

Part 1

Answer *three* of the following six questions (each question is worth 28 marks).

Question 1 (Numerical relationships)

The aim of this question is for you to demonstrate your understanding of averages, price indices and percentages.

- (i) As part of a transport management survey, the number of vehicles passing a school is recorded for 5-minute intervals over an hour. The results are given in Table 1.

Table 1: Number of vehicles passing a school during 5-minute intervals

Number of vehicles passing the school	12	18	17	24	20	21	21	18	15	19	25	24
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Calculate the mean number of vehicles passing the school over a 5-minute interval during this period. [2]

- (ii) An Open University student gains the following scores on assignments during a course.

Table 2: A student's TMA scores

TMA number	Score	Weight
01	92	10
02	78	20
03	59	25
04	55	25
05	71	20

Calculate the student's weighted mean score. [4]

- (iii) Table 3 shows the average price of a kilogram of grapes at selected dates during 2006.

Table 3: The average price of a kilogram of grapes in 2006
(Source: Office for National Statistics)

	February	June	October
Price (£)	2.44	3.65	2.73

- (a) Find the percentage increase in the average price of a kilogram of grapes between February and June 2006, giving your answer correct to 1 decimal place. [3]

- (b) Using the methods in Section 3 of *Unit 2*, construct a price index for the average price of grapes. Use February 2006 as the base month with a price index of 100, and calculate the price indices for June and October. Give your answers correct to 1 decimal place. [6]

- (c) With February 2006 as the base month, the price index for February 2007 was 96.7. Find the average price of a kilogram of grapes in February 2007. [3]

(iv) In this part of the question, you are asked to demonstrate your understanding of your work from MU120 on *finding and using averages of data sets*.

- (a) Choose an example of your work from MU120 which uses a type of average different from those in parts (i) and (ii) of this question. Your example can be a TMA or CMA question or an activity or exercise from the course, which demonstrates your understanding of using an average.

Include your original working for your example, or a photocopy, giving a full reference (e.g. assignment number and question number or unit number, page number and activity number).

Your tutor will be looking for evidence that you understand this topic, so annotate your work to show this by:

- marking the section of your work that is relevant;
- explaining why an average was used in your example. [3]

- (b) Referring to your answers in this question and other examples from MU120 that use an average:

- describe how two different types of average may be found;
- explain the strengths and weaknesses of the median and the mean.

As a guide, your answer should be between 150 and 300 words. [7]

Question 2 (Graphs and diagrams)

The aim of this question is for you to demonstrate your understanding of the use of graphs.

- (i) A horticulturalist is testing germination rates of seeds at different temperatures. She plants batches of 20 seeds, maintains them at either 18°C or 22°C for two weeks, and then counts the number of seeds in each batch that have germinated. Her results are given in Table 4.

Table 4: Number of seeds germinating at different temperatures

Number of seeds germinating from a batch at 18°C	Number of seeds germinating from a batch at 22°C
17	17
12	15
16	18
15	16
9	12
15	16
14	15
12	13
7	13
8	17
14	14

- (a) Using a common axis, draw accurate boxplots to illustrate these data. [5]

- (b) Use your boxplots to compare the germination rates at the different temperatures. [4]

- (ii) (a) Find the equation of the straight line that passes through the points $(-1, 5)$ and $(2, -4)$. [3]
- (b) Find the points where the line $x + 2y = 6$ crosses the x -axis and the y -axis. [2]
- (c) Find the points where the parabola $y = x^2 - x + 4$ meets the line $y = 6$. [4]

(iii) In this part of the question, you are asked to demonstrate your understanding of your work from MU120 on *using graphs to help answer questions in a practical context*.

- (a) Choose an example of your work from MU120 where you have used a graph, *other than a boxplot*, to help answer a question in a practical context. Your example can be a TMA or CMA question or an activity or exercise from the course, which demonstrates your understanding of using a graph to help answer a question in a practical context.

Include your original working for your example, or a photocopy, giving a full reference (e.g. assignment number and question number or unit number, page number and activity number).

Your tutor will be looking for evidence that you understand this topic, so annotate your work to show this by:

- marking the section of your work that is relevant;
- stating both the question that was asked, and the answer that you found. [3]

- (b) Referring to your answers in this question and other examples from MU120, describe two different types of graph that can be used to help answer a question in a practical context. Your description should include:

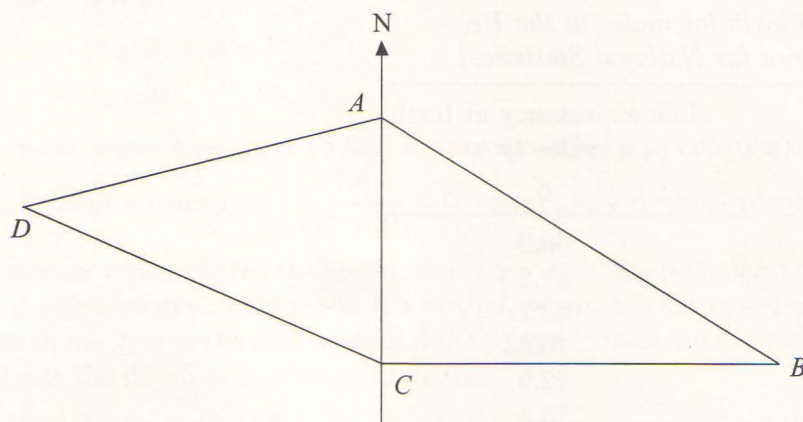
- the kind of information or data that you need for each graph;
- how each graph is constructed;
- how each graph can be used to answer a question.

As a guide, your answer should be between 150 and 300 words. [7]

Question 5 (Trigonometry)

The aim of this question is for you to demonstrate your understanding of trigonometry.

- (i) The diagram below shows part of an orienteering course which is on a flat area of countryside.



- (a) A track horse rider starts at point A and rides to the first control at B , on a bearing of 122° . The second control is at C , due south of A and due west of B . Find all the angles of triangle ABC . [2]
- (b) The distance from A to C is 870 metres. Use trigonometry to find the distance from B to C . Give your answer correct to 3 significant figures. [4]
- (c) The next control is at D , on a bearing of 291° from C . At D the rider heads back to A on a bearing of 076° . Find all the angles of triangle ACD . [3]
- (d) Use the sine formula to find the distance from C to D . [4]
- (e) Use the cosine formula in triangle BCD to find the straight-line distance from B to D . Note that you need only find angle BCD in triangle BCD for this calculation. [5]
- (ii) The equation $d = 4 + 2 \sin\left(\frac{2\pi t}{13}\right)$ can be used to model the depth d metres of water in a harbour at time t hours after midnight on a particular day.
- (a) Enter the equation into your course calculator (set in radian mode) and hence sketch the graph for time 0 to 30 hours. [3]
- (b) Use the model to predict the maximum and minimum depths of water in the harbour. [2]
- (c) Use the model to predict the depth of water in the harbour at 6 am. [2]
- (d) A boat coming into the harbour requires a minimum depth of water of 3 metres. Find the earliest time after 9 am when the boat will be able to enter the harbour. [3]