LJH Worked Solutions

edexcel

GCSE Mathematics Practice Tests: Set 3

Paper 3H (Calculator)

Time: 1 hour 30 minutes

You should have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator.

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Practice Tests: Set 3 Regular (3H) – Version 1.0

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. $-2 < n \leq 3$
n is an integer.

(*a*) Write down all the possible values of n.

B1 4 correct values
B1 all correct

$-1, 0, 1, 2, 3$

(2)

x is a number.
Another number is 9 greater than x. $x + 9$
Both numbers are whole numbers.
Add
The total of the two numbers is less than 60

(*b*) Find the greatest possible value of x.

$x + x + 9 < 60$ M1
$2x + 9 < 60$ $[-9$
$2x < 51$ $[\div 2$
$x < 25.5$ A1

25 A1

(3)

(Total 5 marks)

M1 appropriate pair of arcs

A1 perpendicular bisector drawn.

Use ruler and compasses to **construct** the perpendicular bisector of the line AB.
You must show all your construction lines.

(Total 2 marks)

3. Alex and Ben go to a cafe with some friends.

Alex buys 4 cups of coffee and 3 cups of tea.
He pays a total of £6.95

Ben buys 5 cups of coffee and 2 cups of tea.
He pays a total of £7.20

Work out the cost of each cup of coffee and the cost of each cup of tea.

let c be a cup of coffee and t be a cup of tea M1

$4c + 3t = 695$ (1)
$5c + 2t = 720$ (2) A1 correct equations

(1) x2: $8c + 6t = 1390$ (3)
(2) x3: $15c + 6t = 2160$ (4) M1

DA (55)

(4) − (3): $7c = 770$ ÷ 7
$c = 110$

subs c in (1) to find t: $4 \times 110 + 3t = 695$ M1
$440 + 3t = 695$
$3t = 255$ ÷ 3
$t = 85$

must have units

Cup of coffee ..£1.10.. A1

Cup of tea ..85p..

(Total 5 mark)

Beth has 600 counters.

$\frac{3}{5}$ of the counters are yellow.

25% of the counters are red.
The rest of the counters are green.

Beth is given some more red counters.
Now the ratio of the number of green counters to the number of red counters is 1 : 2

How many red counters was Beth given?

Yellow $\frac{3}{5}$ of 600 = 360 m1

Red 25% of 600 = 150 m1

Green 600 − 360 − 150 = 90
m1

Green : Red
90 : 150

If the ratio of green to red is 1:2 Beth must have twice as many red counters as green counters. Therefore Beth must have (90×2 =) 180 Red counters A1

Beth was given 30 Red counters

30

(Total 4 mark)

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5. Work out $(9.5 \times 10^9) \div (3.8 \times 10^3)$
Give your answer in standard form.

= 2500000 m1

$= 2.5 \times 10^6$

type onto calculator exactly like this

standard form one digit • $\times 10^x$

2.5×10^6 A1

(Total 2 marks)

SOH CAH TOA

6.

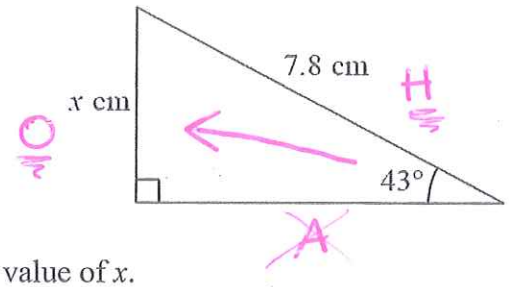
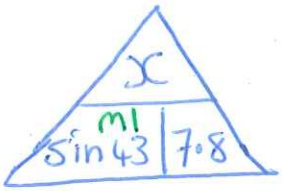


Diagram **NOT** accurately drawn

Work out the value of x.
Give your answer correct to 3 significant figures.



$x = \sin(43) \times 7.8$ ml

$= 5.319587\ldots$

$= 5.32$ cm (3sf)

A1

awrt 5.32

$x =$ 5.32 cm

(Total 3 marks)

(*a*) $A = \{p, r, a, g, u, e\}$

$B = \{p, a, r, i, s\}$

$C = \{b, u, d, a, p, e, s, t\}$

List the members of the set

(i) $A \cap B$

A And

p, a, r B1 no repeats allowed for mark

(ii) $B \cup C$

0 Or

B1

p, a, r, i, s, b, u, d, e, t

(2)

(*b*) $D = \{r, o, m, e\}$

$E = \{l, i, s, b, o, n\}$

$F = \{b, e, r, l, i, n\}$

Put one of the letters D, E or F in the box below to make the statement correct.

$$A \cap \boxed{E} = \emptyset$$

empty set

Explain your answer.

no letters appear in set A AND Set E B1

(1)

(Total 3 marks)

8. Here is a formula used to work out the speed, v mph, of a car making an emergency stop.

$$v = \sqrt{21d}$$

d feet is the length of the mark the car's tyres make on the road when making an emergency stop.

A car makes an emergency stop.
The car's tyres make a mark 90 feet long.

(*a*) Work out the speed of the car.
Give your answer correct to the nearest whole number.

$d = 90$

$v = \sqrt{21 \times 90}$ M1

$= \sqrt{1890} = 43.67\ldots$

Accept 43 → 43.5

43 ..... mph

A1 (2)

A car made an emergency stop.
The car's speed was 50 mph.

(*b*) Work out the length of the mark on the road.
Give your answer correct to the nearest whole number.

$v = 50$

$(50)^2 = (\sqrt{21d})^2$ M1 [square

$2500 = 21d$ M1 [÷ 21

$119.067\ldots = d$

Accept 119 → 119.05

A1 119 ..... feet

(3)

(Total 5 marks)

9. The diagram shows a large tin of pet food in the shape of a cylinder.

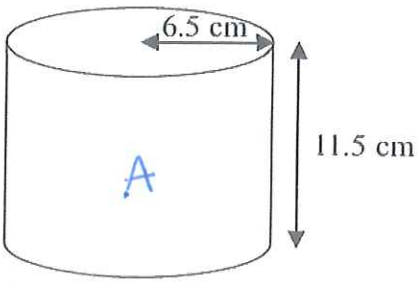
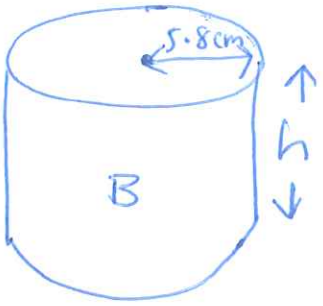


Diagram **NOT** accurately drawn



The large tin has a radius of 6.5 cm and a height of 11.5 cm.

A pet food company wants to make a new size of tin.

The new tin will have a radius of 5.8 cm.
It will have the same volume as the large tin.

Calculate the height of the new tin.
Give your answer correct to one decimal place.

Volume tin A $= \pi r^2 h$

$= \pi \times 6.5^2 \times 11.5$ ml

$= \frac{3887}{8}\pi$ 1526.421331

Volume tin B $= \pi r^2 h$ ml

$= \pi \times 5.8^2 \times h$

$= \frac{841}{25}\pi h$ 105.6831769

Volume tin A = Volume B

$\frac{3887}{8}\pi = \frac{841}{25}\pi h$ [÷ π

$\frac{3887}{8} = \frac{841}{25} h$ [÷ $\frac{841}{25}$

$h = 14.44337099$

A1

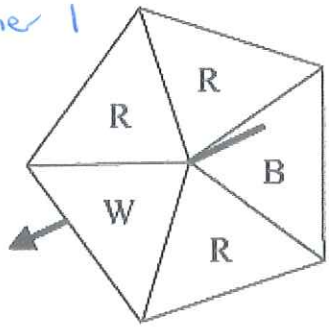
Accept 14.4 → 14.5 14.4 ..... cm

(Total 3 marks)

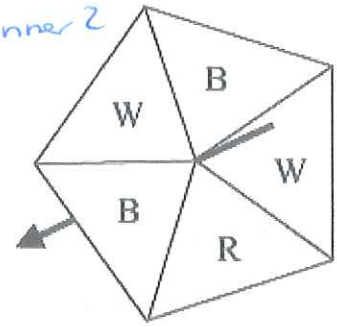
10. Simon wants to raise money for charity.
He designs a game for people to play.

Simon uses two fair 5-sided spinners for the game.

spinner 1



Spinner 2



People spin each spinner once.
A person wins the game when both spinners land on the same letter.

People pay 40p for each game they play. The prize for a win is £1.

Work out if Simon is likely to raise any money for charity with his game.

Spinner 1

Spinner 2	R	R	R	B	W
B	BR	BR	BR	BB	BW
B	BR	BR	BR	BB	BW
W	WR	WR	WR	WB	WW
W	WR	WR	WR	WB	WW
R	RR	RR	RR	RB	RW

lots of different methods suitable here - see mark scheme for ideas

M1
M1

$P(\text{Win}) = \frac{7}{25}$ A1 $\quad +40p - £1 = -60p$

$P(\text{not Win}) = \frac{18}{25} \quad +40p$

Simon will raise 40p $\frac{18}{25}$ of the time and will lose 60p $\frac{7}{25}$ of the time

Consider 100 games

$\frac{18}{25} \times 40 + \frac{7}{25} \times -60 = 12$ M1

Simon will make 12p in every 100 games

C1

(Total 5 marks)

The value of a motor bike depreciates by 20% each year.

Brian says,

"After two years, the value of the motor bike will have reduced by 40%".

He is **wrong**.

Explain why.

Let the cost of the motor bike be £100

Year 1 £100 × 0.8 = £80

Year 2 £80 × 0.8 = £64 M1

$$\% \text{ change} = \frac{£100 - £64}{£100} \times 100$$

$$= \frac{36}{100} \times 100$$ M1

= 36% reduction

Brian is wrong, the value of the motor bike will have reduced by 36% C1

(Total 3 marks)

12. The diagram shows a regular pentagon *ABCDE*.

$360° \div 5 = 72°$ M1

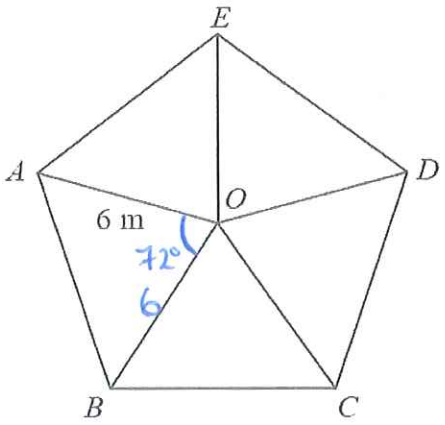
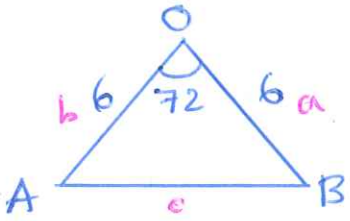


Diagram **NOT** accurately drawn

The pentagon is divided into 5 isosceles triangles.
$OA = OB = OC = OD = OE = 6$ m

Work out the area of the pentagon.
Give your answer correct to 1 decimal place.



Area one triangle $= \frac{1}{2} ab \sin O$
$= \frac{1}{2} \times 6 \times 6 \times \sin 72$
$= 17.11901\ldots$ M1

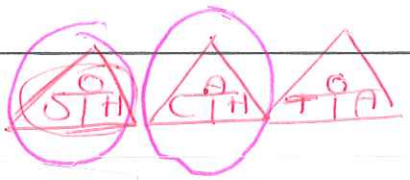
Area pentagon $= 5 \times$ Area one triangle
$= 85.59508\ m^2$ M1

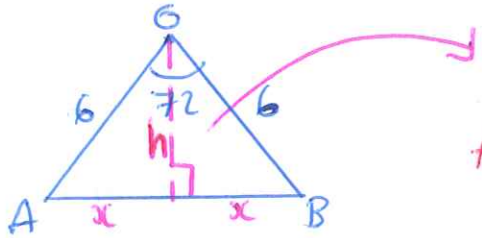
Accept
$85.5 \rightarrow 85.6$

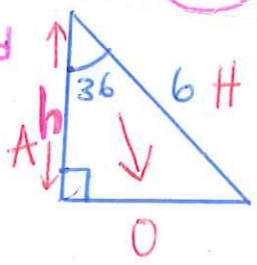
..... 85.6 m^2 A

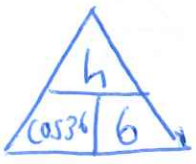
(Total 4 marks)

Alternative method



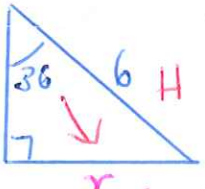


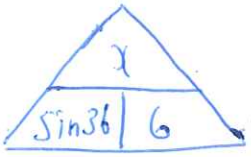




$h = \cos(36) \times 6$
$= 4.8541\ldots$

Area triangle
$= \frac{1}{2}$ base $\times$ height
$= 3.5267 \times 4.8541$
$= 17.11901$





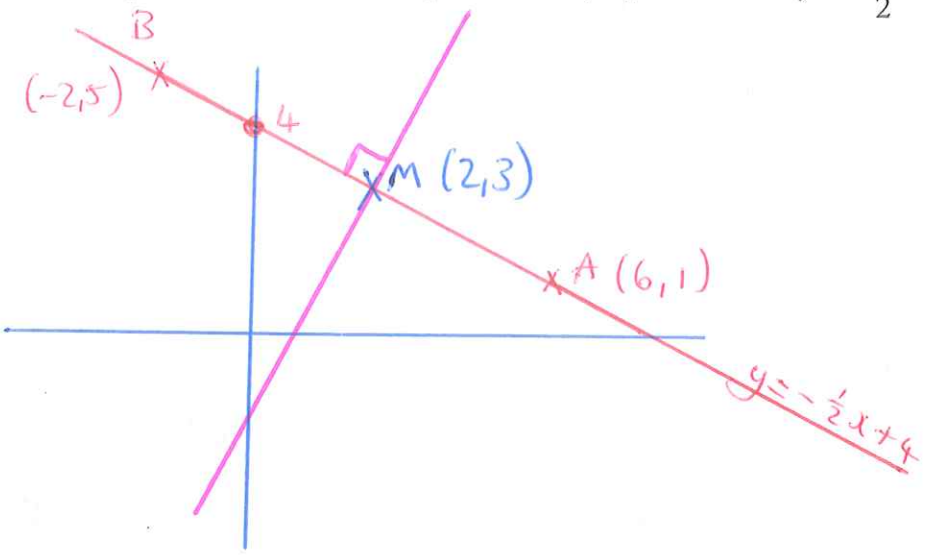
$x = \sin(36) \times 6$
$= 3.5267\ldots$

Area pentagon $= 5 \times 17.11901$
$= 85.5908\ m^2$

13. The points $A(6, 1)$ and $B(-2, 5)$ are on the line with equation $y = -\frac{1}{2}x + 4$

M is the midpoint of AB.

Find an equation of the line through M that is perpendicular to $y = -\frac{1}{2}x + 4$



midpoint of AB $= \left(\frac{6+-2}{2}, \frac{1+5}{2}\right)$ M1 gradient of line AB $= -\frac{1}{2}$

$= (2, 3)$

equation of perpendicular line

$y = mx + c$ $m = 2$ M1

(negative reciprocal of $-\frac{1}{2}$)

Line passes through point $(2,3)$ $x=2, y=3$

$y = mx + c$

$3 = 2 \times 2 + c$ M1

$3 = 4 + c$

$-1 = c$

∴ equation of line $y = 2x - 1$ A1

$y = 2x - 1$

(Total 4 marks)

14. In the winter a farmer feeds his cows with hay each day.

The number of days, d, the hay will last is inversely proportional to the number of cows, c, the farmer has.

The farmer has enough hay to feed 280 cows for 25 days.

(*a*) Find a formula for d in terms of c.

$d \propto \frac{1}{c}$

$d = \frac{k}{c}$

$25 = \frac{k}{280}$ M1 [x280

$7000 = k$ $\therefore d = \frac{7000}{c}$

A1

$d = \frac{7000}{c}$

.....

(2)

The farmer has 350 cows.

(*b*) How many days will the farmer be able to feed all his cows with hay?

$c = 350$ $d = \frac{7000}{350}$ M1

$= 20$ days

A1

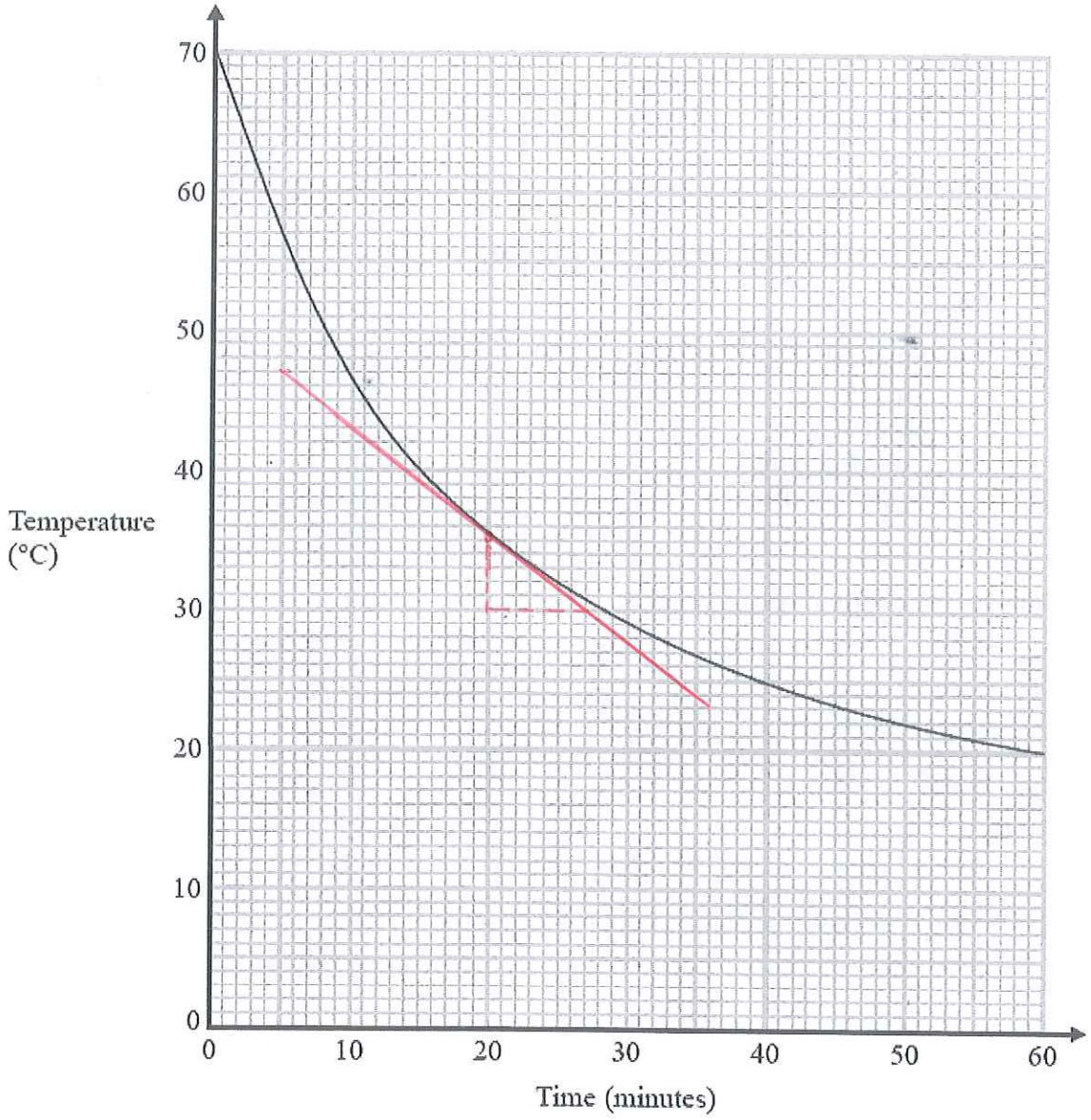
20 ..... days

(2)

(Total 4 marks)

15. Hot drinks are served at a temperature of 70 °C.

The graph shows the temperature of a hot drink as it cools in a china mug from the time it is served.



Work out the rate of cooling of the drink at time 20 minutes.

1) Draw a tangent to the graph at 20 minutes and find the gradient of the line M1

gradient = $\frac{\text{rise}}{\text{run}} = \frac{5}{7} = 0.714$ M1

OR $\frac{\text{change in } y}{\text{change in } x}$

0.714 A1

..... °C per minute

Accept 0.7 → 0.9

(Total 3 marks)

Condone a negative answer.

16. Adele grew 30 cabbages.

She gave fertiliser to 15 of the cabbages.
She did **not** gave fertiliser to the other 15 cabbages.

$n = 15$

$\frac{n+1}{2} = \frac{16}{2} = 8$

median is 8th value

Here are the final weights, in kilograms, of the 15 cabbages Adele gave fertiliser to.

LQ

1.5	1.5	1.6	1.6	1.6	1.7	1.8	1.8
2.0	2.0	2.0	2.0	2.2	2.5	2.6	

UQ

Median

Here is some information about the final weights, in kilograms, of the 15 cabbages Adele did **not** give fertiliser to.

	not fertiliser	fertiliser
Smallest	1.0	1.5
Largest	2.1	2.6
Median	1.4	1.8
Lower quartile	1.2	1.6
Upper quartile	1.6	2.0
IQR = UQ - LQ	0.4	0.4

C1

Compare the two distributions of weights.

The cabbages which had fertiliser have a higher median weight suggesting that the fertiliser produced heavier cabbages C1

Both sets of cabbages have the same inter quartile range showing that the consistency of weights is the same.

(Total 2 marks)

17. A field is in the shape of a rectangle.
The width of the field is 28 metres, measured to the nearest metre.

(*a*) Work out the upper bound of the width of the field.

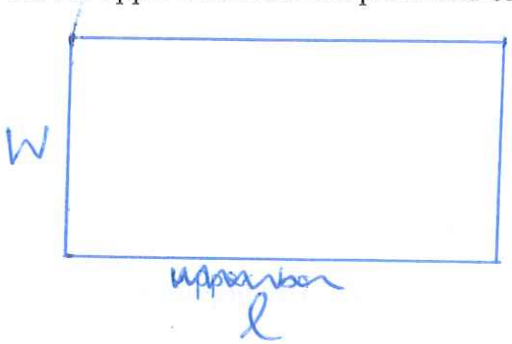
B1

28.5 metres

(1)

The length of the field is 145 metres, measured to the nearest 5 metres.

(*b*) Work out the upper bound for the perimeter of the field.

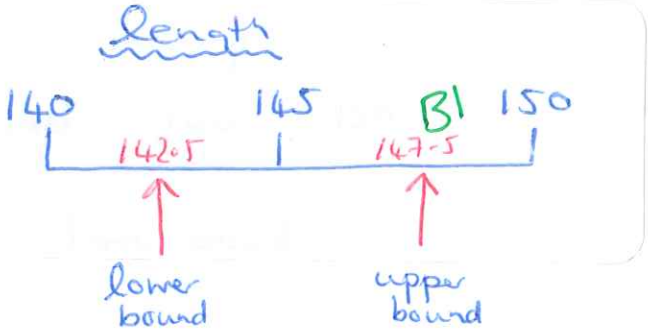


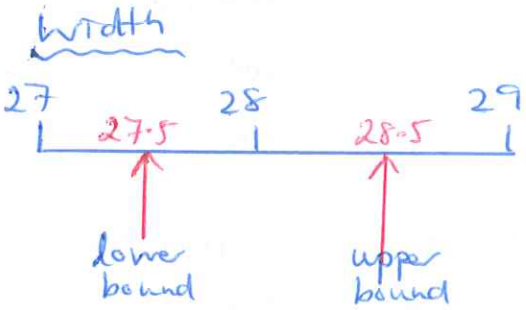
352 A1

metres

(3)

(Total 4 marks)





Perimeter = 2w + 2l

Upper bound Perimeter = 2 × 28.5 + 2 × 147.5 m1

= 57 + 295

= 352 m

18. The tables show some information about the population of the United Kingdom (UK) in 2003 and in 2008.

2003		
	Area (km²)	**Number of people per km²**
England	130 281	383
Northern Ireland	13 576	125
Scotland	77 925	65
Wales	20 732	142

× M1 = 49 897 623 people

2008	
	Percentage of total UK population
England	84%
Northern Ireland	4%
Scotland	9%
Wales	3%

84% of 61 million = 51 240 000 people M1 A1

total pop = 61 million

In 2008, the total population of the UK was 61 million.

The population of **England** increased between

2003 and 2008 Work out this increase.
Give your answer correct to 2 significant figures.

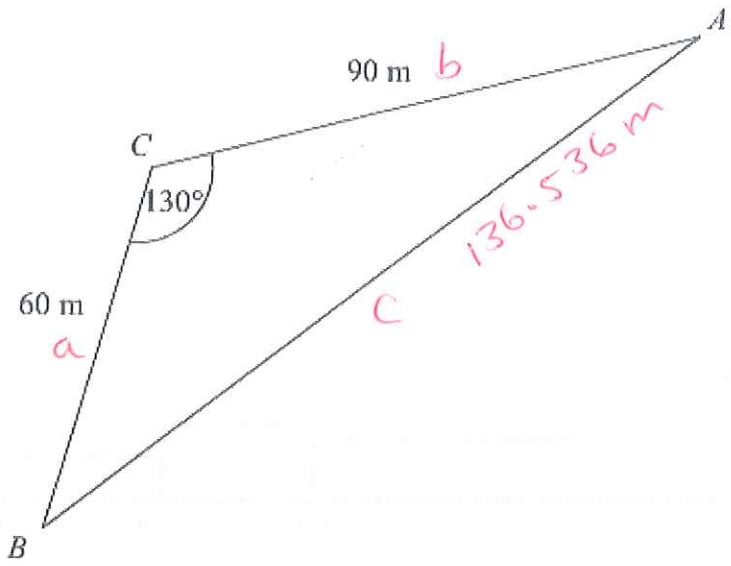
increase = 51 240 000 − 49 897 623 M1
= 1342377
= 1300000 (2sf)

A1
1 300 000

(Total 5 marks)

19. Here is a triangle ABC.

Diagram **NOT** accurately drawn



$AC = 90$ m.
$BC = 60$ m.
Angle $ACB = 130°$.

Calculate the perimeter of the triangle.
Give your answer correct to one decimal place.

Cosine rule $c^2 = a^2 + b^2 - 2ab\cos C$ m1

$= 60^2 + 90^2 - 2 \times 60 \times 90 \times \cos 130°$ m1

$= 18642.10618$

$c = 136.5360985$ A1

accept 136 → 137

Perimeter $= 60 + 90 + 136.5360985$

$= 286.5360985$

$= 286.5$ m (1 dp)

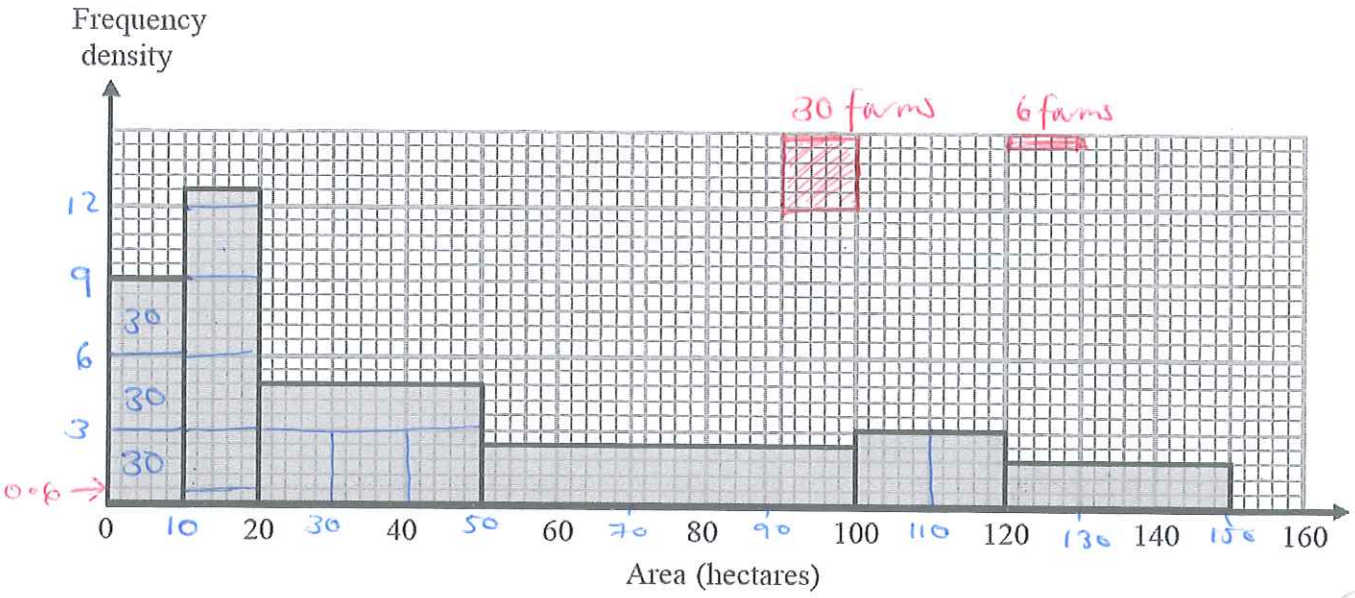
A1

286.5 m

accept 286 → 287

(Total 4 marks)

20. The histogram shows information about the areas of some farms.



90 of the farms have an area of 10 hectares or less.

60% of the farms with an area of 100 hectares or less are arable farms.

$\frac{1}{2}$ of the farms with an area of more than 100 hectares are arable farms.

Work out an estimate for the total number of arable farms.

Area	w	FD	Frequency
0 – 10	10	9	90 ✓
10 – 20	10	12·6	126 ✓
20 – 50	30	4·8	144 ✓
50 – 100	50	2·4	120 ✓
100 – 120	20	3·0	60 ✓
120 – 150	30	1·8	54 ✓

M1 A1

number of farms less than 100 hectares
= 120 + 144 + 126 + 90
= 480

number of farms more than 100 hectares
= 60 + 54
= 114

345

(Total 5 marks)

Total Arable farms = 60% of 480 + ½ of 114
= 288 M1 + 57 M1
= 345 A1

21. Solve $\dfrac{5(2x+1)^2}{4x+5} = 5x - 1$

[× $4x+5$

$5(2x+1)^2 = (5x-1)(4x+5)$ M1

$5(2x+1)(2x+1) = (5x-1)(4x+5)$

$5[4x^2+2x+2x+1] = 20x^2+25x-4x-5$ M1

$5[4x^2+4x+1] = 20x^2+21x-5$

A1 $20x^2+20x+5 = 20x^2+21x-5$ A1 [$-20x^2$

$20x+5 = 21x-5$ [$+5$

$20x+10 = 21x$ [$-20x$

$10 = x$

$x = 10$ A1

.....

(Total 5 marks)

TOTAL FOR PAPER IS 80 MARKS