X101/204

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.

FORMULAE LIST

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.
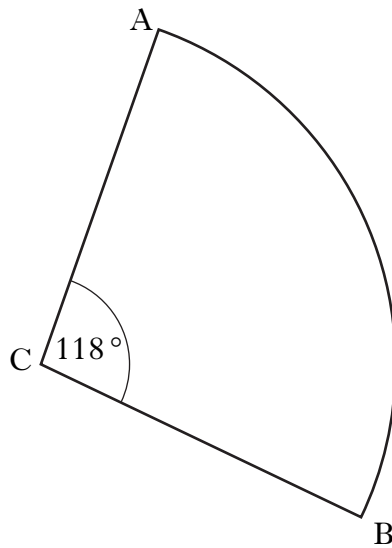
ALL questions should be attempted.

1. 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**

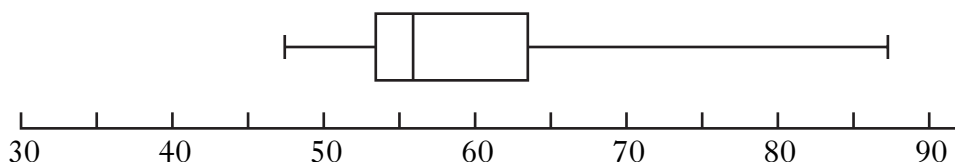   **[Turn over**

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

		Girls							Boys						

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          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
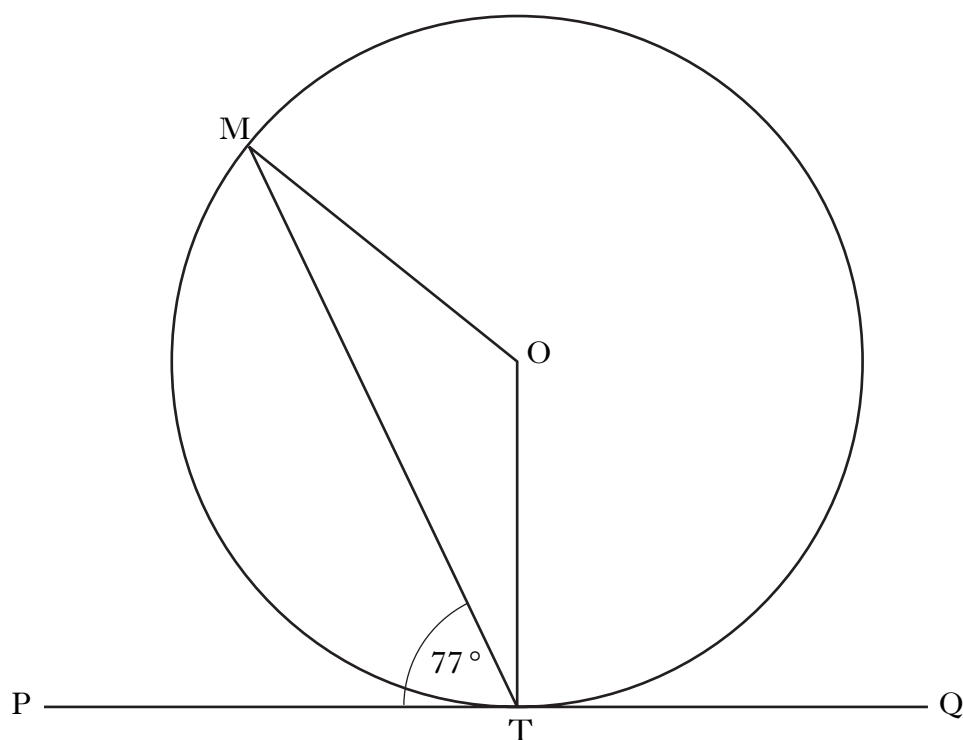 (iii) the upper quartile.   1

(*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

4.

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

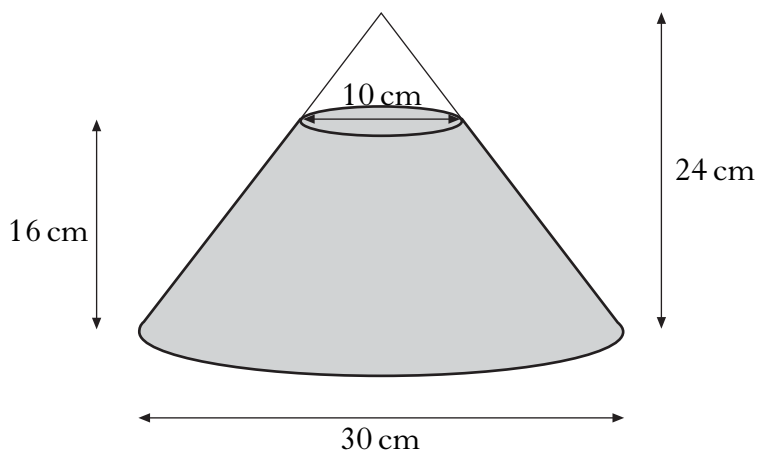(*a*) Calculate the size of angle MOT. **2**

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

[Turn over

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
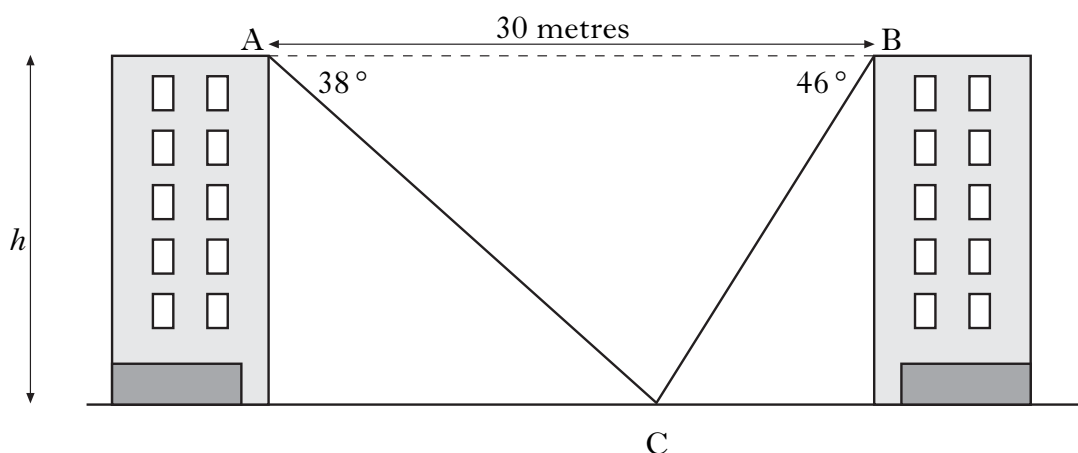>
> Phone 0141 533 1541 for information

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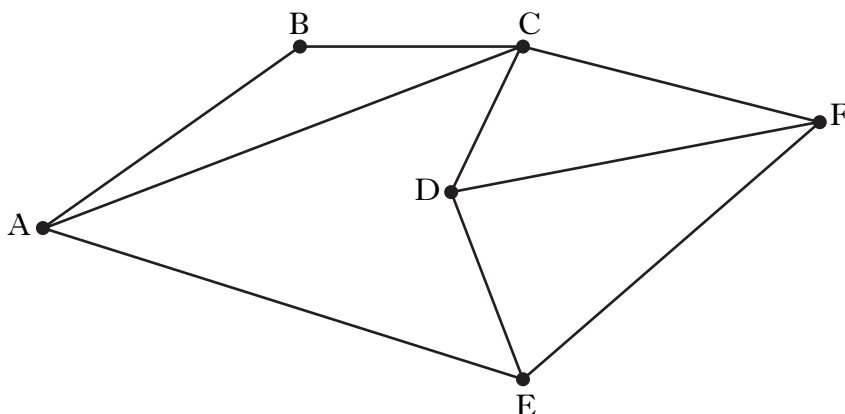From B, the angle of depression is 46°.
The distance AB is 30 metres.

Calculate the height, h, in metres.

5

[Turn over

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**

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

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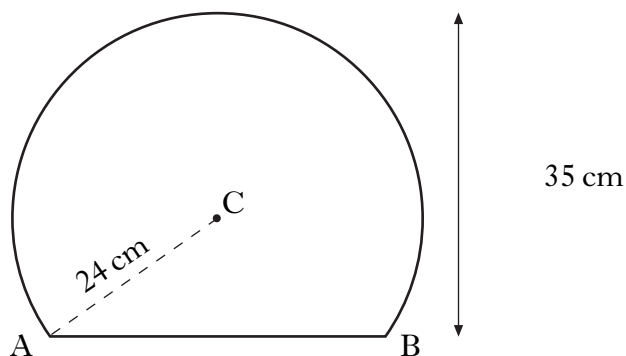
The radius of the circle, centre C, is 24 centimetres.
The height of the mirror is 35 centimetres.

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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