N5

National Qualifications 2018

Mark

X844/75/01

Applications of Mathematics
Paper 1 (Non-Calculator)

THURSDAY, 3 MAY

9:00 AM – 10:05 AM

X8447501

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 — 45

Attempt ALL questions.

You may NOT 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.
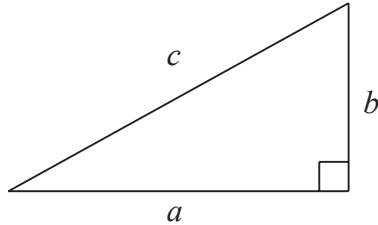
SQA ©

X8447501011

FORMULAE LIST

Circumference of a circle: $\qquad C = \pi d$

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

Theorem of Pythagoras:

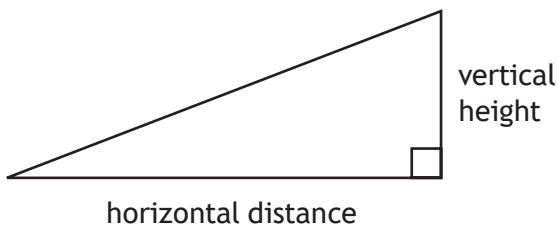$$a^2 + b^2 = c^2$$

Volume of a cylinder: $\qquad V = \pi r^2 h$

Volume of a prism: $\qquad V = Ah$

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

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

Standard deviation: $\qquad s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n-1}} = \sqrt{\dfrac{\Sigma x^2 - (\Sigma x)^2/n}{n-1}}$, where n is the sample size.

Gradient:

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

Total marks — 45

Attempt ALL questions

1. A baking company will reject cakes if they do not weigh $400\,g \pm 3\%$.

   The weights of a sample of 13 cakes are shown below.

   385, 391, 409, 403, 386, 412, 413, 407, 400, 390, 387, 405, 388

   Calculate the fraction of cakes that will be rejected.

   Use your working to justify your answer. **3**

2. Jennifer is planning to go on a **4 night** city break.

The costs are shown in the table below.

Flights	£270
Accommodation	£90 per night
Spending money	£450
Insurance	£30

She earns £400 per week.

She saves $\frac{1}{8}$ of her earnings each week towards her city break.

Calculate the minimum number of weeks it will take Jennifer to save enough money for her city break.

3

3. The heights and weights of 8 children aged six are recorded in the table below.

Height in centimetres	104	107	120	124	99	127	104	130
Weight in kilograms	18	19	24	22	17	25	19	24

(a) On the grid below draw a scattergraph to show this data.

   (An additional grid, if required, can be found on *page 17*.)

2

Height (centimetres)
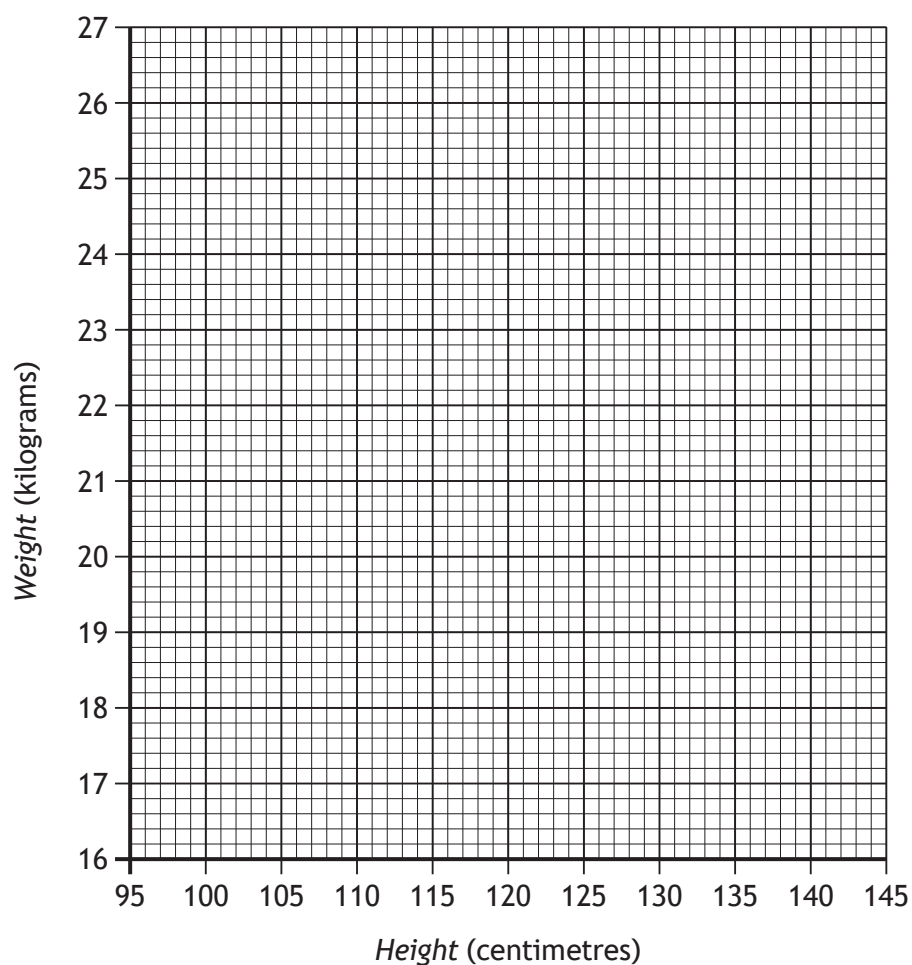
(b) Draw a line of best fit on the scattergraph.

1

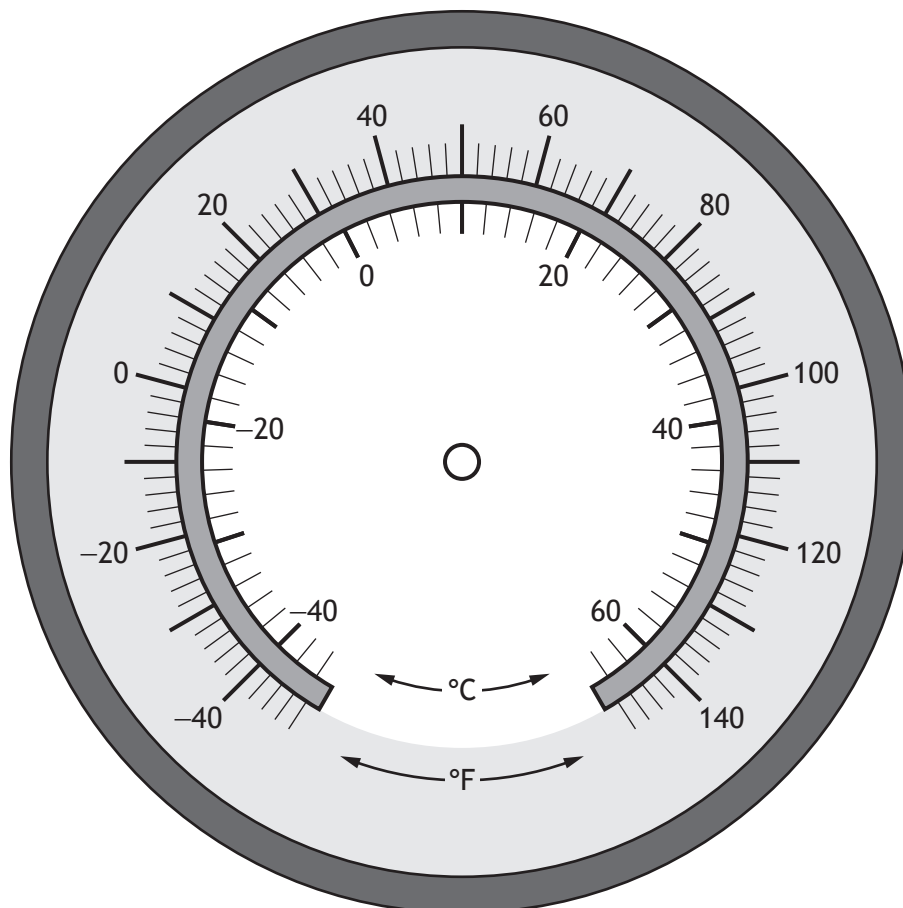(c) Use your line of best fit to estimate the height of a child who weighs 20 kilograms.

1

4. Lynn is flying an aircraft and has been told that the outside temperature is 34 °C lower than the ground temperature.

The ground temperature is 6 °C.

Calculate the outside temperature and mark it on the gauge below.

2

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

5. Guests at a wedding were asked to choose their main course.

- $\frac{3}{7}$ of the guests chose chicken

- $\frac{1}{3}$ of the guests chose beef

- the remaining guests chose the vegetarian option.

Calculate the fraction of guests that chose the vegetarian option.   **3**

6. Tom thinks that the answer to the following calculation is 8·7.

$$27\cdot2 - 4\cdot6 \times 3 + 4\cdot7$$

Is Tom correct?

Use your working to justify your answer.   **2**

7. Gavin is going to South America to do charity work.

He changes £750 into Bolivian boliviano.

Currency exchange	
Pounds sterling (£)	**Other currencies**
1	20 Argentine peso
1	9 Bolivian boliviano
1	4 Brazilian real

(a) How many Bolivian boliviano will he receive?　　　　　**1**

He spends 2700 Bolivian boliviano.

He changes the remaining Bolivian boliviano into Argentine peso.

(b) How many Argentine peso will he receive?　　　　　**2**

8. Ian buys a new sofa.

   The original price was £700.

   The shop is having a sale with 25% off the price of all sofas.

   When he goes to the shop he finds there is an additional 5% off the sale price.

   Calculate the price Ian pays for his sofa. **3**

9. Steven flew to Hong Kong to start a new job.

The flight included a stop in Doha.

He flew from Edinburgh to Doha then from Doha to Hong Kong.

- The flight from Edinburgh to Doha took 6 hours 35 minutes.

- The flight from Doha to Hong Kong took 7 hours 20 minutes.

- Hong Kong is 8 hours ahead of Edinburgh.

Steven's plane took off from Edinburgh at 9:15 am local time.

It landed in Hong Kong at 8:50 am local time.

How long was the stop in Doha? **3**

10. David sat a class test.

His results are shown in the table below.

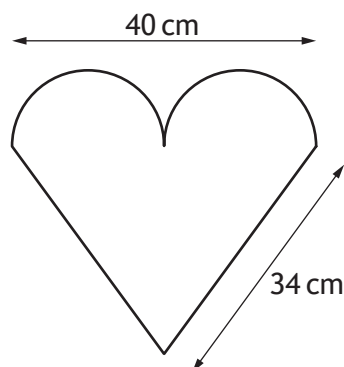|	Marks available	Percentage achieved
Paper 1	35	80%
Paper 2	65	60%

(a) Calculate the number of **marks** he achieved in paper 1.   **1**

(b) Calculate his overall percentage for this test   **1**

11. Ribbon has to be placed around the outside of the love heart cake shown below.

40 cm

34 cm

The top of the cake is in the shape of an isosceles triangle with two identical semi-circles.

The ribbon needs to be the length of the perimeter of the top of the cake plus an extra 2·8 cm.

Calculate the length of ribbon needed for the cake.   **3**

Take $\pi = 3 \cdot 14$.

12. A helicopter flew from Aberdeen airport to transport workers to oil rig 1 and then continued on to oil rig 2.

It flew 82 km on a bearing of 042° to oil rig 1.

It then flew 46 km on a bearing of 194° to oil rig 2.

(a) Construct a scale drawing to illustrate this journey. **3**

Use a scale of 1 cm : 10 km.

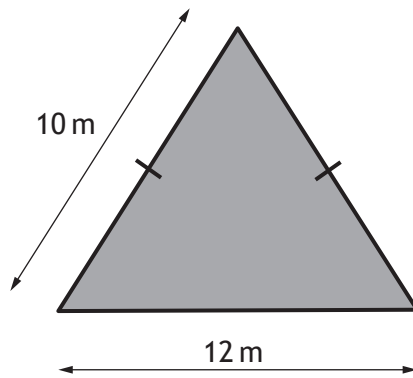(An additional diagram, if required, can be found on *page 19*.)

N
↑

Airport

The helicopter then returns to Aberdeen airport from oil rig 2.

(b) Use the scale drawing to determine the distance and bearing of the airport from oil rig 2. **2**

13. A lawn is to be created in the shape of an isosceles triangle with dimensions as shown below.
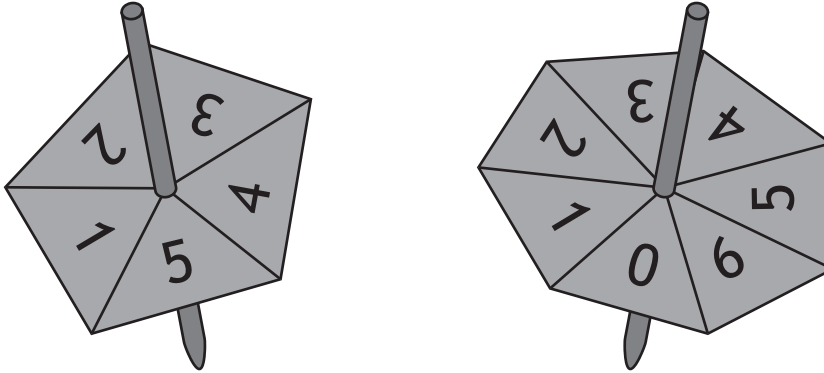
10 m

12 m

Calculate the area of the lawn. **3**

14. Michael runs a stall at the school fayre.

His game requires two spinners to be spun and allowed to come to rest.
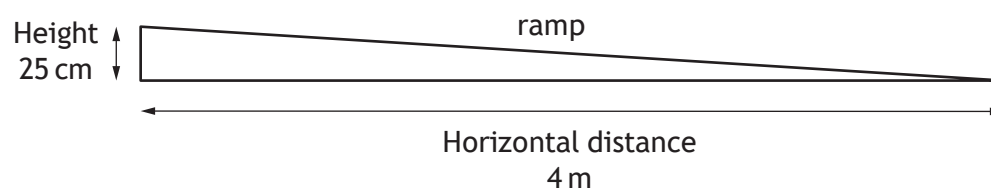
The spinners are shown below.

The numbers on which the spinners come to rest are multiplied together.

To win a prize the answer to this multiplication must be **less than 5**.

Calculate the probability of winning a prize.   **3**

15. A ramp to allow wheelchair access to a school has the dimensions shown below.

Height 25 cm

ramp

Horizontal distance
4 m

The maximum gradient allowed for a ramp with a horizontal distance of 4 m is $\dfrac{1}{14}$.

Does the gradient of this ramp meet the regulations?

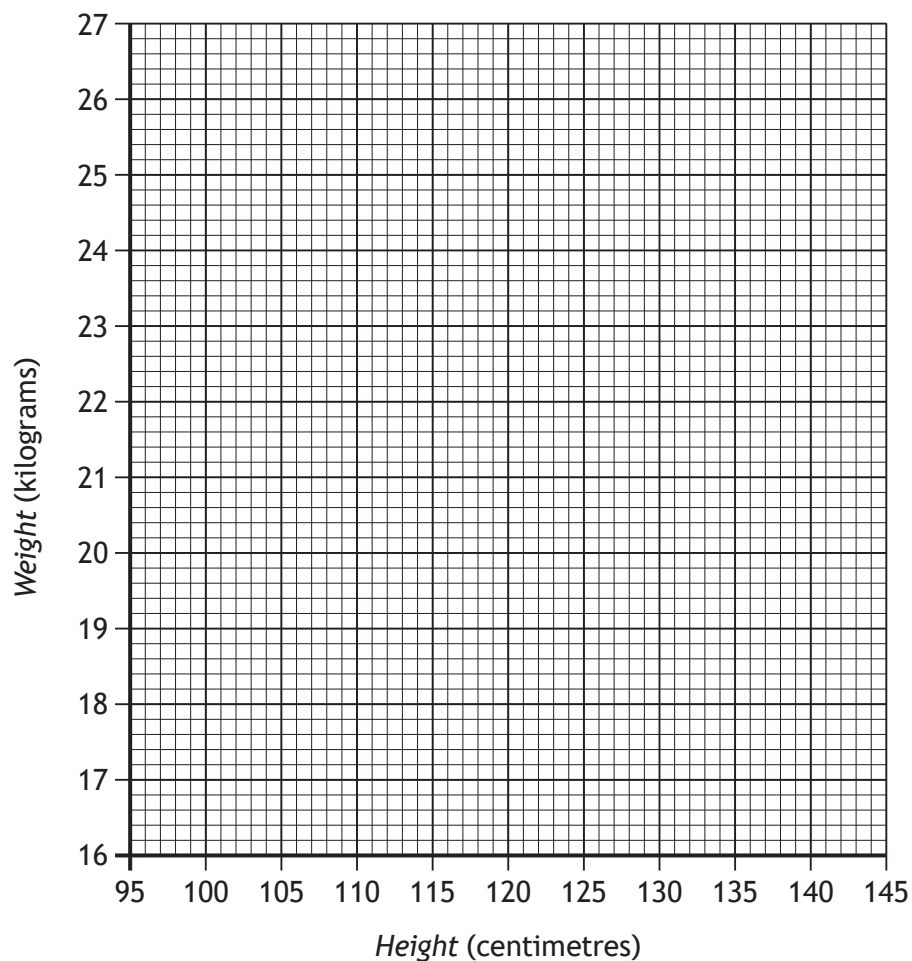Use your working to justify your answer.

3

[END OF QUESTION PAPER]

ADDITIONAL SPACE FOR ANSWERS

Additional grid for use in question 3 (a)

ADDITIONAL SPACE FOR ANSWERS

Additional gauge for use in question 4
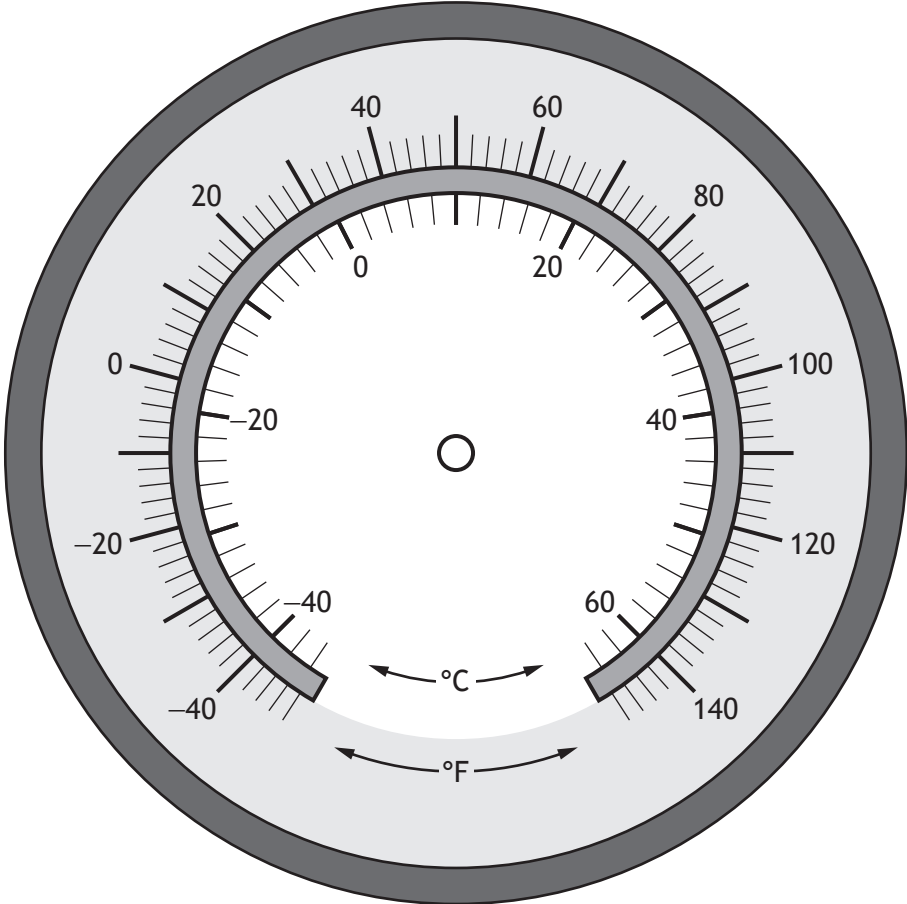
ADDITIONAL SPACE FOR ANSWERS

Additional diagram for use in question 12 (a)

N

Airport

ADDITIONAL SPACE FOR ANSWERS

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N5

National Qualifications 2018

Mark

X844/75/02

Applications of Mathematics
Paper 2

THURSDAY, 3 MAY

10:25 AM – 12:25 PM

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 — 65

Attempt ALL questions.

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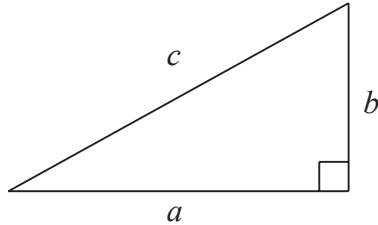
FORMULAE LIST

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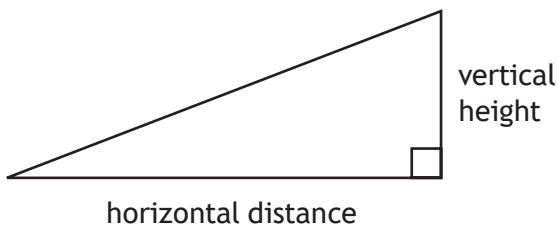Volume of a cylinder: $V = \pi r^2 h$

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Gradient:

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

Total marks — 65

Attempt ALL questions

1.   Jack bought a car 3 years ago costing £1400.

   The car has decreased in value by 13% each year.

   (a)   Calculate the current value of the car.

      Give your answer to **2 significant figures**.   **4**

   Jack sells his car for £950.

   (b)   Calculate his loss as a percentage of the **original price**.   **2**

2. The number of podcasts Omar downloaded each month for a year is shown in the table below.

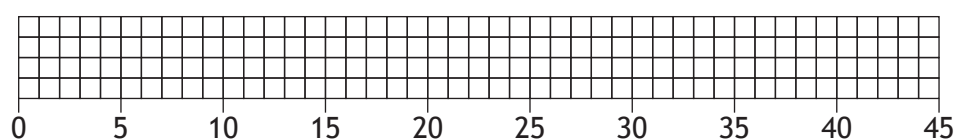| 12	34	19	22	9	13
21	19	5	26	10	28

(a) For this data, calculate:

the median
the lower quartile
the upper quartile. **2**

(b) Construct a boxplot for this data. **2**

(An additional diagram, if required, can be found on *page 21*.)

```
0    5    10   15   20   25   30   35   40   45
```

3. Ross is changing his internet package.

The table below shows the internet packages he is considering.

Package	Speed (Mbps)	Usage	Monthly line rental	Monthly broadband cost	Initial fee	Length of contract
A	52	25 GB	£8·95	£19·99	£59·99	12 months
B	52	Unlimited	£8·95	£20·99	£59·99	12 months
C	38	50 GB	£7·99	£16·99	£59·99	12 or 18 months
D	52	Unlimited	£7·99	£18·99	£109·99	12 or 18 months
E	52	50 GB	£6·99	£15·99 for 1st 12 months then £19·99	Free	24 months

Ross requires:

- a minimum speed of 52 Mbps
- at least 50 GB of usage
- a 12 month contract.

Ross will choose the package with the lowest overall **annual** price.

Which package will he choose?

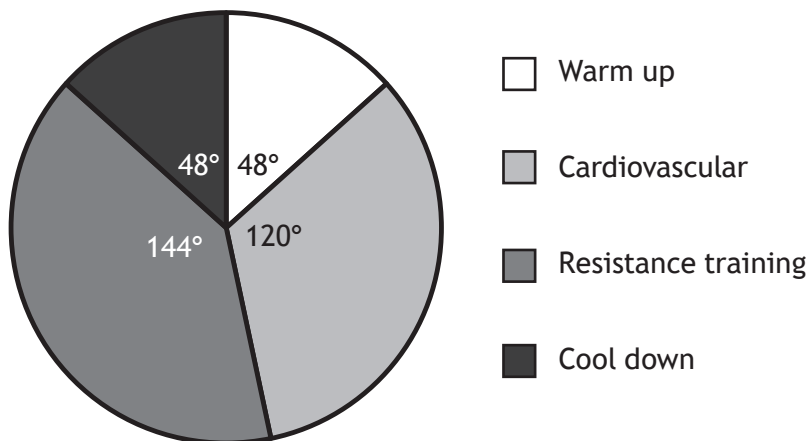Use your working to justify your answer. **3**

4. Nicola has joined a gym.

The pie chart shows the proportion of time that Nicola will spend on each type of workout exercise.

Types of workout exercises

□ Warm up

▨ Cardiovascular

▨ Resistance training

■ Cool down

Nicola spent 1 hour and 45 minutes exercising in the gym.

(a) Calculate how long, **in minutes**, Nicola spent on resistance training. **2**

Nicola spent 21 minutes exercising on a treadmill.
Her average speed was 6·6 km/h.

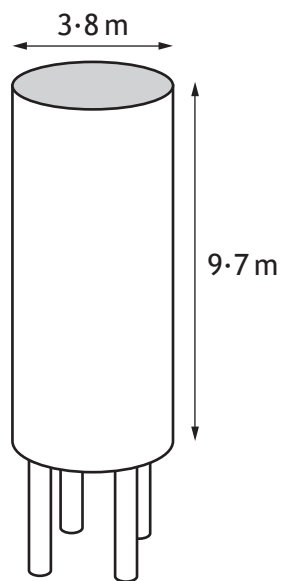(b) Calculate the distance she ran on the treadmill. **2**

5. Three tonnes of sheep food will feed 350 sheep for 18 days.

The number of sheep **increases** by 100.

(a) How long will the same weight of food now last?

3

The storage container for the sheep food is in the shape of a cylinder, with dimensions as shown below.

3·8 m

9·7 m

(b) Calculate the volume of the storage container.

2

[Turn over

6. Ali, Kate and Jim are paid to deliver leaflets advertising a new restaurant.

They shared the money they were paid in a ratio of $3:5:7$.

Jim received £154.

Calculate how much the restaurant paid, **in total**, to deliver the leaflets.   **2**

7. Sam drives from Paris in France to Zurich in Switzerland.

He knows:

- his car will cover an average of 47 miles per gallon of fuel
- the fuel tank holds 50 litres of fuel when it is full
- it is 650 km from Paris to Zurich.

Will Sam be able to complete his journey with one full tank of fuel?

4

Use your working to justify your answer.

1 mile = 1·609 km
1 gallon = 4·545 litres

8. Scott decides to build a new track bike.

Scott needs to buy a frame, a handlebar, a pair of pedals, a saddle, 2 wheels and 2 tyres.

Different retailers offer these parts.

The prices, in pounds, are shown in the table.

Retailer	Handlebar	Pedals (pair)	Wheels (each)	Saddle	Tyres (each)
Bikes 2 Go	63·33	33·33	51·25	41·66	54·98
Bikevelo	55·49	42·50	46·66	62·37	58·33
Velo cycles	68·83	36·66	61·20	53·99	61·66
Cycle trax	59·50	43·33	52·25	63·33	69·99
EP bikes	71·58	41·66	44·49	47·85	49·99

Scott can buy the parts from different retailers.

The bike frame costs £2640·95.

(a) Calculate the **minimum** total cost of the frame and parts.   **2**

8. **(continued)**

Scott cannot afford to pay for the bike all at once.

The cash price of the complete bike from EP bikes is £2991·00.

He chooses to buy the complete bike from EP bikes, as they are the only retailer offering a finance package.

The finance package consists of:

- a deposit of 15% of the cash price

- 36 payments of £76·50.

(b) Calculate how much more this finance package will cost compared to the **minimum** total cost. **4**

8. **(continued)**

Scott trains at the velodrome on his new bike.

He records his top speed, in kilometres per hour, for each lap.

Six of these speeds are shown below.

| 61·2 | 58·3 | 59·1 | 58·8 | 60·4 | 59·8 |

(c) For these speeds, calculate:

   (i) the mean;   **1**

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

Scott had a mean top speed on his old bike of 57·3 km/h and a standard deviation of 1·21 km/h.

(d) Make two valid comments comparing his top speed on the two different bikes.   **2**

9. A factory produces cans of tinned beans.

The table shows the list of tasks and the time taken to complete them.

Task	Detail	Preceding task	Time (seconds)
A	Boil beans to cook them	C	500
B	Put on lid	H,E	3
C	Blanch dried beans in water	None	300
D	Attach label	I	5
E	Put sauce in tin	F	2
F	Make the sauce	None	900
G	Put in box	D	5
H	Put beans in tin	A	2
I	Cook beans in sauce in tin	B	300

(a) Complete the diagram below to show the tasks and times in the boxes.　　**1**

(An additional diagram, if required, can be found on *page 21*.)
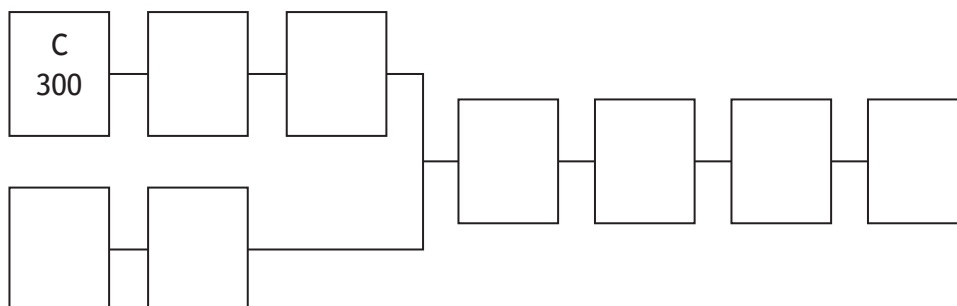
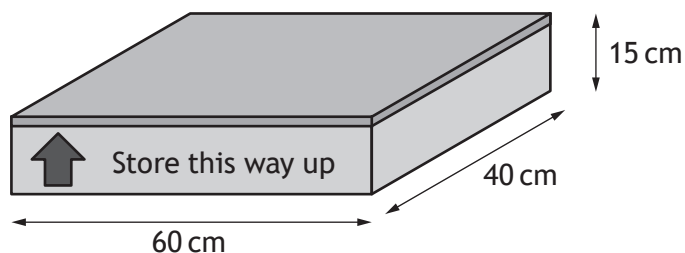The factory manager thinks that the whole process can be completed in less than 25 minutes.

(b) Based on the times given, is the factory manager correct?

Use your working to justify your answer.　　**2**
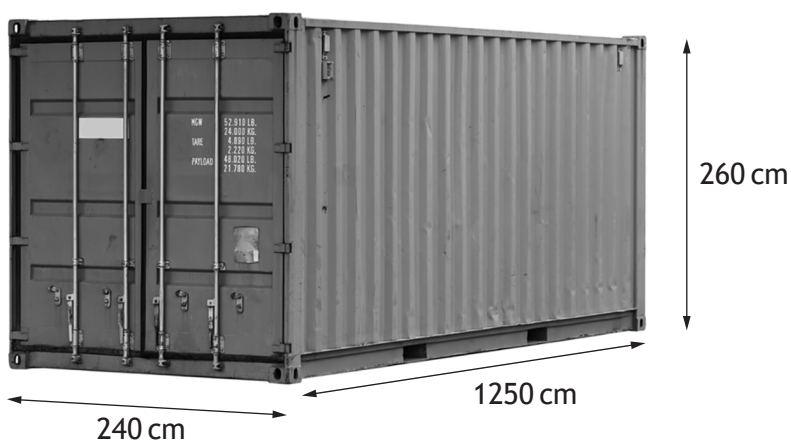
9. **(continued)**

MARKS

DO NOT
WRITE IN
THIS
MARGIN

The tins are packed in boxes.

Each box has dimensions 60 cm × 40 cm × 15 cm as shown below.

15 cm

Store this way up

40 cm

60 cm

The boxes must be packed into containers for shipping to Canada.

The container has the internal dimensions shown below.

260 cm

1250 cm

240 cm

All the boxes must be aligned in the same direction.

(c) Calculate the maximum number of boxes that will fit in the container. **3**

9. (continued)

It takes 277 hours to sail from the UK to Canada.

The local time in Canada is 5 hours behind the local time in the UK.

The ship leaves the UK at 2200 on 3rd June.

(d) Calculate the date and local time that the ship will arrive in Canada.   **3**

10. Fiona is a vet.

She has started a new job.

Her new salary is £42 000.

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

National Insurance rates	
Up to £8164	0%
From £8164 to £45 032	12%
Over £45 032	2%

(a)   (i) Calculate Fiona's annual National Insurance payment. **2**

Fiona's annual income tax payment is £5427·96.

She pays an annual contribution of £3360 into her pension.

Fiona is paid in 12 equal monthly payments.

(ii) Calculate Fiona's monthly net pay. **2**

10. (continued)

MARKS

DO NOT
WRITE IN
THIS
MARGIN

Fiona plans to rent accommodation.

She needs to work out how much she can afford to spend on rent, electricity and council tax.

The table shows her monthly outgoings.

	Outgoings
Car payment	395
Car insurance	28
Road tax	12
Food	380
Clothes	130
Mobile phone	64
Internet	55
Socialising	250
Loan	200
Savings	200
Total	

(b) Calculate how much she will have available per month for rent, electricity and council tax.

1

10. (continued)

Fiona is considering these 3 properties.

2 Bedroom House

Total Monthly Cost £730 including Rent, Council Tax and Electricity

1 Bedroom Apartment

Weekly Rent £132
Council Tax Band F
Weekly Electricity £12

3 Bedroom Farmhouse

Monthly Rent £390
Council Tax Band E
Monthly Electricity £76

Annual Council Tax
(to be paid in 12 equal monthly instalments)
Band A: £1000·92
Band B: £1167·72
Band C: £1334·52
Band D: £1501·32
Band E: £1834·92
Band F: £2168·64
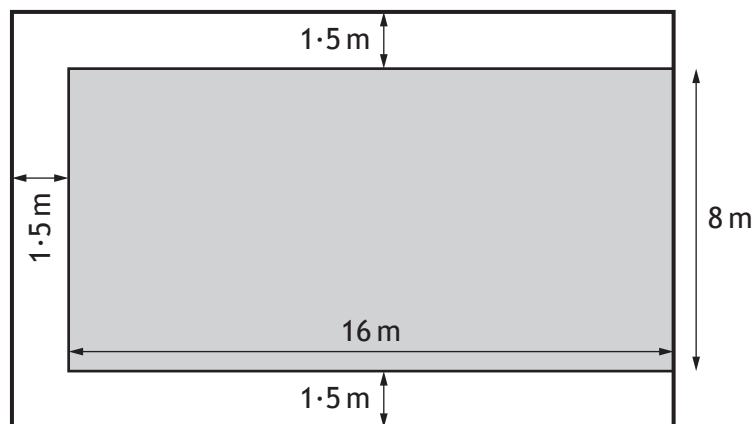Band G: £2502·24
Band H: £3002·64

(c) Which property is the cheapest option?

Use your working to justify your answer.

3

11. A new hotel is being planned in Benidorm.

   The pool will have a walkway around three sides.

   The walkway will be 1·5 m wide.

   This is shown in the diagram.

   (a) Calculate the total area of the walkway. **2**

   The walkway will be covered in tiles.

   16 tiles are needed to cover 1 square metre.

   The tiles are sold in boxes of 50.

   Each box costs 71·95 euro.
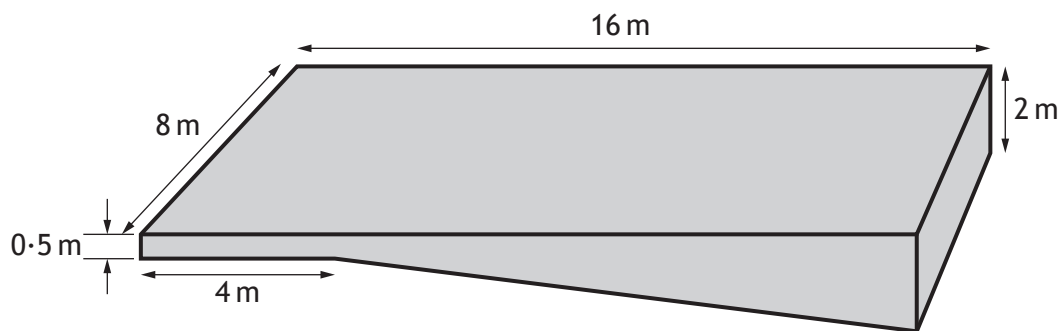
   (b) Calculate the cost of the tiles needed for the walkway. **2**

[Turn over for next question

11. **(continued)**

The swimming pool is a prism, with dimensions as shown in the diagram below.

16 m

8 m

2 m

0·5 m

4 m

(c) Calculate the volume of the swimming pool.

Give your answer **in litres**. 4

[END OF QUESTION PAPER]

ADDITIONAL SPACE FOR ANSWERS

Additional diagram for use in question 2 (b)

```
0    5    10   15   20   25   30   35   40   45
```

Additional diagram for use in question 9 (a)

```
┌──────┐  ┌──────┐  ┌──────┐
│  C   │──│      │──│      │──┐
│ 300  │  │      │  │      │  │
└──────┘  └──────┘  └──────┘  │   ┌──────┐  ┌──────┐  ┌──────┐  ┌──────┐
                              ├───│      │──│      │──│      │──│      │
┌──────┐  ┌──────┐            │   │      │  │      │  │      │  │      │
│      │──│      │────────────┘   └──────┘  └──────┘  └──────┘  └──────┘
│      │  │      │
└──────┘  └──────┘
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ADDITIONAL SPACE FOR ANSWERS

ADDITIONAL SPACE FOR ANSWERS