

# Candidate 1

## Question 1

1. A lake had a volume of 14 730 000 litres.

Due to decreasing rainfall the volume of the lake is expected to decrease by 2.8% annually.

Calculate the expected volume of the lake after 3 years.

Give your answer to 3 significant figures.

4

Year 1

$$14\,730\,000 \div 100 \times 2.8 = 412\,440$$

$$14\,730\,000 - 412\,440 = 10\,605\,600$$

Year 2

$$10\,605\,600 \div 100 \times 2.8 = 296\,956.8$$

$$10\,605\,600 - 296\,956.8 = 10\,308\,643.2$$

Year 3

$$\div 100 \times 2.8 = 288\,643.2$$

$$\text{take away} = 10\,020\,000.0$$

10 000 000 to 3 sf

## Candidate 2

### Question 1

1. A lake had a volume of 14 730 000 litres.

Due to decreasing rainfall the volume of the lake is expected to decrease by 2.8% annually.

Calculate the expected volume of the lake after 3 years.

Give your answer to 3 significant figures.

4

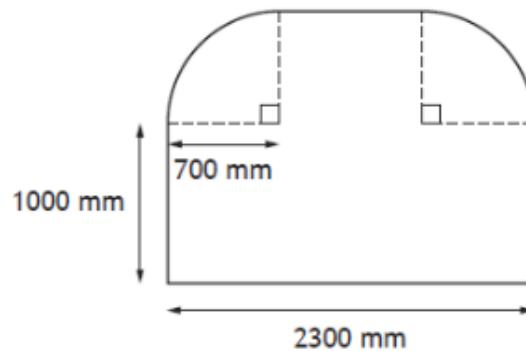
$$\begin{aligned} & 14730000 \div 1.028^3 \\ & = 13558867 \\ & = 1360000 \text{ to 3 sig figs} \end{aligned}$$

## Candidate 3

### Question 2

2. A glazier is edging the perimeter of a window.

The window is in the shape of two rectangles and two identical quarter circles.



Calculate the length of edging required for the perimeter of the window.

3

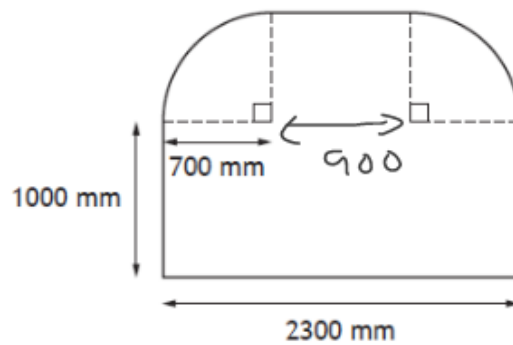
$$\begin{aligned} & 2300 + 1000 + 700 + 700 + 2300 \\ & - 1400 + 700 + 700 + 1000 \\ & = 8000 \text{ mm} \end{aligned}$$

## Candidate 4

### Question 2

2. A glazier is edging the perimeter of a window.

The window is in the shape of two rectangles and two identical quarter circles.



Calculate the length of edging required for the perimeter of the window.

3

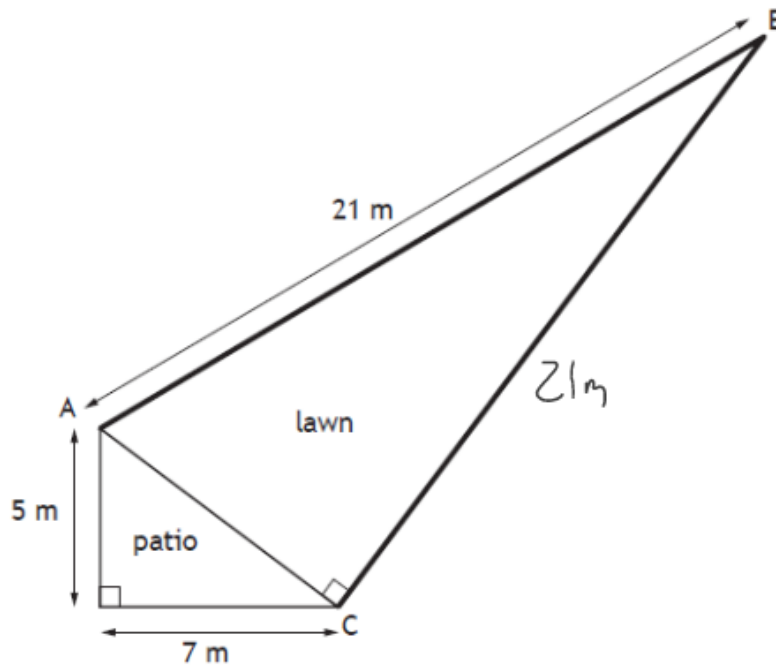
$$\begin{aligned}
 C &= \pi d \\
 &= \pi \times 700 \\
 &= 2199
 \end{aligned}$$

$$\begin{aligned}
 &2199 + 1000 + 1000 + 900 + 2300 \\
 &= 7399 \text{ mm}
 \end{aligned}$$

## Candidate 5

### Question 3

3. Fiona is having her back garden redesigned.



A new fence is to be put from A to B and from B to C.

Rolls of fencing are 3 m long and cost £22 per roll.

Calculate the cost of the fencing.

6

$$21 + 21 = 42$$

$$42 \div 3 = 14$$

$$14 \times 22 = \pounds 308$$

## Candidate 6

### Question 3

A new fence is to be put from A to B and from B to C.

Rolls of fencing are 3 m long and cost £22 per roll.

Calculate the cost of the fencing.

6

$$5^2 + 7^2 = 74 \quad 21^2 + 8.6^2 = 515$$

$$\sqrt{74} = 8.6 \quad \sqrt{515} = 22.7$$

$$21 + 22.7 = 43.7$$

$$43.7 \div 3 = 14.56\dots$$

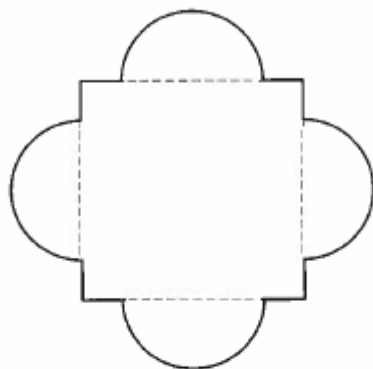
14 rolls

$$14 \times £22 = £308$$

## Candidate 7

### Question 4(a)

4. The reception area in a hotel features a large mirror.  
The mirror is in the shape of a square with identical semi-circles on each side.
- The square has sides of length 1.2 metres.
  - The semi-circles have a **diameter** of 0.7 metres.



(a) Calculate the area of the mirror.

2

$$\begin{aligned}A &= 0.7^2 \times \pi \div 2 \\ &= 1.539 \div 2 \\ &= 0.7697 \dots\end{aligned}$$

$$1.2 \times 1.2 = 1.44$$

$$\begin{aligned}1.44 + 0.7697 \\ = \underline{\underline{2.21 \text{ m}^2}}\end{aligned}$$

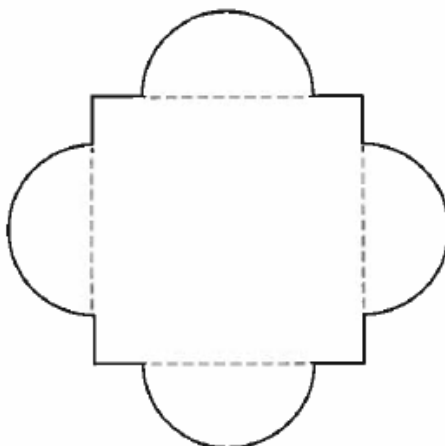
## Candidate 8

### Question 4(a)

4. The reception area in a hotel features a large mirror.

The mirror is in the shape of a square with identical semi-circles on each side.

- The square has sides of length 1.2 metres.
- The semi-circles have a **diameter** of 0.7 metres.



- (a) Calculate the area of the mirror.

2

$$A = 1.2 \times 1.2 = 1.44$$

$$A = \pi r^2$$

$$A = \pi \times 0.35 \div 2 \\ = 0.55$$

$$0.55 \times 4 = 2.2$$

$$1.44 + 2.2 = 3.64$$



## Candidate 9

### Question 4(b)

#### 4. (continued)

The hotel bought a different mirror for the ballroom.

The options for mirrors are shown in the table.

|                                   |                                   |             |                                    |                              |                                 |                |
|-----------------------------------|-----------------------------------|-------------|------------------------------------|------------------------------|---------------------------------|----------------|
| <b>Glass coating</b>              | standard: £12 per m <sup>2</sup>  |             | anti-glare: £16 per m <sup>2</sup> |                              |                                 |                |
| <b>Fixings</b>                    | basic:<br>£19 per mirror          |             | standard:<br>£32 per mirror        |                              | premium:<br>£42 per mirror      |                |
| <b>Backing</b>                    | no backing: £0 per mirror         |             |                                    | foil backing: £20 per mirror |                                 |                |
| <b>Glass colour and thickness</b> | <b>Bronze (per m<sup>2</sup>)</b> |             | <b>Silver (per m<sup>2</sup>)</b>  |                              | <b>Gold (per m<sup>2</sup>)</b> |                |
|                                   | 4 mm<br>£18                       | 6 mm<br>£36 | 4 mm<br>£38                        | 6 mm<br>£58                  | 4 mm<br>£66                     | 6 mm<br>£86.50 |

The hotel bought a mirror with an area of 3 m<sup>2</sup>.

The hotel chose the following options for the mirror:

- 4 mm thick silver glass
- anti-glare glass coating
- standard fixings
- foil backing.

(b) Calculate the total cost of this mirror.

2

$$\begin{array}{r}
 16 \\
 19 \times 3 = 57 \\
 20 \\
 38 \times 3 = 114 \\
 \\
 = \text{£} 207
 \end{array}$$

## Candidate 10

### Question 4(b)

#### 4. (continued)

The hotel bought a different mirror for the ballroom.

The options for mirrors are shown in the table.

|                            |                                  |             |                                    |                              |                            |                |
|----------------------------|----------------------------------|-------------|------------------------------------|------------------------------|----------------------------|----------------|
| Glass coating              | standard: £12 per m <sup>2</sup> |             | anti-glare: £16 per m <sup>2</sup> |                              |                            |                |
| Fixings                    | basic:<br>£19 per mirror         |             | standard:<br>£32 per mirror        |                              | premium:<br>£42 per mirror |                |
| Backing                    | no backing: £0 per mirror        |             |                                    | foil backing: £20 per mirror |                            |                |
| Glass colour and thickness | Bronze (per m <sup>2</sup> )     |             | Silver (per m <sup>2</sup> )       |                              | Gold (per m <sup>2</sup> ) |                |
|                            | 4 mm<br>£18                      | 6 mm<br>£36 | 4 mm<br>£38                        | 6 mm<br>£58                  | 4 mm<br>£66                | 6 mm<br>£86.50 |

The hotel bought a mirror with an area of 3 m<sup>2</sup>.

The hotel chose the following options for the mirror:

- 4 mm thick silver glass      114
- anti-glare glass coating      48
- standard fixings      96
- foil backing.      60

(b) Calculate the total cost of this mirror.

2

£318

# Candidate 11

## Question 5(a)

5. Stuart records the chlorine levels in his hot tub.

A sample of the levels is shown below.

| Mon | Tue | Wed | Thurs | Fri | Sat | Sun |
|-----|-----|-----|-------|-----|-----|-----|
| 0.8 | 1.9 | 1.1 | 2.6   | 3.1 | 2.4 | 2.1 |

(a) For these levels, calculate:

(i) the mean

1

$$14 \div 7 = 2$$

(ii) the standard deviation.

3

| $x$ | $x^2$ |
|-----|-------|
| 0.8 | 0.64  |
| 1.9 | 3.61  |
| 1.1 | 1.21  |
| 2.6 | 6.76  |
| 3.1 | 9.61  |
| 2.4 | 5.76  |
| 2.1 | 4.41  |
| 14  | 32    |

$$\sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}}$$

$$= \sqrt{\frac{32 - 28}{6}}$$

$$= 0.833$$

## Candidate 12

### Question 5(a)

5. Stuart records the chlorine levels in his hot tub.

A sample of the levels is shown below.

| Mon | Tue | Wed | Thurs | Fri | Sat | Sun |
|-----|-----|-----|-------|-----|-----|-----|
| 0.8 | 1.9 | 1.1 | 2.6   | 3.1 | 2.4 | 2.1 |

(a) For these levels, calculate:

(i) the mean

1

$$\frac{14}{7} = 2$$

(ii) the standard deviation.

3

| $x$ | $x - \bar{x}$ | $(x - \bar{x})^2$ |
|-----|---------------|-------------------|
| 0.8 | -1.2          | 1.44              |
| 1.9 | -1.1          | 1.21              |
| 1.1 | -0.9          | 0.81              |
| 2.6 | 0.6           | 0.36              |
| 3.1 | 1.1           | 1.21              |
| 2.4 | 0.4           | 0.16              |
| 2.1 | 0.1           | 0.01              |
|     |               | 4.2               |

$$Sd = \frac{\sqrt{4.2}}{7-1}$$

$$= \sqrt{0.7}$$

$$= 0.84$$

## Candidate 13

### Question 5(b)

His friend Colin's hot tub had a mean chlorine level of 2.2 and a standard deviation of 1.4.

- (b) Make two valid comparisons about the chlorine levels in Stuart's and Colin's hot tubs.

2

On average Colin's levels are higher  
and more spread out.

## Candidate 14

### Question 5(b)

His friend Colin's hot tub had a mean chlorine level of 2.2 and a standard deviation of 1.4.

- (b) Make two valid comparisons about the chlorine levels in Stuart's and Colin's hot tubs.

2

Colin had a higher average chlorine level.  
Stuart's chlorine is more consistent

## Candidate 15

### Question 5(c)

Colin had a new hot tub installed in his garden.

It normally takes a team of 4 workers 12 hours to complete the task.

The company sent an additional worker to help complete the task.

All workers work at the same rate.

The workers started at 08:00 and they took a 30 minute break for lunch.

(c) Determine the time they finished installing the hot tub.

3

$$5 \div 4 = 1.25$$

$$12 \div 1.25 = 9.6$$

$$9 \text{ hrs } 36 \text{ mins} + 30 \text{ mins} = 10 \text{ hrs } 6 \text{ mins}$$

$$\underline{6.06}$$

## Candidate 16

### Question 5(c)

Colin had a new hot tub installed in his garden.

It normally takes a team of 4 workers 12 hours to complete the task.

The company sent an additional worker to help complete the task.

All workers work at the same rate.

The workers started at 08:00 and they took a 30 minute break for lunch.

(c) Determine the time they finished installing the hot tub.

3

$$12 \div 4 = 3$$

$$12 - 3 = 9 \text{ hours}$$

## Candidate 17

### Question 6(a)

6. Lorna is travelling around Europe.

| Rates of exchange   |                    |
|---------------------|--------------------|
| Pounds sterling (£) | Other currencies   |
| 1                   | 1.15 euros         |
| 1                   | 4.94 Polish zlotys |

- Lorna converted £640 into Polish zlotys.
- She was in Poland for 4 days.
- She spent 340 Polish zlotys each day she was in Poland.
- She converted her remaining Polish zlotys into euros.

(a) Calculate how many euros she received.

3

$$640 \div 4.94 = 129.55$$

$$340 \times 4 = 1360$$

$$129.55 - 1360 = -1230.45$$

$$1230.45 \div 4.94 \times 1.15 = 286.44$$

## Candidate 18

### Question 6(a)

6. Lorna is travelling around Europe.

| Rates of exchange   |                    |
|---------------------|--------------------|
| Pounds sterling (£) | Other currencies   |
| 1                   | 1.15 euros         |
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- She spent 340 Polish zlotys each day she was in Poland.
- She converted her remaining Polish zlotys into euros.

- (a) Calculate how many euros she received.

3

$$340 \times 4.94 = 3161$$

$$3161 - 4 \times 340 = 1801$$

$$1801 \div 4.94 = 364$$

$$364 \times 1.15 = \underline{\underline{418.6}}$$



# Candidate 19

## Question 6(b)

6. (continued)

Lorna visited Switzerland and decided to buy some cheese.

The cost of five types of cheese is shown in the table.

| Type of cheese | Cost per 250 grams in Swiss francs |
|----------------|------------------------------------|
| Emmental       | 2.50                               |
| Gruyere        | 7.50                               |
| Raclette       | 7.00                               |
| Edam           | 3.00                               |
| Mozzarella     | 2.00                               |

Lorna saw 3 different deals for buying cheese.



Lorna is going to buy 250 grams of each cheese.

(b) Determine the best deal for buying all 5 cheeses.

Use your working to justify your answer.

2

$$10\% \text{ of } 22 = 2.20$$

$$5\% = 1.10$$

$$15\% = 3.30$$

Deal A as it has biggest savings.

## Candidate 20

### Question 6(b)

6. (continued)

Lorna visited Switzerland and decided to buy some cheese.

The cost of five types of cheese is shown in the table.

| Type of cheese | Cost per 250 grams in Swiss francs |
|----------------|------------------------------------|
| Emmental       | 2.50                               |
| Gruyere        | 7.50                               |
| Raclette       | 7.00                               |
| Edam           | 3.00                               |
| Mozzarella     | 2.00                               |

Lorna saw 3 different deals for buying cheese.



Lorna is going to buy 250 grams of each cheese.

(b) Determine the best deal for buying all 5 cheeses.

Use your working to justify your answer.

2

$$2.50 + 7.50 + 7.00 + 3.00 + 2.00$$

$$= 22 \text{ sf}$$

$$22 - 3 - 3 = 18.7$$

$$10\% = 2.2$$

$$5\% = 1.1$$

$$15\% = 3.3$$

Deal A

[Turn over

## Candidate 21

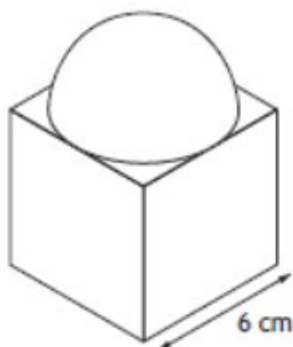
### Question 6(c)

6. (continued)

Lorna also purchased a paperweight as a gift.

The paperweight is made in the shape of a cube with a hemisphere on top.

The hemisphere is half of a sphere with a diameter of 6 cm.



(c) Calculate the volume of the paperweight.

3

$$\frac{4}{3} \times \pi \times 3^3 \div 2 = 55.5$$

$$6 \times 6 = 36$$

$$36 + 55.5 = 91.5 \text{ cm}^3$$

## Candidate 22

### Question 6(c)

6. (continued)

Lorna also purchased a paperweight as a gift.

The paperweight is made in the shape of a cube with a hemisphere on top.

The hemisphere is half of a sphere with a diameter of 6 cm.



(c) Calculate the volume of the paperweight.

3

$$\frac{4}{3}\pi r^3 = \frac{4}{3} \times \pi \times 6^3$$
$$= 904.8$$

$$6 \times 6 \times 6 = 216$$

$$904.8 + 216 = 1120.8 \text{ cm}^3$$

## Candidate 23

### Question 7(a)

7. Dave has a job in an office typing documents.  
He is contracted to work 35 hours per week.  
He earns £11.20 per hour.  
He is paid time and a half for any overtime he works.  
Last week Dave worked 37.5 hours.

(a) Calculate his gross wage last week.

$$\begin{aligned} \pounds 11.20 \div 2 &= \pounds 5.60 & \pounds 11.20 \times 37.5 &^2 \\ \pounds 5.60 \times 2.5 &= \pounds 14 & &= \pounds 420 \end{aligned}$$

$$\pounds 420 + \pounds 14 = \underline{\underline{\pounds 434}}$$

## Candidate 24

### Question 7(a)

7. Dave has a job in an office typing documents.  
He is contracted to work 35 hours per week.  
He earns £11.20 per hour.  
He is paid time and a half for any overtime he works.  
Last week Dave worked 37.5 hours.

(a) Calculate his gross wage last week.

2

$$\begin{aligned} \pounds 11.20 \div 2 &= \pounds 5.60 & \pounds 5.60 + \pounds 11.20 \\ & & = \pounds 16.80 \end{aligned}$$

$$\pounds 16.80 \times 37.5 = \pounds 630$$

$$5.60 \times 35 = \pounds 196$$

$$\text{Wage} = \pounds 826$$

## Candidate 25

### Question 7(b), 7(c), 7(d)(i) and (ii)

Dave records the number of words per minute that he typed during a 14-minute period.

37, 37, 39, 41, 42, 44, 46, 47, 48, 48, 49, 51, 54  
~~47 39 51 49 42 44 47 54 48 37 41 46 37 44~~

(b) For this data, calculate:

- the median 46
- the lower quartile 40
- the upper quartile. 48.5

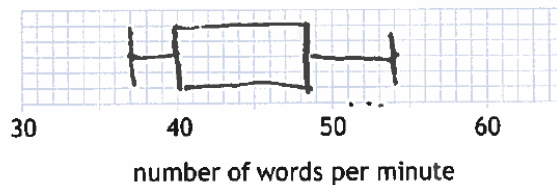
2

7. (continued)

(c) Construct a boxplot for this set of data.

2

(An additional grid, if required, can be found on page 18.)



(d) (i) Calculate the interquartile range for the number of words Dave can type per minute.

1

$$\frac{48.5 - 40}{2} = \underline{\underline{4.25}}$$

Lynn works in the same office as Dave.

Lynn also records the number of words per minute that she can type.

The interquartile range for the number of words that Lynn can type per minute is 5.

(ii) Make one valid comment comparing the number of words Dave and Lynn can type per minute.

1

Lynn's typing speed is more varied than Dave's

## Candidate 26

### Question 7(e)(i) and (ii)

Lynn earns £1052 a week.

National Insurance is calculated on a person's wage **before** deductions such as pension contributions.

| National Insurance rates (weekly) |        |
|-----------------------------------|--------|
| Up to £242                        | 0%     |
| From £242 to £967                 | 13.25% |
| Over £967                         | 3.25%  |

(e) (i) Calculate Lynn's weekly National Insurance payment.

3

$$(1025 - 967) \times 0.0325 = \pounds 1.88$$

$$(967 - 242) \times 0.1325 = \pounds 96.06 +$$

$$\pounds 97.94$$

$$1052 - 97.94 = \pounds 954.06$$

Lynn pays 4.5% of her weekly wage into her pension.

Her weekly income tax is £52.08.

(ii) Calculate Lynn's weekly net pay.

2

$$954.06 \times 0.955 = \pounds 911.13$$

$$911.13 - 52.08 = \pounds 859.05$$



## Candidate 27

### Question 7(e)(i)(ii)

Lynn earns £1052 a week.

National Insurance is calculated on a person's wage **before** deductions such as pension contributions.

| National Insurance rates (weekly) |        |
|-----------------------------------|--------|
| Up to £242                        | 0%     |
| From £242 to £967                 | 13.25% |
| Over £967                         | 3.25%  |

- (e) (i) Calculate Lynn's weekly National Insurance payment.

3

$$1052 \div 3.25 = 323.69$$

Lynn pays 4.5% of her weekly wage into her pension.

Her weekly income tax is £52.08.

- (ii) Calculate Lynn's weekly net pay.

2

$$1052 \div 4.5 = 233.77$$

$$1052 - 233.77 - 52.08 = £766.15$$

## Candidate 28

### Question 8(a)

8. Jacqueline buys items online and sells them in her shop.  
Jacqueline bought a painting for £320 and sold it for £415.

(a) Calculate the percentage profit that she made.

2

$$415 - 320 = 105$$

$$105 \div 415 \times 100 = 25.3\%$$

## Candidate 29

### Question 8(a)

8. Jacqueline buys items online and sells them in her shop.  
Jacqueline bought a painting for £320 and sold it for £415.

(a) Calculate the percentage profit that she made.

2

$$\frac{320}{415} \times 100 = 77.1$$

$$100\% - 77.1\% = \underline{\underline{22.9\%}}$$

## Candidate 30

### Question 8(b)

Eileen wants to buy a new dining table from the shop.

It is advertised at a price of £800.

Eileen wishes to use a payment plan to buy the dining table.

The total price of the payment plan is 14% more than the advertised price.

The payments are calculated as follows:

- the deposit is  $\frac{1}{4}$  of the total price
- 10 equal monthly instalments
- followed by a final payment of £100.

(b) Calculate the cost of each monthly instalment.

3

$$800 + 14 = 814$$

$$\frac{1}{4} \text{ of } 814 = \frac{203.50}{610.50}$$

$$610.50 \div 10 = 61.05$$

## Candidate 31

### Question 8(b)

Eileen wants to buy a new dining table from the shop.

It is advertised at a price of £800.

Eileen wishes to use a payment plan to buy the dining table.

The total price of the payment plan is 14% more than the advertised price.

The payments are calculated as follows:

- the deposit is  $\frac{1}{4}$  of the total price
- 10 equal monthly instalments
- followed by a final payment of £100.

(b) Calculate the cost of each monthly instalment.

3

$$800 \times 1.14 = \pounds 912$$

$$912 - 300 = 612$$

$$612 \div 12 = \underline{\underline{\pounds 51}}$$

## Candidate 32

### Question 8(c)

Jacqueline owns shops in Edinburgh, New York and Dubai.

Jacqueline wants an item sent from her Dubai shop to her New York shop.

It will be sent from her Dubai shop at 8:45 am local time on 24 November.

The expected delivery time is 90 hours.

New York is 5 hours behind Edinburgh.

Dubai is 4 hours ahead of Edinburgh.

- (c) Determine the local time and date the item is expected to arrive at her New York shop.

3

$$\begin{aligned} 8:45 \text{ am} + 9 \text{ hrs} &= 5:45 \text{ pm} && + 24 \\ &&& + 24 \\ &&& + 24 \\ &&& \hline &&& 72 \\ &&& + 18 \text{ hrs} \\ &&& \hline &&& 11:45 \text{ am } 27\text{th} \end{aligned}$$

