2014 National 5 Paper 1

1. Evaluate $\frac{5}{12} \times 2\frac{2}{9}$.

   Give the answer in simplest form. 2

- Change mixed number to improper fraction
- Follow rules for multiplying
- simplify

2. Multiply out the brackets and collect like terms:

   $(2x-5)(3x+1)$. 2

- multiply second bracket by 2x then -5
- should generate 4 terms
- collect like terms

negatives

3. Express $x^2-14x+44$ in the form $(x-a)^2+b$. 2

- value of a is exactly half of the co-efficient of x
- subtract a^2 from +44 to get b.

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

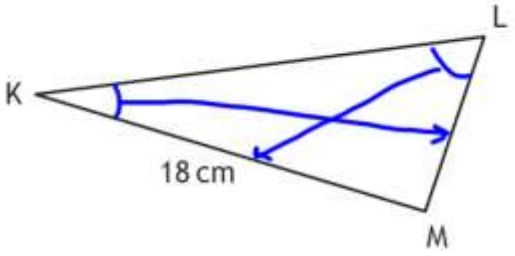
Express your answer in component form. 2

- $2\underline{u}$ is 2× each component of $\underline{u}$
- subtract the components of $\underline{v}$ from the components of $2\underline{u}$

⚠ negatives

5. In triangle KLM

- KM = 18 centimetres
- sin K = 0·4
- sin L = 0·9

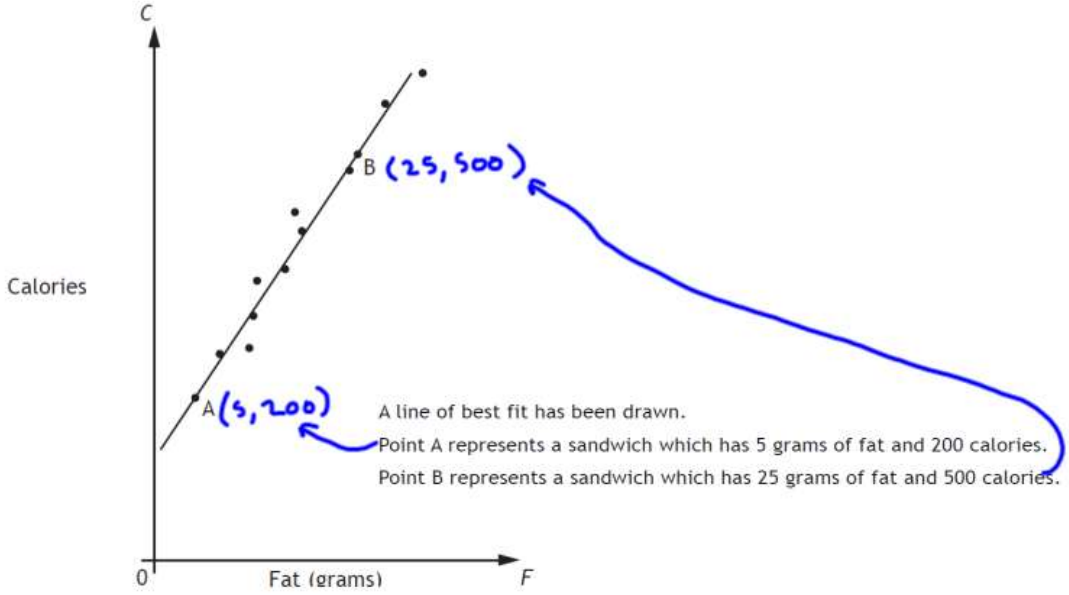


Calculate the length of LM. 3

- sine rule
- form an equation using values given in the question
- you can eliminate decimals to make calculations easier. e.g. $\frac{18}{0.9}=\frac{180}{9}$

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.



6. **(continued)**

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

- need gradient & any point
- turn the information given about A & B into coordinates
- $m = \frac{y_2 - y_1}{x_2 - x_1}$
- sub m & one of the points A or B into

$$y - b = m(x - a)$$

⚠ instead of y & x your equation should be in C & F.

(b) A Super Deluxe sandwich contains 40 grams of fat.

Use your answer to part (a) to estimate the number of calories this sandwich contains.

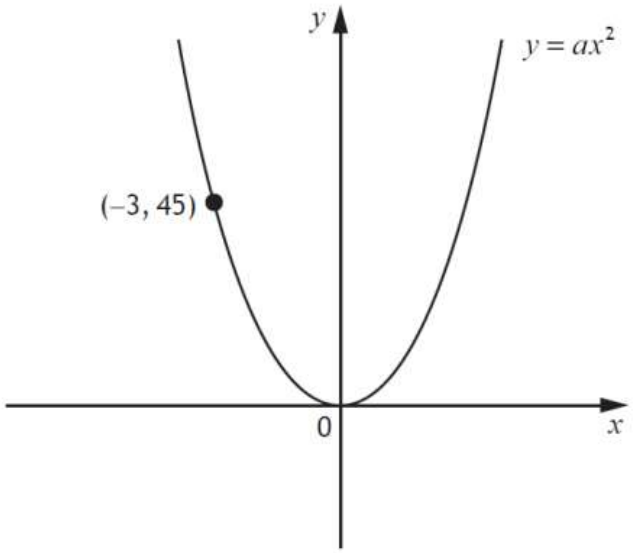
Show your working. **1**

- you have an equation

$$C = mF + c$$

- Sub in $F = 40$

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



Find the value of a. **2**

- sub in $x = -3$ & $y = 45$
- solve for k

8. Express $\sqrt{40} + 4\sqrt{10} + \sqrt{90}$ as a surd in its simplest form. **3**

- simplify $\sqrt{40}$ & $\sqrt{90}$
- collect like terms

9. 480 000 tickets were sold for a tennis tournament last year.

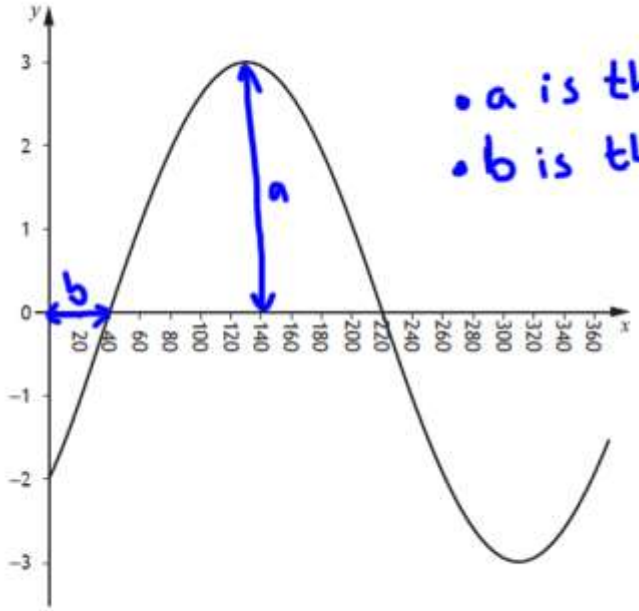
This represents 80% of all the available tickets.

Calculate the total number of tickets that were available for this tournament. **3**

- We need to work backwards from 80% to either 1%, 10% or 20%.
- 80% = 480 000

10% = ...

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



- a is the amplitude
- b is the horizontal shift (phase angle)

Think twice about + or − for b

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. 2

- Re-arrange the line into the form $y=mx+c$
- gradient will be co-efficient of x

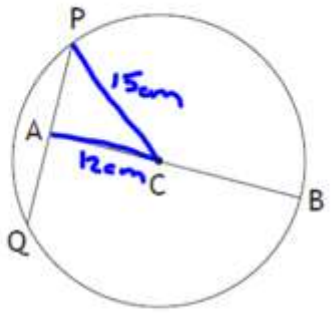
Q: What do you think the most common error is with a question like this?

(b) Find the coordinates of the point where this line crosses the x-axis. 2

- Sub in $y=0$
- Solve for x

You could do this even if you couldn't answer part a)

12. The diagram below shows a circle, centre C.



The radius of the circle is 15 centimetres.

A is the mid-point of chord PQ.

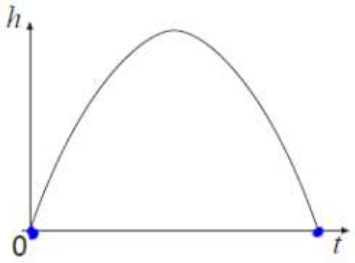
The length of AB is 27 centimetres.

Calculate the length of PQ. 4

- AC = AB - radius
- Use Pythagoras' Theorem to calculate PA.
- Double PA to find 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

- $h(t) = 60 \Rightarrow 16t - t^2 = 60$
- Re-arrange so equation $= 0$
- Factorise
- Obtain roots

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

- need to find max height
- find mid-point between roots & sub in to equation
- compare max height with 70m and draw conclusion

⚠ When justifying your answer you must make a numerical comparison.