N5

Practice Prelim: Paper A
Non Calculator

Units 1 - 3

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.

1. Multiply out the brackets and collect like terms

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

3

2. Factorise $a^2-9a+20$

1

3. Evaluate $3\frac{5}{8}+4\frac{2}{3}$

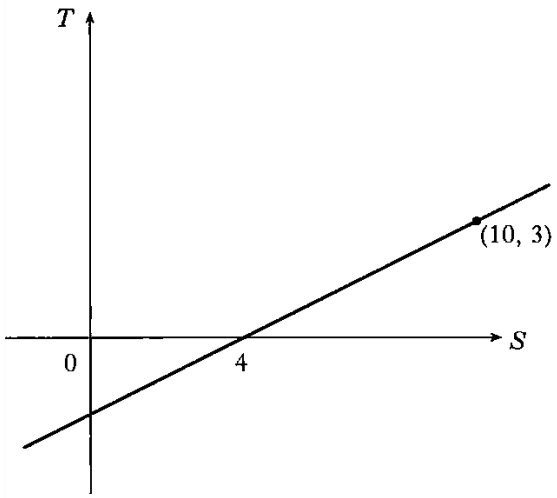
2

4. Solve algebraically the inequality

$$2y<3-(y+6)$$

3

5.



Find the equation of the given straight line in terms of *T* and *S*.

3

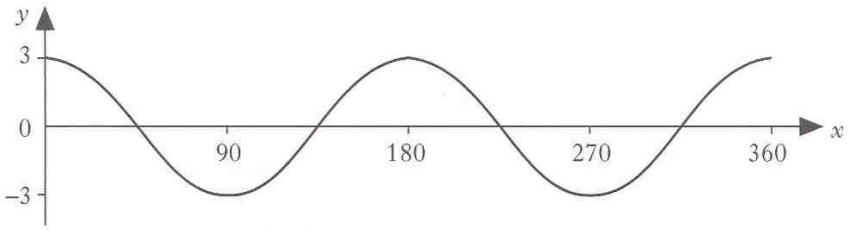
6. $h(t)=15t-3t^2$
Find $h(-2)$.

2

7. If $\underline{a}=\begin{pmatrix}2\\4\\5\end{pmatrix}$ and $\underline{b}=\begin{pmatrix}-4\\2\\0\end{pmatrix}$, calculate $3\underline{a}-2\underline{b}$

2

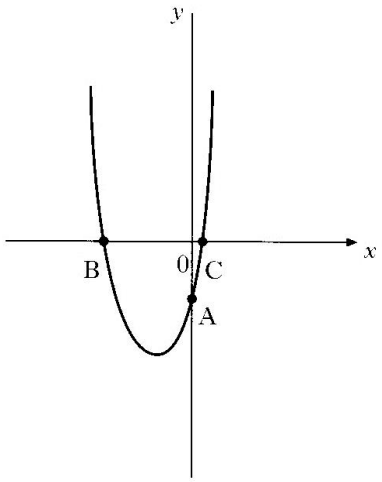
8.



The diagram shows the graph of $y=acosbx$, $\quad 0\leq x\leq 360$.
Find the values of a and b.

2

9. The diagram below shows part of the graph of $y = 4x^2 + 4x - 3$.
The graph cuts the y-axis at A and the x-axis at B and C.

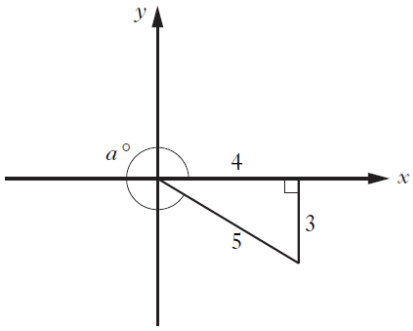


(a) Write down the coordinates of A. **1**

(b) Find the coordinates of B and C. **3**

(c) Calculate the minimum value of $4x^2 + 4x - 3$ **2**

10.



Write down the value of $cosa°$. **1**

11. Alloys are made by mixing metals.

Two different alloys are made using iron and lead.

To make the first alloy, 3 cubic centimetres of iron and 4 cubic centimetres of lead are used.
This alloys weighs 65 grams.

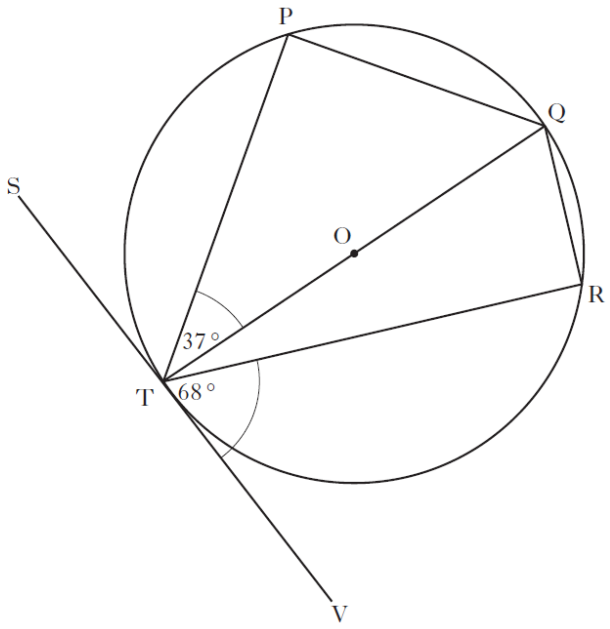
(a) Let x grams be the weight of 1 cubic centimetre of iron and y grams be the weight of 1 cubic centimetre of lead.
Write down an equation in x and y which satisfies the above condition. **1**

To make the second alloy, 5 cubic centimetres of iron and 7 cubic centimetres of lead are used.
This alloys weighs 112 grams.

(b) Write down a second equation in x and y which satisfies this condition. **1**

(c) Find the weight of 1 cubic centimetre of iron and the weight of 1 cubic centimetre of lead. **3**

12.



The tangent SV touches the circle, centre O, at T.
Angle PTQ is 37° and angle VTR is 68°.
Calculate the size of angle PQR.

3

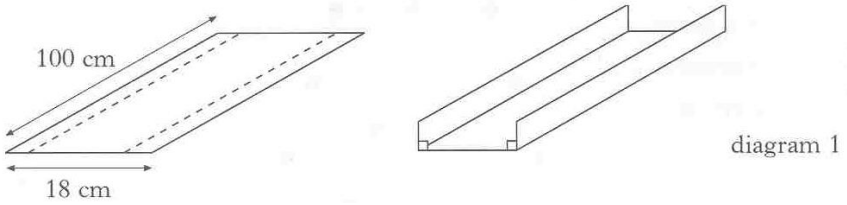
13. Two variables x and y are connected by the relationship $y = mx + c$.
Sketch a possible graph of y against x to illustrate this relationship when m and c are each less than zero.

3

14. Simplify $\dfrac{cosx°tanx°}{sinx°}$

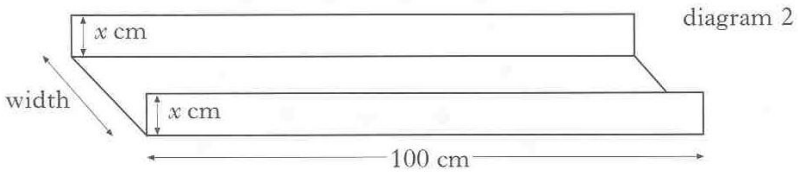
2

15. A rectangular sheet of plastic 18cm by 100cm is used to make gutter for draining rain water.
The gutter is made by bending the sheet of plastic as shown below in diagram 1.



(a) The depth of the gutter is x centimetres as shown in diagram 2 below.
Write down an expression in x for the width of the gutter.

1



(b) Show that the volume, V cubic centimetres, of this gutter is given by

$$V = 1800x - 200x^2$$

2

(c) Find the dimensions of the gutter which has the largest volume.
Show clearly all your working.

4

N5

Practice Prelim: Paper A
Calculator

Units 1 - 3

1. Given that $x^2 - 10x + 18 = (x - a)^2 + b$,
Find the values of a and b.

2

2. Paul bought a car last year.
It has lost 12½% of its value since then.
It is now valued at £10 500.
How much did Paul pay for his car?

2

3. Two forces acting on a rocket are represented by vector $\underline{u}$ and $\underline{v}$.

$$\underline{u} = \begin{pmatrix} 2 \\ -5 \\ -3 \end{pmatrix} \quad \text{and} \quad \underline{v} = \begin{pmatrix} 7 \\ 4 \\ -1 \end{pmatrix}$$

Calculate $|\underline{u} + \underline{v}|$, the magnitude of the resultant force.

3

4. The price, in pence per litre, of petrol at 10 city garages is shown below.

84.2	84.4	85.1	83.9	81.0
84.2	85.6	85.2	84.9	84.8

(a) Calculate the mean and standard deviation of these prices. **4**
(b) In 10 rural garages, the petrol prices had a mean of 88.8 and a standard deviation of 2.4.
How do the rural prices compare with the city prices? **2**

5. $M = R^2t - 3$
Change the subject of the formula to R.

3

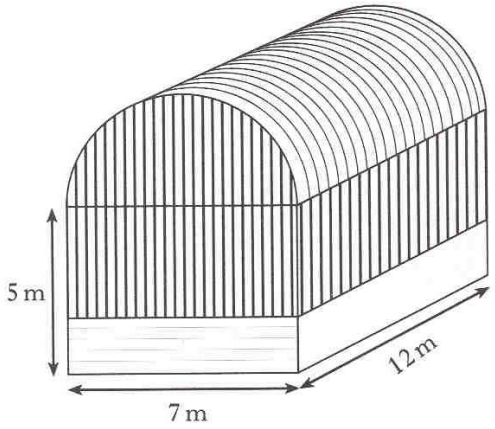
6. Solve algebraically the equation $5tanx - 9 = 0, \quad 0 \leq x \leq 360$.

3

7. In January 2017, it was estimated that the number of monkeys in a colony was 5000.
The number of monkeys is decreasing at the rate of 12% per year.
How many monkeys are expected to be in this colony in January 2020?
Give your answer to the nearest 10.

3

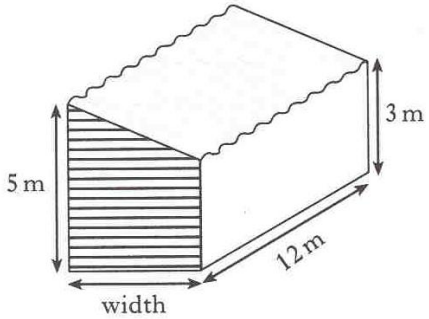
8. A storage barn is prism shaped, as shown below.



The cross-section of the storage barn consists of a rectangle measuring 7 metres by 5 metres and a semi-circle of radius 3.5 metres.

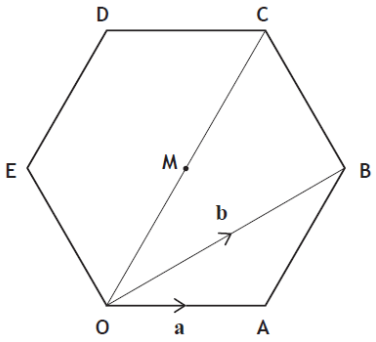
(a) Find the volume of the storage barn.
Give your answer in cubic metres, correct to 2 significant figures. **4**

(b) An extension to the barn is planned to increase the volume by 200 cubic metres.



The uniform cross-section of the extension consists of a rectangle and a right-angled triangle.
Find the width of the extension. **3**

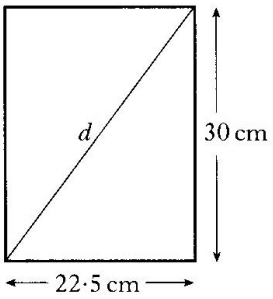
9. In the diagram, OABCDE is a regular hexagon with centre M.
Vectors $\underline{a}$ and $\underline{b}$ are represented by $\overrightarrow{OA}$ and $\overrightarrow{OB}$ respectively.



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

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

10. A rectangular picture frame is to be made.



It is 30 centimetres high and 22.5 centimetres wide, as shown.

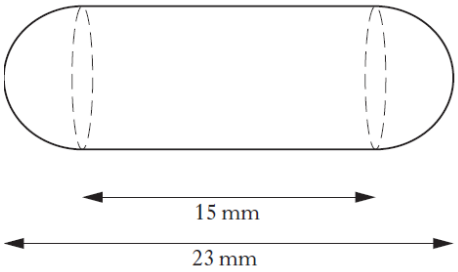
To check that the frame is rectangular, the diagonal, d, is measured.
It is 37.3 centimetres long.

Is the frame rectangular?

4

11. A health food shop produces cod liver oil capsules for its customers.

Each capsule is in the shape of a cylinder with hemispherical ends as shown in the diagram below.



The total length of the capsule is 23 millimetres and the length of the cylinder is 15 millimetres.

Calculate the volume of on cod liver oil capsule.

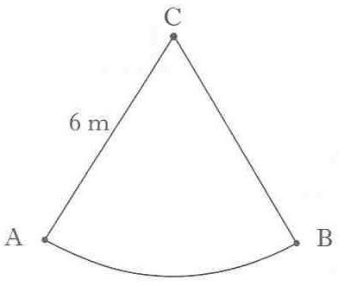
4

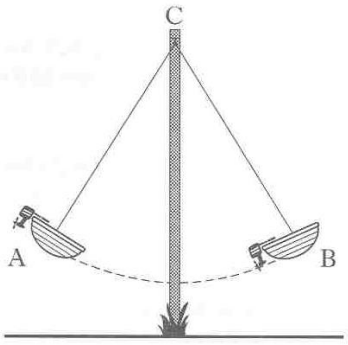
12. Solve algebraically the equation

$$\frac{m}{3} = \frac{1-m}{5}$$

3

13. The boat on a carnival ride travels along an arc of a circle, centre C.

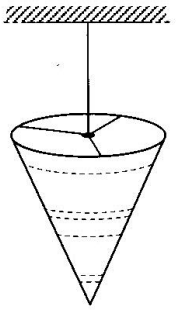




The boat is attached to C by a rod 6 metres long.
The rod swings from position CA to position CB.
The length of the arc AB is 7 metres.
Find the angle through which the rod swings from position A to position B.

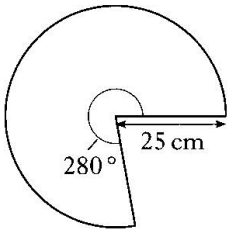
3

14. A lampshade is made in the shape of a cone, as shown.



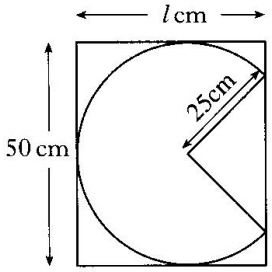
The shape of the material used for the lampshade is a sector of a circle.

The circle has radius 25 centimetres and the angle of the sector is 280°.



(a) Find the area of the sector of the circle. **3**

Each sector is cut from a rectangular piece of material, 50 centimetres wide.



(b) Find, to the nearest centimetre, the minimum length, l, required for the piece of material. **4**

END OF QUESTION PAPER