Dr Oliver Mathematics
Mathematics: National Qualifications N5
2014 Paper 1: Non-Calculator
1 hour

The total number of marks available is 40.
You must write down all the stages in your working.

1. Evaluate (2)
$$\tfrac{5}{12} \times 2\tfrac{2}{9}.$$

   Give the answer in simplest form.

2. Multiply out the brackets and collect like terms: (2)
$$(2x - 5)(3x + 1).$$

3. Express (2)
$$x^2 - 14x + 44$$

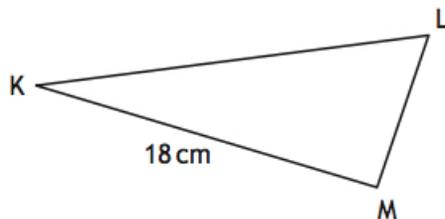   in the form
$$(x - a)^2 + b.$$

4. Find the resultant vector $2\mathbf{u} - \mathbf{v}$ when (2)
$$\mathbf{u} = \begin{pmatrix} -2 \\ 3 \\ 5 \end{pmatrix} \text{ and } \mathbf{v} = \begin{pmatrix} 0 \\ -4 \\ 7 \end{pmatrix}.$$

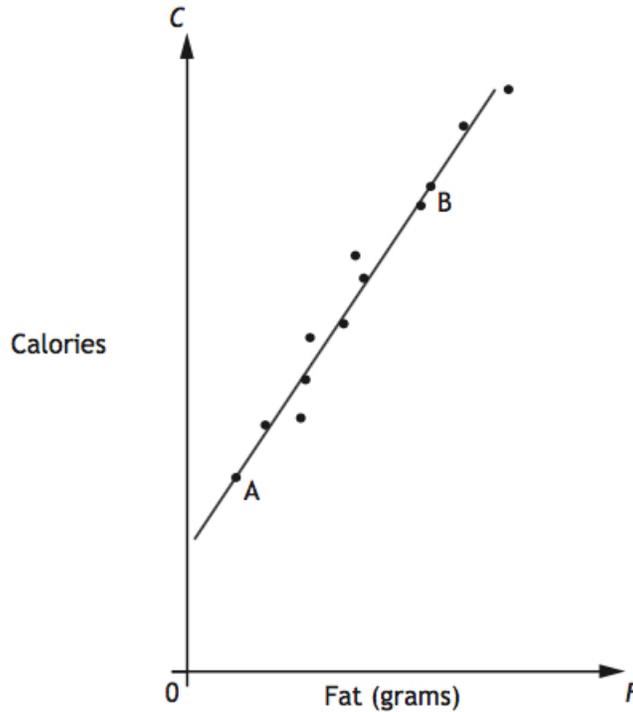   Express your answer in component form.

5. In triangle KLM, (3)

   - $KM = 18$ centimetres

   - $\sin K = 0.4$, and

   - $\sin L = 0.9$.

Calculate the length of LM.

6. McGregor's Burgers sells fast food.

The graph shows the relationship between the amount of fat, F grams, and the number of calories, C, in some of their sandwiches.

A line of best fit has been drawn.
Point A represents a sandwich which has 5 grams of fat and 200 calories.
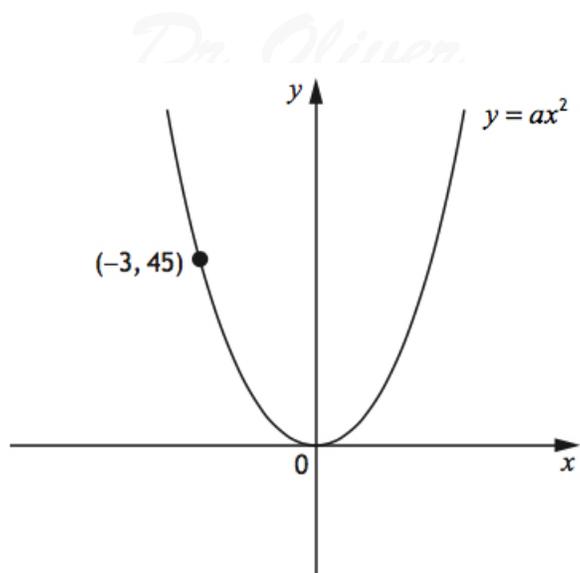Point B represents a sandwich which has 25 grams of fat and 500 calories.

(a) Find the equation of the line of best fit in terms of F and C. (3)

(b) A Super Deluxe sandwich contains 40 grams of fat. (1)
   Use your answer to part (a) to estimate the number of calories this sandwich contains.
   Show your working.

7. The diagram below shows part of the graph of $y = ax^2$. (2)

Find the value of a.

8. Express
$$\sqrt{40} + 4\sqrt{10} + \sqrt{90}$$
as a surd in its simplest form.

(3)

9. 480 000 tickets were sold for a tennis tournament last year.
This represents 80% of all the available tickets.
Calculate the total number of tickets that were available for this tournament.
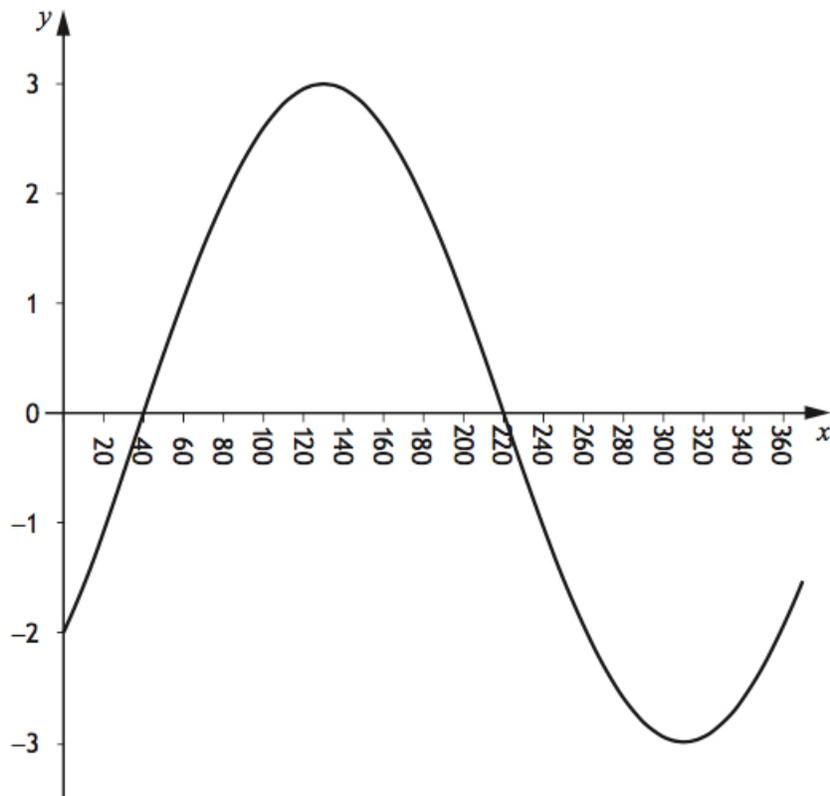
(3)

10. The graph of
$$y = a\sin(x + b)^\circ, \ 0 \leqslant x \leqslant 360,$$
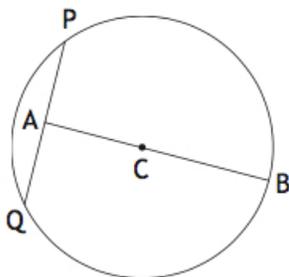is shown below.

(2)

Write down the values of a and b. (2)

11. (a) A straight line has equation
$$4x + 3y = 12.$$
Find the gradient of this line.

(b) Find the coordinates of the point where this line crosses the x-axis. (2)
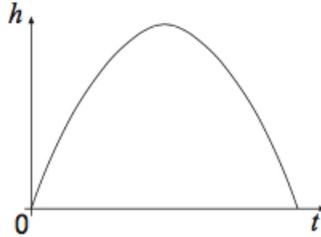
12. The diagram below shows a circle, centre C. (4)

The radius of the circle is 15 centimetres.
A is the mid-point of chord PQ.

The length of AB is 27 centimetres.
Calculate the length of PQ.

13. The diagram below shows the path of a small rocket which is fired into the air. The height, h metres, of the rocket after t seconds is given by

$$h(t) = 16t - t^2.$$

(a) After how many seconds will the rocket first be at a height of 60 metres? (4)

(b) Will the rocket reach a height of 70 metres? (3)
    Justify your answer.

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