[core:maths]
A NEW QUALIFICATION FOR WORK, STUDY & LIFE

Godalming College

You have one week to complete this. What you hand in should be your best work, and you must attempt every question.

If you are stuck then please either consult notes or textbooks, attend a workshop, or ask your teacher.

You may need to refer to the formula book, found here:

or financial information, found here:

1) A house is to have new carpets fitted throughout. The work involved has been divided into a number of tasks, as shown in the table.

Activity	Immediate predecessor	Duration (hours)
A: Remove old carpets upstairs	–	0.5
B: Remove old grippers upstairs	A	0.2
C: Remove old carpets downstairs	–	1
D: Remove old grippers downstairs	C	0.3
E: Fit new grippers upstairs	B	0.7
F: Fit new grippers downstairs	D	0.9
G: Lay underlay	E, F	2
H: Fit new carpets	G	4.5
I: Fit doorplates upstairs	H	0.6
J: Fit doorplates downstairs	H	0.7
K: Clean	I, J	0.5

(a) Construct an activity network for the project. *(3 marks)*

(b) Find the earliest start time for each activity. *(2 marks)*

(c) Find the latest finish time for each activity. *(3 marks)*

(d) Find the critical activities and state the length of the critical path. *(2 marks)*

(e) On the grid given on the answer sheet, construct a Gantt (cascade) diagram for the project. *(3 marks)*

2) Twins Alec and Eric are members of the same local cricket club and play for the club's under 18 team.

The probability that Alec is selected to play in any particular game is 0.85.
The probability that Eric is selected to play in any particular game is 0.60.
The probability that both Alec and Eric are selected to play in any particular game is 0.55.

(i) show that the probability that neither twin is selected for a particular game is 0.10;

(ii) find the probability that at least one of the twins is selected for a particular game;

(iii) find the probability that exactly one of the twins is selected for a particular game. *(5 marks)*

3) Rita runs a restaurant in Southpool.

60% of Rita's customers choose a pizza.

Of those that choose pizza, $\frac{1}{4}$ choose chips.

Of those that choose burger, $\frac{4}{5}$ choose chips.

Menu
pizza or burger
with
chips or salad

(a) Complete the tree diagram to show this information. **[2 marks]**

(b) What assumption have you made when completing the tree diagram? **[1 mark]**

(c) A customer at Rita's restaurant is picked at random.

Find the probability that this customer orders chips. **[3 marks]**

(d) Rita opens a new restaurant in Eastwich.
84 of her first 240 customers order chips.

How do the choices of customers at the two restaurants compare?
Justify your answer. **[2 marks]**

4) A small pharmaceutical company has developed a new screening test for diabetes.

The cost of developing the screening test was £1 000 000

The company has three options

- manufacture and distribute the test itself
- go into partnership with a large business and take a royalty
- sell all the rights for £2 500 000

The profit that can be expected depends on the level of sales and is shown below.

	Expected profit (£ thousands)		
	High sales	**Medium sales**	**Low sales**
Manufacture itself	8000	4000	−2000
Go into partnership	5000	3000	1000

The table shows the probabilities associated with each level of sales.

	Probability
High sales	0.2
Medium sales	0.5
Low sales	0.3

Which one of the options gives the highest expected profit?
You must show all your working.

5) GasIn is an insurance company that insures central heating systems.

GasIn insures 350 000 central heating systems each year.
GasIn charges £55 to insure a central heating system for a year.

The probability that a central heating system will develop a fault is 0.18
The average claim for a central heating system fault is £273

How much profit is GasIn likely to make in a year?

6) Henrietta lives on a small farm where she keeps some hens.

For a period of 35 weeks during the hens' first laying season, she records, **each week**, the total number of eggs laid by the hens.

Her records are shown in the table.

(i) state values for the mode and the range; **[2 marks]**

(ii) find values for the median and the interquartile range; **[3 marks]**

(iii) calculate values for the mean and the standard deviation. **[4 marks]**

7) The table below shows information about the ages of the 136 people who lived in St. Martin's in the Isles of Scilly in March 2011

(a) Draw a cumulative frequency diagram on the grid opposite to show the data. You may use the spare column in the table for any calculation required. **[4 marks]**

(b) Use your cumulative frequency diagram to find:

(b) (i) the median; **[1 mark]**

(b) (ii) the interquartile range. **[2 marks]**

(c) Cartmel is a village in Cumbria. The ages of people living in Cartmel in March 2011 were also recorded. These are shown in the box and whisker diagram below. For March 2011, compare the ages of people living in Cartmel with the ages of people living in St.Martin's. **[4 marks]**

8) In the USA, the price of a Kindle with free 3G was $202. The exchange rate was $1.62 to £1.

Calculate the cost of the Kindle in pounds (£).

The price of a block of butter in 2015 was half the price it was in 2017.

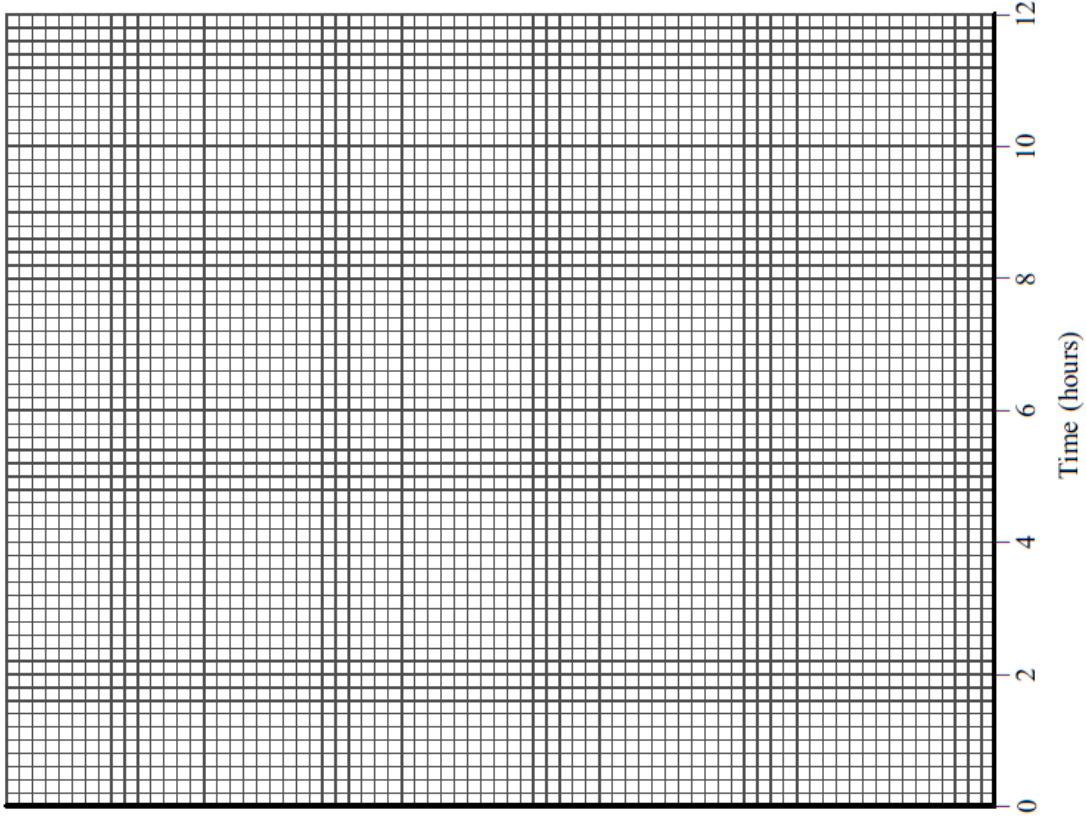**9)** Taking 2015 as the base year, what is the index number for the price of butter in 2017? Circle your answer. **[1 mark]**
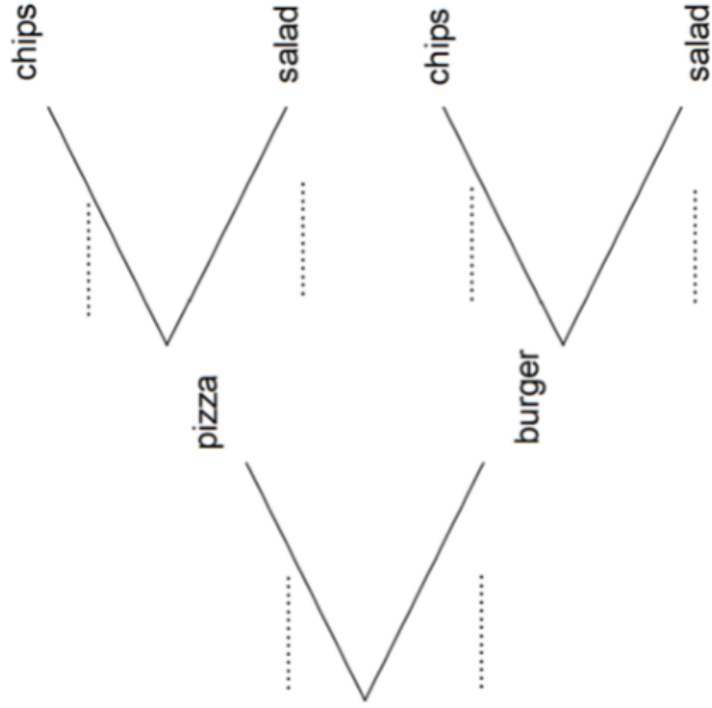
| 0.5 | 50 | 150 | 200 |

1)

Time (hours)

3)

chips

pizza

salad

chips

burger

salad

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Homework 19B – Answer sheet

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6)

Total number of eggs laid in a week (x)	Number of weeks (f)
66	1
67	2
68	3
69	5
70	7
71	8
72	4
73	2
74	2
75	1
Total	**35**

7)

Age, a years	Number of people	
$0 \leqslant a < 20$	22	
$20 \leqslant a < 40$	42	
$40 \leqslant a < 60$	31	
$60 \leqslant a < 80$	31	
$80 \leqslant a < 100$	10	
Total	136	

Cumulative frequency graph — y-axis: Cumulative frequency (0, 20, 40, 60, 80, 100, 120, 140); x-axis: Age (a years) (0, 20, 40, 60, 80, 100).

Cartmel box plot — x-axis: Age (a years) (0, 20, 40, 60, 80, 100, 120).