FOR OFFICIAL USE

N5

National Qualifications 2015

Mark

X747/75/01

Mathematics Paper 1 (Non-Calculator)

TUESDAY, 19 MAY

9:00 AM – 10:00 AM

X7477501

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

Scottish candidate number

Total marks — 40

Attempt ALL questions.

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.

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.

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.

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X7477501 01

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 $6\frac{1}{5} - 2\frac{1}{3}$. **2**

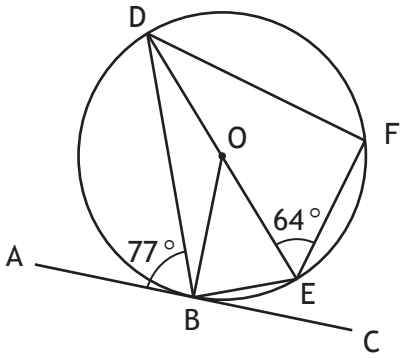
2. Solve algebraically the inequality

$$11 - 2(1 + 3x) < 39$$

3

[Turn over

3.



AC is a tangent to the circle, centre O, with point of contact B.
DE is a diameter of the circle and F is a point on the circumference.
Angle ABD is 77° and angle DEF is 64°.
Calculate the size of angle BDF. **3**

4. Multiply out the brackets and collect like terms

$(x-4)(x^2+x-2)$. **3**

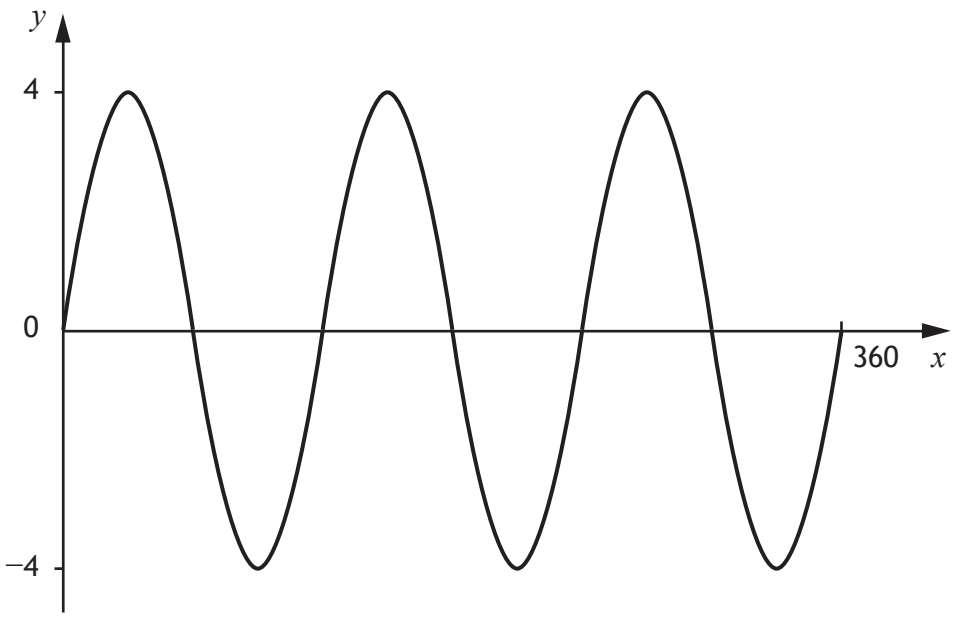
MARKS | DO NOT WRITE IN THIS MARGIN

5. The standard deviation of 1, 2, 2, 2, 8 is equal to $\sqrt{a}$.

Find the value of a. **3**

[Turn over

6. Part of the graph of $y = a \sin bx^\circ$ is shown in the diagram.

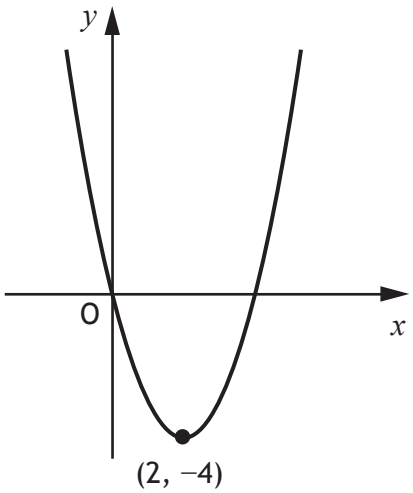


State the values of a and b. **2**

MARKS | DO NOT WRITE IN THIS MARGIN

7. The graph below shows part of the parabola with equation of the form

$$y = (x + a)^2 + b.$$



The minimum turning point (2, −4) is shown in the diagram.

(a) State the values of

(i) a **1**

(ii) b. **1**

(b) Write down the equation of the axis of symmetry of the graph. **1**

[Turn over

8. Find the equation of the line joining the points $(-2, 5)$ and $(3, 15)$.
Give the equation in its simplest form. **3**

9. Write the following in order of size starting with the smallest.

$\cos 90°$ $\cos 100°$ $\cos 300°$

Justify your answer. **2**

MARKS | DO NOT WRITE IN THIS MARGIN

10. Ten couples took part in a dance competition.

The couples were given a score in each round.

The scores in the first round were

16 27 12 18 26 21 27 22 18 17

(a) Calculate the median and semi-interquartile range of these scores. **3**

(b) In the second round, the median was 26 and the semi-interquartile range was 2·5.

Make two valid comparisons between the scores in the first and second rounds. **2**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

11. Solve algebraically the system of equations

$3x + 2y = 17$

$2x + 5y = 4.$ **3**

MARKS | DO NOT WRITE IN THIS MARGIN

12. Simplify $\frac{x^2 - 4x}{x^2 + x - 20}$. **3**

[Turn over for Question 13 on *Page twelve*

MARKS | DO NOT WRITE IN THIS MARGIN

13. Express $\frac{4}{\sqrt{8}}$ with a rational denominator.

Give your answer in its simplest form. **3**

14. Evaluate $8^{\frac{5}{3}}$. **2**

[END OF QUESTION PAPER]

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X747/75/02

Mathematics Paper 2

TUESDAY, 19 MAY

10:20 AM – 11:50 AM

X7477502

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

Scottish candidate number

Total marks — 50

Attempt ALL questions.

You may use a calculator.

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X7477502 01

FORMULAE LIST

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MARKS | DO NOT WRITE IN THIS MARGIN

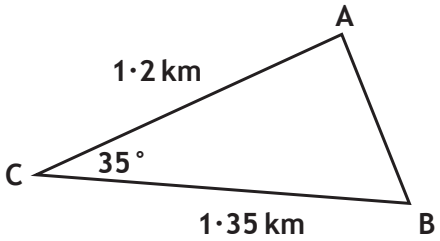
1. A house is valued at £240 000.
Its value is predicted to rise by 2·8% per annum.
Calculate its predicted value after 2 years. **3**

2. A function is defined as $f(x) = 3x + 2$.

Given that $f(a) = 23$, calculate a. **2**

[Turn over

3. Triangle ABC is shown below.



Calculate the length of AB. **3**

MARKS | DO NOT WRITE IN THIS MARGIN

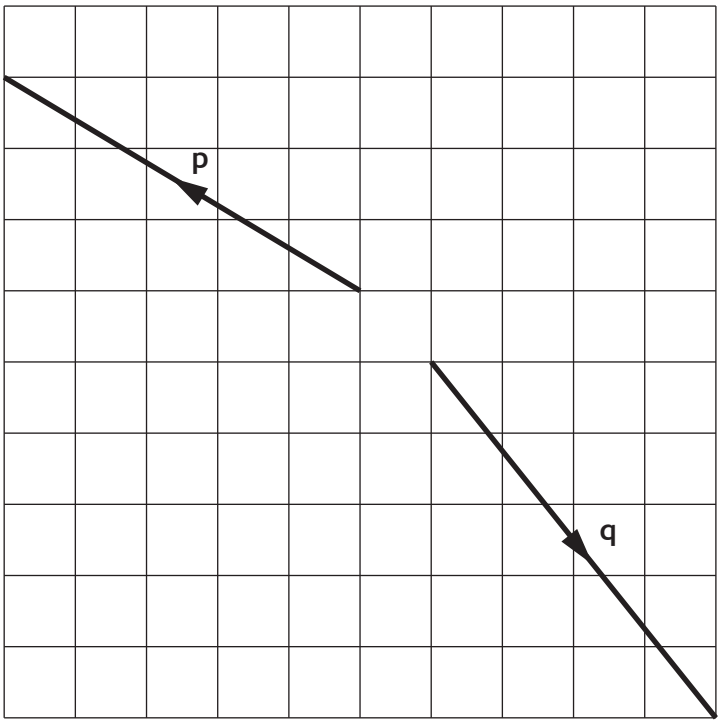
4. Find $|\mathbf{u}|$, the magnitude of vector $\mathbf{u} = \begin{pmatrix} 6 \\ -13 \\ 18 \end{pmatrix}$. **2**

[Turn over

5. The vectors **p** and **q** are shown in the diagram below.

Find the resultant vector **p** + **q**.

Express your answer in component form.



2

MARKS | DO NOT WRITE IN THIS MARGIN

6. (a) The Earth is approximately spherical with a radius of 6400 kilometres.

Calculate the volume of the Earth giving your answer in scientific notation, correct to 2 significant figures.

3

(b) The approximate volume of the Moon is $2{\cdot}2 \times 10^{10}$ cubic kilometres.

Calculate how many times the Earth's volume is greater than the Moon's.

2

[Turn over

7. Express $\frac{5t}{s} \div \frac{t}{2s^2}$ in its simplest form. **3**

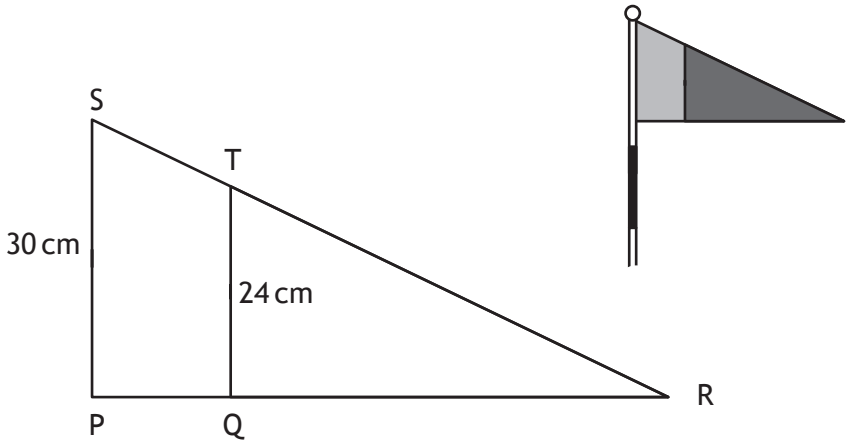
8. James paid £297·50 for a laptop in a sale.
The discount in the sale was 15%.
Calculate the original price of the laptop. **3**

9. The flag at each hole on a golf course is coloured red and blue.

The diagram below represents a flag.

Triangle QRT represents the red section.

PQTS represents the blue section.



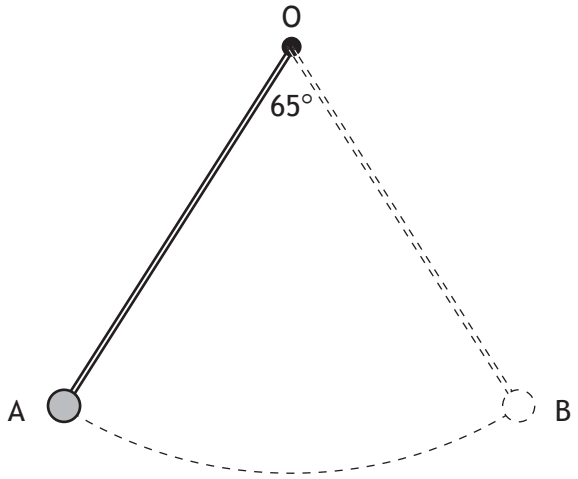
Triangles PRS and QRT are mathematically similar.

The area of triangle QRT is 400 square centimetres.

Calculate the area of PQTS, the blue section of the flag. **4**

[Turn over

10. The pendulum of a clock swings along an arc of a circle, centre O.



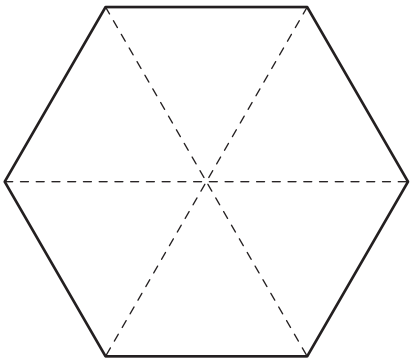
The pendulum swings through an angle of 65°, travelling from A to B.

The length of the arc AB is 28·4 centimetres.

Calculate the length of the pendulum. **4**

11. The top of a table is in the shape of a regular hexagon.

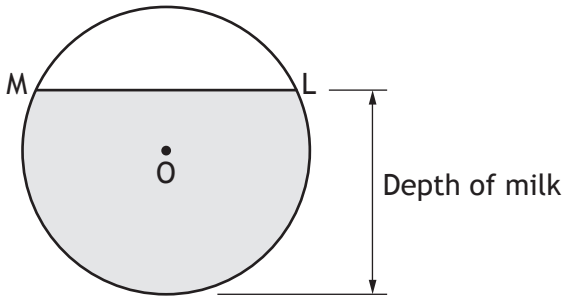
The three diagonals of the hexagon which are shown as dotted lines in the diagram below each have length 40 centimetres.



Calculate the area of the top of the table. **4**

[Turn over

12. The diagram below shows the circular cross-section of a milk tank.



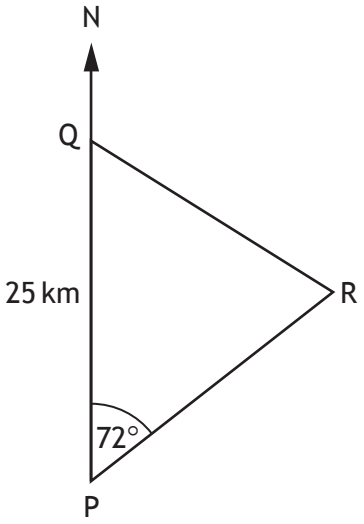
The radius of the circle, centre O, is 1·2 metres.

The width of the surface of the milk in the tank, represented by ML in the diagram, is 1·8 metres.

Calculate the depth of the milk in the tank. **4**

MARKS | DO NOT WRITE IN THIS MARGIN

13. In the diagram below P, Q and R represent the positions of Portlee, Queenstown and Rushton respectively.



Portlee is 25 kilometres due South of Queenstown.
From Portlee, the bearing of Rushton is 072°.
From Queenstown, the bearing of Rushton is 128°.

Calculate the distance between Portlee and Rushton.

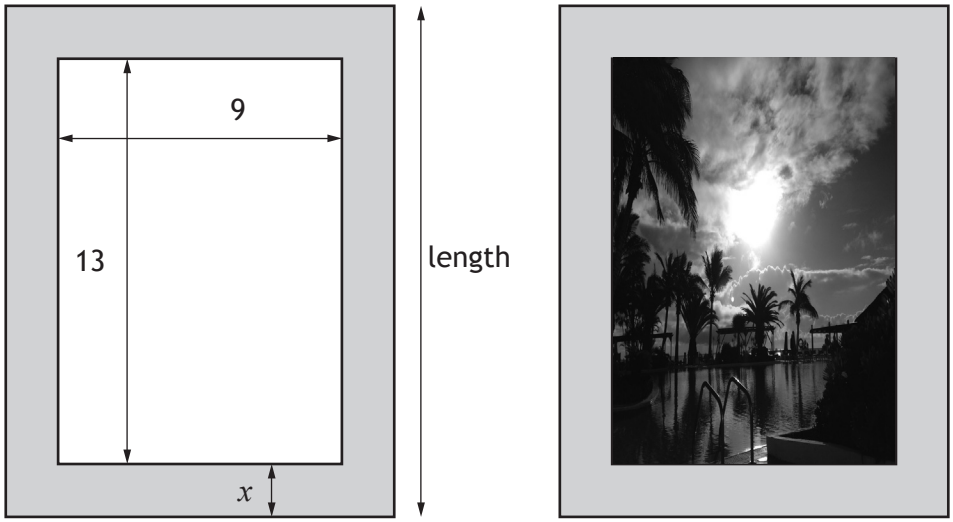
Do not use a scale drawing. **4**

[Turn over

14. A rectangular picture measuring 9 centimetres by 13 centimetres is placed on a rectangular piece of card.

The area of the card is 270 square centimetres.

There is a border x centimetres wide on all sides of the picture.



(a) (i) Write down an expression for the length of the card in terms of x. **1**

(ii) Hence show that $4x^2 + 44x - 153 = 0$. **2**

14. (continued)

(b) Calculate x, the width of the border.
Give your answer correct to one decimal place. **4**

[END OF QUESTION PAPER]

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ACKNOWLEDGEMENTS

Question 6 – Anton Balazh/shutterstock.com