Name _____

Teacher _____

Mathematics
Paper 2

National 5 Booster Paper B2

Duration: 1 hour 50 minutes

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.

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

Notes:

- This is a **Booster Paper**. Your May exam will be (a bit) harder than this.
- The Booster Papers get **more challenging** as you work through them.
- The final Booster Paper will be as challenging as your May exam.
- The number of marks indicated beside each question is intended as a guide and may differ slightly from SQA marking instructions.
- These original papers are **produced independently of the SQA** and are **free of charge**.
- All Booster Papers and answers can be found at www.maths180.com/BoosterPapers

FORMULAE LIST

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

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

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

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

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

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

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

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

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

Total marks – 60

Attempt ALL questions

1. Solve $5\cos x^\circ + 1 = 3$ where $0 \le x \le 360^\circ$ 3

2. Solve, algebraically, $3x + 38 \ge 7x + 6$ 3

3. The number of electric cars using a charging point was counted and recorded every day for 5 days in 2015. The results are shown below.

3	3	2	3	4

(a) Calculate (correct to 1 decimal place) the mean and standard deviation for this data.   4

The same survey was conducted over a week in 2019.
The mean number of cars was 7 and the standard deviation was 1.5

(b) Make two valid comparisons between the data for 2015 and 2019.   2

4. Solve, algebraically, $\dfrac{x+9}{2} + \dfrac{x-3}{3} = 5$ 3

5. Find the resultant vector $3\boldsymbol{u} - 2\boldsymbol{v}$ when $u = \begin{pmatrix} 4 \\ -2 \\ 3 \end{pmatrix}$ and $v = \begin{pmatrix} -5 \\ 3 \\ -2 \end{pmatrix}$.

Express your answer in component form.   3

6.   A house has reduced in value by 20% to £86000.

Calculate the original value.   3

7.   Simplify $\dfrac{24x^6}{5x^3 \times 4x^2}$ 2

8. This sector has an area of 28.6 square centimetres and radius 5 centimetres.

Calculate the size of angle $x°$

Give your answer to the nearest degree.   4

5 cm

$x°$

9.   Use the discriminant to determine the nature of the roots of $y = 9x^2 - 12x + 4$.   3
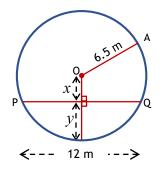
10.   These two juice bottles are mathematically similar.

8 cm

4 cm

The volume of the smaller bottle is 28 cubic centimetres.

Find the volume of the larger bottle.   3

11. OA is a radius with length 6.5 metres.

PQ is a chord with length 12 metres.

All lengths are in metres.

The line marked x joins the centre to the chord.

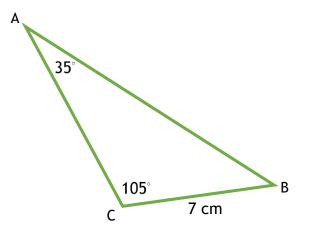(a) Find the length of the line marked x.　　　　　　　　　　　　　3

The line marked y meets the chord PQ at $90°$ and joins the chord to the circumference.

(b) Find the length of the line marked y.　　　　　　　　1

12. Calculate the length of side AB.

Give your answer to 3 significant figures.

3

13.   Solve the equation

$$5x^2 - 3x - 7 = 0$$

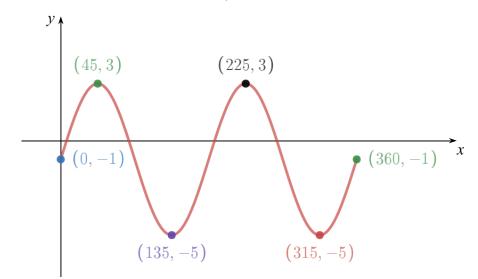Give your answer(s) correct to two decimal places.   4

14. Solve the equation $\dfrac{2x+3}{2} = 4x$

Give your answer in its simplest form. 3

15. This graph has an equation of the form $y = a\sin bx + c$

Write down the values of a, b and c. 3

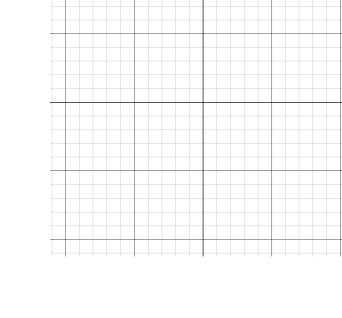16. (a) Write down the coordinates of the turning point of the graph of $y = (x+3)^2 + 1$. **2**

    (b) Write down equation of the axis of symmetry. **1**

    (c) Write down the coordinates of the point where the graph meets the y-axis. **1**

    (d) Sketch and annotate fully the graph of $y = (x+3)^2 + 1$. **2**
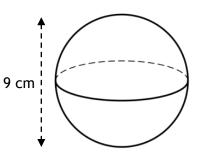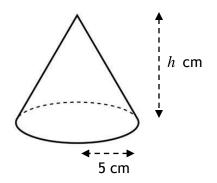
17. The sphere shown has diameter 9 centimetres.

    (a)   Calculate the volume of this sphere.

9 cm

2

The cone shown here has radius 5 centimetres and volume 209.44 cubic centimetres.

    (b)   Find (to the nearest centimetre) the height (h) of this cone.

h cm

5 cm

3

End of Booster Paper B2