FOR OFFICIAL USE

National Qualifications 2022 MODIFIED

Mark

X844/76/01 Applications of Mathematics

WEDNESDAY, 4 MAY
9:00 AM – 11:05 AM

* X 8 4 4 7 6 0 1 *

Fill in these boxes and read what is printed below.

Full name of centre: WORKED SOLUTIONS

Town:

Forename(s):

Surname: HY

Number of seat:

Date of birth
Day | Month | Year

Scottish candidate number

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.

You should refer to the pre-release material for Higher Applications of Mathematics which you can access electronically.

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.

Questions 5, 7 and 9 must be completed on software and then be printed.

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

Before leaving the examination room, you must place your printouts inside the front cover of this booklet. Give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

SQA ©

* X 8 4 4 7 6 0 1 0 1 *

Information and instructions for candidates

The electronic files listed below are provided for you to use during this examination:

- **'Q5 School Roll.xlsx'** — a spreadsheet file containing 1 worksheet
- **'Q7 Jump.csv'** — a spreadsheet file containing a data set
- **'Q7 Jump Answers.docx'** — a word processing file. Your output from the statistical software in questions 7 (a) (i), (b) (i), (b) (ii), and (c) must be copied and pasted into this file for printing.
- **'Q9 Car Repayments.xlsx'** — a spreadsheet containing 2 worksheets

You must display your name, SCN and centre name on all pages on each printout. Spaces have been provided in each electronic file for you to complete this information.

When printing spreadsheet files, ensure that:

- landscape orientation is used
- grid lines are shown
- row and column headings are shown
- the option 'Fit All Columns on One Page' is selected.

When printing word processing files ensure that portrait orientation is used.

Use this table to make sure you have all the printouts required.

Question	Printout	Completed (✓)
5 (a) (i) and (c) (i)	'School Roll' worksheet • value view • formula view This should include the graph.	✓ ✓
7 (all parts)	'Q7 Jump Answers.docx' This should include your statistical software output, and answers.	✓
9 (a)	'Bank Loan' worksheet • value view • formula view	✓ ✓
9 (b)	'Car Finance' worksheet • value view • formula view	✓ ✓

MARKS | DO NOT WRITE IN THIS MARGIN

Total marks — 65

Attempt ALL questions

1. Jill borrows £5650 from a bank.

   The annual effective rate of interest on the loan is 9%.

   Jill makes level monthly repayments of £186.01 at the end of each month.

   Complete the following loan schedule for Jill's loan to show the loan outstanding at the end of month 2. **3**

Time (months)	Repayment (£)	Interest content of repayment (£)	Capital content of repayment (£)	Loan outstanding (£)
0				5650
1	186.01	40.72	145.29	5504.71
2	186.01	39.67	146.34	5358.37

Space for working if required.

$100\% + 9\% = 109\% = 1.09$ annually

$1.09^{\frac{1}{12}} - 1 = 0.007207\ldots = 0.7207\%$ monthly

Interest (1) = 0.7207% of £5650 = £40.72

Capital (1) = 186.01 − 40.72 = £145.29

Loan (1) = 5650 − 145.29 = £5504.71

Interest (2) = 0.7207% of £5504.71 = £39.67

Capital (2) = 186.01 − 39.67 = £146.34

Loan (2) = 5504.71 − 146.34 = £5358.37

[Turn over

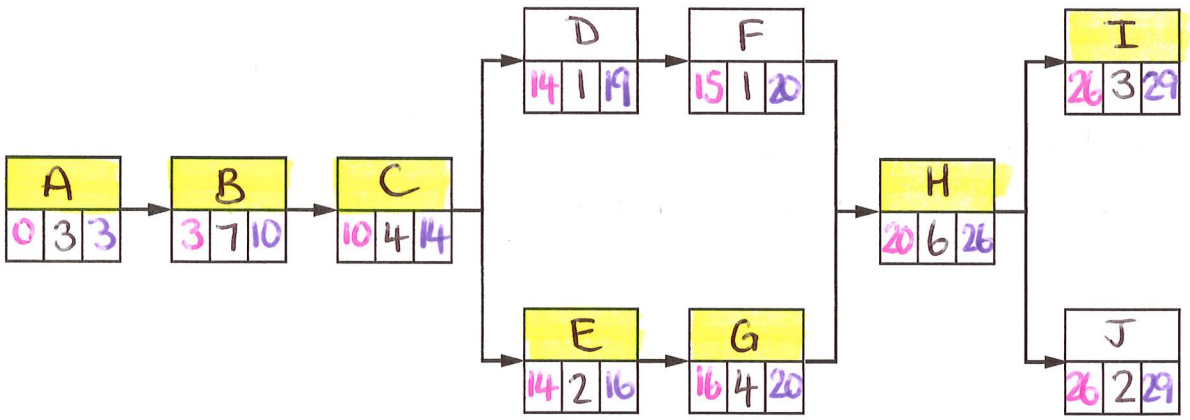
2. A company provides a team of workers to re-roof a house.

The table shows the list of tasks required to complete this job, the time required for each task, and the order in which the tasks are to be completed.

Task	Description	Preceding task	Time (hours)
A	Transport materials to location	None	3
B	Construct scaffolding	A	7
C	Remove old tiles	B	4
D	Take old tiles to recycling site	C	1
E	Inspect roofing	C	2
F	Purchase required number of roof tiles	D	1
G	Replace roofing felt	E	4
H	Replace roofing tiles	F, G	6
I	Remove scaffolding	H	3
J	Clean up	H	2

(a) Complete the PERT chart showing the earliest start time and the latest completion time for each task. 6

(An additional diagram, if required, can be found on *page 16*.)



2. **(continued)**

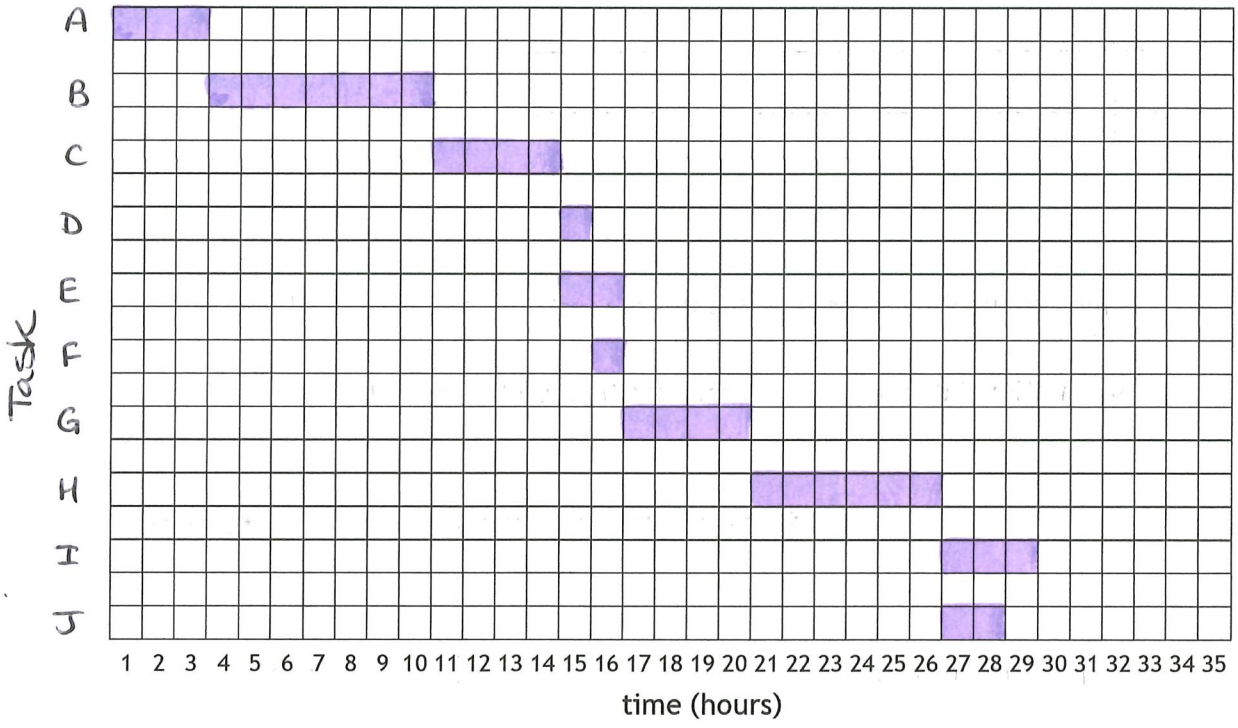
(b) The roofing company works for 9 hours each day on this job.

State the minimum number of days that the company will require to complete this job. **1**

Critical Path = A – B – C – E – G – H – I.
= 3 + 7 + 4 + 2 + 4 + 6 + 3
= 29 hours ∴ 4 days.

(c) Construct a Gantt chart, without float times, for this job. **3**

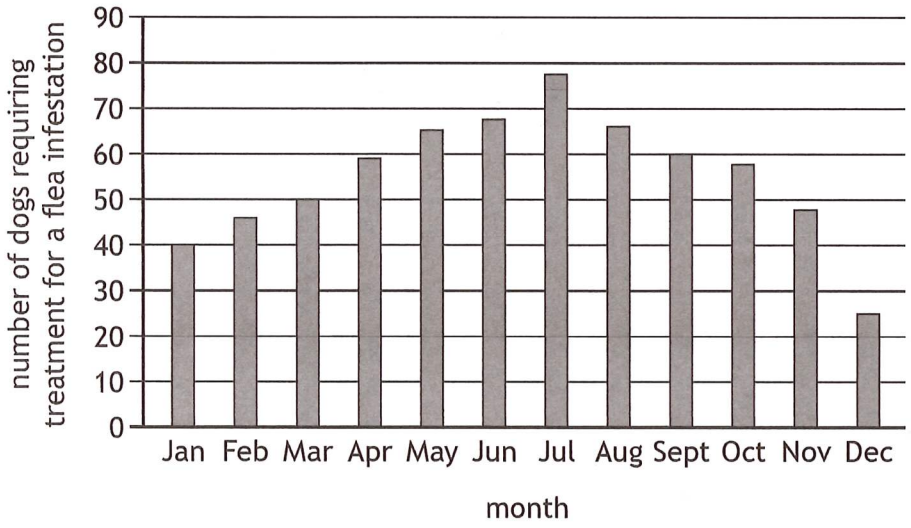
(An additional grid, if required, can be found on *page 16*.)



[Turn over

3. You must refer to the information on 'Dogs and fleas' given in the pre-release material when answering this question.

After Study 1 the following bar chart was created. It shows the number of dogs requiring treatment for a flea infestation against the month of the year.



(a) State the type of data that best describes the number of dogs requiring treatment for a flea infestation. 1

Discrete numerical data.

The student vet claims this graph proves that flea infestations are more common in the warmer months across the UK.

(b) Explain why this claim is not valid. 1

The data was gathered from one vet clinic in Edinburgh – this is not representative of the whole UK.

3. (continued)

The data gathered from Study 2 is shown in the table.

Area	Number of dogs inspected	Number of dogs with a flea infestation
Urban Clinic	213	30
Rural Clinic	156	43

(c) State a statistical test that would be appropriate to determine whether this data provides evidence of a difference in flea infestations between urban and rural areas. 1

Z-test for two proportions.

(d) State one part of the design of Study 2 that would be needed to ensure that the assumptions required to perform the test in (c) are valid. 1

Dogs would need to be chosen randomly from the two vet clinics.

To fit in with the student vet's placements, the data from the urban clinic was collected from July to September, and the data from the rural clinic was collected from October to December.

(e) Explain how this may affect the conclusions of Study 2. 1

The samples are not comparable as the data was not collected over the same time period.

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

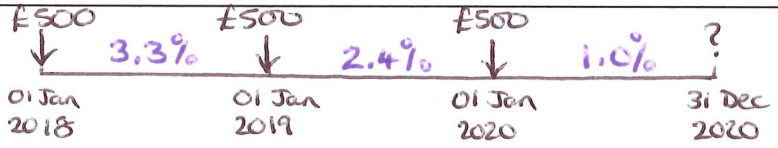
4. Zac deposits £500 into a bank account on 1 January 2018, 1 January 2019, and 1 January 2020.

The bank pays interest into his account at the end of every year, using the following annual effective rates:

- 2018 3.3%
- 2019 2.4%
- 2020 1.0%

He makes no withdrawals from his account.

(a) Calculate the balance in Zac's account at the end of 2020. **3**



01 Jan 2019 = £500 × 1.033 + £500 = £1016.50

01 Jan 2020 = £1016.50 × 1.024 + £500 = £1540.90

31 Dec 2020 = £1540.90 × 1.01 = £1556.31

On 1 January 2021 Zac deposits another £500 into his account.

He makes no further deposits into his account in 2021.

(b) Calculate the annual effective rate of interest needed in 2021 for the account balance to be £2100 by the end of the year. **2**

01 Jan 2021 = £1556.31 + £500 = £2056.31

$$\text{Interest Rate} = \left(\frac{2100}{2056.31} - 1\right) \times 100$$

$$= 2.12467796...$$

$$= 2.125\ \%.$$

5. You must refer to the spreadsheet file 'Q5 School Roll.xlsx' when answering this question.

You must complete part (a) (i) and (c) (i) using the spreadsheet file.

Parts (a) (ii), (b), and (c) (ii) must be completed in the answer spaces provided.

A school is planning a new building as it is approaching its maximum capacity.

The school roll in August 2021 was 650 pupils.

- Approximately 18% of pupils leave by the end of each school year.
- 140 new S1 pupils join the roll in August each year.

(a) (i) Complete the 'School Roll' worksheet to predict the school roll in August 2031. **3**

(ii) Comment on the precision of this prediction. **1**

Both numbers of pupils leaving and joining the roll each year is approximate.

(b) Comment on the relationship between time and the predicted school roll up to August 2031. **1**

From 2021 to 2031, the school roll gradually increases each year.

The school moves forward with plans for a new building.

This will increase the capacity of the school to 800 pupils.

(c) (i) Extend the table in your worksheet to construct a graph to show what is predicted to happen to the school roll in the long term.

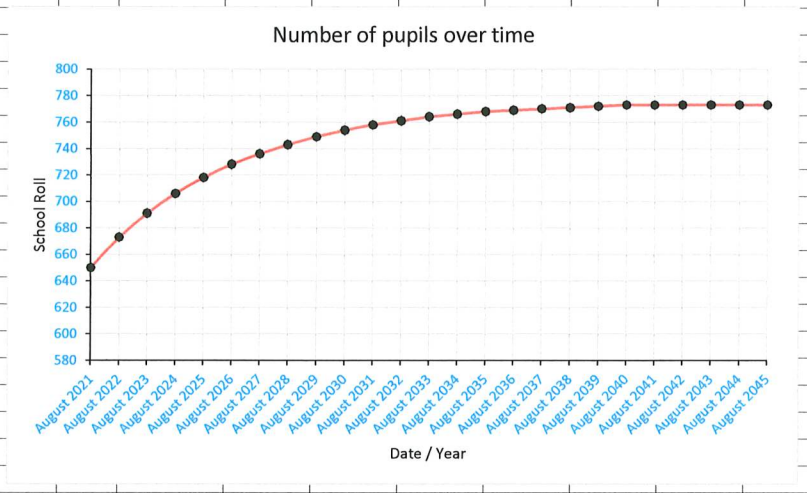
You must consider what happens to the school roll beyond August 2031. **2**

(ii) Use your graph to determine whether the new capacity is suitable. **1**

Yes the new capacity is suitable as the school roll is not expected to exceed 800 pupils long term.

Print the 'School Roll' worksheet in value view and in formula view. Ensure the graph is positioned below the table and is contained on one page in the printout.

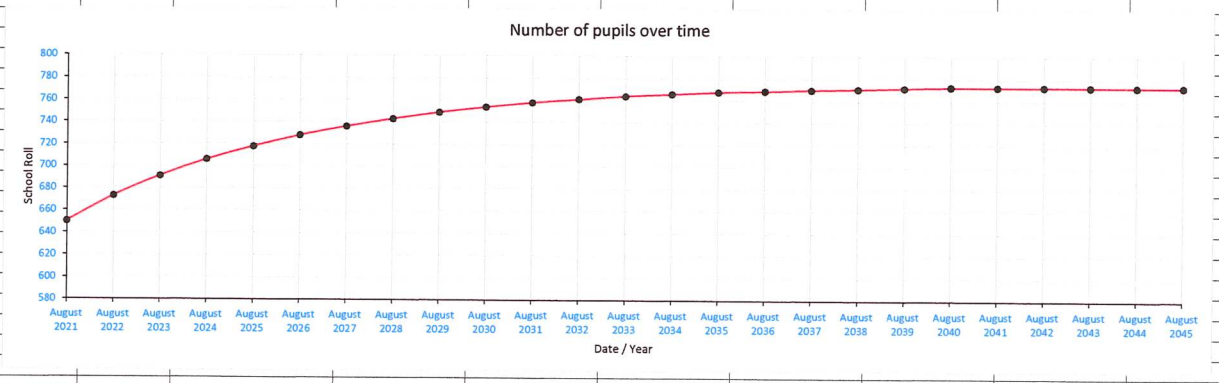
	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Name:	H WALLACE										
2		SCN:											
3		Centre name:	WORKED SOLUTIONS										
4													
5		School Roll Prediction											
6													
7		Number of pupils in August 2021		650									
8		Leavers (%)		18%									
9		School roll at end of year (%)		82%									
10		S1 intake (August)		140									
11		School roll in August 2031		758									
12													
13		Date	Number of Pupils										
14		August 2021	650										
15		August 2022	673	I HAVE USED ROUNDING TO NEAREST INTEGER									
16		August 2023	691	SQA MARKING INSTRUCTIONS USED ROUND, O.									
17		August 2024	706										
18		August 2025	718										
19		August 2026	728										
20		August 2027	736										
21		August 2028	743										
22		August 2029	749										
23		August 2030	754										
24		August 2031	758										
25		August 2032	761										
26		August 2033	764										
27		August 2034	766										
28		August 2035	768										
29		August 2036	769										
30		August 2037	770										
31		August 2038	771										
32		August 2039	772										
33		August 2040	773										
34		August 2041	773										
35		August 2042	773										
36		August 2043	773										
37		August 2044	773										
38		August 2045	773										



VALUE VIEW

Question 5

	A	B	C	D	E	F	G	H	I	J	K	L	M
1			**Name:**	H WALLACE									
2			**SCN:**										
3			**Centre name:**	WORKED SOLUTIONS									
4													
5		**School Roll Prediction**											
6													
7		Number of pupils in August 2021		650									
8		Leavers (%)		0.18									
9		School roll at end of year (%)		=1-D8									
10		S1 intake (August)		140									
11		School roll in August 2031		=C24									
12													
13		**Date**	**Number of Pupils**										
14		August 2021	=D7										
15		August 2022	=INT(C14*$D$9+$D$10)	I HAVE USED ROUND									
16		August 2023	=INT(C15*$D$9+$D$10)	SQA MARKING INSTR									
17		August 2024	=INT(C16*$D$9+$D$10)										
18		August 2025	=INT(C17*$D$9+$D$10)										
19		August 2026	=INT(C18*$D$9+$D$10)										
20		August 2027	=INT(C19*$D$9+$D$10)										
21		August 2028	=INT(C20*$D$9+$D$10)										
22		August 2029	=INT(C21*$D$9+$D$10)										
23		August 2030	=INT(C22*$D$9+$D$10)										
24		August 2031	=INT(C23*$D$9+$D$10)										
25		August 2032	=INT(C24*$D$9+$D$10)										
26		August 2033	=INT(C25*$D$9+$D$10)										
27		August 2034	=INT(C26*$D$9+$D$10)										
28		August 2035	=INT(C27*$D$9+$D$10)										
29		August 2036	=INT(C28*$D$9+$D$10)										
30		August 2037	=INT(C29*$D$9+$D$10)										
31		August 2038	=INT(C30*$D$9+$D$10)										
32		August 2039	=INT(C31*$D$9+$D$10)										
33		August 2040	=INT(C32*$D$9+$D$10)										
34		August 2041	=INT(C33*$D$9+$D$10)										
35		August 2042	=INT(C34*$D$9+$D$10)										
36		August 2043	=INT(C35*$D$9+$D$10)										
37		August 2044	=INT(C36*$D$9+$D$10)										
38		August 2045	=INT(C37*$D$9+$D$10)										



FORMULAE VIEW

MARKS | DO NOT WRITE IN THIS MARGIN

6. The average price of petrol increased at the following annual effective rates:

- March 2018 to 2019: 2.1%
- March 2019 to 2020: 0.5%
- March 2020 to 2021: 2.0%

(a) Calculate the overall percentage increase in the average price of petrol over the three years from March 2018 to March 2021. **1**

Overall % increase $= [(1.021 \times 1.005 \times 1.02) - 1] \times 100$

$= 0.0466271 \times 100$

$= 4.66271$...

$= 4.66\%$

The average price of petrol in March 2021 was 136.4 pence per litre.

(b) Hence calculate the average cost of filling a 45-litre tank with petrol in March 2018. **2**

Unit price in 2018 $= 136.4 \div 1.0466$

$= 130.3$ pence (1dp)

Cost to fill tank in 2018 $= 130.3 \times 45$

$= 5863.5$ pence

$= £58.64$

7. You must refer to the information on 'Strength and conditioning' given in the pre-release material when answering this question.

You must also refer to the spreadsheet file 'Q7 Jump.csv' for the data, and the word processing file 'Q7 Jump Answers.docx' when answering this question.

You must complete parts (a) (i), (b) (i), (b) (ii), and (c) using appropriate statistical software.

You must include all output from statistical software, and your answers in the word processing file 'Q7 Jump Answers.docx'.

A strength and conditioning coach wants to increase vertical jump height performance in their trainees. The data in the spreadsheet file shows back squat weight (kg) and vertical jump height (cm).

(a) (i) Construct a scatter plot of vertical jump height on back squat weight for the data. **2**

(ii) Make an appropriate comment about the relationship between vertical jump height and back squat weight. **1**

(b) (i) Find the correlation coefficient between back squat weight and vertical jump height. **2**

(ii) Find the equation of the regression line of vertical jump height on back squat weight. **2**

(c) Use your statistical software to estimate the vertical jump height for a trainee who can back squat 165 kg, and comment on the accuracy of the predicted value. **2**

Based on the correlation, the coach advises the trainees that increasing their back squat weight will increase their vertical jump height.

(d) Explain why the statistical analysis does not support this advice. **1**

Print the word processing file 'Q7 Jump Answers.docx'.

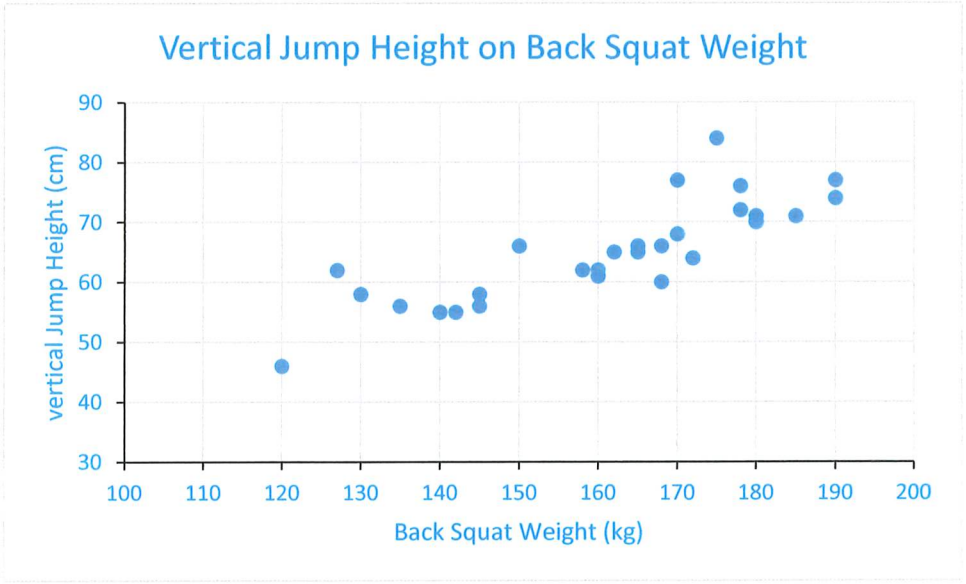
[Turn over

Name: H WALLACE SCN:

Centre name: WORKED SOLUTIONS (USING EXCEL)

(a) (i)

Statistical software output:



(ii)

Answer:

There is an approximate positive linear relationship between vertical jump height and back squat weight. As back squat weight increases, the vertical jump height also increases.

(b) (i)

Statistical software output:

```
=PEARSON(B2:B31,C2:C31)
```

Answer:

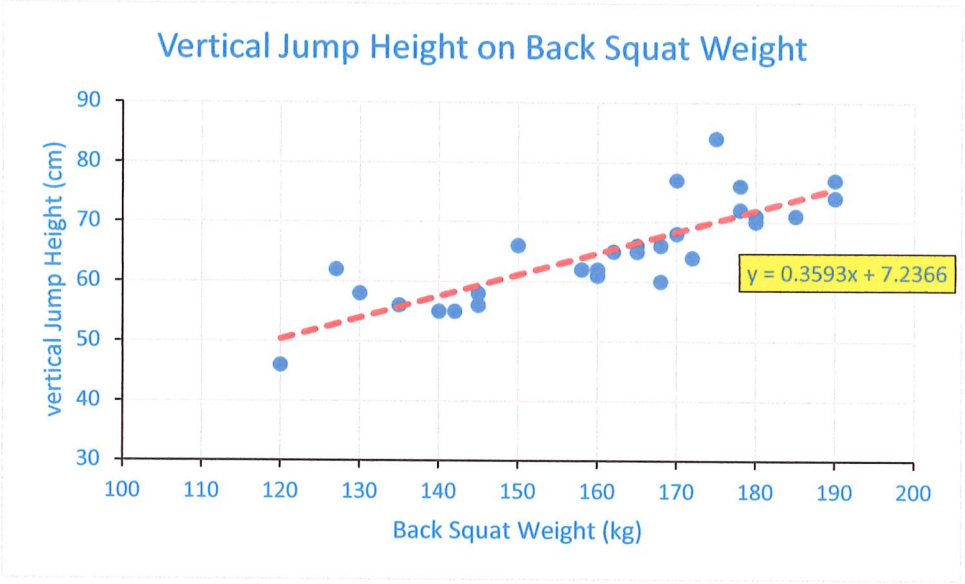
Correlation coefficient value = 0.828727

Name: H WALLACE SCN:

Centre name: WORKED SOLUTIONS (USING EXCEL)

(b) (ii)

Statistical software output:



Answer:

Vertical jump height (cm) = 0.3593 x Back squat weight (kg) + 7.2366

(c)

Statistical software output:

Vertical jump height (cm) = 0.3593 x 165 + 7.2366 = 66.5211 cm

Answer:

Vertical jump height is approximately 66.5cm.
Since the back squat weight of 165kg is within the range of the data used to generate the model, we can be confident that the model is a strong linear model.

(d)

Answer:

The statistical analysis does not support the advice from the coach (that increasing back squat weight will increase their vertical jump height) since correlation is not causation.

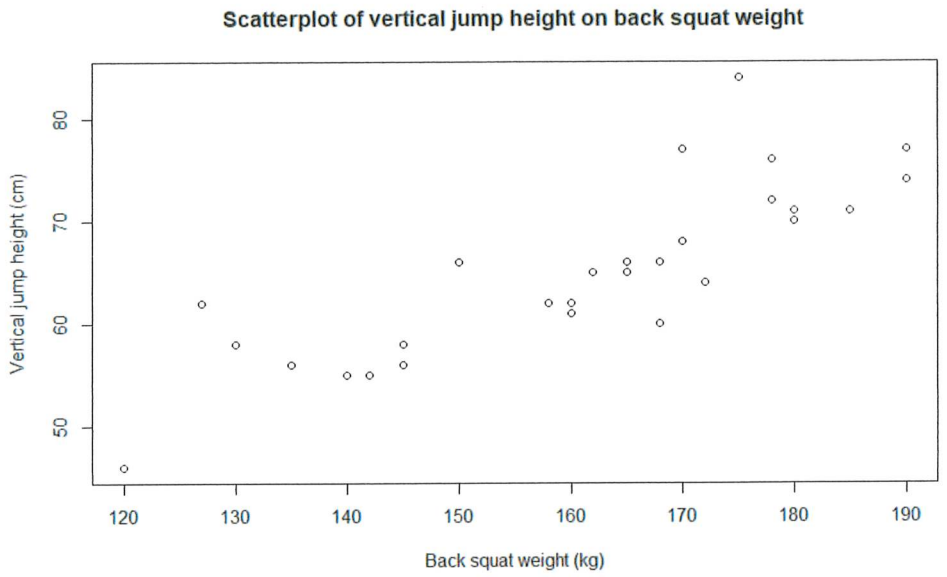
Question 7

Name: H WALLACE SCN:

Centre name: WORKED SOLUTIONS (USING R STUDIO)

(a) (i)

Statistical software output:



(ii)

Answer:

There is an approximate positive linear relationship between vertical jump height and back squat weight. As back squat weight increases, the vertical jump height also increases.

(b) (i)

Statistical software output:

```
> cor.test(back,jump)

        Pearson's product-moment correlation

data:  back and jump
t = 7.6944, df = 27, p-value = 2.825e-08
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 0.6638573 0.9167773
sample estimates:
      cor
0.8287274
```

Answer:

Correlation coefficient value = 0.8287274

Question 7

Name: H WALLACE SCN:

Centre name: WORKED SOLUTIONS (USING R STUDIO)

(b) (ii)

Statistical software output:

```
> lm(jump~back)

Call:
lm(formula = jump ~ back)

Coefficients:
(Intercept)         back
     7.2366       0.3593
```

Answer:

Vertical jump height (cm) = 0.3593 x Back squat weight (kg) + 7.2366

(c)

Statistical software output:

```
> predict(lm(jump ~ back), newdata=data.frame(back=165),interval = "pred")
       fit      lwr      upr
1 66.52568 56.72259 76.32877
```

Answer:

For a trainee squatting 165kg, their vertical jump height is approximately 66.5cm. The true value is likely to be between 56.7 and 76.3cm.

(d)

Answer:

The statistical analysis does not support the advice from the coach (that increasing back squat weight will increase their vertical jump height) since correlation is not causation.

MARKS | DO NOT WRITE IN THIS MARGIN

8. You must refer to the information on 'Deductions from salaries' given in the pre-release material when answering this question.

Sophie starts a job selling mobile phones. Her company provides the following financial benefits **at the end of each month:**

Salary: £1000 per month

Commission: £20 for each mobile phone sold during the month

Pension scheme: Sophie pays 2.5% of her monthly earnings (salary and commission) before tax into her pension fund. The company contributes another 6.5% of the same monthly earnings.

Sophie expects to sell 150 mobile phones per month.

(a) Calculate how much income tax Sophie expects to pay each year. **3**

Commission = £20 × 150 = £3000

Gross Pay = £1000 + £3000 = £4000

Pension = 2.5% of £4000 = £100

Taxable Income = 4000 − 100 = £3900 per month

Annual taxable income = 3900 × 12 = £46 800

Band	Rate	Value	Income Tax
P. Allowance	0%	12570	0
Starter	19%	2097	398.43
Basic	20%	10629	2125.80
Intermediate	21%	18366	3856.86
Higher	41%	3138	1286.58
		£46,800	£7667.67

Sophie's annual tax bill is £7667.67

8. (continued)

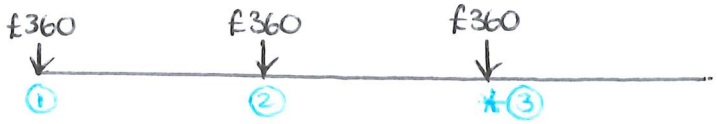
100+10 = 110% = 1.1

Sophie's pension fund earns an annual effective rate of interest of 10%.

(b) Calculate the expected value of Sophie's pension fund immediately after the third pension contribution is made. **3**

Employers' contribution = 6.5% of £4000 = £260

Total monthly contribution = £260 + £100 = £360



Value after second = $£360 \times 1.1^{\frac{1}{12}} + £360 = £722.87$

Value after third = $£722.87 \times 1.1^{\frac{1}{12}} + £360 = £1088.63$

Sophie has the choice to leave the company pension scheme.

(c) State one reason why Sophie would not leave the company pension scheme. **1**

It is important for Sophie to save now to provide a pension income in retirement when she is no longer working.

[Turn over

9. You must refer to the spreadsheet file 'Q9 Car Repayments.xlsx' when answering this question.

You must complete parts (a), and (b) using the spreadsheet file.

Part (c) must be completed in the space provided.

Maria is buying a car for £15,000. She has arranged a loan for the full amount from the bank, to be paid back with level monthly repayments for 48 months. The annual effective interest rate is 9.5%.

Open the 'Bank Loan' worksheet.

(a) Complete the 'Loan Repayment Schedule' to determine the level monthly repayment amount, and the final repayment amount. 4

The car dealership has their own finance options.

Option 1

- Pay £300 per month for 48 months, and return the car to the dealer.
- Additional charges will apply if the mileage exceeds 24 000 miles when the car is returned.

Option 2

- Pay £300 per month for 48 months, and keep the car by making an additional payment of £5000 in the final month.

Open the 'Car Finance' worksheet.

(b) Complete the 'Finance Repayment Schedule' to find the annual effective interest rate of Option 2. 3

(c) State two reasons why Maria might decide to purchase the car using the bank loan instead of the car dealership finance options. 2

With the bank loan, at least Maria will own the car outright after 48 monthly payments without needing to find a £5000 lump sum. as per option 2.

Maria would also be at risk of paying additional charges as per option 1 if she was to exceed 24000 miles before returning the car.

Print the 'Bank Loan' worksheet in value view and in formula view. Print the 'Car Finance' worksheet in value view and in formula view.

	A	B	C	D	E	F
1		Name:	H WALLACE			
2		SCN:				
3		Centre name:	WORKED SOLUTIONS			
4						
5		Loan Repayment Schedule				
6					VALUE VIEW	
7		Initial loan amount	£ 15,000.00			
8		Annual effective interest rate	9.50%			
9		Monthly effective interest rate	0.76%			
10		Loan Period (months)	48			
11		Monthly Repayment	£ 374.06			
12		Final Repayment	£ 373.99			
13						
14		Time (months)	Repayment (£)	Interest content of repayment (£)	Capital content of repayment (£)	Loan outstanding (£)
15		0				15,000.00
16		1	374.06	113.87	260.19	14,739.81
17		2	374.06	111.90	262.16	14,477.65
18		3	374.06	109.91	264.15	14,213.50
19		4	374.06	107.90	266.16	13,947.34
20		5	374.06	105.88	268.18	13,679.16
21		6	374.06	103.85	270.21	13,408.95
22		7	374.06	101.79	272.27	13,136.68
23		8	374.06	99.73	274.33	12,862.35
24		9	374.06	97.64	276.42	12,585.93
25		10	374.06	95.55	278.51	12,307.42
26		11	374.06	93.43	280.63	12,026.79
27		12	374.06	91.30	282.76	11,744.03
28		13	374.06	89.16	284.90	11,459.13
29		14	374.06	86.99	287.07	11,172.06
30		15	374.06	84.81	289.25	10,882.81
31		16	374.06	82.62	291.44	10,591.37
32		17	374.06	80.40	293.66	10,297.71
33		18	374.06	78.18	295.88	10,001.83
34		19	374.06	75.93	298.13	9,703.70
35		20	374.06	73.67	300.39	9,403.31
36		21	374.06	71.39	302.67	9,100.64
37		22	374.06	69.09	304.97	8,795.67
38		23	374.06	66.77	307.29	8,488.38
39		24	374.06	64.44	309.62	8,178.76
40		25	374.06	62.09	311.97	7,866.79
41		26	374.06	59.72	314.34	7,552.45
42		27	374.06	57.33	316.73	7,235.72

Question 9 (a)

	A	B	C	D	E	F
1		Name:	H WALLACE			
2		SCN:				
3		Centre name:	WORKED SOLUTIONS			
4						
43		28	374.06	54.93	319.13	6,916.59
44		29	374.06	52.51	321.55	6,595.04
45		30	374.06	50.07	323.99	6,271.05
46		31	374.06	47.61	326.45	5,944.60
47		32	374.06	45.13	328.93	5,615.67
48		33	374.06	42.63	331.43	5,284.24
49		34	374.06	40.12	333.94	4,950.30
50		35	374.06	37.58	336.48	4,613.82
51		36	374.06	35.03	339.03	4,274.79
52		37	374.06	32.45	341.61	3,933.18
53		38	374.06	29.86	344.20	3,588.98
54		39	374.06	27.25	346.81	3,242.17
55		40	374.06	24.61	349.45	2,892.72
56		41	374.06	21.96	352.10	2,540.62
57		42	374.06	19.29	354.77	2,185.85
58		43	374.06	16.59	357.47	1,828.38
59		44	374.06	13.88	360.18	1,468.20
60		45	374.06	11.15	362.91	1,105.29
61		46	374.06	8.39	365.67	739.62
62		47	374.06	5.61	368.45	371.17
63		48	373.99	2.82	371.17	0.00

Question 9 (a)

	A	B	C	D	E	F
1		Name:	H WALLACE			
2		SCN:				
3		Centre name:	WORKED SOLUTIONS			
4						
5		**Loan Repayment Schedule**				
6						
7		Initial loan amount	15000		FORMULAE VIEW.	
8		Annual effective interest rate	0.095			
9		Monthly effective interest rate	=((1+C8)^(1/12))-1			
10		Loan Period (months)	48			
11		Monthly Repayment	374.06			
12		Final Repayment	=C63			
13						
14		**Time (months)**	**Repayment (£)**	**Interest content of repayment (£)**	**Capital content of repayment (£)**	**Loan outstanding (£)**
15		0				=C7
16		1	=$C$11	=ROUND($C$9*F15,2)	=C16-D16	=F15-E16
17		2	=$C$11	=ROUND($C$9*F16,2)	=C17-D17	=F16-E17
18		3	=$C$11	=ROUND($C$9*F17,2)	=C18-D18	=F17-E18
19		4	=$C$11	=ROUND($C$9*F18,2)	=C19-D19	=F18-E19
20		5	=$C$11	=ROUND($C$9*F19,2)	=C20-D20	=F19-E20
21		6	=$C$11	=ROUND($C$9*F20,2)	=C21-D21	=F20-E21
22		7	=$C$11	=ROUND($C$9*F21,2)	=C22-D22	=F21-E22
23		8	=$C$11	=ROUND($C$9*F22,2)	=C23-D23	=F22-E23
24		9	=$C$11	=ROUND($C$9*F23,2)	=C24-D24	=F23-E24
25		10	=$C$11	=ROUND($C$9*F24,2)	=C25-D25	=F24-E25
26		11	=$C$11	=ROUND($C$9*F25,2)	=C26-D26	=F25-E26
27		12	=$C$11	=ROUND($C$9*F26,2)	=C27-D27	=F26-E27
28		13	=$C$11	=ROUND($C$9*F27,2)	=C28-D28	=F27-E28
29		14	=$C$11	=ROUND($C$9*F28,2)	=C29-D29	=F28-E29
30		15	=$C$11	=ROUND($C$9*F29,2)	=C30-D30	=F29-E30
31		16	=$C$11	=ROUND($C$9*F30,2)	=C31-D31	=F30-E31
32		17	=$C$11	=ROUND($C$9*F31,2)	=C32-D32	=F31-E32
33		18	=$C$11	=ROUND($C$9*F32,2)	=C33-D33	=F32-E33
34		19	=$C$11	=ROUND($C$9*F33,2)	=C34-D34	=F33-E34
35		20	=$C$11	=ROUND($C$9*F34,2)	=C35-D35	=F34-E35
36		21	=$C$11	=ROUND($C$9*F35,2)	=C36-D36	=F35-E36

Question 9 (a)

	A	B	C	D	E	F
1		Name:	H WALLACE			
2		SCN:				
3		Centre name:	WORKED SOLUTIONS			
4						
37		22	=$C$11	=ROUND($C$9*F36,2)	=C37-D37	=F36-E37
38		23	=$C$11	=ROUND($C$9*F37,2)	=C38-D38	=F37-E38
39		24	=$C$11	=ROUND($C$9*F38,2)	=C39-D39	=F38-E39
40		25	=$C$11	=ROUND($C$9*F39,2)	=C40-D40	=F39-E40
41		26	=$C$11	=ROUND($C$9*F40,2)	=C41-D41	=F40-E41
42		27	=$C$11	=ROUND($C$9*F41,2)	=C42-D42	=F41-E42
43		28	=$C$11	=ROUND($C$9*F42,2)	=C43-D43	=F42-E43
44		29	=$C$11	=ROUND($C$9*F43,2)	=C44-D44	=F43-E44
45		30	=$C$11	=ROUND($C$9*F44,2)	=C45-D45	=F44-E45
46		31	=$C$11	=ROUND($C$9*F45,2)	=C46-D46	=F45-E46
47		32	=$C$11	=ROUND($C$9*F46,2)	=C47-D47	=F46-E47
48		33	=$C$11	=ROUND($C$9*F47,2)	=C48-D48	=F47-E48
49		34	=$C$11	=ROUND($C$9*F48,2)	=C49-D49	=F48-E49
50		35	=$C$11	=ROUND($C$9*F49,2)	=C50-D50	=F49-E50
51		36	=$C$11	=ROUND($C$9*F50,2)	=C51-D51	=F50-E51
52		37	=$C$11	=ROUND($C$9*F51,2)	=C52-D52	=F51-E52
53		38	=$C$11	=ROUND($C$9*F52,2)	=C53-D53	=F52-E53
54		39	=$C$11	=ROUND($C$9*F53,2)	=C54-D54	=F53-E54
55		40	=$C$11	=ROUND($C$9*F54,2)	=C55-D55	=F54-E55
56		41	=$C$11	=ROUND($C$9*F55,2)	=C56-D56	=F55-E56
57		42	=$C$11	=ROUND($C$9*F56,2)	=C57-D57	=F56-E57
58		43	=$C$11	=ROUND($C$9*F57,2)	=C58-D58	=F57-E58
59		44	=$C$11	=ROUND($C$9*F58,2)	=C59-D59	=F58-E59
60		45	=$C$11	=ROUND($C$9*F59,2)	=C60-D60	=F59-E60
61		46	=$C$11	=ROUND($C$9*F60,2)	=C61-D61	=F60-E61
62		47	=$C$11	=ROUND($C$9*F61,2)	=C62-D62	=F61-E62
63		48	=$C$11-0.07	=ROUND($C$9*F62,2)	=C63-D63	=F62-E63

	A	B	C	D	E	F
1		**Name:**	H WALLACE			
2		**SCN:**				
3		**Centre name:**	WORKED SOLUTIONS			
4						
5		**Finance Repayment Schedule**				
6					VALUE VIEW.	
7		Initial loan amount	£ 15,000.00			
8		Annual effective interest rate	11.05%			
9		Monthly effective interest rate	0.88%			
10		Loan Period (months)	48			
11		Monthly Repayment	£ 300.00			
12		Additional Payment	£ 5,000.00			
13						
14		**Time (months)**	**Repayment (£)**	**Interest content of repayment (£)**	**Capital content of repayment (£)**	**Loan outstanding (£)**
15		0				15,000.00
16		1	300.00	131.55	168.45	14,831.55
17		2	300.00	130.07	169.93	14,661.62
18		3	300.00	128.58	171.42	14,490.20
19		4	300.00	127.08	172.92	14,317.28
20		5	300.00	125.56	174.44	14,142.84
21		6	300.00	124.03	175.97	13,966.87
22		7	300.00	122.49	177.51	13,789.36
23		8	300.00	120.93	179.07	13,610.29
24		9	300.00	119.36	180.64	13,429.65
25		10	300.00	117.78	182.22	13,247.43
26		11	300.00	116.18	183.82	13,063.61
27		12	300.00	114.57	185.43	12,878.18
28		13	300.00	112.94	187.06	12,691.12
29		14	300.00	111.30	188.70	12,502.42
30		15	300.00	109.65	190.35	12,312.07
31		16	300.00	107.98	192.02	12,120.05
32		17	300.00	106.29	193.71	11,926.34
33		18	300.00	104.59	195.41	11,730.93
34		19	300.00	102.88	197.12	11,533.81
35		20	300.00	101.15	198.85	11,334.96
36		21	300.00	99.41	200.59	11,134.37
37		22	300.00	97.65	202.35	10,932.02
38		23	300.00	95.87	204.13	10,727.89
39		24	300.00	94.08	205.92	10,521.97
40		25	300.00	92.28	207.72	10,314.25
41		26	300.00	90.46	209.54	10,104.71
42		27	300.00	88.62	211.38	9,893.33

Question 9 (b)

	A	B	C	D	E	F
1		Name:	H WALLACE			
2		SCN:				
3		Centre name:	WORKED SOLUTIONS			
4						
43		28	300.00	86.77	213.23	9,680.10
44		29	300.00	84.90	215.10	9,465.00
45		30	300.00	83.01	216.99	9,248.01
46		31	300.00	81.11	218.89	9,029.12
47		32	300.00	79.19	220.81	8,808.31
48		33	300.00	77.25	222.75	8,585.56
49		34	300.00	75.30	224.70	8,360.86
50		35	300.00	73.33	226.67	8,134.19
51		36	300.00	71.34	228.66	7,905.53
52		37	300.00	69.33	230.67	7,674.86
53		38	300.00	67.31	232.69	7,442.17
54		39	300.00	65.27	234.73	7,207.44
55		40	300.00	63.21	236.79	6,970.65
56		41	300.00	61.13	238.87	6,731.78
57		42	300.00	59.04	240.96	6,490.82
58		43	300.00	56.92	243.08	6,247.74
59		44	300.00	54.79	245.21	6,002.53
60		45	300.00	52.64	247.36	5,755.17
61		46	300.00	50.47	249.53	5,505.64
62		47	300.00	48.28	251.72	5,253.92
63		48	5,300.00	46.08	5,253.92	-

Question 9 (b)

	A	B	C	D	E	F
1		Name:	H WALLACE			
2		SCN:				
3		Centre name:	WORKED SOLUTIONS			
4						
5		**Finance Repayment Schedule**				
6					FORMULAE VIEW.	
7		Initial loan amount	15000			
8		Annual effective interest rate	=((1+$C$9)^12)-1			
9		Monthly effective interest rate	0.00877006708946753			
10		Loan Period (months)	48			
11		Monthly Repayment	300			
12		Additional Payment	5000			
13						
14		**Time (months)**	**Repayment (£)**	**Interest content of repayment (£)**	**Capital content of repayment (£)**	**Loan outstanding (£)**
15		0				=C7
16		1	=$C$11	=ROUND($C$9*F15,2)	=C16-D16	=F15-E16
17		2	=$C$11	=ROUND($C$9*F16,2)	=C17-D17	=F16-E17
18		3	=$C$11	=ROUND($C$9*F17,2)	=C18-D18	=F17-E18
19		4	=$C$11	=ROUND($C$9*F18,2)	=C19-D19	=F18-E19
20		5	=$C$11	=ROUND($C$9*F19,2)	=C20-D20	=F19-E20
21		6	=$C$11	=ROUND($C$9*F20,2)	=C21-D21	=F20-E21
22		7	=$C$11	=ROUND($C$9*F21,2)	=C22-D22	=F21-E22
23		8	=$C$11	=ROUND($C$9*F22,2)	=C23-D23	=F22-E23
24		9	=$C$11	=ROUND($C$9*F23,2)	=C24-D24	=F23-E24
25		10	=$C$11	=ROUND($C$9*F24,2)	=C25-D25	=F24-E25
26		11	=$C$11	=ROUND($C$9*F25,2)	=C26-D26	=F25-E26
27		12	=$C$11	=ROUND($C$9*F26,2)	=C27-D27	=F26-E27
28		13	=$C$11	=ROUND($C$9*F27,2)	=C28-D28	=F27-E28
29		14	=$C$11	=ROUND($C$9*F28,2)	=C29-D29	=F28-E29
30		15	=$C$11	=ROUND($C$9*F29,2)	=C30-D30	=F29-E30
31		16	=$C$11	=ROUND($C$9*F30,2)	=C31-D31	=F30-E31
32		17	=$C$11	=ROUND($C$9*F31,2)	=C32-D32	=F31-E32
33		18	=$C$11	=ROUND($C$9*F32,2)	=C33-D33	=F32-E33
34		19	=$C$11	=ROUND($C$9*F33,2)	=C34-D34	=F33-E34
35		20	=$C$11	=ROUND($C$9*F34,2)	=C35-D35	=F34-E35
36		21	=$C$11	=ROUND($C$9*F35,2)	=C36-D36	=F35-E36

Question 9 (b)

	A	B	C	D	E	F
1		Name:	H WALLACE			
2		SCN:				
3		Centre name:	WORKED SOLUTIONS			
4						
37		22	=$C$11	=ROUND($C$9*F36,2)	=C37-D37	=F36-E37
38		23	=$C$11	=ROUND($C$9*F37,2)	=C38-D38	=F37-E38
39		24	=$C$11	=ROUND($C$9*F38,2)	=C39-D39	=F38-E39
40		25	=$C$11	=ROUND($C$9*F39,2)	=C40-D40	=F39-E40
41		26	=$C$11	=ROUND($C$9*F40,2)	=C41-D41	=F40-E41
42		27	=$C$11	=ROUND($C$9*F41,2)	=C42-D42	=F41-E42
43		28	=$C$11	=ROUND($C$9*F42,2)	=C43-D43	=F42-E43
44		29	=$C$11	=ROUND($C$9*F43,2)	=C44-D44	=F43-E44
45		30	=$C$11	=ROUND($C$9*F44,2)	=C45-D45	=F44-E45
46		31	=$C$11	=ROUND($C$9*F45,2)	=C46-D46	=F45-E46
47		32	=$C$11	=ROUND($C$9*F46,2)	=C47-D47	=F46-E47
48		33	=$C$11	=ROUND($C$9*F47,2)	=C48-D48	=F47-E48
49		34	=$C$11	=ROUND($C$9*F48,2)	=C49-D49	=F48-E49
50		35	=$C$11	=ROUND($C$9*F49,2)	=C50-D50	=F49-E50
51		36	=$C$11	=ROUND($C$9*F50,2)	=C51-D51	=F50-E51
52		37	=$C$11	=ROUND($C$9*F51,2)	=C52-D52	=F51-E52
53		38	=$C$11	=ROUND($C$9*F52,2)	=C53-D53	=F52-E53
54		39	=$C$11	=ROUND($C$9*F53,2)	=C54-D54	=F53-E54
55		40	=$C$11	=ROUND($C$9*F54,2)	=C55-D55	=F54-E55
56		41	=$C$11	=ROUND($C$9*F55,2)	=C56-D56	=F55-E56
57		42	=$C$11	=ROUND($C$9*F56,2)	=C57-D57	=F56-E57
58		43	=$C$11	=ROUND($C$9*F57,2)	=C58-D58	=F57-E58
59		44	=$C$11	=ROUND($C$9*F58,2)	=C59-D59	=F58-E59
60		45	=$C$11	=ROUND($C$9*F59,2)	=C60-D60	=F59-E60
61		46	=$C$11	=ROUND($C$9*F60,2)	=C61-D61	=F60-E61
62		47	=$C$11	=ROUND($C$9*F61,2)	=C62-D62	=F61-E62
63		48	=$C$11+$C$12	=ROUND($C$9*F62,2)	=C63-D63	=F62-E63

MARKS | DO NOT WRITE IN THIS MARGIN

10. You must refer to the information on 'Mountain gorillas' given in the pre-release material when answering this question.

The 2020 study found that the population of mountain gorillas had increased to 1004.

An expert has stated that if the mountain gorilla population in the Virunga Mountains continues to grow exponentially there will be 1600 gorillas by the year 2032.

(a) Determine if the expert's statement is correct.

Give a reason for your answer. **2**

680 gorillas in 2018, now 1004 gorillas in 2020.
An increase of 324 gorillas over 2 years.

% increase = $\frac{324}{680} \times 100 = 47.647\%$.

Population in 2032 = $1004 \times 1.47647 \approx 1482$

The expert is incorrect as $1482 < 1600$.

A typical adult mountain gorilla eats 30 kg of food per day.

(b) Estimate the **maximum** amount of termites and ants (in kg) that a typical mountain gorilla will eat during their adult lifetime.

State any assumptions you have made. **3**

25 years adult lifetime

Estimate = 30kg x 365 days x 25 years
= 273 750 kg. total food.

Gorillas mostly eat vegetarian, so maximum percentage of diet from ants/termites is 49%.

49% of 273 750kg = 134 137.5 ≈ 134 000kg.

[END OF QUESTION PAPER]