FOR OFFICIAL USE

N5

National Qualifications 2014

Mark

X747/75/01

Mathematics Paper 1 (Non-Calculator)

TUESDAY, 06 MAY

9:00 AM – 10:00 AM

* X 7 4 7 7 5 0 1 *

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day Month Year

D D M M Y Y

Scottish candidate number

Total marks — 40

Attempt ALL questions.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

You may NOT use a calculator.

Full credit will be given only to solutions which contain appropriate working.

State the units for your answer where appropriate.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

SQA ©

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$ or $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: $A = \frac{1}{2}ab\sin C$

Volume of a sphere: $V = \frac{4}{3}\pi r^3$

Volume of a cone: $V = \frac{1}{3}\pi r^2 h$

Volume of a pyramid: $V = \frac{1}{3}Ah$

Standard deviation: $s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n-1}} = \sqrt{\dfrac{\Sigma x^2 - (\Sigma x)^2/n}{n-1}}$, where n is the sample size.

MARKS | DO NOT WRITE IN THIS MARGIN

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

Give the answer in simplest form. **2**

2. Multiply out the brackets and collect like terms:

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

[Turn over

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

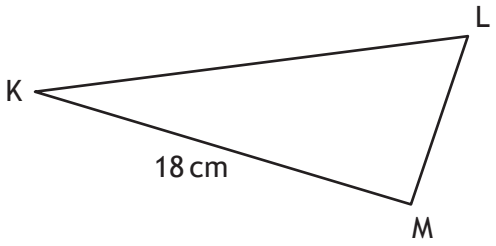
4. Find the resultant vector $2\boldsymbol{u} - \boldsymbol{v}$ when $\boldsymbol{u} = \begin{pmatrix} -2 \\ 3 \\ 5 \end{pmatrix}$ and $\boldsymbol{v} = \begin{pmatrix} 0 \\ -4 \\ 7 \end{pmatrix}$.

Express your answer in component form. **2**

5. In triangle KLM

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

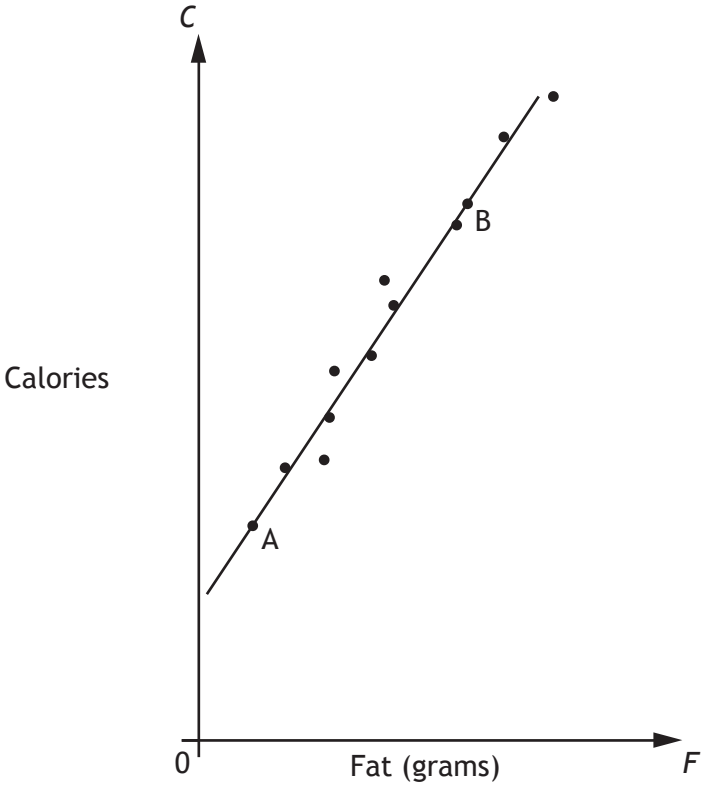
Calculate the length of LM. **3**



[Turn over

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.

6. (continued)

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

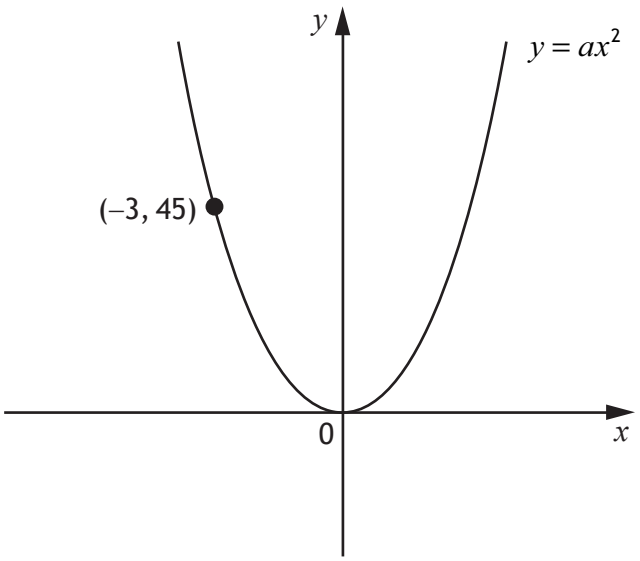
(b) A Super Deluxe sandwich contains 40 grams of fat.

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

Show your working. **1**

Total marks 4

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



Find the value of *a*. **2**

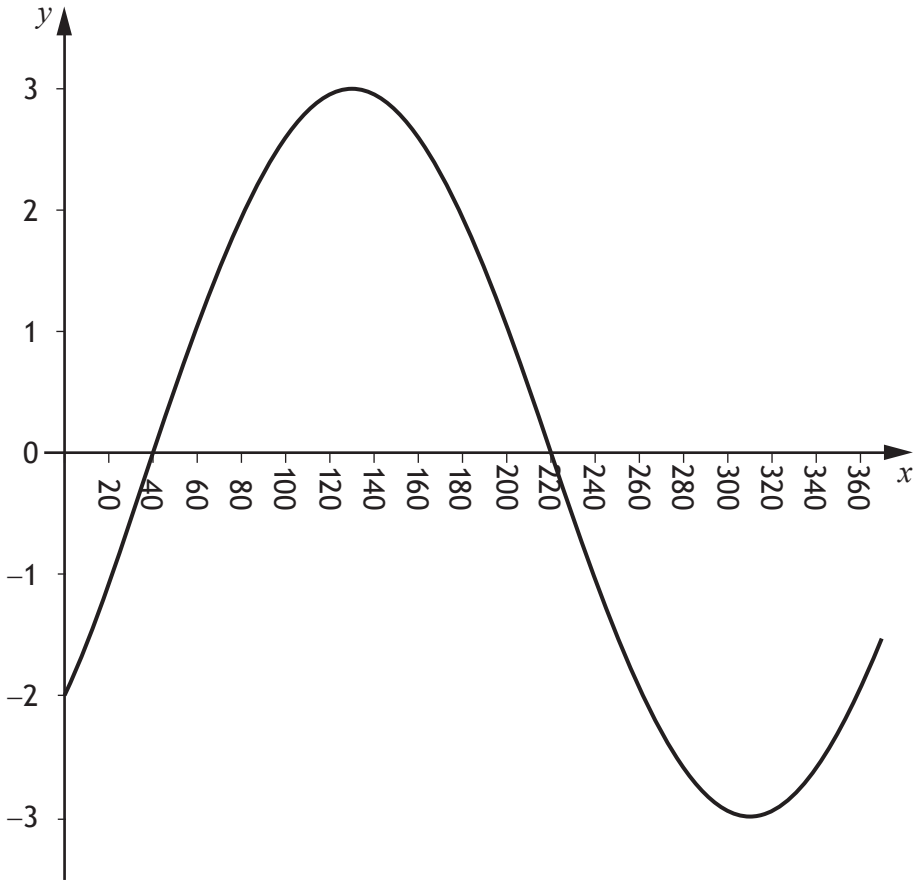
MARKS | DO NOT WRITE IN THIS MARGIN

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**

[Turn over

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



Write down the values of *a* and *b*. **2**

MARKS | DO NOT WRITE IN THIS MARGIN

11. (a) A straight line has equation $4x + 3y = 12$.

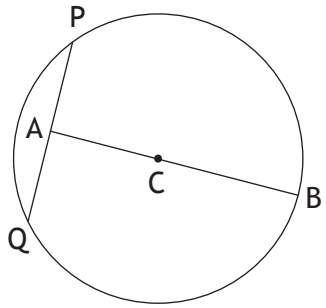
Find the gradient of this line. **2**

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

Total marks 4

[Turn over

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.

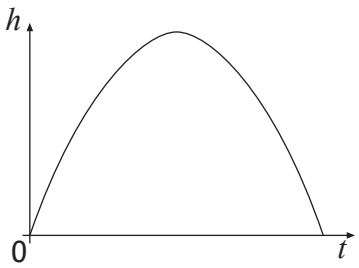
The length of AB is 27 centimetres.

Calculate the length of PQ. **4**

MARKS | DO NOT WRITE IN THIS MARGIN

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?
Justify your answer. **3**

Total marks 7

[END OF QUESTION PAPER]

MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS

MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS

[BLANK PAGE]

DO NOT WRITE ON THIS PAGE

FOR OFFICIAL USE

N5

National Qualifications 2014

Mark

X747/75/02

Mathematics Paper 2

TUESDAY, 06 MAY

10:20 AM – 11:50 AM

* X 7 4 7 7 5 0 2 *

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day Month Year

D D M M Y Y

Scottish candidate number

Total marks — 50

Attempt ALL questions.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

You may use a calculator.

Full credit will be given only to solutions which contain appropriate working.

State the units for your answer where appropriate.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

SQA ©

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$ or $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: $A = \frac{1}{2}ab\sin C$

Volume of a sphere: $V = \frac{4}{3}\pi r^3$

Volume of a cone: $V = \frac{1}{3}\pi r^2 h$

Volume of a pyramid: $V = \frac{1}{3}Ah$

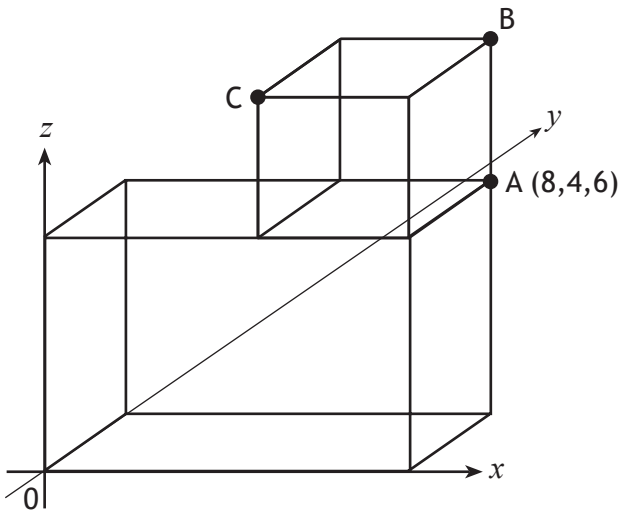
Standard deviation: $s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n-1}} = \sqrt{\dfrac{\Sigma x^2 - (\Sigma x)^2/n}{n-1}}$, where n is the sample size.

MARKS | DO NOT WRITE IN THIS MARGIN

1. There are 964 pupils on the roll of Aberleven High School.
It is forecast that the roll will decrease by 15% per year.
What will be the expected roll after 3 years?
Give your answer to the nearest ten. **3**

[Turn over

2. The diagram shows a cube placed on top of a cuboid, relative to the coordinate axes.



A is the point (8,4,6).

Write down the coordinates of B and C. **2**

MARKS | DO NOT WRITE IN THIS MARGIN

3. Two groups of people go to a theatre.

Bill buys tickets for 5 adults and 3 children.

The total cost of his tickets is £158·25.

(a) Write down an equation to illustrate this information. **1**

(b) Ben buys tickets for 3 adults and 2 children.

The total cost of his tickets is £98.

Write down an equation to illustrate this information. **1**

(c) Calculate the cost of a ticket for an adult and the cost of a ticket for a child. **4**

Total marks 6

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

4. A runner has recorded her times, in seconds, for six different laps of a running track.

53 57 58 60 55 56

(a) (i) Calculate the mean of these lap times.

Show clearly all your working. **1**

(ii) Calculate the standard deviation of these lap times.

Show clearly all your working. **3**

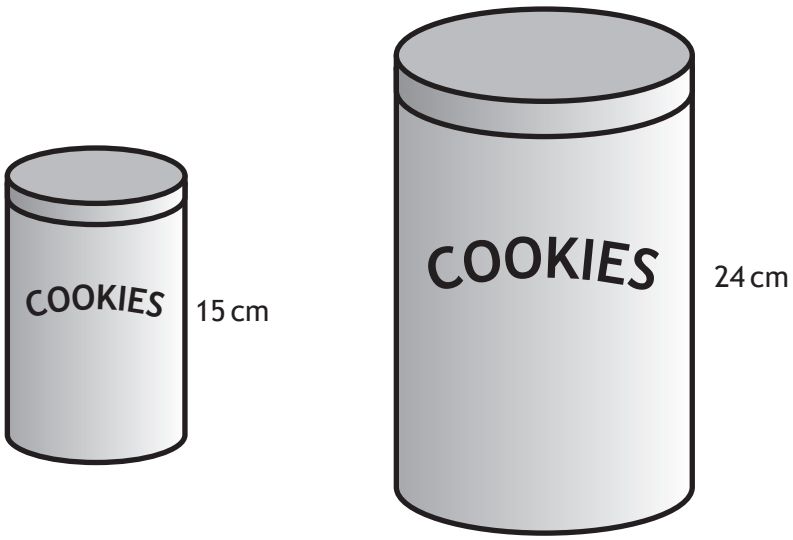
4. (continued)

(b) She changes her training routine hoping to improve her consistency.
After this change, she records her times for another six laps.
The mean is 55 seconds and the standard deviation 3·2 seconds.
Has the new training routine improved her consistency?
Give a reason for your answer. **1**

Total marks 5

[Turn over

5. A supermarket sells cylindrical cookie jars which are mathematically similar.



The smaller jar has a height of 15 centimetres and a volume of 750 cubic centimetres.

The larger jar has a height of 24 centimetres.

Calculate the volume of the larger jar. **3**

MARKS | DO NOT WRITE IN THIS MARGIN

6. The diagram below shows the position of three towns.

Lowtown is due west of Midtown.

The distance from

- Lowtown to Midtown is 75 kilometres.
- Midtown to Hightown is 110 kilometres.
- Hightown to Lowtown is 85 kilometres.

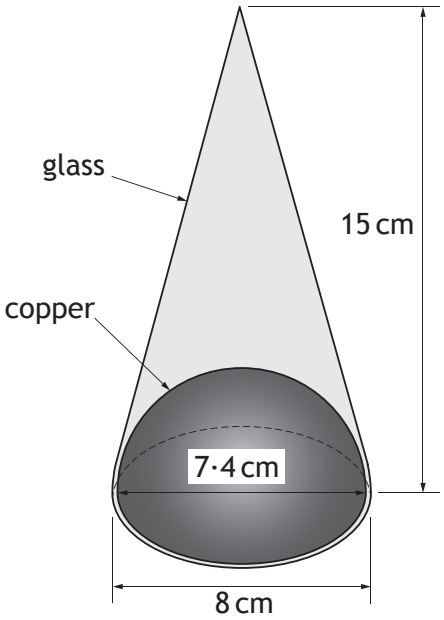
Is Hightown directly north of Lowtown?

Justify your answer. **4**

[Turn over

7. An ornament is in the shape of a cone with diameter 8 centimetres and height 15 centimetres.

The bottom contains a hemisphere made of copper with diameter 7·4 centimetres. The rest is made of glass, as shown in the diagram below.



Calculate the volume of the glass part of the ornament.

Give your answer correct to 2 significant figures. **5**

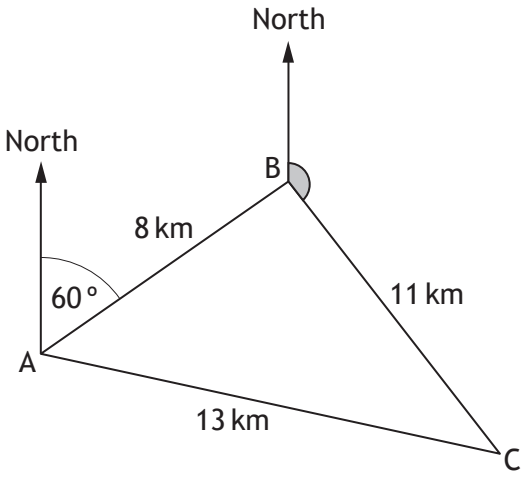
MARKS | DO NOT WRITE IN THIS MARGIN

8. Simplify $\frac{n^5 \times 10n}{2n^2}$. **3**

9. Express $\frac{7}{x+5} - \frac{3}{x}$ $x \neq -5,\ x \neq 0$ as a single fraction in its simplest form. **3**

[Turn over

10. In a race, boats sail round three buoys represented by A, B, and C in the diagram below.



B is 8 kilometres from A on a bearing of 060°.

C is 11 kilometres from B.

A is 13 kilometres from C.

(a) Calculate the size of angle ABC. **3**

(b) Hence find the size of the shaded angle. **2**

Total marks 5

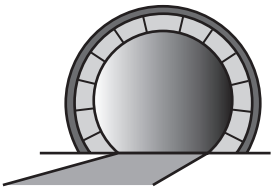
MARKS | DO NOT WRITE IN THIS MARGIN

11. Change the subject of the formula $s = ut + \frac{1}{2}at^2$ to a. **3**

12. Solve the equation $11\cos x° - 2 = 3$, for $0 \leq x \leq 360$. **3**

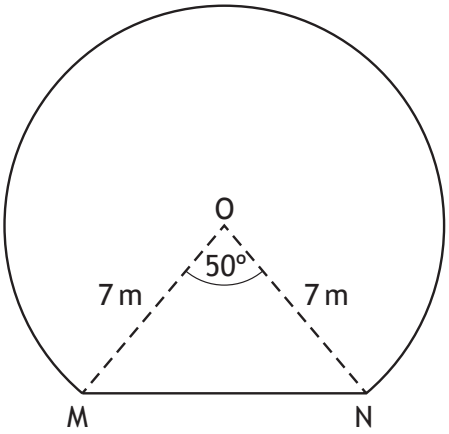
[Turn over

13. The picture shows the entrance to a tunnel which is in the shape of part of a circle.



The diagram below represents the cross-section of the tunnel.

- The centre of the circle is O.
- MN is a chord of the circle.
- Angle MON is 50°.
- The radius of the circle is 7 metres.



Calculate the area of the cross-section of the tunnel. **5**

[END OF QUESTION PAPER]

MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS

MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS