, find the number of terms, n. *[6 marks]*

5)

The diagram shows triangle ABC. Point C has coordinates $(4, 7)$ and the equation of the line AB is $x + 2y = 8$.

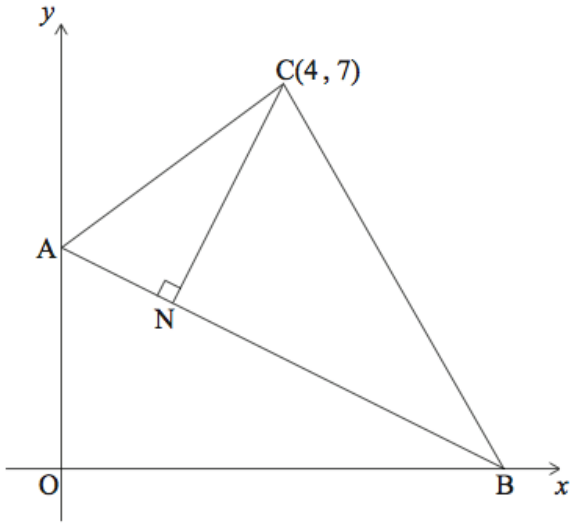


diagram not to scale

(a) Find the coordinates of

(i) A;

(ii) B. *[2 marks]*

(b) Show that the distance between A and B is 8.94 correct to 3 significant figures. *[2 marks]*

N lies on the line AB. The line CN is perpendicular to the line AB.

(c) Find

(i) the gradient of CN;

(ii) the equation of CN. *[5 marks]*

(d) Calculate the coordinates of N. *[3 marks]*

It is known that $AC = 5$ and $BC = 8.06$.

(e) Calculate the size of angle ACB. *[3 marks]*

(f) Calculate the area of triangle ACB. *[3 marks]*