Surname	Centre Number	Candidate Number
Other Names		0

WJEC CBAC

GCSE

4370/05

MATHEMATICS – LINEAR
PAPER 1
HIGHER TIER

SOLUTIONS

A.M. MONDAY, 9 June 2014

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

ADDITIONAL MATERIALS

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **9***(b)*.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	7	
2.	6	
3.	4	
4.	4	
5.	4	
6.	10	
7.	3	
8.	3	
9.	8	
10.	5	
11.	5	
12.	6	
13.	5	
14.	5	
15.	3	
16.	7	
17.	5	
18.	6	
19.	4	
Total	100	

4370 050001

Examiner only

1. *(a)* Estimate the value of $\frac{43{\cdot}3 \times 49{\cdot}8}{200}$. [2]

$\frac{40 \times 50}{200} \approx \frac{2000}{200} \approx 10$

(b) Estimate the value of $\frac{0{\cdot}963}{0{\cdot}482}$. [1]

$\approx \frac{1}{0{\cdot}5}$

$\approx \frac{2}{1} \approx 2$

(c) Given that $54 \times 732 = 39\,528$, find the exact value of the following.

(i) $0{\cdot}054 \times 73{\cdot}2$ [1]

$\div 1000$ $\div 10$

$39528 \div 10000 = 3{\cdot}9528$

(ii) $\frac{39\,528}{0{\cdot}54}$ [1]

From given sum $\frac{39528}{54} = 732$

Top + Bottom $\times 100 = \frac{3952800}{54}$

$= 73200$

(d) Write down the value of one half of $3\frac{1}{2}$. [2]

$\frac{1}{2}$ of $3\frac{1}{2}$

$= \frac{1}{2} \times \frac{7}{2}$

$= \frac{7}{4}$

$= 1\frac{3}{4}$

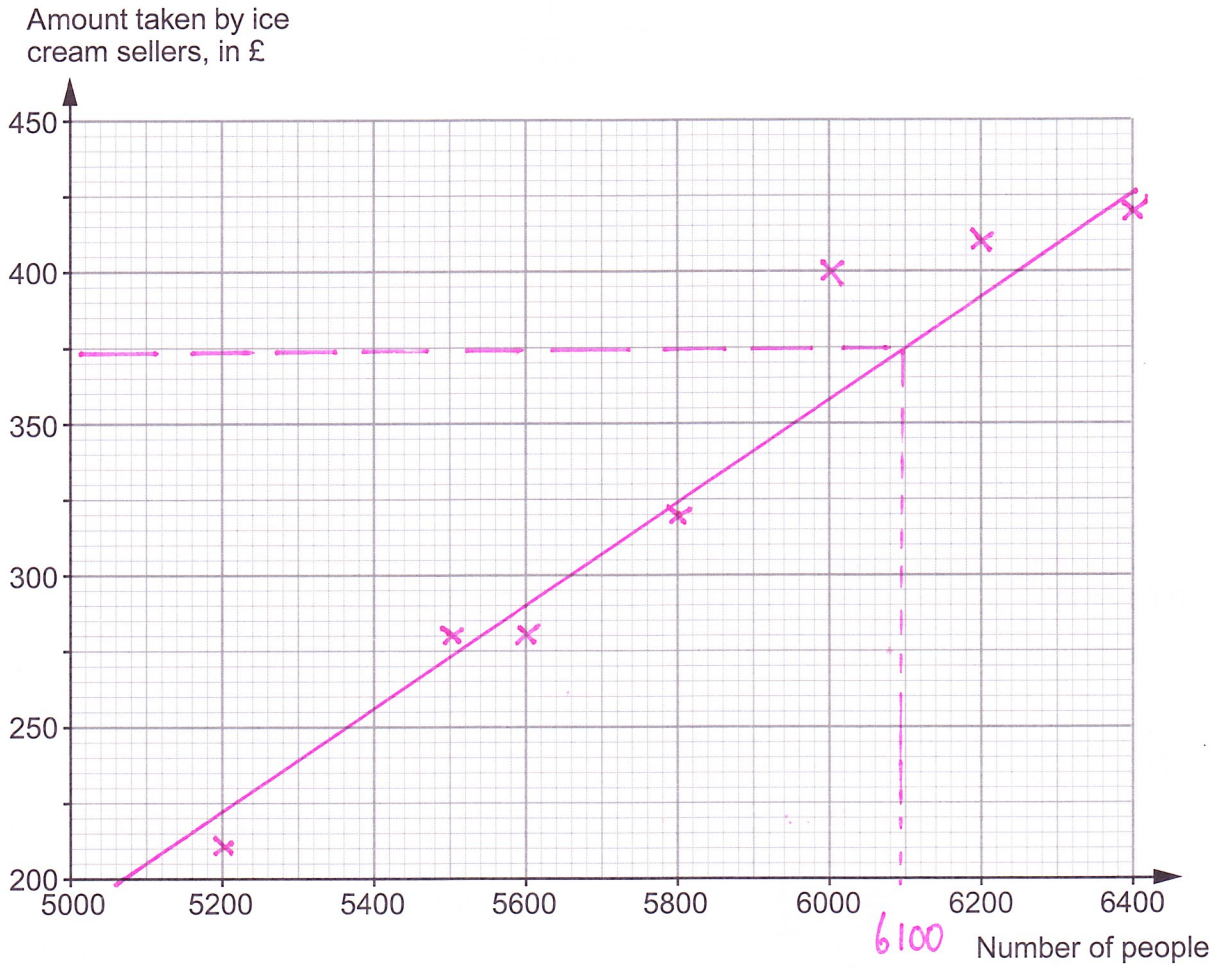
4370 050003

Examiner only

2. A festival took place over 7 days in August.
Each day, the number of people at the festival and the amount of money taken by the ice cream sellers were recorded.
The table below shows the results.

Number of people	5500	6000	5600	5200	5800	6400	6200
Amount taken by ice cream sellers, in £	280	400	280	210	320	420	410

(a) On the graph paper below, draw a scatter diagram of these results. [2]



Examiner only

(b) Write down the type of correlation that is shown by the scatter diagram. [1]

POSITIVE

(c) Draw, by eye, a line of best fit on your scatter diagram [1]

(d) Estimate the amount of money that may have been taken by ice cream sellers during one day had 6100 people attended the festival on that day. [1]

375

(e) Explain why it is not possible to work out how much a typical ice cream costs at the festival. [1]

It only says how much money was taken It doesn't say how many ice creams were sold.

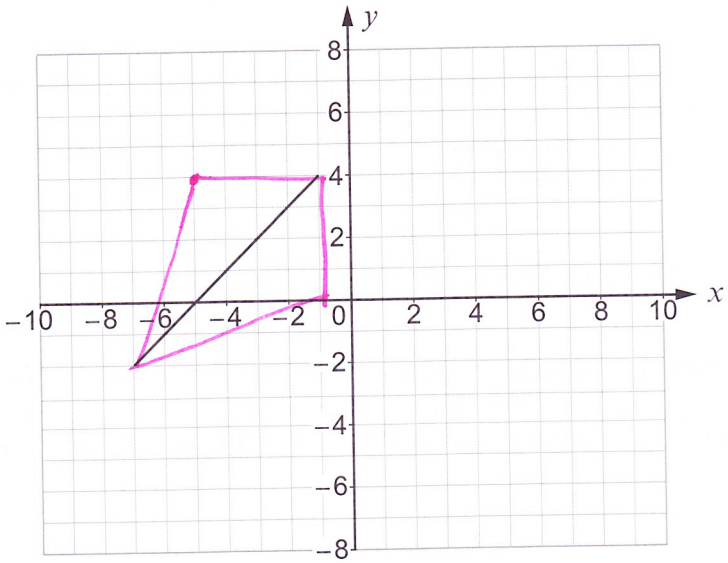
Examiner only

3. Lorna has begun to draw two quadrilaterals, one on each of two grids.
She had drawn a **diagonal** of a quadrilateral on each grid.

She then gives clues to help you draw the quadrilaterals.

By completing the drawings, write down the coordinates of the vertices of each of the quadrilaterals.

(a)



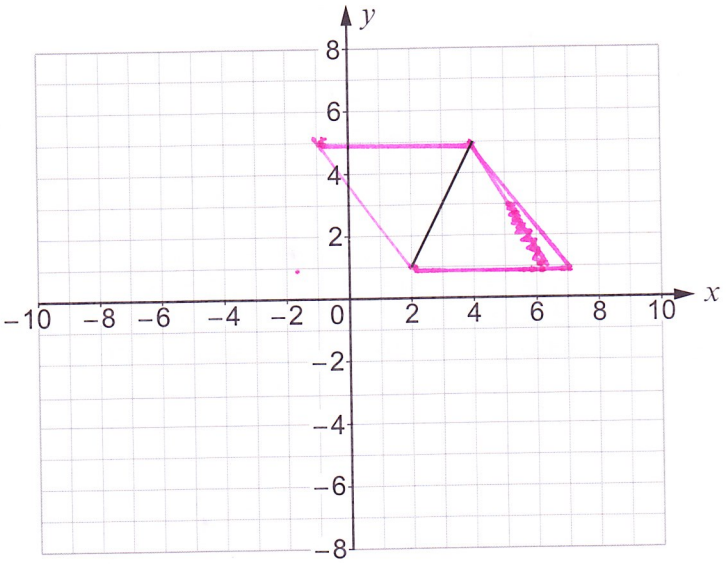
'My shape is a kite. One of the diagonals is shown.
One of the vertices of the kite is at (-5, 4).'

[2]

The vertices of the kite are at

(–5, 4), (-1 , 4), (-7 , -2) and (-5 , 4)

(b)



'My shape is a rhombus. The shorter diagonal is shown.
The other diagonal is twice as long as the one I have already drawn.'

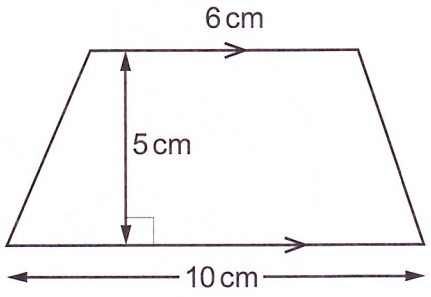
[2]

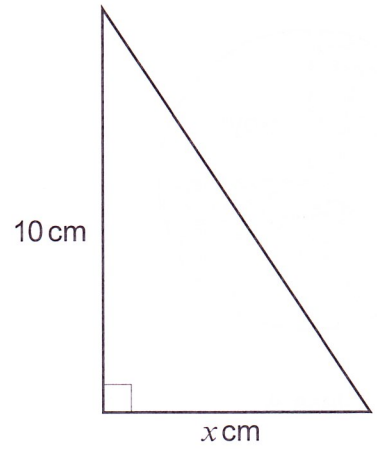
The vertices of the rhombus are at

(-1 , 5), (2 , 1), (7 , 1) and (4 , 5)

Examiner only

4. The area of the trapezium is equal to the area of the right-angled triangle.





Diagrams not drawn to scale

Calculate the value of x. [4]

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

$= \frac{(10+6)5}{2}$

$= 8 \times 5$

$= 40\text{ cm}$

Area triangle $= \frac{bh}{2}$

$= \frac{x(10)}{2}$

$= 5x$

$\therefore \quad 40 = 5x$

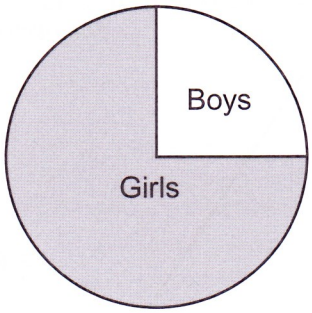
$\frac{40}{5} = x$

$8\text{ cm} = x$

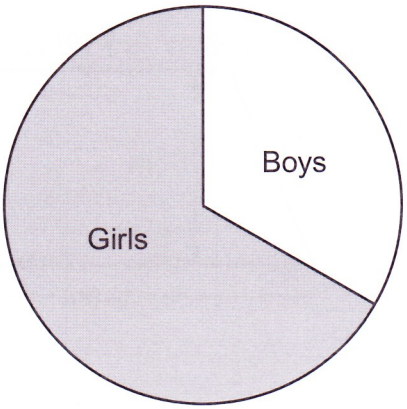
4370 050007

Examiner only

5. The pie charts show the proportion of boys to girls in class A and class B.



Class A



Class B

There are more pupils in class B than in class A.

There are 4 boys in class A.

There are $1\frac{1}{2}$ times as many girls in class B than in class A.

How many boys are there in class B? [4]

Class A

4 boys = 90°

∴ 3 × 4 = 12 girls

Class B

Girls = $1\frac{1}{2} \times 12$

= 18 girls

Examiner only

6. *(a)* Solve $6x - 27 = 4x - 13$. [3]

$6x - 4x = -13 + 27$

$2x = 14$

$x = \frac{14}{2}$

$x = 7$

(b) Solve $\frac{x}{2} + 18 = 26$. [2]

$\frac{x}{2} = 26 - 18$

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

$x = 8 \times 2$

$x = 16$

(c) Factorise $y^2 - 5y$. [1]

$y(y-5)$

(d) Expand $y(y^2 + 4)$. [2]

$y^3 + 4y$

(e) Solve $5x - 6 < 30$. [2]

$5x < 30 + 6$

$5x < 36$

$x < \frac{36}{5}$

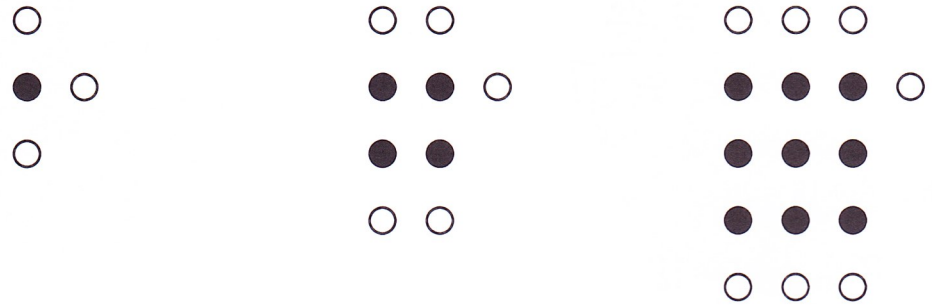
$x < 7\frac{1}{5}$

4370 050009

Examin only

7. Patterns made with black and white circles are shown below.

Pattern 1 | Pattern 2 | Pattern 3



Complete the following statements, in terms of n. [3]

'There will be n^2 black circles in Pattern n.'

'There will be $2n + 1$ white circles in Pattern n.'

Double pattern number + 1

Examiner only

8. In the diagram, angles a, b and c are measured in degrees.

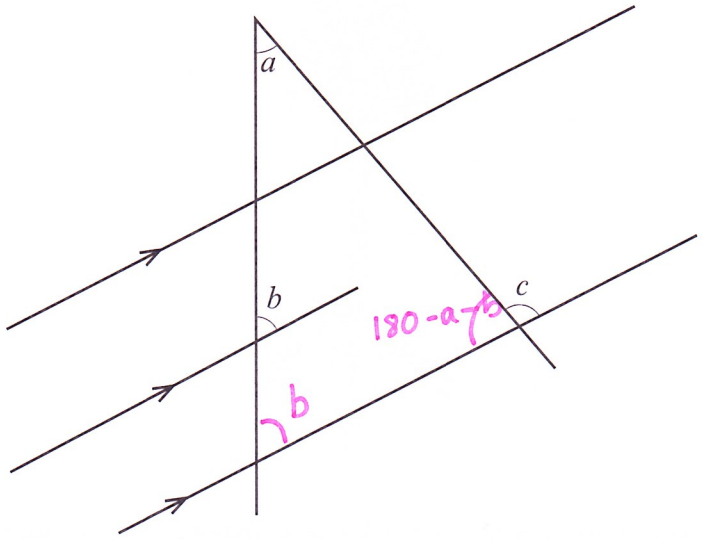


Diagram not drawn to scale

Find the size of angle c in terms of a and b.
You must show all your working, which may be indicated on the diagram. [3]

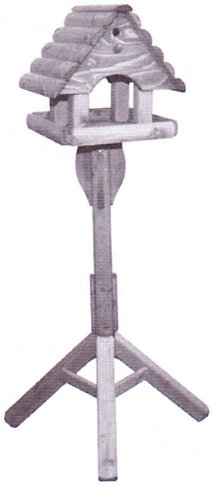
For large triangle.
Top angle a
Bottom left = b because of parallel corresponding angles
3rd angle = 180 - a - b

∴ c = 180 - (180 - a - b) Angle on straight line.
= 180 - 180 + a + b
= a + b

4370 050011

Examin only

9. Amelia regularly buys bird food to place on her bird table.



(a) The winter mix bird food contains buckwheat, millet and sunflower seeds.
For every 2 g of buckwheat there are 3 g of millet and 5 g of sunflower seeds.
How much millet is there in an 850 g bag of winter mix bird food? [2]

2 : 3 : 5

10 ratio parts = 850g

1 ratio part = $\frac{850}{10}$ = 85g

Millet 3 ratio parts = 3 × 85 = 255g

(b) *You will be assessed on the quality of your written communication in this part of the question.*

The summer mix bird food is sold in different sized bags.
The sizes of the bags and the prices are shown below.

Size	Price
250 g	49p
300 g	54p
4 kg	£7.60

Amelia bought exactly 5 kg of the summer mix bird food.
She found the cheapest option for buying the bird food.

How much did Amelia pay for the bird food?
You must show how many bags of each size Amelia bought.
You must show all your working. [6]

Examiner only

Combinations to give 5kg = 5000g bird food mix

(A) $(1 \times 4kg) + (4 \times 250g) = 7{\cdot}60 + 4 \times 0{\cdot}49$
$= 7{\cdot}60 + 1{\cdot}96 = £9{\cdot}56$

OR

(B) $(20 \times 250g) = 0{\cdot}49 \times 20 = £9{\cdot}80$

OR

(C) $(10 \times 300g) + (8 \times 250g) = (10 \times 0{\cdot}54) + (8 \times 0{\cdot}49)$
$= 5{\cdot}40 + 3{\cdot}92 = £9{\cdot}32$

OR

(D) $(5 \times 300g) + (14 \times 250g)$
$= (5 \times 0{\cdot}54) + (14 \times 0{\cdot}49)$
$= £2{\cdot}70 + 6{\cdot}86$
$= £9{\cdot}56$

OR

(E) $(15 \times 300g) + (2 \times 250g)$
$= (15 \times 0{\cdot}54) + (2 \times 0{\cdot}49)$
$= 8{\cdot}10 + 0{\cdot}98$
$= £9{\cdot}08$

Option E is cheapest

ie 15, 300g packets
2, 250g packets
$= £9{\cdot}08$

4370 050013

Examiner only

10. Maggie has lots of tiles.
All of her tiles are in the shape of regular polygons.
The edges of all the tiles have the same length.

She places two 12-sided tiles to meet edge-to-edge.
Maggie places a different-shaped tile with these two tiles.
She finds that the 3 tiles tessellate.

By calculation, find the number of sides of this third tile.
You must show all your working. [5]

2 less than Sides

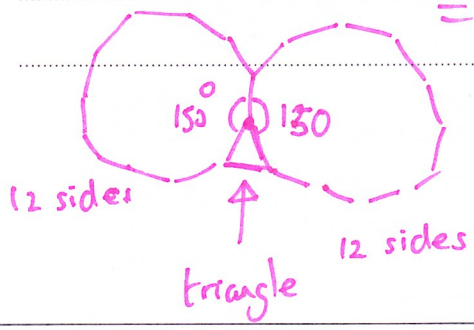
12 sided shape.

Angles add up to $10 \times 180°$
$= 1800°$

∴ Regular 12 sided shape
Each angle $= \frac{1800}{12} = 150°$

So 2 of these shapes $= 150 \times 2$
$= 300°$

∴ 60° left to make 360°
∴ Third shape is equilateral triangle
ie 3 sides.



Examiner only

11. Iona and Dafydd went shopping.
They each bought some bottles of the same blackcurrant cordial and the same soda water.
Iona bought 2 bottles of blackcurrant cordial and 3 bottles of soda water.
Dafydd bought 4 bottles of blackcurrant cordial and 1 bottle of soda water.
Iona spent £2.04 and Dafydd spent £2.48.
Use an algebraic method to calculate the cost of a bottle of blackcurrant cordial and the cost of a bottle of soda water. [5]

Iona $2B + 3S = 2.04$ — (1) $\times 1$

Dafydd $4B + S = 2.48$ — (2) $\times 3$

change sign bottom line

$$\begin{array}{rrcl} & 2B + 3S & = & 2.04 \\ - & 12B + 3S & = & 7.44 \\ \hline \text{ADD} & -10B & = & -5.4 \end{array}$$

$5.4 = 10B$

$£0.54 = B$

(2) $\Rightarrow$

$4(0.54) + S = 2.48$

$2.16 + S = 2.48$

$S = 2.48 - 2.16$

$S = £0.32$

Cost of a bottle of blackcurrant cordial is £0.54

Cost of a bottle of soda water is £0.32

Exami only

12. *(a)* Solve $\frac{6+x}{2}+\frac{2-3x}{3}=\frac{31}{6}$. [4]

LCM on left + right = 6

$\frac{3(6+x)}{6}+\frac{2(2-3x)}{6}=\frac{31}{6}$

$\times 6$ $\quad 3(6+x)+2(2-3x)=31$

$18+3x+4-6x=31$

$22-31=6x-3x$

$-9=3x$

$\frac{-9}{3}=x$

$-3=x$

(b) Factorise $2(x+3)^2-4(x+3)$. [2]

$=2(x+3)[(x+3)-2]$

common factor

$=2(x+3)(x+3-2)$

$=2(x+3)(x+1)$

$=2(x+3)(x+1)$

common factor 2

Examiner only

13. *(a)* The diagram shows a semicircle joined to a square.

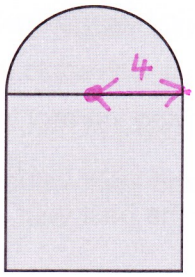


Diagram not drawn to scale

Calculate the total area of the shaded shape, leaving your answer in terms of π. [2]

$A = \frac{\pi r^2}{2} + lb$

$A = \frac{\pi (4^2)}{2} + (8 \times 8)$

$A = 8\pi + 64$

common factor $A = 8(\pi + 8)\ cm^2$

(b) Evaluate 8^0. [1]

1 (Any number to power 0 = 1)

(c) Evaluate $\frac{4{\cdot}5 \times 10^8}{9 \times 10^{12}}$, giving your answer in standard form. [2]

$(4{\cdot}5 \div 9) \times \frac{10^8}{10^{12}}$

$= 0{\cdot}5 \times 10^{-4}$

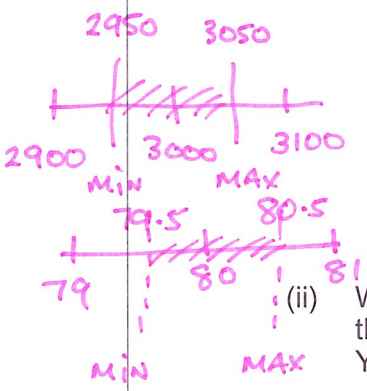
$= 5 \times 10^{-5}$

14. *(a)* Last month, Klaus sold his car.
He was the only driver of the car.

His car's data readings for the past year showed that

- he had travelled 3000 miles, correct to the nearest 100 miles, and
- he had spent 80 hours driving, correct to the nearest hour.

(i) Write down the greatest and least values for the time spent and distance travelled by Klaus in his car during the past year, [2]



Distance travelled:

Least distance 2950 miles Greatest distance 3050 miles

Time spent:

Least time 79·5 hrs Greatest time 80·5 hrs

(ii) Write down the calculation Klaus would need to enter into his calculator to work out the greatest value for the average speed reading for his car during these journeys. You do not need to calculate the answer. [1]

MAX Speed = MAX DISTANCE / MIN TIME = 3050 / 79·5

(b) Last week, Klaus bought a new car.

Klaus's first journey in his new car was 60 miles.
This journey was made in a time of 2 hours.
His second journey in his new car was x miles.
This second journey was made in a time of y hours.

The times are correct, but each of the journey distances is only correct to the nearest mile.
Klaus wants to calculate the least value for the average speed for these two journeys combined.

Write down an expression in terms of x and y for the calculation Klaus would have to perform. [2]

Minimum Total distance = 59·5 + x − 0·5 = x + 59 mi
Total time = 2 + y hrs

∴ Least average speed = Min distance / Time

= $\frac{x+59}{2+y}$

Examiner only

15.

Fifteen small ceramic pebbles are arranged in a straight row.
Each pebble touches the next pebble in the row.
All of the pebbles are identical in size and shape.
Each of the pebbles has a volume of $2\,cm^3$.

A **similar** larger ceramic pebble is made with a volume of $54\,cm^3$.
A straight row of these pebbles is made in the same way as with the smaller pebbles.

How many of these larger pebbles will be needed to form a straight row equal in length to the row of 15 smaller pebbles?
You must show all your working. [3]

Volume large $= 54\,cm^3$

Volume small $= 2\,cm^3$

$\therefore \dfrac{\text{Volume large}}{\text{Volume small}} = \dfrac{54}{2} = 27$

$\therefore$ Scale factor of sides $= \sqrt[3]{27} = 3$

$\therefore$ 15 small pebbles

$= \dfrac{15}{3} = 5$ large pebbles in a row.

16. *(a)* Express each of the following as a **decimal**.

(i) $2{\cdot}1 \times 10^{-2}$ [1]

$0{\cdot}021$

(ii) $400^{-\frac{1}{2}}$ [2]

$= \frac{1}{400^{1/2}}$

$= \frac{1}{\sqrt{400}} = \frac{1}{20} = \frac{5}{100} = 0{\cdot}05$

(b) Express $\frac{12}{99}$ as a recurring decimal. [2]

Let $x = \frac{12}{99}$

$99x = 12$

$100x - x = 12$

$\therefore \quad x = 0{\cdot}\dot{1}\dot{2}$

$100x = 12{\cdot}\dot{1}\dot{2}$

$\therefore \quad \frac{12}{99} = 0{\cdot}\dot{1}\dot{2}$

(c) Given that $a = \sqrt{5}$, $b = \sqrt{7}$ and $c = \sqrt{70}$, find the value of abc.

Write your answer in the form $n\sqrt{2}$ where n is a whole number. [2]

$abc = \sqrt{5}\sqrt{7}\sqrt{70}$

$= \sqrt{35}\sqrt{70}$

$= \sqrt{35}\sqrt{35 \times 2}$

$= \sqrt{35}\sqrt{35}\sqrt{2}$

$= 35\sqrt{2}$

Examiner only

17. Given that y is inversely proportional to x, and that $y = 50$ when $x = 2$,

(a) find an expression for y in terms of x, [3]

$y = \frac{k}{x}$

$50 = \frac{k}{2}$

$100 = k$ $\therefore$ $y = \frac{100}{x}$

(b) use the expression you found in *(a)* to complete the following table. [2]

x	$\frac{1}{2}$	2	8
y	200	50	12·5

$x = \frac{1}{2}$ $y = \frac{100}{\frac{1}{2}} = \frac{200}{1} = 200$

find x if $y = 12{\cdot}5$

$12{\cdot}5 = \frac{100}{x}$

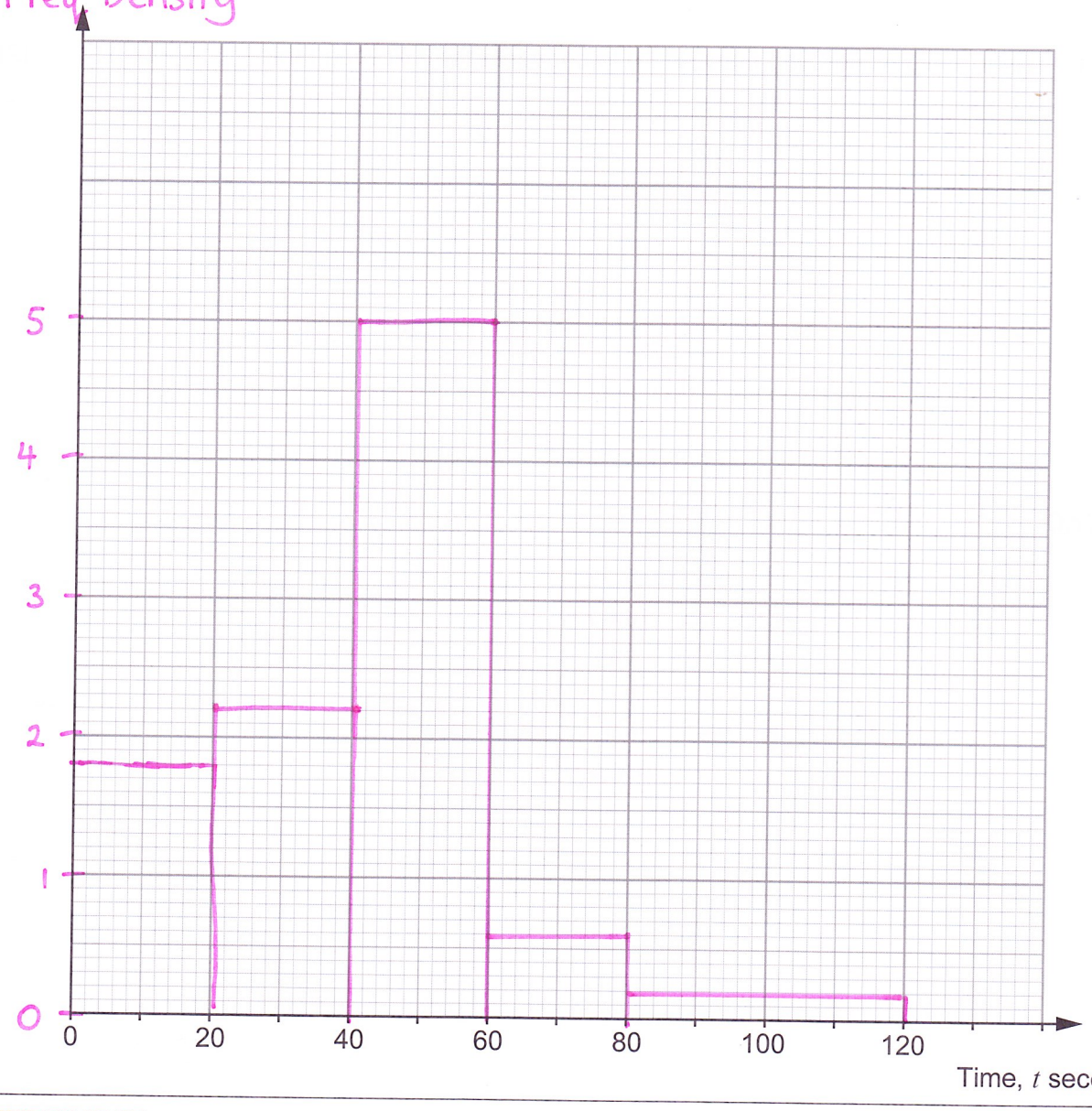
$x = \frac{100}{12{\cdot}5} = \frac{200}{25} = 8$

18. The time taken to answer a short questionnaire was measured for each person in a group of 200 ten-year-olds.
The following grouped frequency distribution was obtained.

Time, t seconds (Width)	$0 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 80$	$80 < t \leqslant 120$
Number of ten-year-olds (Area)	36	44	100	12	8

(a) Draw a histogram to illustrate the distribution on the graph paper below. [4]

Freq Density $\frac{36}{20} = 1.8$ $\frac{44}{20} = 2.2$ $\frac{100}{20} = 5$ $\frac{12}{20} = 0.6$ $\frac{8}{40} = 0.2$



Examiner only

(b) 200 twenty-year-olds were set an identical task.
The times taken to answer the short questionnaire were also recorded using the same time intervals as were used for the ten-year-olds.
The median time taken by the twenty-year-olds to answer the short questionnaire was 58 seconds.

Gemma says,

'The median for the 10-year-olds is the same as the median for the 20-year-olds.'

Fred disagrees. He says,

'The median for the 10-year-olds could be less than the median for the 20-year-olds.'

Explain why either Gemma or Fred could be correct. [2]

Median is 100th result in ascending order

100th result lies in interval $40 < t \leq 60$

∴ Gemma could be right as 58 secs lies in this interval.

Fred could be right as median for 10 year olds could be < 58 secs and still lie in $40 < t \leq 60$.

Examiner only

19. Ralph does not like strawberry flavoured chocolates.
In a dark cinema during a film, Ralph selects two chocolates at random from a box.
There are 20 chocolates in the box.
Of these chocolates, 5 are strawberry flavoured.
Calculate the probability that at least one of the chocolates that Ralph selects is strawberry flavoured. [4]

5 strawberry 15 other

P(NO strawberry)

= P(NOT strawberry and NOT strawberry)

$= \frac{15}{20} \times \frac{14}{19}$

$= \frac{3}{\cancel{4}_{2}} \times \frac{\cancel{14}^{7}}{19}$

$= \frac{21}{38}$

∴ P(at least one strawberry)

$= 1 - \frac{21}{38}$

$= \frac{17}{38}$

END OF PAPER

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE