

**WJEC**  
**INTERMEDIATE TIER**  
**REVISION BOOK**  
**SJHS**

**SJHS**

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WJEC INTERMEDIATE TIER PERCENTAGES NUMERACY WORKSHEET

(a) Students are taking tests in English and Welsh.  
The English test is marked out of 80.  
The Welsh test is marked out of 70.

(i) Dyfed scores 35 in his English test.  
Estimate Dyfed's score as a percentage.  
Circle your answer.

[1]

4%

20%

23%

44%

51%

(ii) Liam scores 22 in his Welsh test.  
Estimate Liam's score as a percentage.  
Circle your answer.

[1]

0.3%

3%

22%

31%

40%

(a)



Lotty and Rafael decide to enter a prize draw.  
They agree to share any money they win in the ratio 2 : 3 respectively.  
After winning a total of £2000, they think again and decide that Lotty's share should be increased by 30%.

- (i) Rafael thinks that his share will be reduced by 30%.  
Without any calculation, explain why Rafael's thinking is incorrect. [1]

They will be increasing Lotty's share by 30% not by 30% of the total amount i.e. increasing 30% of  $\frac{2}{5}$ .

- (ii) Calculate the amount of money Lotty wins after the decision is made to increase her share. [4]

Lotty's winnings:

$$A : 2 + 3 = 5$$

$$D : 2000 \div 5 = 400$$

$$A : 2 \times 400 = \text{£}800$$

$$M : 3 \times 400 = \text{£}1200$$

$$30\% \text{ of } 800 = \frac{800}{10} \times 3 = \text{£}240$$

Lotty's new share

$$800 + 240 = \text{£}1040$$



- (iii) Find the ratio that is now used to share the money between Lotty and Rafael. Express your answer in its simplest form. [3]

$$2000 - 1040 = 960$$

$$\text{Ratio: } 1040 : 960$$

$$\div 10 \downarrow \div 10$$

$$104 : 96$$

$$\div 4 \downarrow \div 4$$

$$26 : 24$$

$$\div 2 \downarrow \div 2$$

$$13 : 12$$

$$\text{Lotty's winnings : Rafael's winnings} = 13 : 12$$

- (b) In another prize draw, it was planned to give £5000 as the first prize. To make it more popular, the organisers decide to increase this first prize by 26%.

The most efficient method of calculating the amount of the increased first prize is

$$1.26 \times 5000.$$

The second prize was planned to be £3000, but it is now decided to decrease this prize by 6%.

Write down the most efficient method of calculating the amount of the decreased second prize.

You are not expected to work out the answer. [1]

$$100\% - 6\% = 94\% = \frac{94}{100} = 0.94$$

$$0.94 \times 3000$$

Lazar wants to send a package to Germany.  
He looks at pricing charts for three different companies, *ParcelMax*, *DirectGo* and *Pack2save*.

<b>ParcelMax</b>
Total cost = Sum of the 3 dimensions in cm $\times$ £0.60
<b>DirectGo</b>
Total cost = Volume measured in $\text{cm}^3 \times$ £0.01
<b>Pack2save</b>
Total cost = Total area of all 6 faces measured in $\text{cm}^2 \times$ £0.02

Lazar's parcel is a cuboid measuring 10 cm by 20 cm by 30 cm.

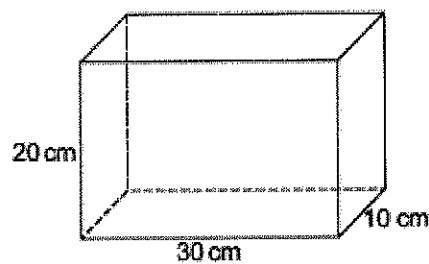


Diagram not drawn to scale

- (a) Find the cost of sending the parcel for each of the three different companies.  
Give each of your answers in pounds (£).

(i) *ParcelMax* [2]

$$\begin{aligned} & (20 + 30 + 10) \times 0.6 \\ & = 60 \times 0.6 \\ & = \text{£}36 \end{aligned}$$

(ii) *DirectGo* [3]

$$\begin{aligned} & (20 \times 30 \times 10) \times 0.01 \\ & = 6000 \times 0.01 \\ & = \text{£}60 \end{aligned}$$

(iii) Pack2save

[4]

$$\begin{aligned} & (2(20 \times 30) + 2(20 \times 10) + 2(30 \times 10)) \times 0.02 \\ &= (1200 + 400 + 600) \times 0.02 \\ &= 2200 \times 0.02 \\ &= £44 \end{aligned}$$

(b) What is the percentage saving that Lazar will make by choosing the cheapest option rather than the most expensive option? [2]

$$\frac{36}{60} \times 100 = 60\%$$

$$100 - 60 = 40\%, \text{ saving}$$



- (a) Jasmine entered herself, Sophie and Bryn as a group in a talent contest. Bryn only had a minor part.

Bryn, Sophie and Jasmine won the contest. They shared the prize money in the ratio 2 : 6 : 7, with Bryn getting the smallest share. Jasmine won £560, the largest share.

- (i) How much money did Bryn and Sophie each win? [4]

$$\frac{560}{7} = 80$$

$$\text{Bryn} - 80 \times 2 = \text{£}160$$

$$\text{Sophie} - 80 \times 6 = \text{£}480$$

Bryn receives £ 160

Sophie receives £ 480

- (ii) Jasmine gave 15% of her winnings to charity. How much did Jasmine have left? [2]

$$10\% \text{ of } 560 = \frac{560}{10} = \text{£}56$$

$$5\% \text{ of } 560 = \frac{56}{2} = \text{£}28$$

$$15\% \text{ of } 560 = 56 + 28 = \text{£}84$$

$$\text{Jasmine has left: } 560 - 84 = \text{£}476$$

- (b) The talent contest is held once a year.  
Every year, the cost of putting on the talent contest increases by 10% of the previous year's cost.  
In summer 2014 the cost was £6600.

Calculate the cost of putting on the summer 2017 talent contest.  
You must show all your working.

[3]

2014

£6600

2015

$$6600 + \frac{6600}{10} = 6600 + 660 = £7,260$$

2016

$$7260 + \frac{7260}{10} = 7260 + 726 = £7,986$$

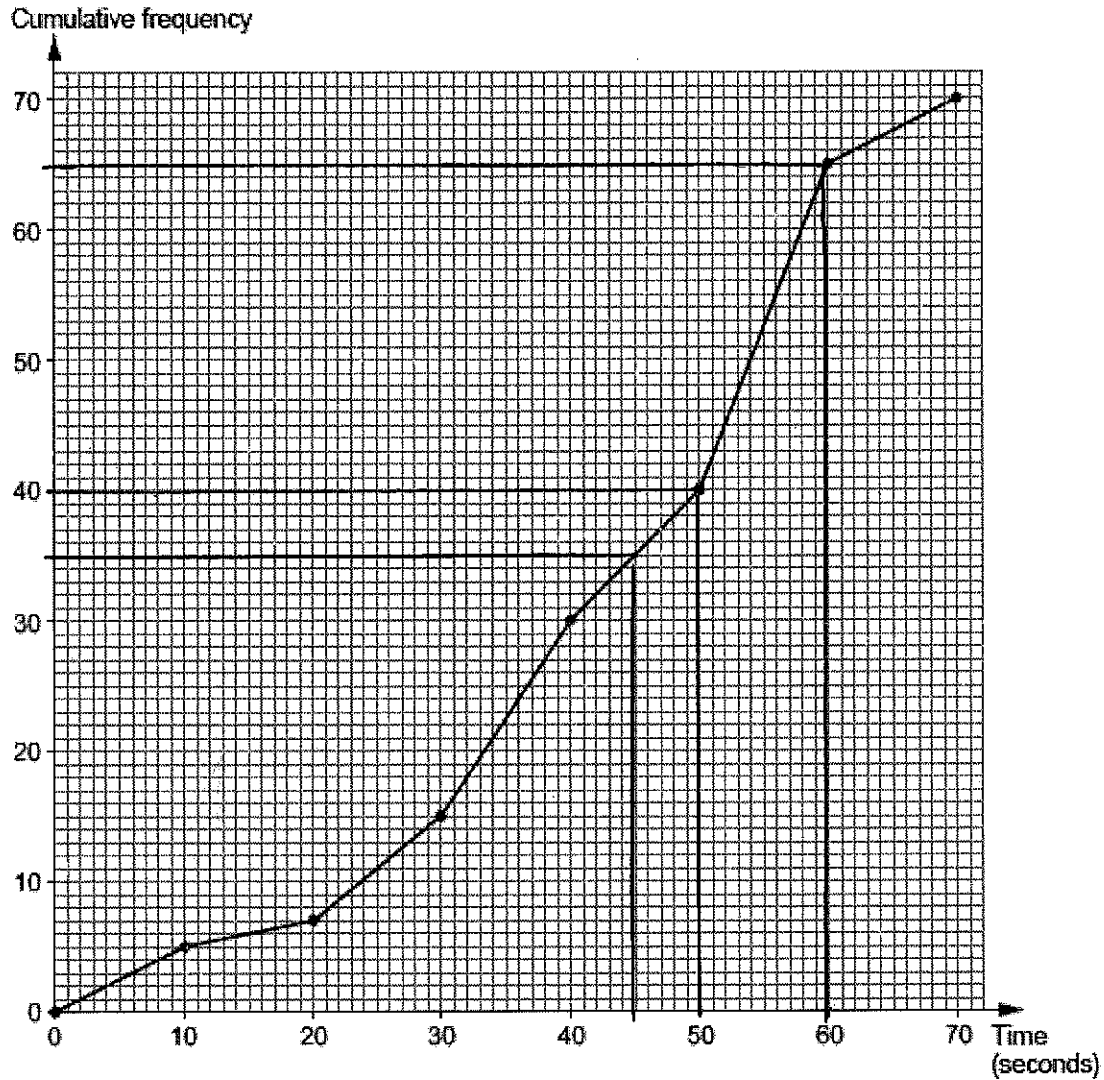
2017

$$7986 + \frac{7986}{10} = 7986 + 798.6 = £8784.60$$

OR

$$6600 \times 1.1^3 = £8784.60$$

10. Cambria Airlines has planes that can carry up to 70 passengers. For safety, the crew practise the emergency exit procedures with a group of 70 passengers. Every 10 seconds the safety officer records the total number of passengers who have left the plane. He has displayed the results in the cumulative frequency diagram shown below.



- (a) Estimate the median time taken by the passengers to leave the plane. [1]

45 seconds

$$70 - 40 = 30$$

- (b) How many passengers took more than 50 seconds to leave the plane?  
Circle your answer.

[1]

10

20

30

40

50

- (c) Cambria Airlines has a policy that states the following.

'In the event of an emergency exit procedure, at least 90% of the 70 passengers must have left the plane within 1 minute.'

Did the practice emergency exit procedure meet the requirements of the airline's policy?  
You must show all your working. [4]

$$90\% \text{ of } 70 = \frac{70 \times 9}{10} = 63$$

10

From graph: 65 people left within  
1 minute.

Yes the practice emergency exit procedure  
met the requirements

Loretta is paid in euros.  
She is checking her tax bill for last year.

The tax rates last year were as follows:

- No tax on the first €3500 of earnings
- Earnings in excess of €3500 and up to €10 500: taxed at a rate of 25%
- Earnings above €10 500: taxed at a rate of 35%

Last year, Loretta's total earnings before tax were €34 500.

How much tax did Loretta pay in total?  
You must show all your working.

[6]

Tax @ 35% :

$$34500 - 10500 = \text{€}24,000$$
$$35\% \text{ of } 24000 = 0.35 \times 24000 = \text{€}8,400$$

Tax @ 25% :

$$10500 - 3500 = \text{€}7,000$$
$$25\% \text{ of } 7000 = 0.25 \times 7000 = \text{€}1,750$$

Total tax :

$$8400 + 1750 = \text{€}10,150$$

$$\text{Tax paid} = \text{€ } 10,150$$





(a) The total area of all the woodlands in Wales is 303 000 hectares.

Individual woodlands that have an area of 2000 hectares or more make up 76% of the total area of all the woodlands in Wales.

Complete the following statement.

'Woodlands with areas of less than 2000 hectares in Wales cover a total area of

72,720 hectares.'

[3]

$$100\% - 76\% = 24\% = \frac{24}{100} = 0.24$$

$$\cancel{0.24 \times 2000 = 480}$$

$$0.24 \times 303\,000 = 72,720$$

Gwenda enjoys road running.

(a) She keeps a record of her run each day this week.

Day	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
Distance	4.6km	5.4km	2.2km	6.2km	7.2km	2.2km	3.4km
Time	26 mins	31 mins	12 mins	35 mins	40 mins	14 mins	22 mins

Last week, her average speed for the week was 9.6 kilometres per hour.

Calculate Gwenda's percentage improvement in her average speed from last week to this week. You must show all your working. [6]

$$s = \frac{d}{t}$$

$$\text{Mean} = \left( \frac{4.6}{(26 \div 60)} + \frac{5.4}{(31 \div 60)} + \frac{2.2}{(12 \div 60)} + \frac{6.2}{(35 \div 60)} + \frac{7.2}{(40 \div 60)} + \frac{2.2}{(14 \div 60)} + \frac{3.4}{(22 \div 60)} \right) \div 7$$

$$= 10.3 \text{ km/h}$$

$$\frac{9.6}{10.3} \times 100 = 93.2\% \quad 100\% - 93.2\% = 6.8\%$$

Percentage improvement is 6.8 %

Luigi lives in south Wales.  
Rosina lives in west Wales.  
For each of the first 65 days of 2017, they recorded whether or not it rained.

Luigi recorded that it rained on 28 of these days.  
Rosina recorded that it rained on 40% of these 65 days.

Luigi says,

'For the first 65 days of 2017, there were more days with rain where I live than where Rosina lives.'

Is Luigi correct?  
You must show all your working.

[3]

Luigi

28 of 65 days rained

Rosina

40% of 65 =  $\frac{65}{10} \times 4 = 26$  days of rain

Luigi is correct, it did rain more where he was

Mali's scooter depreciated (decreased) in value by 24% in the first year. In all further years, her scooter depreciated by 13% of its previous year's value. She originally paid £850 for her scooter. Calculate the value of Mali's scooter after 7 years. [3]

$$100\% - 24\% = 76\% = \frac{76}{100} = 0.76$$

$$850 \times 0.76 = £646$$

$$646 \times 0.87^6 = £280.12$$

After 7 years, the value of Mali's scooter was £ 280.12

- (b) The television was reduced in the sale by 26% of its original price. It cost Marta £710.40 in the sale. What was the original price of the television? [2]

$$100\% - 26\% = 74\% = \frac{74}{100} = 0.74$$

$$\frac{710.40}{0.74} = £960$$

$$0.74$$

Original price £ 960

A newspaper report claimed the following:

- 12% of the world population is left-handed.
- Twice as many men as women are left-handed.
- 30% of the world population is mixed-handed.  
Mixed-handed people prefer to use the left hand for some tasks and the right hand for others.
- It is very rare to be ambidextrous, that is being able to do all tasks equally well with either hand.

In 2011, Wales had a population of 3 063 000.  
In 2014, Wales had a population of 3 092 000.

- (a) Calculate the number of left-handed people living in Wales in 2011.  
State what assumption you have made. [3]

$$3,063,000 \times 0.12 = 367,560$$

Assumption:

Wales has the same percentage of left handed people as the rest of the world.

- (b) In 2011, Wales had a population of 3 063 000.  
1 559 000 of these people were women.

In 2011, what percentage of the population of Wales were men?  
Give your answer correct to 1 decimal place. [3]

$$\begin{aligned} \text{Men} &: 3,063,000 - 1,559,000 \\ &= 1,504,000 \end{aligned}$$

$$\% \text{ Men} : \frac{1,504,000}{3,063,000} \times 100 = 49\%$$

- (c) How many mixed-handed people do you think were living in Wales in 2014?  
You must show your working.  
Give your answer to the nearest 1000 people.

[2]

$$3,092,000 \times 0.3 = 927,600$$
$$\approx 928,000$$

- (d) A country of 6 million people meets all the claims given in the newspaper report.  
8% of the women in this country are left-handed.

There are 3 million men living in this country.  
How many left-handed men would you expect there to be in this country?

[4]

$$\text{Men : } 3,000,000$$

$$\text{Women : } 6,000,000 - 3,000,000 = 3,000,000$$

$$\text{Left handed : } 3,000,000 \times 0.08 = 240,000$$

women

$$\text{Left handed : } 240,000 \times 2 = 480,000$$

men

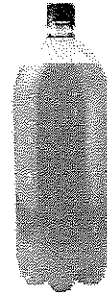
WJEC INTERMEDIATE TIER MONEY NUMERACY WORKSHEET



Small bottle  
300 ml for 66p



Medium bottle  
400 ml for 92p



Large bottle  
500 ml for £1.25

- (a) In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

Roland is going to buy some orange juice for a party.  
Which size bottle of orange juice offers the best value for money?  
You must show your working.

[3 + 2 OCW]

Small bottle:

$$300 \text{ ml} = \text{£}0.66$$

$$\div 3 \downarrow \div 3$$

$$100 \text{ ml} = \text{£}0.22$$

Medium bottle:

$$400 \text{ ml} = \text{£}0.92$$

$$\div 4 \downarrow \div 4$$

$$100 \text{ ml} = \text{£}0.23$$

Large bottle:

$$500 \text{ ml} = \text{£}1.25$$

$$\div 5 \downarrow \div 5$$

$$100 \text{ ml} = \text{£}0.25$$

Small money is best  
value for money.

- (b) Galina needs to buy exactly 800 ml of orange juice.  
Which is the best option for Galina?  
You must show your working and consider all options.  
You must give a reason for your choice.

[3]

$$\text{Small \& large: } \text{£}0.66 + \text{£}1.25 = \text{£}1.91$$

$$\text{Medium \& medium: } \text{£}0.92 + \text{£}0.92 = \text{£}1.84$$

2 medium bottles are best option.

Marcin has a market stall to sell his printed T-shirts.

It costs him:

- £250 to buy 100 plain T-shirts,
- 50p to print a design on each T-shirt.

Marcin sells his printed T-shirts for £4.00 each.

At the start of the week:

- His bank account balance is £820.
- Marcin has 100 printed T-shirts ready to sell.
- He has already paid for these printed T-shirts.

During the week:

- Marcin sells his stock of 100 T-shirts.
- He pays all the money he takes from selling T-shirts into his bank account.
- He buys and prints another 400 T-shirts.
- Marcin does not sell any of these 400 T-shirts.



How much will Marcin have in his bank account at the end of this week?  
You must show all your working.

[4]

$$\begin{aligned} \text{Opening balance} &: £820 \\ \text{Money from selling} &: 100 \times 4 = £400 \\ \text{Money spent} &: (250 \times 4) + (0.5 \times 400) \\ &= 1000 + 200 \\ &= £1200 \\ \text{Money left} &: £820 + £400 - £1200 \\ &= £1220 - £1200 \\ &= £20 \end{aligned}$$



In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

	<b>Maes Alun Camping Charges</b>	
Tents covering ground area:		
• less than or equal to 12m <sup>2</sup>	cost	£14 per night
• greater than 12m <sup>2</sup>	cost	£16 per night
<u>AND</u>		
Charge per person: £4 per night		
Stay 5 nights and get the next night completely free. This means no charge for tents or people on every 6 <sup>th</sup> night.		

Rhodri and Lars are planning a camping holiday, staying at Maes Alun Camping. They are going to

- take only one tent between them,
- take a tent covering a rectangular ground area, measuring 2.5 metres by 4.4 metres,
- both stay for a total of 12 nights.

Their holiday is just 8 weeks away.

They each plan to save £15 per week from now until their holiday in 8 weeks' time.

Will the amount they save be enough to pay for their holiday?

You must show all your working.

[8 + 2 OCW]

$$\begin{aligned} \text{Area of tent} &: 2.5 \times 4.4 = 11 \text{ m}^2 \\ \text{Cost of tent} &: 10 \times 14 = \text{£}140 \\ \text{Cost for people} &: ~~2 \times 4 \times 10~~ \\ & 2 \times 4 \times 10 = \text{£}80 \\ \text{Total cost} &: 140 + 80 = \text{£}220 \\ \text{Amount saved} &: 2 \times 8 \times 15 = \text{£}240 \end{aligned}$$

The amount saved is enough for the holiday.

Handwriting practice lines consisting of 20 horizontal dashed lines.

S J H S

Lazar wants to send a package to Germany.  
He looks at pricing charts for three different companies, *ParcelMax*, *DirectGo* and *Pack2save*.

<i>ParcelMax</i> Total cost =	Sum of the 3 dimensions in cm $\times$ £0.60
<i>DirectGo</i> Total cost =	Volume measured in $\text{cm}^3 \times$ £0.01
<i>Pack2save</i> Total cost =	Total area of all 6 faces measured in $\text{cm}^2 \times$ £0.02

Lazar's parcel is a cuboid measuring 10 cm by 20 cm by 30 cm.

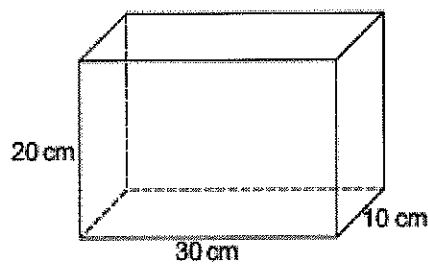


Diagram not drawn to scale

- (a) Find the cost of sending the parcel for each of the three different companies.  
Give each of your answers in pounds (£).

(i) *ParcelMax*

[2]

$$(20 + 30 + 10) \times 0.6 = 60 \times 0.6$$
$$= \text{£}36$$

(ii) *DirectGo*

[3]

$$(20 \times 30 \times 10) \times 0.01 = 6000 \times 0.01$$
$$= \text{£}60$$

(iii) Pack2save

[4]

$$[2(20 \times 30) + 2(20 \times 10) + 2(30 \times 10)] \times 0.02$$

$$= (1200 + 400 + 600) \times 0.02$$

$$= 2200 \times 0.02$$

$$= \pounds 44$$

(b) What is the percentage saving that Lazar will make by choosing the cheapest option rather than the most expensive option? [2]

$$\frac{36}{60} \times 100 = 60\%$$

60

$$100\% - 60\% = 40\% \text{ saving}$$



- (a) Jasmine entered herself, Sophie and Bryn as a group in a talent contest. Bryn only had a minor part.

Bryn, Sophie and Jasmine won the contest. They shared the prize money in the ratio 2 : 6 : 7, with Bryn getting the smallest share. Jasmine won £560, the largest share.

- (i) How much money did Bryn and Sophie each win? [4]

$$\frac{560}{7} = £80$$

$$2 \times 80 = £160$$

$$6 \times 80 = £480$$

Bryn receives £ 160

Sophie receives £ 480

- (ii) Jasmine gave 15% of her winnings to charity. How much did Jasmine have left? [2]

$$0.85 \times 560 = £476$$

- (b) The talent contest is held once a year.  
Every year, the cost of putting on the talent contest increases by 10% of the previous year's cost.  
In summer 2014 the cost was £6600.

Calculate the cost of putting on the summer 2017 talent contest.  
You must show all your working.

[3]

2014

£6600

2015

$$6600 \times 1.1 = £7260$$

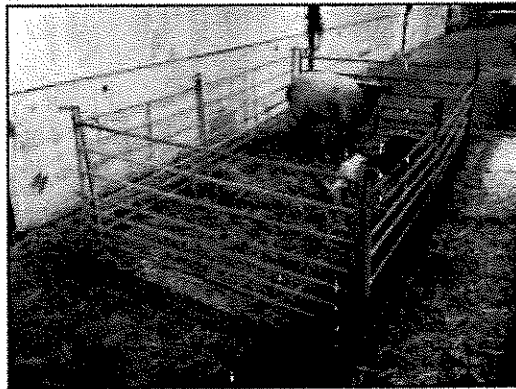
2016

$$7260 \times 1.1 = £7986$$

2017

$$7986 \times 1.1 = £8784.60$$

Bethan builds a rectangular sheep pen.



- (a) The perimeter fence of the sheep pen is 18 m long.  
It costs her £1.10 for every 0.5 metres of fencing used to make the sheep pen.

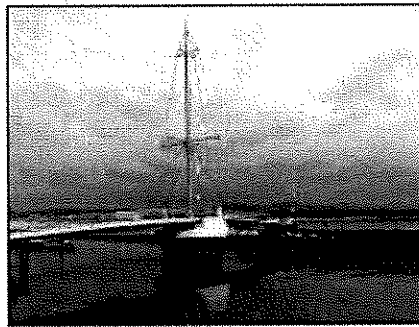
(i) Calculate the cost of the fencing used to make this sheep pen. [2]

$$\frac{18}{0.5} = 36$$

$$36 \times 1.10 = £39.60$$

Cost is £ 39.60

Pont y Ddraig (Dragon's Bridge) opened in Rhyl harbour in autumn 2013.



The harbour development cost £9.8 million.  
£4.3 million of this money was spent on Pont y Ddraig.

- (a) How much was spent on the rest of the harbour development in Rhyl?  
Circle your answer.

[1]

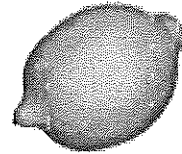
£55000    £550000    £5500000    £55000000    £550000000

9,800,000

- 4,300,000

5,500,000

- Four different supermarkets have special offers on the price of lemons.



Supermarket	Special offer
Cost 4go	Lemons: usually 40p each Now on offer! Buy 3 for the price of 2
Edges Mart	A net of 4 lemons for 75p
Food Uno	A bag of 5 lemons for 76p
Greenway	Lemons: only 26p each

Aled needs 6 lemons to make lemon cakes for a birthday party.

- (a) *In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Aled only has time to go to one supermarket.

Calculate how much Aled would pay in each of the supermarkets.  
In which supermarket will he be able to get the lemons he needs for the least amount of money?

You must show all your working.

[5 + 2 OCW]

$$\begin{array}{l} \text{Cost 4go:} \\ 0.40 \times 4 = \text{£}1.60 \end{array} \qquad \begin{array}{l} \text{Food Uno:} \\ 0.76 \times 2 = \text{£}1.52 \end{array}$$

$$\begin{array}{l} \text{Edges Mart:} \\ 0.75 \times 2 = \text{£}1.50 \end{array} \qquad \begin{array}{l} \text{Greenway:} \\ 0.26 \times 6 = \text{£}1.56 \end{array}$$

Edges Mart would cost the least.



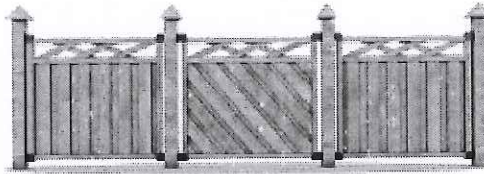
(b) Aled can use any left over lemons to make muffins.

Which supermarket gives the best value for money?  
Give a reason for your answer.

[1]

Food Uno is the best value for  
money, the lemons are cheapest per lemon.

3. Mehmet needs a new fence for one end of his garden. Fences are constructed using panels and posts.



- (a) Posts are needed between each fence panel and at both ends. How many posts are needed for a fence made with 34 panels? Circle your answer.

[1]

33

35

37

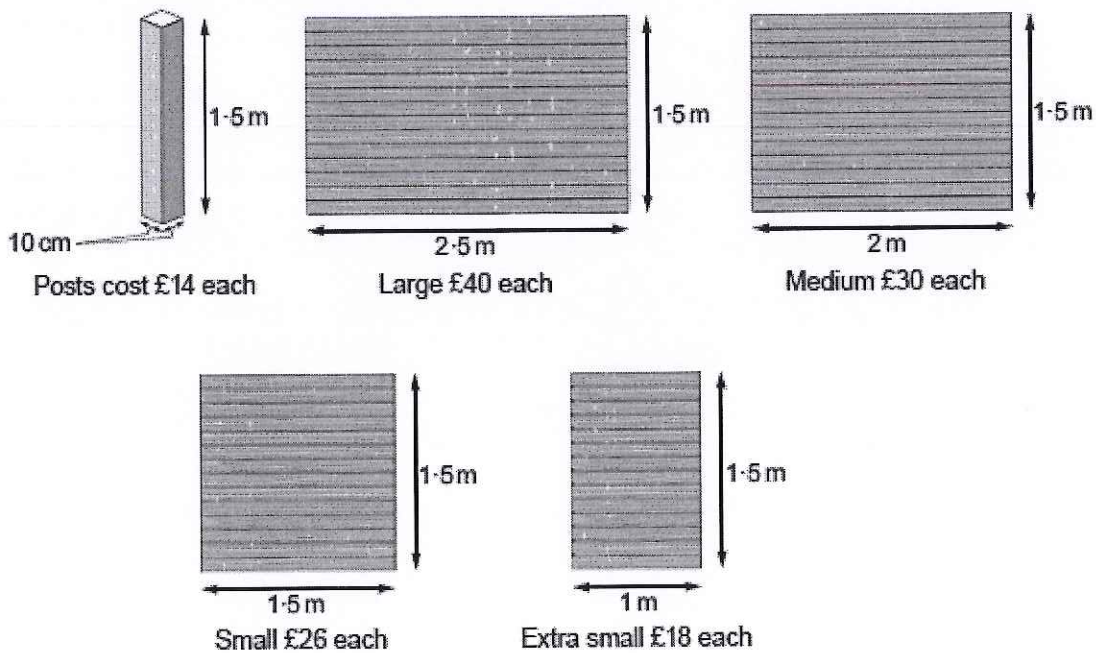
34

36

.....

.....

- (b) Mehmet wants a new 1.5 m high fence for his garden. The fence panels come in different lengths. The posts Mehmet wants to use are all the same size. Mehmet has the following information.



The fence Mehmet wants to make is 8.5 m long, including the posts. He has started to sketch a plan, as shown below.

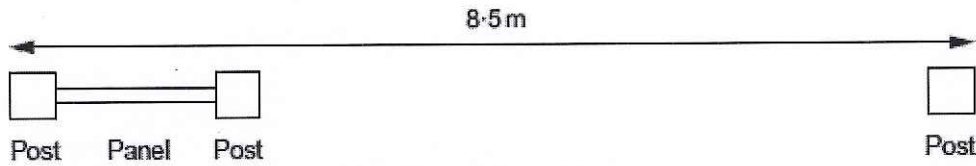


Diagram not drawn to scale

Mehmet needs to use 5 posts.  
Work out one possible choice of panels that Mehmet could use.  
You may use the plan to help you.  
Calculate the total cost of the posts and panels for this choice of fence. [6]

Space needed for posts:

$$10 \text{ cm} \times 5 = 50 \text{ cm} = \frac{50}{100} = 0.5 \text{ m}$$

Space left for fencing:

$$8.5 - 0.5 = 8 \text{ m}$$

No. of medium panels needed:

$$\frac{8}{2} = 4$$

Cost of panels

$$30 \times 4 = \text{£}120$$

Cost of posts

$$14 \times 5 = \text{£}70$$

Total cost of making the 8.5 m fence is  $\text{£}120 + 70 = \text{£}190$

(c) It costs 2p to paint each  $100 \text{ cm}^2$  of a fence post.  
How much will it cost to paint the 4 vertical sides of 1 fence post? [3]

Area to be covered:

$$4(10 \times 150) = 4 \times 1500 = 6000 \text{ cm}^2$$

Amount of paint needed:

$$\frac{6000}{100} = 60$$

Cost of paint:

$$60 \times 0.02 = \text{£}1.20$$

- i. *Truetool* is a tool hire company.



Hire charges	
The cost of hiring a cement mixer in £:	$13 \times \text{number of days} + 26$
The cost of hiring a jet washer in £:	$9 \times \text{number of days} + 38$

- (a) Sara hires a cement mixer for 5 days and a jet washer for 7 days from *Truetool*. How much change would she get from £200? [3]

Cost of cement mixer:

$$13 \times 5 + 26 = 65 + 26 = \text{£}91$$

Cost of jet washer:

$$9 \times 7 + 38 = 63 + 38 = \text{£}101$$

Total cost:

$$91 + 101 = \text{£}192$$

Change:

$$200 - 192 = \text{£}8$$

- (b) Geraint hired a cement mixer for a number of days. Lois hired a jet washer for the same number of days. They each paid the same amount of money.

For how many days did they each hire these tools from *Truetool*? You must show all your working. [3]

$$13x + 26 = 9x + 38$$

$$-9x \downarrow -9x$$

$$4x + 26 = 38$$

$$-26 \downarrow -26$$

Number of days .....

$$4x = 12$$

$$\div 4 \downarrow \div 4$$

$$x = 3$$



No. of units of :  $14400 - 13900 = 500$

electricity used

charge for electricity :  $500 \times 0.21 = \text{£}105$

500 units @ 21p per unit

standing charge :  $3 \times 7.80 = \text{£}23.40$

3 months @ £7.80 per month

Total charges :  $105 + 23.40 = \text{£}128.40$

VAT @ 5% :  $0.05 \times 128.40 = \text{£}6.42$

Amount to pay :  $128.40 + 6.42 = \text{£}134.82$

Money left in :  $470 - 134.82 = \text{£}335.18$

Megan's account

Megan can afford a £330 washing machine.

11. Megan Pugh's electricity bill is shown below.  
It covers the period May, June and July 2017.

Megan Pugh 203 Stryd Bryntor Maesgwyn			
Period	Previous meter reading	Present meter reading	Number of units of electricity used
May, June and July 2017	13450	13900	450
Charge for electricity: 450 units at 20p per unit		£90.00	
Standing charge: 3 months at £7.60 per month		£22.80	
Total charges:		£112.80	
VAT at 5%: 5% of £112.80		£5.64	
<b>Amount to pay: £112.80 + £5.64 = £118.44</b>			

- (a) On 1 August 2017, the charge per unit for electricity was increased by 5%.  
What is the increased cost per unit of electricity?  
Circle your answer.

[1]

20.5p

21p

21.5p

22p

22.5p

$$20 \times 1.05 = 21p$$

- (b) Megan wants to calculate her next 3-monthly electricity bill.  
She knows the following:

- Her meter reading on 31 October 2017 was 14400.
- The charge per unit for electricity has increased by 5% since her last bill.
- The standing charge has increased by 20p per month since her last bill.
- VAT remains at 5%.

On 31 October 2017, Megan had £470 in her bank account.

After paying her next 3-monthly electricity bill, will Megan be able to buy a new washing machine costing £330?

You must show all your working.

[9]

Loretta is paid in euros.  
She is checking her tax bill for last year.

The tax rates last year were as follows:

- No tax on the first €3500 of earnings
- Earnings in excess of €3500 and up to €10 500: taxed at a rate of 25%
- Earnings above €10 500: taxed at a rate of 35%

Last year, Loretta's total earnings before tax were €34 500.

How much tax did Loretta pay in total?  
You must show all your working.

[8]

Tax @ 25% :

$$10500 - 3500 = €7000$$

$$7000 \times 0.25 = €1750$$

Tax @ 35% :

$$34500 - 10500 = €24000$$

$$24000 \times 0.35 = €8400$$

Total tax :

$$1750 + 8400 = €10,150$$

Tax paid = € 10,150



Ewan is going on holiday to India.  
He has saved £450 to exchange for Indian rupees.

- (a) The exchange rate on the internet last week was £1 = 99.40 rupees.  
Had Ewan been going on holiday last week, how many rupees could he have bought?

[2]

$$450 \times 99.40 = 44,730 \text{ rupees}$$

- (b) Ewan exchanges his money on arrival in India.  
The exchange rate is now £1 = 99.72 rupees.

The exchange bureau only has 500 rupee notes.  
Ewan wants to buy as many rupees as possible with his £450 savings.

How much of his £450 will Ewan spend buying rupees?  
Give your answer correct to the nearest penny.  
You must show all your working.

[4]

$$450 \times 99.72 = 44,874 \text{ rupees}$$

Can only get 44,500 rupees

$$44,500 \div 99.72 = £446.25$$



- (a) In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

Railcard for 16 to 25 year olds

£30 for a year

Get  $\frac{1}{3}$  off all your rail travel

Nerys and Eleri are sisters.  
Nerys is 22 years old and Eleri is 27 years old.

The two sisters live in Holyhead.  
Their aunt lives in Milford Haven.  
They travel by train to visit their aunt 3 times a year.

Nerys buys a 16-25 Railcard to use for these journeys.  
They buy single rail tickets for each journey.  
The cost of a single rail ticket from Holyhead to Milford Haven is £84.50.  
The journey home from Milford Haven also costs £84.50 per ticket.

In a year, how much less does Nerys pay than Eleri for the journeys to Milford Haven and back?

You must show all your working.

[5 + 2 OCW]

Nerys:

3 times a year = 6 journeys

6 journeys cost =  $6 \times 84.50 = £507$

Price of fair after =  $\frac{2}{3}$  of 507 =  $507 \times \frac{2}{3} = £338$

Total cost =  $338 + 30 = £368$

Eleri:

3 times a year = 6 journeys

6 journeys cost =  $6 \times 84.50 = £507$

Difference in cost:

$507 - 368 = £139$

- (b) Cristiano is 22 years old.  
He sometimes travels from Rhyl to Llandudno Junction by train.  
The cost of a single rail ticket from Rhyl to Llandudno Junction is £7.80.

Nerys advises Cristiano to buy a Railcard.  
Cristiano says,

It is not worth paying £30 for the Railcard.

How many times in a year would Cristiano have to travel to make it worthwhile for him to buy a Railcard? [3]

Cristiano:

$$\text{Price of fair after discount} : \frac{2}{3} \text{ of } 7.80 = \frac{7.80 \times 2}{3} = \pounds 5.20$$

$$\text{Saving} : 7.80 - 5.20 = \pounds 2.60$$

$$\text{No. of journeys needed to make railcard worthwhile} : \frac{30}{2.6} = 11.5 \approx 12 \text{ journeys}$$

- (b) The price of softwood changes each year.  
The price has increased by 6% per annum for each of the last 5 years.  
Before this, the price had decreased by 2% per annum.  
Seven years ago the price of softwood was £34 per m<sup>3</sup>.

Calculate the current price of softwood.

[3]

$$34 \times 0.98^2 \times 1.06^5 = \text{£}43.70 \text{ per m}^3$$

Current price of softwood is £ 43.70 per m<sup>3</sup>

- (b) In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

Organics4U has 16 vehicles on the road every working day.  
The company has 6 vans and 10 trucks.

Ffion has the following information for each type of vehicle.

Type of vehicle	Average distance travelled per litre (km per litre)	Average distance travelled per day (km per day)
Van	8	256
Truck	5.5	704

The fuel used by all of the 16 vehicles costs £1.10 per litre.  
Use this information to calculate the total fuel bill for 1 working day.  
You must show all your working.

[6 + 2 OCW]

Van:

$$\text{No. of litres used: } \frac{256}{8} = 32 \text{ litres}$$

$$\text{Cost of fuel for } 6 \text{ vans: } 6 \times 1.10 \times 32 = \text{£}211.20$$

Trucks:

$$\text{No. of litres used: } \frac{704}{5.5} = 128 \text{ litres}$$

$$\text{Cost of fuel for } 10 \text{ trucks: } 10 \times 1.10 \times 128 = \text{£}1408$$

Fuel bill:

$$1408 + 211.2 = \text{£}1619.20$$

Mali's scooter depreciated (decreased) in value by 24% in the first year.  
In all further years, her scooter depreciated by 13% of its previous year's value.  
She originally paid £850 for her scooter.  
Calculate the value of Mali's scooter after 7 years.

[3]

$$850 \times 0.76 = £646$$

$$646 \times 0.87^6 = £280.12$$

After 7 years, the value of Mali's scooter was £ 280.12

- (b) The television was reduced in the sale by 26% of its original price.  
It cost Marta £710.40 in the sale.  
What was the original price of the television?

[2]

$$710.40 = £960$$

$$0.74$$

Original price £ 960

- (c) A television uses 1 unit of electricity every 10 hours.  
A unit of electricity costs 9.8p.

- (i) Calculate the cost of having a television turned on for 24 hours.  
Circle your answer.

[1]

£23.52

£2.35

40.83p

23.52p

2.45p

$$24 = 2.4$$

$$2.4 \times 9.8 = 23.52$$

10

- (ii) On average, Marta watches 4 hours of television each day.  
On average, how much a week does it cost her to watch television?  
Circle your answer.

[1]

27.44p

£27.44

£39.20

39.2p

10.78p

$$4 \times 7 = 28$$

$$28 = 2.8$$

$$2.8 \times 9.8 = 27.44p$$

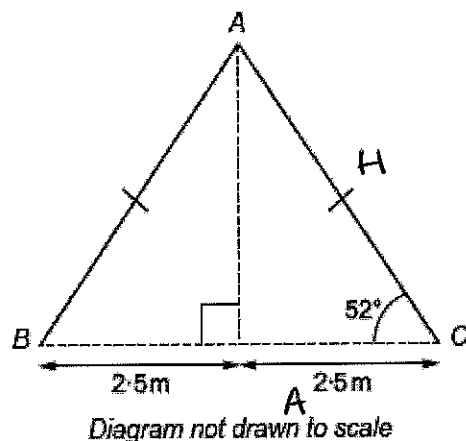
10

The diagram below shows where Levi wants to attach a string of lights to his house.

String of lights:



Levi wants to attach a single string of lights from B to A and then from A to C. The diagram below shows the measurements Levi has taken.



He spends £410 at the electrical store buying a string of lights. After putting up the lights, Levi finds he has 6 metres of the string of lights left over at one end.

How much did the electrical store charge Levi, per metre, for the string of lights? [6]

SOH (CAH) TOA

$$\cos B = \frac{A}{H} \quad \cos 52 = \frac{2.5}{H}$$

$$\times H \downarrow \times H$$

$$H \times \cos 52 = 2.5$$

$$\div \cos 52 \downarrow \div \cos 52$$

$$H = \frac{2.5}{\cos 52}$$

$$= 4.1 \text{ m}$$

Length of string needed:  $4.1 \times 2 = 8.2 \text{ m}$

Length of string bought:  $8.2 + 6 = 14.2 \text{ m}$

Cost of string per metre:  $\frac{410}{14.2} = £28.87$



Raspberries cost £3.60 per kg

Pears cost £2.60 per kg

Rhys buys some raspberries and some pears.  
Rhys weighs the fruit he buys.  
The raspberries cost him £4.50.

- (a) Calculate the mass of the raspberries Rhys buys. [2]

$$\frac{4.5}{3.6} = 1.25 \text{ kg}$$

- (b) *In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

He finds that the mass of the pears is three times the mass of the raspberries.  
How much change does Rhys get from £20 when buying the raspberries and pears?  
You must show all your working. [4 + 2 OCW]

$$\text{Mass of pears : } 1.25 \times 3 = 3.75 \text{ kg}$$

$$\text{Cost of pears : } 3.75 \times 2.6 = \text{£}9.75$$

$$\text{Cost of raspberries : } \text{£}4.50$$

$$\text{Total cost : } 4.5 + 9.75 = \text{£}14.25$$

$$\text{Change : } 20 - 14.25 = \text{£}5.75$$



(c) The currency widely used in Patagonia is the Argentine peso.

Alvaro sells alpaca fleeces from Patagonia.

His fleeces are priced in Argentine pesos.

Tom lives in Wales and buys fleeces from Alvaro.

Tom pays for the fleeces in pounds.

Tom's purchases are shown in the table below.

	Number of fleeces bought	Price per fleece, in Argentine pesos	Exchange rate
January 2015	80	19.20	£1 = 15.47 Argentine pesos
March 2016	20	22.30	£1 = 15.21 Argentine pesos
April 2017	100	24.50	£1 = 14.93 Argentine pesos

For each of Tom's 3 purchases he paid correct to the nearest penny.

How much did Tom pay for these 200 fleeces, in pounds?

Give your answer correct to the nearest penny.

You must show all your working.

[4]

Cost of fleeces in Jan 15

$$80 \times 19.20 = 1536$$

$$1536 \div 15.47 = £99.29$$

Cost of fleeces in Mar 16

$$20 \times 22.30 = 446$$

$$446 \div 15.21 = £29.32$$

Cost of fleeces in April 17

$$100 \times 24.50 = 2450$$

$$2450 \div 14.93 = £164.10$$

Total cost:

$$99.29 + 29.32 + 164.10 = £292.71$$

Handmade socks, knitted using pure cashmere wool, are very expensive to buy.

Rowena buys cashmere wool in 20g balls.  
Each ball of cashmere wool costs her £1.42.  
She pays her sister £8 to knit each pair of socks.  
135g of cashmere wool is used to knit each pair of socks.



Rowena sells 40 pairs of cashmere socks for £18.95 per pair.  
What is her percentage profit?  
Give your answer correct to 2 significant figures.  
You must show all your working.

[7]

Amount of cashmere wool needed:

$$40 \times 135 = 5,400\text{g}$$

No. of balls of wool needed:

$$5400 \div 20 = 270$$

Cost of balls of wool:

$$270 \times 1.42 = £383.40$$

Money paid to sister:

$$40 \times 8 = £320$$

Total cost:

$$383.40 + 320 = £703.40$$

Money made from selling socks:

$$40 \times 18.95 = £758$$

~~£~~ Profit:

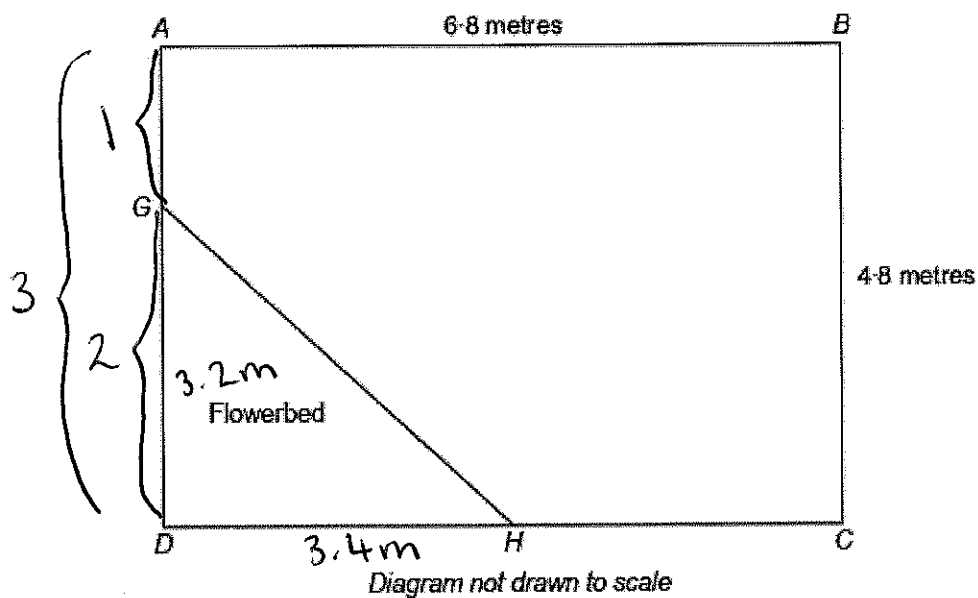
$$758 - 703.40 = £54.60$$

% profit:

$$\frac{54.60}{703.40} \times 100 = 7.8\%$$

Bethan has a plan of her rectangular lawn, which she has labelled  $ABCD$ . She wants to cut out a triangular flowerbed from her lawn, labelled  $GHD$ . Bethan decides that  $AG : GD$  should be  $1 : 2$  and that  $DH = HC$ .

She has made a sketch shown below.



(a) Calculate the length of  $GH$ .

[4]

$$A : 1 + 2 = 3$$

$$6.8 \div 2 = 3.4 \text{ m}$$

$$D : \frac{4.8}{3} = 1.6$$

3

$$AM : 1 \times 1.6 = 1.6 \text{ m}$$

$$2 \times 1.6 = 3.2 \text{ m}$$

$$a^2 + b^2 = c^2$$

$$3.2^2 + 3.4^2 = c^2$$

$$21.8 = c^2$$

$$\sqrt{\quad} \downarrow \sqrt{\quad}$$

$$4.7 \text{ m} = c$$

(b) The flowerbed, GHD, is to have a flexible edging strip placed around its perimeter. The edging strip costs £3.50 per metre and can only be bought in strips of complete metres.

- How much will the edging strip cost Bethan?
- What length of strip will be left over?  
Give your answer in centimetres.

[4]

Perimeter:

$$3.2 + 3.4 + 4.7 = 11.3\text{m}$$

Must buy 12m

Cost of edging strip:

$$12 \times 3.5 = \text{£}42$$

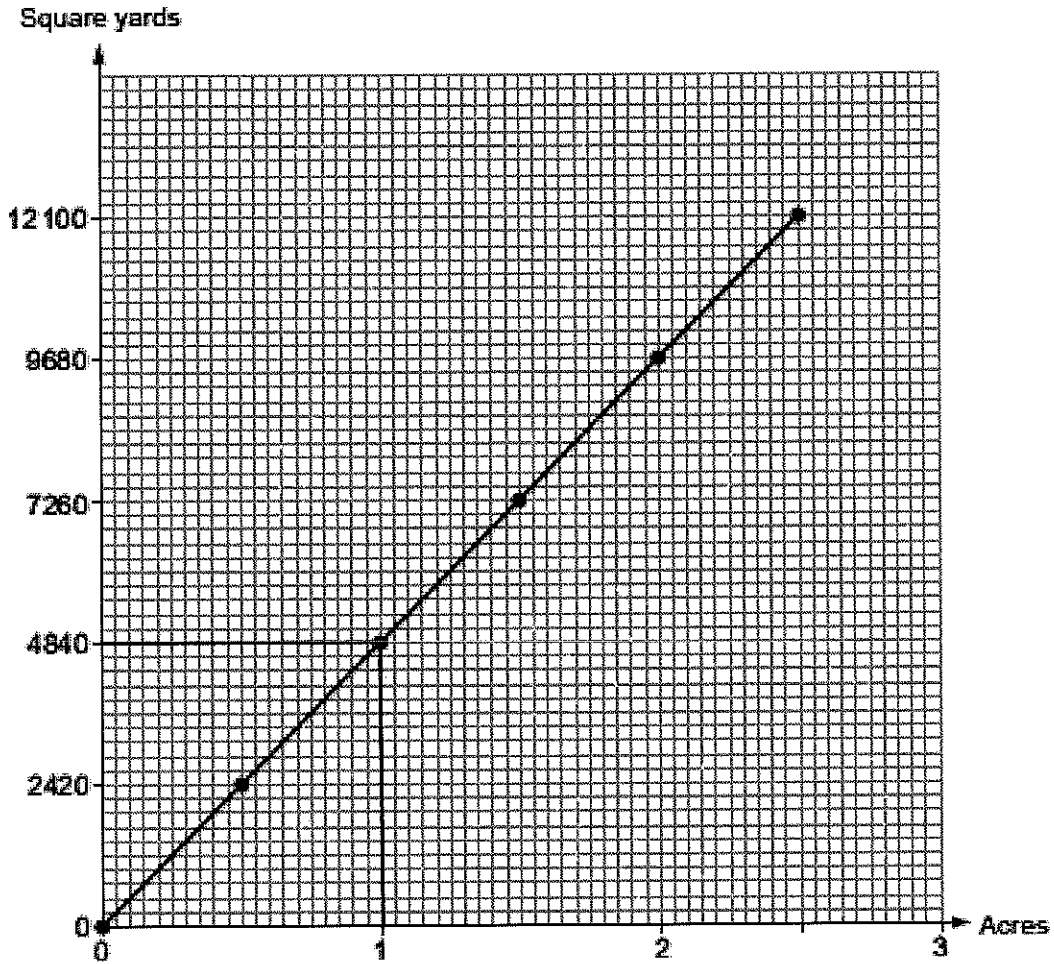
$$12 - 11.3 = 0.7\text{m} = 0.7 \times 100 = 70\text{cm}$$

Cost £ 42

70 cm left over

WJEC INTERMEDIATE TIER CONVERSION GRAPHS WORKSHEET

Marcus is a farmer.  
He has his own conversion graph to change between acres and square yards.



Complete each of the following statements.

(a) 3 acres is equal to 14520 square yards. [1]

1 acre = 4840 sq. yards

x 3 ↓ x 3

3 acres = 14520 sq. yards

(b) 5.5 acres is equal to \_\_\_\_\_ square yards. [2]

1 acre = 4840 sq. yards

x 5.5 ↓ x 5.5

5.5 acres = 26620 sq. yards

Petra is organising a prom for her year group.

The number of people attending the prom is likely to be between 20 and 80.

The cost of holding the prom at Hotel Aforwen would be as follows.

- Hire of the room: £100
- Food: £15 per person
- Welcome drink on arrival: £3 per person
- Decorations: £2 per person

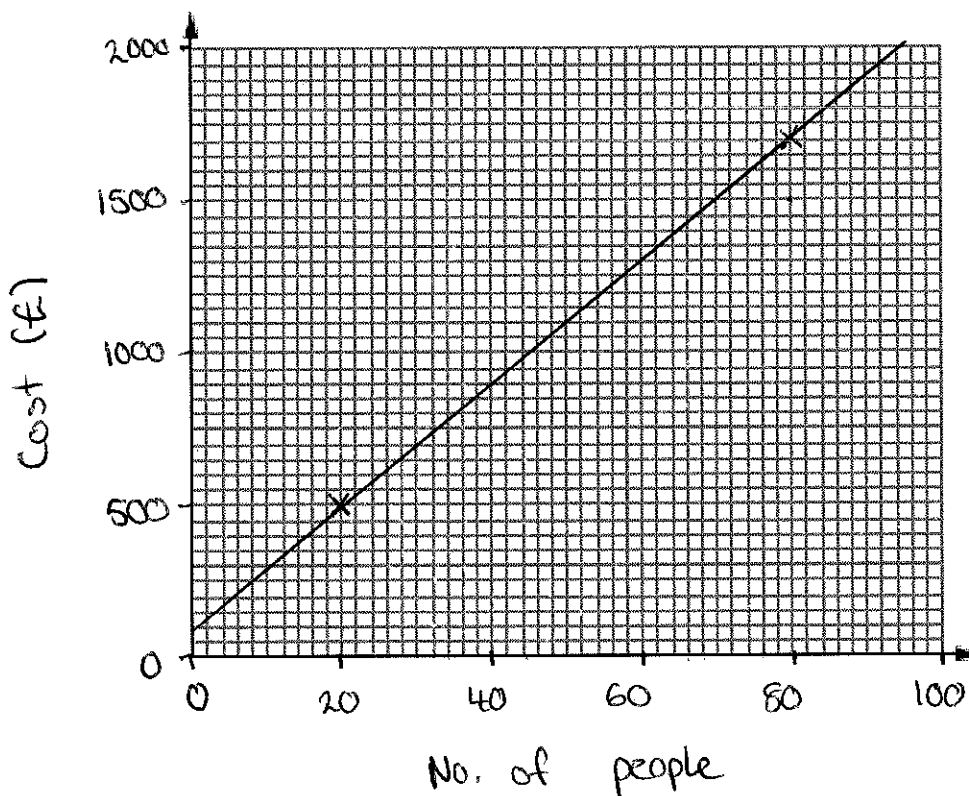
(a) Draw a graph to illustrate the total cost of holding the prom for between 20 and 80 people. Use the graph paper below. [4]

Cost for 20:

$$100 + (20 \times 15) + (20 \times 3) + (20 \times 2) = \text{£}500$$

Cost for 80:

$$100 + (80 \times 15) + (80 \times 3) + (80 \times 2) = \text{£}1700$$



(b) Petra decides to share all the costs equally between the people attending.

- Let  $\pounds P$  be the price paid per person.
- Let  $N$  be the number of people attending the prom.

Write a formula for  $P$ , in terms of  $N$ .

[3]

$$P = \frac{100 + 20}{N}$$

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(c) Hiring a larger room at *Hotel Afonwen* costs  $\pounds 200$ .

The cost per person for food, welcome drinks and decorations remains the same.  
If the total cost is  $\pounds 2240$ , how many people attend?

[2]

$$2240 - 200 = \pounds 2040$$

$$2040 \div 20 = 102 \text{ people.}$$

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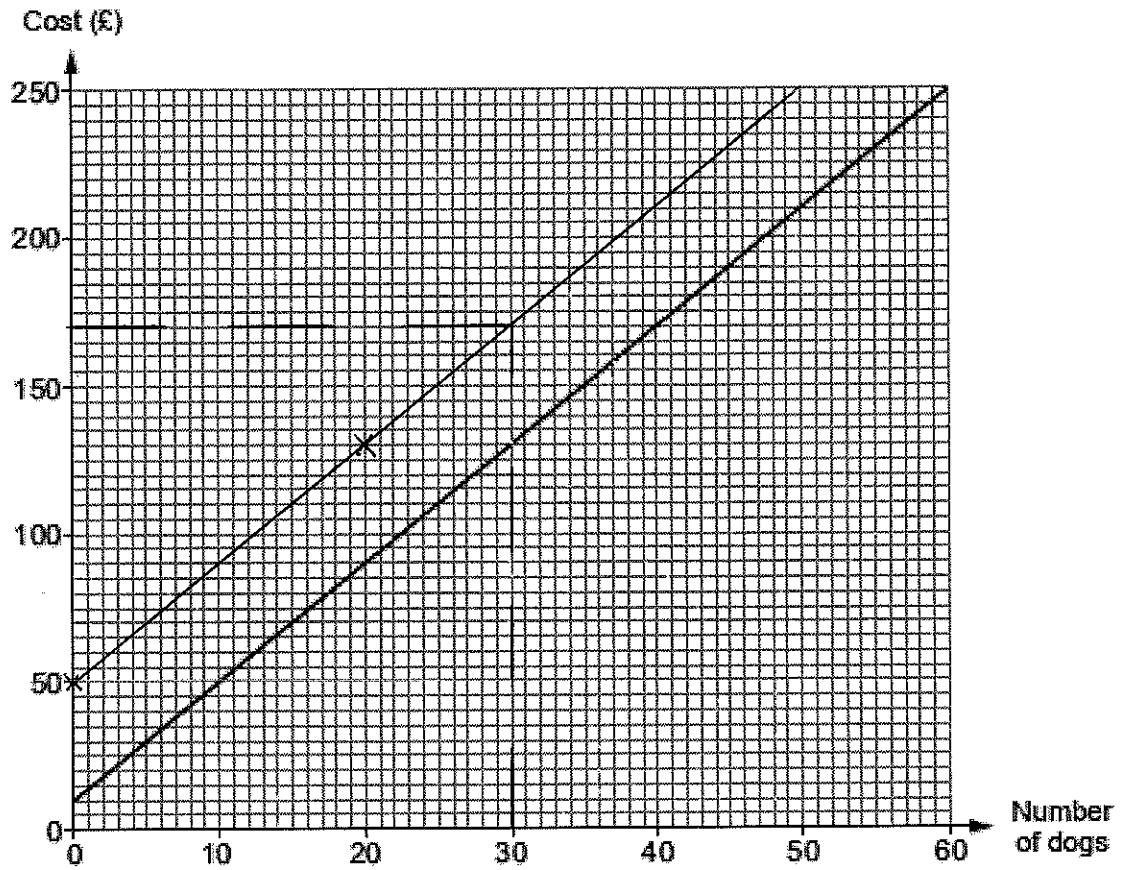
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William owns and runs dog kennels.  
 His costs depend on the number of dogs in the kennels.  
 The running costs for one day are shown on the graph below.



(a) Why does the graph not pass through (0, 0)?

[1]

There is a fixed cost.



- (b) What is the increase in the daily running costs for each additional dog that is kept in the kennels? [2]

$$10 \text{ dogs} = \text{£}50$$

$$50 - 10 = \text{£}40$$

$$40 \div 10 = \text{£}4$$

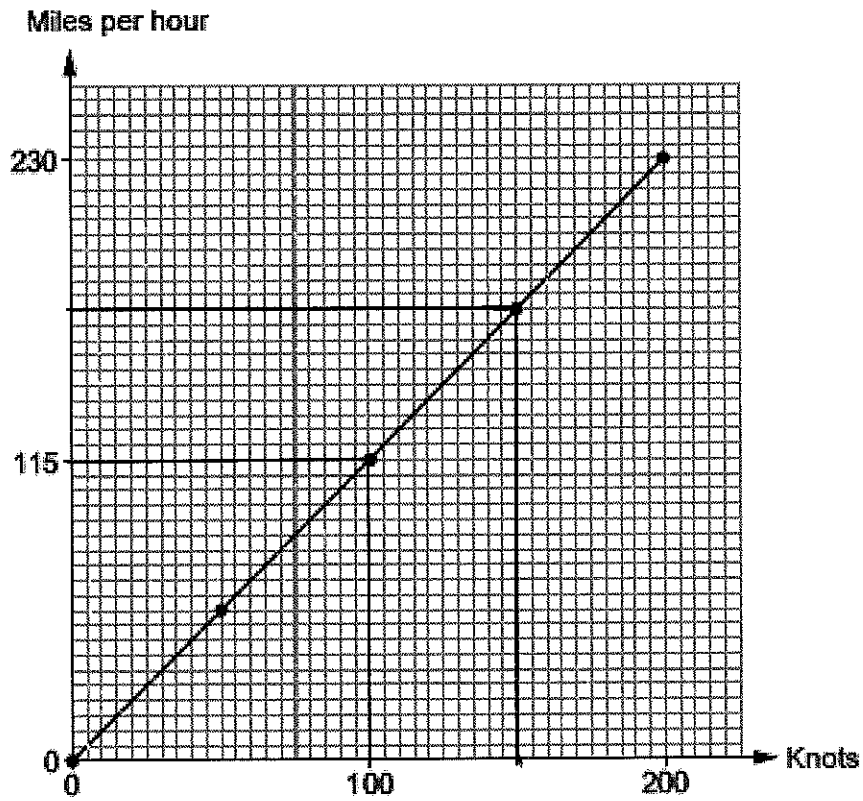
- (c) (i) Freda also runs a dog kennels.  
The cost of keeping 20 dogs in her kennels for one day is £130.  
She knows that as the number of dogs increases, the overall cost increases at the same rate as in William's kennels.

Display this information on the graph paper opposite. [2]

- (ii) Find the cost of keeping 30 dogs for one day in Freda's kennels. [1]

£ 170

Alun has made his own conversion graph to change knots to miles per hour.



(a) Use Alun's conversion graph to write 150 knots in miles per hour.

[1]

$$\frac{(230 + 115)}{2} = 172.5 \text{ mph}$$

2

(b) Nikita thinks Alun's conversion graph may be inaccurate.

Nikita knows that 1000 knots is 1150.779 miles per hour, correct to 3 decimal places.

Convert 20 knots to miles per hour

- using Alun's conversion graph, and then
- using Nikita's values.

Calculate the difference, in miles per hour, between your answers.

Give your answer correct to 2 decimal places.

You must show all your working.

[4]

Alun's conversion graph:

$$100 \text{ knots} = 115 \text{ mph}$$

$$\div 5 \downarrow \div 5$$

$$20 \text{ knots} = 23 \text{ mph}$$

Nikita's knowledge:

$$1000 \text{ knots} = 1150.779 \text{ mph}$$

$$\div 50 \downarrow \div 50$$

$$20 \text{ knots} = 23.02 \text{ mph}$$

Difference:

$$23.02 - 23 = 0.02 \text{ mph}$$

WJEC INTERMEDIATE TIER LOCI CONSTRUCTIONS WORKSHEET

The scale diagram opposite shows an Eisteddfod camping field.

The camping field is 100 metres long and 80 metres wide.

A river runs along the side AB.  
There is a hedge along AD.  
There is a fence along BC.  
DC is an opening with access to the Eisteddfod camping field.

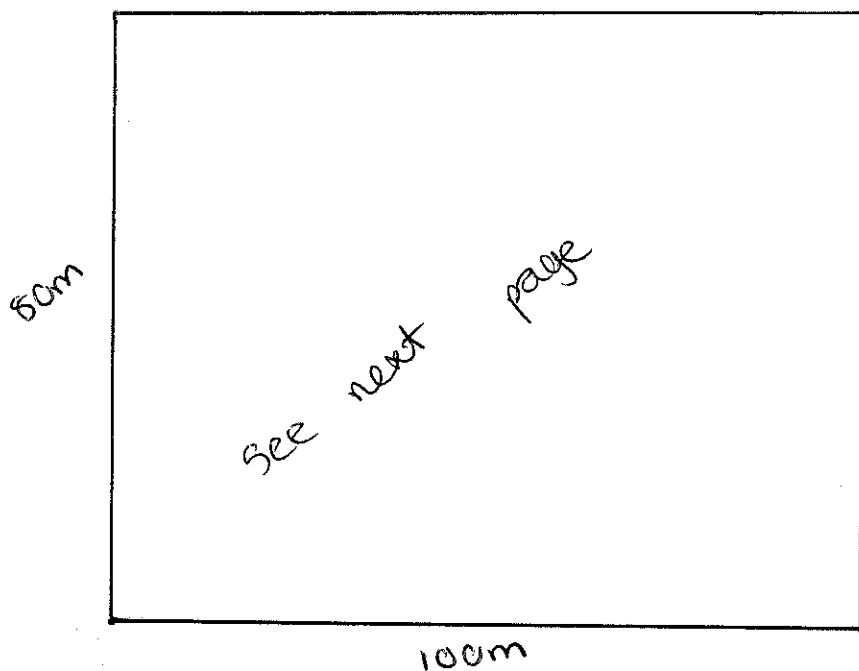
The scale used is 1 cm represents 10 metres.

A barbecue area is to be built on the camping field.

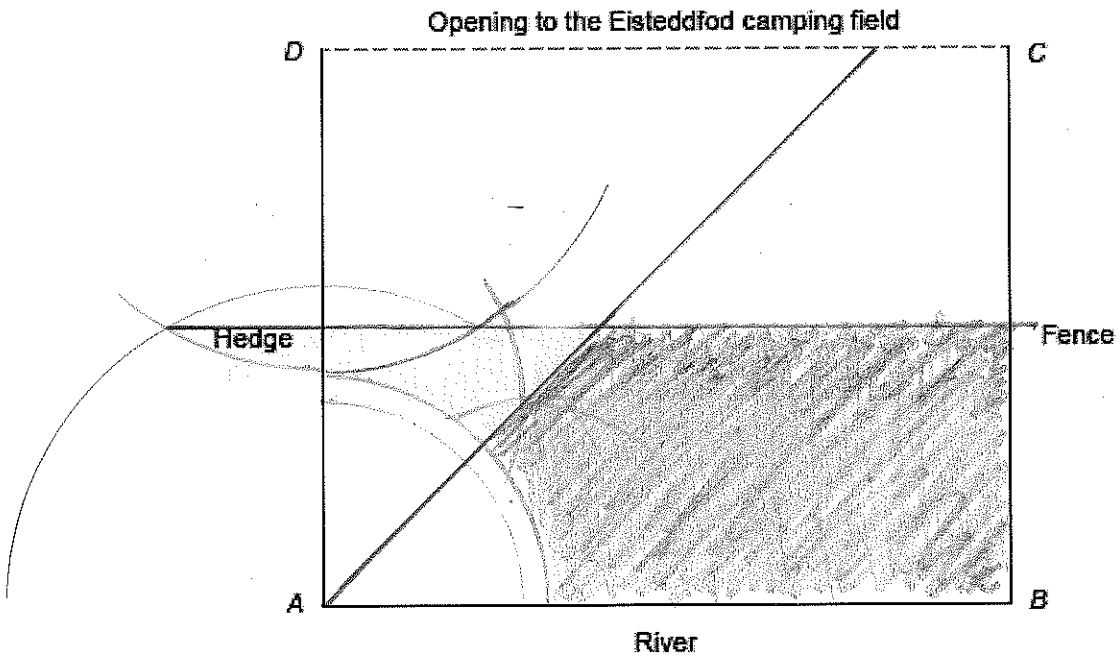
The barbecue area must be

- nearer to the river than to the opening to the Eisteddfod camping field,
- nearer to the river than to the hedge,
- more than 30 metres from the corner of the field where the hedge meets the river.

Draw suitable lines on the diagram and shade the region where the barbecue area could be built. [5]



1 cm represents 10 metres



Kari is making a jigsaw puzzle.  
 She has designed the pattern on a piece of paper.  
 Kari plans to make each piece of the jigsaw a different colour.

Part of her plan is shown below.

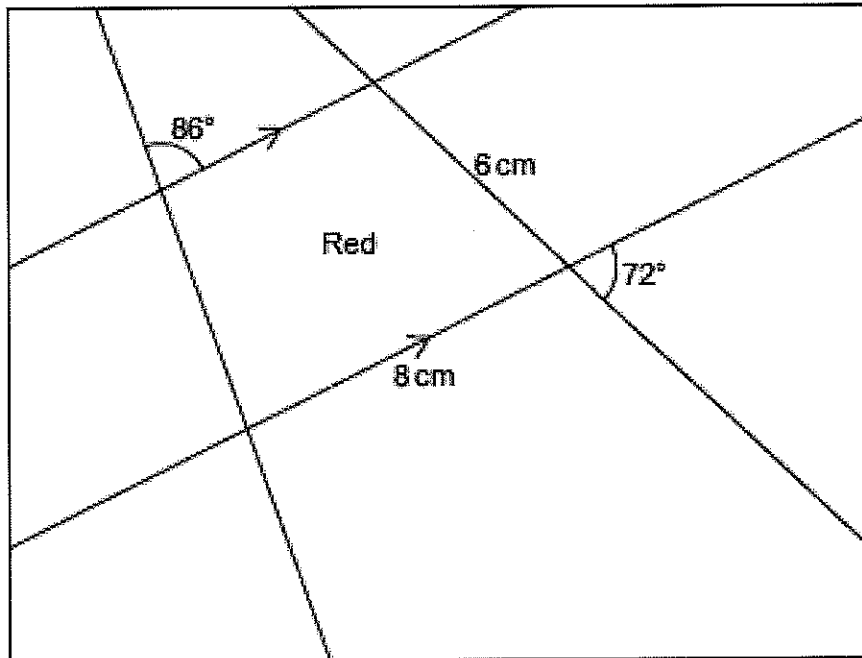
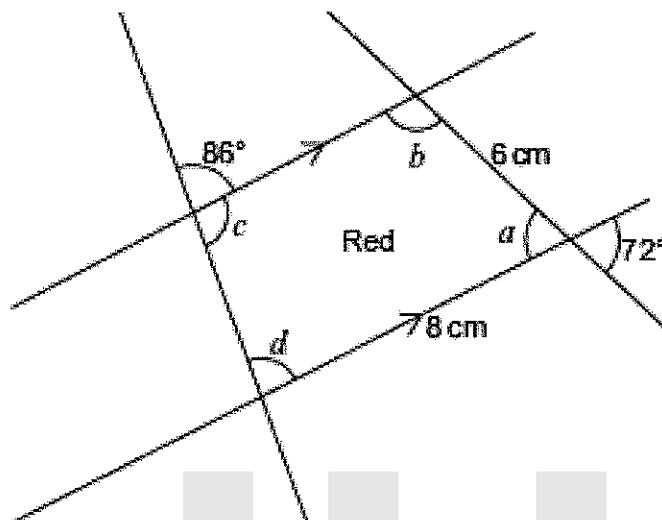


Diagram not drawn to scale

Kari now sketches a diagram of the red piece of the jigsaw, which is shown below.  
 She shows some extended lines and indicates all the angles she needs to find.



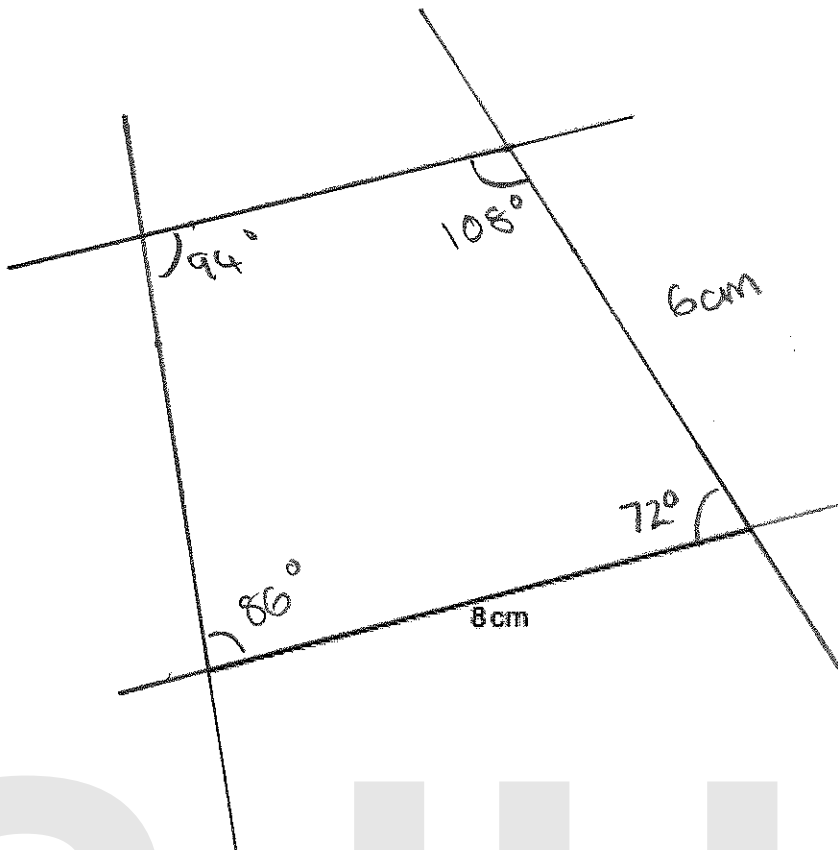
Find the 4 missing angles in the red piece of the jigsaw.  
 Draw the red piece of Kari's jigsaw accurately.  
 One side has been drawn for you.

[6]

$$\begin{array}{r} 180 \\ - 72 \\ \hline 108 \end{array} \qquad \begin{array}{r} 180 \\ - 86 \\ \hline 94 \end{array}$$

$a = 72^\circ$ ,  $b = 108^\circ$ ,  $c = 94^\circ$ ,  $d = 86^\circ$

Space for drawing the red piece of jigsaw:



The diagram below shows a sketch of the existing gas pipes that run to and from Tŷ Gwyn. It also shows a proposed 180m gas pipe which is to be laid to provide gas to Cae Nia. The proposed pipe bisects the angle formed by the existing pipes at Tŷ Gwyn.

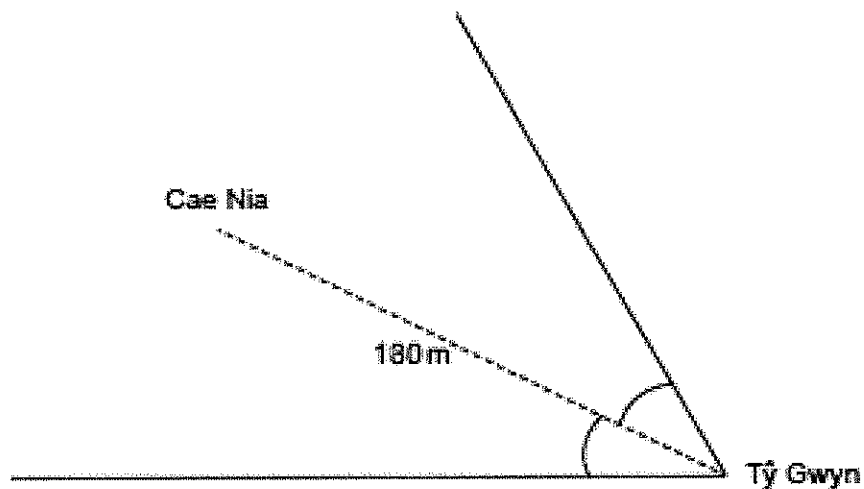


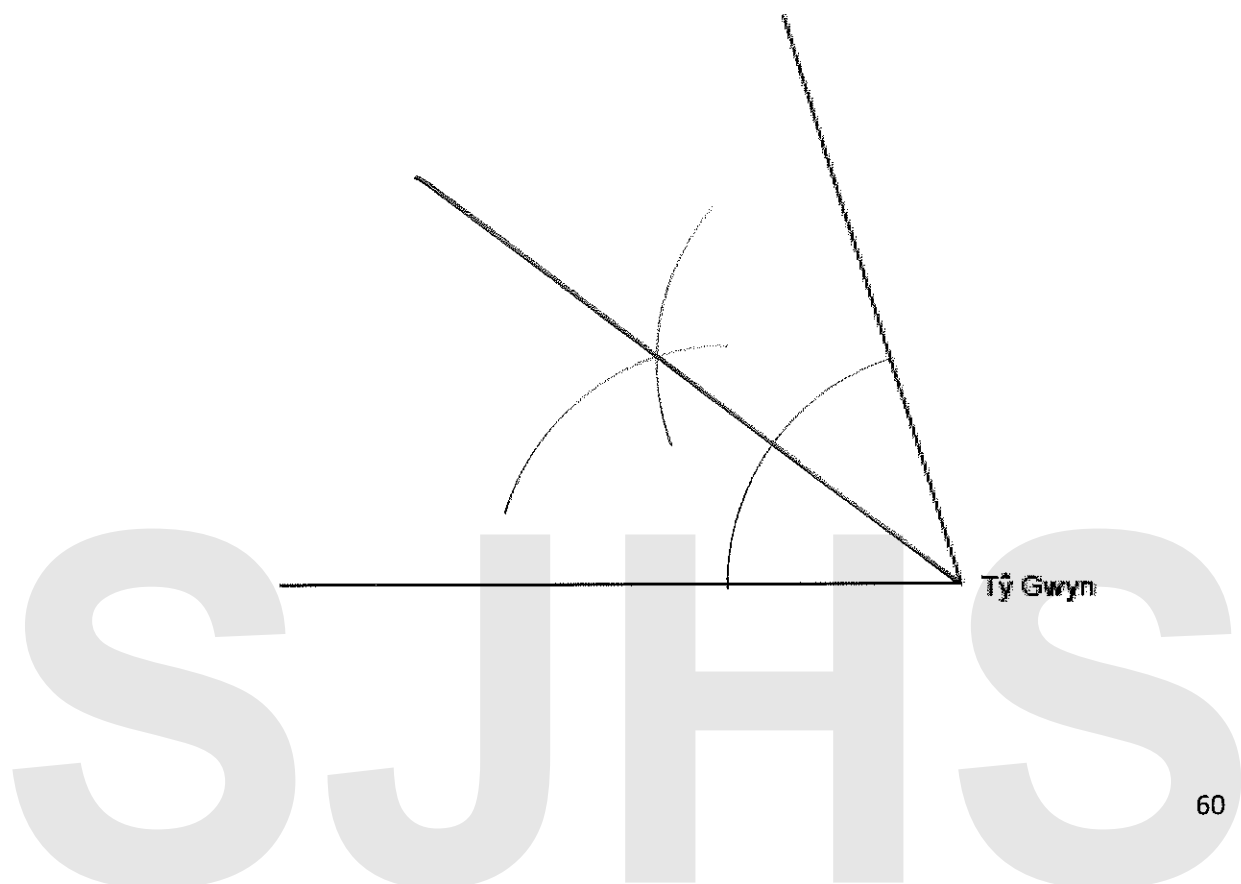
Diagram not drawn to scale

Complete the scale drawing below to show the proposed pipe.

- You must use a pair of compasses to construct the angle bisector.
- Use a scale of 1 cm to represent 20 metres.

[3]

$$\frac{180}{20} = 9\text{cm}$$





- (a) Organics4U is planning to have its headquarters in Wales. The manager has instructed Ffion to look for a site for the headquarters.

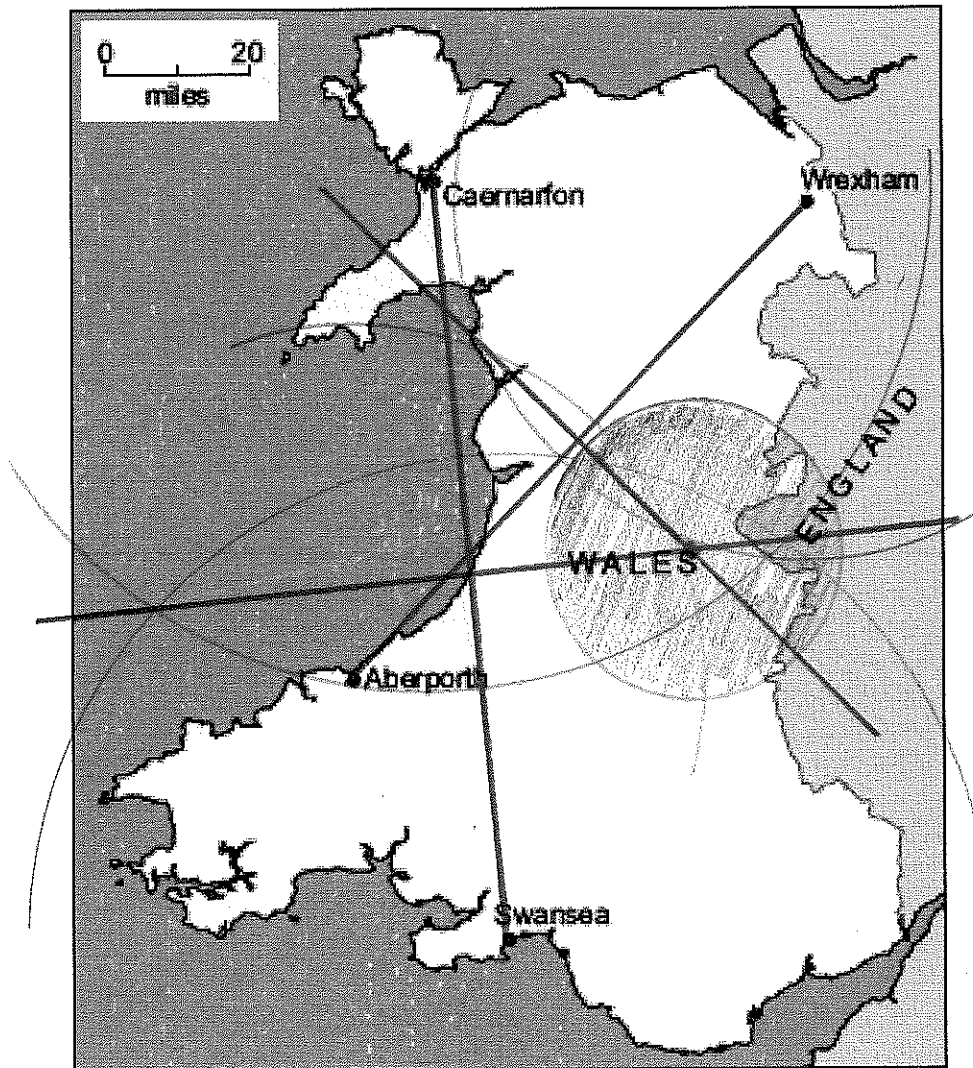
Here are the instructions that Ffion has been given by her manager.

'Find the point that is

- an equal distance between Wrexham and Aberparth, and
- an equal distance between Caernarfon and Swansea.

The new headquarters needs to be within 20 miles of this point.'

On the map below, shade the region, in Wales, that Ffion should identify for her manager. [4]



(b) In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

Organics4U has 16 vehicles on the road every working day.  
The company has 6 vans and 10 trucks.

Ffion has the following information for each type of vehicle.

Type of vehicle	Average distance travelled per litre (km per litre)	Average distance travelled per day (km per day)
Van	8	256
Truck	5.5	704

The fuel used by all of the 16 vehicles costs £1.10 per litre.  
Use this information to calculate the total fuel bill for 1 working day.  
You must show all your working.

[8 + 2 OCW]

Vans:

$$\text{litres used} = \left( \frac{256}{8} \right) \times 6 = 32 \times 6 = 192 \text{ litres}$$

$$\text{Cost of fuel} = 192 \times 1.1 = \text{£}211.20$$

Trucks:

$$\text{litres used} = \left( \frac{704}{5.5} \right) \times 10 = 128 \times 10 = 1280 \text{ litres}$$

$$\text{Cost of fuel} = 1280 \times 1.1 = \text{£}1408$$

Total fuel bill:

$$211.20 + 1408 = \text{£}1619.20$$

- (a) Bronwen and Alvaro decide to keep some alpacas on their farm in Patagonia.



Alvaro knows it is possible to keep between 4 and 6 alpacas on each acre of suitable farmland.

They have 13 hectares of farmland that they want to use to keep the alpacas. Bronwen knows that 1 acre is  $4046.86 \text{ m}^2$  and that  $10000 \text{ m}^2 = 1$  hectare.

Use this information to advise Bronwen and Alvaro on the number of alpacas they could keep on their farmland.

State any assumption that you make.

You must show all your working.

[6]

$$13 \text{ hectares} = 13 \times 10000 = 130000 \text{ m}^2$$

$$130000 \text{ m}^2 = \frac{130000}{4046.86} = 32.12 \text{ acres}$$

$$4046.86$$

Minimum no. of alpacas:

$$32.12 \times 4 = 128.48 \approx 128 \text{ alpacas}$$

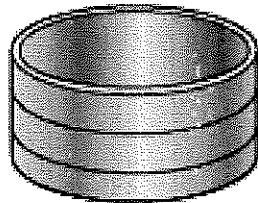
Maximum no. of alpacas:

$$32.12 \times 6 = 192.72 \approx 192 \text{ alpacas}$$

Assumption:

That each alpaca requires the same amount of space.

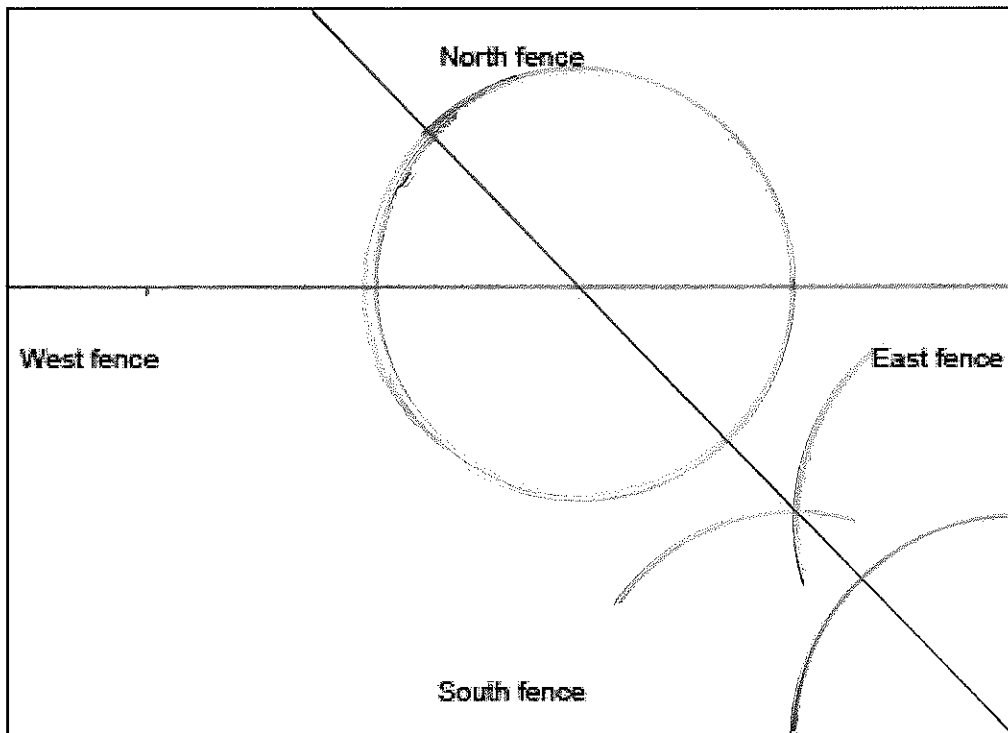
- (b) Bronwen decides to place a cylindrical water container in the small paddock on the farm.



The water container has a diameter of 1.4 metres.

- (i) The scale diagram opposite shows the small paddock on the farm. The small paddock is rectangular, measuring 7 metres by 5 metres.

Scale 2 cm represents 1 m



Bronwen decides to place the centre of the water container so that it is:

- equidistant from the south fence and the east fence,
- 3 metres from the south fence.

Show the placement of the water container on the scale diagram of the small paddock above.

Your diagram should include an accurate plan view of the water container. [4]

(ii) The water container holds 900 litres of water when full.

Calculate the height of the water container in centimetres. [4]

$$V = A \times S \times h$$

$$900000 = \pi \times r^2 \times h$$

$$900000 = \pi \times 70^2 \times h$$

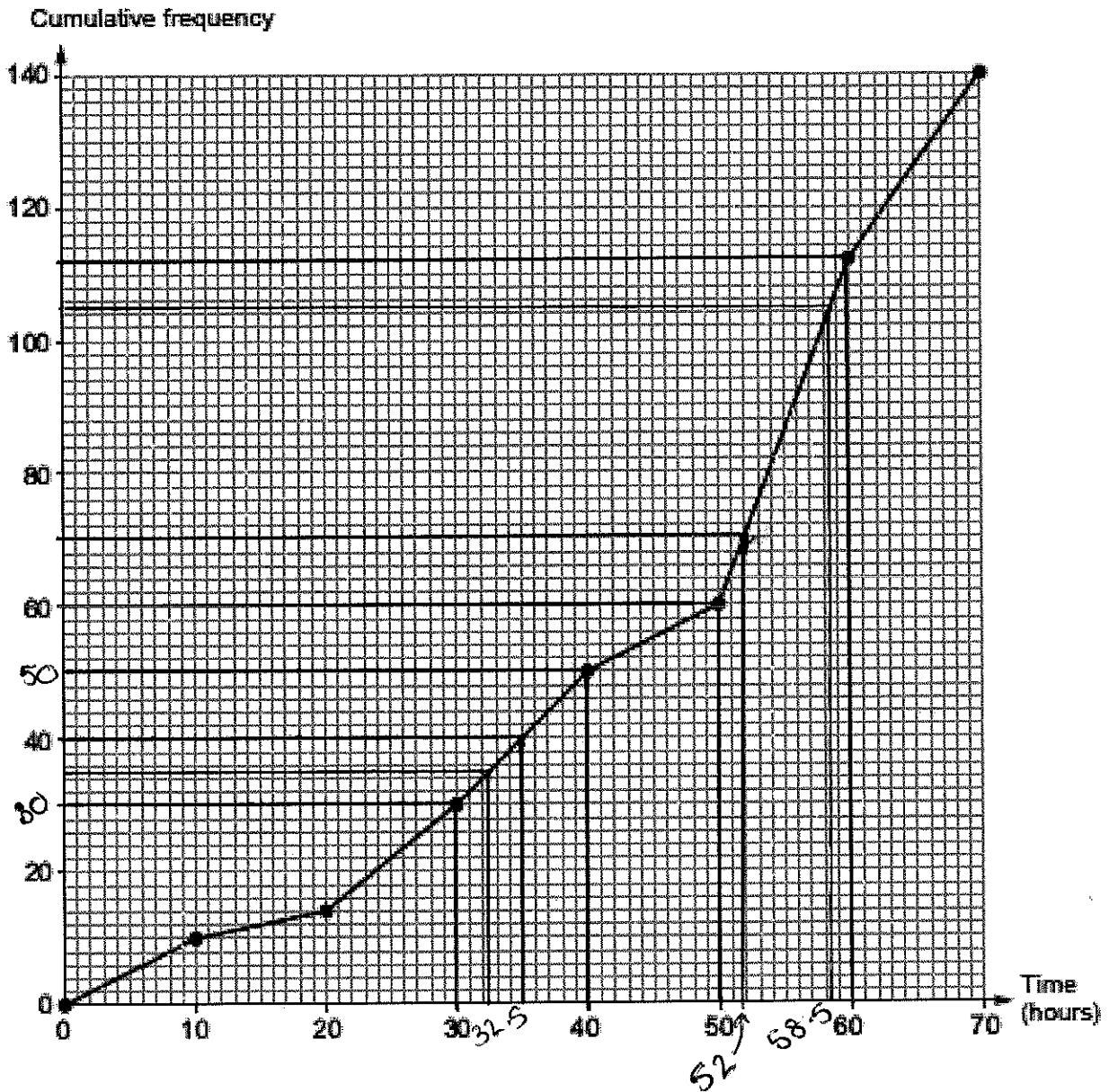
$$h = \frac{900000}{\pi \times 70^2}$$

$$h = 58.5 \text{ cm}$$

The height of the water container is 58.5 cm

WJEC INTERMEDIATE TIER CUMULATIVE FREQUENCY WORKSHEET

11. (a) 140 girls were asked how long they spent revising for their GCSE examinations. The cumulative frequency diagram shows the results.



- (i) Estimate the median time the girls spent revising. Circle your answer.

35 hours      40 hours      48 hours      52 hours      70 hours

[1]

- (ii) Calculate the number of girls who spent between 40 and 50 hours revising. Circle your answer.

0 girls      5 girls      10 girls      15 girls      20 girls

[1]

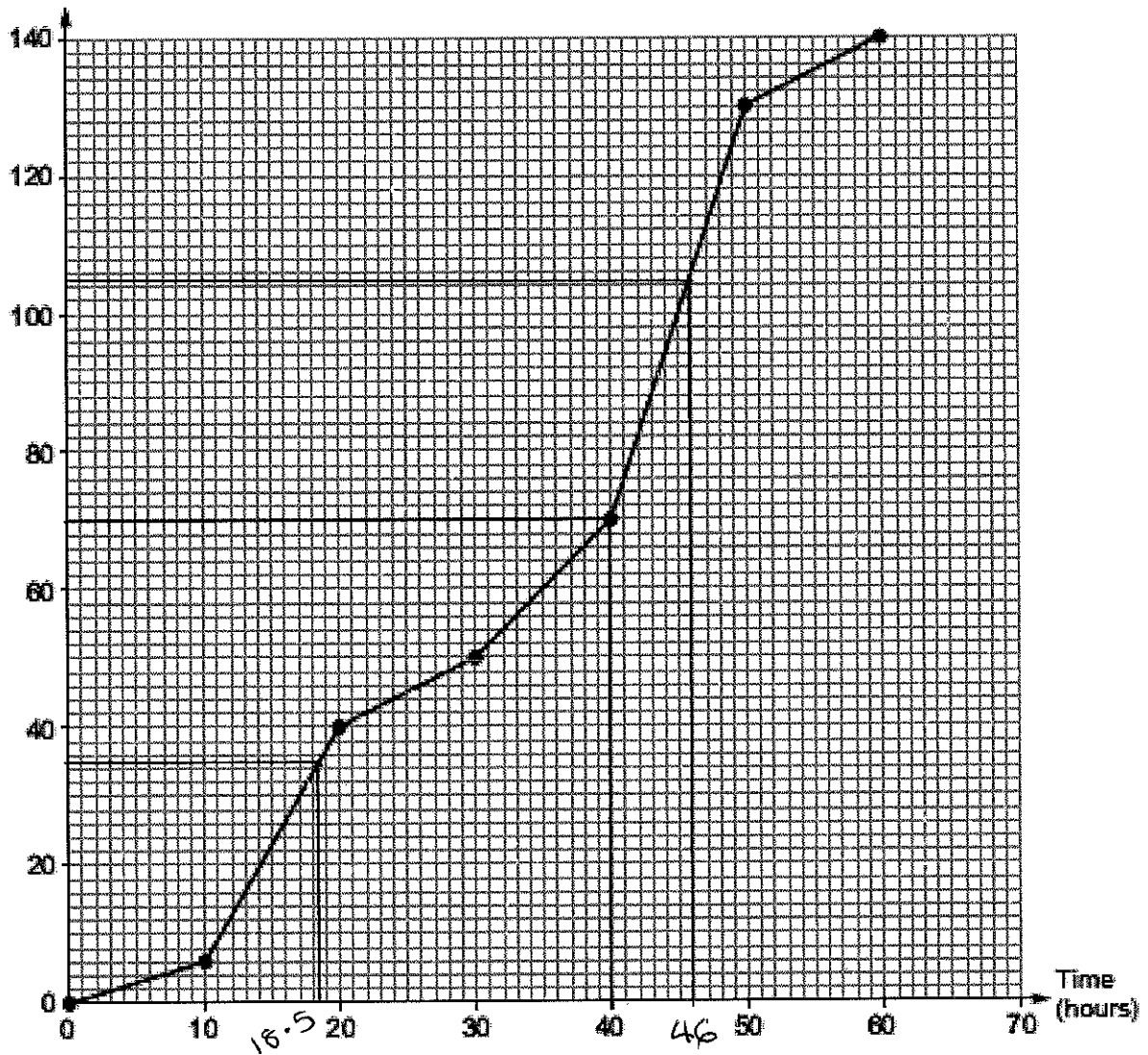
(iii) Circle either TRUE or FALSE for each of the following statements.

[2]

25 girls spent between 30 and 50 hours revising.	TRUE	<u>FALSE</u>
No girls spent more than 80 hours revising.	<u>TRUE</u>	FALSE
The modal group is between 50 and 60 hours spent revising.	<u>TRUE</u>	FALSE
20 girls spent more than 60 hours revising.	TRUE	<u>FALSE</u>

- (b) 140 boys were asked how long they spent revising for their GCSE examinations. The cumulative frequency diagram below shows the results.

Cumulative frequency



Trefor makes two statements.

1. The boys' interquartile range is greater than the girls' interquartile range.
2. On average, boys spent more time revising.

Are both Trefor's statements correct?

Show calculations and give reasons to support your answers.

[4]

Statement 1:  $IQR = UQ - LQ$

$$\text{Boys } IQR = 46 - 18.5 = 27.5$$

$$\text{Girls } IQR = 58.5 - 32.5 = 26$$

Trefor's statement is correct, the boy's interquartile range is greater than the girls'

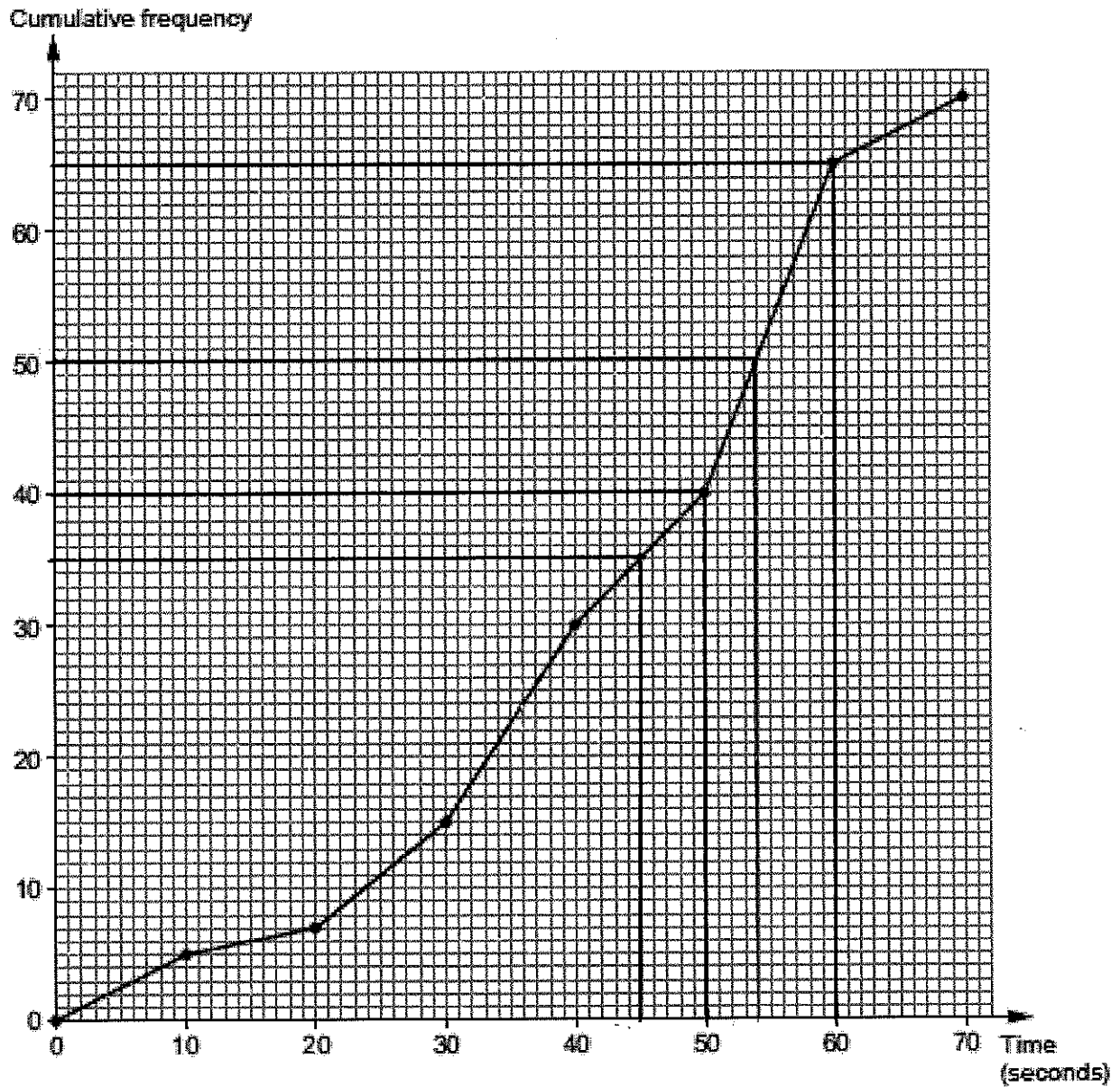
Statement 2: Boys median = 46 hours

Girls median = 52 hours

Trefor's statement is incorrect, the girls spent more time revising on average than the boys.



10. Cambria Airlines has planes that can carry up to 70 passengers. For safety, the crew practise the emergency exit procedures with a group of 70 passengers. Every 10 seconds the safety officer records the total number of passengers who have left the plane. He has displayed the results in the cumulative frequency diagram shown below.



- (a) Estimate the median time taken by the passengers to leave the plane. [1]

45 seconds

$$70 - 40 = 30$$

- (b) How many passengers took more than 50 seconds to leave the plane?  
Circle your answer.

[1]

10

20

30

40

50

- (c) Cambria Airlines has a policy that states the following.

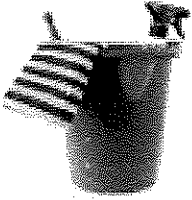
'In the event of an emergency exit procedure, at least 90% of the 70 passengers must have left the plane within 1 minute.'

Did the practice emergency exit procedure meet the requirements of the airline's policy?  
You must show all your working. [4]

$$90\% \text{ of } 70 = \frac{70}{10} \times 9 = 63$$

From the graph 65 people had left the plane within 1 minute 2 more than the 63 required. The practice emergency exit procedure met the requirements.

10.

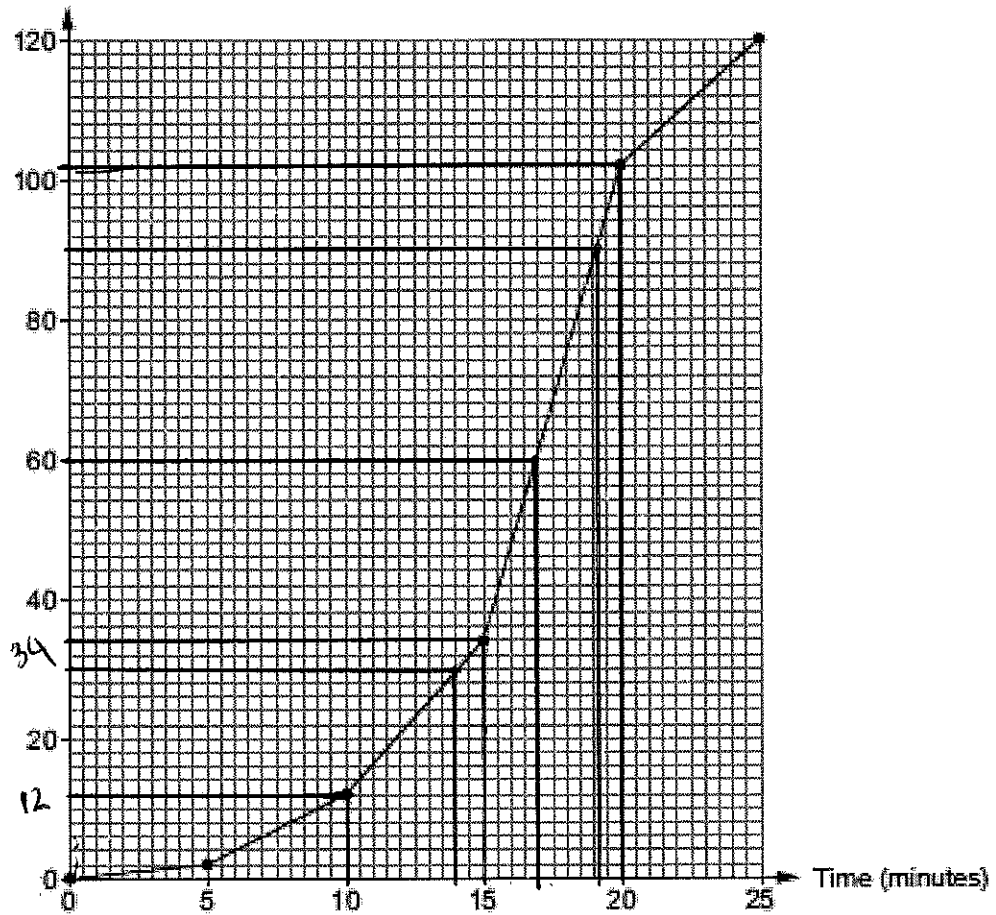


**Meirion's Window Cleaning Business**  
No job too small!  
Email: [meirion@mwcb.cymru](mailto:meirion@mwcb.cymru)

Meirion is a window cleaner.  
From Monday to Friday, he records how long he spends cleaning windows for each of his customers.

He draws a cumulative frequency diagram to display the findings.

Cumulative frequency



- (a) (i) Use Meirion's cumulative frequency diagram to find the median and interquartile range of the times he spends cleaning windows for each of his customers. [3]

Median 17 minutes

$$IQR = UQ - LQ = 19 - 14$$

Interquartile range 5 minutes

- (ii) Meirion looks back at his raw data.  
He finds that the median is actually 17 minutes 30 seconds.  
Why is there a difference between the median from his cumulative frequency diagram and the actual median from his raw data? [1]

This is because Meirion plotted the number of windows cleaned at 5 minute intervals not the time spent cleaning each individual window

- (b) Meirion is looking at the time it took to clean individual customers' windows.  
Find the number of customers whose windows took between 10 and 15 minutes to clean. [2]

$$34 - 12 = 22$$

- (c) Meirion thinks that for approximately 80% of his customers, he cleaned their windows in less than 20 minutes.  
Is Meirion correct?  
You must show all your working. [3]

$$80\% \text{ of } 120 = \frac{120 \times 8}{10} = 96$$

From the graph Meirion cleaned 102 customers windows in less than 20 minutes. Meirion's approximation was close but incorrect

WJEC INTERMEDIATE TIER FORMULA WORKSHEET

Petra is organising a prom for her year group.

The number of people attending the prom is likely to be between 20 and 80.

The cost of holding the prom at *Hotel Afonwen* would be as follows.

- Hire of the room: £100
- Food: £15 per person
- Welcome drink on arrival: £3 per person
- Decorations: £2 per person

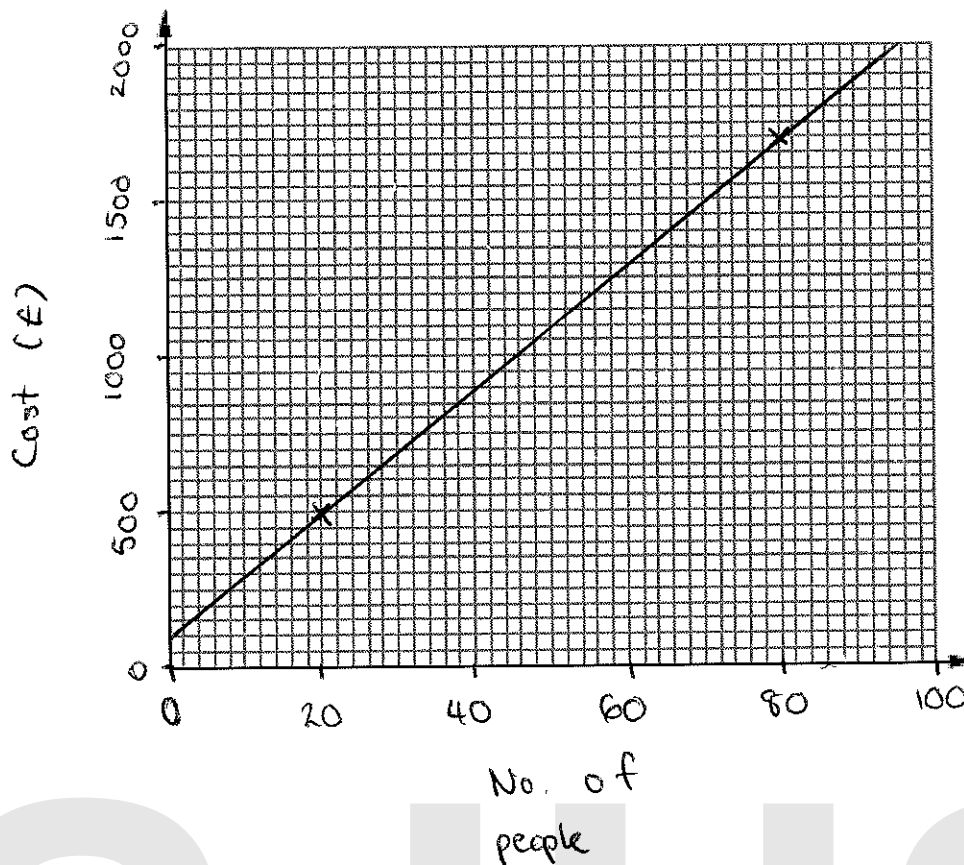
(a) Draw a graph to illustrate the total cost of holding the prom for between 20 and 80 people. Use the graph paper below. [4]

Cost for 20 people:

$$100 + (20 \times 15) + (20 \times 3) + (20 \times 2) = \text{£}500$$

~~100~~ Cost for 80 people:

$$100 + (80 \times 15) + (80 \times 3) + (80 \times 2) = \text{£}1700$$



(b) Petra decides to share all the costs equally between the people attending.

- Let  $\pounds P$  be the price paid per person.
- Let  $N$  be the number of people attending the prom.

Write a formula for  $P$ , in terms of  $N$ .

[3]

$$P = \frac{100 + 20}{N}$$

(c) Hiring a larger room at *Hotel Aforwen* costs  $\pounds 200$ .

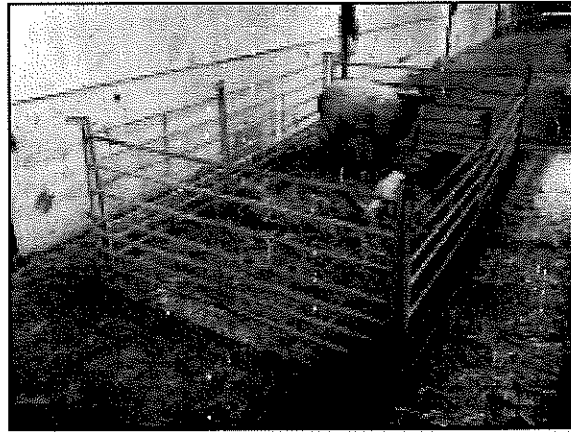
The cost per person for food, welcome drinks and decorations remains the same.  
If the total cost is  $\pounds 2240$ , how many people attend?

[2]

$$2240 - 200 = 2040$$

$$2040 \div 20 = 102$$

Bethan builds a rectangular sheep pen.



- (a) The perimeter fence of the sheep pen is 18 m long.  
It costs her £1.10 for every 0.5 metres of fencing used to make the sheep pen.

(i) Calculate the cost of the fencing used to make this sheep pen. [2]

$$\text{£}1.10 = 0.5 \text{ m}$$

$$\times 2 \downarrow \times 2$$

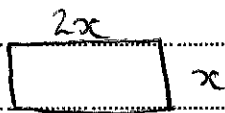
$$\text{£}2.20 = 1 \text{ m}$$

$$\times 18 \downarrow \times 18$$

$$\text{£}39.60 = 18 \text{ m}$$

Cost is £ 39.60

- (ii) The length of Bethan's sheep pen is two times its width.  
Find the length and width of this sheep pen.  
You must show your working. [2]



$$2x + x + 2x + x = 18$$

$$6x = 18$$

$$\div 6 \downarrow \div 6$$

$$x = 3 \text{ m}$$

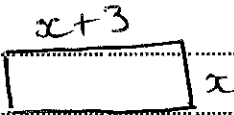
Length is 6 metres

Width is 3 metres

- (b) Bethan decides to build a new sheep pen.  
The perimeter fence of the new sheep pen is 16 m long.  
The length of the new sheep pen is 3 metres longer than the width.

Form an equation and solve it to find the dimensions of this new sheep pen.

[3]

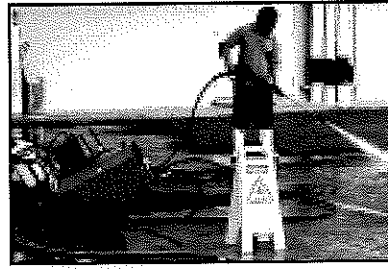
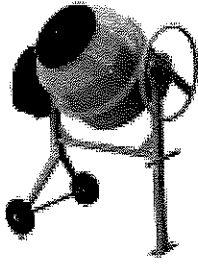

$$\begin{aligned}x+3 + x+3 + x + x &= 16 \\4x + 6 &= 16 \\-6 \downarrow -6 & \\4x &= 10 \\\div 4 \downarrow \div 4 & \\x &= 2.5\text{m}\end{aligned}$$

Length is 5.5 metres

Width is 2.5 metres



6. Truetoof is a tool hire company.



Hire charges	
The cost of hiring a cement mixer in £:	$13 \times \text{number of days} + 26$
The cost of hiring a jet washer in £:	$9 \times \text{number of days} + 38$

- (a) Sara hires a cement mixer for 5 days and a jet washer for 7 days from Truetoof. How much change would she get from £200? [3]

Cement mixer:

$$13 \times 5 + 26 = 65 + 26 = \text{£}91$$

Jet washer:  $9 \times 7 + 38 = 63 + 38 = \text{£}101$

Total cost:

$$91 + 101 = \text{£}192$$

Change:

$$200 - 192 = \text{£}8$$

- (b) Geraint hired a cement mixer for a number of days. Lois hired a jet washer for the same number of days. They each paid the same amount of money. For how many days did they each hire these tools from Truetoof? You must show all your working. [3]

$$13x + 26 = 9x + 38$$

$$-9x \downarrow -9x$$

$$4x + 26 = 38$$

$$-26 \downarrow -26$$

Number of days 3

$$4x = 12$$

$$\div 4 \downarrow \div 4$$

$$x = 3$$

7. (a) The Headteacher of Ysgol Bro Gwyn investigates building a new bike shed.

Bike sheds are built on a rectangular base of width  $x$  metres and length  $y$  metres.

(i) Which is the correct expression for the perimeter of the bike shed?

Circle your answer.

[1]

$xy$  metres

$xy$  square metres

$x + y$  metres

$2x + y$  metres

$2x + 2y$  metres

(ii) The Headteacher is given a formula for working out the number of bikes,  $b$ , that can be stored in a bike shed that has a base of width  $x$  metres and length  $y$  metres.

He is told the formula only works when

- $x$  and  $y$  are whole numbers
- $x$  is greater than 3
- $y$  is greater than 5

The formula is as follows:

$$b = \frac{6xy}{5}$$

• According to the formula, how many bikes can be stored in a bike shed 5 metres wide and 8 metres long?

Circle your answer.

[1]

3

7

42

48

240

• A bike shed  $x$  metres wide and  $y$  metres long can hold  $b$  bikes.

According to the details the Headteacher has been given, what is the formula for calculating the length,  $y$  metres?

Circle your answer.

[1]

$$y = \frac{b-5}{6x}$$

$$x = \frac{6b}{5y}$$

$$y = \frac{b+5}{6x}$$

$$y = \frac{5b}{6x}$$

$$y = \frac{6x}{5b}$$

$$b = \frac{6xy}{5}$$

$$\times 5 \downarrow \times 5$$

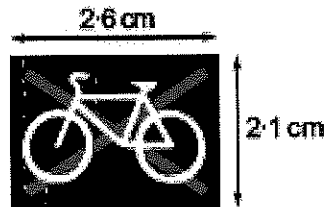
$$5b = 6xy$$

$$\div 6x \downarrow \div 6x$$

$$\frac{5b}{6x} = y$$

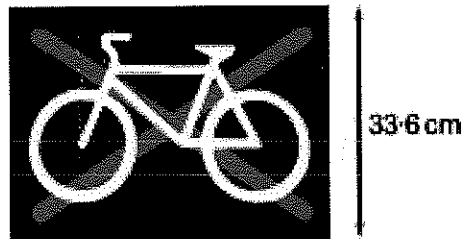
- (b) The Headteacher decides to place signs around the school site to stop pupils using their bikes on grassed areas.

He introduces a new sign to pupils in the school newsletter.  
The size of the sign in the newsletter is shown below.



*Diagram not drawn to scale*

A mathematically similar new sign is placed near the side of the playing field.



*Diagram not drawn to scale*

It is 33.6 cm high.  
How wide is this sign?

[2]

$$kSF = \frac{33.6}{2.1} = 16$$

$$\text{width} = 16 \times 2.6 = 41.6 \text{ cm}$$

Width is 41.6 cm

(a) Gustav is making some scones for his sister's birthday party.

**Recipe to make 12 scones**

450g self raising flour  
2 teaspoons of baking powder  
75g butter  
50g caster sugar  
2 eggs  
225ml milk

Bake at 428°F for 10 to 15 minutes

(i) How much self raising flour will Gustav need to make 30 scones?  
Circle your answer.

[1]

900g                  1000g                  1100g                  1125g                  1350g

$\frac{30}{12} = 2.5$                    $450 \times 2.5 = ~~1080~~ 1125g$

(ii) In the recipe, the temperature of the oven is given in degrees Fahrenheit, F.  
The temperature gauge on Gustav's oven shows degrees Celsius, C.

The formula below is used to convert Fahrenheit into Celsius.

$$C = \frac{5F - 160}{9}$$

At what temperature should Gustav bake the scones?  
Give your answer in degrees Celsius.

[2]

$C = \frac{5 \times 428 - 160}{9} = \frac{2140 - 160}{9} = \frac{1980}{9} = 220$

220 °C

- (b) Gustav also makes a birthday cake for his sister. The top face of the cake is in the shape of a trapezium.

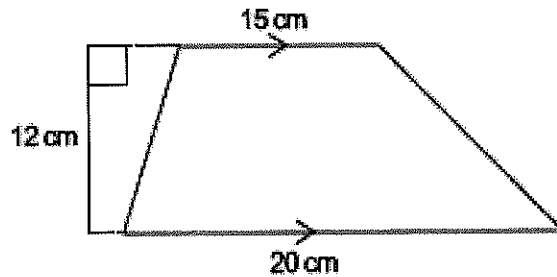


Diagram not drawn to scale

Gustav plans to ice the top face of the cake. Each packet of icing costs £1.35 and is enough to cover  $65 \text{ cm}^2$ . He has to buy complete packets of icing.

- (i) Calculate the area of the top face of the cake Gustav has made. [2]

$$A = \frac{1}{2}(a+b) \times h = \frac{1}{2}(15+20) \times 12 = 210 \text{ cm}^2$$

- (ii) How much will it cost Gustav to ice the top face of the cake? You must show all your working. [3]

$$\frac{210}{65} = 3.23 \approx 4 \quad 4 \times 1.35 = \text{£}5.40$$

- (iii) Gustav also plans to decorate the cake with small pieces of marzipan shaped as shown below.

The top face of each piece of marzipan is a rhombus. Will these pieces of marzipan tessellate?

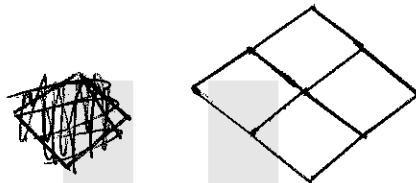


Yes

No

Draw a simple diagram to support your answer.

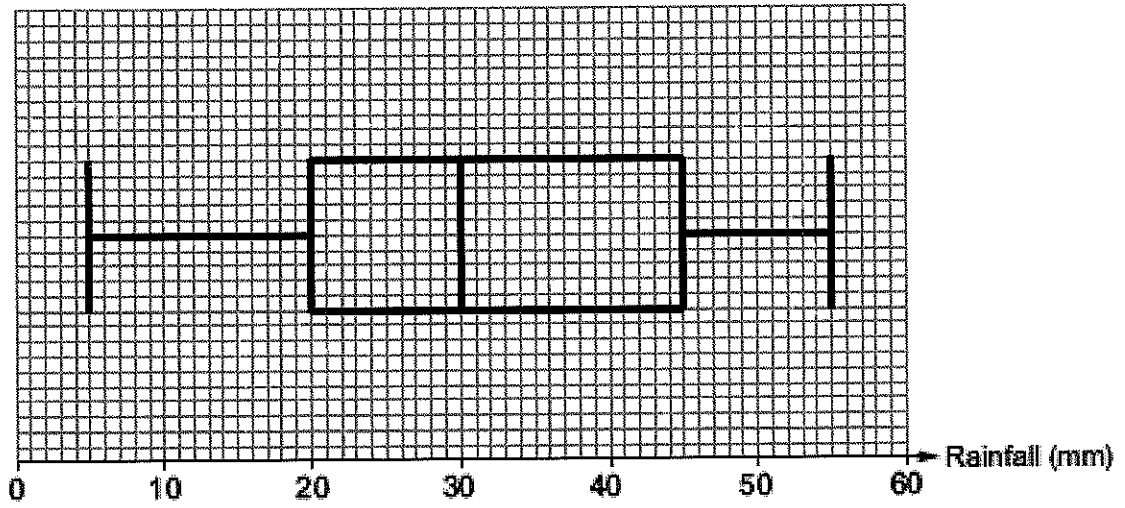
[1]



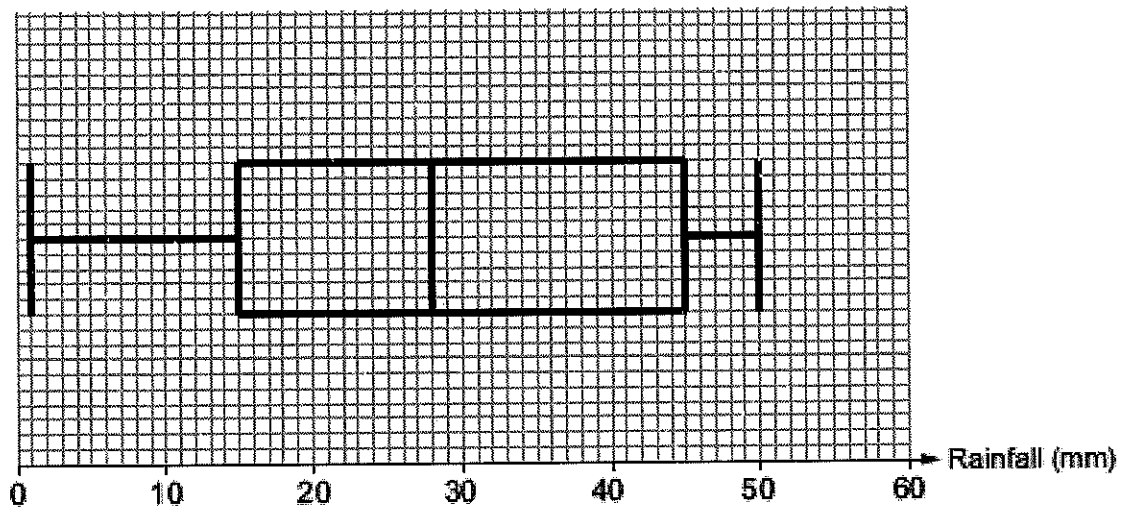
WJEC INTERMEDIATE TIER BOX PLOTS WORKSHEET

The following box-and-whisker plots illustrate the daily rainfall for April 2016 in Trefwen and in Nawrby.

April rainfall in Trefwen



April rainfall in Nawrby



(a) Complete the following table.

[4]

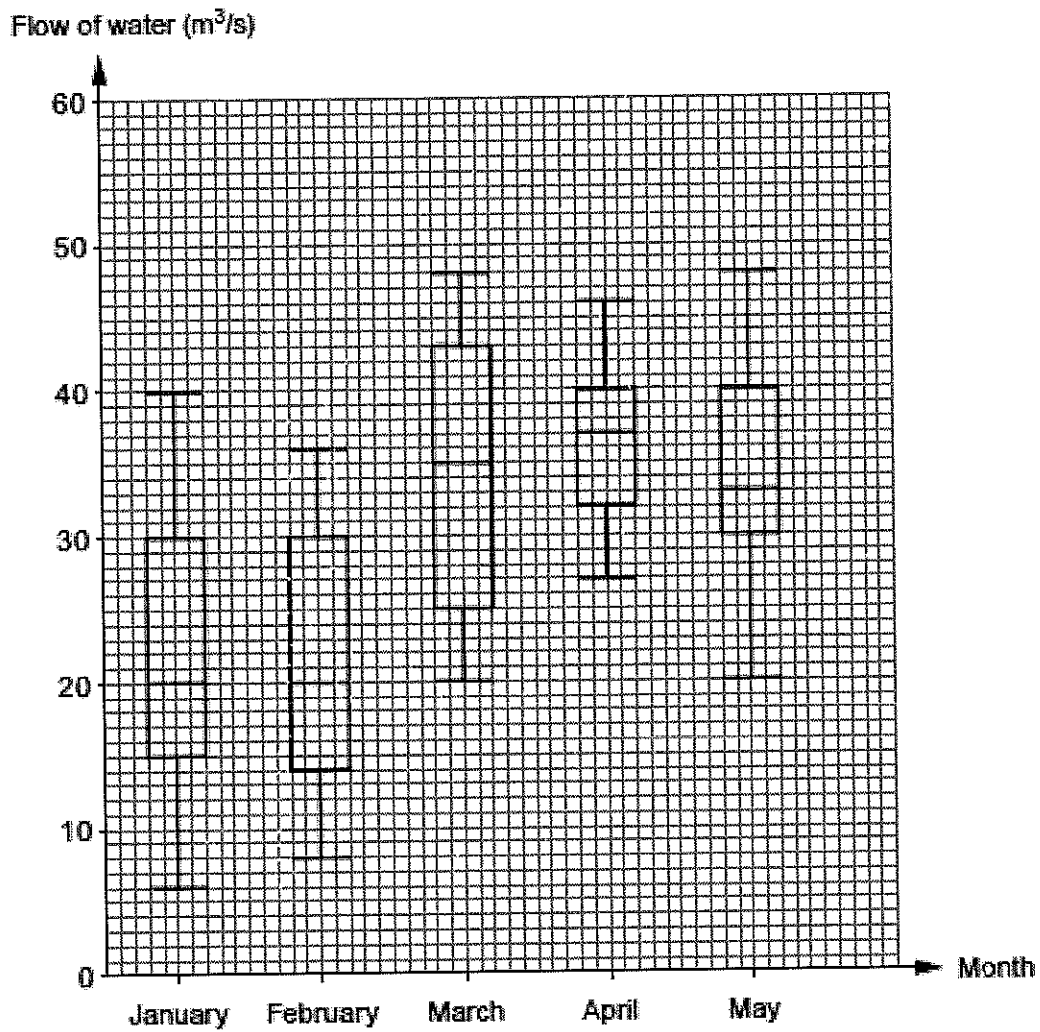
	Range	Median	Interquartile range
Trefwen	50 mm	30 mm	25 mm
Nawrby	49 mm	28 mm	30 mm

(b) Iona is going on holiday next April.  
She is hoping for good weather, with hardly any rain.  
She decides to go to Nawrby.  
Give a reason to support Iona's decision.  
Include values for both Trefwen and Nawrby.

[1]

Nawrby's decision is supported by the median rainfall (28 vs. 30) indicating on average there is less rainfall in Nawrby than Trefwen.

The following box and whisker plots show the flow of water through a drain, measured in  $\text{m}^3/\text{s}$ . The flow of water was measured at 11 a.m. each day for the first 5 months of the year.



(a) In which of the five months was the median flow of water the greatest? [1]

..... April .....

.....



(b) In which of the five months was the range of the flow of water the greatest? [1]

January

(c) Iona is writing some statements for a report on the flow of water through the drain. Complete each of the statements given below.

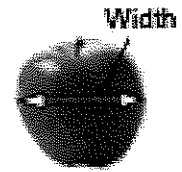
(i) 'Both the upper quartiles and medians in the months of January and February were the same.' [1]

(ii) '25% of the results in March show the flow of water was greater than 4.3 m<sup>3</sup>/s.' [1]

(d) Circle either TRUE or FALSE for each of the following statements. [2]

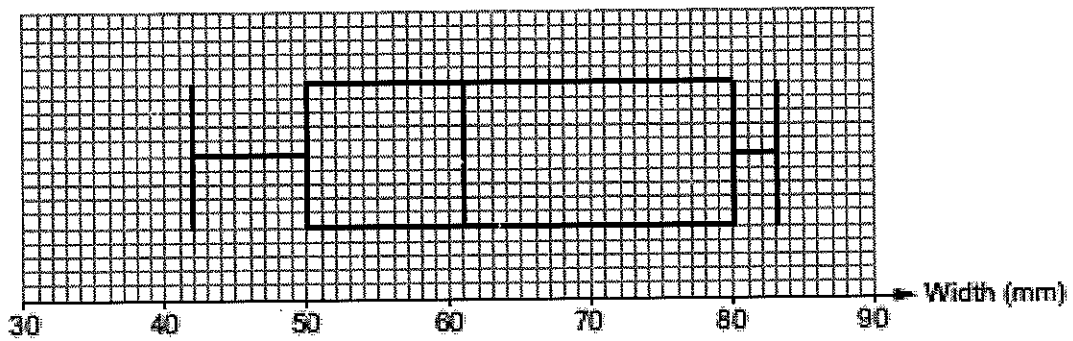
25% of the results in January show the flow of water was less than 6 m <sup>3</sup> /s.	TRUE	<input checked="" type="radio"/> FALSE
The units, m <sup>3</sup> /s, measure the volume of water passing through the drain each second.	<input checked="" type="radio"/> TRUE	FALSE
The mean flow of water in April was certainly greater than 36 m <sup>3</sup> /s.	TRUE	<input checked="" type="radio"/> FALSE
The month with the greatest difference between the lower quartile and the median was May.	TRUE	<input checked="" type="radio"/> FALSE

Lena has three apple trees in her garden.  
 She has one Gala apple tree, one Orange Pippin tree and one Pink Lady tree.  
 She picks 50 apples from each of the 3 trees.  
 She records the width of each apple, as shown.

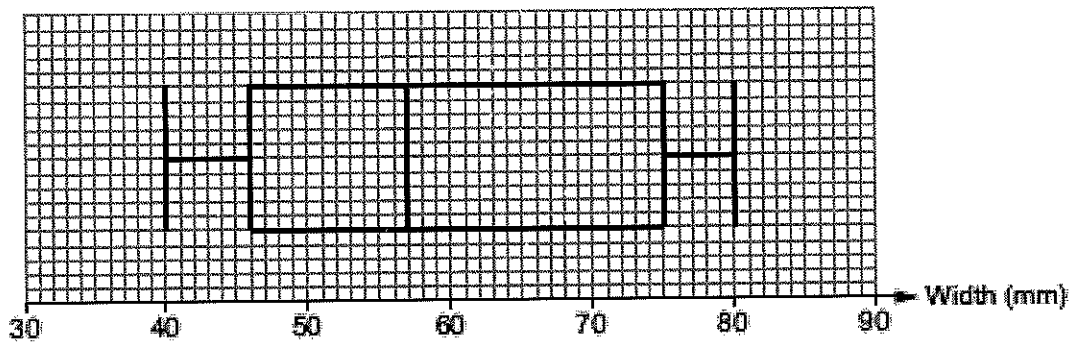


Lena constructs box and whisker diagrams for the widths of the apples collected from each of the three trees.

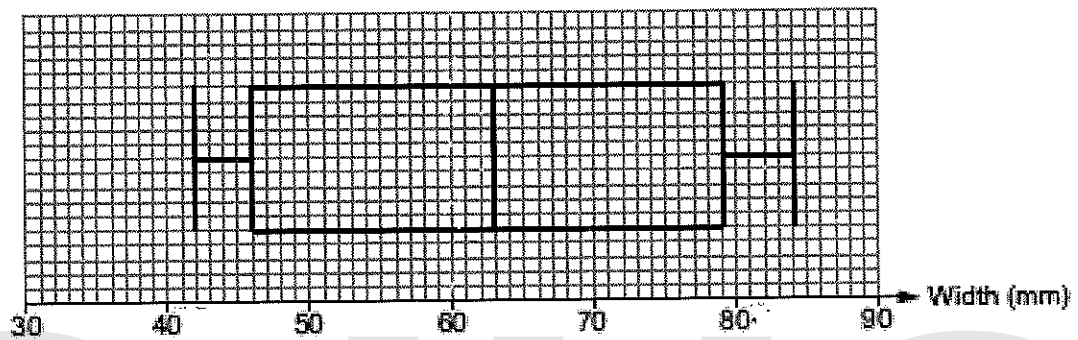
Gala apple tree



Orange Pippin apple tree



Pink Lady apple tree



(a) Complete each of the following statements.

(i) 'Apples from the Orange Pippin apple tree have the least median width.

The median width of apples recorded for this tree is 57 mm.' [1]

(ii) 'The range of the widths of apples recorded for the Gala apple tree is 41 mm.'

[1]

(iii) 'The Pink lady apple tree has apples with the greatest interquartile range of widths.

The interquartile range of the widths of apples recorded for this tree is 33 mm.'

[2]



(b) Which tree has a higher proportion of larger apples?  
You must give a reason for your answer.

[1]

Pink lady apple tree because it has  
the highest median to maximum meaning  
half of the apples have a width between  
63 to 84.

WJEC INTERMEDIATE PERIMETER AND AREA WORKSHEET

In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

	<b>Maes Alun Camping Charges</b>	
Tents covering ground area:		
• less than or equal to $12\text{ m}^2$	cost	£14 per night
• greater than $12\text{ m}^2$	cost	£16 per night
<u>AND</u>		
Charge per person: £4 per night		
Stay 5 nights and get the next night completely free. This means no charge for tents or people on every 6 <sup>th</sup> night.		

Rhodri and Lars are planning a camping holiday, staying at Maes Alun Camping. They are going to

- take only one tent between them,
- take a tent covering a rectangular ground area, measuring 2.5 metres by 4.4 metres,
- both stay for a total of 12 nights.

Their holiday is just 8 weeks away.

They each plan to save £15 per week from now until their holiday in 8 weeks' time.

Will the amount they save be enough to pay for their holiday?

You must show all your working.

[B + 2 OCW]

Area:  $2.5 \times 4.4 = 11\text{ m}^2$  Money saved:  $2 \times 8 \times 15 = \text{£}240$

Cost of tent:  $14 \times 10 = \text{£}140$  They have enough to go on holiday

Cost for people:  $2 \times 4 \times 10 = \text{£}80$

Total cost:  $140 + 80 = \text{£}220$

Lazar wants to send a package to Germany.  
He looks at pricing charts for three different companies, ParcelMax, DirectGo and Pack2save.

<b>ParcelMax</b>
Total cost = Sum of the 3 dimensions in cm $\times$ £0.60
<b>DirectGo</b>
Total cost = Volume measured in $\text{cm}^3 \times$ £0.01
<b>Pack2save</b>
Total cost = Total area of all 6 faces measured in $\text{cm}^2 \times$ £0.02

Lazar's parcel is a cuboid measuring 10 cm by 20 cm by 30 cm.

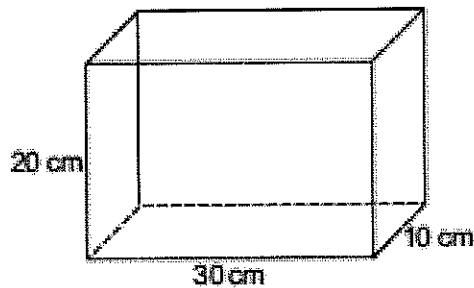


Diagram not drawn to scale

- (a) Find the cost of sending the parcel for each of the three different companies.  
Give each of your answers in pounds (£).

(i) ParcelMax [2]

$$\begin{aligned} & (20 + 30 + 10) \times 0.6 \\ & = 60 \times 0.6 \\ & = \pounds 36 \end{aligned}$$

(ii) DirectGo [3]

$$\begin{aligned} & (20 \times 30 \times 10) \times 0.01 \\ & = 6000 \times 0.01 \\ & = \pounds 60 \end{aligned}$$

(iii) Pack2save

[4]

$$\begin{aligned} & ((2 \times 20 \times 30) + (2 \times 20 \times 10) + (2 \times 30 \times 10)) \times 0.02 \\ &= (1200 + 400 + 600) \times 0.02 \\ &= 2200 \times 0.02 \\ &= £44 \end{aligned}$$

(b) What is the percentage saving that Lazar will make by choosing the cheapest option rather than the most expensive option? [2]

$$\begin{aligned} & 100 - \left( \frac{36}{60} \times 100 \right) \\ &= 100 - 60 \\ &= 40\% \end{aligned}$$

Bethan builds a rectangular sheep pen.



- (a) The perimeter fence of the sheep pen is 18 m long.  
It costs her £1.10 for every 0.5 metres of fencing used to make the sheep pen.

- (i) Calculate the cost of the fencing used to make this sheep pen. [2]

$$\text{£}1.10 = 0.5 \text{ m}$$

$$\times 2 \downarrow \times 2$$

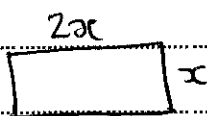
$$\text{£}2.20 = 1 \text{ m}$$

$$\times 18 \downarrow \times 18$$

$$\text{£}39.60 = 18 \text{ m}$$

Cost is £ 39.60

- (ii) The length of Bethan's sheep pen is two times its width.  
Find the length and width of this sheep pen.  
You must show your working. [2]



$$2x + 2x + x + x = 18$$

$$6x = 18$$

$$\div 6 \downarrow \div 6$$

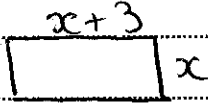
$$x = 3$$

Length is 6 metres

Width is 3 metres

- (b) Bethan decides to build a new sheep pen.  
The perimeter fence of the new sheep pen is 16 m long.  
The length of the new sheep pen is 3 metres longer than the width.

Form an equation and solve it to find the dimensions of this new sheep pen. [3]


$$x+3 + x+3 + x + x = 16$$
$$4x + 6 = 16$$
$$-6 \downarrow -6$$
$$4x = 10$$
$$\div 4 \downarrow \div 4$$
$$x = 2.5$$

Length is 5.5 metres

Width is 2.5 metres



- (b) Gustav also makes a birthday cake for his sister.  
The top face of the cake is in the shape of a trapezium.

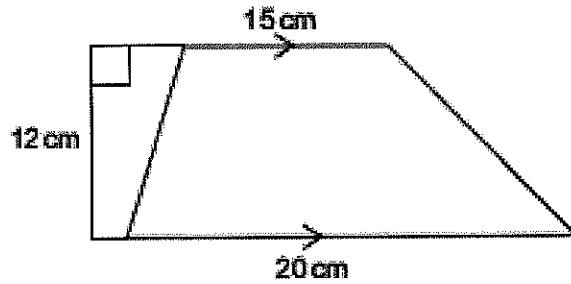


Diagram not drawn to scale

Gustav plans to ice the top face of the cake.  
Each packet of icing costs £1.35 and is enough to cover 65 cm<sup>2</sup>.  
He has to buy complete packets of icing.

- (i) Calculate the area of the top face of the cake Gustav has made. [2]

$$A = \left( \frac{a+b}{2} \right) \times h = \left( \frac{20+15}{2} \right) \times 12 = 210 \text{ cm}^2$$

- (ii) How much will it cost Gustav to ice the top face of the cake?  
You must show all your working. [3]

$$\frac{210}{65} = 3.23 \approx 4 \quad 4 \times 1.35 = \pounds 5.40$$

- (iii) Gustav also plans to decorate the cake with small pieces of marzipan shaped as shown below.  
The top face of each piece of marzipan is a rhombus.  
Will these pieces of marzipan tessellate?

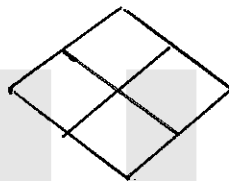


Yes

No

Draw a simple diagram to support your answer.

[1]



- (a) Bronwen and Alvaro decide to keep some alpacas on their farm in Patagonia.



Alvaro knows it is possible to keep between 4 and 6 alpacas on each acre of suitable farmland.

They have 13 hectares of farmland that they want to use to keep the alpacas. Bronwen knows that 1 acre is  $4046.86 \text{ m}^2$  and that  $10000 \text{ m}^2 = 1$  hectare.

Use this information to advise Bronwen and Alvaro on the number of alpacas they could keep on their farmland.

State any assumption that you make.

You must show all your working.

[6]

$$13 \text{ hectares} = 13 \times 10,000 = 130,000 \text{ m}^2$$

$$130,000 \text{ m}^2 = \frac{130,000}{4046.86} = 32.12 \text{ acres}$$

$$\text{Minimum no.} = 32.12 \times 4 = 128.48 \approx 128 \text{ alpacas}$$

of alpacas

$$\text{Maximum no.} = 32.12 \times 6 = 192.72 \approx 192 \text{ alpacas}$$

of alpacas

Assumption:

Each alpaca needs the same space.

Bethan has a plan of her rectangular lawn, which she has labelled ABCD. She wants to cut out a triangular flowerbed from her lawn, labelled GHD. Bethan decides that  $AG : GD$  should be  $1 : 2$  and that  $DH = HC$ .

She has made a sketch shown below.

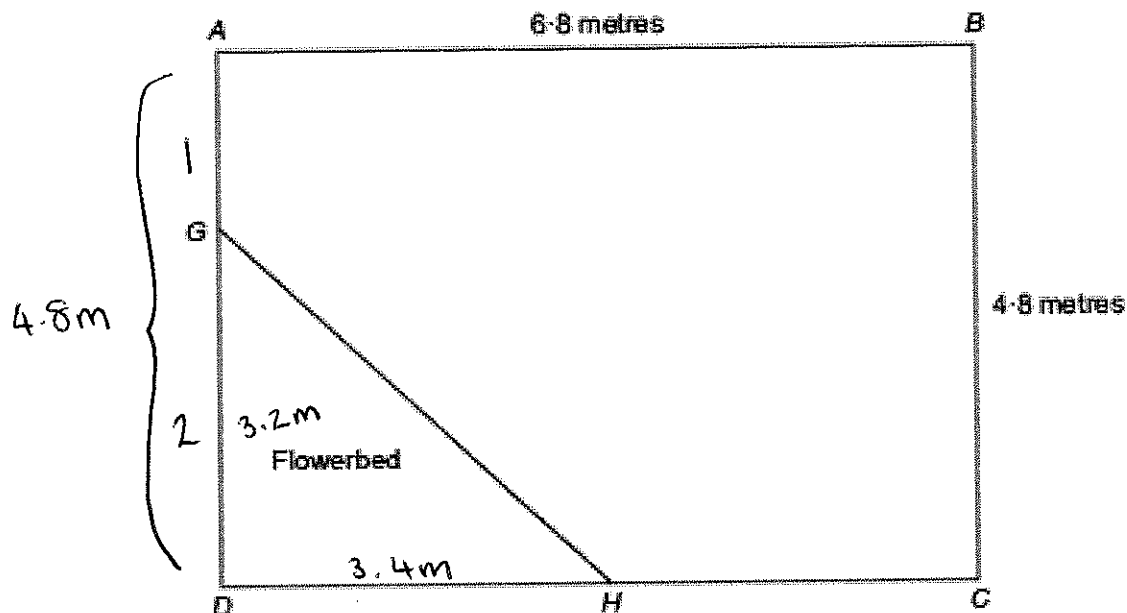


Diagram not drawn to scale

(a) Calculate the length of GH.

[4]

$$A: 1 + 2 = 3$$

$$6.8 \div 2 = 3.4m$$

$$D: \frac{4.8}{3} = 1.6m$$

3

$$a^2 + b^2 = c^2$$

$$AM: 1.6 \times 1 = 1.6m$$

$$3.2^2 + 3.4^2 = c^2$$

$$1.6 \times 2 = 3.2m$$

$$21.8 = c^2$$

$$\sqrt{\quad} \downarrow \sqrt{\quad}$$

$$4.7m = c$$

(b) The flowerbed, GHD, is to have a flexible edging strip placed around its perimeter. The edging strip costs £3.50 per metre and can only be bought in strips of complete metres.

- How much will the edging strip cost Bethan?
- What length of strip will be left over?  
Give your answer in centimetres.

[4]

Perimeter :  $3.2 + 3.4 + 4.7 = 11.3\text{m}$

Need to buy 12m strip.

Cost of strip :  $12 \times 3.5 = £42$

strip left :  $12 - 11.3 = 0.7\text{m} = 0.7 \times 100 = 70\text{cm}$

Cost £ 42

70 cm left over

WJEC INTERMEDIATE PYTHAGORAS WORKSHEET

The wire window guard shown below is to be made.

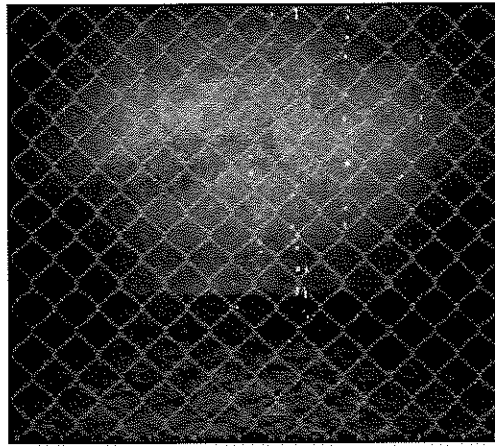


Diagram not drawn to scale

The length of the sides of each small wire square shown is 3.3 cm.

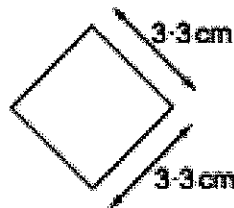


Diagram not drawn to scale

Linos considers the length of the diagonal of each small square.

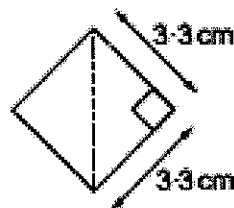


Diagram not drawn to scale

She says,

The height of the window guard is equal to 9.5 diagonals of the square.  
The width of the window guard is equal to 11 diagonals of the square.

- (a) Calculate the length of the diagonal of a small square.  
Give your answer correct to 1 decimal place.

[3]

$$\begin{aligned} a^2 + b^2 &= c^2 \\ 3.3^2 + 3.3^2 &= c^2 \\ 21.78 &= c^2 \\ \sqrt{\quad} \downarrow \sqrt{\quad} & \\ 4.7 \text{ cm} &= c \end{aligned}$$

- (b) Calculate the area of the window guard.  
You must show all your working.

[3]

$$\begin{aligned} \text{Height: } & 9.5 \times 4.7 = 44.65 \text{ cm} \\ \text{width: } & 11 \times 4.7 = 51.7 \text{ cm} \end{aligned}$$

$$\begin{aligned} A &= b \times h \\ &= 44.65 \times 51.7 \\ &= 2308.4 \text{ cm}^2 \end{aligned}$$

Marta buys a new television.

- (a) Marta wants to fit the television in a bookcase on the wall. In the shop she forgot to write down the length of the television. She did write down the height and the diagonal of the screen.

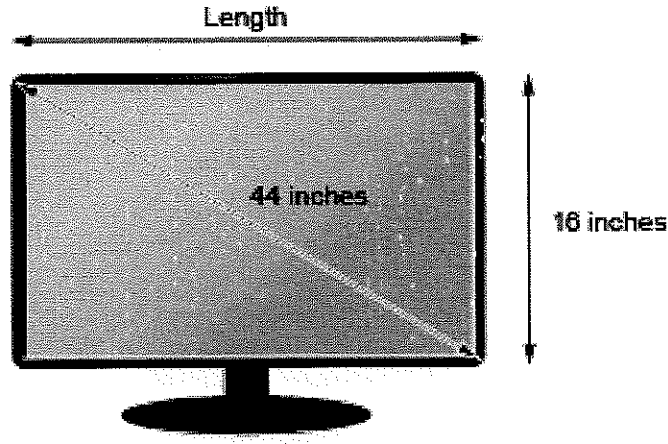


Diagram not drawn to scale

Marta needs to know the length of the screen before she opens the box, in case she wants to return the television.

Calculate the length of the screen.

Give your answer correct to 2 significant figures.

[4]

$$c^2 - a^2 = b^2$$

$$44^2 - 16^2 = b^2$$

$$1680 = b^2$$

$$\sqrt{\quad} \downarrow \sqrt{\quad}$$

$$41 \text{ in} = b$$

Length is 41 inches, correct to 2 significant figures.

Bethan has a plan of her rectangular lawn, which she has labelled ABCD. She wants to cut out a triangular flowerbed from her lawn, labelled GHD. Bethan decides that  $AG : GD$  should be  $1 : 2$  and that  $DH = HC$ .

She has made a sketch shown below.

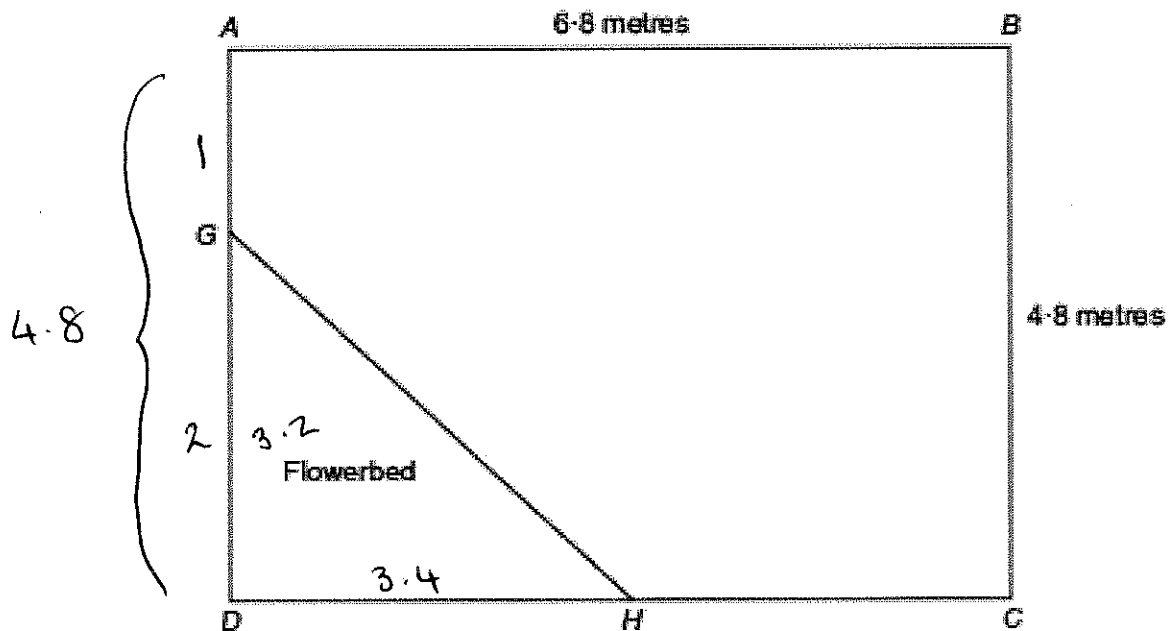


Diagram not drawn to scale

(a) Calculate the length of GH.

[4]

$$A: 1 + 2 = 3$$

$$6.8 \div 2 = 3.4$$

$$D: \frac{4.8}{3} = 1.6$$

$$a^2 + b^2 = c^2$$

$$AM: 1 \times 1.6 = 1.6$$

$$3.2^2 + 3.4^2 = c^2$$

$$2 \times 1.6 = 3.2$$

$$21.8 = c^2$$

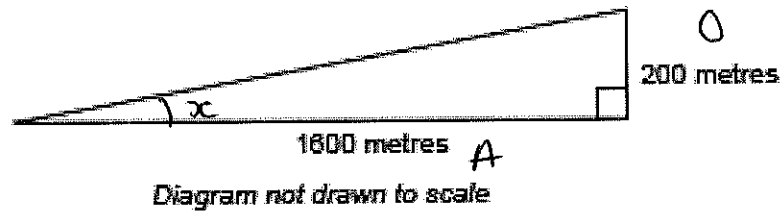
$$\sqrt{\quad} \downarrow \sqrt{\quad}$$

$$4.7m = c$$



WJEC INTERMEDIATE TRIGONOMETRY WORKSHEET

(b) The diagram shows the cross-section of one part of her run.



Calculate the angle of elevation of the road.

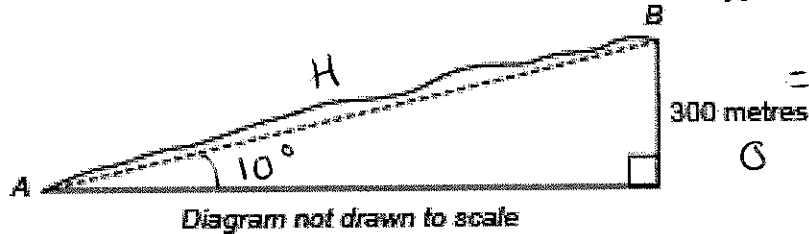
[3]

SOH CAH **TOA**  $\tan \theta = \frac{O}{A}$   $\tan x = \frac{200}{1600}$

$\tan^{-1} \downarrow \tan^{-1}$   
 $x = \tan^{-1}\left(\frac{200}{1600}\right)$

$= 7.1^\circ$

(c)



Gwenda runs on another section of uneven road from A to B. The rise in this section of the road is 300 metres. The angle of elevation of B from A is 10°.

(i) Calculate an estimate of how far Gwenda has run. State any assumption you have made.

[4]

**SOH** CAH TOA  $\sin \theta = \frac{O}{H}$   $\sin 10 = \frac{300}{H}$

$\times H \downarrow \times H$

$H \times \sin 10 = 300$

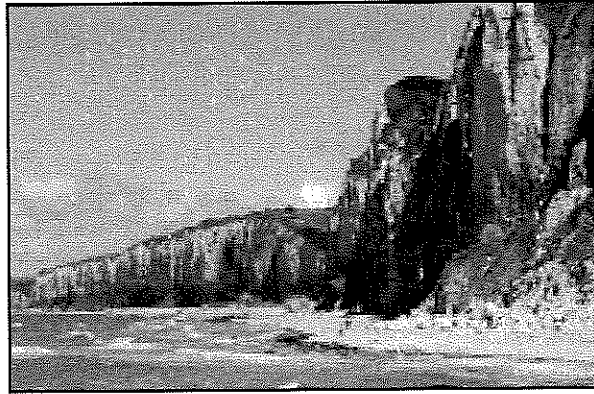
Assumption: Road is flat

$\div \sin 10 \downarrow \div \sin 10$

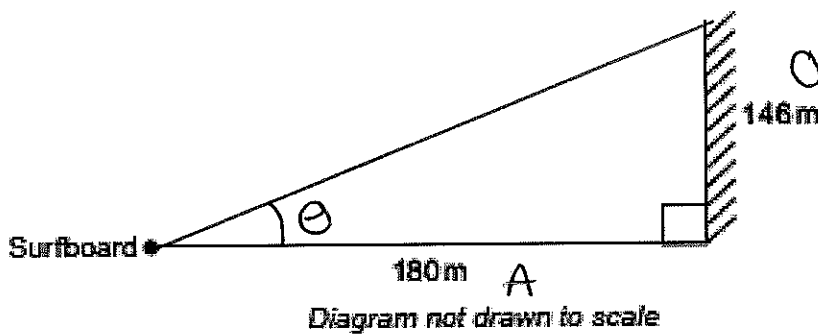
$H = \frac{300}{\sin 10} = 1727.6\text{m}$

(ii) What is the impact of your assumption on your answer?

It means my answer is not accurate & is likely an underestimate as the road is uneven.



Ursula is lying on her surfboard 180 metres away from the foot of a vertical cliff. The height of the cliff is 146 metres.



Ursula was told that if the angle of elevation of the top of the cliff from her lying position is between  $42^\circ$  and  $45^\circ$ , it is safe for her to attempt to stand on her surfboard.

Calculate the angle of elevation of the top of the cliff from Ursula's position lying on her surfboard.

State whether it is

- safe for Ursula to attempt to stand, or
- not safe as she is too near the cliff, or
- not safe as she is too far out at sea.

[4]

SOH CAH (TOA)

$$\tan \theta = \frac{O}{A}$$

$$\tan \theta = \frac{146}{180}$$

$$\tan^{-1} \downarrow \tan^{-1}$$

$$\theta = \tan^{-1} \left( \frac{146}{180} \right)$$

$$\theta = 39.05^\circ$$

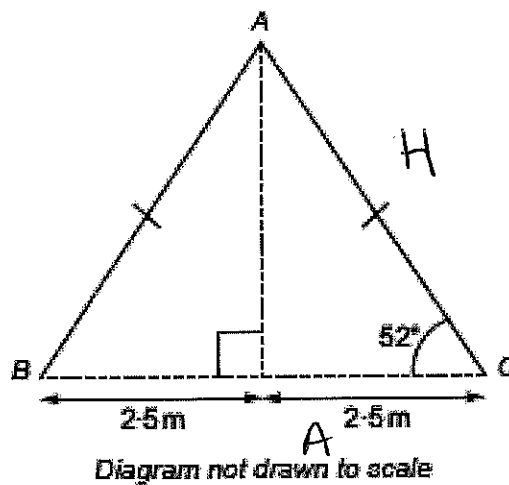
not safe as she is too far out at sea.

The diagram below shows where Levi wants to attach a string of lights to his house.

String of lights:



Levi wants to attach a single string of lights from B to A and then from A to C. The diagram below shows the measurements Levi has taken.



He spends £410 at the electrical store buying a string of lights. After putting up the lights, Levi finds he has 6 metres of the string of lights left over at one end.

How much did the electrical store charge Levi, per metre, for the string of lights? [8]

SOH (CAH) TOA       $\cos \theta = \frac{A}{H}$        $\cos 52 = \frac{2.5}{H}$

$2 \times 2.5 = 5$        $H \times \cos 52 = 2.5$

$5 + 6 = 11$        $\div \cos 52 \downarrow \div \cos 52$

$410 \div 11 = £37.27$  per metre       $H = \frac{2.5}{\cos 52}$

$H = 4.1$  m

WJEC INTERMEDIATE ESTIMATED MEAN WORKSHEET

Rhodri has carried out an experiment to measure the diameters of 20 spherical dust particles, in microns.

Here are his results.

Diameter, $d$ (microns)	Frequency	M.P	M.P $\times$ $f$
$1 \leq d < 2$	2	1.5	3
$2 \leq d < 4$	6	3	18
$4 \leq d < 5$	8	4.5	36
$5 \leq d < 8$	4	7.5	30
	20		87

- (a) (i) Calculate an estimate of the mean diameter of a dust particle. [4]

$$\text{Mean} = \frac{\sum \text{M.P} \times f}{\sum f} = \frac{87}{20} = 4.35 \text{ microns}$$

- (b) Yesterday morning, Simon only managed to sample 10 people. He calculated the mean hand span of these 10 people to be 22.8 cm. Yesterday afternoon, Simon recorded the hand spans of a further 20 people. The results for these 20 people are shown in the frequency table below.

Hand span, to the nearest mm	Frequency	M.P	M.P $\times$ F
20.0 cm to 20.8 cm	2	20.4	40.8
20.9 cm to 21.7 cm	3	21.3	63.9
21.8 cm to 22.6 cm	10	22.2	222
22.7 cm to 23.5 cm	5	23.1	115.5
			442.2

Calculate an estimate of the mean of all 30 hand spans that Simon measured yesterday. [6]

$$10 \times 22.8 = 228$$

$$\frac{442.2 + 228}{30} = \frac{670.2}{30} = 22.34 \text{ mm}$$

- (c) What could Simon do to improve his estimate of the mean hand span of people in Wales? [1]

Collect more measurements.

Alptai is a ski resort.  
The daily snowfall for January is given in the table below.

Daily snowfall, $s$ (cm)	Number of days	M.P	M.P $\times$ $f$
$0 \leq s < 5$	10	2.5	25
$5 \leq s < 10$	16	7.5	120
$10 \leq s < 20$	4	15	60
$20 \leq s < 30$	0	25	0
$30 \leq s < 50$	1	40	40

- (a) Calculate an estimate for the mean daily snowfall for the <sup>31</sup> 31 days of January. [4] 245

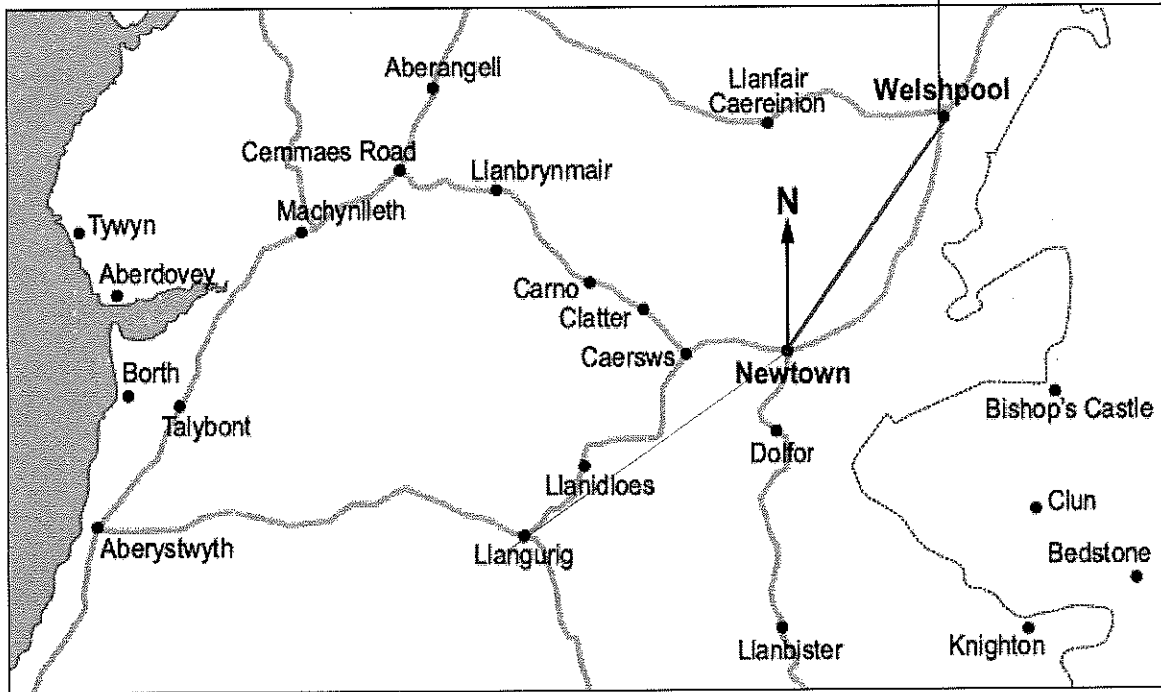
$$\text{Mean} = \frac{\sum M.P \times f}{\sum f} = \frac{245}{31} = 7.9 \text{ cm}$$

- (b) Circle either TRUE or FALSE for each of the following statements. [2]

The table above shows that there definitely was snowfall on each of the 31 days in January.	TRUE	<b>FALSE</b>
There were 16 days when the daily snowfall was less than 10 cm.	TRUE	<b>FALSE</b>
There was only 1 day with snowfall greater than or equal to 20 cm.	<b>TRUE</b>	FALSE
The modal group also contains the median daily snowfall.	<b>TRUE</b>	FALSE

WJEC INTERMEDIATE CONVERSIONS WORKSHEET

4. The map shows a part of Wales.  
The position of Newtown is shown on the map.



- (a) Write down the bearing of Welshpool from Newtown. [1]

035 ± 2°

- (b) Name the place on the map that is on a bearing of 235° from Newtown. [2]

Llangurig

360 - 235  
= 125°  
ACW.

(c) The distance from Newtown to Welshpool is approximately 14 miles by road.

(i) Estimate the distance by road from Welshpool to Llanfair Caereinion in miles. [1]

8-11 miles

(ii) Megan lives in Cemmaes Road.  
To travel to work, she starts by heading towards Machynlleth.  
Her journey to work is approximately 40 km.

Convert 40 km to miles. [2]

$8 \text{ km} = 5 \text{ miles}$   
 $\times 5$   $\times 5$   
 $40 \text{ km} = 25 \text{ miles}$

25 miles

In which town or village could Megan work? [1]

Aberystwyth

(d) A different map has a scale of 1 : 10 000.  
Megan measures 3 cm on this map.  
What distance does this represent in metres? [2]

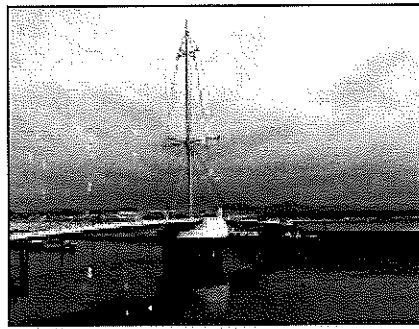
$3 \text{ cm} = 30000 \text{ cm}$

$1 \text{ m} = 100 \text{ cm}$

300 metres



Pont y Ddraig (Dragon's Bridge) opened in Rhyl harbour in autumn 2013.



The harbour development cost £9.8 million.  
£4.3 million of this money was spent on Pont y Ddraig.

$$9.8 \text{ mil} - 4.3 \text{ mil} = 5.5 \text{ mil}$$

- (a) How much was spent on the rest of the harbour development in Rhyl?  
Circle your answer. [1]

£55 000

£550 000

£5 500 000

£55 000 000

£550 000 000

- (b) A newspaper at the time said,  
'Pont y Ddraig provides the final link in 15 miles of traffic-free cycling across Conwy and Denbighshire.'

Write 15 miles in kilometres. [2]

$$\begin{aligned} 8 \text{ km} &= 5 \text{ miles} \\ 24 &= 15 \text{ miles} \end{aligned}$$

24 km

- (c) The height of the mast on the bridge is 148 feet.  
Using the conversion 1 foot = 30 cm, calculate the height of the mast in metres. [3]

$$1 \text{ ft} = 30 \text{ cm}$$

$$\times 148 \downarrow 148$$

$$148 \text{ ft} = 4440 \text{ cm}$$

$$= 44.4 \text{ metres}$$

WJEC INTERMEDIATE RATIO WORKSHEET

(a)



Lotty and Rafael decide to enter a prize draw.  
They agree to share any money they win in the ratio 2 : 3 respectively.  
After winning a total of £2000, they think again and decide that Lotty's share should be increased by 30%.

- (i) Rafael thinks that his share will be reduced by 30%.  
Without any calculation, explain why Rafael's thinking is incorrect. [1]

30% of a smaller share

- (ii) Calculate the amount of money Lotty wins after the decision is made to increase her share. ADAM then 10 inc [4]

$$2000 \div 5 = 400$$

$$\text{Lotty gets } 400 \times 2 = \text{£}800$$

but increase by 30%

$$10\% = 30$$

$$30\% = 240$$

Lotty's total  $800 + 240$

£1040

- (iii) Find the ratio that is now used to share the money between Lotty and Rafael. Express your answer in its simplest form. [3]

Lotty : Rafael

1040 : 960

104 : 96

(Simplify)

26 : 24

13 : 12

Lotty's winnings : Rafael's winnings = 13 : 12

- (b) In another prize draw, it was planned to give £5000 as the first prize. To make it more popular, the organisers decide to increase this first prize by 26%.

The most efficient method of calculating the amount of the increased first prize is

$$1.26 \times 5000.$$

The second prize was planned to be £3000, but it is now decided to decrease this prize by 6%.

$$100 - 6 = 94$$

Write down the most efficient method of calculating the amount of the decreased second prize.

You are not expected to work out the answer.

[1]

$$0.94 \times 3000$$



- (a) Jasmine entered herself, Sophie and Bryn as a group in a talent contest. Bryn only had a minor part.

Bryn, Sophie and Jasmine won the contest. They shared the prize money in the ratio 2 : 6 : 7, with Bryn getting the smallest share. Jasmine won £560, the largest share.

- (i) How much money did Bryn and Sophie each win? [4]

$$\begin{aligned} \text{Jasmine: } 560 &= 7 \text{ parts} \\ &= 280 \\ 80 &= 1 \text{ share} \end{aligned}$$

$$\text{B: } 80 \times 2$$

$$\text{S: } 80 \times 6$$

$$\text{Bryn receives } \pounds 160$$

$$\text{Sophie receives } \pounds 480$$

- (ii) Jasmine gave 15% of her winnings to charity. How much did Jasmine have left? [2]

$$10\% \text{ of } 560 = 56$$

$$5\% \text{ of } 560 = 28$$

$$15\% = 84$$

$$560 - 84 = \pounds 476$$

- (b) The talent contest is held once a year.  
 Every year, the cost of putting on the talent contest increases by 10% of the previous year's cost.  
 In summer 2014 the cost was £6600.

Calculate the cost of putting on the summer 2017 talent contest.  
 You must show all your working.

[3]

$$\begin{array}{r}
 2014 : \text{£}6600 \qquad \qquad \qquad 6600 \\
 \qquad \qquad \qquad (+10\%) + 660 \\
 \hline
 \qquad \qquad \qquad \qquad \qquad \qquad 7260
 \end{array}$$

$$\begin{array}{r}
 2015 : \text{£}7260 \qquad \qquad \qquad 7260 \\
 \qquad \qquad \qquad (+10\%) + 726 \\
 \hline
 \qquad \qquad \qquad \qquad \qquad \qquad 7986
 \end{array}$$

$$\begin{array}{r}
 2016 : \text{£}7986 \qquad \qquad \qquad 7986.00 \\
 \qquad \qquad \qquad (+10\%) + 798.60 \\
 \hline
 \qquad \qquad \qquad \qquad \qquad \qquad 8784.60
 \end{array}$$

$$2017 : \text{£}8784.60$$

Rhodri has carried out an experiment to measure the diameters of 20 spherical dust particles, in microns.

Here are his results.

Diameter, $d$ (microns)	Frequency	MP	$f \times MP$
$1 \leq d < 2$	2	1.5	3
$2 \leq d < 4$	6	3	18
$4 \leq d < 5$	8	4.5	36
$5 \leq d < 9$	4	7	28
			<u>85</u>

- (a) (i) Calculate an estimate of the mean diameter of a dust particle.

[4]

$$\frac{85}{20} = 4.25 \text{ microns}$$

- (ii) Rhodri measures the diameters of another 25 dust particles.

Rhodri is told,

'The ratio of dust particles with diameters less than 4 microns to those with diameters greater than or equal to 4 microns is 7 : 8.'

He finds this fact is true when he considers all 45 dust particles.

How many of the extra 25 dust particles have a diameter of less than 4 microns? You must show your working. [3]

originally: 8:12  $\xrightarrow{\text{needs to be}}$  7:8 (15...)

$\times 3/3$

21:24  $\leftarrow$  out of 45

need 21 altogether

so 13 more

- (a) Gustav is making some scones for his sister's birthday party.

Recipe to make 12 scones  
450g self raising flour  
2 teaspoons of baking powder  
75g butter  
50g caster sugar  
2 eggs  
225ml milk  
  
Bake at 428°F for 10 to 15 minutes

- (i) How much self raising flour will Gustav need to make 30 scones?  
Circle your answer.

[1]

900g

1000g

1100g

1125g

1350g

- (ii) In the recipe, the temperature of the oven is given in degrees Fahrenheit,  $F$ .  
The temperature gauge on Gustav's oven shows degrees Celsius,  $C$ .

The formula below is used to convert Fahrenheit into Celsius.

$$C = \frac{5F - 160}{9}$$

- At what temperature should Gustav bake the scones?  
Give your answer in degrees Celsius.

[2]

$$C = \frac{5(428) - 160}{9}$$

220 °C

- (a) *Organics4U* is planning to have its headquarters in Wales. The manager has instructed Ffion to look for a site for the headquarters.

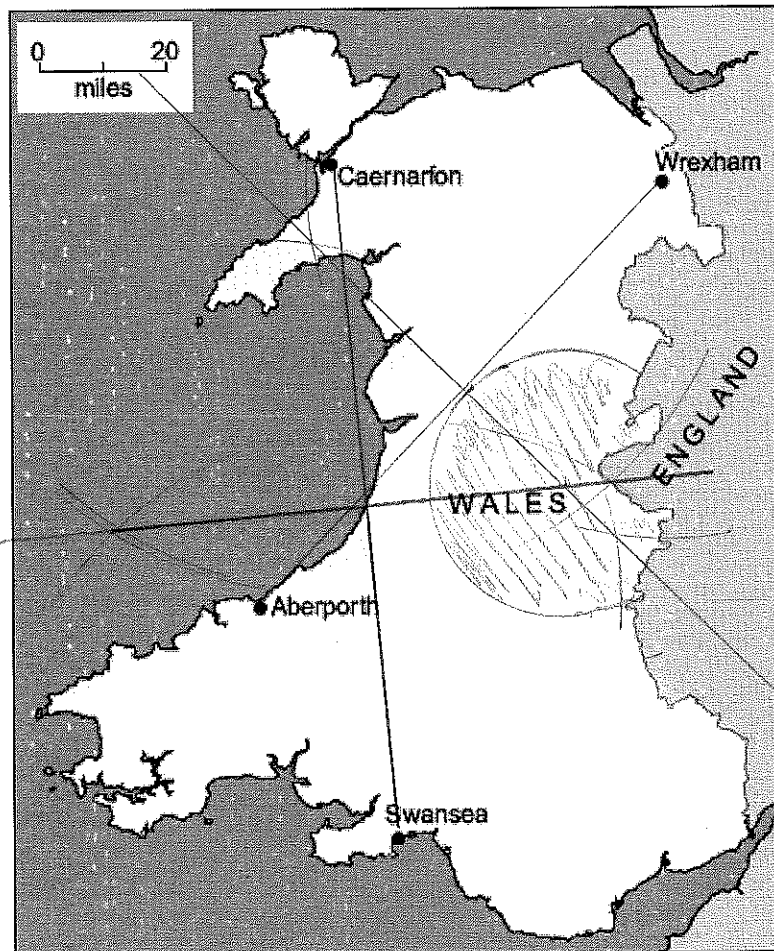
Here are the instructions that Ffion has been given by her manager.

'Find the point that is

- an equal distance between Wrexham and Aberporth, and
- an equal distance between Caernarfon and Swansea.

The new headquarters needs to be within 20 miles of this point.'

On the map below, shade the region, in Wales, that Ffion should identify for her manager. [4]





- (b) In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

Organics4U has 16 vehicles on the road every working day.  
The company has 6 vans and 10 trucks.

Ffion has the following information for each type of vehicle.

Type of vehicle	Average distance travelled per litre (km per litre)	Average distance travelled per day (km per day)
Van	8	256
Truck	5.5	704

6 vans  
10 trucks

The fuel used by all of the 16 vehicles costs £1.10 per litre.  
Use this information to calculate the total fuel bill for 1 working day.  
You must show all your working.

[6 + 2 OCW]

Vans  $256 \times 6 = 1536$  km total  
8 km per litre so  
 $1536 \div 8 = 192$  litres needed

Trucks:  $704 \times 10 = 7040$  km total  
5.5 km per litre  
 $7040 \div 5.5 = 1280$  litres needed

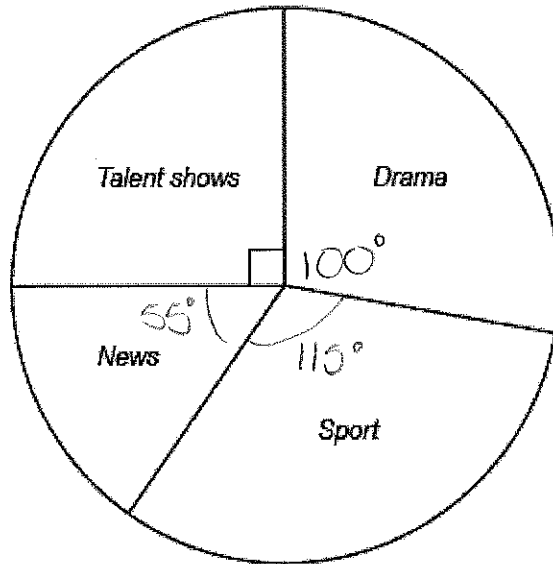
Total litres:  $192 + 1280 = 1472$

$1.10 \times 1472 =$

£1619.20.

WJEC INTERMEDIATE PIE CHARTS WORKSHEET

- (a) 36 000 people took part in a survey to find out their favourite type of TV programme. The pie chart shows the results.



- (i) How many people chose *Drama* as their favourite type of TV programme? You must show your working. [3]

$$360 \div 36000 = 0.01 \text{ per person}$$

$$100^\circ = 10000 \text{ people}$$

- (ii) How many more people chose *Sport* rather than *News* as their favourite type of TV programme? You must show your working. [3]

$$\text{Sport} = 115^\circ \div 0.01 = 11500 \text{ people}$$

$$\text{News} = 55^\circ \div 0.01 = 5500 \text{ people}$$

$$11500 - 5500 = 6000 \text{ people}$$

- (iii) Twice as many women as men chose *Talent shows* as their favourite type of TV programme.  
Calculate how many women chose *Talent shows*.  
You must show your working. [3]

$$\text{Talent shows: } \frac{1}{4} \text{ of } 36000 \\ = 9000$$

Ratio men: women  
1 : 2      Ratio  $\rightarrow$  ADAM

$$9000 \div 3 = 3000 \text{ (men)} \\ 3000 \times 2 = 6000 \text{ women}$$

- (b) 1000 people were asked,

'Should news programmes include details of the weather?  
Yes or No?'

70% of the people answered 'yes'.

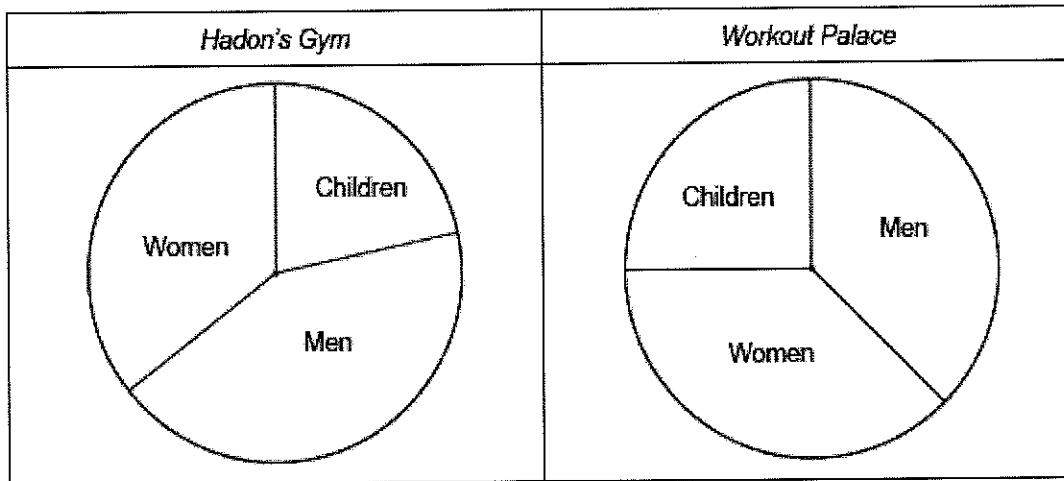
A pie chart is to be drawn to represent the answers to this question.  
What size would the angle be to represent the answer 'yes'?

[2]

$$70\% \text{ of } 360 = 252$$

Angle representing 'yes' is 252°

3. Tomos is looking at gym memberships for *Hadon's Gym* and *Workout Palace*. Each of these gyms displays its membership in a pie chart.



- (a) About what percentage of the members at *Hadon's Gym* are children?  
Circle your answer.

[1]

10%      20%      30%      40%      50%

- (b) Which of the following is the best estimate for the percentage of the members at *Workout Palace* who are women?  
Circle your answer.

[1]

25%      28%      30%      32%      38%

- (c) Tomos says,  
'There are more men with membership at *Hadon's Gym* than at *Workout Palace*.'  
Is Tomos certain to be correct?  
You must give a reason for your answer.

[1]

Yes

No

We don't know how many are  
at each gym

Lloyd has carried out a survey in his school.  
He surveyed 300 pupils.  
Below is a section from his questionnaire.

1.	Which year group are you in? _____
2.	Do you like the colours of the school uniform? _____
3.	What is your favourite colour? _____

(a) Afterwards, Lloyd thinks he should have given option boxes in questions 1 and 2. What could these option boxes be? [2]

Question 1:

Y7      Y8      Y9      Y10      Y11      Y12      Y13

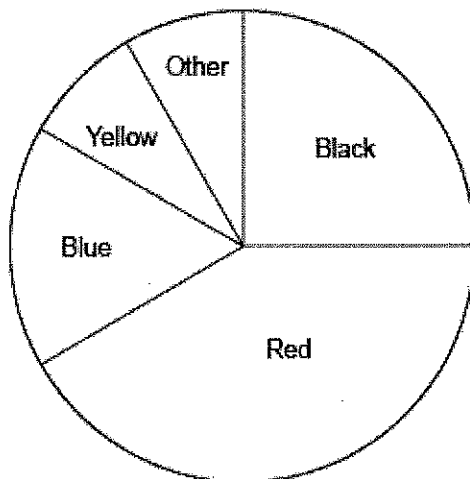
                      

Question 2:

yes      no      other

(b) A pie chart displaying the results from question 3 of the questionnaire is shown below.



(i) Which colour was chosen by 75 pupils as their favourite colour? Circle your answer. [1]

Black       Red       Blue       Yellow       Other

$\frac{75}{300} = \frac{1}{4}$

- (ii) What fraction of the pupils said that blue was their favourite colour?  
Give your answer in its simplest form.

[3]

measure →

$$\frac{60}{360} = \frac{1}{6}$$

WJEC INTERMEDIATE VOLUME WORKSHEET

Lazar wants to send a package to Germany.  
He looks at pricing charts for three different companies, *ParcelMax*, *DirectGo* and *Pack2save*.

<b>ParcelMax</b>	Total cost =	$\frac{\text{Sum of the 3 dimensions in cm} \times \text{£}0.60}{\text{-----}}$
<b>DirectGo</b>	Total cost =	Volume measured in $\text{cm}^3 \times \text{£}0.01$
<b>Pack2save</b>	Total cost =	Total area of all 6 faces measured in $\text{cm}^2 \times \text{£}0.02$

Lazar's parcel is a cuboid measuring 10 cm by 20 cm by 30 cm.

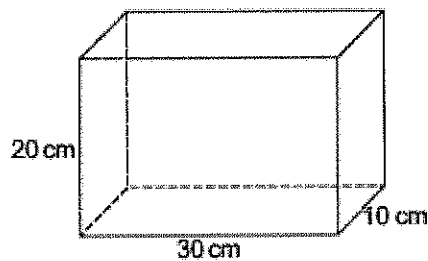


Diagram not drawn to scale

- (a) Find the cost of sending the parcel for each of the three different companies.  
Give each of your answers in pounds (£).

(i) *ParcelMax* [2]

$$20 + 30 + 10 = 60 \text{ cm}$$

$$60 \times 0.60 = \text{£}36.00$$

(ii) *DirectGo* [3]

$$\text{Vol} = 20 \times 30 \times 10$$

$$6000 \text{ cm}^3$$

$$6000 \times 0.01 = \text{£}60.00$$

(iii) Pack2save

[4]

$$\text{Top + bottom: } 30 \times 10 = 300 \\ \times 2 = \boxed{600}$$

$$\text{l + r: } 20 \times 10 = 200 \\ \times 2 = \boxed{400}$$

$$\text{front + back: } 30 \times 20 = 600 \\ \times 2 = \boxed{1200}$$

$$\text{Total} = 600 + 400 + 1200$$

$$= 2200 \quad \text{Cost: } 2200 \times 0.02 \\ = \text{£}44.00$$

(b) What is the percentage saving that Lazar will make by choosing the cheapest option rather than the most expensive option? [2]

Cheapest: £36.00

most expensive: £60

$$\frac{60 - 36}{60} = \frac{24}{60} = 40\%$$



Rhodri has carried out an experiment to measure the diameters of 20 spherical dust particles, in microns.

Here are his results.

Diameter, $d$ (microns)	Frequency	$mp$	$f \times mp$
$1 \leq d < 2$	2	1.5	3
$2 \leq d < 4$	6	3	18
$4 \leq d < 5$	8	4.5	36
$5 \leq d < 9$	4	7	28
			<u>85</u>

(a) (i) Calculate an estimate of the mean diameter of a dust particle. [4]

$$\frac{85}{20} = 4.25 \text{ microns}$$

(ii) Rhodri measures the diameters of another 25 dust particles.

Rhodri is told,

'The ratio of dust particles with diameters less than 4 microns to those with diameters greater than or equal to 4 microns is 7 : 8.'

He finds this fact is true when he considers all 45 dust particles.

How many of the extra 25 dust particles have a diameter of less than 4 microns? You must show your working. [3]

originally,  $8:12$   $\xrightarrow{\text{needs to be } \times 3}$   $7:8$   $\xrightarrow{\times 3}$   $21:24$  ← out of 45

21 needed altogether

so

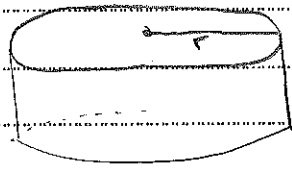
13 more

$\times 3$   $7:8$   $\times 3$   
 $21:24$

- (b) Rhodri studies a cylindrical cell under his microscope.  
The height of the cell is 2 microns.  
The circumference of the cell is 5 microns.

Calculate the volume of the cell he sees under the microscope.  
Give your answer in microns<sup>3</sup>, correct to 1 significant figure.

[5]



$$\text{Circumf} = 5 \text{ microns}$$

$$\text{Vol} = \pi r^2 h$$

need radius

use

$$C = \pi d$$

$$5 = \pi \times d$$

$$\frac{5}{\pi} = d$$

$$1.59... = d$$

$\div 2$  for radius

$$0.796 = r$$

$$\text{Volume} = \pi r^2 h$$

$$= \pi \times 0.796^2 \times 2$$

$$\text{Volume} = 3.98$$

Volume is 4 microns<sup>3</sup>

Elin's old fish tank is leaking.

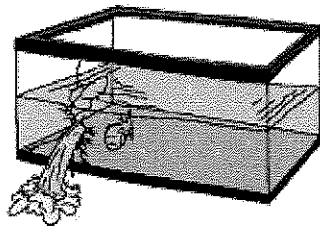


Diagram not drawn to scale

This old fish tank is in the shape of a cuboid.  
The base of this tank measures 60 cm by 40 cm.  
Before the leak, the height of the water level in Elin's old fish tank was 45 cm.

Elin decides to replace her fish tank with a cylindrical one.

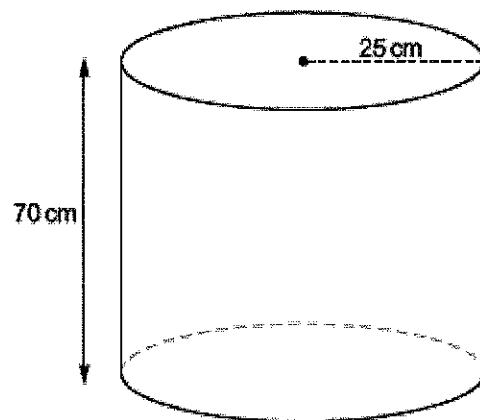


Diagram not drawn to scale

She selects a new cylindrical fish tank that has a radius of 25 cm and a height of 70 cm.

Will all the original contents, including the water and the fish, fit into this cylindrical tank?  
You must show all your working.

[4]

$$\begin{aligned} \text{Vol of original water} &= 60 \times 40 \times 45 \\ &= 108000 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Vol of cylindrical tank} &= \pi r^2 h \\ &= \pi \times 25^2 \times 70 \\ &= 137444.7 \text{ cm}^3 \end{aligned}$$

$$108000 < 137444.6$$

so yes it will fit.



S J H S

WJEC INTERMEDIATE SDT WORKSHEET

Glenda plans to drive from Flint to Cardiff.

On a long journey, her average speed is usually 42 mph.

Last time she drove from Flint to Cardiff it took her  $3\frac{1}{2}$  hours.

→ 3.5

- (a) Use this information to calculate the distance between Flint and Cardiff.

[2]



$$\text{Dist} = \text{Speed} \times \text{time}$$

$$D = 42 \times 3.5$$

$$D = 147$$

147

miles

- (b) Give a possible reason why your answer in (a) is only an estimate of the distance between Flint and Cardiff.

[1]

- 42mph is only an average; could have been stuck in traffic.
- She may drive fast/slow

(a) What is 3 hours 12 minutes in hours?  
Circle your answer.

[1]

3-102 hours

3-12 hours

3-15 hours

3-2 hours

3-25 hours

$$\frac{12}{60} = \frac{1}{5} = 0.2$$

(b) The first 40 miles of a journey took 1 hour 15 minutes.  
The remaining 80 miles were completed in 2 hours 15 minutes.  
Calculate the average speed, in mph, of the 120-mile journey.

[3]

Total distance = 120 miles

Total time = 1hr 15 + 2hr 15  
= 3 hours 30 mins  
= 3.5 hours

$$\text{Speed} = \frac{D}{T} = \frac{120}{3.5} = 34.3 \text{ mph}$$

WJEC INTERMEDIATE ANGLES WORKSHEET

Kari is making a jigsaw puzzle.  
 She has designed the pattern on a piece of paper.  
 Kari plans to make each piece of the jigsaw a different colour.

Part of her plan is shown below.

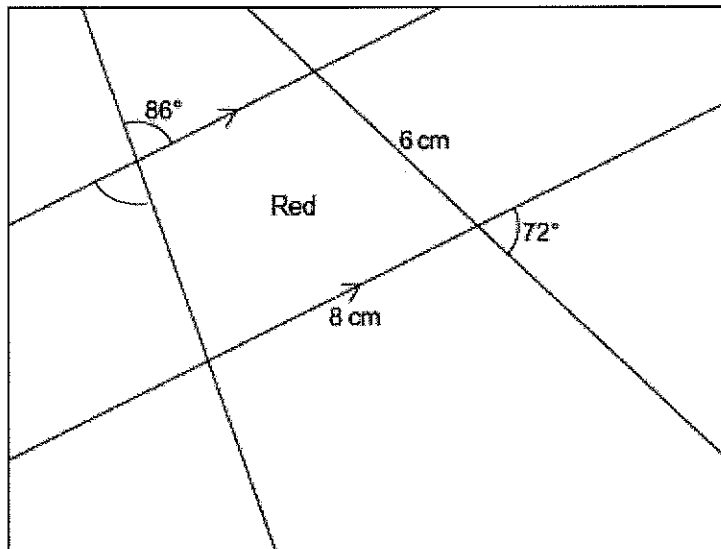


Diagram not drawn to scale

Kari now sketches a diagram of the red piece of the jigsaw, which is shown below.  
 She shows some extended lines and indicates all the angles she needs to find.

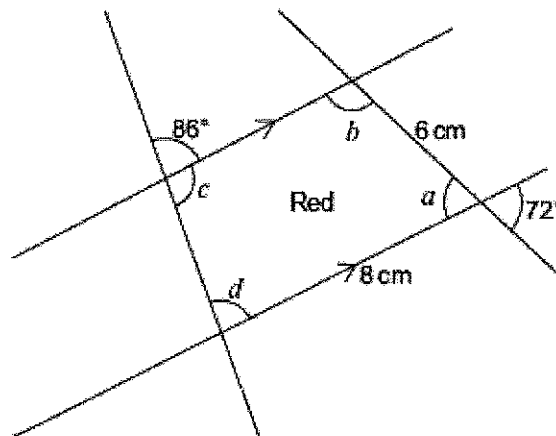


Diagram not drawn to scale

Find the 4 missing angles in the red piece of the jigsaw.  
Draw the red piece of Kari's jigsaw accurately.  
One side has been drawn for you.

[6]

$$a = 72^\circ \text{ (opp angles)} \quad b = 180 - 72 = 108$$

(C-angles)

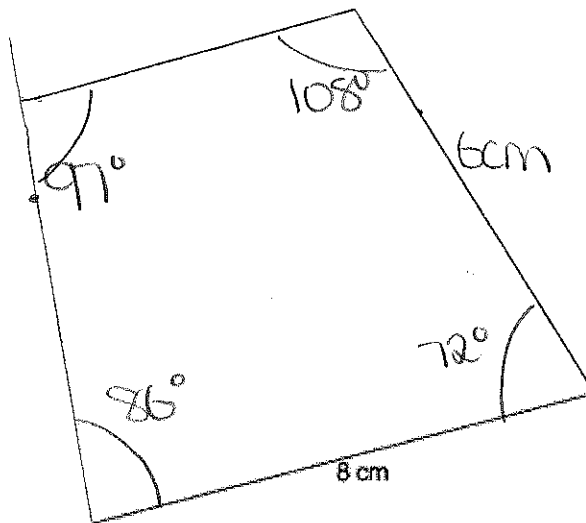
$$c = 180 - 86 = 94$$

(angles on a line)

$$d = 86^\circ \text{ (F angles)}$$

$$a = 72^\circ; \quad b = 108^\circ; \quad c = 94^\circ; \quad d = 86^\circ$$

Space for drawing the red piece of jigsaw:





A number of paths are to be laid to join three new office buildings.  
A sketch of the architect's plan is shown below.

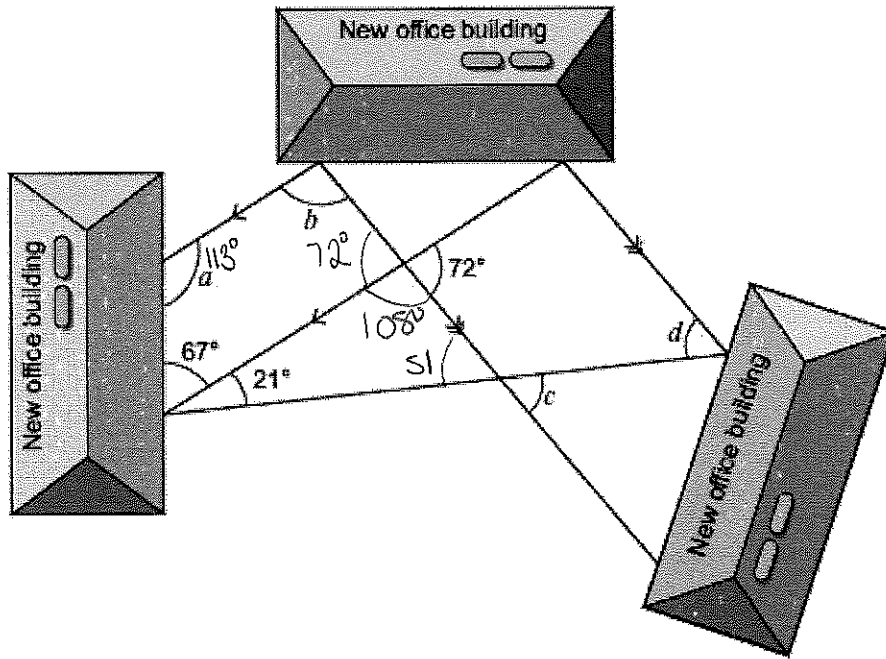


Diagram not drawn to scale

The architect has shown a number of the angles in his planning for the new paths.

Calculate the size of each of the angles  $a$ ,  $b$ ,  $c$  and  $d$ .

[4]

$$a = 180 - 67$$

$$= 113^\circ \text{ (C angles)}$$

$$c = 51^\circ \text{ (}\Delta\text{)}$$

$$b = 108^\circ \text{ (F angles or C angle with } 72^\circ\text{)}$$

$$d = 51^\circ \text{ (Z angle)}$$

$$\hat{a} = 113^\circ \quad \hat{b} = 108^\circ \quad \hat{c} = 51^\circ \quad \hat{d} = 51^\circ$$