Rewarding Learning

71	

Candidate Number

General Certificate of Secondary Education
January 2012

Mathematics

Unit T3
(With calculator)
Higher Tier

[GMT31]

WEDNESDAY 11 JANUARY

9.15 am–11.15 am

GMT31

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
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20	
21	
Total Marks	

TIME

2 hours.

INSTRUCTIONS TO CANDIDATES

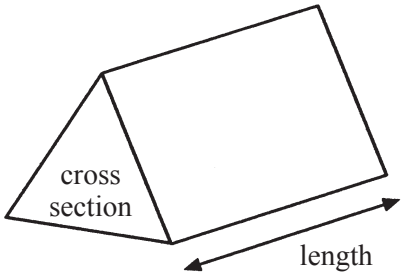
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all twenty-one** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

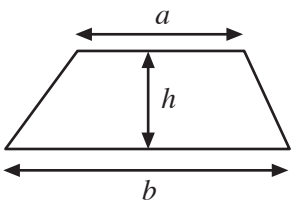
The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **question 2**.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is overleaf.

Formula Sheet

Volume of prism = area of cross section × length

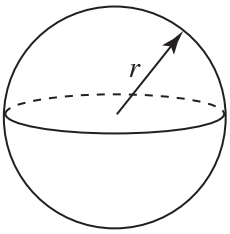


Area of trapezium $= \frac{1}{2}(a+b)h$



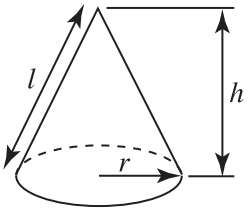
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

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

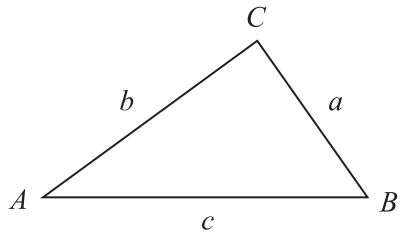


Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

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

In any triangle *ABC*



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

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

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

Answer **all** questions.

Examiner Only	
Marks	Remark

1 **(a)** Calculate $\dfrac{6.5 \times 5.8}{5.3 + 2.1}$

Give your answer correct to 2 decimal places.

Answer _____ [2]

(b) A girl uses $\frac{2}{5}$ of a bag of flour to make a dozen scones.

How many bags of flour does she need to buy to make 80 scones?

Answer _____ [3]

Quality of written communication will be assessed in this question.

Examiner Only	
Marks	Remark

2 Aaron wants to find out how often people go to the cinema.
He designs the following questionnaire to use to gather data for his survey.

> How often do you go to the cinema?
>
> Tick one box below.
>
> Not very often ☐ Sometimes ☐ A lot ☐

(a) Write down two things that are wrong with this questionnaire.

1. _____

_____

2. _____

_____ [2]

(b) Design a better questionnaire for him to use to find out how often people go to the cinema.
You should include some response boxes.

[2]

(c) Aaron intends to give out his questionnaire to all the men leaving the cinema.
Give two reasons why the data he will collect from his survey will be biased.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

3 **(a)** In April last year, it rained on 24 days.

What percentage of days in April were dry?

Answer _____% [2]

(b) A wealthy American has $300 000 to spend on a holiday villa in Spain.

The exchange rates are shown below:

£1 = 1.1752 euro	£1 = $1.5669

She sees a villa priced at 240 000 euro.

Has she enough money to buy the villa?

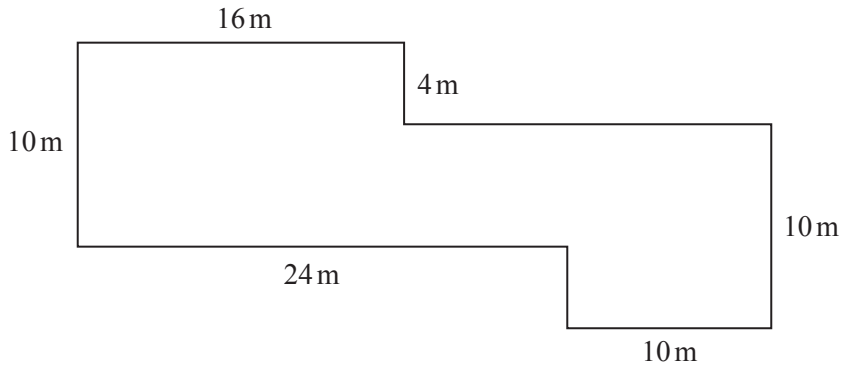
Show working to explain your answer.

Answer _____

_____ [3]

Examiner Only	
Marks	Remark

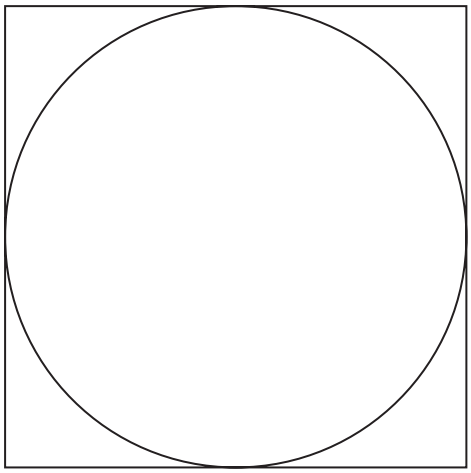
4 **(a)** Calculate the surface area of the water in a hotel swimming pool with dimensions as shown.



Answer _____ [3]

(b) A square of side 8 cm has a circle drawn inside it which just touches its four sides.

Calculate the area of the circle.



Not drawn to scale

Answer _____ cm^2 [2]

5 **(a)** Factorise $20d + 35$

Answer _____ [1]

(b) Work out the value of x in the quadrilateral below.

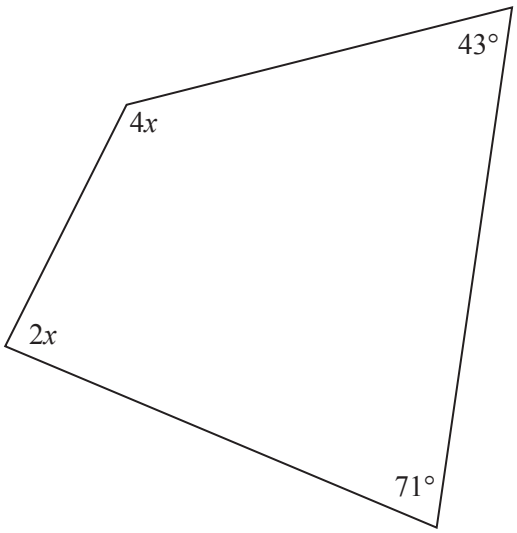


Diagram not drawn accurately

Answer $x =$ _____° [4]

Examiner Only

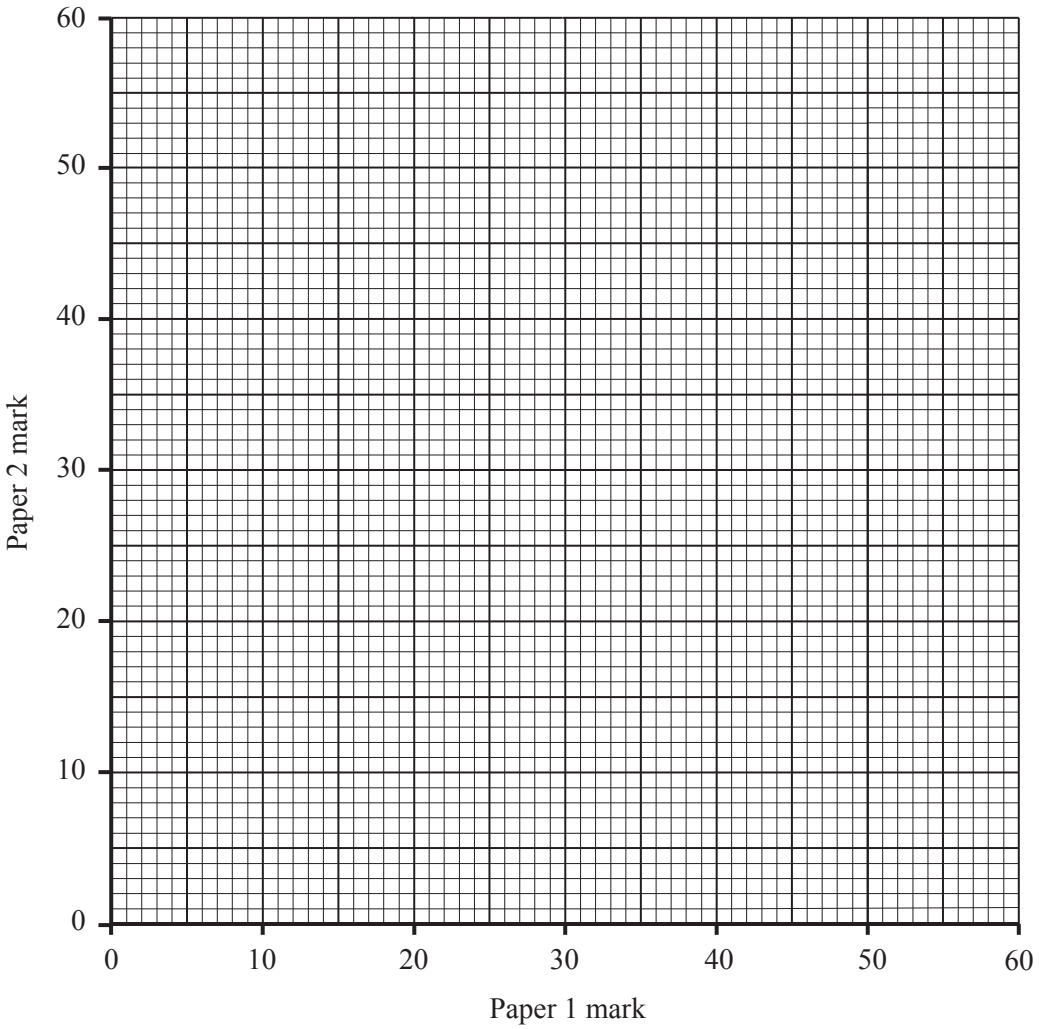
Marks	Remark

Examiner Only	
Marks	Remark

6 The table below shows the marks scored by 8 students in two papers in a Mathematics examination.

Paper 1 mark	20	7	14	23	31	35	41	35
Paper 2 mark	20	2	9	28	41	46	58	50

(a) Draw a scatter graph below.



[2]

(b) Describe the correlation between the marks on Paper 1 and Paper 2.

Answer _____ [1]

(c) Draw a line of best fit on the grid. [1]

Another student was absent for Paper 1 but scored 35 marks on Paper 2.

(d) Use your line of best fit to estimate a mark for Paper 1 for this student.

Answer _____ [1]

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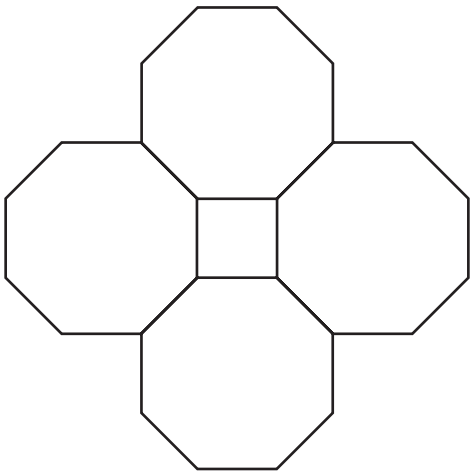
(Questions continue overleaf)

Examiner Only	
Marks	Remark

7 **(a)** Calculate the size of the interior angle in a regular octagon.

Answer _____° [2]

(b) Four floor tiles, each in the shape of a regular octagon are placed together as shown. Explain why the shape between them must be a square.



Answer _____

_____ [2]

(c) AB is parallel to CD. EF is a straight line. BC = BD. Angle ABC = 42°

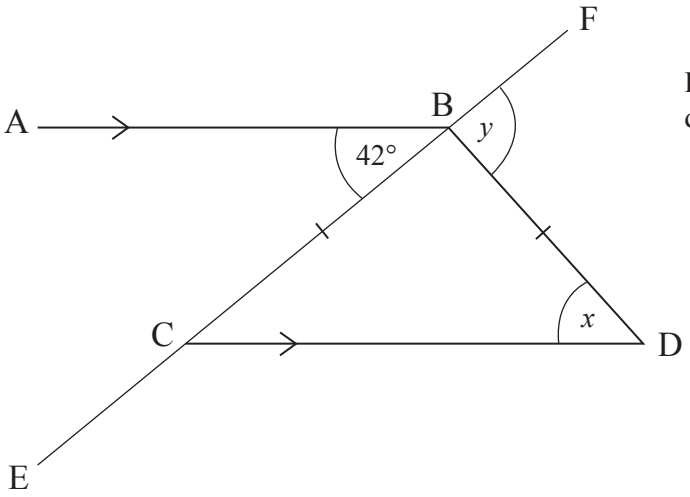


Diagram not drawn accurately

(i) Calculate the size of angle x.

Answer x = _____° [1]

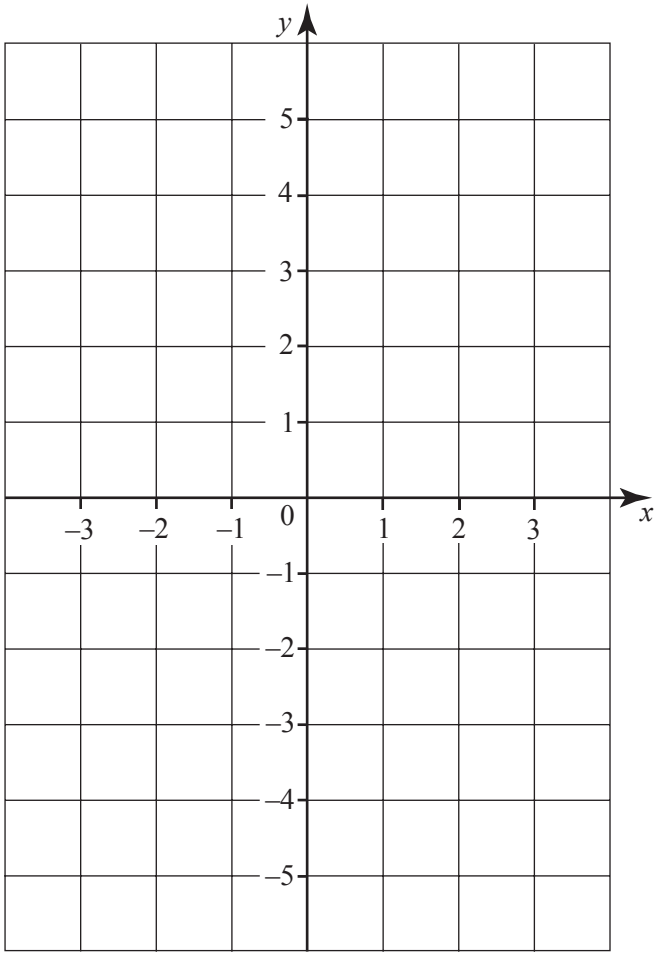
(ii) Calculate the size of angle y.

Answer y = _____° [2]

Examiner Only

Marks	Remark

8 Draw the graph of $y = 1 - 2x$



[3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

9 **(a)** **(i)** Write 24 as a product of prime factors.

Answer _____ [2]

(ii) What is the smallest whole number 24 could be multiplied by to make it a square number?

Answer _____ [2]

(b) From a large bottle containing $2\frac{1}{2}$ litres of lemonade, a girl pours four full glasses each holding $\frac{2}{5}$ litre.

How many **more** full glasses can she pour before running short of lemonade?

Answer _____ [3]

---

10 **(a)** Expand and simplify $7(2a + 3) + 3(4a - 2)$.

Answer _____ [2]

(b) Kyle bought 6 pears at x pence each and 3 tins of meat at $4x$ pence each. He got £4.24 change from £10.

Write down an equation in terms of x and solve it to find the value of x.

Answer x = _____ [4]

11 The table shows information about the number of hours that 100 children used a computer for last week.

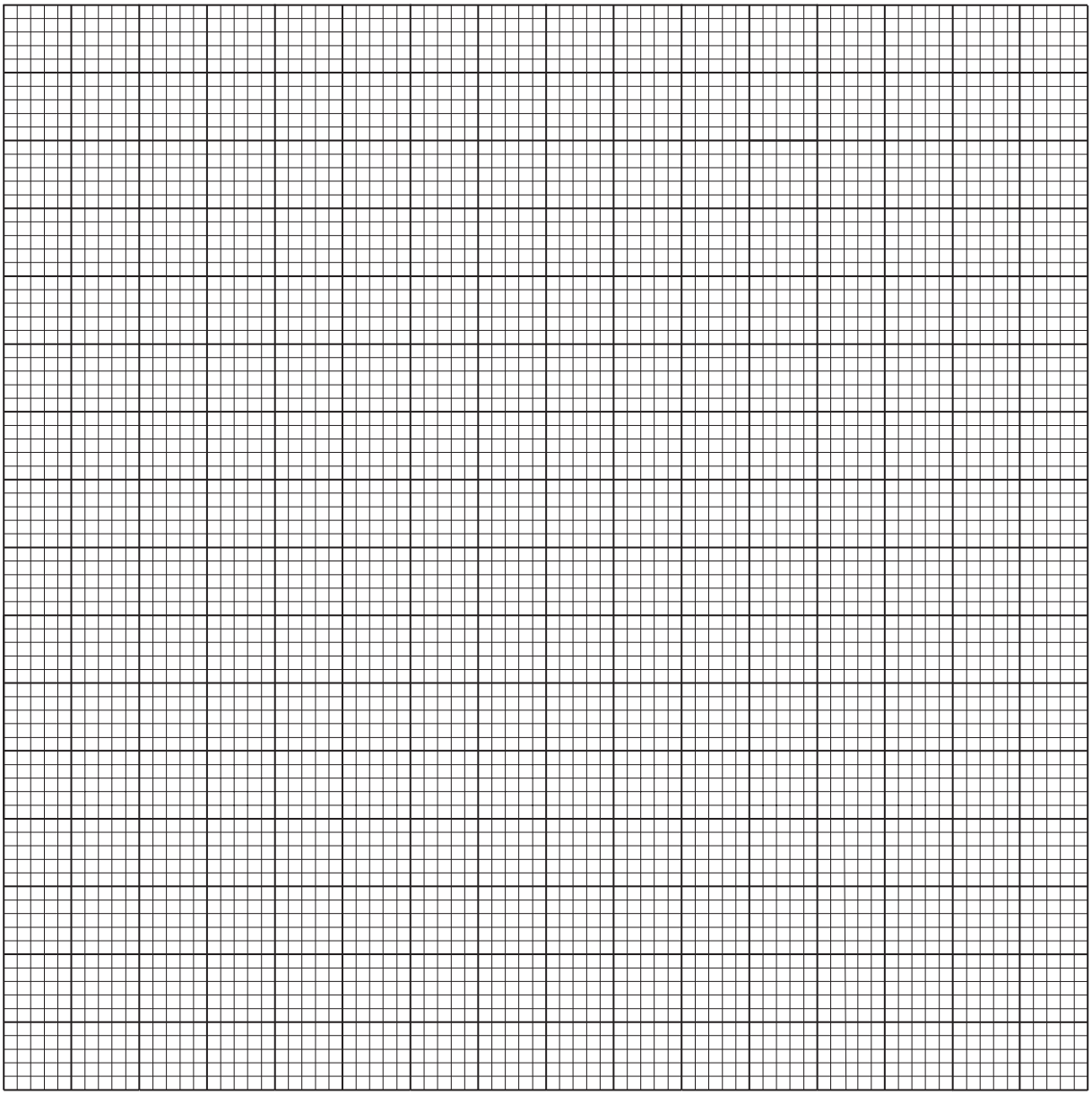
Number of hours (H)	Frequency
$0 < H \leq 3$	8
$3 < H \leq 6$	16
$6 < H \leq 9$	21
$9 < H \leq 12$	36
$12 < H \leq 15$	12
$15 < H \leq 18$	7

(a) Work out an estimate for the mean number of hours that the children used a computer for last week.

Answer _____ hours [4]

Examiner Only	
Marks	Remark

(b) On the grid below draw a frequency polygon to illustrate the data opposite.



[2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

12 A solution to the equation $x^3 - 5x = 27$ lies between 3 and 4.
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.
Show each stage of your working.

Answer $x =$ _____ [3]

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13 A man measures the length of his house as 13 metres using a stick which he thinks is **1 metre** long. Later he finds out that the stick is actually 99.3 centimetres long.

Calculate by how much the length of the house is shorter than 13 metres.

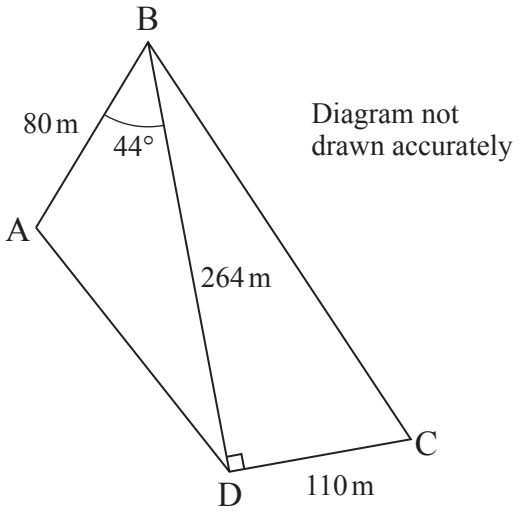
Answer _____ cm [3]

---

14 Jane attends both piano and flute lessons on August 31st.
She attends flute lessons every 8 days and piano lessons every 10 days.
On what date will she next attend both lessons?

Answer _____ [2]

15 A field ABCD has straight sides. AB = 80 m, DC = 110 m and BD = 264 m. Angle BDC = 90° and angle ABD = 44°.



(a) Calculate the length of BC.

Answer _____ m [3]

(b) Calculate angle ABC.

Answer _____° [3]

Examiner Only

Marks	Remark

16 Fifty-five pupils in Year 11 do an end of year French test.

Their data is recorded in the table below.

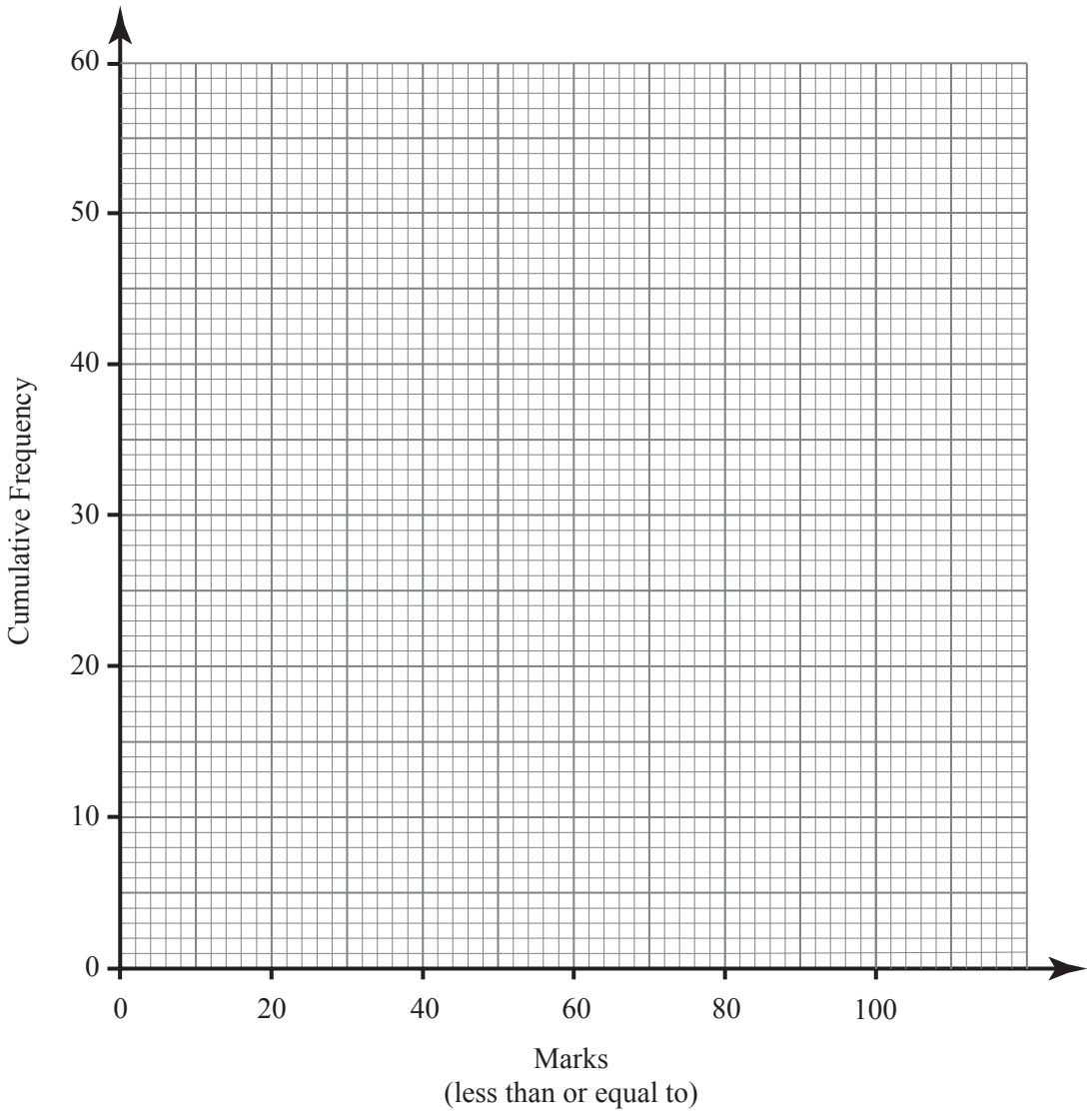
Mark	0–20	21–40	41–60	61–80	81–100
Frequency	6	17	20	9	3

(a) Complete the cumulative frequency table below.

Mark (less than or equal to)	20	40	60	80	100
Cumulative Frequency	6				

[1]

(b) Draw a cumulative frequency graph to illustrate this information.



[3]

Examiner Only

Marks	Remark

(c) Use your graph to estimate the median mark.

Answer _____ [1]

The pass mark for the examination was 52.

(d) Use your graph to estimate the number of students who passed the examination.

Answer _____ [2]

Examiner Only	
Marks	Remark

17 An electric fire cost £135.66 including VAT at 20%.
How much VAT was payable on the bill?

Answer £ _____ [3]

18 **(a)** Solve the simultaneous equations $7x + 3y = 15$
$4x + 3y = 6$

Answer $x =$ _____, $y =$ _____ [2]

(b) Solve the equation $\frac{4x+1}{12} + \frac{2x-3}{6} = \frac{7}{4}$

Answer $x =$ _____ [4]

Examiner Only	
Marks	Remark

19 The temperature in a cooling furnace falls by 5% every hour.
The temperature is measured every hour.
At 10 am the temperature is 1200°C.
At what hour will it first be found to measure below 1000 °C?
Show your working.

Answer _____ [2]

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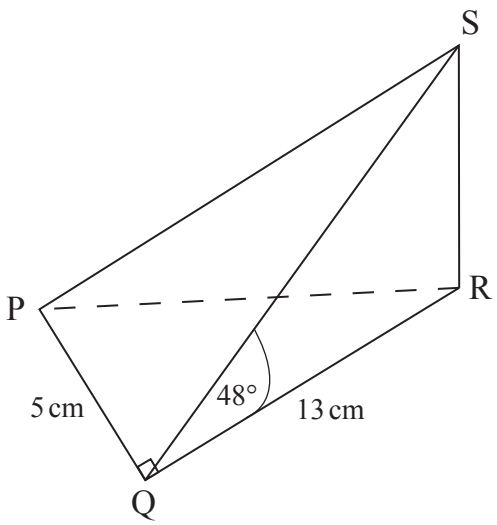
20 The diagram shows a pyramid PQRS in which RS is at right angles to the horizontal base PQR. PQ = 5 cm, QR = 13 cm, angle PQR = 90° and angle RQS = 48°.

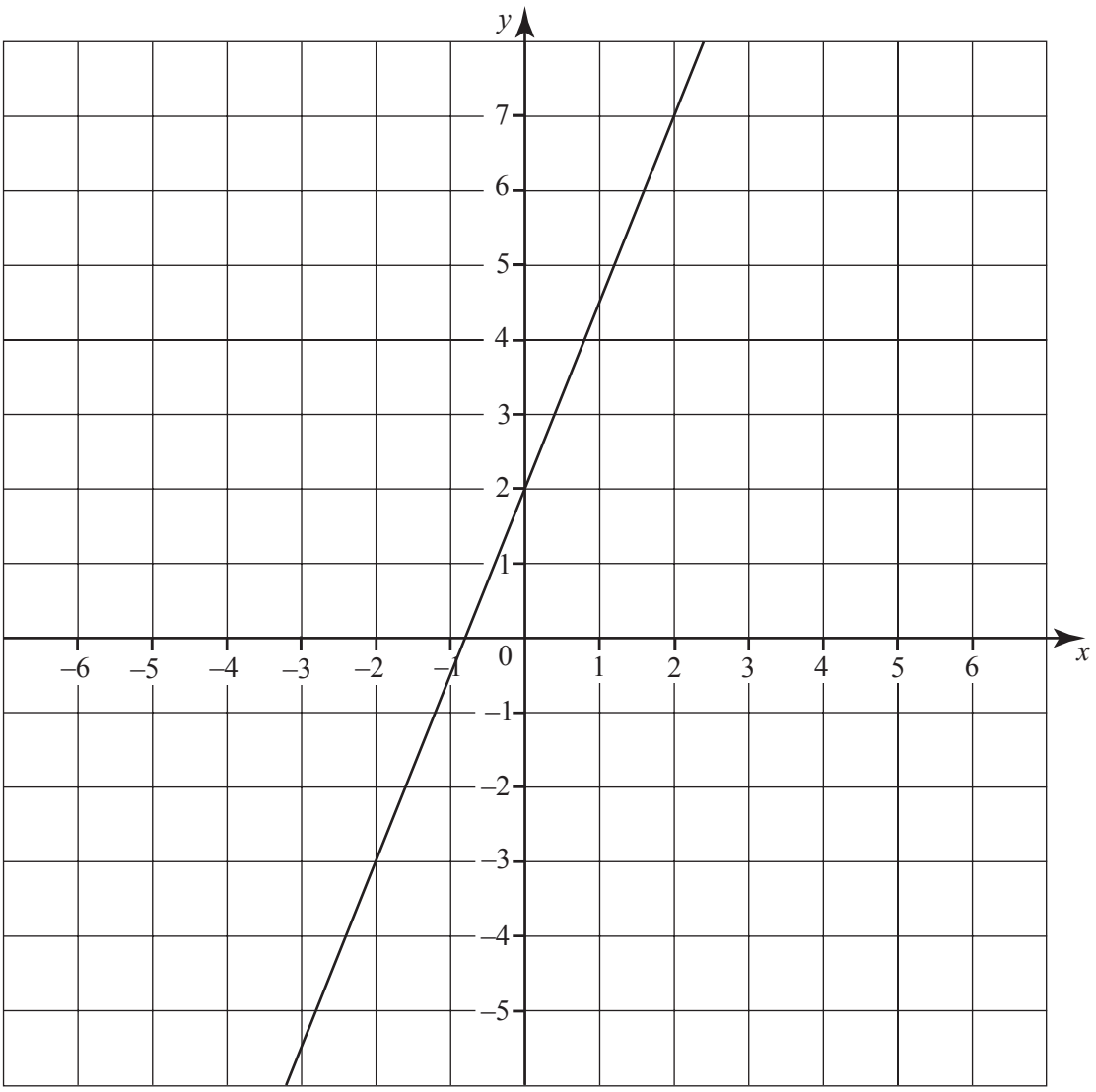


Calculate the length SR.

Answer _____ cm [3]

21 (a)

Examiner Only	
Marks	Remark



(i) Write down the gradient of the line drawn above.

Answer _____ [1]

(ii) Hence write down the equation of this line.

Answer _____ [2]

(b) Factorise fully $9x^2y + 15x$

Answer _____ [2]

THIS IS THE END OF THE QUESTION PAPER

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