Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE

General Certificate of Secondary Education

WJEC CBAC

CYD-BWYLLGOR ADDYSG CYMRU

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185/05

MATHEMATICS

PILOT EXAMINATION

HIGHER TIER PAPER 2

A.M. MONDAY, 11 June 2007

(2 Hours)

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	6	
2	8	
3	3	
4	6	
5	10	
6	5	
7	4	
8	3	
9	4	
10	4	
11	5	
12	4	
13	4	
14	6	
15	3	
16	4	
17	7	
18	4	
19	4	
20	6	
TOTAL MARK		

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution especially when a calculator is used.

Unless stated, diagrams are not drawn to scale.

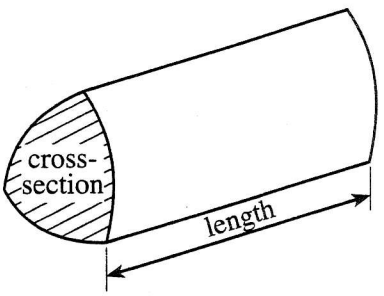
Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

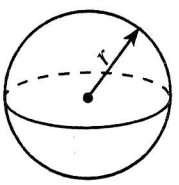
Formula List

Volume of prism = area of cross-section × length



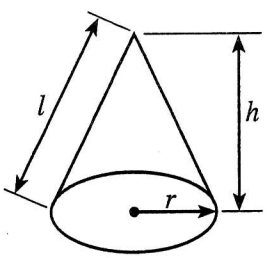
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



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

Curved surface area of cone $= \pi r l$

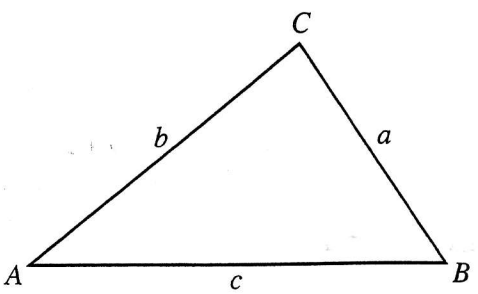


In any triangle ABC

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

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Standard Deviation

Standard deviation for a set of numbers

$x_1, x_2, \ldots, x_n$, having a mean of $\bar{x}$ is given by

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} \quad \textbf{or} \quad s = \sqrt{\frac{\sum x^2}{n} - \left\{\frac{\sum x}{n}\right\}^2}$$

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1. The diagram shows a composite shape formed using three rectangles.

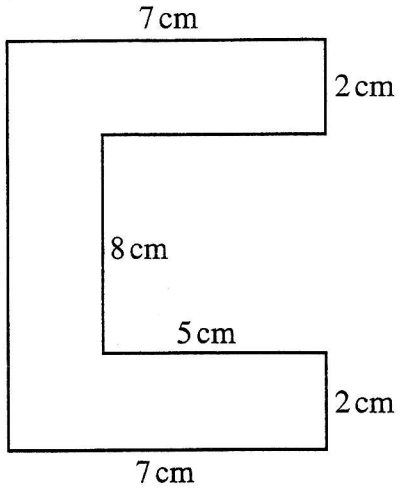

Diagram not drawn to scale.

(a) Find the area of the composite shape.

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[2]

(b) Find the perimeter of the composite shape.

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[2]

(c) Change $6{\cdot}4\ m^2$ into cm^2.

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[2]

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2. *(a)* The nth term of a sequence is $n^2 + 10$. Write down the first three terms of this sequence.

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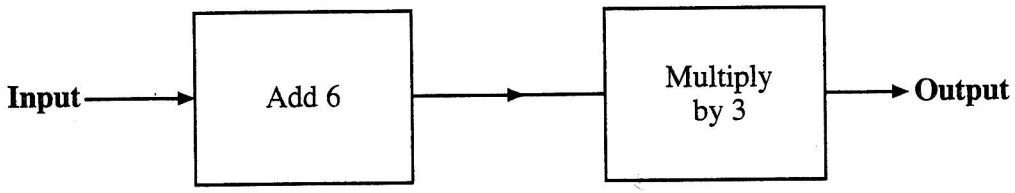
[2]

(b) The diagram shows a number machine.



(i) Find the **Input** to the number machine when the **Output** is –18.

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[1]

(ii) Write down the **Output** from the number machine when the **Input** is n.

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[2]

(c) The diagram shows a triangle with angles, measured in degrees, of $5x$, $2x$ and $3x$.

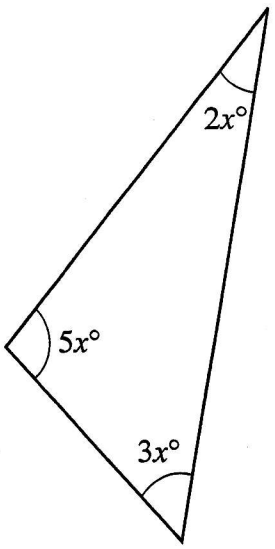

Diagram not drawn to scale.

Form an equation in x and solve it.

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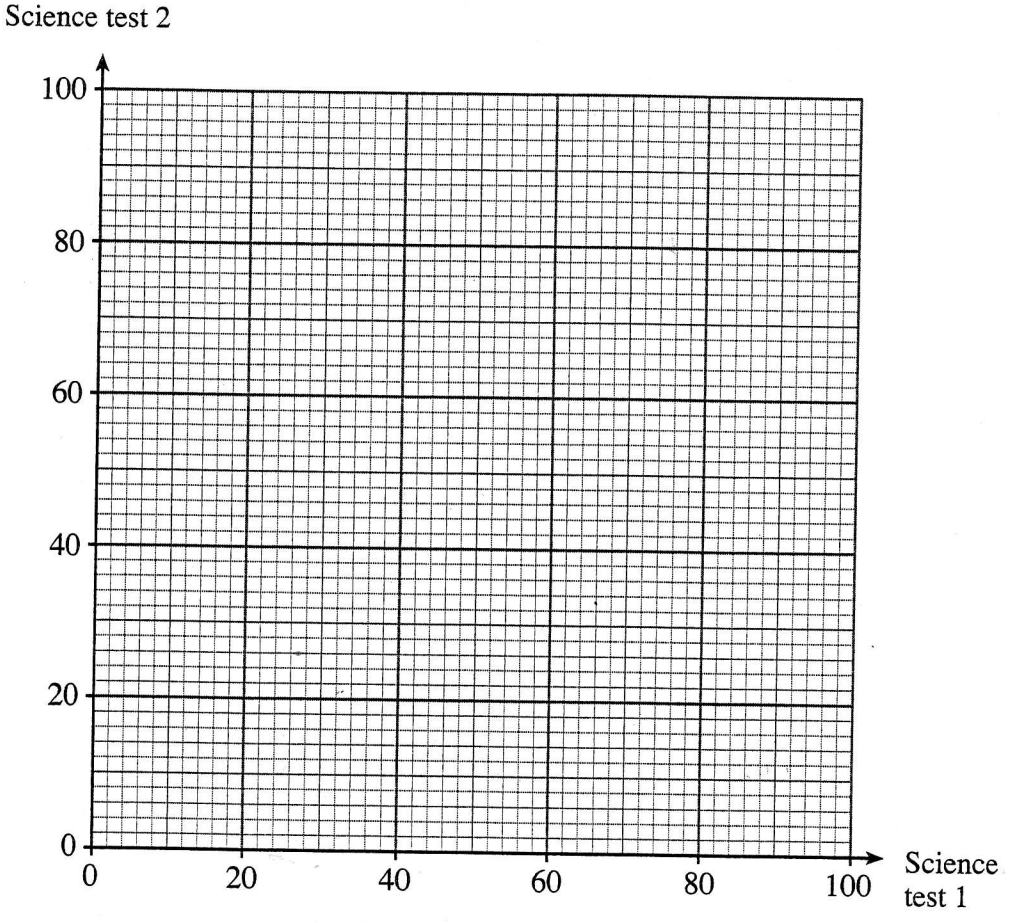
[3]

3. The following table shows the pairs of marks obtained by a set of pupils in two science tests.

Science test 1	74	92	56	38	54	82	40	46	96
Science test 2	48	64	42	24	38	56	28	32	72

(a) On the graph paper below draw a scatter diagram for these tests. [2]



(b) What type of correlation is shown by your scatter diagram?

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[1]

4. *(a)* Solve the following equations.

(i) $\frac{3x}{5} = 6$

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(ii) $4x + 3 = 2x - 5$

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[5]

(b) Factorise $7a + 21$.

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[1]

5. *(a)* Andrew sells his house for £210 000.

(i) The estate agent selling the house charges 1·5% on the first £150 000 of the selling price and 2·4% on the remainder.

Calculate the total amount Andrew has to pay to the estate agent.

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(ii) Charlie, Mary and Sian buy the house for £210 000.
They contribute to the cost of buying the house in the ratio 8:7:5.
How much does each contribute?

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Charlie contributes £ .....

Mary contributes £ .....

Sian contributes £ .....

[7]

(b) Jenny bougth some jewellery, in a car boot sale, for £25. She sold the jewellery to Alan and made a 30% profit. How much did Alan pay for the jewellery?

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[3]

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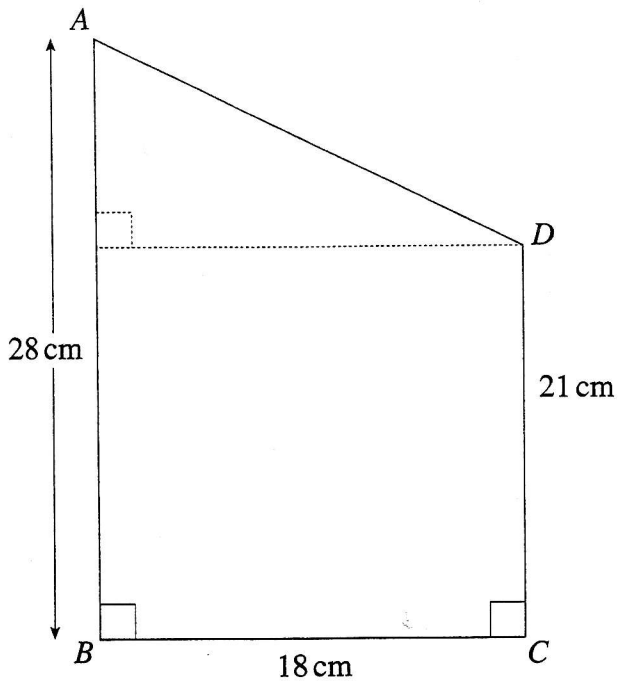
6.



The above diagram shows a trapezium $ABCD$ with $AB = 28$ cm, $BC = 18$ cm and $CD = 21$ cm.
Angle $ABC = 90°$ and angle $BCD = 90°$.
Calculate the length of AD, giving your answer to an appropriate degree of accuracy.

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[5]

7. A solution to the equation

$$x^3 - 5x - 34 = 0$$

lies between 3·7 and 3·8.

Use the method of trial and improvement to find this solution correct to two decimal places.

[4]

8. Judith invests £600 for 2 years at 4% per annum compound interest. What is the value of her investment after 2 years?

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[3]

9. *(a)* Write down the *n*th term of the sequence 5, 9, 13, 17, 21, ...

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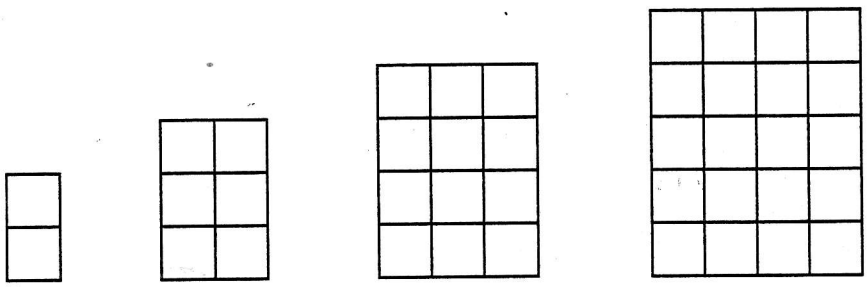
(b) The diagrams show tile patterns.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

Find an expression for the number of tiles in Pattern *n*.

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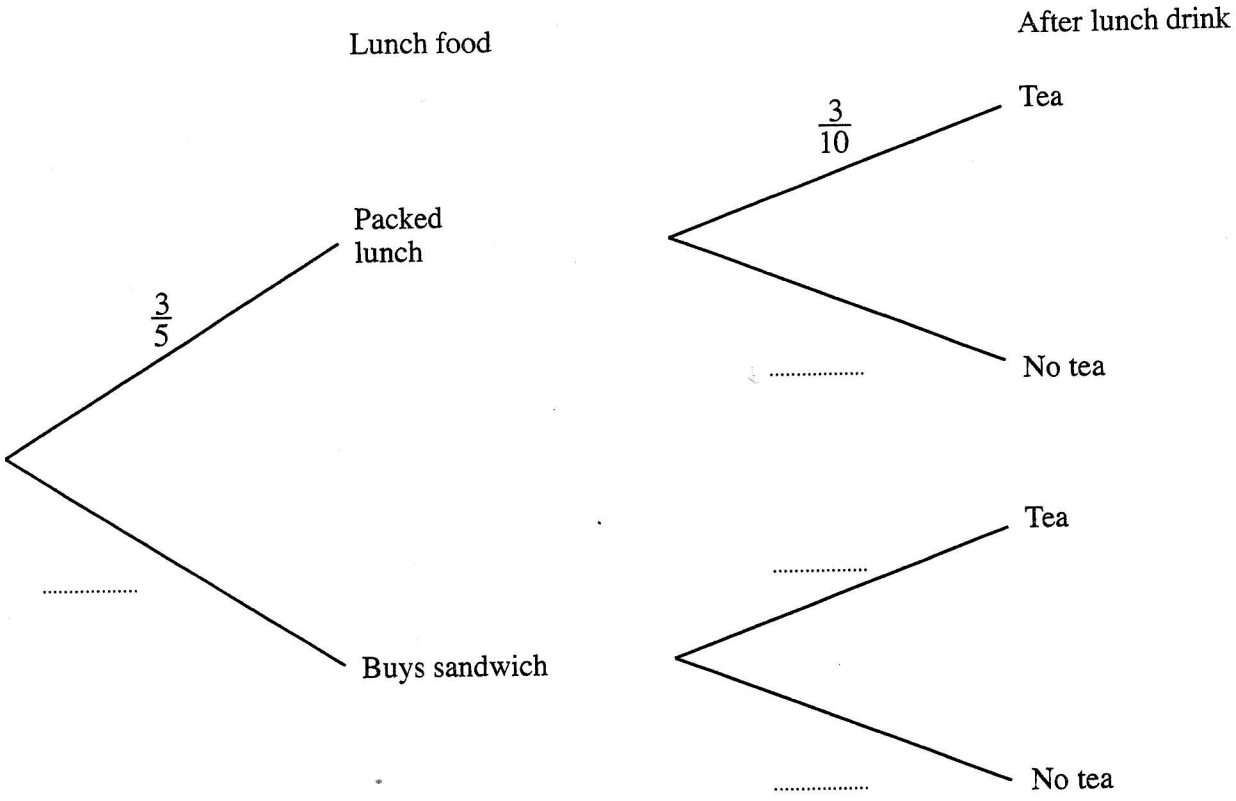
[2]

10. Each lunchtime Paul either eats a packed lunch or he eats a sandwich bought in the snack bar. The probability that he eats a packed lunch is $\frac{3}{5}$. Whatever he eats for lunch the probability that he buys a mug of tea is $\frac{3}{10}$.

(a) Complete the following tree diagram.



[2]

(b) Calculate the probability that Paul eats a packed lunch and he buys a mug of tea.

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[2]

11. The length of a roll of plastic sheeting is 500 cm, measured to the nearest 5 cm.

(a) Write down the least possible length and greatest possible length of the roll of plastic sheeting.

Least possible length ..... cm Greatest possible length ..... cm [2]

(b) A plastic sheet of length 100 cm, measured to the nearest 5 cm, is cut from the roll of plastic sheeting. Find the least possible length of the sheeting left on the roll.

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[3]

12. On the graph paper below, draw the region which satisfies **all** of the following inequalities.

$$y \leqslant 5$$
$$y \geqslant x - 8$$
$$x \leqslant 8$$
$$y \geqslant -5x$$

Make sure that you clearly indicate the region that represents your answer.

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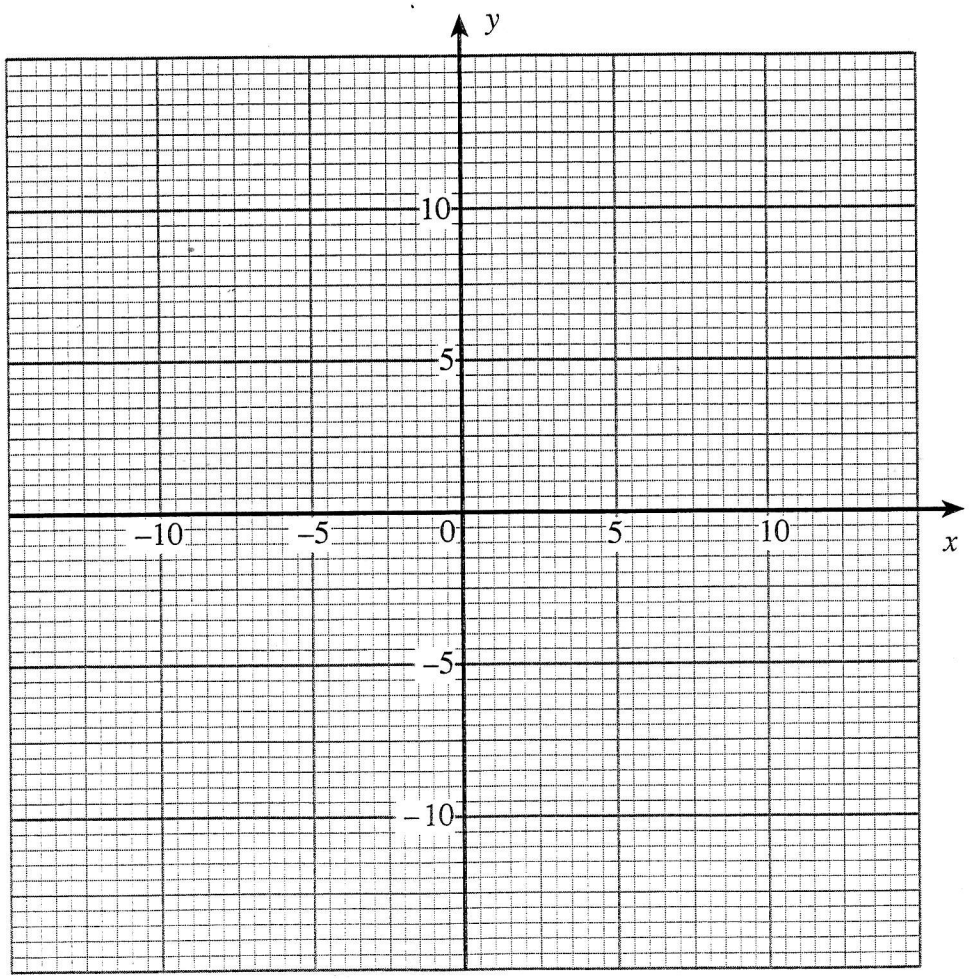
[4]



13. *(a)* Write **each** of the following numbers in standard form.

(i) 23 million

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(ii) 0·00098

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[2]

(b) Find, in standard form, the value of $(5{\cdot}4 \times 10^3) \times (3 \times 10^5)$.

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[2]

14. *(a)* The triangle ABC is such that $\hat{CAB} = 90°$, $CB = 32$ mm and $\hat{ACB} = 52°$.

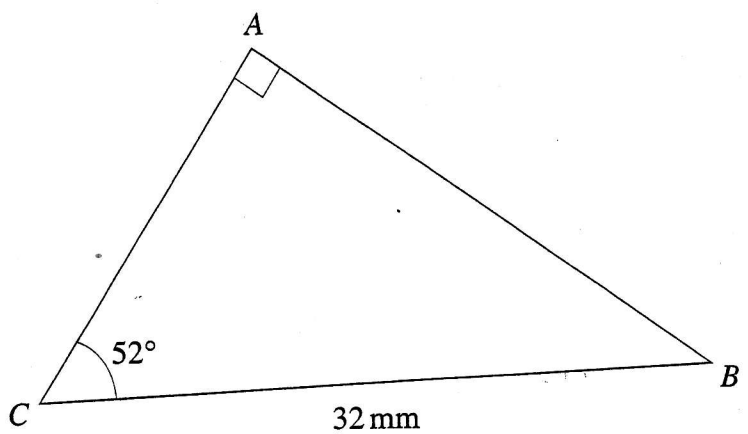

Diagram not drawn to scale.

Calculate the length of AB.

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[3]

(b) The triangle STU is such that $\hat{TUS} = 90°$, $SU = 32{\cdot}5$ cm and $ST = 43{\cdot}8$ cm.

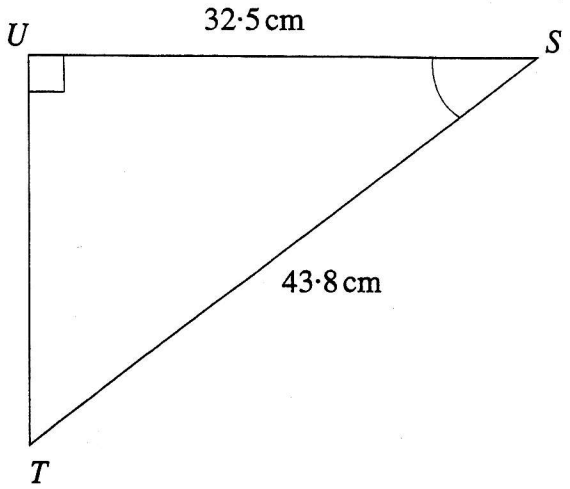

Diagram not drawn to scale.

Calculate the size of $\hat{UST}$.

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[3]

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15. Find the standard deviation of this set of ten numbers.

4, 8, 7, 3, 5, 6, 1, 9, 5, 4

[3]

16. *(a)* Four points A, B, C and D lie on the circumference of a circle. The lines AC and BD intersect at the point F.

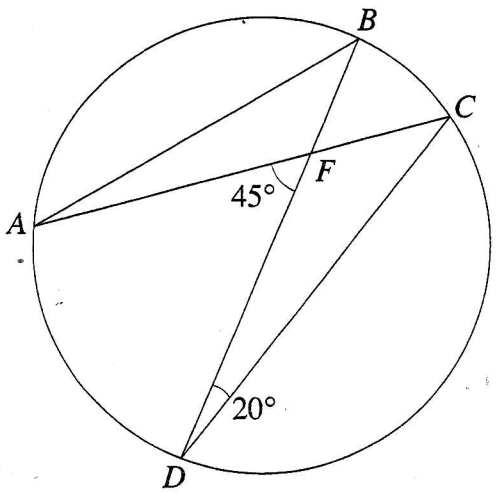

Diagram not drawn to scale.

Given that $A\hat{F}D = 45°$ and $B\hat{D}C = 20°$, find the size of $A\hat{B}D$ giving a reason for your answer.

[2]

(b) Three points P, Q and R lie on the circumference of a circle.
The tangent XY touches the circle at R.

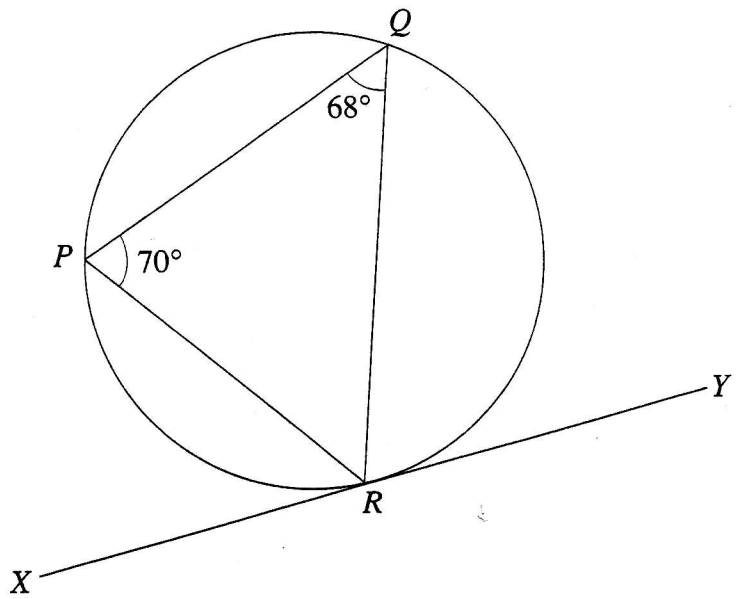

Diagram not drawn to scale.

Given that $R\hat{P}Q = 70°$ and $P\hat{Q}R = 68°$, find the size of $P\hat{R}X$, giving a reason for your answer.

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[2]

17. The diagram shows a trapezium.

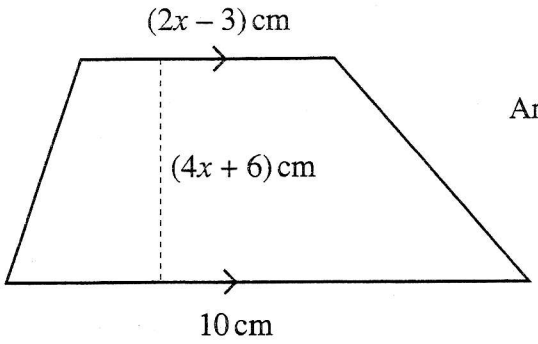

Diagram not drawn to scale.

The parallel sides of a trapezium are of lengths 10 cm and $(2x - 3)$ cm. The height of the trapezium is $(4x + 6)$ cm and its area is 70 cm^2.

(a) Show that $4x^2 + 20x - 49 = 0$.

[3]

(b) Use the quadratic formula to solve the equation $4x^2 + 20x - 49 = 0$. Give your answers correct to one decimal place.

[3]

(c) Hence write down the height of the trapezium.

[1]

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18. An international clothing manufacturer employs people in Peru, Mexico, Finland, Thailand and Vietnam.
The number of people employed by the clothing manufacturer in each country is given in the following table.

Country	Number of employees
Peru	564
Mexico	346
Finland	320
Thailand	2130
Vietnam	3450

The clothing manufacturer is arranging a fashion show and decides to invite a total of 18 employees to represent all the employees in the five countries.

Use a stratified sampling method to calculate how many people from each country should be invited to the fashion show.

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[4]

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19. You are given that $\mathbf{JL} = 3\mathbf{x} + 2\mathbf{y}$, $\mathbf{LM} = 5\mathbf{x} - 2\mathbf{y}$ and $\mathbf{MN} = 20\mathbf{x} - 8\mathbf{y}$.

(a) Express **JM** in terms of **x** and **y** in its simplest form.

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[2]

(b) (i) Show that $\mathbf{LN} = k\,\mathbf{LM}$ where the value of the constant k is to be found.

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[1]

(ii) What can you say about the points L, M and N?

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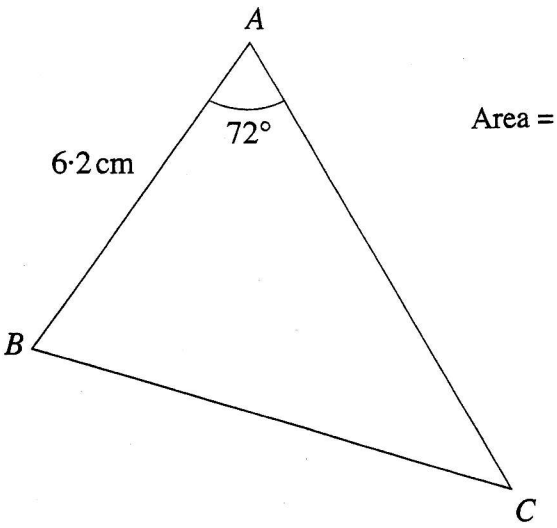
[1]

20. The diagram shows triangle ABC.



Area = 42·6 cm^2

Diagram not drawn to scale.

Given that $B\hat{A}C = 72°$, $AB = 6{\cdot}2$ cm and that the area of the triangle ABC is 42·6 cm^2, find BC.

[6]