

[Braille page 1]

X844/75/02

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N5

National Qualifications

2024

Applications of Mathematics

Paper 2

Monday, 13 May

Instructions to Candidates

Candidates should enter their surname, forename(s), date of birth, Scottish candidate number and the name and level of the subject at the top of their first answer sheet.

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.

You must clearly identify the question number you are attempting on your answer sheet.

An owl in the margin indicates a new question.

Questions marked with an asterisk differ in some respects from those in the printed paper.

Marks are shown in square brackets at the end of each question or part question.

A separate formula sheet is provided.

[Braille page 2]

Total marks — 55

Attempt ALL questions

Question 1. A school currently has 1200 pupils.

The number of pupils is expected to increase by 5.3% each year for the next 4 years.

Calculate the expected number of pupils after 4 years.

Give your answer rounded to 3 significant figures. [4 marks]

Question 2. Refer to the diagram for Question 2. A snooker ball is a sphere with a diameter of 5.2 cm.

(a) Calculate the volume of the snooker ball. [2 marks]

The density of an object can be calculated using the formula below.

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

The mass of the snooker ball is 142 grams.

(b) Calculate the density of the snooker ball.

Give your answer in grams per cubic centimetre. [1 mark]

[Braille page 3]

Question 3. A lottery consists of a draw with 49 balls numbered from 1 to 49.

In the draw six numbered balls are drawn and not replaced.

These six numbers were 3, 7, 12, 13, 28 and 42.

A further bonus ball is then drawn.

Calculate the probability of the bonus ball being a number less than 8.

Question 4. Refer to the diagram for Question 4. A section of garden is in the shape of four identical right-angled triangles.

It consists of a circular flower bed surrounded by a patio as shown in the diagram.

The flower bed has a radius of 4 metres.

The patio is represented by the shaded area.

Calculate the area of the patio. [4 marks]

[Braille page 4]

ow * 5. Akira has an annual salary of £35,670.

National Insurance is calculated on a person's salary before deductions.

[In the table below, Annual Salary is followed by: Annual National Insurance rate.]

Up to £12,584: 0%.

From £12,584 to £50,284: 12%.

Over £50,284: 2%.

(a) Calculate Akira's annual National Insurance payment. [2 marks]

Akira pays 9.4% of her annual salary into her pension.

Her annual income tax is £3994.42.

She is paid in 52 weekly payments.

(b) Calculate Akira's weekly net pay. [2 marks]

[Braille page 5]

ow 6. Refer to the diagram for Question 6. A boat sails due East from a harbour.

A lighthouse is 500 metres due North of the harbour.

When the boat is at position A it is 600 metres away from the lighthouse.

It sails a further 400 metres to position B.

Calculate the direct distance from position B to the lighthouse as shown by the dotted line.

Do not use a scale drawing. [4 marks]

[Braille page 6]

ow * 7. Rab bought a house at auction to modernise and then sell.

The purchase price was £85,800.

In addition, he paid:

- 1.5% of the purchase price in legal fees
- a fee of £250 to the auction house.

(a) Calculate the total amount that Rab paid for the house. [1 mark]

(b) Rab wanted to lay tiles on the hallway floor.

He needs 36 boxes of tiles.

He looked at three different shops before buying the tiles.

[In the table below, Shop is followed by: Price per box; Special Offer.]

A: £26; Buy 2 boxes and get a third box half price.

B: £32; 30% discount on total price when 20 or more boxes are purchased.

C: £22; No special offer.

Determine the lowest price for buying 36 boxes of tiles.

Use your working to justify your answer. [3 marks]

(c) Refer to the diagram for Question **[Braille page 7]** 7(c).

(i) Rab modernised the house.

The work done is shown in the table.

[In the table below, Activity is followed by: Description; Preceding task; Time in days.]

A: clear rubbish from house and garden; none; 7.

B: landscape the garden; A; 10.

C: plaster the walls; E, G; 9.

D: decorate the house; C; 8.

E: rewire the house; F; 15.

F: fix the roof; A; 18.

G: re-plumb the house; F; 11.

H: lay all the flooring; C; 6.

I: advertise the house for sale; B, D, H; 1.

Write the order in which the tasks need to be done AND the time taken for each task. Refer to the spaces labelled (i) to (viii) in the diagram and write the letter of the task that corresponds to the boxes marked (i) to (viii) on your answer sheet. Activity I has been done for you. [2 marks]

(c) (ii) Calculate the minimum time required for the renovations to **[Braille page 8]** be completed. [2 marks]

(d) Rab employed GreenPlant Gardeners to landscape the garden.

The company told Rab that 3 workers would take 10 days to landscape the garden.

The company were able to provide 2 extra workers.

All the workers work at the same rate.

They work Monday to Friday each week.

The work started on the morning of Monday 2 October.

Determine the date the work will finish. [3 marks]

[Braille page 9]

ow 8. A bathroom company counts the number of visitors to their shop in Stirling each Sunday.

A sample of these results is shown.

44 55 32 39 43 26 34

(a) For these results, calculate:

(i) the mean [1 mark]

(ii) the standard deviation. [3 marks]

The number of visitors to the company's shop in Aberdeen each Sunday was also recorded.

The mean number of visitors was 49 and the standard deviation was 3.2.

(b) Make two valid comments about the number of visitors each Sunday to the shops in Stirling and Aberdeen. [2 marks]

The shop tracks the methods used to purchase a new bathroom.
The three methods available are debit card, credit card or cash.
Last year the purchase methods used were in a ratio of 3:4:2 respectively.
172 bathrooms were purchased using a credit card.

(c) Calculate the total number of bathrooms purchased last year. [2 marks]

The advertised price for a deluxe **[Braille page 10]** bathroom is £6700.
It can be bought using a payment plan.

The payment plan is £325 more expensive than the advertised price.

The payment plan consists of:

- a deposit of 12.5% of the advertised price
- 50 equal monthly instalments.

(d) Calculate the monthly instalment. [3 marks]

[Braille page 11]

ow 9. Emma is planning a holiday to Spain.

Her sister, who lives in the USA, sent her \$100 for her birthday.

Emma exchanged it for euros to use as spending money.

Exchange Rates

£1 = 1.11 euros

£1 = \$1.30

(a) Calculate how many euros Emma received. [2 marks]

Emma worked overtime to earn some extra spending money.

Her basic rate of pay is £12.80 an hour.

She is contracted to work 37.5 hours per week. She is paid time-and-a-half for any overtime she works.

Last week Emma worked 5 days from 07:30 until 12:30. After a lunch break she then worked from 13:00 until 17:30 on each of those 5 days.

(b) Calculate how much Emma earned last week. [3 marks]

Emma intends to fly to Alicante airport.

She considers two options:

- a bus to Edinburgh Airport for a flight to Alicante, or

- drive to Manchester Airport for **[Braille page 12]** a flight to Alicante.

The costs associated with each option are shown in the table below.

[In the table below, Airport is followed by: Return flight costs; Other costs named.]

Edinburgh: £256; Return bus fare £14.50.

Manchester: £152; Parking £49, Fuel costs?.

- The return journey from Emma's house to the car park at Manchester Airport is 492 miles.
- Emma's car will cover an average of 48 miles per gallon of fuel.
- 1 gallon = 4.545 litres.
- 1 litre of fuel costs £1.42.

(c) Determine which option is cheaper for Emma. [4 marks]

Emma chose to fly from Edinburgh.

Her plane took off at 11:30 local time.

The time in Alicante is 1 hour ahead of the time in Edinburgh.

The plane flew 1552.5 miles at an average speed of 575 miles per hour.

(d) Calculate the local time that the **[Braille page 13]** plane landed in Alicante. [3 marks]

[END OF QUESTION PAPER]