N5

Mɑthematics

National 5 Practice Paper A

Paper 1

Duration – 1 hour

Total marks – 40

- You may NOT 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

$$ax^2 + bx + c = 0 \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Sine rule:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Cosine rule:

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

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:

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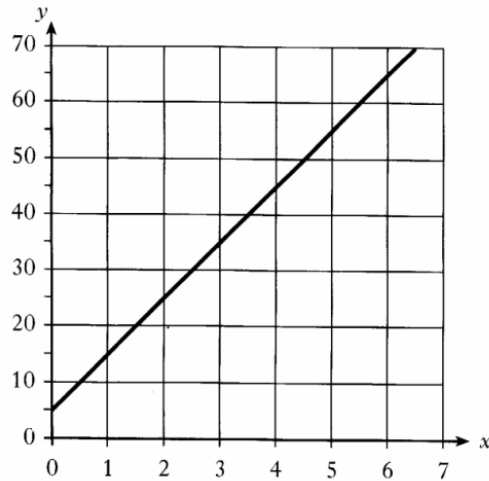
Volume of a pyramid:

$$V = \frac{1}{3} Ah$$

Standard deviation:

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n-1}} = \sqrt{\frac{\sum x^2 - (\sum x)^2/n}{n-1}} \quad , \quad \text{where } n \text{ is the sample size.}$$

1.   Evaluate $3\frac{2}{5} - 1\frac{3}{4}$ 2

2.   Factorise $x^2 + 2x - 15.$ 2

3.

Find the equation of this straight line in the form $y = mx + c$ 3

4.   Express $y = x^2 + 8x - 7$ in the form $y = (x + a)^2 + b$ and hence state
the coordinates of the turning point.   3

5. $P = R^2b - 5$

Change the subject of the formula to R.   3

6. Two vectors are defined as $u = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$ and $v = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$.
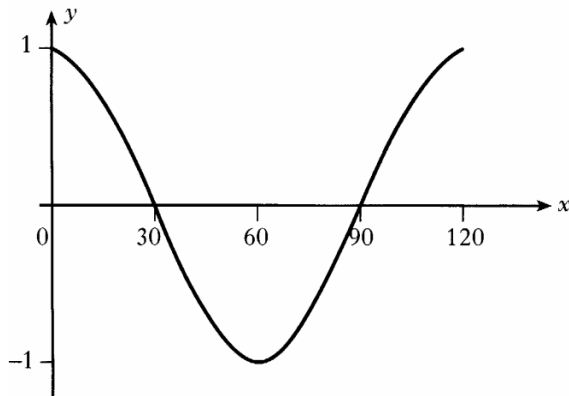
    (a) Find the resultant vector $u + 3v$.   **1**

    (b) Find $|u + 3v|$.   **2**

7.

    Part of the graph of $y = \cos bx°$ is shown in the diagram.

    State the value of b.   **1**

8. Find the point of intersection of the straight lines with equations

    $2x + y = 5$ and $x - 3y = 6$.   **4**

9. A parabola has equation $y = x^2 - 3x + 7$.

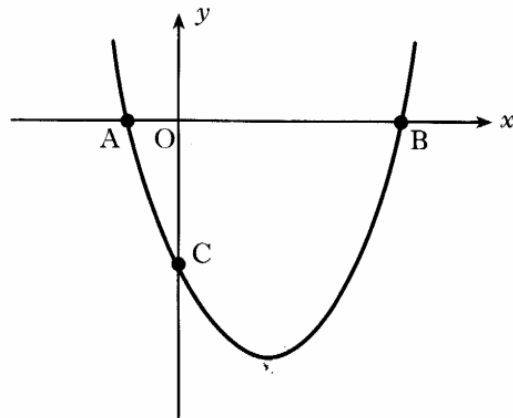   Using the discriminant, determine the nature of its roots.   **3**

10. A straight line has the equation $3x - y = 9$.

A second line is parallel to this and passes throught the point $(5, -3)$.

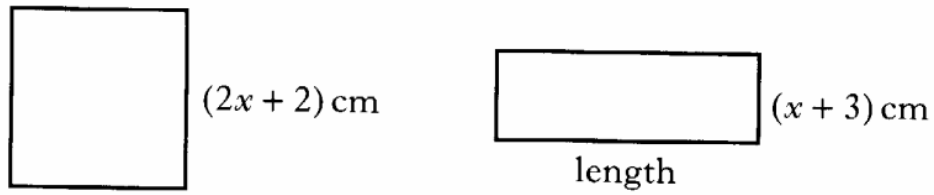Write down the equation of the second line. 3

11.

The equation of the parabola in the diagram above is $y = (x - 2)^2 - 9$.

(a) State the coordinates of the minimum turning point of the parabola. 2

(b) Find the coordinates of C. 2

(c) A is the point $(-1, 0)$. State the coordinates of B. 1

12. The square and rectangle shown below have the same perimeter.

$(2x + 2)$ cm

$(x + 3)$ cm

length

Show that the length of the rectangle is $(3x + 1)$ centimetres. 2

13. (a) Express $\dfrac{3}{x} - \dfrac{5}{x + 2}$, $x \neq 0, x \neq 2$, as a single fraction in its simplest form. 3

(b) Express $\sqrt{18} - \sqrt{2} + \sqrt{72}$ as a surd in its simplest form. 3

[End of question paper]

N5

Mαthematics

National 5 Practice Paper A

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.

1. The population of a city is increasing at a steady rate of 2.4% per annum.
    The current population is 528 000.

    What is the expected population in 4 years?

    Give your answer to the nearest thousand.   3

2. Two groups of 6 students are given the same test.

    (a) The marks of Group A are:

         73   47   59   71   48   62.

         Use an appropriate formula to calculate the mean and the standard
         deviation.

         Show clearly all your working.   4

    (b) In Group B, the mean is 60 and the standard deviation is 29.8.
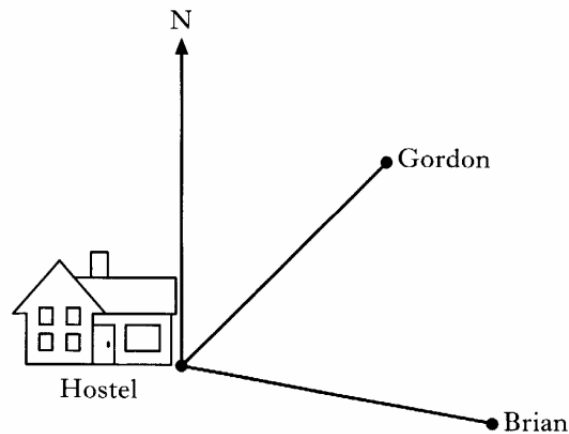
         Compare the results of the two groups.   2

3. Multiply out the brackets and collect like terms.

    $(x + 4)(2x^2 + 3x - 1)$ 3

4.   Gordon and Brian leave a hostel at the same time.
       Gordon walks on a bearing of 045° at a speed of 4.4 kilometres per hour.
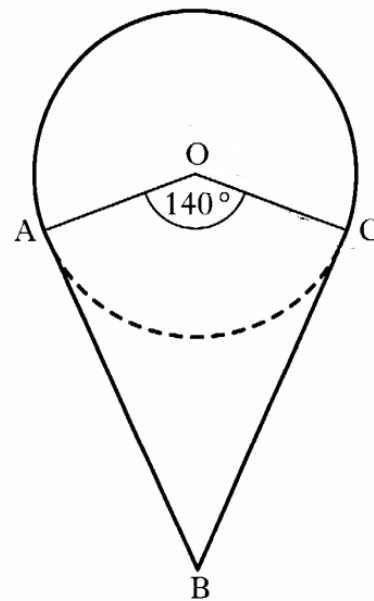   Brian walks on a bearing of 100° at a speed of 4.8 kilometres per hour.

N

Gordon

Hostel

Brian

       If they both walk at stead speeds, how far apart will they be after 2 hours?   5

5.   The diagram shows a mirror which has
       been designed for a new hotel.

       The shape consists of a sector of a
       circle and a kite AOCB.

           o   The circle, centre O, has a
               radius of 50 centimetres.
           o   Angle AOC = 140°
           o   AB and CB are tangents to the
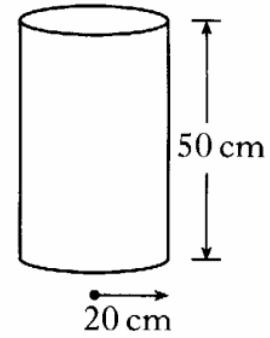   circle at A and C respectively.

       Find the perimeter of the mirror.   5
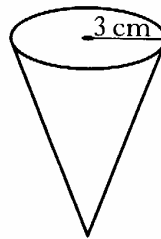

O

140°

A   C

B

6. A drinks container is in the shape of a
    cylinder with radius 20 centimetres and
    height 50 centimetres.

    (a) Calculate the volume of the drinks
         container.
         Give your answer in cubic centimetres,
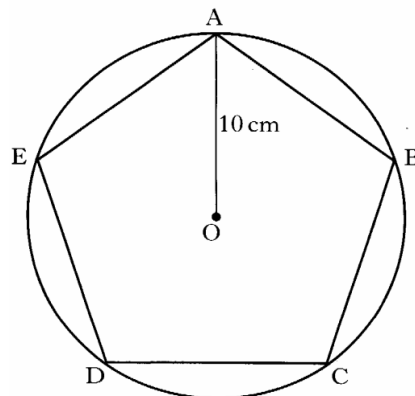   correct to two significant figures.

         50 cm

         20 cm

                                                                3

    (b) Liquid from the full container can fill 800 cups, in the shape of cones,
         each of radius 3 centimetres.

         3 cm

         What will be the height of liquid in each cup?   4

7.

    A

    10 cm

    E   B

    O

    D   C

    A regular pentagon ABCDE is drawn in a circle, centre O , with radius 10 centimetres.

    Calculate the area of the regular pentagon.   5

8.   (a)   Express $a^2 \left(2a^{-\frac{1}{2}} + a \right)$ in its simplest form.   2

     (b)   Use an appropriate formula to solve the quadratic equation

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

           Give your answers correct to 1 decimal place.   4

9.   (a)   Solve the equation

           $4 \tan x° + 5 = 0, \qquad 0 \leq x \leq 360.$ 3

     (b)   Show that

           $\tan x \cos x = \sin x.$ 2

10. A rectangular wall vent is 30 centimetres long and 10 centimetres wide.

It is to be enlarged by increasing both the length and the width by x centimetres.

(a) Show that the area, A square centimetres, of the new vent is given by

$$A = x^2 + 40x + 300.$$

The area of the new vent must be at least 75% more than the original area.

(b) Find the minimum dimensions of the new vent. 5

[End of question paper]