N5

National Qualifications 2019

X844/75/02

Applications of Mathematics
Paper 2

THURSDAY, 2 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 — 65

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 on your answer sheet.

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.

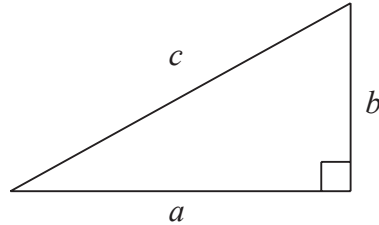An OW in the margin indicates a new question.

A separate formulae sheet is provided.

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FORMULAE LIST

Circumference of a circle $\quad C = \pi d$

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

Theorem of Pythagoras

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

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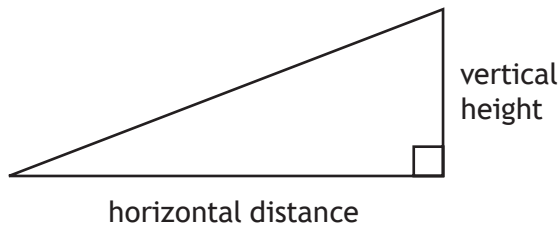
Volume of a prism $\quad V = Ah$

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

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

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

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

Gradient

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

1. Sam buys a rare stamp for his stamp collection at an auction. He buys the stamp for £920.

    The stamp

    *   increased in value by 7% in each of the first 2 years

    *   decreased in value by 4% in the third year.

    Calculate the value of the stamp after these 3 years.

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

* 2. Refer to diagram 1 and diagram 2 for Question 2. A bottle consists of a cylinder on top of a cuboid.

    Diagram 1 shows the front view of the bottle

    Diagram 2 shows the base of the cylinder and the base of the cuboid.

    The dimensions are shown in the diagrams.

    Calculate the volume of the bottle. **[4 marks]**

* 3. Refer to the diagram for Question 3. The graph shows how many pounds sterling could be bought for 1 euro during December 2017.

    Daniel changed 250 euros to pounds sterling on 7 December.

    (a) Calculate how many pounds he received. **[2 marks]**

    Daniel was working in France.

    He bought a laptop costing 400 euros.

    He calculated this was equivalent to £334·80.

    (b) Use the graph to find the date that Daniel bought the laptop.

    Use your working to justify your answer. **[2 marks]**

* **4.** Karen buys and sells silver, gold and platinum.

The table shows the price per ounce of each of these metals, on the first trading day of each month, over the last year.

Month	Price of silver	Price of gold	Price of platinum
Jan	15·60	1170	1275
Feb	17·40	1140	1050
Mar	16·50	1210	1100
Apr	17·00	1200	1150
May	16·70	1190	1100
Jun	16·70	1275	1075
Jul	15·60	1175	1100
Aug	14·50	1190	850
Sep	14·60	1140	975
Oct	14·50	1125	1000
Nov	15·60	1195	1125
Dec	16·50	1200	1200
All prices in US dollars			

Karen bought 1 ounce of gold on the first trading day in March and sold it on the first trading day in September.

Calculate the percentage loss she made.

Give your answer **to 2 decimal places. [3 marks]**

* **5.** Refer to the diagram for Question 5. A hotel is having a swimming pool built.

It is in the shape of a rectangle and two quarter circles as shown in the diagram.

The swimming pool will have a safety rail fitted around its edge.

- There will be two 125 cm wide gaps to allow access to the pool
- Safety rail is sold in 3 metre lengths
- Each 3 metre length costs £11·49

Calculate the minimum cost of the safety rail for the pool. **[5 marks]**

6. Denisa bought 375 shares for £4·50 per share.

She later sold them all for £5·20 per share.

She had to pay commission of 2·7% of the total selling price.

Calculate her total profit. **[3 marks]**

* 7. The birth weight of babies in a hospital in 2017 was recorded.

A sample of the weights, in kilograms, is shown.

2·5   4·5   3·7   3·1   3·8   3·4

(a) For these weights, calculate

   (i) the mean **[1 mark]**

   (ii) the standard deviation. **[3 marks]**

The birth weight of babies born in hospital in 1987 was also recorded. The mean weight in 1987 was 3·4 kg and the standard deviation was 0·95 kg.

(b) Make two valid comparisons about the weight of babies in 1987 and 2017. **[2 marks]**

The lengths and weights of 8 new-born babies are recorded in the table as shown.

Length (cm)	46	47	49	51	52	52	54	55
Weight (kg)	2·7	2·8	3·5	3·8	3·4	3·8	4·0	4·4

 * (c)   (i) Refer to the diagram for Question 7(c). On the grid draw a scatter graph to show this data. The first three points have been plotted for you. **[2 marks]**

   (ii) Draw a line of best fit on your scatter graph. **[1 mark]**

   (iii) Use your line of best fit to estimate the weight of a baby who was 50 cm when born. **[1 mark]**

Baby milk powder is sold in 900 g packs.

The feeding guide from one of these packs is shown.

Approximate baby weight (kg)	Number of feeds per 24 hours	Number of level scoops per feed	Quantity of water per feed	
			ml	fl oz
less than 3·5	6	3	60	2
3·5 up to 4·0	6	4	90	3
4·0 up to 5·0	5	6	120	4
5·0 up to 6·5	5	7	150	5
6·5 up to 7·5	4	8	180	6
7·5 or more	3	7	150	5

Each level scoop contains 4·5 g of milk powder.

Baby Andrew weighs 7·1 kg.

(d) Determine whether a 900 g pack of milk powder will last Andrew 1 week.

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

* **8.** A new road bridge has been built.

A worker paints 367 lines along the centre of the road.

- Each line is four metres long
- There is a gap of two metres between each line
- The first line starts at the beginning of the bridge
- The last line finishes at the end of the bridge

(a) Calculate the length of the bridge. **[2 marks]**

Refer to the diagram for Question 8(b). Two cables support a section of the bridge. This section forms two right-angled triangles, as shown in the diagram.

(b) Calculate the total length of cable needed for this section of bridge.

Do not use a scale drawing. [4 marks]

9. David is writing his new book.

He spends

- 210 hours on research
- 90 hours in meetings
- 240 hours writing the book.

* (a) Refer to the diagram for Question 9(a). Construct a pie chart to illustrate this information. **[3 marks]**

The publishing company produced the following table to show all the tasks involved in publishing the book.

Activity	Description	Preceding task
A	Illustrate cover	H
B	Write 1st draft	C
C	Research ideas	None
D	Edit book	B
E	Publish book	A,J,G
F	Re-work	D
G	Proof read	F
H	Choose title	B
I	Copyright	B
J	ISBN	I

* (b) Refer to the diagram for Question 9(b). Write the letter of the task that corresponds to the boxes marked (i) to (vii). **[2 marks]**

* (c) The books are to be stacked on shelves at bookshops. Diagram 1 shows a set of two identical shelves. The books can be stacked vertically or horizontally, as shown in Diagram 2. Calculate the maximum number of books that can be stacked on the shelves. **[3 marks]**

This is the fourth book that David has written in this series of books.

The cost of each book is shown in the table.

Book	Cost	Year published
1	£5·50	2013
2	£8·50	2015
3	£4·00	2016
4	£12·00	2019

The following special offers are available to buy all four books.

Shop A: Buy all 4 save 20%

Shop B: Buy all 4 for 22.99

Shop C: Buy all 4 get the 2 most recently published half price

(d) Determine which shop offers the best deal for buying all four books.

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

*10. Refer to the diagram for Question 10. A sports ground is in the shape of a rectangle and two semi-circles as shown in the diagram.

The running track is shaded in the diagram.

(a) Calculate the area of the running track. **[5 marks]**

The running track is to be resurfaced.

A resurfacing company has a team of 5 workers who can resurface a track of this size in 42 hours.

The resurfacing company are now able to provide 2 more workers to resurface this track.

All the workers work at the same rate.

(b) Calculate the time it will now take to resurface the track. **[3 marks]**

John works for the resurfacing company.

His annual salary is £17 108.

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

National Insurance rates	
Up to £8424	0%
From £8424 to £46 384	12%
Over £46 384	2%

(c) (i) Calculate John's annual National Insurance payment. **[2 marks]**

John pays 7% of his annual salary into his pension.

John's annual income tax is £1051·60.

(ii) Calculate John's annual net pay. **[2 marks]**

[END OF QUESTION PAPER]