



# Mathematics

## National 5 Practice Paper B

### 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:

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

1. Evaluate

$$7.18 - 2.1 \times 3.$$

2

2. Evaluate

$$1\frac{1}{8} \div \frac{3}{4}$$

2

3. Solve the inequality

$$5 - x > 2(x + 1)$$

3

4. Given that  $f(x) = x^2 + 5x$ , evaluate  $f(-3)$ .

2

5. Vector  $\mathbf{u}$  has components  $\begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix}$  and vector  $\mathbf{v}$  has components  $\begin{pmatrix} 2 \\ -4 \\ 1 \end{pmatrix}$ .

Calculate  $|4\mathbf{u} - 2\mathbf{v}|$ .

2

6. (a) Factorise

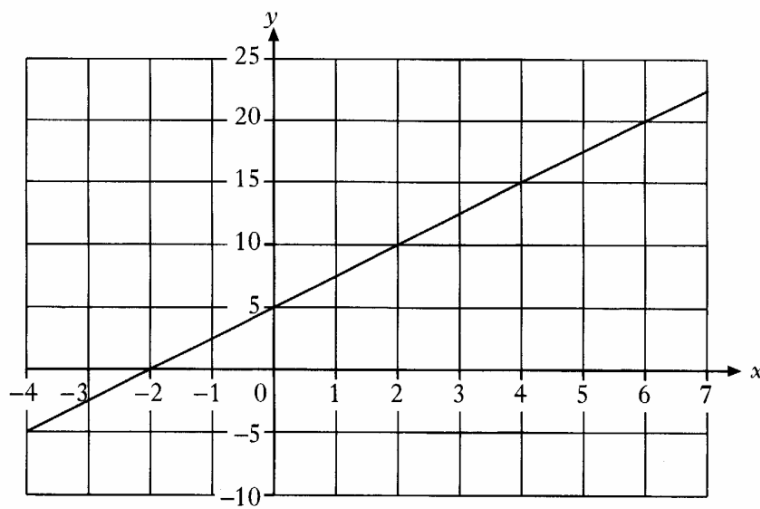
$$p^2 - 4q^2.$$

1

(b) Hence simplify  $\frac{p^2 - 4q^2}{3p + 6q}$ .

2

7.

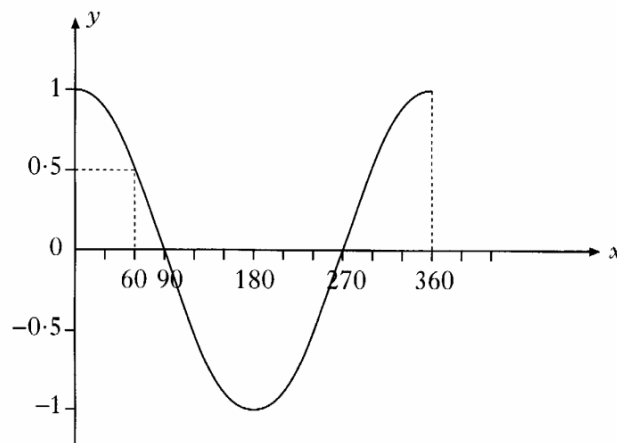


Find the equation of the straight line shown in the diagram.

Give your answer in the form  $y = mx + c$ .

3

8.



Part of the graph of  $y = \cos x^\circ$  is shown above.

If  $\cos 60^\circ = 0.5$ , state two values for  $x$  for which  $\cos x^\circ = -0.5$ ,  $0 \leq x \leq 360$ .

2

9. Multiply out the brackets and collect like terms.

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

3

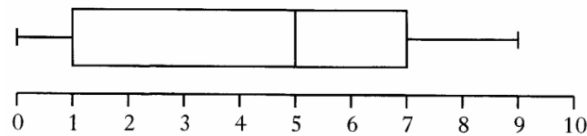
10. A sample of students was asked how many times each had visited the cinema in the last three months.

The results are shown below.

4    5    4    1    4    3    2    2    4    6    2  
3    4    4    1    3    1    2    3    1    1

- (a) From the above data, find the median, the lower quartile and the upper quartile. 3
- (b) Construct a boxplot for the data. 2
- (c) The same sample of students was asked how many times each had attended a football match in the same three months.

The boxplot below was drawn for this data.



Compare the two boxplots and comment. 1

11. Two functions are given below.

$$f(x) = x^2 + 2x - 1$$

$$g(x) = 5x + 3$$

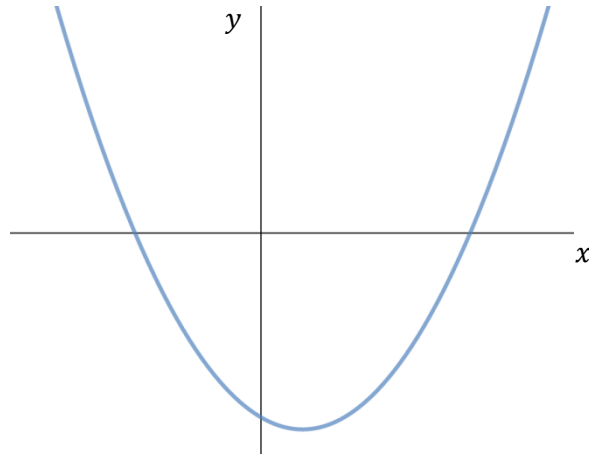
Find the values of  $x$  for which  $f(x) = g(x)$ . 3

12. Express in its simplest form

$$y^8 \times (y^3)^{-2}$$

2

13.



The equation of the parabola in the above diagram is

$$y = (x - 1)^2 - 16.$$

- (a) State the coordinates of the minimum turning point of the parabola. 2
- (b) State the equation of the axis of symmetry of the parabola. 1

14. (a) Express  $\sqrt{45} - 2\sqrt{5}$  as a surd in its simplest form. 2
- (b) Express as a fraction in its simplest form

$$\frac{1}{x^2} + \frac{1}{x}, \quad x \neq 0 \quad 2$$

[End of question paper]



# Mathematics

## National 5 Practice Paper B

### 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. A spider weighs approximately  $19.06 \times 10^{-5}$  kilograms.  
A humming bird is 18 times heavier.  
Calculate the weight of the humming bird.  
Give your answer in scientific notation. 2

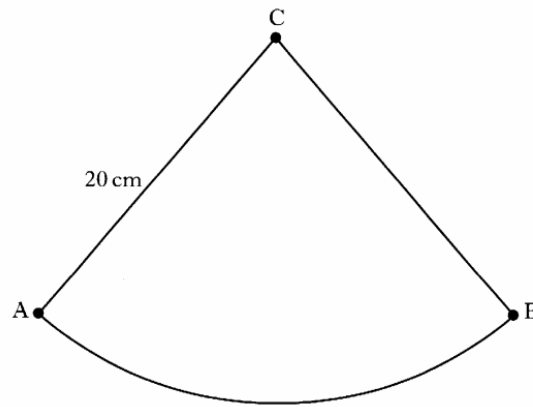
2. A microwave oven is sold for £150.  
This price includes VAT at 20%.  
Calculate the price of the microwave oven without VAT. 3

3. (a) The price, in pence, of a carton of milk in six different supermarkets is shown below.
- 66    70    89    75    79    59
- Use an appropriate formula to calculate the mean and standard deviation of these prices.  
Show clearly all your working. 4

- (b) In six local shops, the mean price of a carton of milk is 73 pence with a standard deviation of 17.7 pence.  
Compare the supermarket prices with those of the local shops. 2



4. A pendulum travels along an arc of a circle, centre C.



The length of the pendulum is 20 centimetres.

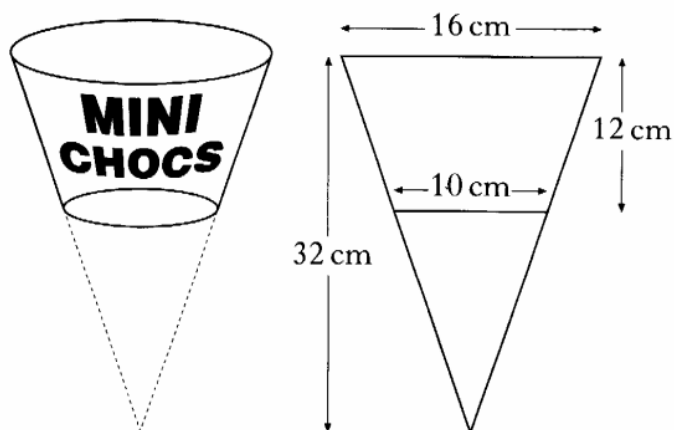
The pendulum swings from A to B.

The length of the arc AB is 28.6 centimetres.

Find the angle through which the pendulum swings from A to B.

4

5. A container to hold chocolates is in the shape of part of a cone with dimensions as shown below.



Calculate the volume of the container.

Give your answer correct to one significant figure.

5

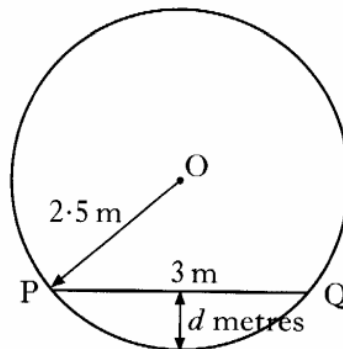
6. Solve the equation

$$2x^2 + 3x - 1 = 0.$$

Give your answers correct to one decimal place.

4

7. The diagram below shows a circular cross-section of a cylindrical oil tank.



In the figure below,

- O represents the centre of the circle.
- PQ represents the surface of the oil in the tank.
- PQ is 3 metres.
- The radius OP is 2.5 metres.

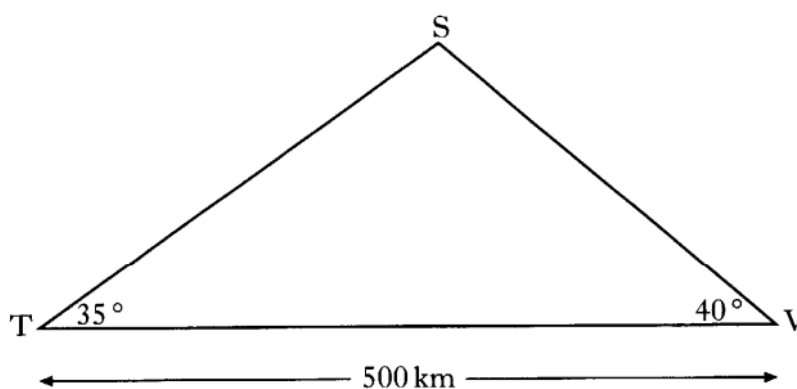
Find the depth,  $d$  metres, of oil in the tank.

4

8. The population of Newtown is 50 000.  
The population of Newtown is increasing at a steady rate of 5% per annum.  
The population of Auldtown is 108 000.  
The population of Auldtown is decreasing at a steady rate of 20% per annum.
- How many years will it take until the population of Newtown is greater than the population of Auldtown?

5

9. A TV signal is sent from a transmitter (T) via a satellite (S) to a village (V), as shown in the diagram. The village is 500 kilometres from the transmitter.



The signal is sent out at an angle of  $35^\circ$  and is received in the village at an angle of  $40^\circ$ .

Calculate the height of the satellite above the ground.

5

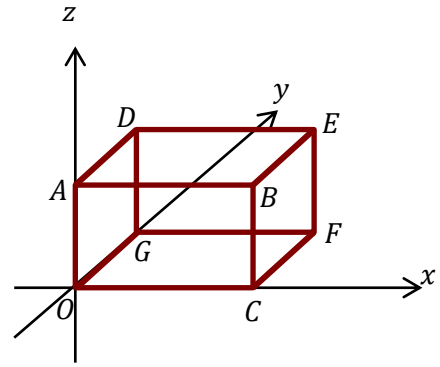
10. Change the subject of the formula to  $p$ .

$$r = 3p - 2t$$

2

11. Look at the cuboid shown on the coordinate diagram.

The coordinates of point  $E$  are  $(5,3,1)$



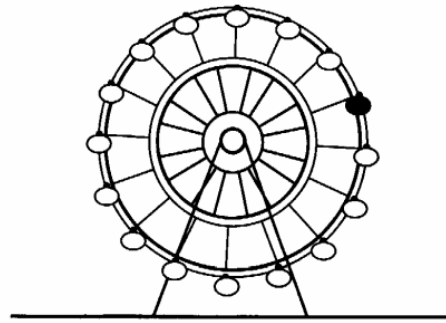
- (a) State the coordinates of  $F$
- (b) State the coordinates of  $G$
- (c) What is the shortest distance between points  $D$  and  $C$ ?

4

12. At the carnival, the height,  $H$  metres, of a carriage on the big wheel above the ground is given by the formula

$$H = 10 + 5 \sin t^\circ,$$

$t$  seconds after starting to turn.



- (a) Find the height of the carriage above the ground after 10 seconds.
- (b) Find the two times during the first turn of the wheel when the carriage is 12.5 metres above the ground.

2

4

[End of question paper]