N5

Mαthematics

National 5 Practice Paper F

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

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

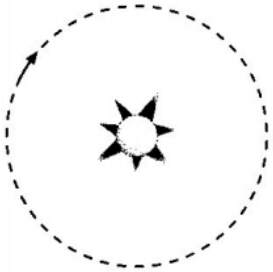
Volume of a Sphere: $V = \dfrac{4}{3}\pi r^3$

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 orbit of a planet around a star is circular.



The radius of the orbit is 4.96×10^7 kilometres.

Calculate the circumference of the orbit.

Given your answer in scientific notation. 3

2. A boat was bought for £35 000. Its value decreases by 8% each year.

How much will the boat be worth after 4 years? 3

3. Change the subject of the formula below to x.

$$\frac{x}{c} + a = b$$

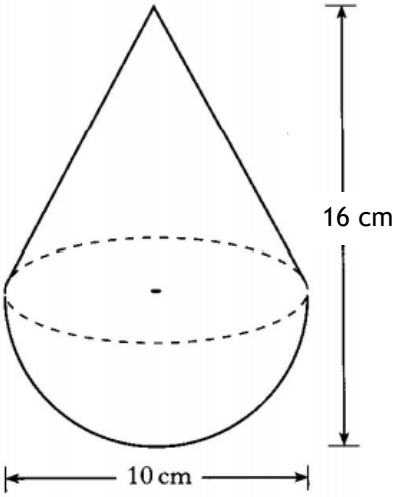
2

4. Solve algebraically the system of equations

$$4x + 2y = 13$$
$$5x + 3y = 17.$$

3

5. A child's toy is in the shape of a hemisphere with a cone on top, as shown in the diagram.

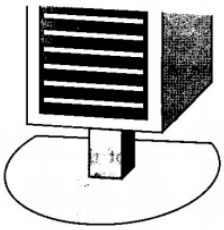


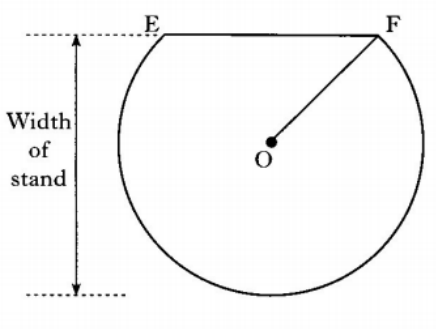
The toy is 10 centimetres wide and 16 centimetres high.

Calculate the volume of the toy.

Give your answer correct to two significant figures. 5

6. The diagram shows the base of a loudspeaker stand which has the shape of part of a circle.



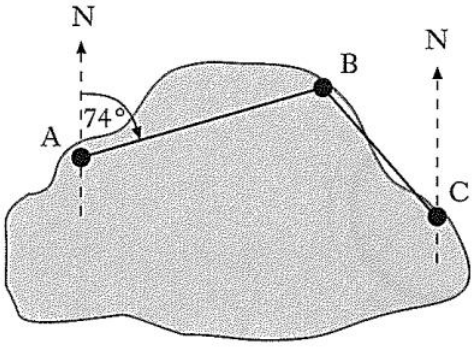


- The centre of the circle is O.
- EF is a chord of the circle.
- EF is 18 centimetres.
- The radius, OF, of the circle is 15 centimetres.

Find the width of the stand. 4

7. There are three mooring points on Lake Sorling.

- From A, the bearing of B is 074°.
- From C, the bearing of B is 310°.



(a) Calculate the size of angle ABC. 2

B is 230 metres from A and 110 metres from C.

(b) Calculate the direct distance from A to C.
Give your answer to 3 significant figures. 4

8. Express

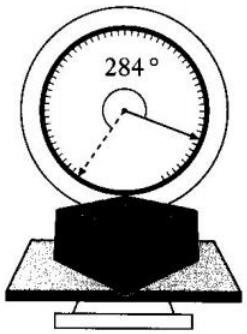
$$\frac{3}{(x+1)} - \frac{1}{(x-2)} \quad , \qquad x \neq -1, \quad x \neq -2$$

as a single fraction in its simplest form. 3

9. A set of scales has a circular dial.

The pointer is 9 centimetres long.

The tip of the pointer moves through an arc of 2 centimetres for each 100 grams of weight on the scales.



A parcel, placed on the scales, moves the pointer through an angle of 284°.

Calculate the weight of the parcel. 4

10. The number of diagonals, d, in a polygon of n sides is given by the formula

$$d = \frac{1}{2}n(n-3).$$

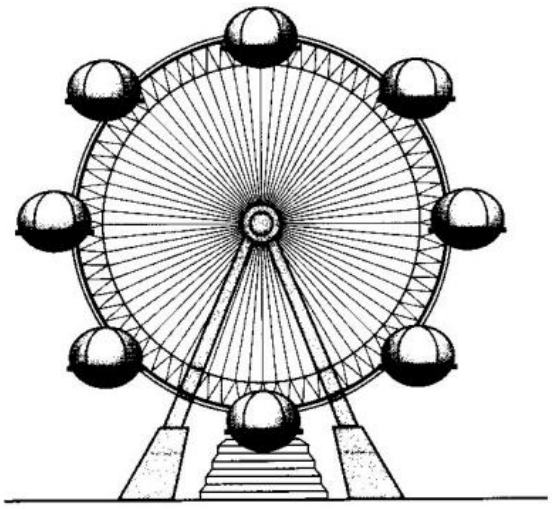
(a) How many diagonals does a polygon of 7 sides have? 2

(b) A polygon has 65 diagonals.

Show that for this polygon, $n^2 - 3n - 130 = 0$. 2

(c) Hence find the number of sides in this polygon. 3

11. Emma goes on the “Big Eye”.



Her height, h metres, above the ground is given by the formula

$$h = -31\cos t° + 33$$

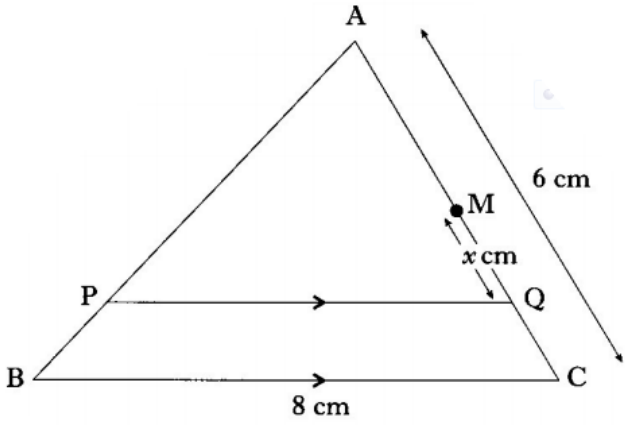
where t is the number of seconds since the start.

(a) Calculate Emma’s height above the ground 20 seconds after the start. 2

(b) When will Emma first reach a height of 60 metres above the ground? 3

(c) When will she next be at a height of 60 metres above the ground? 1

12. In triangle ABC,



- BC = 8 centimetres
- AC = 6 centimetres
- PQ is parallel to BC
- M is the midpoint of AC.
- Q lies on AC, x centimetres from M, as shown in the diagram.

(a) Write down an expression for the length of AQ. 1

(b) Show that PQ $= \left(4 + \frac{4}{3}x\right)$ centimetres. 3

[End of question paper]