| Centre Number | | | | | | Candidate Number | | | | |
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| Surname | | | | | | | | | | |
| Other Names | | | | | | | | | | |
| Candidate Signature | | | | | | | | | | |

| For Examiner's Use | |
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| Examiner's Initials | |
| Pages | Mark |
| 3 | |
| 4 - 5 | |
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| 19 | |
| TOTAL | |

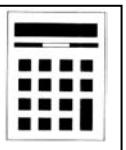
General Certificate of Secondary Education
Higher Tier

# Applications of Mathematics (Linked Pair Pilot) 93701H

**Unit 1 Higher Tier**

**Specimen Paper**

**H**

| **For this paper you must have:**<br>• mathematical instruments.<br>You may use a calculator |  |
|---|---|

**Time allowed**
- 1 hour 30 minutes

**Instructions**
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- If your calculator does not have a $\pi$ button, take the value of $\pi$ to be 3.14 unless another value is given in the question.

**Information**
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- The quality of your written communication is specifically assessed in questions 5, 7, 8 and 12.
  These questions are indicated with an asterisk (✳)
- You may ask for more answer paper, graph paper and tracing paper.
  These must be tagged securely to this answer booklet.
- You are expected to use a calculator where appropriate.

**Advice**
- In all calculations, show clearly how you work out your answer.

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

**1** Mr Jones buys a new car for £18 245 in June 2004.
He sold it for £8500 in June 2009.

He uses a formula to work out the annual depreciation.

$$\text{Annual depreciation} = \frac{\text{Original price (£)} - \text{Final price (£)}}{\text{Number of years}}$$

**1 (a)** Use the formula to work out the annual depreciation of the car.
Give your answer to the nearest £10.

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Answer £ ..... *(3 marks)*

**1 (b)** Estimate the value of the car in June 2010.

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Answer £ ..... *(2 marks)*

**Turn over for the next question**

5

**2** In a science experiment Sita adds weights to a spring.
Each time she adds a weight she measures the length of the spring.
Her results are shown in the table.

| **Weight** (g) | **Length of Spring** (cm) |
|---|---|
| 20 | 165 |
| 30 | 180 |
| 40 | 195 |
| 50 | 210 |

**2 (a)** What is the length of the spring for a total weight of 45 g?

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Answer ..... cm *(2 marks)*

**2 (b)** Work out the length of the spring with no weight on it.

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Answer ..... cm *(2 marks)*

**3** This spreadsheet gives details of the weights of chocolate and packaging in two Easter Eggs.

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | **Easter Egg** | **Weight of Chocolate (g)** | **Weight of packaging (g)** | **Total weight of Easter Egg (g)** | **% of chocolate in Easter Egg by weight** |
| 2 | Chokky | 340 | 170 | 510 | 66.7 |
| 3 | Dairy Crisp | 575 | 240 | | |

**3 (a)** Tom writes formulae to complete the spreadsheet.

This is the formula he writes for column D row 2 = B2 + C2

What formula does he write for column D row 3?

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Answer ..... *(1 mark)*

**3 (b)** His formula for column E row 2 is = B2 ÷ D2 × 100

Use this information to complete the spreadsheet.

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*(2 marks)*

7

**4** A shop manager records the time that customers spend in her shop and the amount of money they spend.

Here are the results

| Time | Average spent per customer |
|---|---|
| 5 minutes or less | £10 |
| Greater than 5 minutes | £20 |

She estimates that if 15 customers visit her shop the takings will be £200.

Use all the information given to work out the greatest number of these 15 customers who spend 5 minutes or less in the shop.

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Answer ..... *(4 marks)*

✳ **5**

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|---|---|
| Buying Euros in England: | £1 = 1.14 Euros |
| Buying Euros in Germany: | £1 = 1.09 Euros |
| Selling Euros in England: | £1 = 1.18 Euros |
| Selling Euros in Germany: | £1 = 1.13 Euros |

Terri goes on holiday to Germany.
She buys some euros for £400 in England.
She buys some more euros for £200 in Germany.

On her holiday Terri spends 484 Euros.
At the end of her holiday Terri decides to sell her remaining euros.

What is the greatest possible amount she could get back?

Show clearly how you work out your answer.

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Answer £ ..... *(6 marks)*

**Turn over for the next question**

**10**

**6** Seb investigates whether members of an athletics club perform better than non-members in a 10 kilometre race.

The table summarises the finishing times of the members.

| **Finishing time, $t$ (minutes)** | **Frequency** | | |
|---|---|---|---|
| $30 \leq t < 40$ | 10 | | |
| $40 \leq t < 50$ | 12 | | |
| $50 \leq t < 60$ | 6 | | |
| $60 \leq t < 70$ | 2 | | |

**6 (a) (i)** Calculate an estimate of the mean finishing time of the members.

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Answer ..... minutes *(4 marks)*

**6 (a) (ii)** A member is chosen at random.

What is the probability that she finishes the race in less than 50 minutes?

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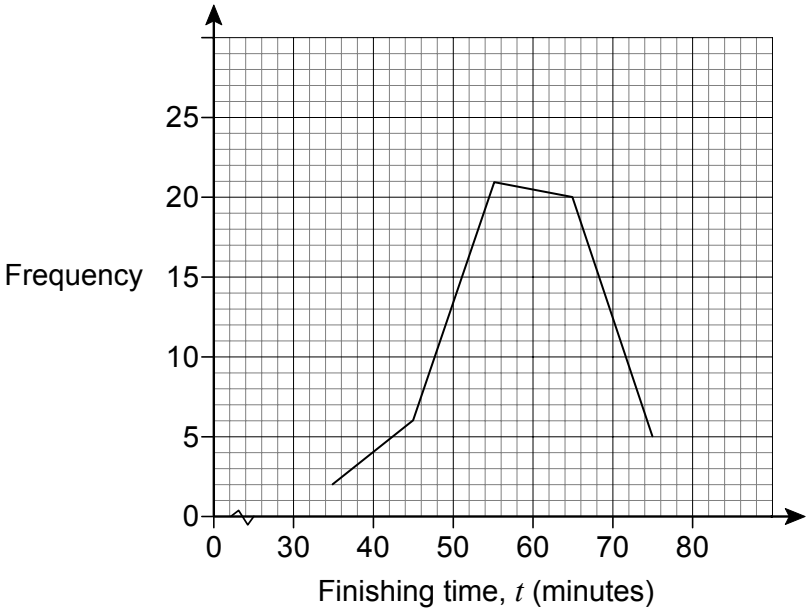
Answer ..... *(2 marks)*

Do not write outside the box

**6 (b)** The frequency polygon for the finishing times of non-members is shown below.




**6 (b) (i)** On the same axes draw the frequency polygon for the finishing times of the members.

*(2 marks)*

**6 (b) (ii)** Seb claims that on average non-members are slower and have more varied finishing times than members.

How can you tell that **both** of Seb's claims are correct?

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*(2 marks)*

**6 (c)** Brendan finishes 11th in the race.

Which of the following could be his finishing time?

Circle your answer.

39 minutes  42 minutes  48 minutes  52 minutes

Explain your choice of answer.

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*(2 marks)*

**12**

✳ **7** Value added tax (VAT) is an extra charge for some goods and services.
The rate of VAT is 15%

$T$ is the total cost including VAT.
$A$ is the amount excluding VAT.

**7 (a)** Which of the following formulae is correct?
Circle **all** correct answers.

$T = 1.15A$ $T = A + 0.15A$ $T = A\,(1 + \frac{15}{100})$ $T = A + \frac{A}{10} + \frac{A}{20}$

*(2 marks)*

**7 (b)** A laptop cost £480 excluding VAT.

The laptop can be paid for in instalments using an interest free offer.

To use the offer a 25% deposit has to be paid and the remaining balance is paid by 24 equal monthly instalments.

How much is **one** monthly instalment?

Show clearly how you work out your answer.

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Answer £ ..... *(6 marks)*

✳ **8** In 2009 a market gardener employs 12 workers to pick strawberries.
The workers pick the strawberries in 10 days.
In 2010 the market gardener plans to increase the number of strawberries by 50%.
He decides to employ 15 workers to pick them.

How long does it take?
Assume that the workers in 2010 pick strawberries at the same rate as the workers in 2009.
You **must** show your working.

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Answer ..... *(4 marks)*

**Turn over for the next question**

**12**

**9** The formula shows the cost of wedding invitation cards, where

$C$ is the cost in £
$n$ is the number of cards

$$C = 50 + \frac{3}{2}(n - 20)$$

**9 (a)** The minimum order is 20 cards.

How much do 20 cards cost?

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Answer £ ..... *(2 marks)*

**9 (b)** Sam is charged £ 340 for his wedding cards.

Show clearly that a mistake has been made.

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*(3 marks)*

**10** After exercise you can work out your fitness index, *F*, using this formula.

$$F = \frac{50T}{a+b+c}$$

You need to know

Exercise time in seconds ($T$)

The number of pulse beats in three 30 second intervals after you have stopped exercising ($a$, $b$ and $c$).

Your fitness grade can be worked out from your fitness index, *F*, using this table.

| **Fitness index *F*** | $< 50$ | 50 to 60 | 60 to 70 | 70 to 80 | 80 to 90 | $\geq 90$ |
|---|---|---|---|---|---|---|
| **Fitness grade** | Very poor | Poor | Fair | Good | Excellent | Superb |

Jamal exercises for 210 seconds.
When he counts his pulse beats he obtains $a = 70$, $b = 55$ and $c = 45$

What is Jamal's fitness grade?

You **must** show your working.

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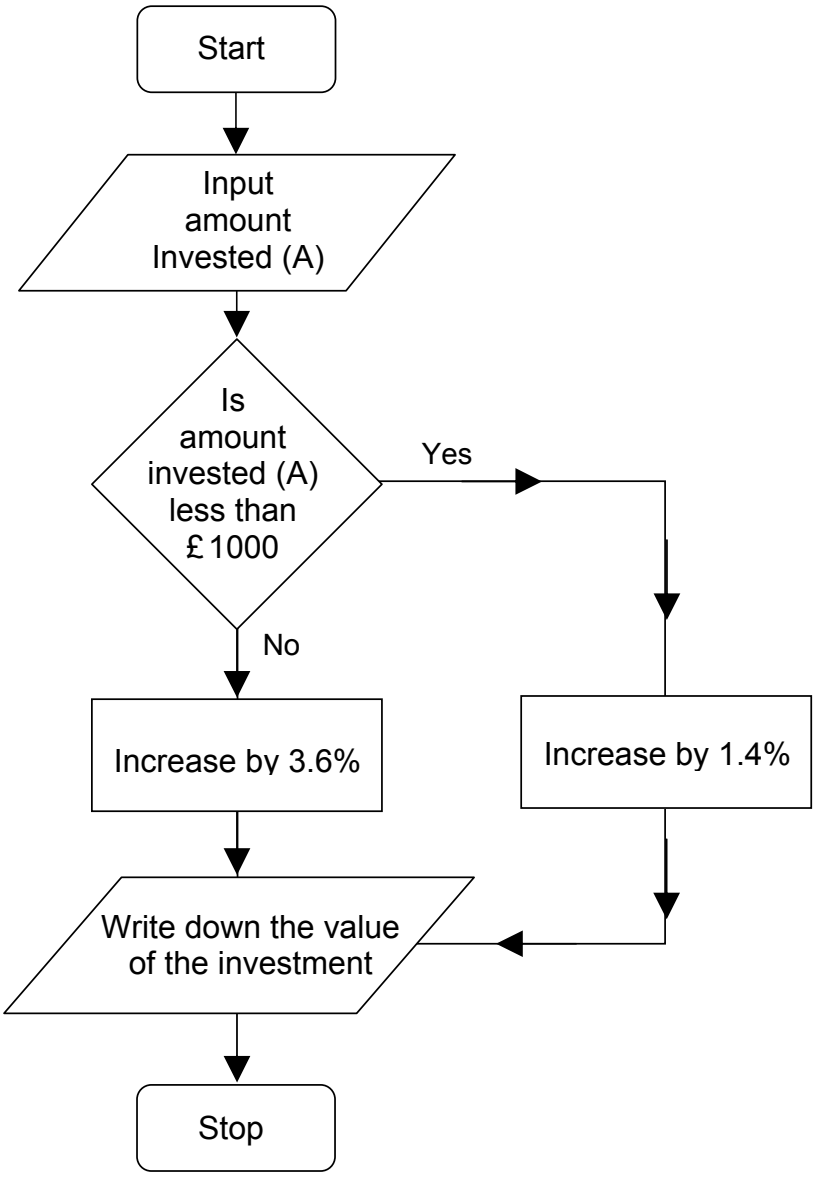
Answer ..... *(3 marks)*

**8**

**11** Here is a flowchart for working out the interest paid on a one year's savings bond.




Dev is planning to invest £950.

How much more interest would he earn if he invested £100 more?

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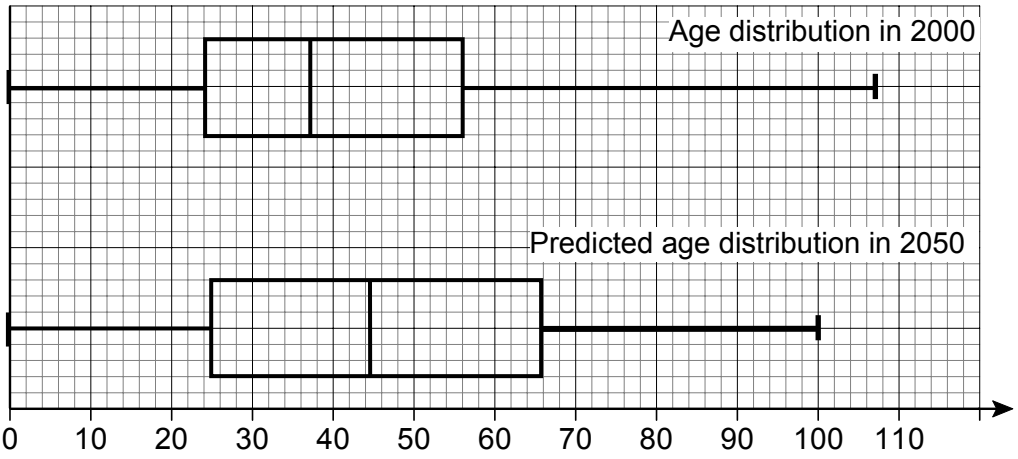
Answer £ ..... *(5 marks)*

✳ **12** These box plots show the age distribution of the UK population in 2000 and the predicted age distribution of the UK population in 2050.




What is expected to happen to the UK population between 2000 and 2050?

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*(3 marks)*

**Turn over for the next question**

**8**

**13** A train company surveys opinions about the quality of its service.
On a particular train journey there are 140 passengers travelling standard class and 35 passengers travelling first class.

A sample of 40 passengers is taken, stratified according to the class of travel.

Calculate the number of passengers travelling standard class and the number of passengers travelling first class that should be in the sample of 40.

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Answer Standard class .....

First class ..... *(3 marks)*

**14** A fork lift truck can safely lift 3.3 tonnes.
Cases weigh 290 kg to two significant figures.

How many cases can the truck lift safely?

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Answer ..... *(4 marks)*

**15** Here is a formula for working out the Annual Equivalent Rate of interest (AER).

$$AER = 100\left(\left(1+\frac{r}{100n}\right)^{n}-1\right)$$

$r$ is the rate of interest used.

$n$ is the number of times each year that it is worked out.

The Cardiff Building Society work out interest every six months using an interest rate of 5%.

The Dover Building Society work out interest daily ($n = 365$) using an interest rate of 4.6%.

Compare the AER of these Building Societies, assuming an investment for a year.

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*(4 marks)*

**Turn over for the next question**

11

**16** A school asks a bus company to transport some students on a trip.

$L$ is the number of large buses used.

$S$ is the number of small buses used.

The company has 4 large buses and 5 small buses available.

Two inequalities that represent the number of buses that the company can use to transport the students are $L \leq 4$ and $S \leq 5$

These inequalities are represented on the grid opposite.

**16 (a)** The company has a maximum of 7 drivers.

The large bus can transport 25 students.

The small bus can transport 15 students.

The company has been asked to transport a total of 90 students.

Write down **two** inequalities that fit these conditions and represent them on the graph.

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*(5 marks)*

**16 (b)** The company charge £250 for each large bus and £100 for each small bus.

What is the cheapest way the bus company can transport the 90 students?

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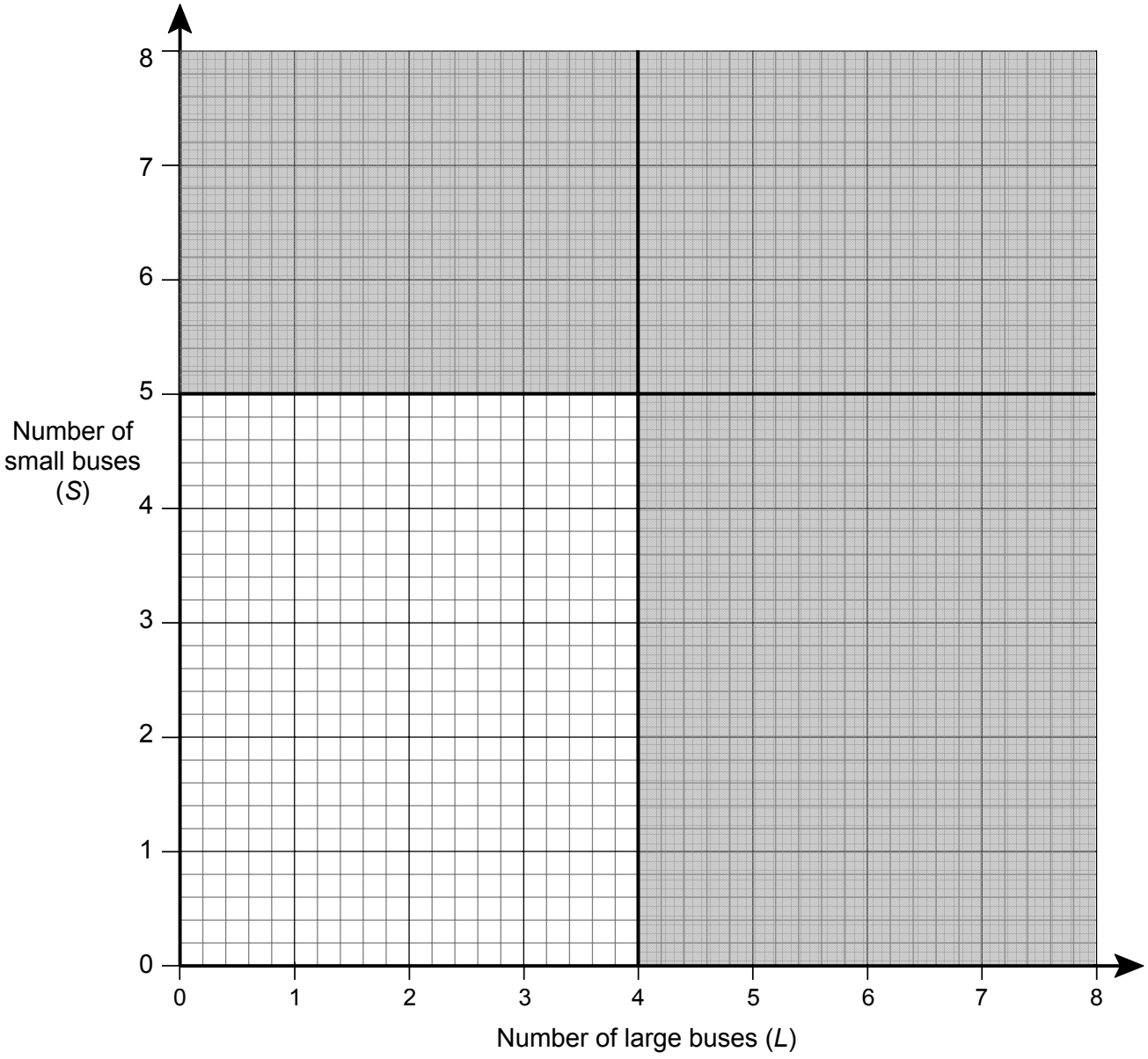
Answer ..... *(2 marks)*




**END OF QUESTIONS**

7

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**ANSWER IN THE SPACES PROVIDED**