X100/203

Read carefully

1 **Calculators may be used in this paper.**

2 Full credit will be given only where the solution contains appropriate working.

3 Square-ruled paper is provided.

SQA
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FORMULAE LIST

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

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

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

Area of a triangle: $\text{Area} = \frac{1}{2} ab \sin C$

Volume of a sphere: $\text{Volume} = \frac{4}{3} \pi r^3$

Volume of a cone: $\text{Volume} = \frac{1}{3} \pi r^2 h$
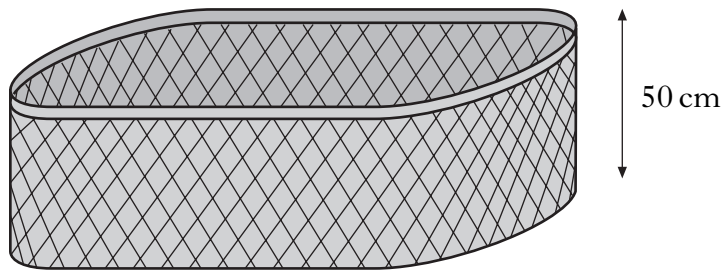
Volume of a cylinder: $\text{Volume} = \pi r^2 h$

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.

ALL questions should be attempted.

1. Calculate the **compound interest** earned when £50 000 is invested for 4 years at 4·5% per annum.

   Give your answer to the nearest penny. **4**

2. Jim Reid keeps his washing in a basket. The basket is in the shape of a prism.

   The height of the basket is 50 centimetres.

   The cross section of the basket consists of a rectangle and two semi-circles with measurements as shown.
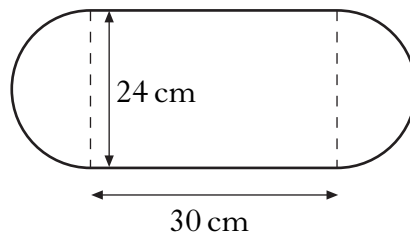
   (*a*) Find the volume of the basket in cubic centimetres.

   Give your answer correct to three significant figures. **4**

   Jim keeps his ironing in a storage box which has a volume **half** that of the basket.
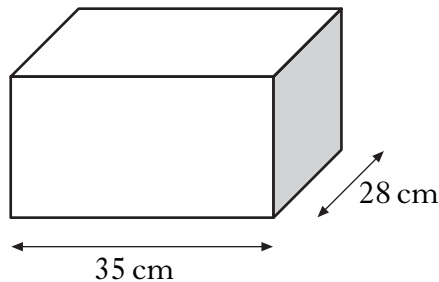
   The storage box is in the shape of a cuboid, 35 centimetres long and 28 centimetres broad.

   (*b*) Find the height of the storage box. **3**

3. The results for a group of students who sat tests in mathematics and physics are shown below.

Mathematics (%)	10	18	26	32	49
Physics (%)	25	35	30	40	41

(*a*) Calculate the standard deviation for the mathematics test.　　　　**4**

(*b*) The standard deviation for physics was 6·8.

　　Make an appropriate comment on the distribution of marks in the two tests.　　　　**1**

These marks are shown on the scattergraph below.
A line of best fit has been drawn.
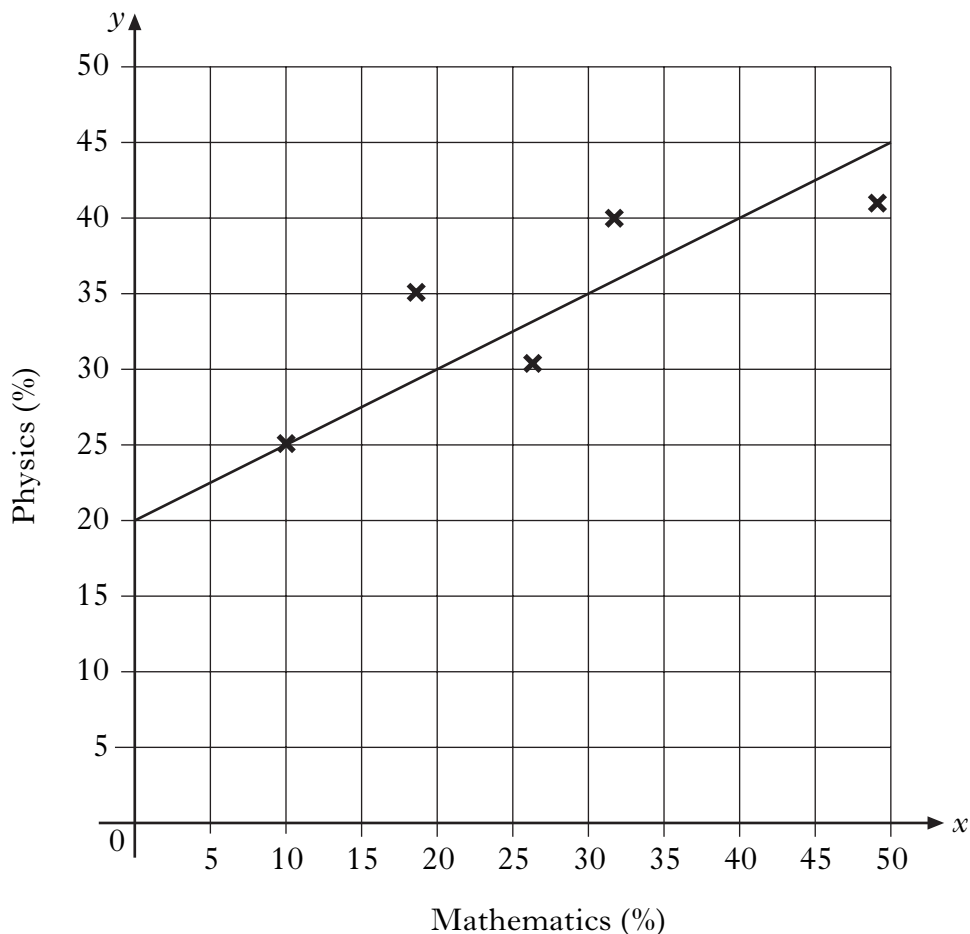
(*c*) Find the equation of the line of best fit.　　　　**3**

(*d*) Another pupil scored 76% in the mathematics test but was absent from the physics test.

　　Use your answer to part (*c*) to predict his physics mark.　　　　**1**

4. Suzie has a new mobile phone. She is charged x pence per minute for calls and y pence for each text she sends. During the first month her calls last a total of 280 minutes and she sends 70 texts. Her bill is £52·50.
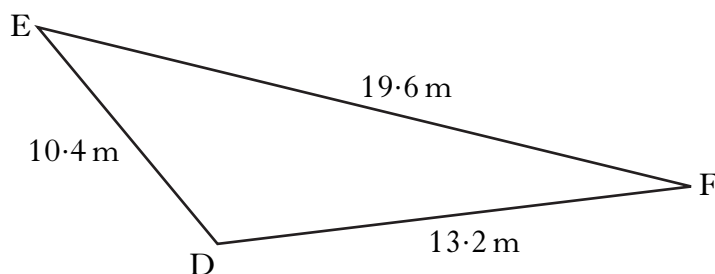
(*a*) Write down an equation in x and y which satisfies the above condition.   **1**

The next month she reduces her bill. She restricts her calls to 210 minutes and sends 40 texts. Her bill is £38·00.

(*b*) Write down a second equation in x and y which satisfies this condition.   **1**

(*c*) Calculate the price per minute for a call and the price for each text sent.   **4**

5. Triangle DEF is shown below.

It has sides of length 10·4 metres, 13·2 metres and 19·6 metres.
Calculate the size of angle EDF.
Do not use a scale drawing.   **3**

6. Solve the equation

$$5x^2 + 4x - 2 = 0,$$

giving the roots correct to 2 decimal places.   **4**

[Turn over

7. (*a*) Simplify

$$\frac{m^5}{m^3}.$$

1

(*b*) Express

$$2\sqrt{5} + \sqrt{20} - \sqrt{45}$$
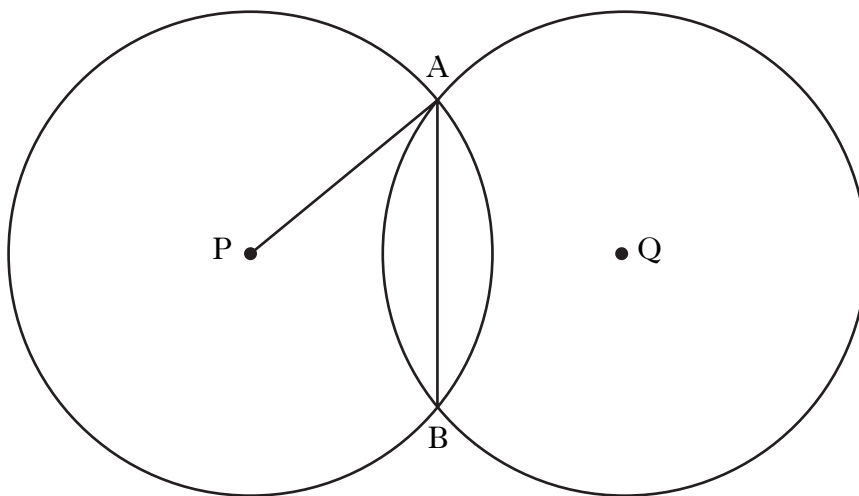
as a surd in its simplest form.

3

8. Solve the equation

$$4\cos x° + 3 = 0, \qquad 0 \le x \le 360.$$

3

9. Two identical circles, with centres P and Q, intersect at A and B as shown in the diagram.

The radius of each circle is 10 centimetres.
The length of the common chord, AB, is 12 centimetres.

Calculate PQ, the distance between the centres of the two circles.

5

10. Change the subject of the formula

$$p = q + \sqrt{a}$$

to *a*. **2**

11. Express

$$\frac{2}{a} - \frac{3}{(a+4)}, \qquad a \neq 0, \ a \neq -4,$$

as a single fraction in its simplest form. **3**

[END OF QUESTION PAPER]

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