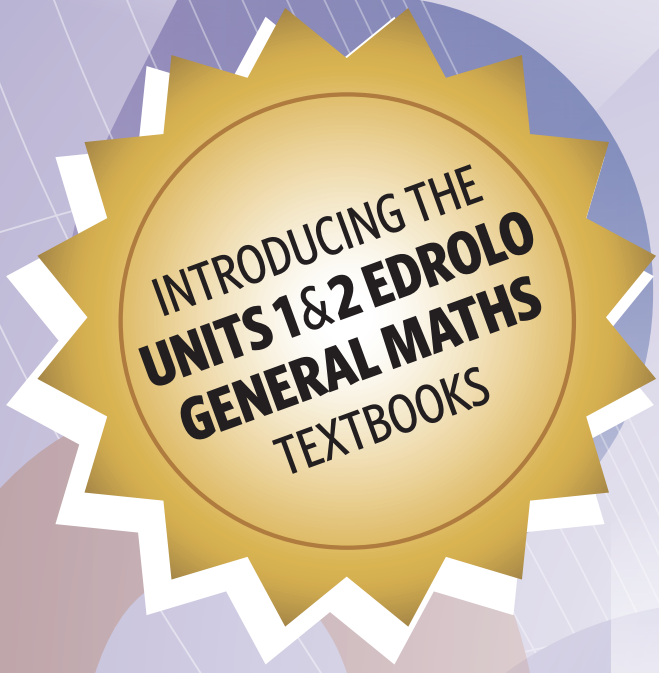


Edrolo

VCE GENERAL MATHEMATICS

Units 1&2

- **VCAA-style questions** based on a thorough analysis of past exams
- **Exemplar answers** with a **video solution** for every multiple-lesson question
- **Step-by-step calculator** instructions for both TI-nspire and Casio Classpad
- **Concise theory** covering the core knowledge required within the scope of the VCAA Study Design
- **Edrolo Theory Master videos aligned** directly to textbook chapters

2ND EDITION

AT THE **BEGINNING** OF **EACH LESSON YOU WILL FIND**:

Key skills show a breakdown of the lesson.

LESSON 12G

Boxplots and outliers

The key skills you will learn in this lesson are:

1. Five-number summaries
2. Outliers
3. Boxplots

VCAA key knowledge point:

"the five-number summary and the boxplot as its graphical representation and display, including the use of the lower fence ($Q_1 - 1.5 \times IQR$) and upper fence ($Q_3 + 1.5 \times IQR$) to identify possible outliers"

Mathematics Area of Study key knowledge points derived from VCE Mathematics Study Design 2016–2020 p.22; © The Victorian Curriculum and Assessment Authority (VCAA). Used with permission.

Key Knowledge dot-points from the study design provide explicit links to the syllabus.

1. Five-number summaries

The five-number summary is five values that give key information about a set of data and its distribution. The summary is as follows:

- Minimum value
- First quartile (Q_1)
- Median (Q_2)
- Third quartile (Q_3)
- Maximum value.

Example

The five-number summary for the data set 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 is:

- Minimum: 1
- First quartile: 3
- Median: 5.5
- Third quartile: 8
- Maximum: 10

WORKED EXAMPLE 24 *(1 mark)*

Create a five-number summary for the following data set:

18, 16, 21, 4, 24, 17, 34, 19, 15, 10, 14.

SOLUTION

Step 1 Rewrite the data in ascending order:

4, 10, 14, 15, 16, 17, 18, 19, 21, 24, 34.

Step 3 Find the position of the median (Q_2) using the formula $\left(\frac{n+1}{2}\right)$, where n is the number of elements in the data set.

$\frac{11+1}{2} = 6$

4, 10, 14, 15, 16, **17**, 18, 19, 21, 24, 34

The median is the sixth element of the data set, which is 17.

Step 4 To find Q_1 and Q_3, we split the data into two halves at the median. Further, if the data set has an **odd** number of elements, the median is removed before splitting the data.

We have an odd number of elements, so the median, 17, is removed.

split

4, 10, 14, 15, 16 | 18, 19, 21, 24, 34

Step 5 Think of Q_1 and Q_3 as the medians of the lower half and upper half respectively.

Find the Q_1 and Q_3 by finding the medians of each half:

4, 10, **14**, 15, 16 and 18, 19, **21**, 24, 34

Step 6 Write the values as the five-number summary:

Minimum: 4

First quartile: 14

Median: 17

Third quartile: 21

Maximum: 34

SOLUTION: TI-NSPIRE

Step 1 Press ctrl + doc and select 'Add Lists & Spreadsheets'.

Step 2 Starting from row 1, enter data into the first column.

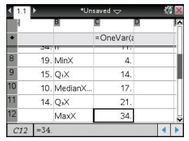
Step 3 Press menu.

Step 4 Select Statistics → Stat Calculations → One Variable Statistics.

Step 5 Press OK to confirm one variable statistics for one data set only.

Step 6 Specify the data set by entering 'a[]' in 'X1 List'.

Step 7 Press OK to exit this window and generate the statistics.



MinX = Minimum

$Q_1X = Q_1$

MedianX = Median

$Q_3X = Q_3$

MaxX = Maximum

SOLUTION: CASIO CLASSPAD

Step 1 From the main menu, tap Statistics.

Step 2 Starting from row 1, enter the data into list1.

Step 3 Tap Calc → One Variable.

Step 4 Specify the data set by keeping 'XList' as list1.

Step 5 Scroll down until you find the five-number summary statistics.

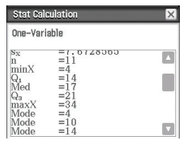
minX = Minimum

$Q_1 = Q_1$

Med = Median

$Q_3 = Q_3$

maxX = Maximum

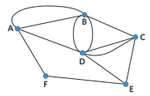


Step-by-step calculator instructions for both Casio Classpad and the TI-Nspire.

QUESTIONS & SOLUTIONS

Questions from multiple lessons

Q12. Difficulty: 1 mark



For the graph above, which one of the following is **not** a path?

A. *DEFAB*
B. *DCBAF*
C. *DBAFE*
D. *DABCE*
E. *DACEF*

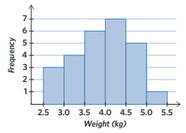
VCAA 2018 Exam 1 Module 2: Networks and decision mathematics Q4 – Adapted

Q13. Difficulty: Year 10 1 mark

The histogram below shows the distribution of *weight*, in kilograms, of 28 cats in an animal shelter.

The most common interval of *weight* for the cats is

A. greater than or equal to 2.5 kg and less than 3.0 kg.
B. greater than or equal to 3.0 kg and less than 3.5 kg.
C. greater than or equal to 3.5 kg and less than 4.0 kg.
D. greater than or equal to 4.0 kg and less than 4.5 kg.
E. greater than or equal to 5.0 kg and less than 5.5 kg.



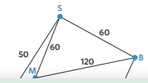
VCAA 2018NHN Exam 1 Data analysis Q3 – Adapted

Q14. Difficulty: 3 marks

Train routes connect different cities in Spain.

Some of the cities are Madrid (M), Barcelona (B), Toledo (T), San Sebastian (S), Valencia (V), and Granada (G).

The graph below gives the cost, in dollars, of train travel along these routes.



Sophie is currently staying in Barcelona (B) and she wants to travel to Granada (G).

a) Sophie considers travelling by train along the route Barcelona (B) - Madrid (M) - Granada (G).
How much will she have to pay? *(1 mark)*

Q3. Skill

How many:

a) minutes are there in 24 hours?
b) grams are there in 4.5k g?

Check your understanding

Q4. Skill

Each day your friend gives you the same amount of stickers. After seven days you have 21 stickers.

How many stickers did you get each day?

2. Finding the amount for one unit

Q5. Skill

Find the following:

a) Ricardo buys 14 snake lollies for $2.10. How much does one snake lolly cost?
b) A dozen eggs weigh 600 g. How much does one egg weigh?
NOTE: A dozen is 12.
c) Joe reads 16 pages of his novel for English homework. It takes him 25 minutes in total. How long does it take him to read one page? Give your answer in minutes rounded to 1 decimal place.

Check your understanding

Q6. Skill

Ingrid says she can read a page of a novel in 1.2 minutes.

How long does it take her to read 16 pages?

3. Finding the amount for many units

Q7. Skill

Find the following:

a) You buy five tickets to a concert. The tickets are $15 each.
How much does it cost in total?
b) An Olympic-sized swimming pool holds 2500 kilolitres of water and water costs $2.70 per kilolitre.
What is the cost of filling up the pool?

Check your understanding

Q8. Application

You want to buy new wheels and laces for your pair of roller skates. There are four wheels and one lace on each skate. How much will it cost you in total?

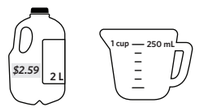
The wheels cost $8 each and the laces cost $2 each.

Joining it all together

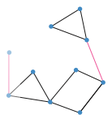
Q9. Application 3 marks

For this two litre bottle of milk:

a) How many mL of milk are there?
b) How much does one mL cost, in cents, rounded to two decimal places?
c) How much does one cup cost, in cents, rounded to two decimal places?



17 2



18 The vertices represent shipping ports. The edges represent the paths ships can take.

The ships cannot traverse all the paths without going over the same path twice.

19 D

20 C

21 B

Questions from multiple lessons

22 ***Network and decision mathematics***

Decoding the question

Keywords: sum, degrees, vertices

Relevant Lesson: 5A

We must find the degree of each vertex in each graph, calculate the sum for each graph and then compare these values.

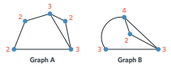
Information we are given

- The given graphs

Using the theory

The degree of a vertex is equal to the number of edges connected to it.

The degrees of each vertex can be found by counting the number of times an edge attaches to it. These are shown below.



Calculate the sum of the degrees of the vertices for each graph.

Graph A: 2 + 2 + 2 + 3 + 3 = 12

Graph B: 3 + 3 + 2 + 4 = 12

Calculate the difference.

12 − 12 = 0

∴ The sum of the degrees of the vertices of Graph B is equal to the sum of the degrees of the vertices of graph A.

Answer

C

1 mark – Correct answer

23 ***Data analysis***

Decoding the question

Keywords: boxplot, five-number summary

We need to read features of the given boxplot to deduce the five-number summary of the data.

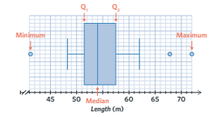
Relevant lesson: 12G

Information we are given

- The given boxplot

Using the theory

The five-number summary's location on the boxplot is shown below.



Hence, the five-number summary, reading from left to right, is: 41.2, 51.4, 54, 57.4, 72.

Careful! Outliers should be included in the five-number summary.

Answer

A

1 mark – Correct answer

24a ***Networks and decision mathematics***

Decoding the question

Keywords: explain, adjacency matrix

Relevant lesson: 5A

We need to use our knowledge of adjacency matrices, along with the context given in the question, to determine the meaning of a zero in the adjacency matrix.

Information we are given

$$\begin{array}{c} \\ S \\ M \\ J \\ B \\ A \end{array} \begin{array}{c} \begin{array}{ccccc} S & M & J & B & A \end{array} \\ \left[\begin{array}{ccccc} 0 & 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & x & 0 \\ 1 & 0 & 0 & y & 1 \\ 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \end{array}\right] \end{array}$$

- The adjacency matrix shows the different friendships between the five peers.

SCAFFOLDED TEXTBOOK QUESTIONS:

- **Refresher questions** test understanding of basic knowledge to be expanded upon during the lesson.
- **Skills questions** are short-answer and multiple-choice questions designed to consolidate understanding and execution of each particular skill.
- **Check your understanding** are higher level questions designed to test the application of each skill in various contexts.
- **Joining it all together** questions draw on multiple skills to provide students with experience completing more complex exam-style questions.
- **VCAA questions** from past exams test practical application of the theory in the lesson.
- **Questions from multiple lessons available online in your Edrolo account:** two multiple choice questions and one short answer question adapted from previous VCAA exams to practice applying knowledge from multiple lessons.

TEXTBOOK SOLUTIONS:

In your Edrolo account you will find:

- **Video solutions for every textbook question** including step-by-step calculator instructions.
- **Worked solutions for multiple-lesson questions** guide students through 'Decoding the question', extracting key information and 'Using the theory'.

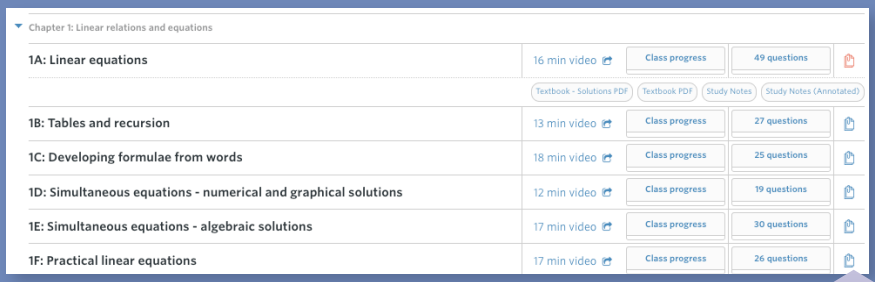
FOR **MORE INFO** SEE THE **TEXTBOOK TRAINING VIDEO** IN **YOUR EDROLO ACCOUNT**

NAVIGATING YOUR EDROLO TEXTBOOK ONLINE

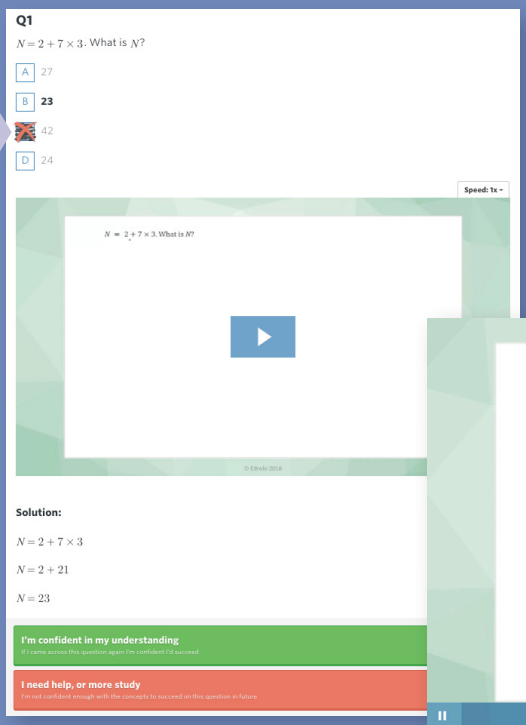
PLANNING AHEAD

To assist with planning, there is an editable and downloadable **unit plan** available for your course.

ACCESSING THE TEXTBOOK PDFS, DIGITAL TEXTBOOK QUESTIONS AND SOLUTIONS

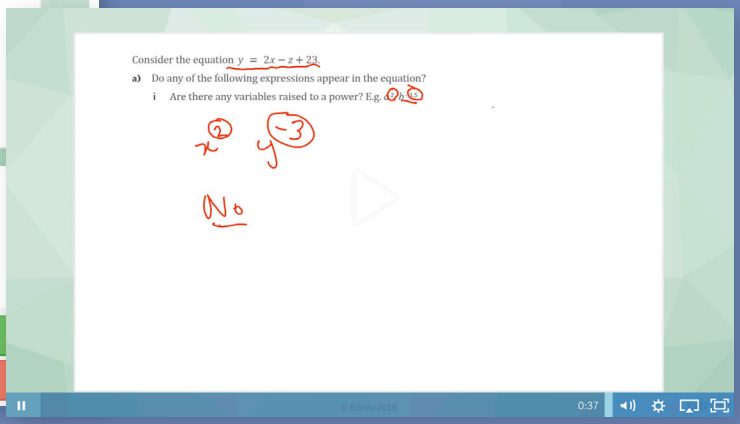


All questions found in the text are also available as interactive digital questions. To access these, click on the **X questions** button next to the corresponding theory lesson.



For multiple-choice questions, students receive immediate feedback.

Click the **Additional Resources icon** beside each **chapter** to find your **Textbook PDFs**.



CHECKING STUDENT RESPONSES

Multiple-choice results: see each student's answer and reflection on their understanding as well as a summary of your whole class.

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