# Homework 13B

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.
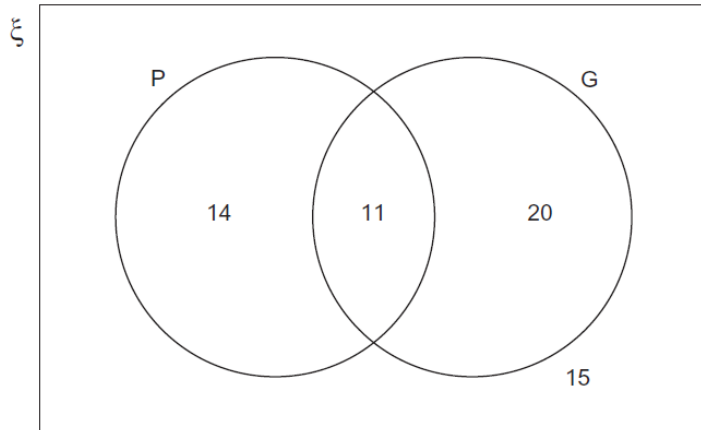
You may need to refer to the formula book, found [here](here):

or financial information, found [here](here):

## 1)

The Venn diagram shows information about 60 students.

P = students who play the piano

G = students who play the guitar

One of these 60 students is chosen at random.

**(a)** Work out the probability that the student plays the piano.

[1 mark]

**(b)** Work out the probability that the student plays the piano **and** the guitar.

[1 mark]

**(c)** One-tenth of the 60 students are male and do not play the piano or the guitar.

Work out the probability that the student is female and does not play the piano or the guitar.

[2 marks]

## 2)

Tina has decided to have a rockery built in her garden.

The work involved has been divided into a number of tasks, as shown in the table. The minimum time required to complete each task is also shown.

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

[3 marks]

**(b)** Find the earliest start time and latest finish time for each activity.

[4 marks]

**(c)** Find the critical path.

[1 mark]

**(d)** Given that all activities start as late as possible, draw a cascade (Gantt) diagram for the work involved. Use the grid

[3 marks]

**(e)** Tina needs a qualified electrician to connect the fountain to the electric cable. He arrives three hours later than the earliest time that he might have been able to start. Find the new minimum time to complete the project and state the corresponding critical path.

[2 marks]

## 3) (a)

Kate flew to Boston.
She paid £65 for UK air passenger duty. This duty was 13.4% of the cost of her return ticket to Boston.

How much did Kate pay for her return ticket to Boston?

[3 marks]

**(b)** In Boston, Kate paid $192 for each night she stayed in a hotel.
The exchange rate was $1.61 to £1.

Calculate the cost, in pounds, of each night in the hotel.

[3 marks]

**(c)** Kate had dinner with her friend Harry. The total cost of the dinner was $84. They agreed to divide the cost of their dinner in the ratio of 4:3, with Kate paying more.

How much, in dollars, did Kate pay?

[3 marks]

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**4)** Kendra and Liam are in a high jump competition.
They each have one chance to jump a height of 170 cm

The probability that Kendra can jump this height is 0.75
The probability that Liam can jump the height is 0.8

**(a)** Complete the tree diagram.
Assume that the jumps of Kendra and Liam are independent.
**[2 marks]**

**(b)** Work out the probability that **both** Kendra and Liam jump the height.
**[2 marks]**

**(c)** Work out the probability that at least one of them jumps the height.
**[3 marks]**

**5)** The table below shows the acreage, yield, production and price per bushel of durum wheat in the USA, from the year 2000 to the year 2009.

| Year | Acreage (000s) | | Yield per harvested acre (bushels) | Production bushels (000s) | Price per bushel (dollars) |
|------|--------|---------|---------|---------|---------|
| | Planted | Harvested | | | |
| 2000 | 3937 | 3572 | 30.7 | 109 805 | 2.66 |
| 2001 | 2910 | 2789 | 30.0 | 83 556 | 3.08 |
| 2002 | 2913 | 2709 | 29.5 | 79 960 | 4.05 |
| 2003 | 2915 | 2869 | 33.7 | 96 637 | 3.97 |
| 2004 | 2561 | 2363 | 38.0 | 89 893 | 3.85 |
| 2005 | 2760 | 2716 | 37.2 | 101 105 | 3.46 |
| 2006 | 1870 | 1815 | 29.5 | 53 475 | 4.43 |
| 2007 | 2156 | 2119 | 34.1 | 72 224 | 9.92 |
| 2008 | 2721 | 2574 | 32.6 | 83 827 | 9.26 |
| 2009 | 2554 | 2428 | 44.9 | 109 042 | 5.47 |

**(a)** Calculate the mean and the standard deviation of the prices per bushel of durum wheat for the years 2000 to 2009 inclusive. Give your answers correct to three significant figures. *(3 marks)*

**(b)** The mean and standard deviation of the prices per bushel of durum wheat from 1980 to 1989 are $3.72 and $0.678 respectively. Compare the mean and the standard deviation of the prices per bushel with those calculated in part **(a)**. *(2 marks)*

**(c)** Calculate the number of planted acres that were not harvested in the year 2000. *(1 mark)*

**6)** At a university, 70% of students are undergraduates and 30% of students are postgraduates.

Amy and Robert want to do a survey.

Amy decides to use simple random sampling to collect a sample of 100 students.

She uses the university database as a sample frame and she numbers each student on the database.
She then generates exactly 100 random numbers and uses these random numbers to select her sample.

(a) Give **two** reasons why Amy's method may **not** produce a sample of 100 students.

Robert decides to use quota sampling to collect a sample of 100 students.
He plans to stand outside the main building until he has interviewed 70 undergraduates and 30 postgraduates.

(b) Give **two** advantages of using quota sampling.

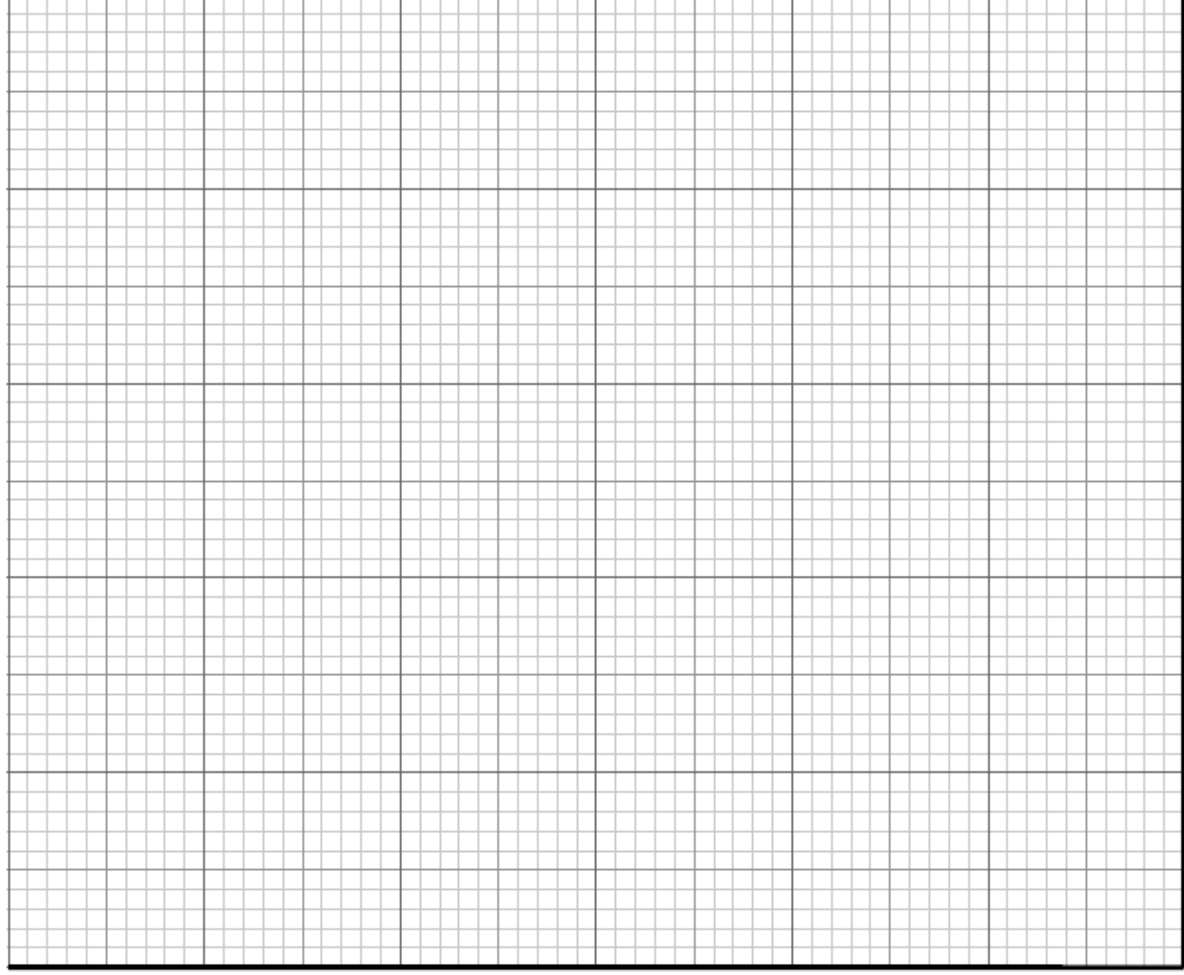(c) Explain why this quota sample is **not** a random sample.

**7)** A department store manager surveys 120 people who visit the store.

- 9 buy clothing, food and home-ware
- 5 buy food and home-ware but **not** clothing
- 13 buy clothing and home-ware but **not** food
- 89 buy clothing, 55 buy food and 31 buy home-ware
- 40 buy clothing and food

**(a)** Use the data to help you complete the Venn diagram.
**[4 marks]**

**(b)** How many people did **not** buy clothing or food or home-ware?
**[1 mark]**

**(c)** One of these 120 people is chosen at random.

Find the probability that the person bought

**(c) (i)** food **and** home-ware,
**[2 marks]**

**(c) (ii)** clothing **or** home-ware,
**[2 marks]**

**(c) (iii)** home-ware **given** that they bought clothing.
**[2 marks]**

# Homework 13B – Answer sheet

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2)

| Activity | Immediate predecessor | Duration (hours) |
|---|---|---|
| A: Remove grass and dig out area for pond | - | 6 |
| B: Dig trench and lay electric cable | - | 5 |
| C: Fit pond base and fountain | A | 3 |
| D: Connect fountain to electric cable | B, C | 1 |
| E: Put rocks around pond | C | 3 |
| F: Bring topsoil to site | A | 1 |
| G: Fill topsoil around rocks and plant shrubs | D, E, F | 1 |
| H: Lay flagstones around pond | D, E, F | 3 |
| I: Fill pond with water | C | 1 |
| J: Fill in trench | D | 1 |
| K: Clean site | G, H, I, J | 1 |

4)

Kendra

Liam

Jumps the height

0.75 ........

Does not jump the height

........

Jumps the height

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Does not jump the height

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Jumps the height

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Does not jump the height

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Jumps the height

........

Does not jump the height

........

7)

ξ

clothing

food

home-ware