N5

Mαthematics

National 5 Practice Paper I

Paper 2

Duration – 1 hour and 30 minutes

Total marks – 50

- You may use a calculator
- Attempt all the questions.
- Use **blue** or **black** ink.
- Full credit will only be given to solutions which contain appropriate working.
- State the units for your answer where appropriate.

FORMULAE LIST

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

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

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

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: $V = \dfrac{1}{3}Ah$

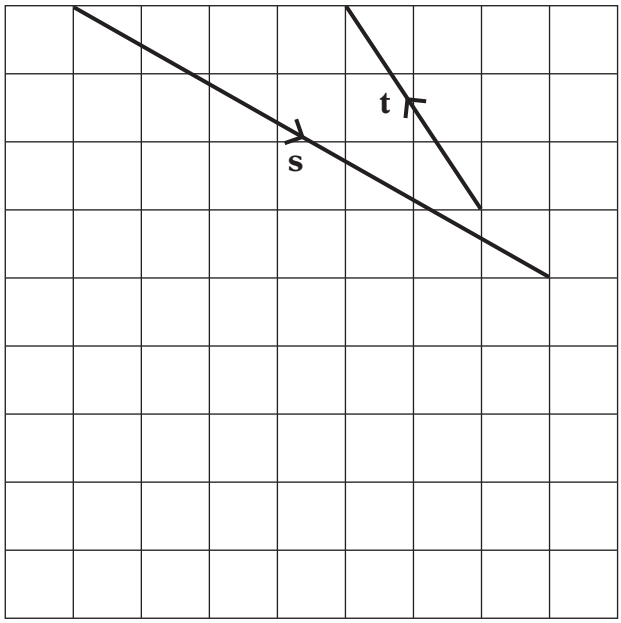
Standard deviation: $s = \sqrt{\dfrac{\sum(x-\bar{x})^2}{n-1}} = \sqrt{\dfrac{\sum x^2 - (\sum x)^2/n}{n-1}}$, where n is the sample size.

1. The National Debt of the United Kingdom was recently calculated as

£1 157 818 887 139.

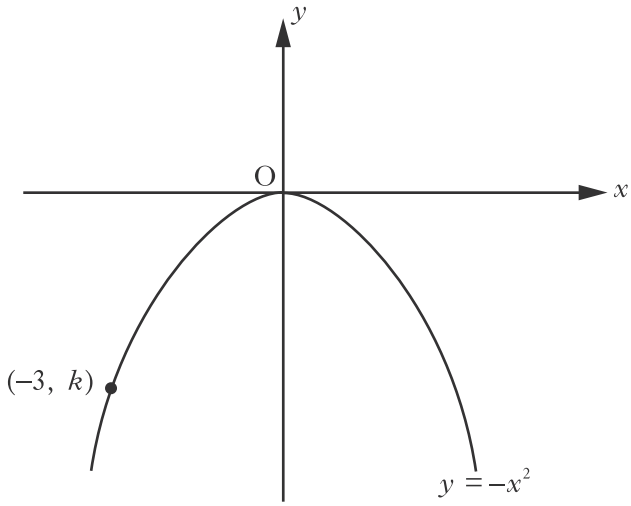
Round this amount to four significant figures. 1

2. The diagram shows vectors s and t.



Find the components of s + t. 2

3. The diagram below shows the graph of $y = -x^2$.

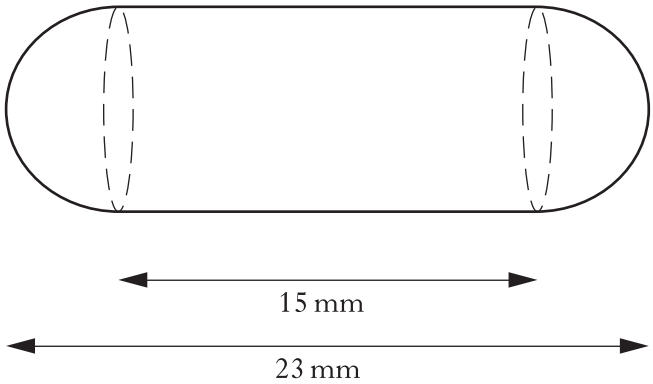


The point $(-3, k)$ lies on the graph.

Find the value of k. 1

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

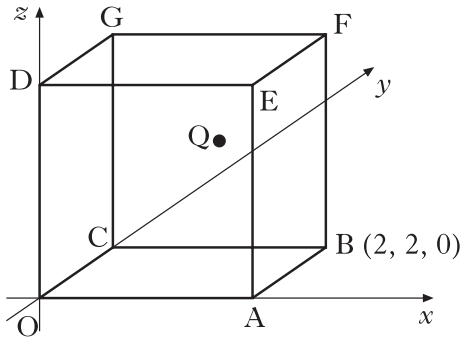
Each capsule is in the shape of a cylinder with hemispherical ends as shown in the diagram below.



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

Calculate the volume of one cod liver oil capsule. 4

5. OABCDEFG is a cube with side 2 units, as shown in the diagram.



B has coordinates (2, 2, 0).

Q is the midpoint of face CBFG.

Write down the coordinates of G and Q. 2

6. Express in its simplest form $y^8 \times (y^3)^{-2}$. 2

7. A straight line is represented by the equation $2y + x = 6$.

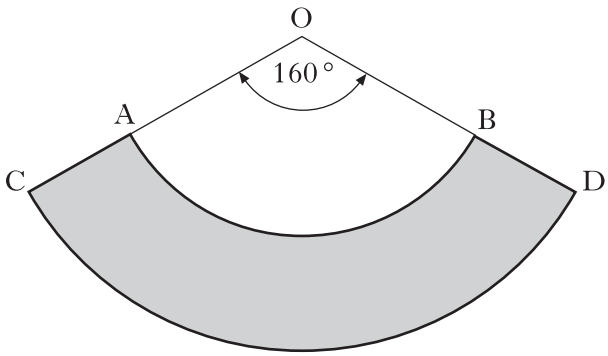
(a) Find the gradient of this line. 2

(b) Write down the coordinates of the point where this line crosses the y-axis. 1

Total marks 3

8. A pet shop manufactures protective dog collars.

In the diagram below the shaded area represents one of these collars.



AB and CD are arcs of the circles with centres at O.

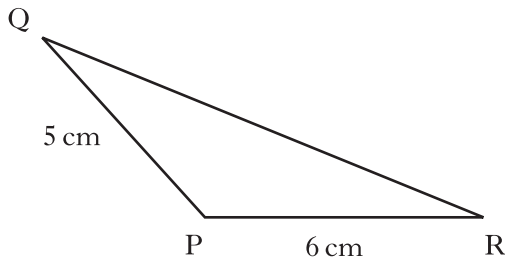
The radius, OA, is 10 inches and the radius, OC, is 18 inches.

Angle AOB is 160°.

Calculate the area of the collar. 4

9. Show that the equation $x(5-2x)=7$ has no real roots. 4

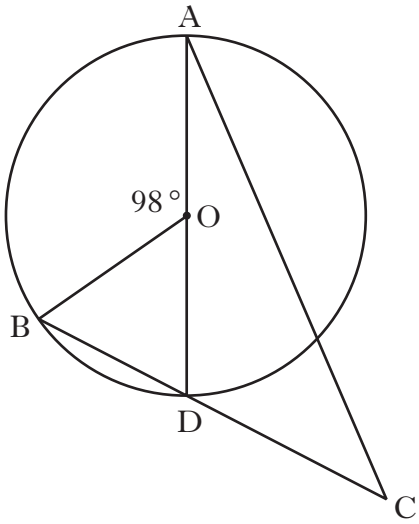
10. In triangle PQR



- PQ = 5 centimetres
- PR = 6 centimetres
- Area of triangle PQR = 12 square centimetres
- Angle QPR is obtuse.

Calculate the size of angle QPR. 4

11.



AD is a diameter of a circle, centre O.

B is a point on the circumference of the circle.

The chord BD is extended to a point C, outside the circle.

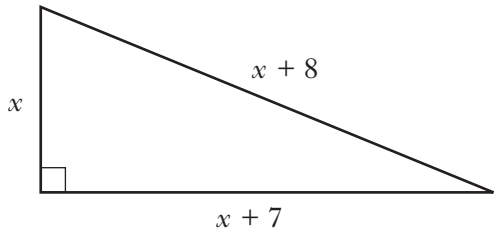
Angle BOA = 98°.

DC = 9 centimetres.

The radius of the circle is 7 centimetres.

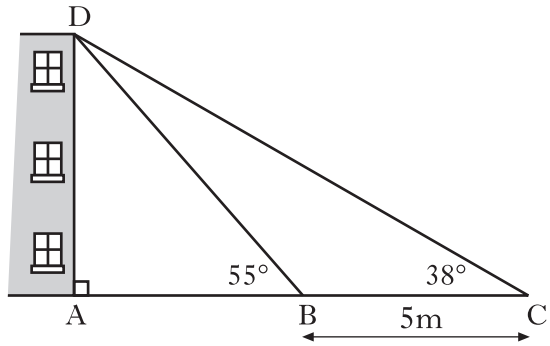
Calculate the length of AC. 5

12. A right-angled triangle has dimensions, in centimetres, as shown.



Calculate the value of x. 5

13. For reasons of safety, a building is supported by two wooden struts, represented by DB and DC in the diagram below.



Angle ABD = 55°.

Angle BCD = 38°.

BC is 5 metres.

Calculate the height of the building represented by AD. 5

14. Due to the threat of global warming, scientists recommended in 2010 that the emissions of greenhouse gases should be reduced by 50% by the year 2050.

The government decided to reduce the emissions of greenhouse gases by 15% every ten years, starting in the year 2010.

Will the scientists' recommendations have been achieved by 2050?

You must give a reason for your answer. 4

15. The depth of water, D metres, in a harbour is given by the formula

$$D = 3 + 1{\cdot}75\sin 30h°$$

where h is the number of hours after midnight.

(a) Calculate the depth of the water at 5 am. 2

(b) Calculate the maximum difference in depth of the water in the harbour.
Do not use a trial and improvement method. 2

Total marks 4

[End of Practice Paper]