X101/11/01

NATIONAL QUALIFICATIONS 2013

WEDNESDAY, 22 MAY
9.00 AM – 9.45 AM

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. If you make use of this, you should write your name on it clearly and put it inside your answer booklet.

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 $= \pi r^2 h$

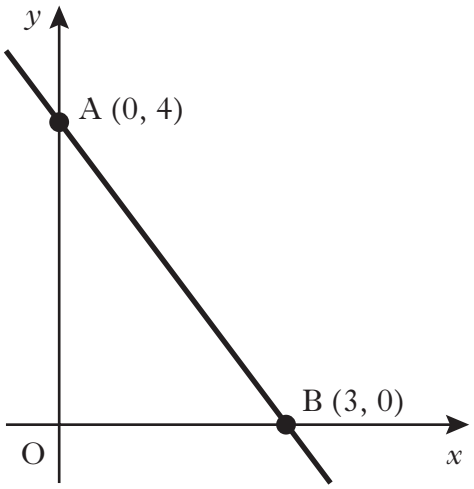
Standard deviation: $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\frac{\sum x^2 - (\sum x)^2 / n}{n-1}}$, where n is the sample size.

ALL questions should be attempted. *Marks*

1. Factorise

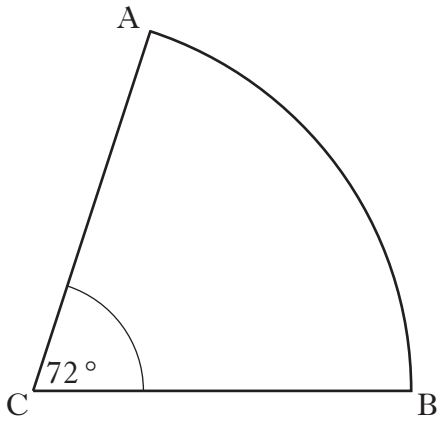
$6ab - 7bc$. **1**

2.



Find the equation of the straight line AB. **3**

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



The radius of the circle is 5 centimetres and angle ACB is 72°.

Calculate the length of arc AB.

Take $\pi = 3{\cdot}14$. **3**

[Turn over

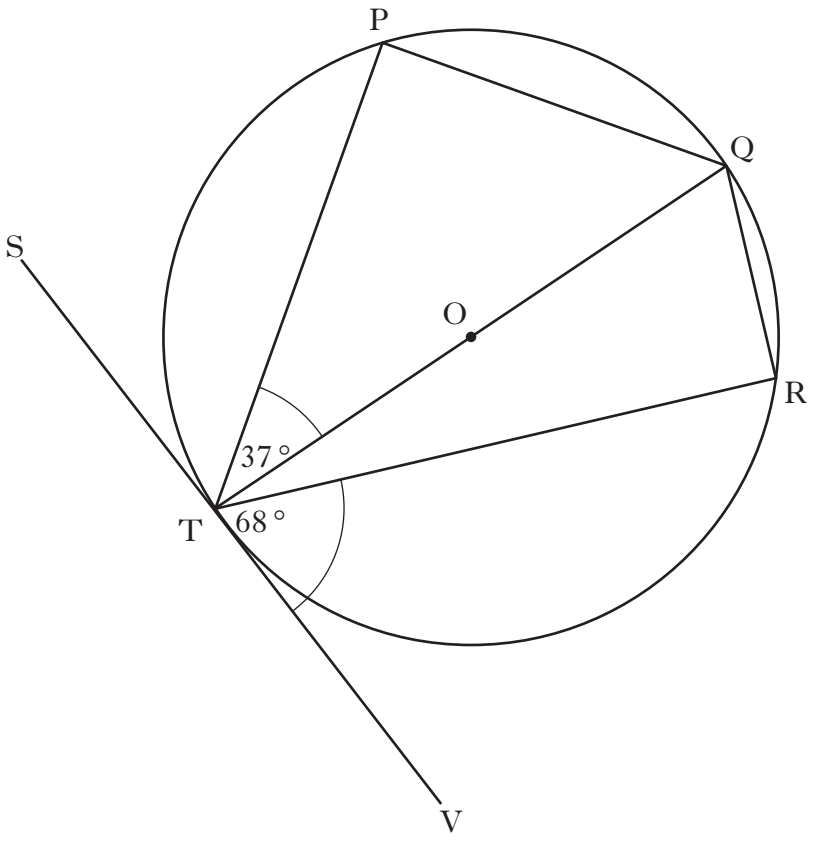
Marks

4. Solve algebraically the system of equations

$$2x - y = 10$$
$$4x + 5y = 6.$$

3

5.



The tangent SV touches the circle, centre O, at T.

Angle PTQ is 37° and angle VTR is 68°.

Calculate the size of angle PQR.

3

Marks

6. The stem and leaf diagram shows the number of minutes on average spent on homework per night by a group of first year pupils.

1	0 5 5 5
2	0 1 2 2 3 5 5 8 9
3	0 5 5 6 6 7 8 9 9 9
4	2 4 4 5 6 7
5	0

n = 30 1 | 0 represents 10 minutes

(*a*) Using the above data find:

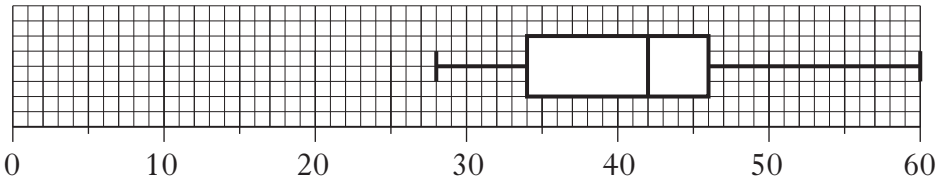
(i) the median; **1**

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

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

(*b*) Draw a boxplot to illustrate this data. **2**

(*c*) A group of fourth year pupils was surveyed to find out how many minutes on average they spent on homework per night. The boxplot below was drawn for this data.

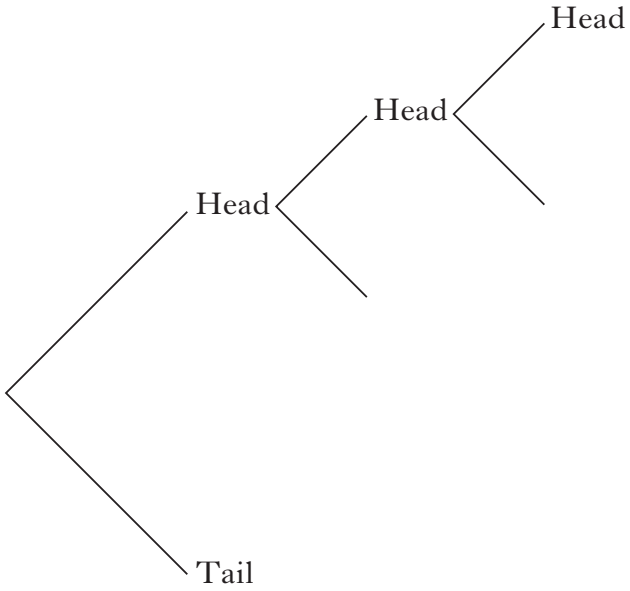


Compare the two boxplots and comment. **2**

[Turn over

Marks

7. **Anna** tosses a coin **three** times.



(*a*) Copy and complete the above tree diagram to show **all** the possible results. **3**

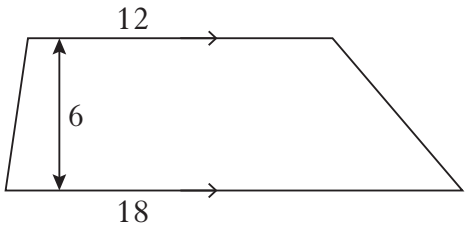
(*b*) What is the probability that, out of three tosses, she gets exactly one tail? **1**

8. The area of a trapezium is calculated by

$$A = \frac{1}{2}(a+b)h$$

where a and b are the parallel sides and h is the vertical distance between them.

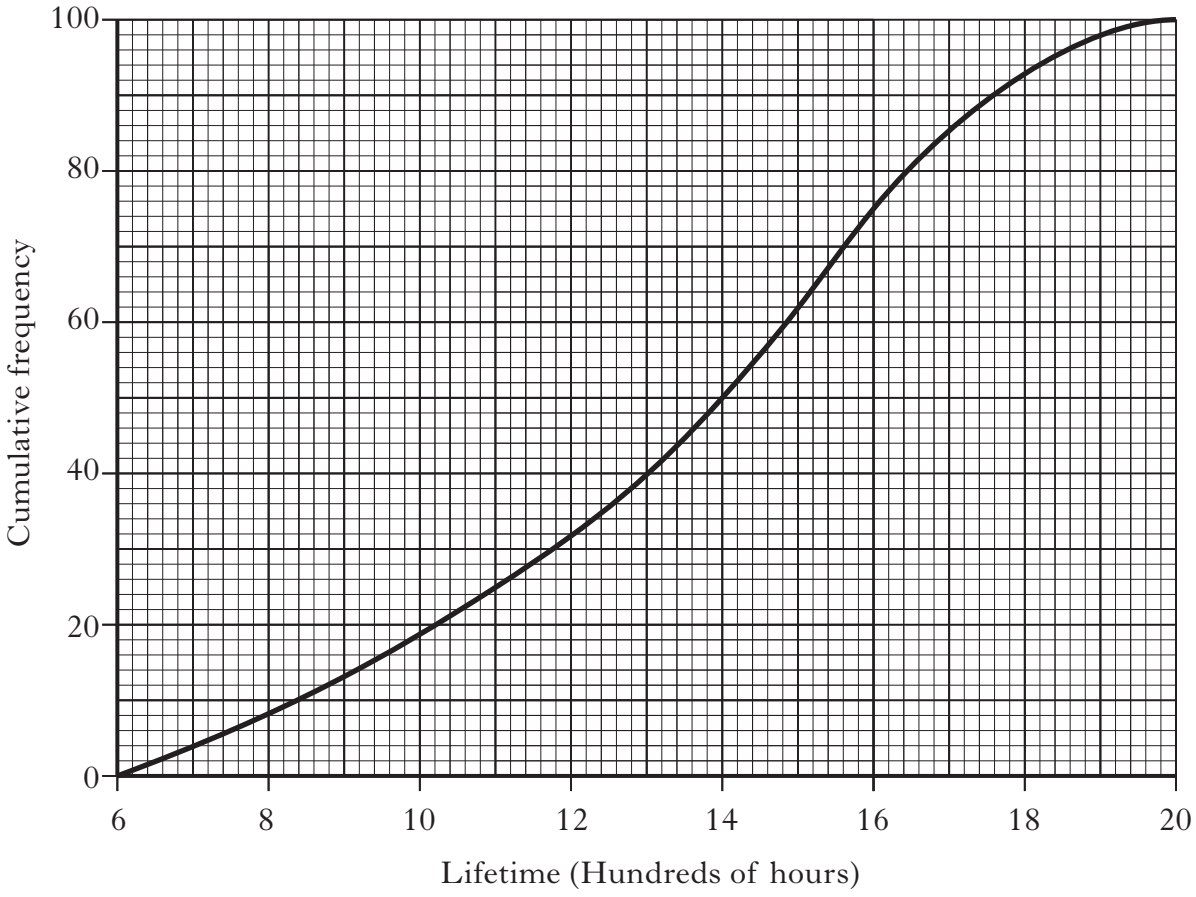
Calculate the area of the trapezium below.



2

Marks

9. A company which manufactures light bulbs tests the lifetime of a sample of 100 bulbs. The results are shown in the cumulative frequency curve below.



(*a*) State the median lifetime for the data represented in the diagram. **1**

(*b*) Calculate the semi-interquartile range. **3**

[*END OF QUESTION PAPER*]

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X101/11/02

NATIONAL QUALIFICATIONS 2013

WEDNESDAY, 22 MAY
10.05 AM – 11.35 AM

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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FORMULAE LIST

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

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1. Multiply out the brackets and collect like terms.

$(x + 2)(x - 5) - 9x$ **3**

2. A company buys machinery worth £750 000.

The value of the machinery depreciates by 20% per annum.

The machinery will be replaced at the end of the year in which its value falls below half of its original value.

After how many years should the machinery be replaced?

You must explain your answer. **4**

3. Erica works as a masseuse at a health club.

Her March payslip, shown below, is only partly completed.

Name E. Roe	**Employee No.** 666	**Tax Code** 710L	**Month** March
Basic Pay £1350	**Overtime Pay** –	**Bonus**	**Gross Pay**
Nat. Insurance £187·42	**Income Tax** £297·59	**Pension**	**Deductions**
			Net Pay

Erica is paid a bonus of £7·25 for each massage she does.

During March she does 88 massages.

Erica pays 6% of her Gross Pay into her Pension.

Calculate Erica's Net Pay for March. **3**

Marks

4. A sample of voters was asked how they intended to vote at the next election. The responses are shown below.

Party	*Percentage*
Scottish National Party (SNP)	35%
Labour (Lab)	30%
Liberal Democrat (Lib Dem)	15%
Conservative (Con)	10%
Others	10%

Construct a pie chart to illustrate this information.

Show all of your working. **3**

5.

Monthly repayments for £10 000 loan		
	With Protection	Without Protection
Safeloan	£226·72	£191·26
Moneyback	£228·41	£196·41
Quickloan	£229·74	£200·71

The table above shows the monthly repayments charged by three companies for a loan of £10 000 repaid over 5 years.

Jennifer takes a £10 000 loan, over 5 years, with protection, from Moneyback.

Calculate the cost of her loan. **3**

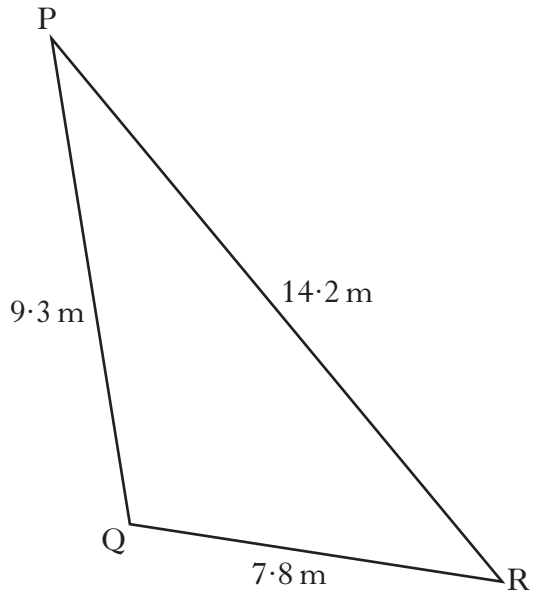
Marks

6. Part of Wendy's credit card statement is shown below.

Credit Limit = **£1000**	
Balance from previous statement	£25·78
Interest	£2·24
Cliff Petrol Station	£36·45
Save More Supermarket	£64·17
H R Brown	£13·25
Total Balance	£A
Minimum repayment	£B
Minimum repayment = 2·5% of balance or £5, whichever is greater	

Calculate the values of A and B. **3**

7. Triangle PQR is shown below.



Calculate the size of angle QPR. **3**

[Turn over

Marks

8. Harry often plays golf and the scores for some of his games are recorded below.

84 78 87 80 81

(*a*) For this sample calculate:

(i) the mean; **1**

(ii) the standard deviation. **3**

Show clearly all your working.

(*b*) His partner for these games is Tony, whose scores are listed below.

104 98 107 100 101

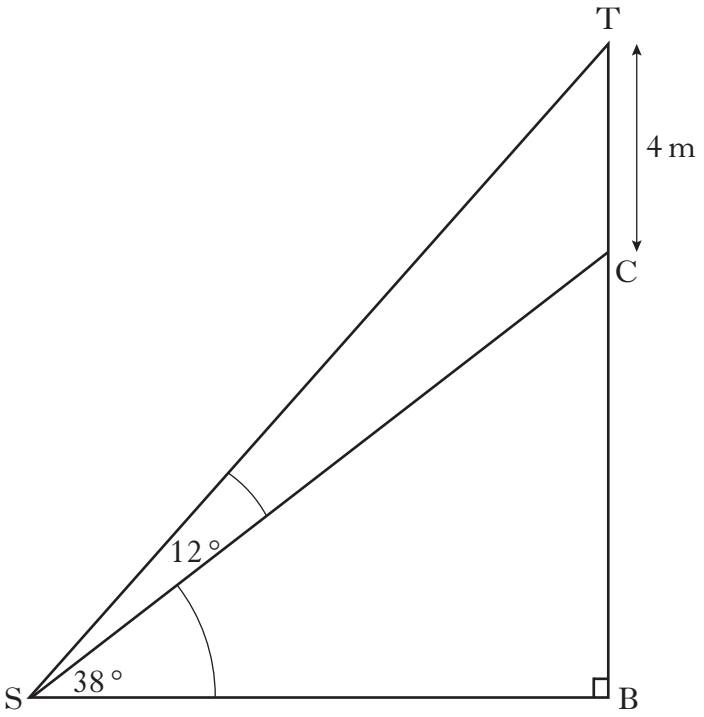
Write down the mean and standard deviation of Tony's scores. **2**

9. A lead **cube**, of side 10 centimetres, is melted down.
During this process 8% of the metal is lost.
The remaining metal is then made into a **cone**, with radius 8 centimetres.
Calculate the height of this cone.
Give your answer correct to 2 significant figures. **5**

Marks

10. A tree surgeon is asked to reduce the height of a tree.

In the diagram below TB represents the original height of the tree and C is the point where the cut is to be made.



The tree surgeon will reduce the height of the tree by 4 metres.

Angle TSC = 12 ° and angle BSC = 38 °.

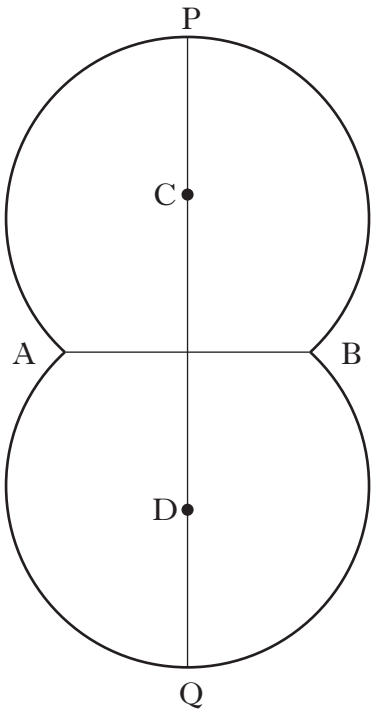
Calculate the height of the tree after it has been cut.

Do not use a scale drawing. **5**

[Turn over

Marks

11. The shape below is used as a logo in an advertising campaign. It is made up from segments of two identical circles.



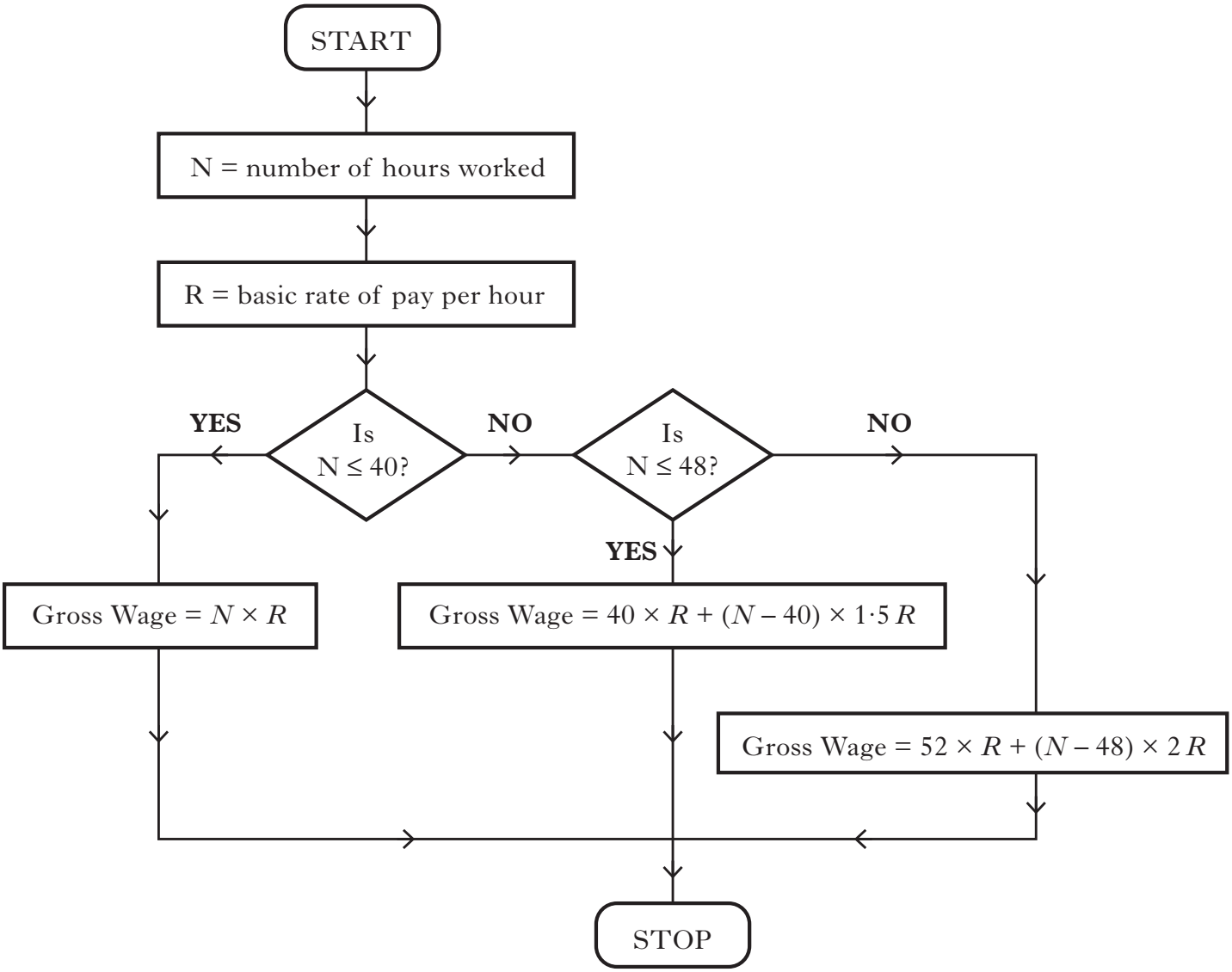
The points C and D are the centres of the circles and each circle has a radius of 24 centimetres.

AB is a common chord of length 30 centimetres.

Calculate the height of the logo, represented by the line PQ. **5**

Marks

12. The flowchart below shows how to calculate a worker's gross weekly wage depending on the number of hours worked and the basic rate of pay per hour.



One week Frank worked 50 hours and had a Gross wage of £364.

Use the flowchart to calculate his basic rate of pay per hour. **4**

[Turn over

Marks

13. Diagrams A and B show a histogram and a cumulative frequency curve respectively.

Diagram A

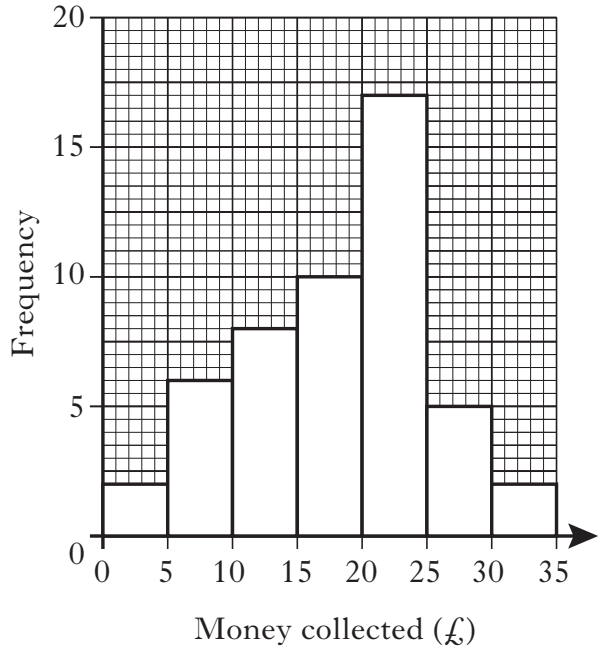
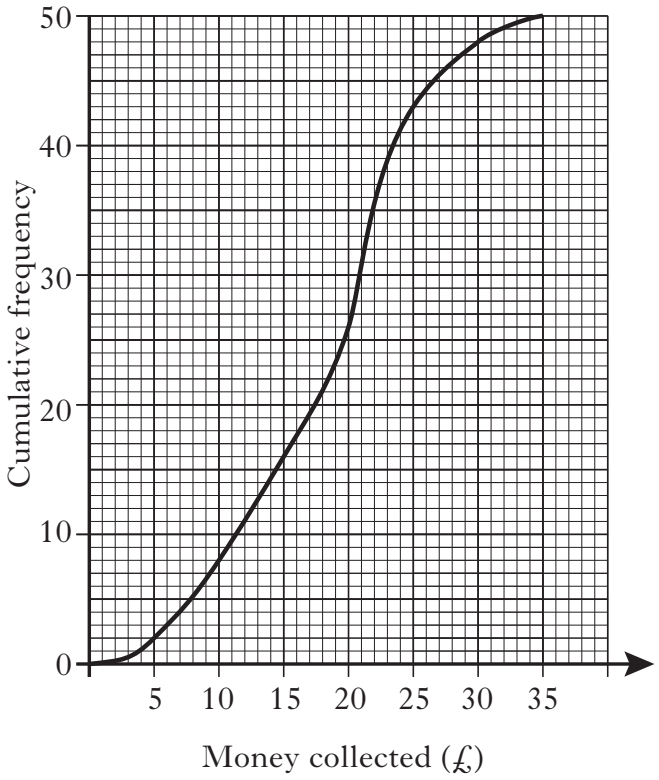


Diagram B



(*a*) Using the data in Diagram A, copy and complete the frequency table below.

Money collected (£)	Frequency
0·01 – 5·00	
5·01 – 10·00	
10·01 – 15·00	
15·01 – 20·00	
20·01 – 25·00	
25·01 – 30·00	
30·01 – 35·00	

1

13. (contined)

(*b*) Jim thinks that both Diagram A and Diagram B may have been drawn using the same set of data.

Is he correct?

Explain your answer, showing all your evidence. **2**

[*END OF QUESTION PAPER*]

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