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General Certificate of Secondary Education
January 2016

Mathematics

Unit T2
(With calculator)
Foundation Tier

[GMT21]

GMT21

MONDAY 11 JANUARY, 9.15 am–10.45 am

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page, on blank pages or tracing paper.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all twenty-six** questions.
All 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 Questions **10** and **16(b)**.
You should have a calculator, ruler, compasses and a protractor.
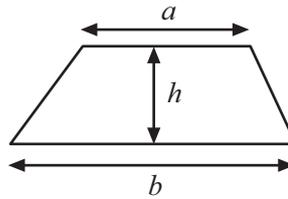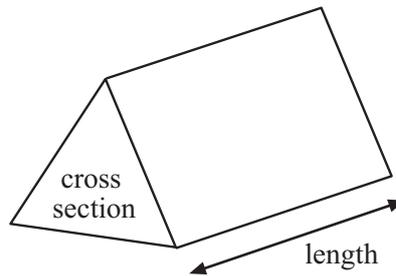The Formula Sheet is on page 2.

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Formula Sheet

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

Volume of prism = area of cross section × length

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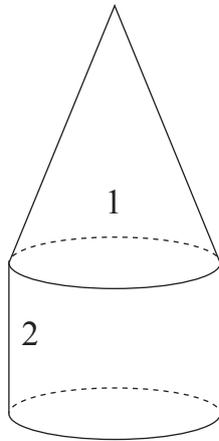**DO NOT WRITE ON THIS PAGE**

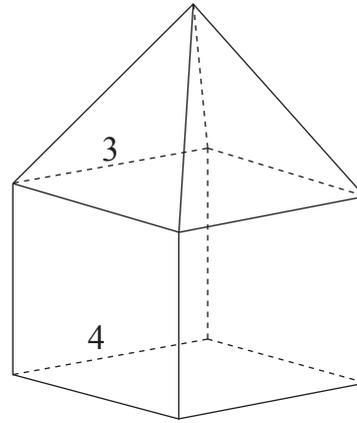**(Questions start overleaf)**

28GMT2103

1 Each of the shapes below is made by joining two different solids together.

(a) Fill in the names of the solids under each shape.

Shape A   Shape B

Solid 1 _____   Solid 3 _____
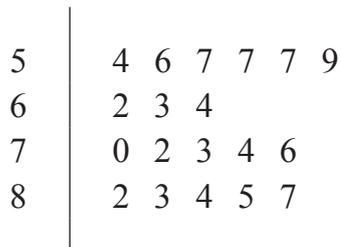
Solid 2 _____   Solid 4 _____

[4]

(b) Complete the following table for **Shape B**.

Number of Faces	Number of Edges	Number of Vertices

[3]

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28GMT2104

2 The stem and leaf diagram illustrates the marks in a test for a group of students.

```
5 | 4 6 7 7 7 9
6 | 2 3 4
7 | 0 2 3 4 6        Key: 5 | 4 = 54%
8 | 2 3 4 5 7
```

(a) The mark for the top student has been left out of the diagram.

The range for the whole class of twenty students was 35.

Calculate the mark for the top student and insert it correctly in the stem and leaf diagram.

[2]

(b) What was the mean of the lowest four marks?
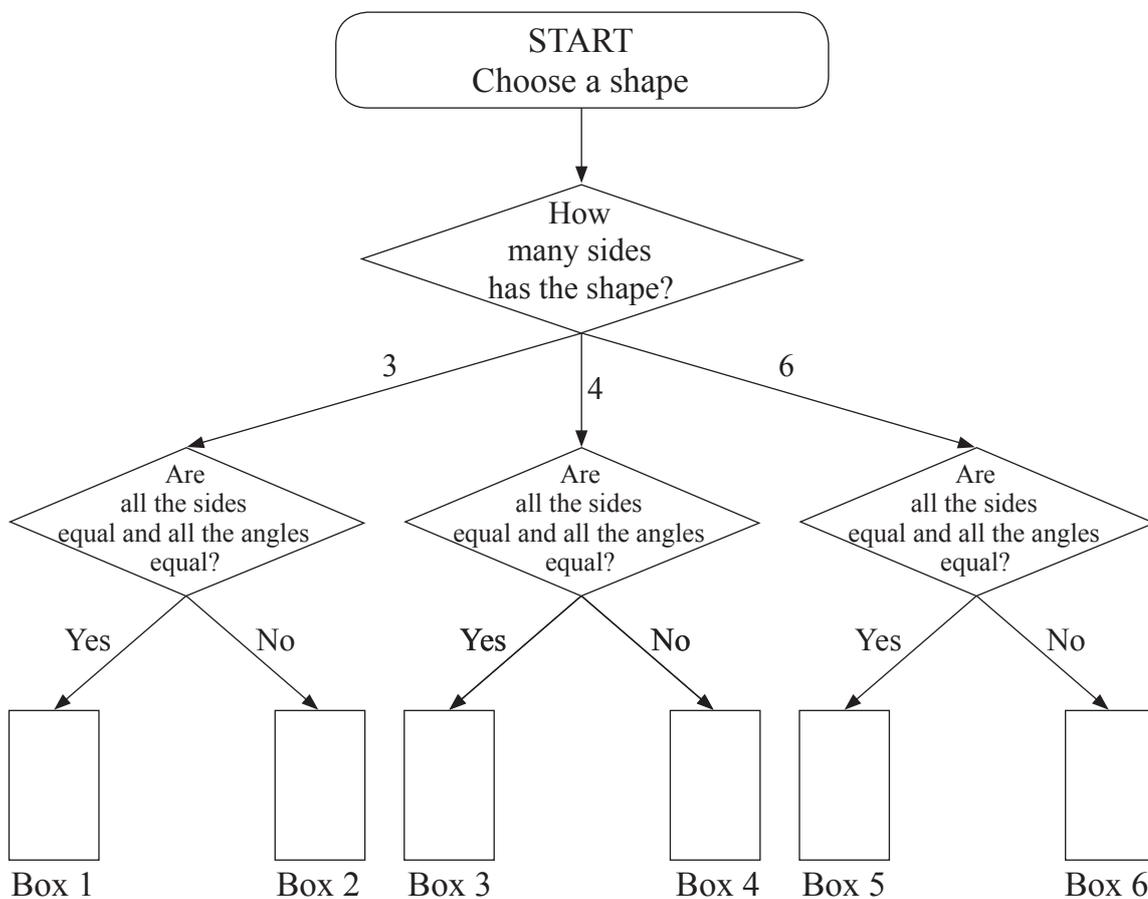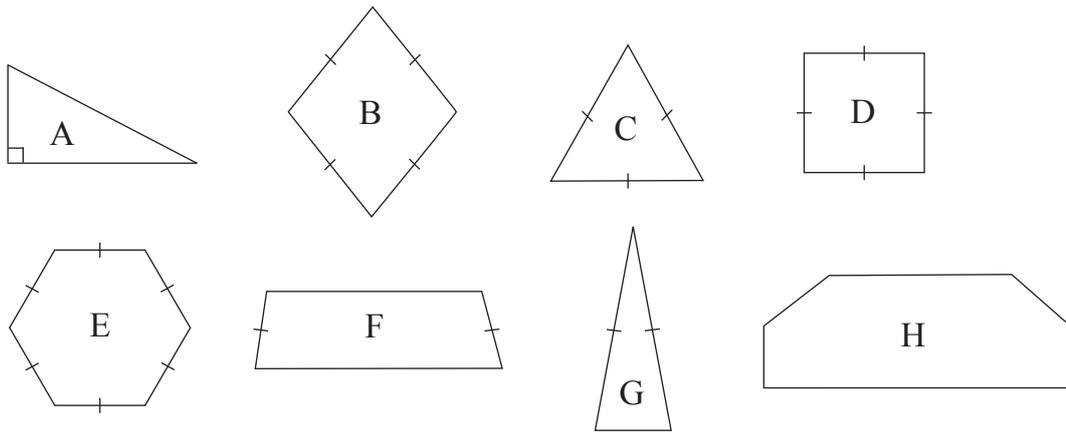
Answer _____ [2]

(c) The top 15% of all the students in the class were awarded an A* grade. What was the lowest mark needed to obtain the A* grade?

Answer _____ % [2]

[Turn over

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3 **(a)** Use the decision tree to sort the shapes A, B, C, D, E, F, G and H.

A

B

C

D

E

F

G

H

START
Choose a shape

How
many sides
has the shape?

3   4   6

Are
all the sides
equal and all the angles
equal?

Are
all the sides
equal and all the angles
equal?

Are
all the sides
equal and all the angles
equal?

Yes   No   Yes   No   Yes   No

Box 1   Box 2   Box 3   Box 4   Box 5   Box 6

[2]

(b) Complete the sentence:

The shapes in Boxes 1, 3 and 5 are all _____ polygons.   [1]

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28GMT2106

4 **(a)** Simplify

$3p - 4r + 7p - 2r$

Answer _____ [2]

(b) Find the value of

$5e - 3f$

when $e = 3$ and $f = -7$

Answer _____ [2]

(c) Expand

$4(y - 6)$

Answer _____ [2]

(d) Solve

$6 - 2x = 12$

Answer $x =$ _____ [2]

[Turn over

9858

5 3.2 metres of electrical cable and 0.6 metres of copper wire cost a total of £4.07

The electrical cable costs 85p per metre.

How much does the copper wire cost per metre?

Show clearly all your working.
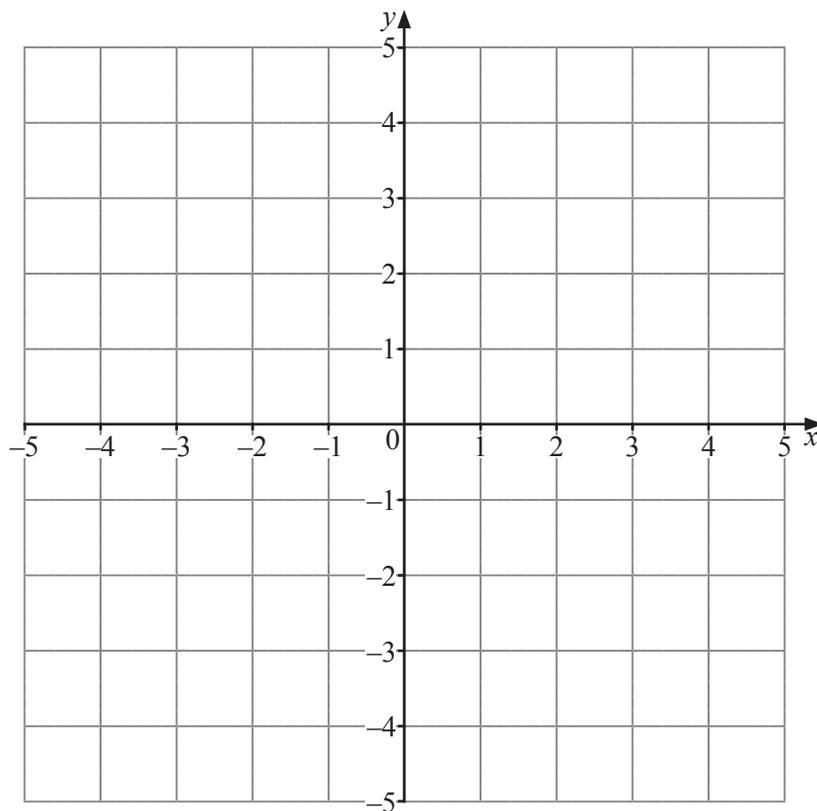
Answer £ _____ per metre [4]

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6 **(a)** Complete the table below for $y = 2x + 1$

x	-2	-1	0	1	2
y	-3		1	3	

[1]

(b) Draw the line $y = 2x + 1$ on the grid provided.

[2]

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7 **(a)** Write 68%   0.64   and $\frac{13}{20}$ in ascending order of size.

Show all your working.

Answer _____ [3]

(b) Which of the numbers in **(a)** is closest in size to $\frac{2}{3}$?

Answer _____ [1]

28GMT2110

8 The scheduled arrival times (Sched.) and the actual landing times (Status) of flights into London Heathrow are given in the table.

London Heathrow		Arrivals		
Sched.	**Flight No.**	**Arriving from**	**Status**	**Terminal**
10.25	BA182	NEW YORK	LANDED 11.30	5
11.10	9W5050	CALGARY	LANDED 11.32	3
11.10	AC850	CALGARY	LANDED 11.32	3
11.10	BD4850	CALGARY	LANDED 11.32	3
11.15	AA6475	DUSSELDORF	LANDED 10.42	5
11.15	BA307	PARIS CDG	LANDED 11.00	5
11.15	BA7062	MADRID	LANDED 11.02	3

(a) How many of these flights arrived early?

Answer _____ [1]

(b) How many minutes late was the flight from New York?
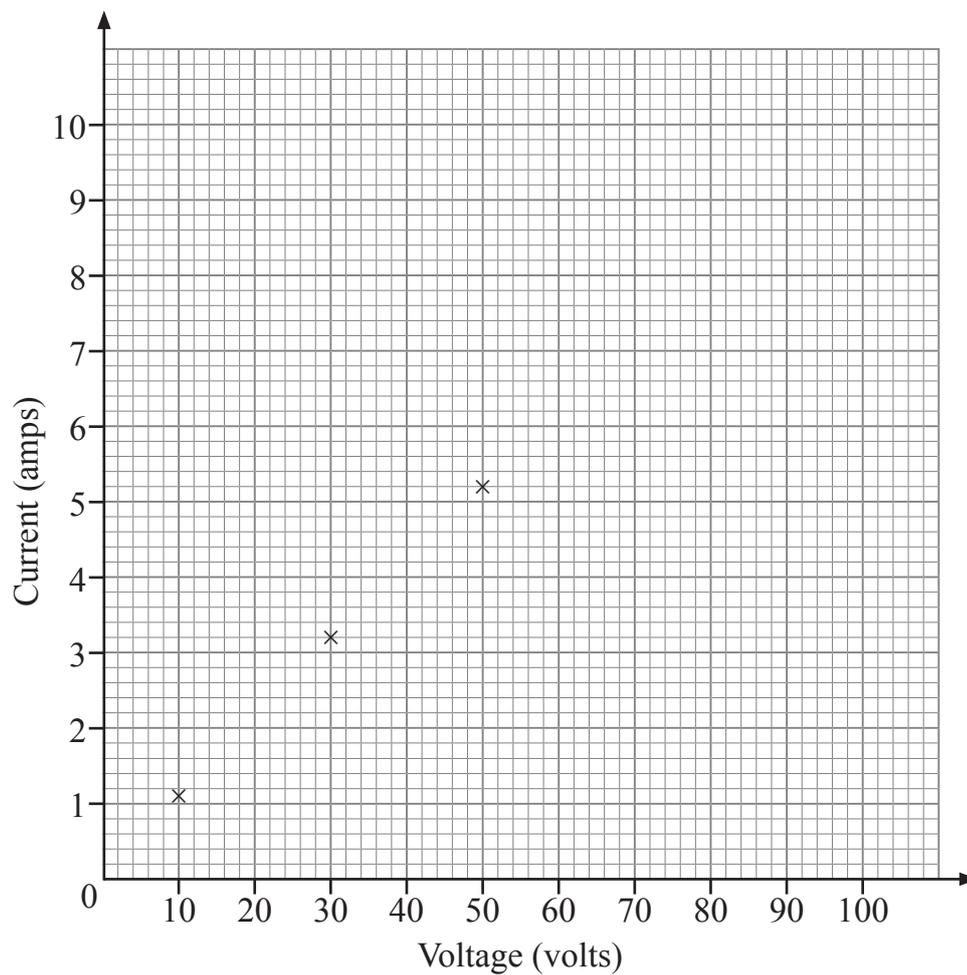
Answer _____ minutes [2]

[Turn over

9858

9 Nine science students each measured the current (in amps) that flowed through a circuit at various voltages.

Their results are recorded below.

Student	1	2	3	4	5	6	7	8	9
Voltage	10	50	30	20	80	40	60	70	90
Current	1.1	5.2	3.2	1.9	8.2	3.7	3.8	6.5	9.3

(a) Draw a scatter graph of the points. The first three points have already been plotted.

[2]

(b) Which student appears to have taken an incorrect reading?

Answer student _____ [1]
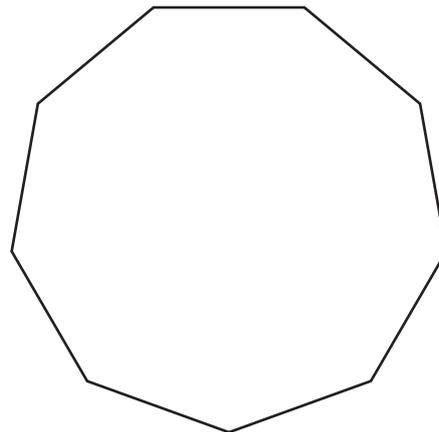
(c) Draw a line of best fit on your scatter graph.   [1]

(d) Use the line of best fit to estimate the current for the incorrect reading taken by the student.

Answer current = _____ amps [1]

Quality of written communication will be assessed in this question.

10

This is a drawing of a regular nonagon (a shape with nine sides of equal length).

Explain why the size of an interior angle is 140°

[2]
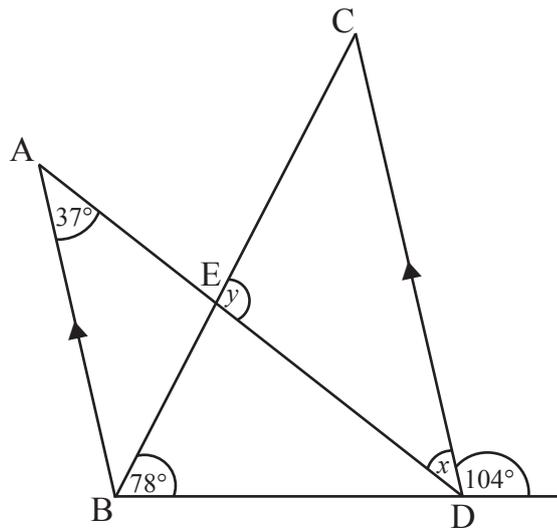
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11 In the diagram lines AB and CD are parallel.

diagram not
drawn accurately

(a) Find the size of the angle x.

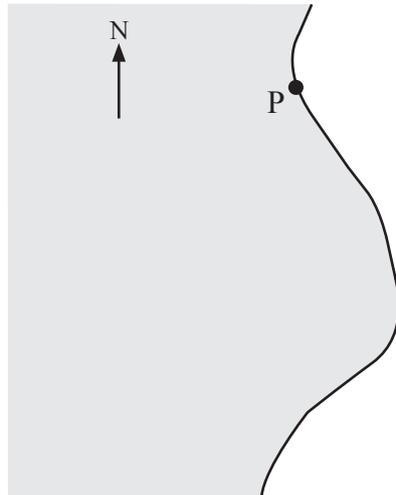Answer _____° [1]

(b) Calculate the size of the angle y.

Answer _____° [2]

9858

28GMT2114

12 A lifeboat leaves port P to answer an emergency call from a ship S.

The ship is 30 km from P on a bearing of 120°

Using a scale of 1 cm = 4 km, mark the position of the ship S.

N

P

[2]

[Turn over

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13 (a) What percentage is £35.25 of £47?

Answer _____ % [2]

(b) John bought a new phone for £44 plus 17.5% VAT.

Mark bought a similar phone in a different shop.

Mark paid £50.31 including VAT at 17.5%

Whose phone was more expensive and by how much?

Show all your working.

Answer _____ by £ _____ [3]

14 Factorise fully each of the following:

(a) $12a + 6$

Answer _____ [1]

(b) $y^2 - 6y$

Answer _____ [1]

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15 ABC is a triangle.

The length of the side AB is $(x + 2)$ cm.

(a) The length of the side AC is twice the length of the side AB.

Find an expression for the length of AC.

Answer _____ cm [1]

(b) The length of the remaining side CB is calculated by adding the lengths of the sides AB and AC together and subtracting 7 cm.

Find an expression for the length of CB.

Answer _____ cm [1]

(c) The perimeter of the triangle ABC is 20 cm.

Form an equation and solve it to find the length of the side AB.

Answer AB = _____ cm [3]

[Turn over

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Quality of written communication will be assessed in part (b) of this question.

16 Pupils are asked to investigate the number of electronic devices such as mobile phones, tablets, laptops etc. that people own.

(a) Joanne surveys her classmates and her results are recorded in the frequency table below.

Number of devices	Frequency
0	3
1	5
2	6
3	4
4	5
5	2
6	3

Calculate the mean number of devices for Joanne's classmates.

Answer _____ [3]

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28GMT2118

(b) Paula surveys 100 people at random coming out of the Leisure Centre one Saturday morning. She calculates the mean for her results to be 3.4

Whose value should give a better estimate for the mean for the whole population?

Give 2 reasons for your answer.

[2]

17 Without using a calculator and showing every step in your working, calculate $\frac{2}{9} \div 4$ giving your answer in its simplest form.
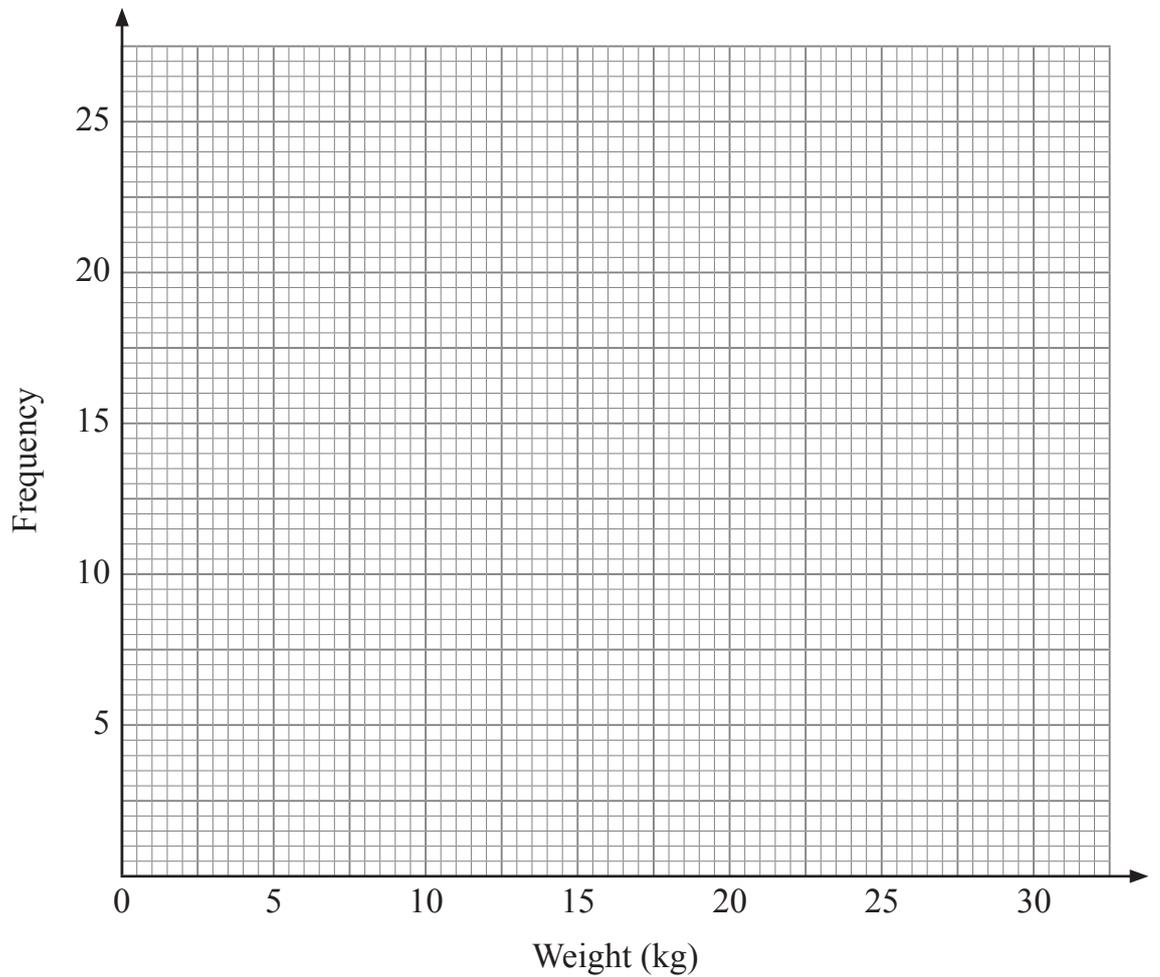
Answer _____ [2]

[Turn over

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18 The table below shows the weight of suitcases checked in for a flight.

Weight (kg)	Frequency
$0 < w \leqslant 5$	2
$5 < w \leqslant 10$	11
$10 < w \leqslant 15$	25
$15 < w \leqslant 20$	18
$20 < w \leqslant 25$	13
$25 < w \leqslant 30$	11

(a) Draw a frequency polygon for the data.

[2]

28GMT2120

(b) Which class interval contains the median weight?

Answer _____ [1]

(c) All luggage is charged at £20 per suitcase. A suitcase weighing over 20 kg has an additional charge of £7.50

How much money is charged for all the luggage on this flight?

Answer £ _____ [2]

[Turn over

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28GMT2121

19 A circular glass shaving mirror has a diameter of 21 cm.

It has glass on both sides.

Calculate the **total** area of glass correct to the nearest whole number.

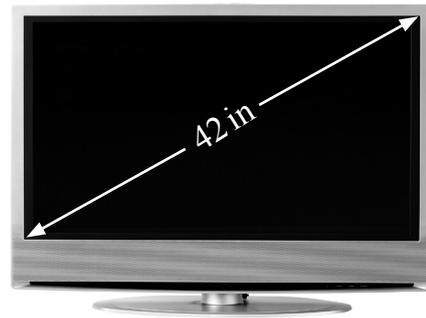*© clark_fang / iStock / Thinkstock*

Answer _____ cm^2 [3]

20 The size of a television is given as the length of the diagonal of the screen.

This television has a size of 42 inches.

The height of the screen is 20.4 inches.

What is the width of the screen?

© Nicholas Nadjar / Hemera / Thinkstock

Answer _____ inches [3]

21 A Christmas Log cake has a uniform cross-sectional area of 120 cm^2 and a length of 22 cm.

Calculate the volume of the cake.

Answer _____ cm^3 [2]

22 (a) Write 200 as a product of its prime factors.

Give your answer in index notation.

Answer _____ [3]

(b) Hence find the smallest number you can multiply 200 by to make a cube number.

Answer _____ [1]

[Turn over

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23 Over a year a car decreased in value from £12 500 to £10 500

Calculate the percentage decrease.

Answer _____ % [3]

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24 Use the method of trial and improvement to solve the equation

$$x^3 - 6x = 12$$

Give your answer correct to 1 decimal place.

Show all your working.

x	$x^3 - 6x$	

Answer $x =$ _____ [4]

[Turn over

28GMT2125

25 (a) Simplify

$5(t - 2) - 3(4 - 2t)$

Answer _____ [2]

(b) Write down the nth term for

(i) 5, 10, 15, 20 _ _ _ _

Answer _____ [1]

(ii) 5, 11, 17, 23 _ _ _ _

Answer _____ [2]

26 (a) Complete the sentence with appropriate words:

As the age (in years) of a family car increases, its value in pounds (£)

_____ , hence there is _____ correlation. [1]

(b) Write down two variables (quantities) which would display no correlation.

_____ and _____ [1]

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28GMT2128