X101/204

NATIONAL QUALIFICATIONS 2008

TUESDAY, 20 MAY 2.05 PM – 3.35 PM

MATHEMATICS INTERMEDIATE 2

Units 1, 2 and Applications of Mathematics Paper 2

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 ©

FORMULAE LIST

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

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

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

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

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

Volume of a cylinder: Volume $= \pi r^2 h$

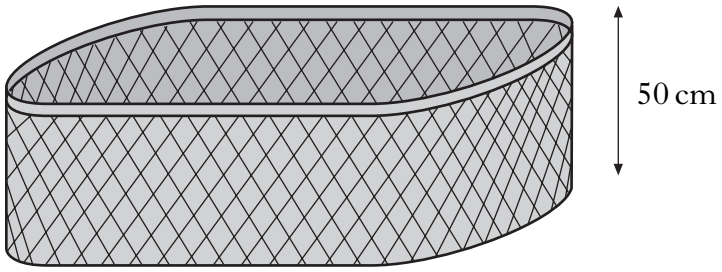
Standard deviation: $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\frac{\sum x^2 - (\sum x)^2 / n}{n-1}}$, where n is the sample size.

ALL questions should be attempted.

Marks

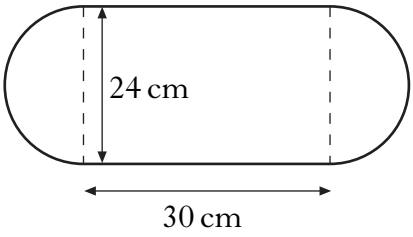
1. Calculate the **compound interest** earned when £50 000 is invested for 4 years at 4·5% per annum.
Give your answer to the nearest penny. **4**

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



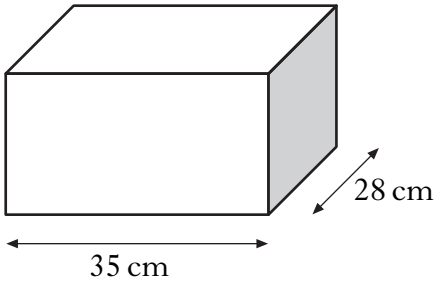
The height of the basket is 50 centimetres.

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**

Marks

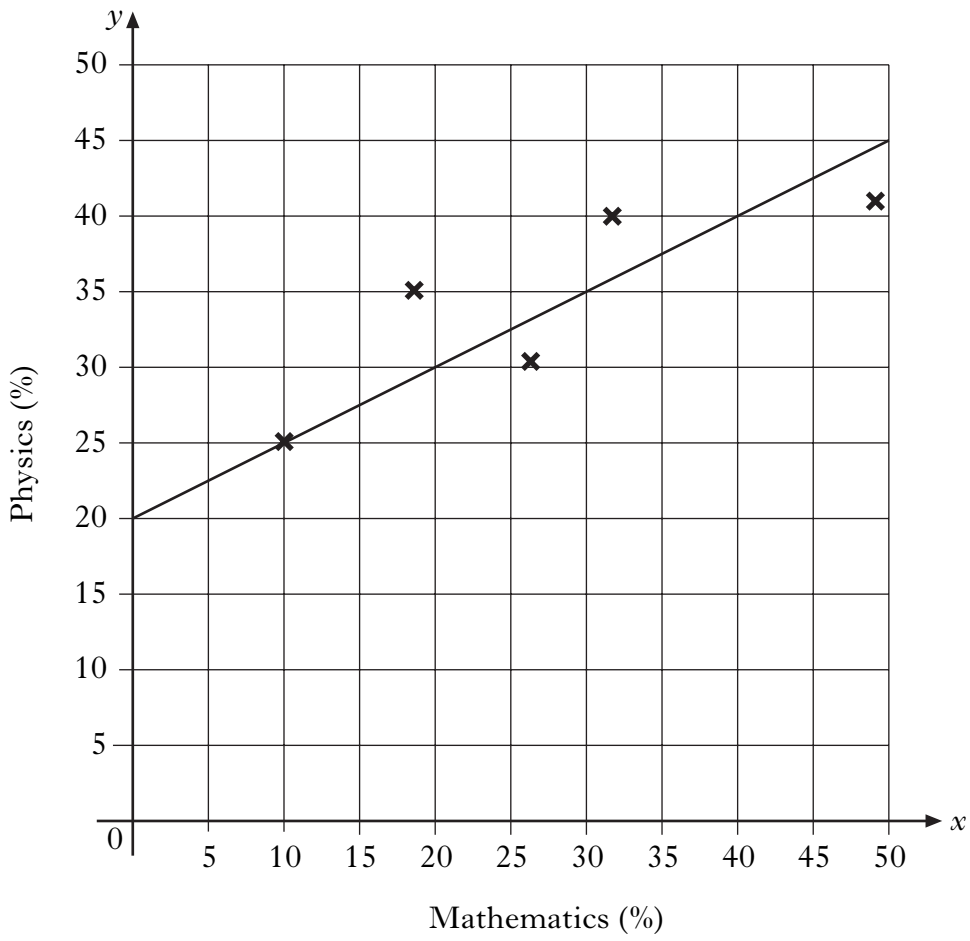
3. The results for a group of students who sat tests in mathematics and physics are shown below.

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**

Marks

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.

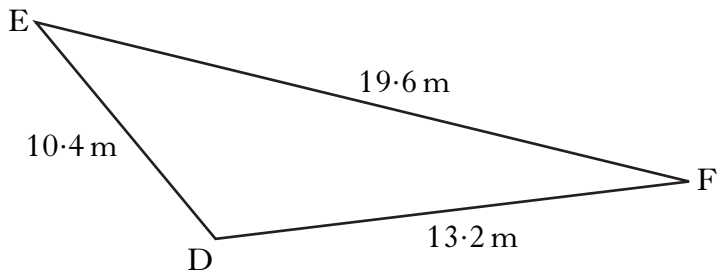
(*a*) Write down an equation in x and y which satisfies the above condition. **1**

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**

[Turn over

Marks

6. Below is a copy of part of David Leblanc's credit card statement.

Southern Star Credit

Name: David Leblanc — 12 May, 2008

Card Number: 4517 6767 2368 9001 — Credit Limit £3600

12 April 2008	Balance brought forward	£125·00
2 May 2008	Payment received	−50·00
	Balance	**A**
	Interest at 1·6%	**B**
5 May 2008	Bon Cave Wines	62·99
5 May 2008	Jacques Delicatessen	15·88
	Balance owed	**C**

Minimum payment: 3% of Balance owed or £5, whichever is greater.

(*a*) Calculate the amounts which would appear at **A**, **B** and **C**. **3**

(*b*) David makes the minimum payment.
How much does he pay? **2**

Marks

7. Steve Bolton has invested £10 000 in the Brigadoon Building Society. The building society adds 0·4% interest to his account at the start of each month. In addition, Steve deposits £250 into his account each month. He designs a spreadsheet to calculate the amount of money he has in the bank each month.

Column B = the amount in his account at the start of each month after interest at 0·4% is added.

Column C = the amount in his account each month after his monthly deposit of £250 is paid in.

	A	B	C
1	**Brigadoon Building Society**		
2			
3	Steve Bolton: Investment Account		
4			
5	Interest rate 0.4% per month		
6			
7	Amount invested £10,000.00		
8	Monthly payment £250.00		
9			
10	**Amount**	**after interest**	**after deposit**
11			
12	January	£10,040.00	£10,290.00
13	February	£10,331.16	£10,581.16
14	March	£10,623.48	£10,873.48
15	April	£10,916.98	£11,166.98
16	May	£11,211.65	£11,461.65
17	June	£11,507.49	£11,757.49
18	July	£11,804.52	£12,054.52
19	August	£12,102.74	£12,352.74
20	September	£12,402.15	£12,652.15
21	October	£12,702.76	£12,952.76
22	November	£13,004.57	£13,254.57
23	December		

(*a*) Write down the **formula** to enter in cell B23 the amount in Steve's account at the start of December after interest has been added. **1**

(*b*) Write down the **formula** to enter in cell C23 the amount in his account in December after his monthly deposit of £250 is paid in. **1**

(*c*) What will appear in cell C23? **2**

[Turn over

Marks

8. Luljeta Dumani sells carpets. Her gross annual salary for the last year was £15 425.

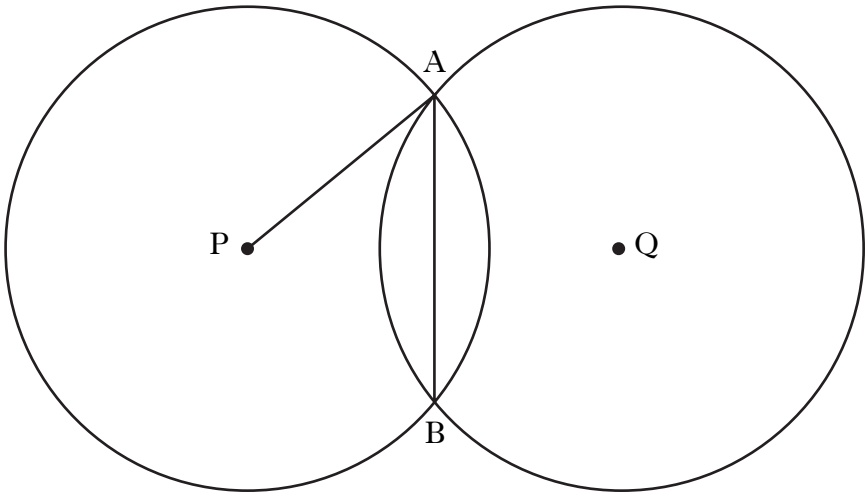
The table below shows the rates of tax applicable for last year.

Taxable Income	Rate
On the first £2230	10%
On the next £32 370	22%
On any income over £34 600	40%

Luljeta's total tax allowance is £5225.

Calculate her annual tax bill for last year. **4**

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**

Marks

10. Irene works in the local chemist's shop.

One week she works 40 hours at her basic rate of pay and 3 hours overtime at double time.

Her gross pay for that week was £239·20.

Calculate Irene's basic hourly rate of pay. **3**

[*END OF QUESTION PAPER*]

[BLANK PAGE]

[BLANK PAGE]

[BLANK PAGE]