

# \* WORKED SOLUTIONS \*

Surname	Centre Number	Candidate Number
Other Names		0



**GCSE**

C300U10-1



S19-C300U10-1



## **MATHEMATICS – Component 1** **Non-Calculator Mathematics** **FOUNDATION TIER**

TUESDAY, 21 MAY 2019

– MORNING

2 hours 15 minutes

### **ADDITIONAL MATERIALS**

The use of a calculator is not permitted in this examination.  
A ruler, protractor and a pair of compasses may be required.

### **INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen.  
You may use a pencil for graphs and diagrams only.  
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.  
If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

### **INFORMATION FOR CANDIDATES**

You should give details of your method of solution when appropriate.  
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.  
You are reminded of the need for good English and orderly, clear presentation in your answers.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	7	
2.	3	
3.	5	
4.	7	
5.	3	
6.	4	
7.	5	
8.	6	
9.	8	
10.	9	
11.	5	
12.	4	
13.	7	
14.	4	
15.	3	
16.	5	
17.	5	
18.	8	
19.	2	
20.	6	
21.	5	
22.	7	
23.	2	
<b>Total</b>	<b>120</b>	

C300U101  
01

### Formula list

#### *Area and volume formulae*

Where  $r$  is the radius of the sphere or cone,  $l$  is the slant height of a cone and  $h$  is the perpendicular height of a cone:

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

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

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

#### *Kinematics formulae*

Where  $a$  is constant acceleration,  $u$  is initial velocity,  $v$  is final velocity,  $s$  is displacement from the position when  $t = 0$  and  $t$  is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

1. (a) (i) Work out  $0.5 \times 100$ .

[1]

50

- (ii) Work out  $45 \div 10$ .

[1]

4.5

- (b) Write 0.31 as

- (i) a fraction,

[1]

 $\frac{31}{100}$ 

- (ii) a percentage.

[1]

31%

- (c) Circle the greatest value.

[1]

4.07

4.18

4.601

4.0615

4.009

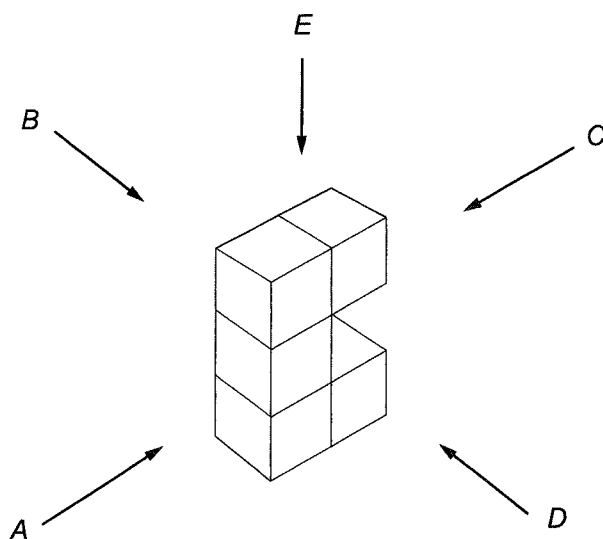
- (d) Work out  $\frac{4}{5}$  of 45.

[2]

$$45 \div 5 = 9$$

$$9 \times 4 = 36 //$$

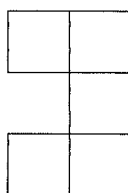
2. (a) Halima makes a shape by joining 5 cubes.



*Diagram not drawn to scale*

She looks at each of the side elevations, from the positions *A*, *B*, *C* and *D*, and the plan, from *E*.

- (i) Here is what Halima sees from one of her positions.



Which position is this?  
Circle your answer.

A



C

D

E

[1]

- (ii) How many square faces can Halima see from position *C*?  
Circle your answer.

1

2



4

5

[1]

- (b) The diagram shows the plan and side elevation of another 3D shape.



Circle the correct name for the 3D shape shown.

[1]

cylinder

circle

pyramid

cone

sphere

3. Cover Insurance sells insurance for laptops. They have two offers.

Laptop insurance **Offer 1**

One payment only  
£60 for one whole year

Laptop insurance **Offer 2**

Pay monthly  
12 months for £4.50 per month

- (a) Mika wants to buy insurance for his laptop.

Show that if Mika uses Offer 2 he will save 10% of the cost of using Offer 1.

[3]

$$\begin{array}{r}
 450 \\
 \times 12 \\
 \hline
 900 \\
 4500 \\
 \hline
 \text{£ } 54.00
 \end{array}$$

Saving  $60 - 54 = \text{£}6 //$

10% of £60 =  $\frac{1}{10} \times 60 = \text{£}6 //$

- (b) During April, Cover Insurance sold 630 policies.

How many policies per day, on average, did they sell for this month?

[2]

30 days in April

$$630 \div 30 = 21 \text{ / day}$$

$$\begin{array}{r}
 21 \\
 30 \overline{) 630} \\
 \underline{60} \phantom{0} \\
 30 \\
 \underline{30} \\
 0
 \end{array}$$

OR  $\frac{630}{30} = 21$

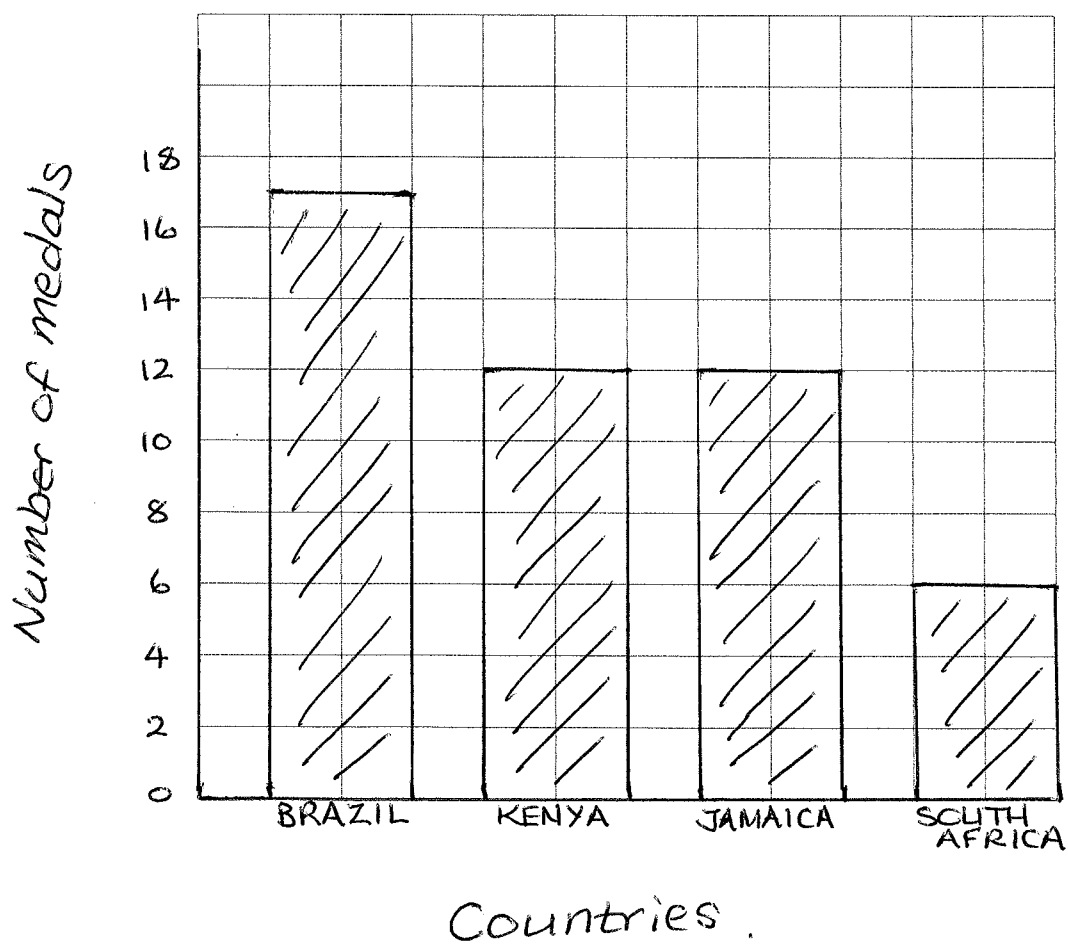
4. (a) (i) This table shows the total number of medals won by four countries in the 2012 London Olympic Games.

Country	Number of medals
Brazil	17
Kenya	12
Jamaica	12
South Africa	6
















Draw a bar chart to show this information.

[3]

2012 Olympic Medals Won



- (ii) The pictogram shows the total number of medals won by the same four countries in the 2016 Rio Olympic Games.

Brazil						19
Kenya						13
Jamaica						11
South Africa						10

Key:  represents 4 medals

Use the information given in the table and pictogram to complete the sentences below:

The total number of medals won by Brazil in 2016 is 2 more than they won in 2012.

The total number of medals won by South Africa in 2016 is 4 more than they won in 2012. [2]

- (b) In 2016, the total of gold, silver and bronze medals won by China was 70.

They won:

- 18 silver medals,
- the same number of gold medals as they did bronze medals.

How many gold medals did China win? [2]

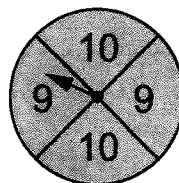
$$70 - 18 = 52$$

$$52 \div 2 = 26$$

$$\begin{array}{r} 26 \\ 2 \overline{) 52} \\ \underline{4} \phantom{0} \\ 12 \\ \underline{10} \\ 2 \end{array}$$

26 gold medals

5.



The diagram shows a fair 8-sided dice, numbered from 1 to 8, and a fair spinner.

Jamie rolls the dice and spins the spinner.  
He then multiplies the two scores.

(a) Complete the diagram to show all Jamie's possible outcomes.

Spinner	10	10	20	30	40	50	60	70	80
	9	9	18	27	36	45	54	63	72
	x	1	2	3	4	5	6	7	8

Dice

[1]

(b) Find the probability that Jamie's outcome is an even number greater than 50.

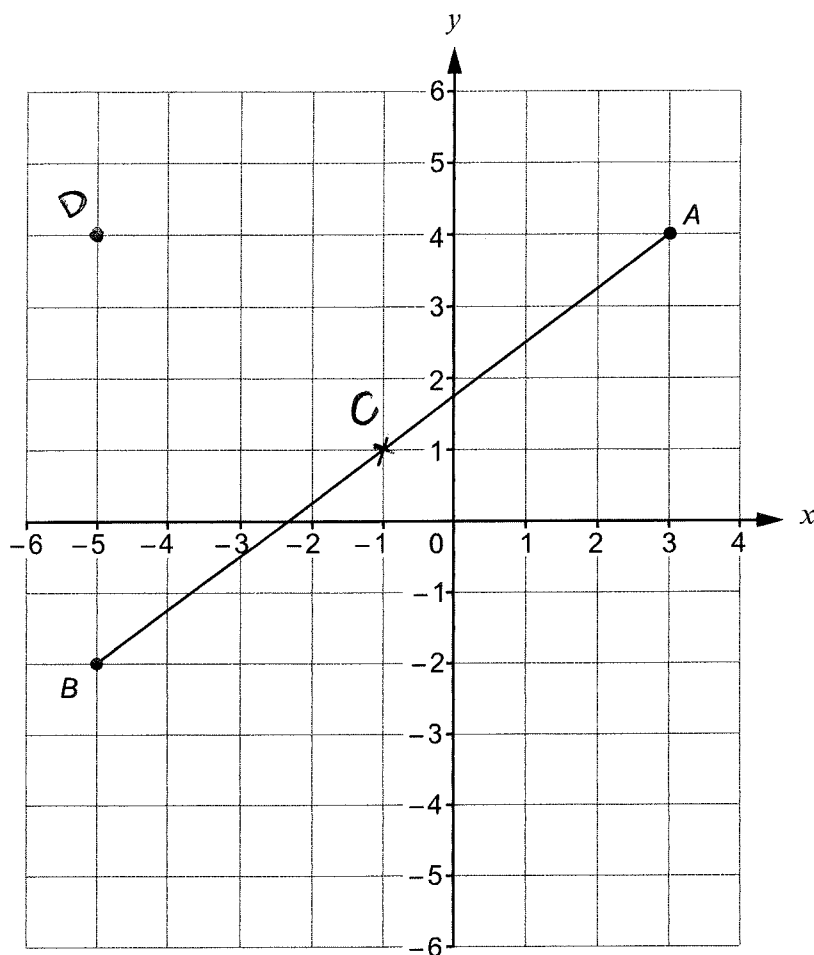
[2]

even numbers > 50 = 60, 70, 80, 54, 72

$$P(\text{even} > 50) = \frac{5}{16}$$



6.



The line  $AB$  is drawn on the 1 cm grid above.

- (a) (i) Write down the coordinates of  $A$ .

[1]

$A$  ( 3 , 4 )

- (ii) The point  $C$  is the mid-point of  $AB$ .

Mark the position of the point  $C$  on the grid.

[1]

- (b) The line  $BD$  is parallel to the  $y$ -axis.  
Triangle  $ABD$  is a right-angled triangle.

Mark the position of point  $D$  on the grid and write down the length of  $AD$ .

[2]

Length  $AD$  = 8 cm

7. (a) Simplify

$$(i) \quad 2a(-b) + 5a(-3b)$$

$$7a - 4b$$

[2]

$$(ii) \quad 1 + 4 \times c \times c$$

$$1 + 4c^2$$

[1]

(b) (i) This formula converts a UK shoe size to a Japanese shoe size.

$$\text{Japanese size} = \text{UK size} + 19$$

Yuto wears a Japanese size 29.5.

What would Yuto's shoe size be in the UK?

[1]

$$29.5 - 19 = 10.5$$

(ii) This table shows the equivalent shoe sizes used in the UK and the USA.

UK size	5	6	7	8	9
USA size	6	7	8	9	10

Complete this formula connecting the UK size and the USA size.

[1]

$$\text{UK size} = \text{USA size} - 1$$

8. The table shows nutritional information about a bottle of the sports drink, *Fitade*.

Nutritional Information	per 100 ml	per bottle
Energy (kilocalories)	28	112
Carbohydrate (grams)	6.25	25
of which sugars (grams)	4	16
Salt (grams)	0.1	0.4

- (a) Complete the table.

[3]

$$\begin{array}{r} 28 \\ \times 4 \\ \hline 112 \\ 3 \end{array}$$

$$0.4 \div 4 = 0.1$$

- (b) One afternoon, Tori drinks 3 full bottles of *Fitade*.

How many millilitres of *Fitade* does Tori drink altogether, and how many grams of salt does this contain? [2]

$$1 \text{ bottle} = 100 \text{ ml} \times 4 = 400 \text{ ml}$$

$$3 \times 400 = 1200 \text{ ml}$$

$$0.4 \times 3 = 1.2 \text{ g}$$

She drinks 1200 ml containing 1.2 grams of salt.

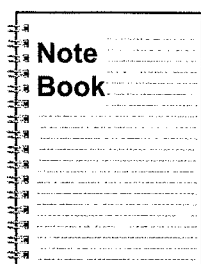
- (c) Show that sugars are 64% of the carbohydrate in *Fitade*.  
You must show all your working. [1]

$$\frac{16}{25} \times \frac{100}{100} = \frac{64}{100} = 64\%$$

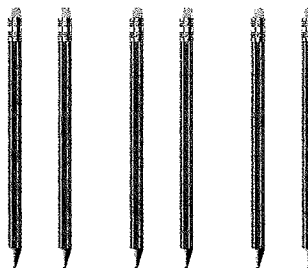
$$\frac{16}{25} \times 4 = \frac{64}{25} = 2.56$$

9. Petra is shopping with 2 of her friends.

(a) She buys a note book and six **identical** pencils.



= 2 pencils



The note book costs the same as 2 of the pencils.  
Her bill is £16.80.

(i) How much does a note book cost?

[3]

$$16.80 \div 8 = £2.10 \text{ each} \quad \begin{array}{r} 2.10 \\ 8 \overline{) 16.80} \end{array}$$

$$\text{Note book} = 2.10 \times 2 = £4.20 //$$

(ii) Petra pays with a £50 note.  
She is given £34.20 change.

She tells the shopkeeper,

"You have given me too much change."

Is Petra correct?

Yes



No



Show how you decide.

[1]

$$\begin{array}{r} \cancel{50}^{9} 00 \\ - 16.80 \\ \hline £ 33.20 \end{array} \quad \text{OR} \quad \begin{array}{r} 34.20 \\ + 16.80 \\ \hline £ 51.00 \end{array} \quad \text{OR} \quad \begin{array}{r} \cancel{48}^{9} 00 \\ - 34.20 \\ \hline £ 15.80 \end{array}$$

- (b) The 3 friends go to a café.  
Here is part of the menu.

Drinks	
Flat white	£4.25
Latte	£3.95
Americano	£2.95
Tea (per pot)	£3.00
Cakes	
Cupcake	£2.00
Cake of the day (per slice)	£4.00



Each of the 3 friends orders one drink and one cake from this menu.

They save a total of exactly £5 using the 3 for 2 offers.

Their bill totals £16.50 after the saving has been taken off.

What drinks and cakes did the 3 friends order?

You must show all your working.

[4]

$$\text{£5 saving} = \text{Tea (£3)} + \text{Cupcake (£2)}$$

$$\begin{aligned} \text{£16.50} &= 2 \text{ drinks} + 2 \text{ cakes} \\ &= (2 \times \text{£4.25}) + (2 \times \text{£4}) \\ &= \text{£8.50} + \text{£8} \end{aligned}$$

$\uparrow$  2 Flat whites       $\nearrow$  2 cake of the day.

Drinks Flat white, Flat white, Tea  
Cakes Cake slice, Cake slice, Cupcake

10. Twelve members of a running club take part in three runs.

(a) The table shows the times taken, in hours, by the 12 runners to complete the first run.

1.2	0.9	2.5	1.3	2.1	2.6
1.8	2.0	2.1	2.1	1.5	2.2

(i) Find the mode of the times.

[1]

Most common time = 2.1 hours //

(ii) Find the range of the times.

[1]

Biggest - smallest

$$2.6 - 0.9 = 1.7 \text{ hours} //$$

(iii) A runner was chosen at random from those who took part in the first run.

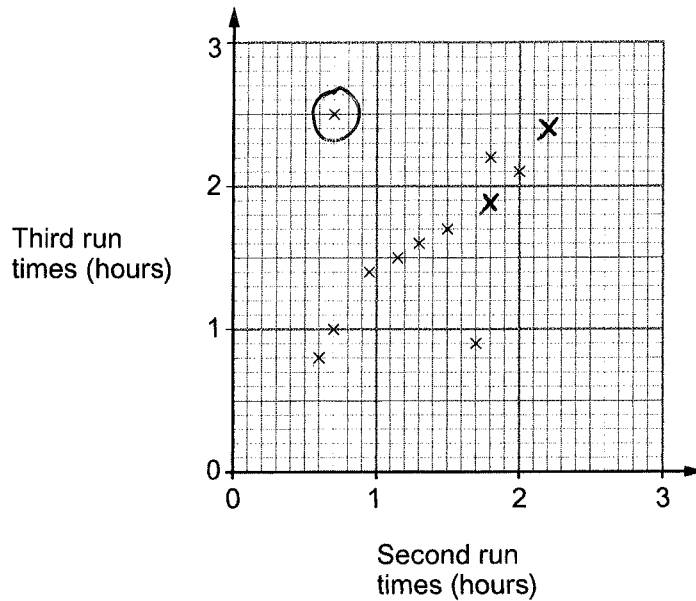
Find the probability that this runner took at most 1.5 hours.

[1]

$$P(\leq 1.5 \text{ hours})$$

$$\frac{4}{12} //$$

- (b) The scatter diagram shows the times it took 10 of the runners to complete the other two runs.



- (i) One of these 10 runners was injured during the third run and walked most of the way.

Circle the plot most likely to represent this runner on the scatter diagram. [1]

- (ii) The times, in hours, taken by the remaining 2 runners were:

	Runner 11	Runner 12
Second run	1.8	2.2
Third run	1.9	2.4

Plot these times on the scatter diagram. [2]

- (iii) Using the information on the completed scatter diagram, what was the difference between the fastest time for the second run and the fastest time for the third run? Give your answer in minutes. [3]

$$0.8 - 0.6 = 0.2 \text{ hour}$$

$$0.1 \text{ of } 1 \text{ hour} = 6 \text{ mins} \quad \frac{1}{10} \times 60 = 6$$

$$\therefore 0.2 \text{ hr} = 2 \times 6 = 12 \text{ mins}$$

Time difference = 12 minutes

11. (a)

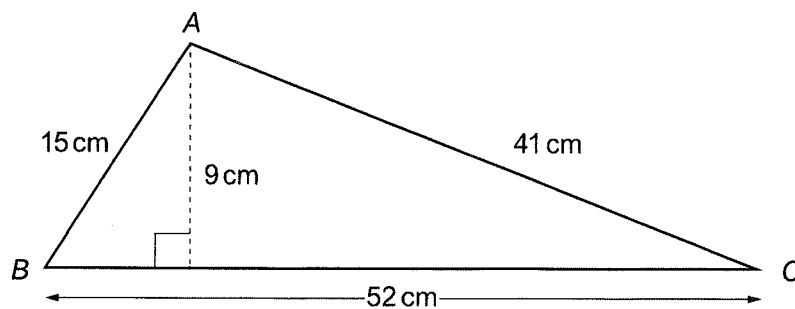
Examiner  
only

Diagram not drawn to scale

Work out the area of triangle ABC.

[2]

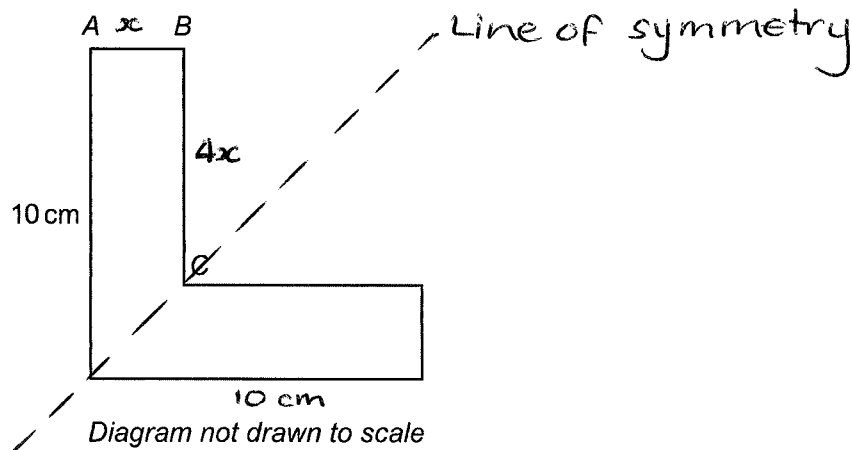
$$\text{Area} = \frac{1}{2}(b \times h) = \frac{1}{2}(52 \times 9) = 234$$

$$\begin{array}{r} 234 \\ 2 \overline{)468} \end{array}$$

$$\begin{array}{r} 52 \\ \times 9 \\ \hline 468 \\ \hline \end{array}$$

$$\text{Area ABC} = 234 \text{ cm}^2$$

(b) This shape is made from two rectangles.



The shape has one line of symmetry.  
The perimeter of the shape is 40 cm.  
The length of BC is 4 times the length of AB.

Work out the length of BC.

[3]

$$4x + x + 10 = 20$$

$$BC = 4x$$

$$-10 \quad \left( \begin{array}{l} 5x + 10 = 20 \\ \hline \end{array} \right) -10$$

$$= 4 \times 2$$

$$\div 5 \quad \left( \begin{array}{l} 5x = 10 \\ \hline \end{array} \right) \div 5$$

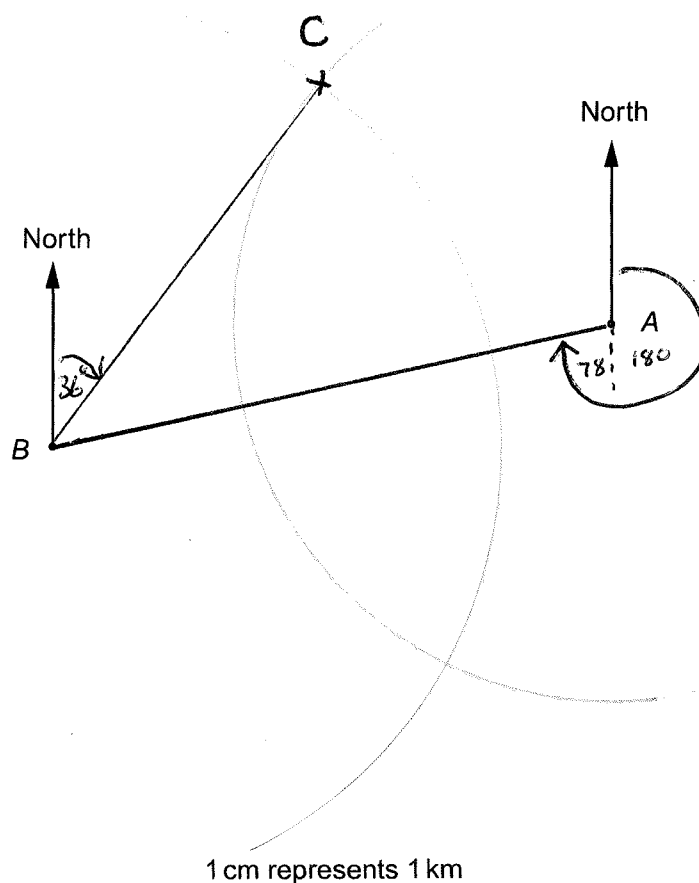
$$= 8$$

$$x = 2$$

$$BC = 8 \text{ cm}$$



12. The diagram shows the position of two points, A and B.  
The scale is 1 cm represents 1 km.



- (a) Measure and write down the bearing of B from A. [1]

$$180 + 78 = 258^\circ$$

- (b) Point C is 5 km from A and 6 km from B.  
The bearing of C from B is an acute angle.

$$5 \text{ km} = 5 \text{ cm}$$

$$6 \text{ km} = 6 \text{ cm}$$

Complete the diagram to find the position of point C. Acute  $< 90^\circ$  [3]

13. Steph is a baker.

- (a) She bakes 42 white rolls and 60 brown rolls.

Write the ratio of white rolls to brown rolls in its simplest form.

[2]

$$\begin{array}{l}
 W : B \\
 42 : 60 \\
 \div 6 \quad \swarrow \quad \searrow \quad \div 6 \\
 7 : 10 \\
 \text{white rolls : brown rolls} = 7 : 10
 \end{array}$$

- (b) Steph makes scones in three flavours: cheese, fruit and plain.  
She makes:

- 4 times as many fruit scones as cheese scones,
- 3 times as many plain scones as cheese scones.

She sells each scone for the same price.

She makes a total of £96 from the sale of all the scones.

How much does she make from the sale of the plain scones?

[3]

$$\begin{array}{l}
 C : F : P \quad \text{Total} \\
 1 : 4 : 3 \quad 8
 \end{array}$$

$$96 \div 8 = £12 \text{ each}$$

$$3 \times 12 = £36 //$$

- (c) Steph makes and sells birthday cakes.  
Each cake costs £54 to make.  
She makes a profit of 15% on each cake.

What is the selling price of Steph's birthday cakes?

[2]

$$\begin{array}{r}
 10\% \text{ of } 54 = £5.40 \\
 5\% \text{ of } 54 = £2.70 \\
 \hline
 15\% \quad \quad \quad £8.10 \\
 \hline
 \end{array}
 \qquad
 \begin{array}{r}
 54.00 \\
 + 8.10 \\
 \hline
 £62.10
 \end{array}$$

$$\text{Selling price} = £ 62.10$$

14.

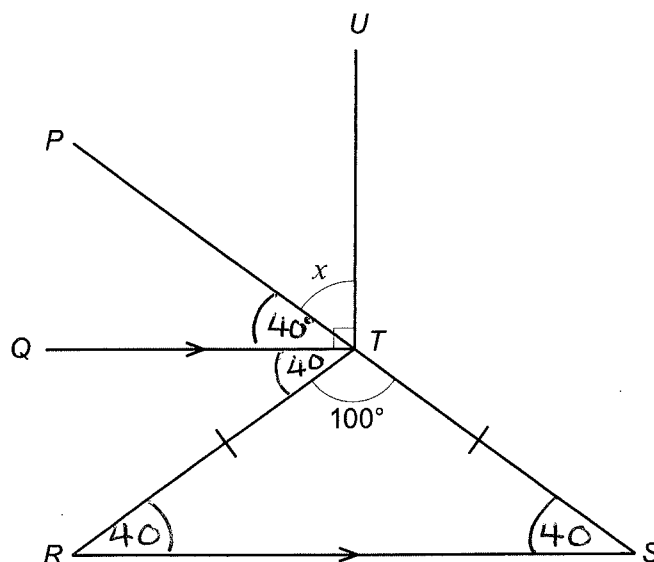


Diagram not drawn to scale

Show that  $x = 50^\circ$ .

Give a reason for each step of your answer.

[4]

RTS is isosceles  $\Delta$   $180 - 100 = 80$ Base angles are equal  $80 \div 2 = 40^\circ$  $\angle TRS = 40^\circ$  Alternate angles are equal (TRS)or  $\angle PTQ = 40^\circ$  Corresponding angles are equal (TSR)or  $\angle PTQ = 180 - 100 - 40$  Angles on a straight line =  $180^\circ$  $x = 90 - 40$   $\angle TU = 90^\circ$  $x = 50^\circ$

15. Terry is doing his homework.

(a) He is trying to find the value of  $x$  when

$$\begin{array}{r} \div 6 \swarrow \quad 30 : 12 \quad \searrow \div 6 \\ \quad x : 2 \\ \quad = 5 \end{array}$$

$$x : 2 = 30 : 12$$

He writes:

$$\begin{array}{r} \quad \quad \quad -18 \\ x : 2 = 30 : 12 \end{array}$$

The rule is -18

$$\text{So } x = 20$$

Explain why Terry is wrong.

[1]

To simplify a ratio he should divide both sides by 6 (not subtract 18) so  $x = 5$

(b) Terry's next question is:

A factory production line makes 275 thousand cans of drink in 5 hours.  
How many hours would it take for this production line to make  
165 thousand cans of the same drink?  
You may assume each can is the same size.

Terry thinks the answer is 3 hours.

Is Terry correct?

Yes



No



Show how you decide.

[2]

$\begin{array}{l} \div 5 \swarrow \quad 5 \text{ hrs} \rightarrow 275\,000 \text{ cans} \quad \searrow \div 5 \\ \quad \quad \quad 1 \text{ hr} \rightarrow 55\,000 \text{ cans} \\ \times 3 \swarrow \quad 3 \text{ hrs} \rightarrow 165\,000 \quad \searrow \times 3 \end{array}$

$$\begin{array}{r} 55\,000 \\ 5 \overline{) 275\,000} \end{array}$$

$$\begin{array}{r} 55\,000 \\ \times 3 \\ \hline 165\,000 \end{array}$$



17. Huw is paid a weekly wage.

Every week he:

- saves  $\frac{1}{5}$  of his wage,
- spends 70% of the money he has left on his living expenses,
- spends all that remains on his social life.

(a) One week, Huw saves £40.

How much does Huw spend on his social life?

[3]

$$\frac{1}{5} \text{ of } ? = £40 \quad \therefore \text{Wage} = 40 \times 5 = £200$$

$$200 - 40 = £160$$

$$\begin{array}{r} 16 \\ \times 7 \\ \hline 112 \\ 4 \end{array} \quad \begin{array}{r} 160 \\ - 112 \\ \hline 48 \end{array}$$

x7 { 10% of 160 = £16  
70% = £112

$$160 - 112 = £48 //$$

(b) What percentage of his weekly wage does Huw spend on his social life?

[2]

$$\frac{48}{200} = \frac{24}{100} = 24\%$$

18. (a) Solve
- $19 - 4x = 11$
- .

[2]

$$\begin{array}{r}
 19 = 11 + 4x \\
 -11 \quad -11 \\
 \hline
 8 = 4x \\
 \frac{8}{4} = \frac{4x}{4} \\
 2 = x
 \end{array}$$

$$x = 2 //$$

- (b) Solve
- $\frac{2x-3}{4} = 3x$
- .

[3]

$$\begin{array}{r}
 2x - 3 = 12x \\
 -2x \quad -2x \\
 \hline
 -3 = 10x \\
 \frac{-3}{10} = \frac{10x}{10}
 \end{array}$$

$$x = -\frac{3}{10} //$$

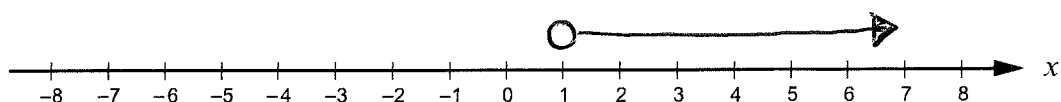
- (c) (i) Solve
- $3x + 2 > 5$
- .

[2]

$$\begin{array}{r}
 3x > 3 \\
 \frac{3x}{3} > \frac{3}{3} \\
 x > 1
 \end{array}
 //$$

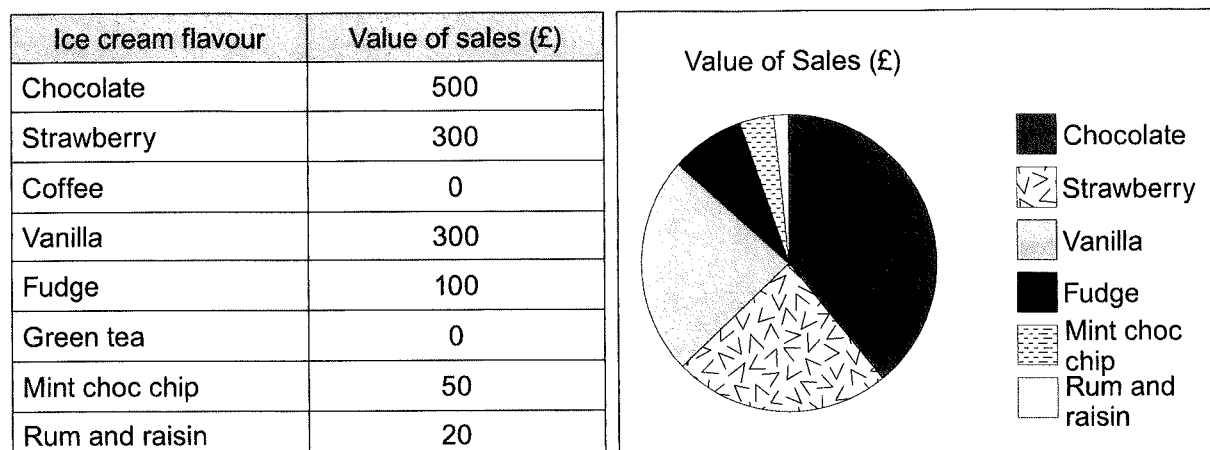
- (ii) Represent your answer to part (c)(i) on the number line below.

[1]



19. Cherie is in charge of marketing for a tourist attraction.

- (a) One weekend, she collects some data about the value of ice cream sales from the café. She records her data in a table and uses it to draw a pie chart.



State one criticism of the use of a pie chart to display her data.

[1]

Too many categories for a pie chart

- (b) Cherie also records the number of visitors to the tourist attraction each season for 4 years. Her results are shown in the table.

	Season	Winter	Spring	Summer	Autumn	
Visitors (thousands)	2015	9	14	19	13	65
	2016	9	13	17	12	51
	2017	6	11	14	9	40
	2018	4	8	15	10	37

Comment on the trend in the annual number of visitors shown by the data in the table.

[1]

They are decreasing each year



20. (a)  $120 = 2^3 \times 3^k \times 5$

Find the value of  $k$ .

[1]

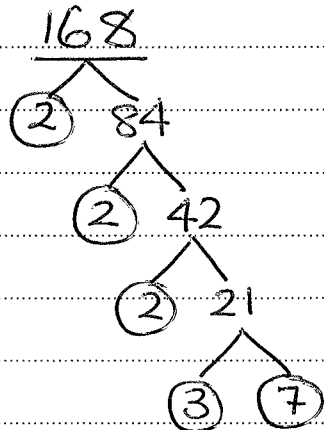
$$120 = 8 \times 3^k \times 5$$

$$\div 40 \quad 120 = 40 \times 3^k \quad \div 40$$

$$3 = 3^k \quad \therefore k = 1$$

(b) Write 168 as a product of its prime factors.

[2]



$$\begin{array}{r} 84 \\ 2 \overline{)168} \\ \underline{42} \\ 84 \end{array}$$

$$2^3 \times 3 \times 7$$

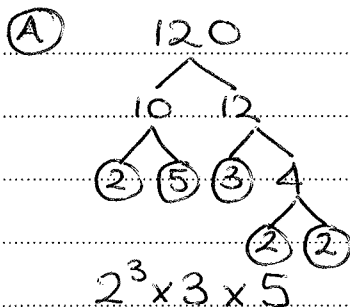
(c) LoWatts Ltd makes light bulbs that are identical in size.

They have regular orders from Company A for 120 light bulbs and from Company B for 168 light bulbs.

LoWatts Ltd uses one size of box to supply both Company A and Company B. Each box used contains the same number of light bulbs and is full. The number of boxes used is as few as possible.

How many light bulbs does each box hold?

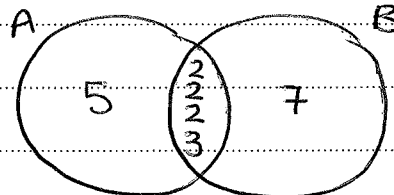
[3]



(B)

$$\begin{array}{r} 168 \\ 2 \overline{)168} \\ \underline{84} \\ 84 \end{array}$$

$$2^3 \times 3 \times 7$$

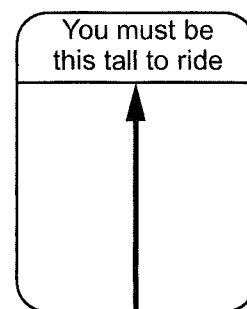


$$\text{HCF} = 2 \times 2 \times 2 \times 3 = \underline{\underline{24}} \text{ in each box}$$

21. When Jenna was measured recently she was 127 cm tall, **correct to the nearest centimetre.**

For safety reasons, the minimum height for a person to ride the Big Coaster at a funfair in the USA is 50 inches.

You are given:  
20 inches = 50.8 cm.



- (a) Using the information given, decide whether it might possibly be safe, it is definitely safe, or it is definitely not safe for Jenna to ride the Big Coaster.

Might possibly be safe



Definitely safe



Definitely not safe



Show how you decide.

[3]

$$20 \text{ inches} = 50.8 \text{ cm}$$

$$20 \text{ inches} = 50.8 \text{ cm}$$

$$10 \text{ inches} = 25.4 \text{ cm}$$

$$50 \text{ inches} = \underline{127.0 \text{ cm}} \text{ minimum height}$$

$$127 \text{ cm} < 127.5 \text{ cm}$$

$$> 126.5 \text{ cm}$$

Actual height  
is  $\geq 126.5 \text{ cm}$  but  
 $< 127.5 \text{ cm}$

$\therefore$  might be safe if she's  $> 127$  but  
 $< 127.5 \text{ cm}$

- (b) (i) State an assumption that you have made in your answer to part (a).

[1]

She's not grown since she was  
last measured.

- (ii) Comment on the effect that your assumption has had on your decision.

[1]

Jenna could be 'definitely safe' to  
ride if she's grown.

22. The table shows some of the values of  $y = x^2 + x - 1$  for  $-2 \leq x \leq 1$ .

$x$	-2	-1	-0.5	0	1
$y = x^2 + x - 1$	1	-1	-1.25	-1	1

- (a) Complete the table above.

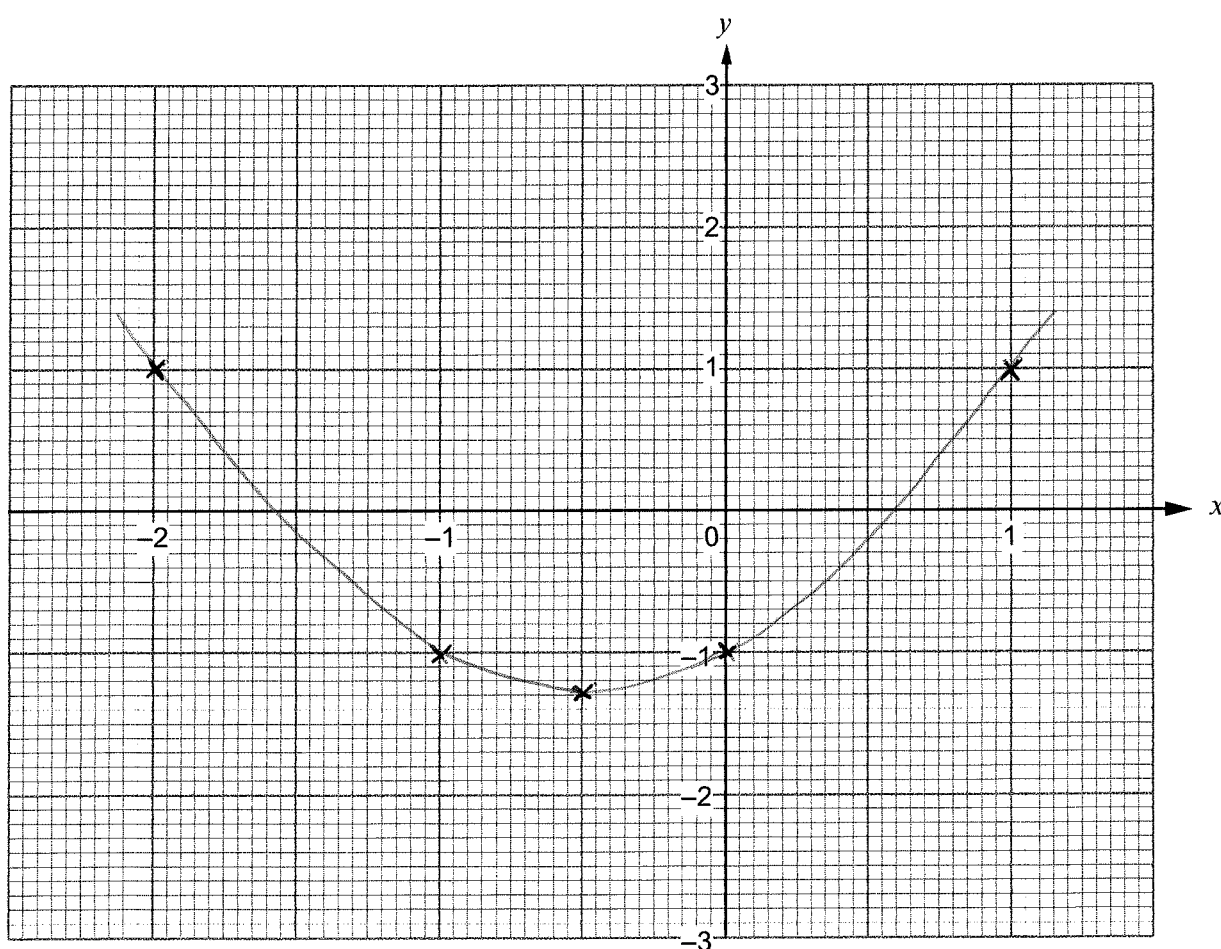
[2]

$$(-2)^2 + (-2) - 1 = 4 - 2 - 1 = 1$$

$$(1)^2 + (1) - 1 = 1 + 1 - 1 = 1$$

- (b) On the graph paper below, draw the graph of  $y = x^2 + x - 1$  for  $-2 \leq x \leq 1$ .

[2]



- (c) State the equation of the line of symmetry of the curve  $y = x^2 + x - 1$ .

[1]

$$x = -\frac{1}{2}$$

- (d) Use your graph to solve  $x^2 + x - 1 = 0$ .

[2]

Crosses the x axis at -1.6 and 0.6

[-1.5 to -1.7 and 0.5 to 0.7]

acceptable

23.

$$\mathbf{p} = \begin{pmatrix} 4 \\ 2 \end{pmatrix} \text{ and } \mathbf{q} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

Work out the column vector  $\frac{1}{2}\mathbf{p} - \mathbf{q}$ .

[2]

$$\frac{1}{2} \begin{pmatrix} 4 \\ 2 \end{pmatrix} - \begin{pmatrix} -3 \\ 2 \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix} - \begin{pmatrix} -3 \\ 2 \end{pmatrix} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$$

$$\frac{1}{2}\mathbf{p} - \mathbf{q} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$$

**END OF PAPER**