X101/202

NATIONAL QUALIFICATIONS 2007

TUESDAY, 15 MAY
1.00 PM – 1.45 PM

MATHEMATICS INTERMEDIATE 2

Units 1, 2 and Applications of Mathematics
Paper 1
(Non-calculator)

Read carefully

1 **You may NOT use a calculator.**

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

3 Square-ruled paper is provided.

LI X101/202 6/11570

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.

Marks

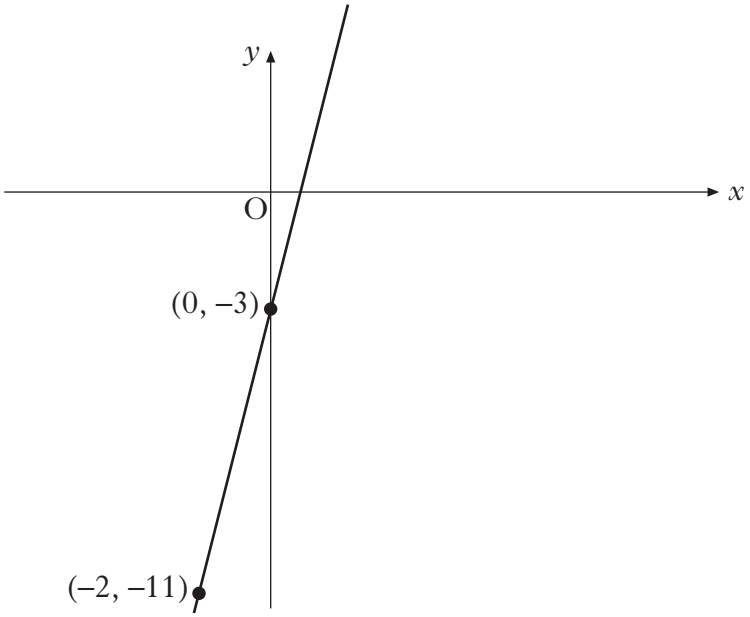
ALL questions should be attempted.

1. The table below shows the results of a survey of First Year pupils.

	Wearing a blazer	*Not wearing a blazer*
Boys	40	22
Girls	29	9

What is the probability that a pupil, chosen at random from this sample, will be a girl wearing a blazer? **1**

2.

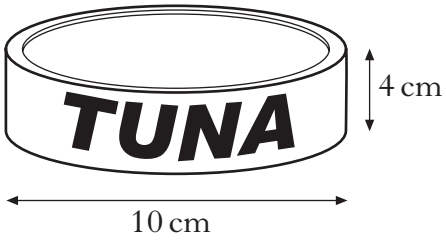


Find the equation of the straight line passing through the points (0, –3) and (–2, –11). **3**

[Turn over

Marks

3. A tin of tuna is in the shape of a cylinder.



It has diameter 10 centimetres and height 4 centimetres.
Calculate its volume.
Take $\pi = 3{\cdot}14$. **2**

4. Find the point of intersection of the straight lines with equations $x + 2y = -5$ and $3x - y = 13$. **4**

5. Multiply out the brackets and collect like terms.

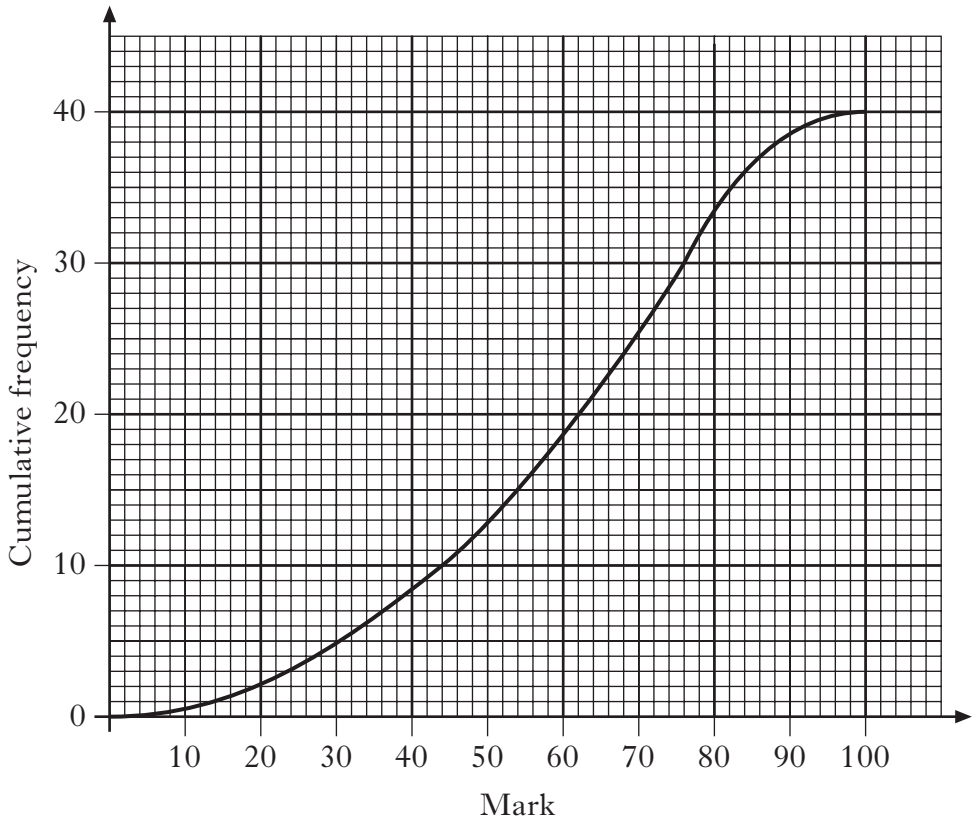
$$(x + 3)(x^2 + 4x - 12)$$ **3**

6. (*a*) Show that the standard deviation of 1, 1, 1, 2 and 5 is equal to $\sqrt{3}$. **3**

(*b*) **Write down** the standard deviation of 101, 101, 101, 102 and 105. **1**

Marks

7. A group of 40 students sat a class test.
The cumulative frequency curve derived from their marks is shown below.

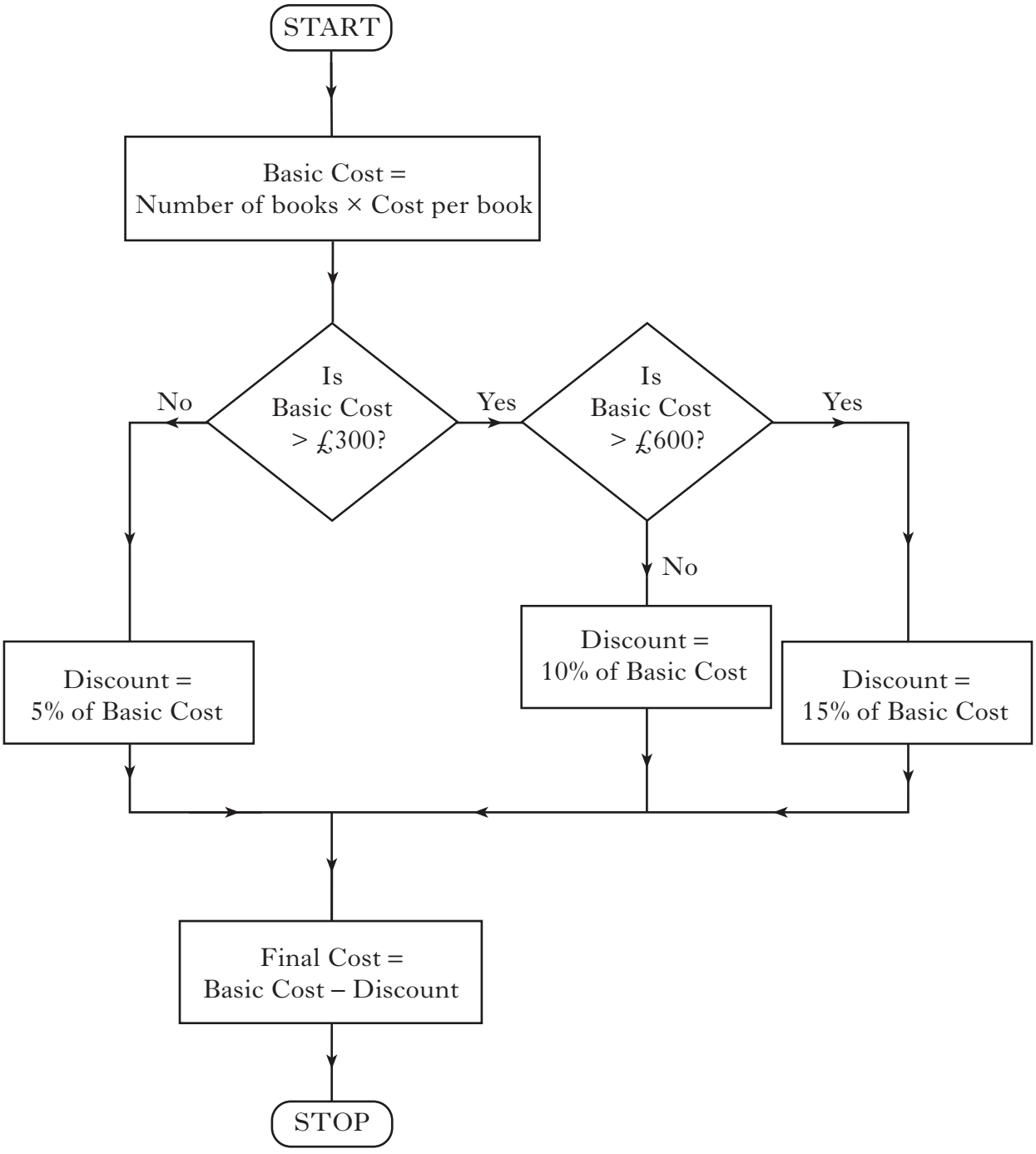


Calculate the semi-interquartile range for the data represented in the diagram. **3**

[Turn over

Marks

8. The flowchart below shows how a publisher calculates the final cost of orders.



A Mathematics department orders 80 books at £9·50 each.
Calculate the final cost of this order. **3**

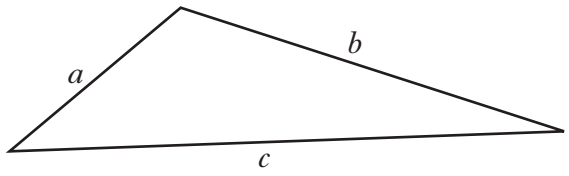
Marks

9. Given that

$$\cos 60° = 0{\cdot}5,$$

what is the value of $\cos 240°$? **1**

10. A triangle has sides with lengths a, b, c.



The area, A, of this triangle can be calculated by using the formula

$$A = \sqrt{s(s-a)(s-b)(s-c)} \qquad \text{where } s = \tfrac{1}{2}(a+b+c).$$

(a) Calculate the value of s when $a = 3$, $b = 6$, $c = 7$. **1**

(b) Using the values for s, a, b and c from part (a), calculate A.
Give your answer for A correct to the nearest whole number. **3**

11. A straight line is represented by the equation $y = ax + b$.
Sketch a possible straight line graph to illustrate this equation when $a = 0$ and $b > 0$. **2**

[*END OF QUESTION PAPER*]

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X101/204

NATIONAL QUALIFICATIONS 2007

TUESDAY, 15 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.**

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3 Square-ruled paper is provided.

LI X101/204 6/11570

FORMULAE LIST

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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.

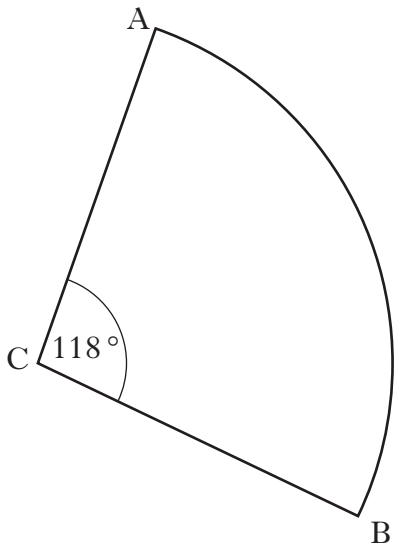
Marks

1. Ian's annual salary is £28 400. His boss tells him that his salary will increase by 2·3% per annum.

What will Ian's annual salary be after 3 years?

Give your answer to the nearest pound. **3**

2. The diagram below shows a sector of a circle, centre C.



The radius of the circle is 10·5 centimetres and angle ACB is 118°.

Calculate the length of arc AB. **3**

[Turn over

Marks

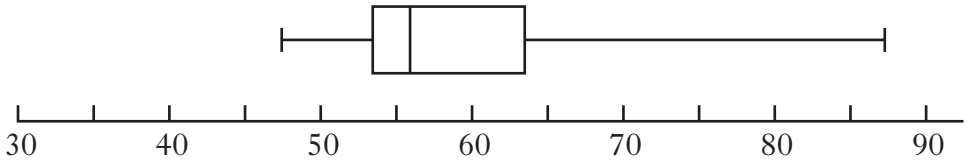
3. This back-to-back stem and leaf diagram shows the results for a class in a recent mathematics examination.

Girls				Boys							
		1	3								
		9	4	7	9						
8	7	4	3	2	2	5	2	3	4	4	6	6	7	9
				9	4	6	3							
			9	6	3	7	4	8						
				8	1	8	7							

n = 15 n = 14

Key			
3	7		represents 73%
	8	7	represents 87%

(*a*) A boxplot is drawn to represent one set of data.



Does the boxplot above represent the girls' data or the boys' data?
Give a reason for your answer. **1**

(*b*) For the **other** set of data, find:

(i) the median; **1**

(ii) the lower quartile; **1**

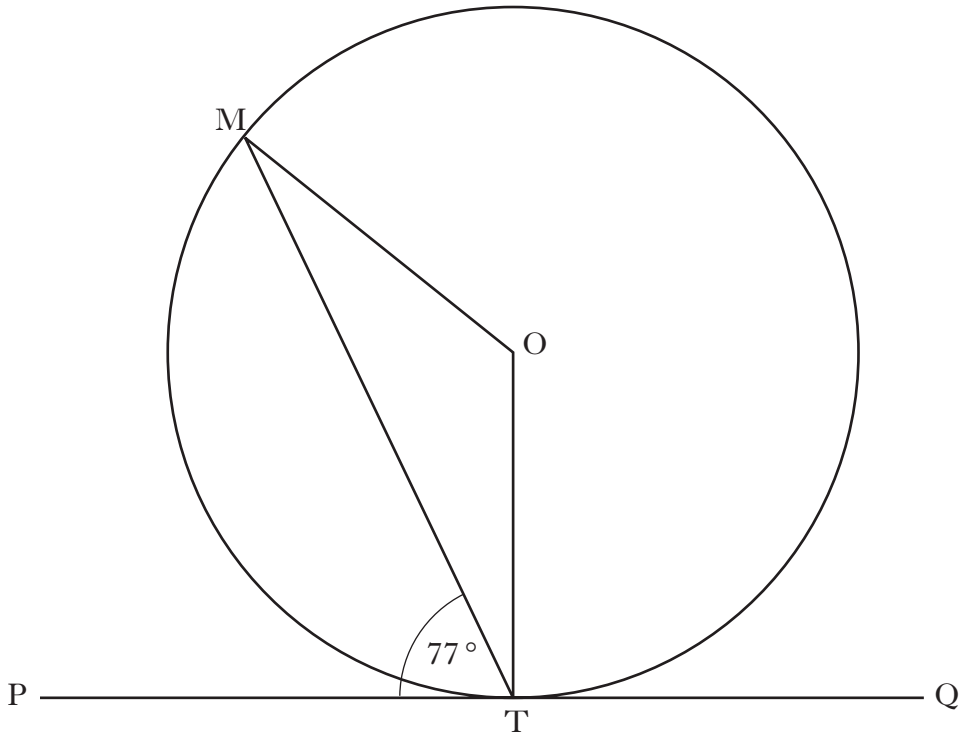
(iii) the upper quartile. **1**

(*c*) Use the answers found in part (*b*) to construct a second boxplot. **2**

(*d*) Make an appropriate comment about the distribution of data in the two sets. **1**

Marks

4.



The tangent PQ touches the circle, centre O, at T.
Angle MTP is 77 °.

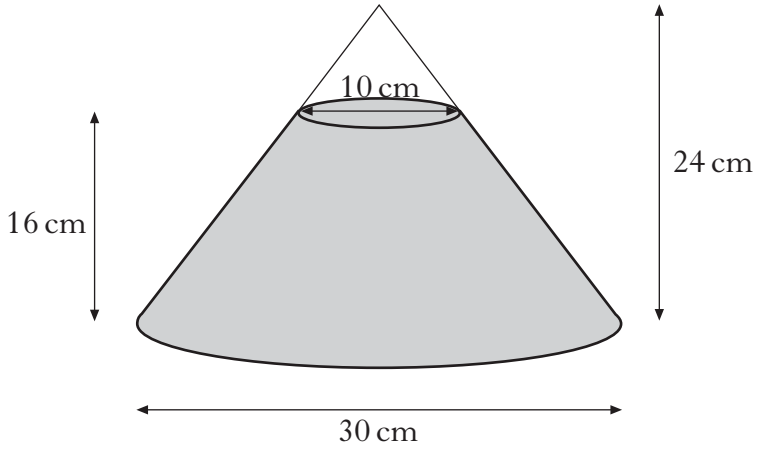
(*a*) Calculate the size of angle MOT. **2**

(*b*) The radius of the circle is 8 centimetres.
Calculate the length of chord MT. **3**

[Turn over

Marks

5. A glass ornament in the shape of a cone is partly filled with coloured water.



The cone is 24 centimetres high and has a base of diameter 30 centimetres.
The water is 16 centimetres deep and measures 10 centimetres across the top.
What is the volume of the water?
Give your answer correct to 2 significant figures. **5**

6. Tasnim rolls a standard dice with faces numbered 1 to 6.
The probability that she gets a number less than 7 is

A 0
B $\frac{1}{7}$
C $\frac{1}{6}$
D 1.

Write down the letter that corresponds to the correct probability. **1**

7. Factorise **fully**

$2x^2 - 18$. **2**

8. A job as a sales consultant is advertised.

Baird Electronics

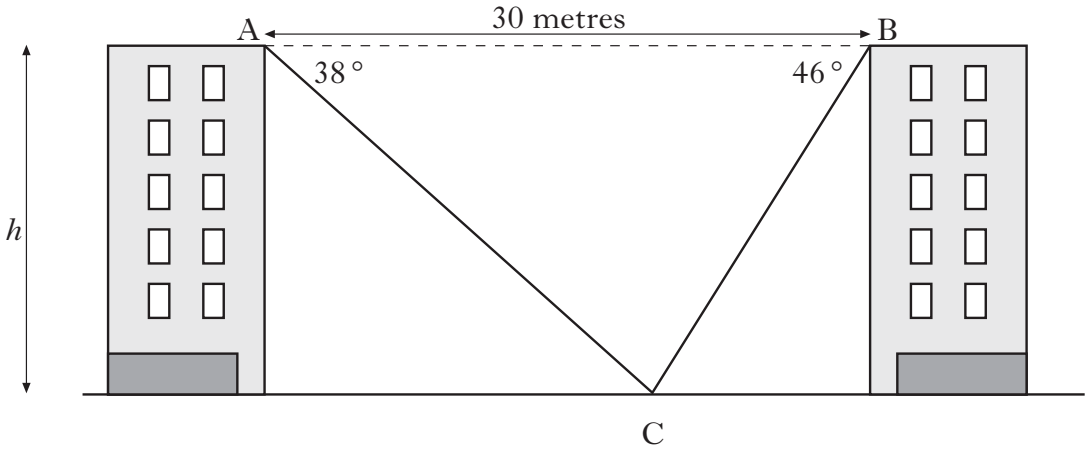
Sales consultant wanted
Opportunity to earn over
£15 000 per annum

Phone 0141 533 1541 for information

Matthew telephones for information and finds out that the basic wage is £15 000. In addition to this he will receive 2·5% commission on all his sales.

What value of sales will Matthew have to make in order to earn £22 000 per year? **3**

9. The diagram shows two blocks of flats of equal height.



A and B represent points on the top of the flats and C represents a point on the ground between them.

To calculate the height, h, of each block of flats, a surveyor measures the angles of depression from A and B to C.

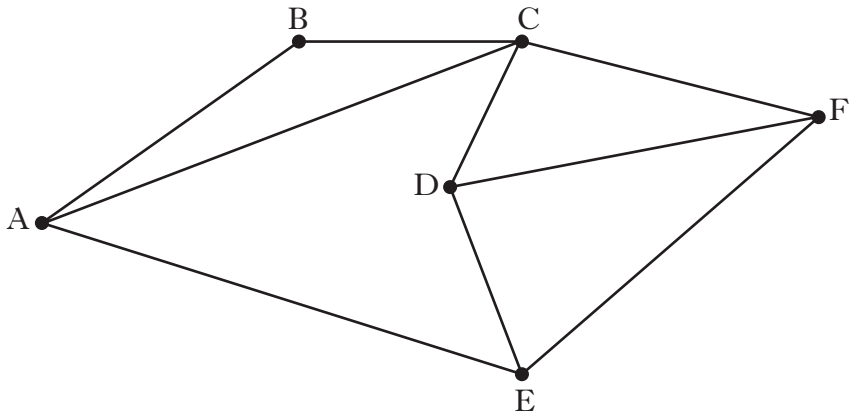
From A, the angle of depression is 38°.
From B, the angle of depression is 46°.
The distance AB is 30 metres.

Calculate the height, h, in metres. **5**

[Turn over

Marks

10. A network diagram is shown below.



State the order of node C. **1**

11. The table below shows the monthly repayments to be made, with and without payment protection, when money is borrowed from the Good Deal Loan Company.

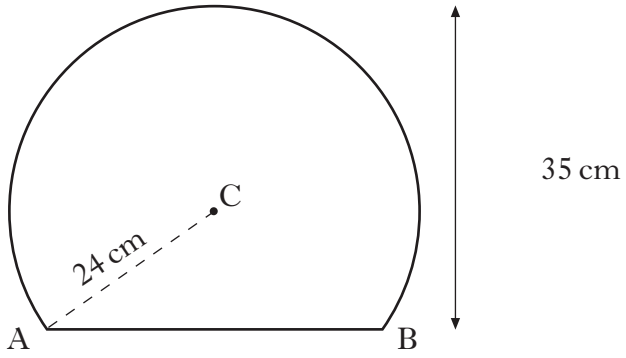
loan amount	60 months		48 months		36 months		24 months	
	W	**WO**	**W**	**WO**	**W**	**WO**	**W**	**WO**
£15 000	342·63	288·49	409·43	350·79	510·76	454·86	736·73	663·35
£12 500	285·53	240·41	341·20	292·33	425·63	379·05	613·94	552·79
£10 000	228·42	192·33	272·95	233·86	340·50	303·24	491·15	442·23
£7500	171·31	144·24	204·72	175·40	255·38	227·43	368·37	331·68
£5000	114·21	96·16	136·48	116·93	170·25	151·62	245·58	221·12
W = with payment protection				**WO** = without payment protection				

(*a*) Joseph decides to borrow £12 500.
If he repays it over 48 months, **without** payment protection, calculate the cost of the loan. **3**

(*b*) Brian thinks it would be cheaper to take a loan of £12 500 over 36 months **with** payment protection.
Is he correct?
Explain your answer. **3**

Marks

12. A mirror is shaped like part of a circle.



The radius of the circle, centre C, is 24 centimetres.
The height of the mirror is 35 centimetres.

Calculate the length of the base of the mirror, represented in the diagram by AB. **3**

13. 28 students timed their journeys from home to college.
The results, in minutes, are listed below.

14	34	22	13	17	15	36
17	8	14	24	2	25	17
31	17	20	23	10	28	19
21	22	28	30	21	16	19

(*a*) Construct a frequency table for the above data using class intervals

1–5, 6–10, 11–15, etc. **2**

(*b*) Using the frequency table in part (*a*), calculate the mean number of minutes per journey. **4**

[*END OF QUESTION PAPER*]

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