N5

National Qualifications
2023 MODIFIED

Mark

X844/75/02

Applications of Mathematics
Paper 2

THURSDAY, 4 MAY

10:20 AM – 12:00 NOON

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day	Month	Year	Scottish candidate number

Total marks — 55

Attempt ALL questions.

You may use a calculator.

To earn full marks you must show your working in your answers.

State the units for your answer where appropriate.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

SQA

A/HTP

FORMULAE LIST

Circumference of a circle $C = \pi d$

Area of a circle $A = \pi r^2$

Theorem of Pythagoras

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

Volume of a cylinder $V = \pi r^2 h$
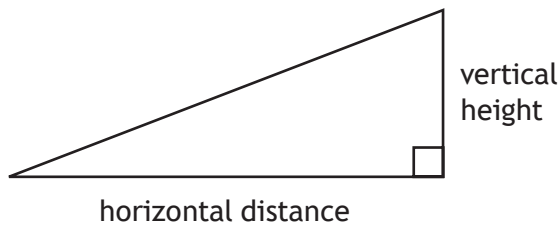
Volume of a prism $V = Ah$

Volume of a cone $V = \frac{1}{3}\pi r^2 h$

Volume of a sphere $V = \frac{4}{3}\pi r^3$

Standard deviation $s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n-1}}$

$\text{or}\quad s = \sqrt{\dfrac{\Sigma x^2 - \dfrac{(\Sigma x)^2}{n}}{n-1}}$, where n is the sample size.

Gradient

$\text{gradient} \ = \ \dfrac{\text{vertical height}}{\text{horizontal distance}}$

Total marks — 55

Attempt ALL questions

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.

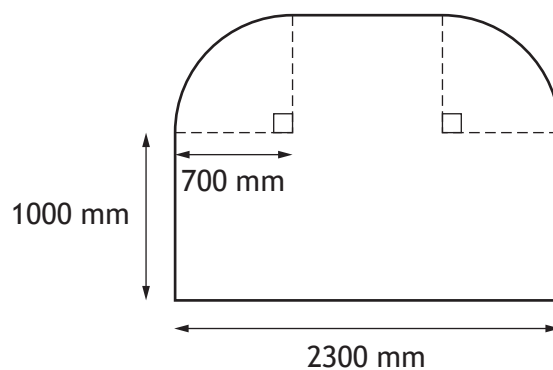   Calculate the expected volume of the lake after 3 years.

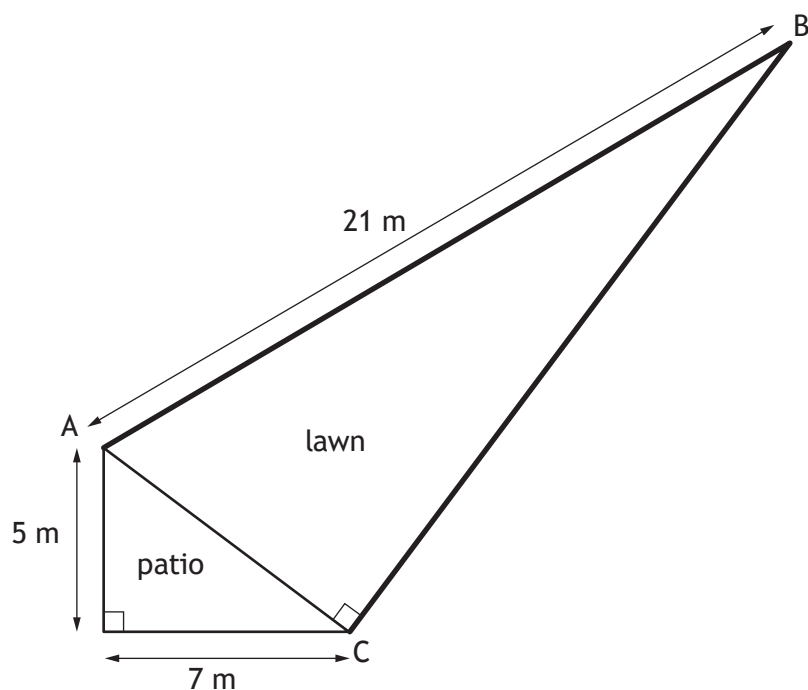   Give your answer to **3 significant figures**. **4**

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**

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**

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.
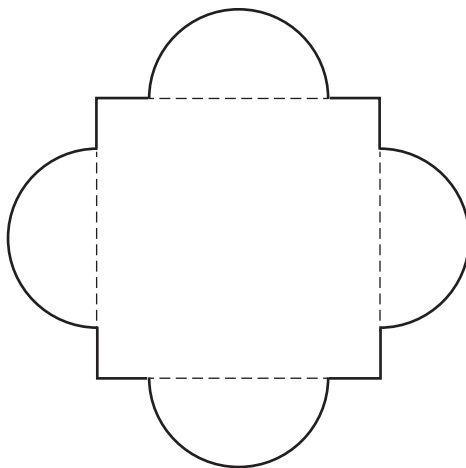
(a) Calculate the area of the mirror. **2**

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^2		anti-glare: £16 per m^2	
Fixings	basic: £19 per mirror	standard: £32 per mirror	premium: £42 per mirror	
Backing	no backing: £0 per mirror		foil backing: £20 per mirror	
Glass colour and thickness	Bronze (per m^2)	Silver (per m^2)	Gold (per m^2)	

Glass colour and thickness	4 mm £18	6 mm £36	4 mm £38	6 mm £58	4 mm £66	6 mm £86.50

The hotel bought a mirror with an area of **3 m^2**.

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**

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**

(ii) the standard deviation. **3**

5. (continued)

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 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**

[Turn over

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**

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.

Deal A
Buy all 5
for 18.50 Swiss francs

Deal B
Buy all 5
get the cheapest free

Deal C
Buy all 5
save 15%

Lorna is going to buy 250 grams of each cheese.

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

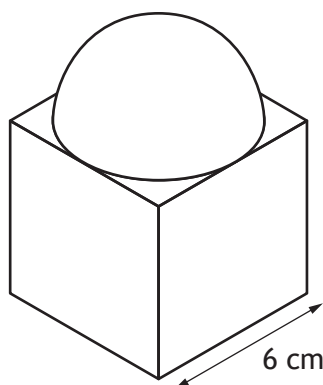Use your working to justify your answer.

2

[Turn over

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.

6 cm

(c) Calculate the volume of the paperweight. **3**

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**

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

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

(b) For this data, calculate:
- the median
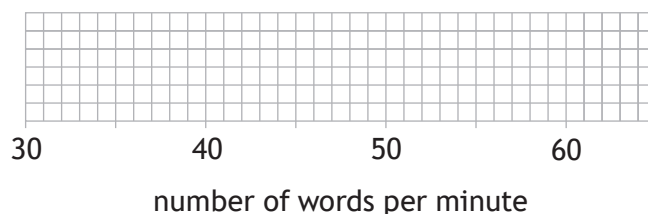- the lower quartile
- the upper quartile. **2**

7. **(continued)**

(c) Construct a boxplot for this set of data. **2**

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

```
30        40        50        60
```
number of words per minute

(d) (i) Calculate the interquartile range for the number of words Dave can type per minute. **1**

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**

7. **(continued)**

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**

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**

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**

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**

8. (continued)

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.

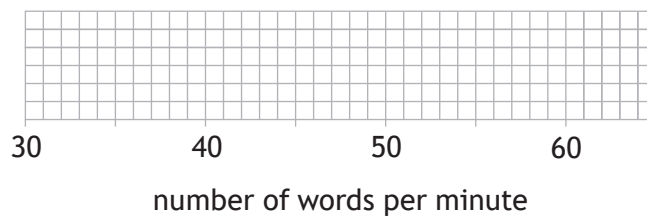(c) Determine the local time **and** date the item is expected to arrive at her New York shop.

3

[END OF QUESTION PAPER]

ADDITIONAL SPACE FOR ANSWERS

Additional grid for use with question 7 (c)

number of words per minute

```
30        40        50        60
```

ADDITIONAL SPACE FOR ANSWERS

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