N5

Essential Skills

National 5

Mathematics

Practice Exam 2025

Paper 2 (Calculator)

Time 1 hour 30 minutes

Total marks – 50

Attempt ALL questions.

You may use a calculator.

To earn full marks, you must show your working in your answers.

State the units for your answer where appropriate.

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

Marks available are harsh but I wanted as much course coverage as possible.

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 $A = \dfrac{1}{2}ab\sin C$

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

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

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

Standard deviation: $s = \sqrt{\dfrac{\sum(x - \overline{x})^2}{n - 1}}$

or $s = \sqrt{\dfrac{\sum x^2 - \dfrac{(\sum x)^2}{n}}{n - 1}}$, where n is the sample size.

Attempt ALL questions
Total marks – 50

1. Roy has a slow puncture in his tyre so puts pressure in when he arrives at work.

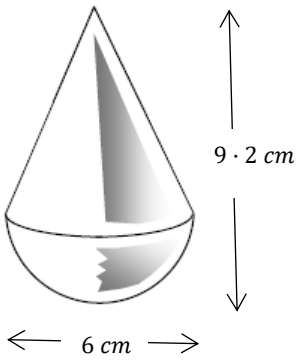
He fills until it reaches 32 psi (pounds per square inch).

It is considered flat and unsafe to drive on less than 20 psi.

His tyre is losing pressure at 10·5% per hour.

Establish if it will be safe to drive to a tyre fitter at the end of his 4 hour shift. **4**

2. A cat toy is formed of a hemisphere with a cone on top, as shown in the diagram.

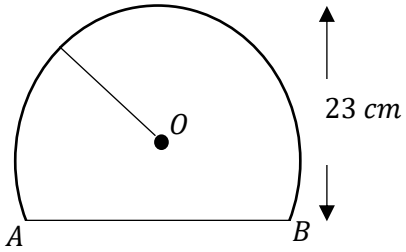


The toy is 6 centimetres wide and 9·2 centimetres high.

Calculate the volume of the toy.

Give your answer to 2 significant figures. **4**

3. The diagram shows part of a circle, centre O.



The circle has radius 14 centimetres.

The height of the shape is 23 centimetres.

Calculate the length of the chord AB. **4**

4. The points $A(6,9)$ and $B(4y, 4y^2)$ lie on a straight line.

Calculate the gradient of the line AB.

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

5. Show that

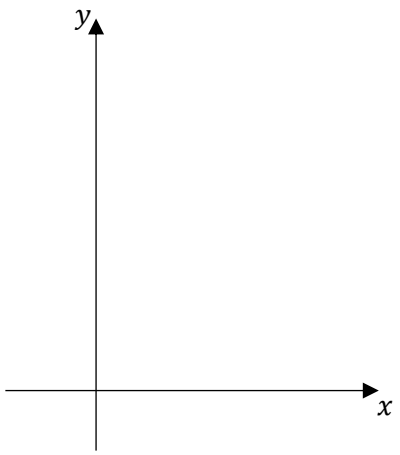
$$\frac{2-2cos^2x}{cos^2x} = 2tan^2x.$$

3

6. **(a)** Express $x^2 - 4x + 11$ in the form $(x + a)^2 + b$. **2**

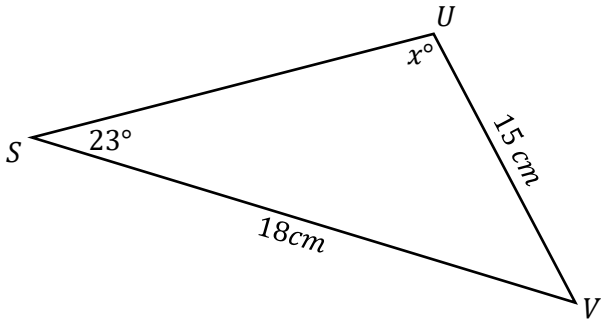
(b) Sketch the graph of $y = x^2 - 4x + 11$ on the axes provided.

Show clearly the coordinates of the turning point and the $y-$ intercept. **2**



7. The diagram shows triangle SUV.

- Angle USV = 23º
- SV = 18 centimetres
- UV = 15 centimetres



Calculate obtuse angle SUV. **3**

8. The population of an occupied land was $2{\cdot}1\times10^{6}$ people in April 2025.

This is 8% less than it was 18 months before.

Calculate the population in October 2023.

Write your answer in scientific notation to 3 significant figures. **3**

9. The British and Irish Lions with take on Australia this summer.
To mark the occasion, they have produced special rugby balls and miniature and full-size.

The full-sized ball has a width of 30 centimetres and a volume of 4500 cubic centimetres.

The miniature ball has a width of 12 cm.

Calculate the volume of the miniature ball. **3**

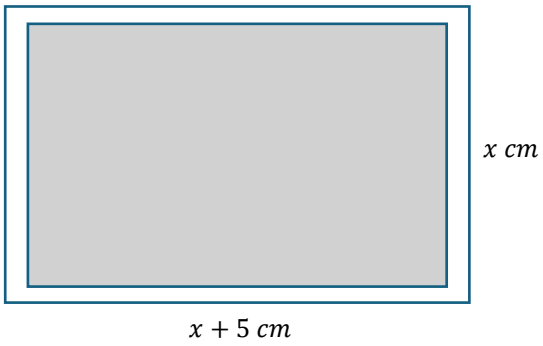
10. The weight, in kilograms, of 10 highland cow calves are

32 25 37 21 40 33 24 38 35 26

Calculate the median and the interquartile range. **2**

11. A rectangular picture has an area of 187cm².

With the frame added the total area is increased by another 60cm².



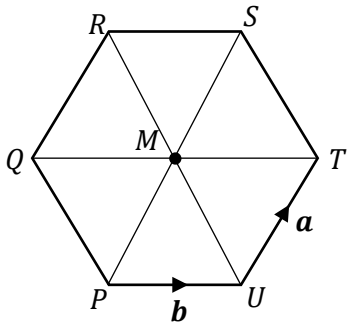
(a) Show that $x^2 + 5x - 247 = 0$. **2**

(b) Calculate the value of x.

Give your answer to one decimal place. **3**

12. In the diagram, PQRSTU is a regular hexagon with centre M.

Vectors $\overrightarrow{UT}$ and $\overrightarrow{PU}$ and represented by $\boldsymbol{a}$ and $\boldsymbol{b}$ respectively.



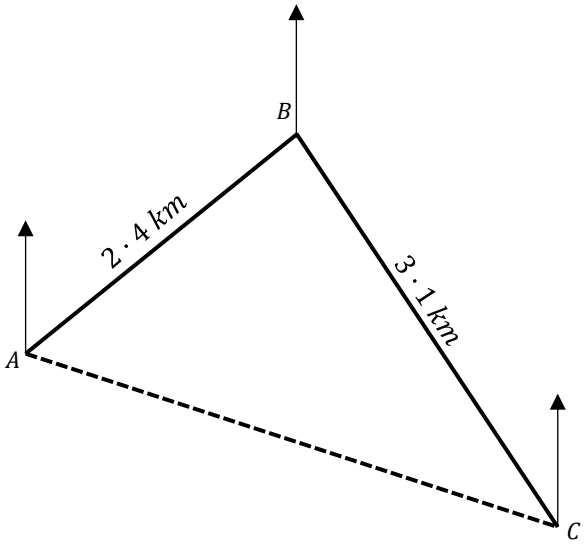
(a) Express $\overrightarrow{UM}$ in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$. **1**

(b) Express $\overrightarrow{RP}$ in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$. **2**

13. Jasmine takes part in an orienteering task around the points A, B and C as shown.

She walks 2·4 kilometres on a bearing of 061º from A to B.

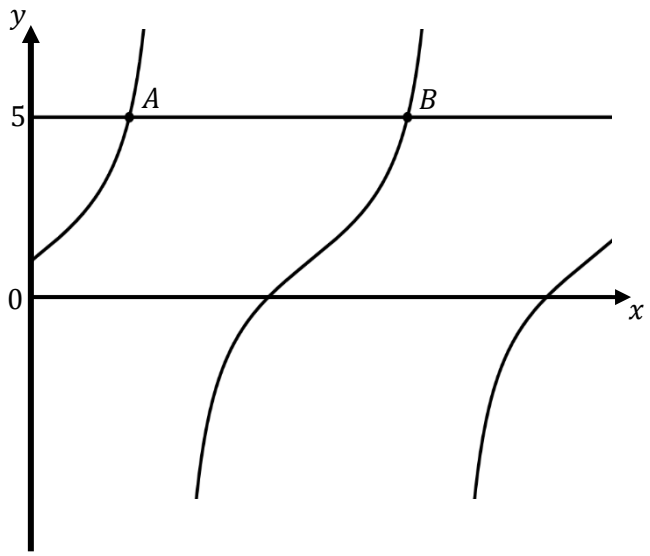
She then walks 3·1 kilometres on a bearing of 123º from B to C.



(a) Calculate the size of angle ABC. **2**

(b) Calculate how far Jasmine must walk directly from C to A. **3**

14. The diagram shows the graph of $y = 2tanx + 1$ being intercepted by the line $y = 5$ at A and B.



Calculate the coordinates of A and B. **4**

[END OF QUESTION PAPER]