N5

National Qualifications 2019

Mark

X847/75/02

Mathematics Paper 2

FRIDAY, 3 MAY
10:45 AM – 12:35 PM

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 — 60

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.

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.

A/PB

FORMULAE LIST

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

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

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

Area of a triangle $\qquad A = \frac{1}{2} ab \sin C$

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

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

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

Standard deviation $\qquad s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n - 1}}$

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

Total marks — 60

Attempt ALL questions

1. A charity distributed 80 000 emergency packages during 2018.

   This number is expected to increase by 15% each year.

   Calculate how many emergency packages the charity expects to distribute in 2021.
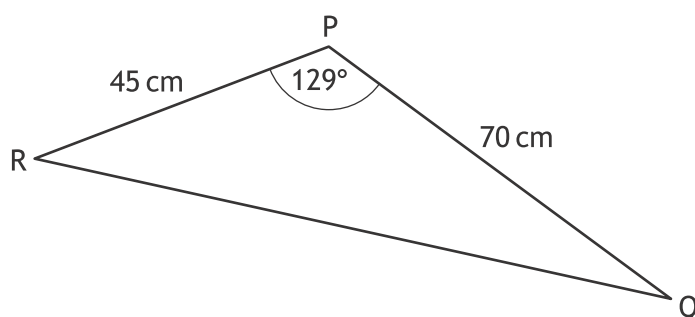
   3

2. Find $|\mathbf{p}|$, the magnitude of vector $\mathbf{p} = \begin{pmatrix} 6 \\ 27 \\ -18 \end{pmatrix}$.

   2

3. The diagram shows triangle PQR.

- PR = 45 centimetres
- PQ = 70 centimetres
- Angle QPR = 129°

Calculate the area of triangle PQR.

2

4. A sesame seed weighs $3 \cdot 6 \times 10^{-6}$ kilograms.

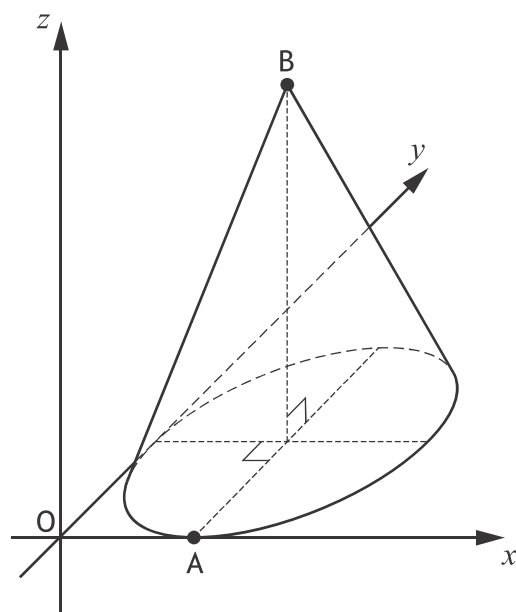The weight of a poppy seed is 8% of the weight of a sesame seed.

Calculate the weight of a poppy seed in kilograms.

Give your answer in scientific notation.

2

5. The diagram shows a cone with diameter 6 units and height 8 units.

- The x-axis and the y-axis are tangents to the base

- A is the point of contact between the base and the x-axis

- B is directly above the centre of the base

Write down the coordinates of A and B.   2
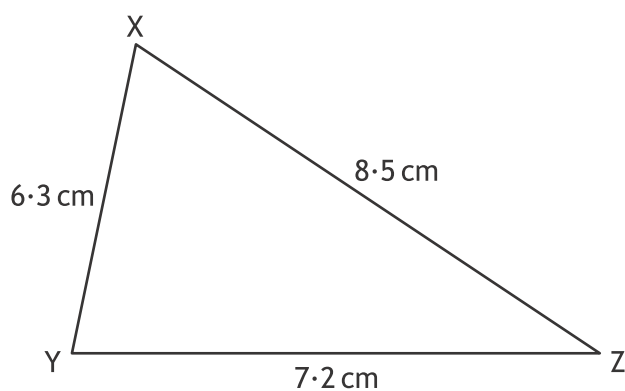
6. Solve the equation $3x^2 + 9x - 2 = 0$.

Give your answers correct to 1 decimal place.

3

7. Triangle XYZ is shown below.

Calculate the size of the smallest angle in triangle XYZ.
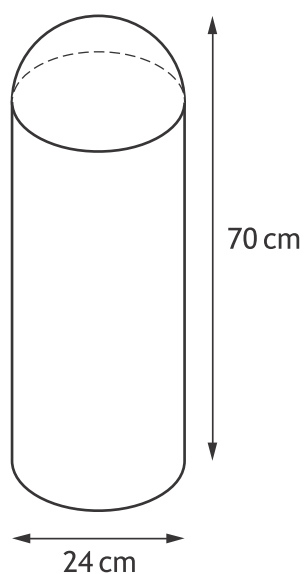
3

8. A traffic bollard is in the shape of a cylinder with a hemisphere on top.

The bollard has

- diameter 24 centimetres
- height 70 centimetres.

70 cm

24 cm

Calculate the volume of the bollard.

Give your answer correct to 3 significant figures.

5

9. Georgie had her roof repaired.

She was charged an extra 2·5% for late payment.

She had to pay a total of £977·85.

Calculate how much she would have **saved** if she had paid on time.　　　**3**
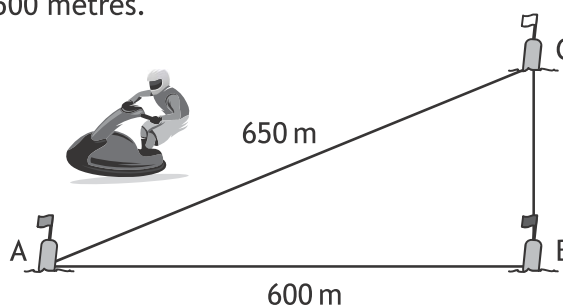
10. Express $x^2 + 10x - 15$ in the form $(x + p)^2 + q$.　　　**2**

11. The diagram shows the course for a jet-ski race.

The course is indicated by markers A, B and C.

The total length of the course is 1500 metres.

- B is 600 metres from A
- C is 650 metres from A
- C is due north of B

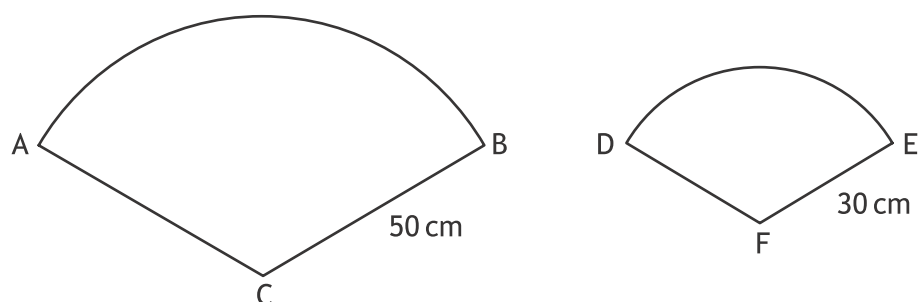650 m

A   600 m   B

Determine whether B is due east of A.

Justify your answer. 4

12. In the diagram

- ABC is a sector of a circle, centre C
- DEF is a sector of a circle, centre F.

50 cm

30 cm

The sectors are mathematically similar.

The area of the larger sector, ABC, is 2750 square centimetres.

(a) Calculate the area of the smaller sector, DEF. **3**

(b) Calculate the size of angle ACB. **3**

13. Find an expression for the gradient of the line joining point A(6,9) to point B($4p, 4p^2$).

Give your answer in its simplest form.

3

14. Solve the equation $5\cos x° + 2 = 1$, $0 \leq x < 360$.

3

15. Express

$$\frac{4}{x-2} - \frac{3}{x+5}, \qquad x \neq 2, x \neq -5$$

as a single fraction in its simplest form.

3

16. Simplify $\dfrac{a^4 \times 3a}{\sqrt{a}}$.

3

17. Expand and simplify

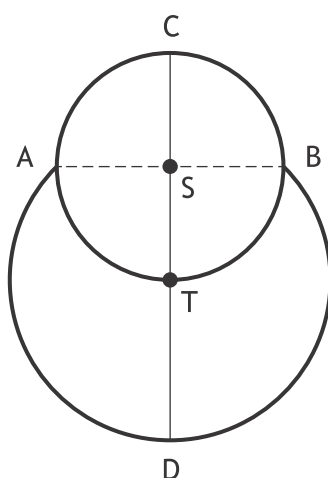$$\left(\sin x^\circ + \cos x^\circ\right)^2.$$

Show your working.

2

18. The picture shows a cartoon snowman.

The diagram below represents the snowman.

C

A — — — — ● — — — — B
         S

T

D

- The head is a small circle, centre S, with diameter 15 centimetres
- The body is part of a larger circle, centre T
- The point T lies on the circumference of the small circle
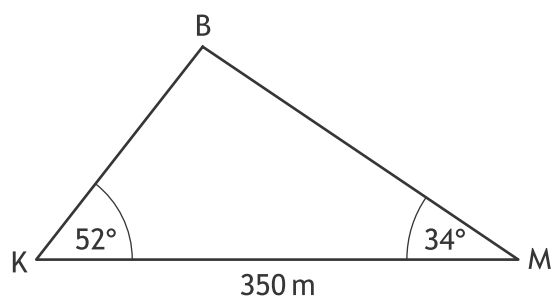- The points A and B lie on the circumferences of both circles

Calculate CD, the height of the snowman.

4

[Turn over for next question

19. Katy and Mona are looking up at a hot-air balloon.

In the diagram below, K, M and B represent the positions of Katy, Mona and the balloon respectively.

B

52° 34°

K

350 m

M

- The angle of elevation of the balloon from Katy is 52°

- The angle of elevation of the balloon from Mona is 34°

- Katy and Mona are 350 metres apart on level ground

Calculate the height of the hot-air balloon above the ground.

5

ADDITIONAL SPACE FOR ANSWERS

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