New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011

Mathematics

Unit T4
(With calculator)
Higher Tier

[GMT41]

TUESDAY 31 MAY

9.15 am–11.15 am

GMT41

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
Total Marks	

TIME

2 hours.

INSTRUCTIONS TO CANDIDATES

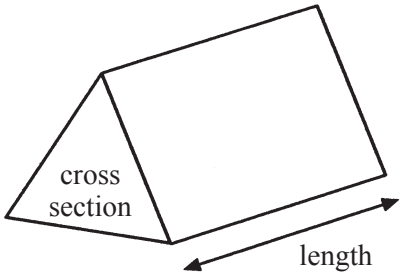
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all nineteen** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct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

INFORMATION FOR CANDIDATES

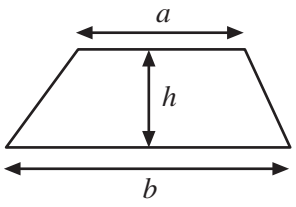
The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **question 11**.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is overleaf.

Formula Sheet

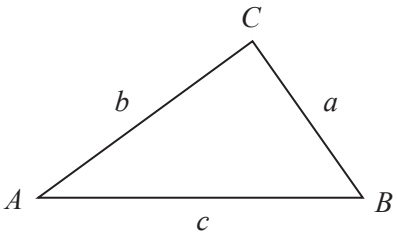
Volume of prism = area of cross section × length



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



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 $= \frac{1}{2}\,ab\sin C$

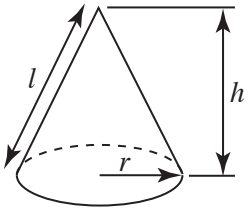
Quadratic Equation

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

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

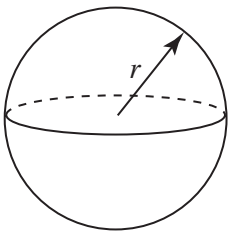
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$



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

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



Answer **all** questions.

Examiner Only	
Marks	Remark

1 The angle of elevation of the top of a telephone mast is 23° from a point 60 metres from the base of the mast on horizontal ground. Calculate the height of the mast.

Answer _____ m [4]

Examiner Only	
Marks	Remark

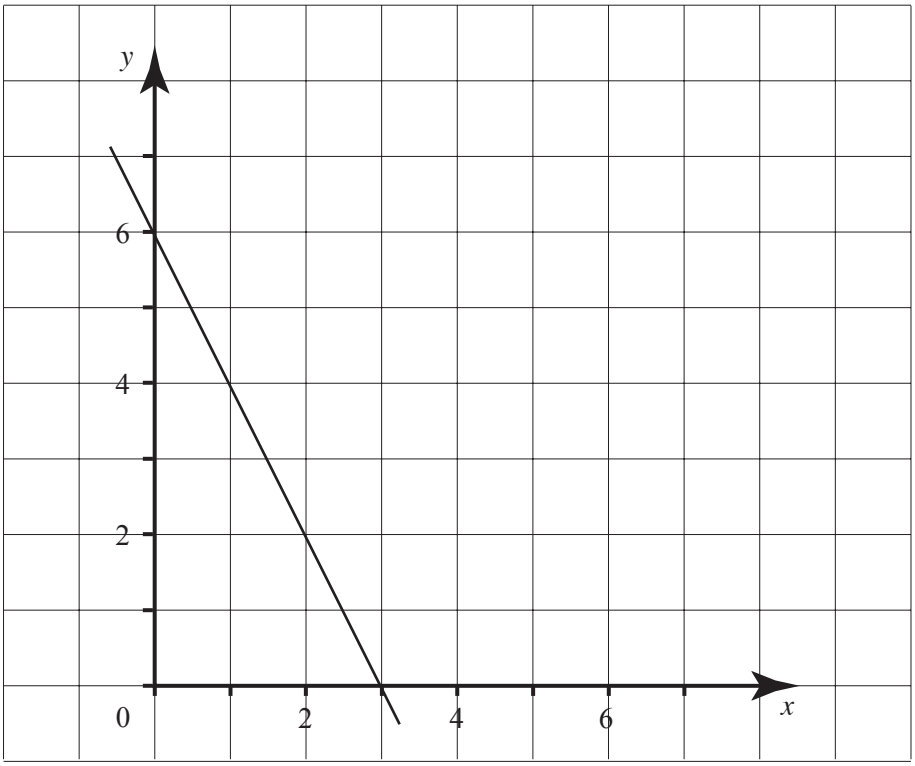
2 **(a)** Solve the equation $\frac{2x-4}{5}+\frac{x+11}{2}=2$

Show your working.

A solution by trial and improvement will not be accepted.

Answer $x =$ _____ [4]

(b)



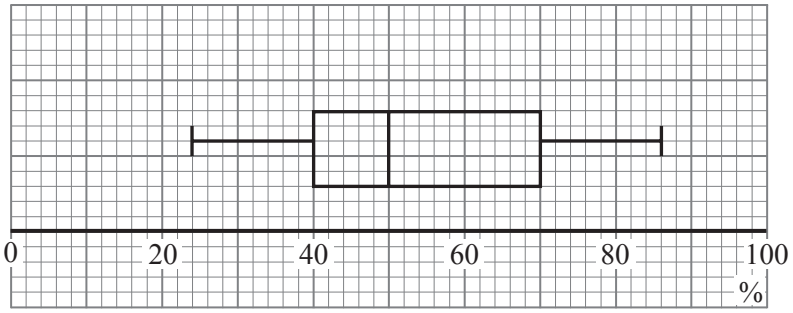
Write down the equation of this line in the form $y = mx + c$.

Answer _____ [3]

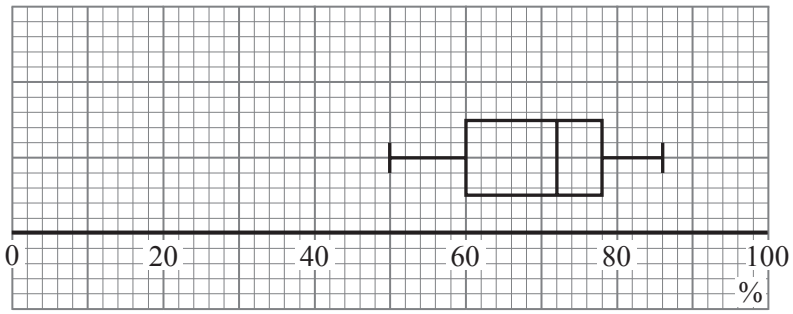
3 The box plots show the distribution of test results for two different classes.

Examiner Only	
Marks	Remark

Class P



Class Q



Comment on **two** differences between the classes.

1. _____

_____ [1]

2. _____

_____ [1]

Examiner Only	
Marks	Remark

4 Bags of coal weigh 12 kg, to the nearest kg.

Find the least and greatest total weight of 9 of these bags.

Answer least _____ kg

greatest _____ kg [2]

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5 **(a)** In the diagram O is the centre of the circle.

SOQ is a straight line.

Angle ORQ = 41° and angle PQS = 24°

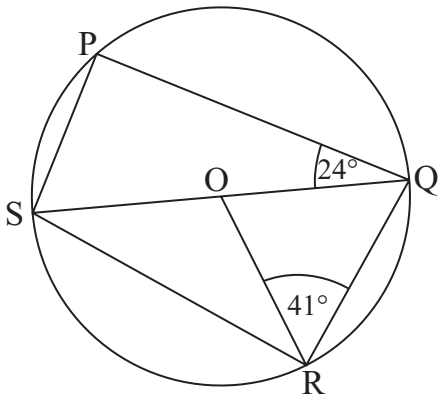


diagram not drawn accurately

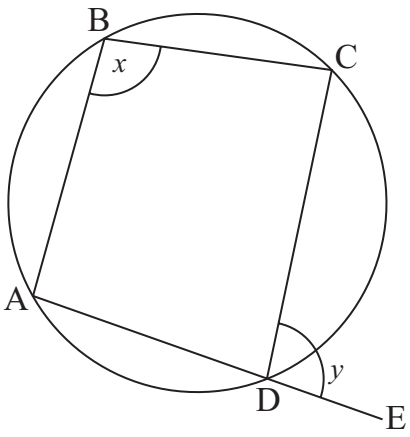
Find the size of the following angles:

(i) OQR = _____° [1]

(ii) PSQ = _____° [1]

(iii) PSR = _____° [1]

(b) Show that the exterior angle of the cyclic quadrilateral equals the interior opposite angle (i.e. $x = y$).



[3]

Examiner Only

Marks	Remark

6 A tea set has a sale price of £63.36 which is a saving of 12% on the original price.

What was the original price of the tea set?

Answer £ _____ [3]

Examiner Only	
Marks	Remark

7 The graph opposite shows the cumulative frequency of scores obtained in a darts tournament.

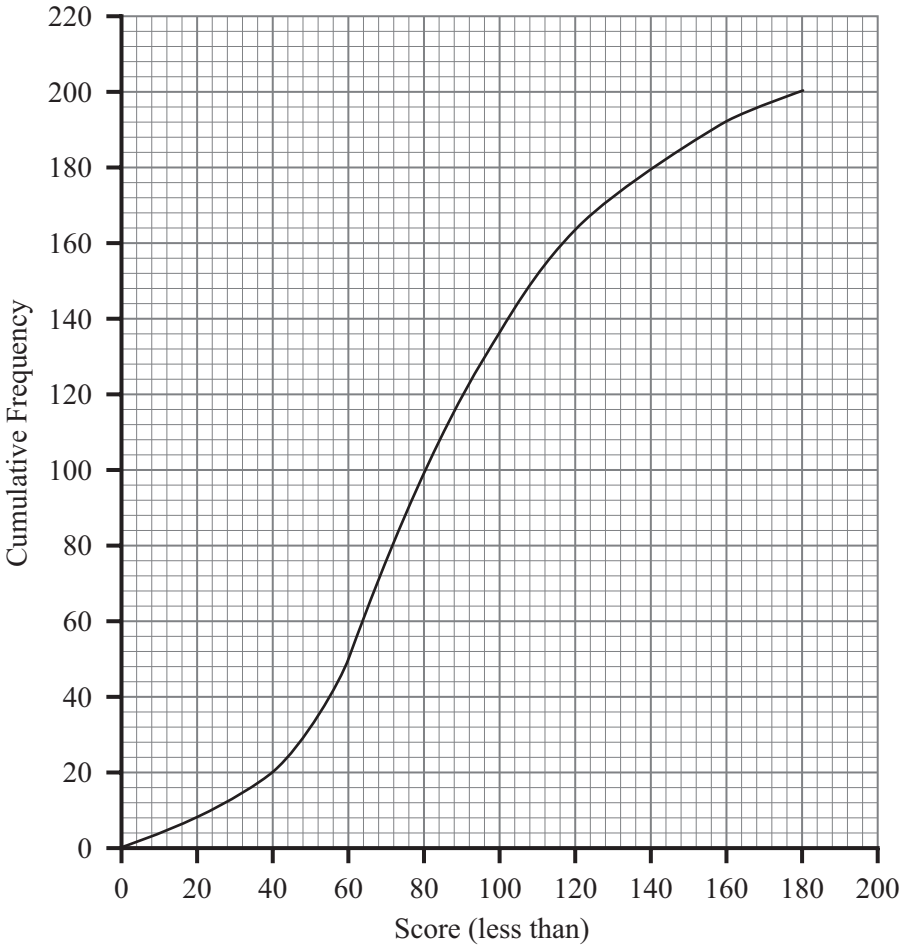
(a) Use the graph to estimate

(i) the median,

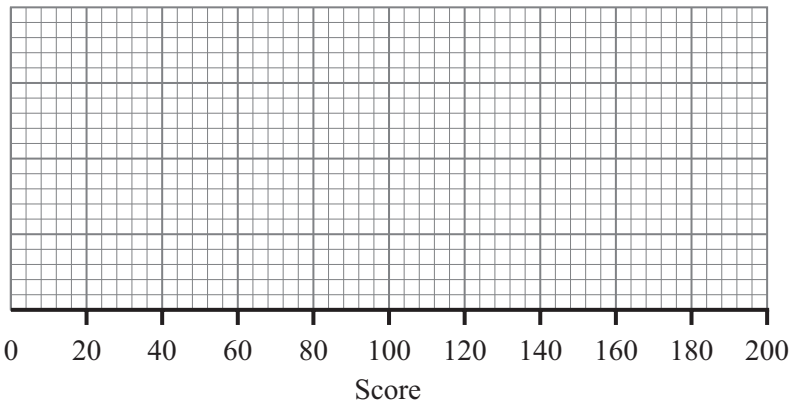
Answer _____ [1]

(ii) how many scores were more than 150

Answer _____ [2]



(b) From the graph draw a box plot.



[3]

Examiner Only

Marks	Remark

8 **(a)** Factorise $9a^2 - 3ay$

Answer _____ [2]

(b) **(i)** Factorise $x^2 + x - 6$

Answer _____ [2]

(ii) Hence solve the equation $x^2 + x - 6 = 0$

Answer _____ [1]

(c) Solve the simultaneous equations $4x + 3y = 1$
$2x - y = -2$

Show your working.

A solution by trial and improvement will not be accepted.

Answer _____ [3]

Examiner Only	
Marks	Remark

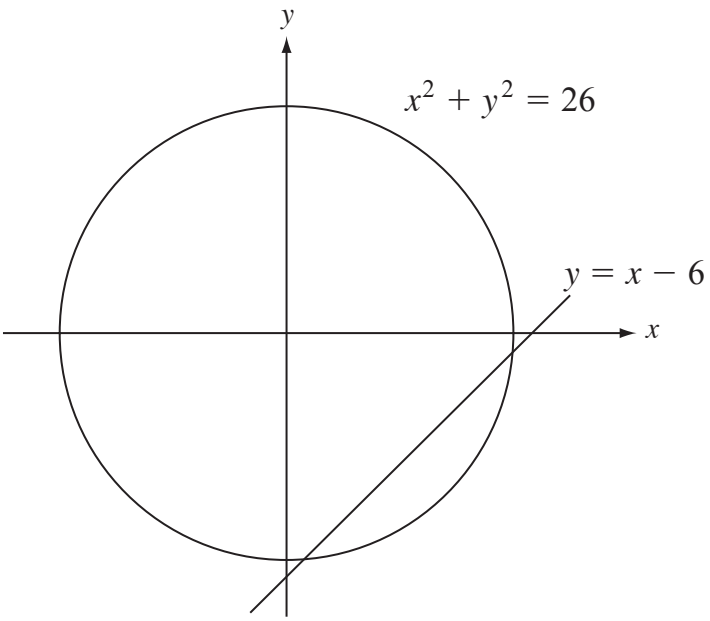
9 Each year a car lost 20% of its value at the beginning of the year. After how many whole years was it worth less than half of its original value?

Show your working.

Answer _____ years [3]

Examiner Only	
Marks	Remark

10 The diagram shows the intersection of the line $y = x - 6$ with the circle with equation $x^2 + y^2 = 26$



(a) Show that the x co-ordinates of the points of intersection of the line with the circle can be found from the solutions to the equation $x^2 - 6x + 5 = 0$

[3]

(b) Hence find the co-ordinates of the points of intersection of the line and the circle.

Answer (____,____) (____,____) [3]

Examiner Only	
Marks	Remark

Quality of written communication will be assessed in this question.

Examiner Only

Marks	Remark

11 The table shows information about 600 workers in a factory.

Age, a years	Number of Males	Number of Females
$20 \leq a < 30$	99	26
$30 \leq a < 40$	142	48
$40 \leq a < 50$	124	64
$50 \leq a < 60$	55	22
$60 \leq a < 70$	20	0

The manager wants to carry out a survey of the workers' views on the workplace. He decides to choose a sample of 80 workers to take part in the survey.

(a) From an alphabetical list of workers' names, he selects every 5th name until he has 80 names.

Explain why this may not produce a fair sample.

Answer _____

_____ [2]

(b) Explain how to take a stratified sample of 80 workers for this data.

[2]

Examiner Only	
Marks	Remark

12 **(a)** y is inversely proportional to the square of x and $y = 10$ when $x = 2$

Express y in terms of x.

Answer _____ [3]

(b) Calculate the value of y when $x = 5$

Answer _____ [1]

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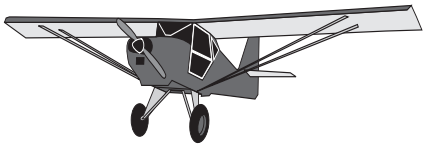
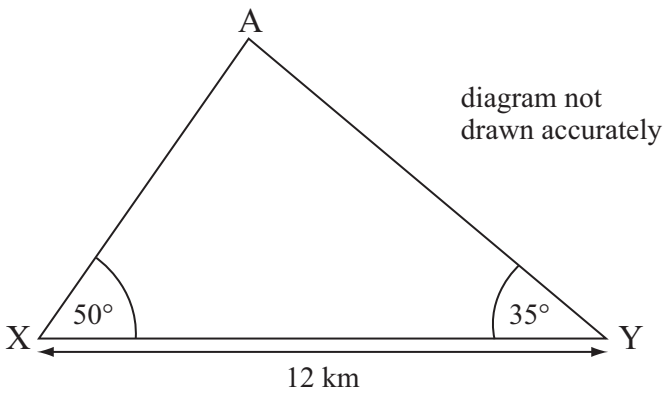
13 A small aircraft, located at position A in the sketch diagram, develops an engine fault while flying between two landing strips located at positions X and Y in the diagram.



The angles from X and Y to the aircraft are 50° and 35° respectively. The aircraft must land as quickly as possible. How much closer is X than Y from A?

Show all working.



Answer _____ km [4]

14 **(a)** Simplify

$$\frac{x^2+3xy-5x-15y}{2x^2-10x}$$

Answer _____ [4]

(b) Hence write down a negative value of x and the corresponding positive value of y for which

$$\frac{x^2+3xy-5x-15y}{2x^2-10x}=0$$

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

Examiner Only	
Marks	Remark

15 The table gives information about the weights of 100 children.

Weight, w kg	Number of children
$20 \leq w < 30$	16
$30 \leq w < 35$	28
$35 \leq w < 40$	36
$40 \leq w < 60$	18
$60 \leq w < 65$	2

(a) Illustrate the data by drawing a histogram, **A**, on the graph paper opposite. [3]

(b) A stratified sample of 20 children was taken from those whose weight was less than 40 kg.

How many of the sample were taken from the interval $35 \leq w < 40$?

Answer _____ [2]

(c) The histogram **B**, already drawn, illustrates the weights of a different group of 100 children. Compare this histogram with the one you have drawn. Give **two** comparisons.

1. _____

_____ [1]

2. _____

_____ [1]

(d) Suggest a reason for the difference in the two histograms.

Answer _____

_____ [1]

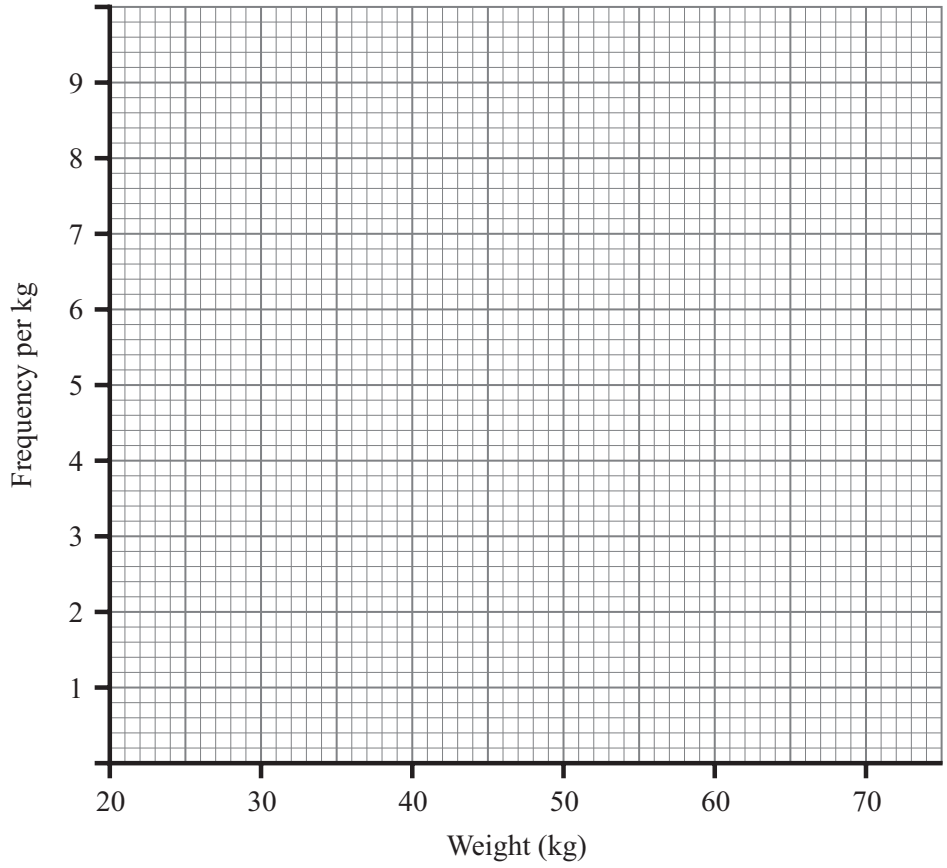
(e) Calculate an estimate for the mean weight of the children in histogram **B**.

Answer _____ kg [4]

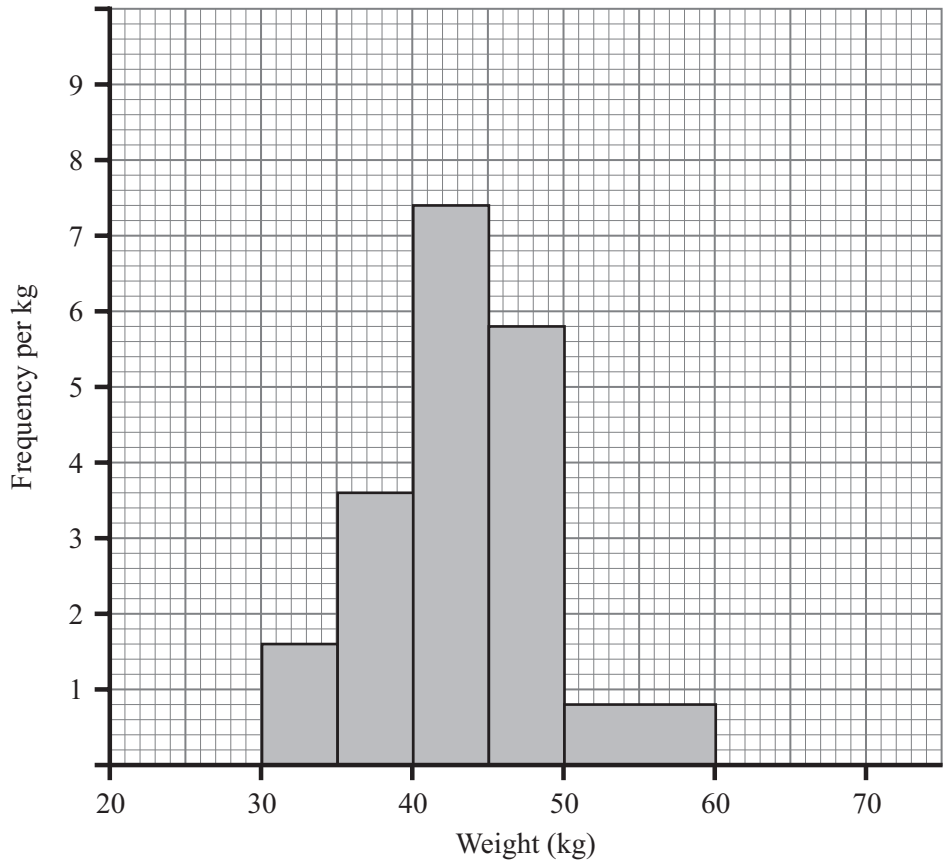
Examiner Only

Marks	Remark

A



B



Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

16 **(a)** Evaluate $289^{\frac{1}{2}}$

Answer _____ [1]

(b) **(i)** m, n are integers and $2^m = \dfrac{1}{4^n}$

Write m in terms of n

Answer $m =$_____ [2]

(ii) m, n are integers and $2^m = \dfrac{1}{2}\left(\dfrac{1}{4^n}\right)$

Write m in terms of n

Answer $m =$_____ [2]

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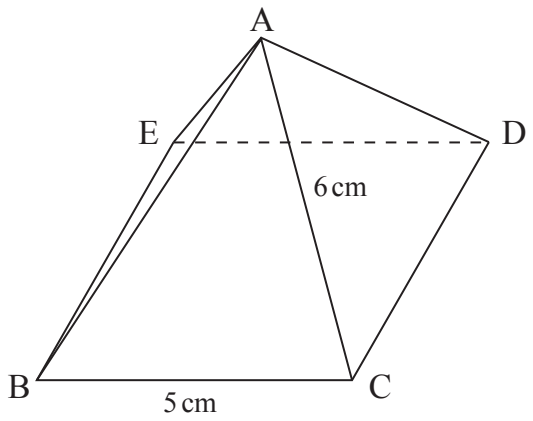
17 Solve $\dfrac{10}{2x-5} + \dfrac{7}{x+2} = 3$

Answer _____ [6]

18



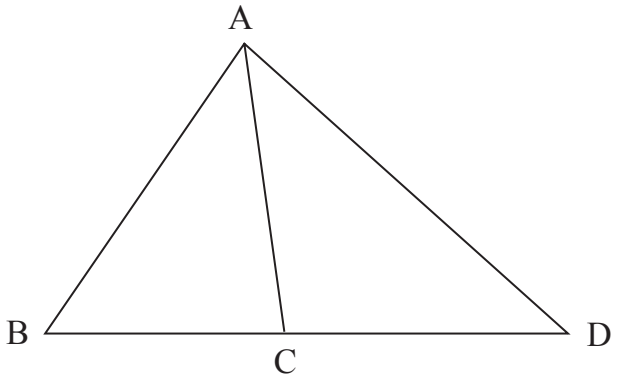
The square-based pyramid has four faces which are isosceles triangles.

Calculate the angle between AB and the base.

Answer _____° [4]

Examiner Only	
Marks	Remark

19



AB = 6.2 cm, angle BAC = 35° and the area of triangle ABC is 9.2 cm^2.

AD = 10.5 cm and CD = 6.4 cm.

Calculate the area of the triangle ACD.

Answer _____ cm^2 [8]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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