# MATHEMATICS QUESTIONS BY TOPICS

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# DATA ANALYSIS

**20 Extended Answer Questions with curriculum references and detailed answers**



- Click here for the question index
- Click here for the answer index
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**Student Book**


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# Mathematics Questions by Topics
# Data Analysis - Extended Answer



## Index – Click on the question.



Creator: William Paul Healy
Title: Mathematics Questions by Topics - Data Analysis - 20 Extended Answer Questions
ISBN: 9781922881076 (eBook)
Series: Mathematics Questions by Topics
Target Audience: School age. Secondary.
Subjects: Mathematics
Other Creators: Barbara Clarice Healy, Vivienne Bond



**About the Authors**: William Paul Healy BSc BA Dip Ed and Barbara Clarice Healy BSc BEd are experienced mathematics and science teachers each with more than 30 years classroom experience. As principal writers for Kilbaha Education they bring a wealth of pedagogical knowledge and expertise to their many publications. The quality of their work has been demonstrated over the years with content written for the VCE examinations in Victoria Australia.

Index





Data Analysis – Extended Answer Question 1 Source: K21FM2Q1

**Question 1 (7 marks)**

The Warburn Trail Festival is an annual event involving a weekend of outdoor running races. One of the races is the River Run.
The table below relates to the 25 competitors in the River Run.

| Competitor | Section | Status | Time (minutes) |
|---|---|---|---|
| 1 | junior | amateur | 41 |
| 2 | senior | amateur | 45 |
| 3 | junior | amateur | 62 |
| 4 | senior | professional | 25 |
| 5 | senior | amateur | 34 |
| 6 | senior | professional | 21 |
| 7 | junior | amateur | 41 |
| 8 | senior | professional | 21 |
| 9 | adult | amateur | 40 |
| 10 | senior | professional | 25 |
| 11 | senior | amateur | 47 |
| 12 | junior | amateur | 39 |
| 13 | junior | amateur | 38 |
| 14 | senior | professional | 27 |
| 15 | adult | amateur | 19 |
| 16 | adult | amateur | 22 |
| 17 | junior | amateur | 37 |
| 18 | adult | professional | 17 |
| 19 | adult | amateur | 35 |
| 20 | junior | amateur | 35 |
| 21 | adult | amateur | 32 |
| 22 | adult | amateur | 23 |
| 23 | senior | amateur | 37 |
| 24 | adult | professional | 19 |
| 25 | senior | amateur | 38 |

Data Analysis – Extended Answer Question 1 Source: K21FM2Q1

**Question 1 (continued)**

The four variables in this data set are:
Competitor – entrant identification number
Section – junior (12-18 years), adult (19-55 years), senior (older than 55 years)
Status – amateur, professional
Time – number of minutes taken to complete the race

**a.** Which one of the four variables is ordinal?

1 mark

_____

**b.** How many competitors in the adult section were also professional?

1 mark

_____

**c.** Use the data table to complete the following two-way frequency table below.

2 marks

| | Status | |
|---|---|---|
| Section | Amateur | Professional |
| junior | | |
| adult | 6 | |
| senior | | |
| Total | 18 | |

**d.** What percentage of amateurs are adults?
Give your answer correct to one decimal place.

1 mark

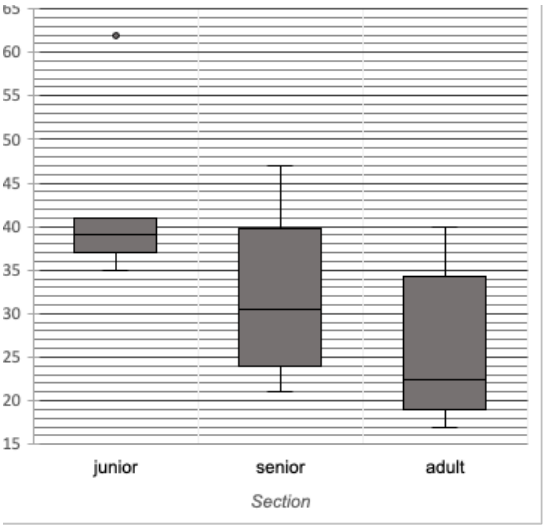
_____

Data Analysis – Extended Answer Question 1 Source: K21FM2Q1

**Question 1 (continued)**

The boxplots below show the distribution of time for each section (junior, senior, adult).




**e.** Explain why the time, in minutes, taken to complete the race is associated with the section of the runner. Refer to the values of an appropriate statistic in your answer.

1 mark

Data Analysis – Extended Answer Question 1 Source: K21FM2Q1

**Question 1 (continued)**

**f.** The data value of 62 for the junior section is an outlier as it is above the upper fence. Determine the value of the upper fence for the junior section.

1 mark

_____

_____

_____

**END OF QUESTION 1**

| Curriculum | Subject | Topic | Description |
|---|---|---|---|
| Australia | General Mathematics Unit 2 | Univariate data analysis | classify a categorical variable as ordinal, such as income level (high, medium, low), or nominal, such as place of birth (Australia, overseas), and use tables and bar charts to organise and display the data (ACMGM027)<br>construct and use parallel box plots (including the use of the 'Q1 – 1.5 x IQR' and 'Q3 + 1.5 x IQR' criteria for identifying possible outliers) to groups in terms of location (median), spread (IQR and range) and outliers and to interpret and communicate the differences observed in the context of the data (ACMGM031) |
| Victoria | General Mathematics Unit 1 | Investigating and comparing data distributions | types of data, including categorical (nominal or ordinal) or numerical (discrete or continuous, interval, ratio). The five-number summary and the boxplot as its graphical representation and display, including the use of the lower fence and upper fence to identify possible outliers |
| New South Wales | Mathematics Standard Stage 6 | Classifying and representing data | investigate and describe the effect of outliers on summary statistics.<br>– use different approaches for identifying outliers, including consideration of the distance from the mean or median, or the use of $Q1-1.5\times IQR$ and $Q3+1.5\times IQR$ |

Data Analysis Extended Answer Question 20 Source: K14FM2Q2

**Question 20 continued)**

**e.** These dentists consider that people with at least 2 cavities have not flossed sufficiently. Use this information to complete the following percentage frequency table. Give answers to one decimal place.

| | Gender | |
|---|---|---|
| Flossing | Female | Male |
| Sufficient | | |
| Insufficient | | |

1 mark

**END OF QUESTION 20**

**End of**
**MATHEMATICS QUESTIONS BY TOPICS**
**DATA ANALYSIS**
**20 Extended Answer Questions**

| Curriculum | Subject | Topic | Description |
|---|---|---|---|
| Australia | General Mathematics Unit 3 | Bivariate data analysis | Calculate and interpret the correlation coefficient ($r$) to quantify the strength of a linear association. (ACMGM054) |
| Victoria | General Mathematics Unit 3, 4 | Data Analysis | Pearson correlation coefficient, $r$, its calculation and interpretation |
| New South Wales | Mathematics Standard Stage 6 | Bivariate data analysis | Calculate and interpret Pearson's correlation coefficient ($r$) using technology to quantify the strength of a linear association of a sample |

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# DATA ANALYSIS

## Answers to 20 Extended Answer Questions

- Click here for the answer index
- Check your answer
- Scan or click the QR code for more questions


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# Mathematics Questions by Topics
# Data Analysis - Extended Answer



## Index – Click on the answer. ACR = Australian curriculum Reference

Index



**Mathematics Questions by Topics**
Data Analysis – Extended Answer

Source: K21FM2S1

**Question 1 (7 marks)**

**a.**
***Section*.**

*Section* is ordinal.
Categorical data that has a natural order. Junior, adult and senior can be ordered by age group.

(1 mark)

**b.**

**Two**

Competitors 18 and 24 are professional adults.

(1 mark)

**c.**

| | **Status** | |
|---|---|---|
| **Section** | **Amateur** | **Professional** |
| junior | 7 | 0 |
| adult | **6** | 2 |
| senior | 5 | 5 |
| **Total** | **18** | 7 |

(2 marks)

**d.**

$$\frac{6}{18} \times 100 \approx \mathbf{33.3}\ \%$$

(1 mark)

**e.**

The median time of 39 minutes for juniors is greater than the median for seniors (30.5) which is greater than for adults (22.5).

(1 mark)

**f.**

*IQR* = 41 – 37 = 4

Upper fence = $Q_3 + 1.5 \times IQR$
$= 41 + 1.5 \times 4$
$= 47$

(1 mark)

**END OF ANSWERS TO QUESTION 1**

Data Analysis Extended Answer Source: K14FM2S2

**Question 20 (7 marks)**

**a.**
Use calculator to get *Number of Cavities* = 5.7 + – 0.5 × *Number of flosses*.

(1 mark)

**b.**
The value of Pearson's correlation coefficient, *r*, is - 0.7, which means there is a moderate negative relationship between number of flosses and number of cavities.

(1 mark)

**c.**
The coefficient of determination, $r^2$, is 0.49.
The data indicates that on average 49% of the variation in the number of cavities can be explained by the variation in the number of flosses.

(3 marks)

**d.**
A gradient of -0.5 indicates that when the number of flosses increases by 1 then the number of cavities decreases by 0.5, or better, when the number of flosses increases by 2 per week, then the number of annual cavities decreases by 1.

(1 mark)

**e.**

| | Gender | |
|---|---|---|
| Flossing | Female | Male |
| Sufficient | $\frac{8}{15}\times 100 = 53.3\%$ | $\frac{3}{15}\times 100 = 20.0\%$ |
| Insufficient | $\frac{7}{15}\times 100 = 46.7\%$ | $\frac{12}{15}\times 100 = 80.0\%$ |

(1 mark)

**END OF ANSWERS TO QUESTION 20**

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# DATA ANALYSIS

## 20 Extended Answer Questions

## STUDENT BOOK

- Click here for the question index

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Index





Data Analysis – Extended Answer Question 3 Source: K21FM2Q4

**Question 3 (4 marks)**

Runners visit Warburn throughout each year to train for the Trail Festival.
The table below shows the number of runners visiting to train each season over two years.

| | Summer | Autumn | Winter | Spring |
|---|---|---|---|---|
| 2018 | 436 | 540 | 340 | 604 |
| 2019 | 386 | 500 | 298 | 576 |

**a.** The seasonal index for Spring is shown in the table below.
Find the seasonal indices for the other three seasons and write them in the table below.
Round your answers to 2 decimal places.

3 marks

| Summer | Autumn | Winter | Spring |
|---|---|---|---|
| | | | 1.28 |

**b.** The total number of runners visiting to train each season in 2020 is shown in the table below.

| | Summer | Autumn | Winter | Spring |
|---|---|---|---|---|
| 2020 | 280 | 306 | 195 | 321 |

Use the appropriate seasonal index from part **a.** to deseasonalise the number of runners visiting in Spring 2020.

Round your answer to the nearest whole number.

1 mark

_____

**END OF QUESTION 3**

 

Index





Data Analysis Extended Answer Question 20 Source: K14FM2Q2

**Question 20 continued)**

**e.** These dentists consider that people with at least 2 cavities have not flossed sufficiently. Use this information to complete the following percentage frequency table. Give answers to one decimal place.

| | Gender | |
|---|---|---|
| Flossing | Female | Male |
| Sufficient | | |
| Insufficient | | |

1 mark

**END OF QUESTION 20**

**End of**
**MATHEMATICS QUESTIONS BY TOPICS**
**DATA ANALYSIS**
**20 Extended Answer Questions**

 