

Mathematics Years 7–10 sample assessment for learning activity

Stage 4

(linked to the *Data Interpretation and Evaluation: How Many Songs Do You Have on Your Portable Music Player?* Sample unit)

Activity name: Data Interpretation and Evaluation:
'How Many Songs Do You Have on Your Portable Music Player?'

Context

This assessment activity is embedded in the Stage 4 sample unit *Data Interpretation and Evaluation: How Many Songs Do You Have on Your Portable Music Player?*

Students have been engaged in learning relating to the collection of data, the interpretation of data displays, and the analysis and evaluation of data using mean, median, mode and range. They have investigated the effect of outliers on measures of location (centre) and spread.

Description of activity

Each team submits a report or makes an oral presentation titled 'Analysis of how many songs the students in our school have on their portable music player'.

The class is divided into teams of 3–5 students. One Year cohort of the school is assigned to each team. One subgroup of each Year cohort is assigned to each student in the team, eg one class is assigned to each team member.

Each student asks every person in their assigned subgroup, 'How many songs do you have on your portable music player?' and records the results. Students should be reminded that a response of zero is a valid data value and needs to be recorded.

The components of the report or presentation should be attributed clearly to either an individual (I) or the team (T), to allow assessment individually and as a team for each of the following:

- data displays for each subgroup, including a frequency distribution table, frequency histogram, stem-and-leaf plot, dot plot (I: each student creates displays for his or her assigned subgroup)
- a spreadsheet of raw data and summary statistics for each subgroup, Year cohort and the whole school calculated using the statistical functions of the spreadsheet application (T)
- data displays constructed for their assigned Year cohort, including a frequency distribution table, frequency histogram and dot plot (T)
- identification and comparison of similarities and differences in the summary statistics, clusters, gaps and outliers of each assigned subgroup with its Year cohort, including consideration and discussion of the effect of outliers (where they exist) on the summary statistics and determination of the most appropriate measure of location for the context (I: each student compares his or her assigned subgroup with the Year cohort)
- a discussion of why or why not each subgroup represents a random sample of its Year cohort with appropriate references to statistical measures (I: each student provides an explanation for his or her assigned subgroup)
- identification and comparison of similarities and differences in the summary statistics, clusters, gaps and outliers of the assigned Year cohort with the whole school population, including consideration and discussion of the effect of outliers (where they exist) on the summary statistics and determination of the most appropriate measure of location for the context (T)
- a discussion of why or why not the assigned Year cohort represents a random sample of the whole school population with appropriate references to statistical measures (T)
- identification and justification of which Year cohort in the school is believed to be the most representative of the whole school population (T).

Use of digital technologies

Digital technologies appropriate for use in the preparation and delivery of the report or presentation include:

- an online file-sharing facility (such as the school portal, Google Docs, SkyDrive, etc) to assist students in working collaboratively in one file
- a spreadsheet application (such as Excel, Numbers, etc)
- applications that assist students in creating data displays (such as Excel, Calc, Math, Geogebra, Microsoft Mathematics, etc)
- a presentation application (such as PowerPoint, Impress, Notebook, Keynote, Prezi, etc) for an oral presentation
- a word processing/publishing application (such as Word, Writer, Publisher, Pages, etc) for a written report.

Areas for assessment

- Working Mathematically: Communicating, Problem Solving, Reasoning
- Stage 4 Statistics and Probability: Single Variable Data Analysis

Outcomes

- MA4-1WM** communicates and connects mathematical ideas using appropriate terminology, diagrams and symbols
- MA4-2WM** applies appropriate mathematical techniques to solve problems
- MA4-3WM** recognises and explains mathematical relationships using reasoning
- MA4-19SP** collects, represents and interprets single sets of data, using appropriate statistical displays
- MA4-20SP** analyses single sets of data using measures of location, and range

Criteria for assessing learning

Students will be assessed on their ability to:

- collect data and display the data in a variety of statistical displays, accurately and appropriately, including with the use of appropriate labelling
- use the statistical functions of a spreadsheet to analyse data, including the following functions: count, minimum value, maximum value, mean, median, mode and range
- determine outliers, clusters and gaps in sets of data
- identify similarities and differences between sets of data based on their summary statistics, clusters, gaps and outliers
- use statistical analysis to compare subsets of population data to the overall population and discuss whether the particular subsets represent random samples of the population.

Feedback

Teacher feedback will be provided orally in relation to the criteria, including at these key intervals in the development of the report or presentation:

- initial production of data displays
- use of spreadsheets to calculate summary statistics and display data
- discussion and comparison of subsets of data with each other, and with the whole population, using summary statistics, clusters, gaps and outliers.

At the completion of the activity, teacher feedback in relation to the criteria will be provided in written form.

Peer- and self-assessment in relation to the way in which each member of the group participated in the various processes required can be provided in written form using a feedback form.

Students consider the feedback from their teacher, peers and themselves to determine the steps that they will take to improve:

- their knowledge, skills and understanding in the aspects of content identified as relative weaknesses
- the effectiveness of group situations.

Sample feedback forms are provided on the following pages.

Sample teacher feedback form*

Feedback to students in relation to the assessment criteria			
Feedback on components of activity you completed: <input type="checkbox"/> on your own <input type="checkbox"/> as a team			
Data displays	The student:		
Construction of frequency distribution table without the use of spreadsheet	uses appropriate headings for columns and lists possible data values in ascending order	shows correct frequencies for all data values	N/A
Construction of frequency histograms without the use of spreadsheet	labels histogram appropriately (headings, axes and scales)	draws all columns from appropriate positions on horizontal axis	uses correct frequencies for all data values
Construction of dot plots without the use of spreadsheet	labels dot plots appropriately (headings, axis and scale)	shows all data values plotted in appropriate positions with equal spacing vertically	N/A
Construction of stem-and-leaf plots without the use of spreadsheet	labels stem-and-leaf plots appropriately (headings, axis and stems)	shows all data values plotted in appropriate positions with equal spacing horizontally	N/A
Use of spreadsheet	The student:		
Use of spreadsheet to record and analyse data	appropriately enters raw data into a spreadsheet	uses statistical functions to calculate mean, median, mode and range	N/A
Use of spreadsheet to generate a frequency distribution table (if student-generated)	produces frequency distribution table from raw data values in spreadsheet	uses appropriate headings for columns and lists possible data values in ascending order	produces frequency distribution table using 'frequency' array function in spreadsheet
Use of spreadsheet to generate a frequency histogram	creates histogram from frequency distribution table as a chart in spreadsheet	labels histogram appropriately (headings, axis and scale)	formats as histogram rather than as column graph

Comparison of subgroup with its Year cohort OR Year cohort with whole school population	The student:		
Identification and comparison of summary statistics	identifies the mean, median, mode and range for the two sets of data	identifies similarities and differences between the two sets of data	suggests reasons for similarities and differences between the two sets of data
Comparison of clusters, gaps and outliers	identifies clusters, gaps and outliers in the two sets of data	identifies similarities and differences between the two sets of data	suggests reasons for similarities and differences between the two sets of data
Discussion of whether the sample is representative of the target population	determines whether or not the sample set of data is representative of the target population	justifies decision with reference to at least one relevant statistical measure	justifies decision with reference to more than one relevant statistical measure
Discussion of the effect of outliers on summary statistics and selection of the most appropriate measure of location for the context	considers and discusses the effect of outliers, if any, on the summary statistics of a set of data	determines the most appropriate measure of location to describe a set of data	N/A
Identification of which sample is the most representative of the target population with justification	identifies the sample that is believed to be the most representative of the target population	justifies decision with reference to at least one relevant statistical measure	justifies decision with reference to more than one relevant statistical measure

* Teachers identify (circle statement, tick within cell) each of the feedback statements in the table that apply for components of the activity completed by the student individually or as a team member, using separate forms for individual and team feedback. If desired, teachers could assign one or more marks to each of the feedback statements identified.

Sample self-assessment form for learning of the content

I know what these are/look like:	Not at all	Sometimes	Often	Always
• mean, median, mode and range				
• clusters, gaps and outliers				
• frequency distribution tables, frequency histograms, dot plots, stem-and-leaf plots				
• sample, population and random sample				
I can:	Not at all	Sometimes	Often	Always
• construct and interpret frequency distribution tables				
• construct and interpret frequency histograms				
• construct and interpret dot plots				
• construct and interpret stem-and-leaf plots				
• calculate the mean				
• determine the mode				
• determine the median				
• calculate the range				
• determine clusters, gaps and outliers in a data set				
• enter data into a spreadsheet				
• use a spreadsheet to calculate summary statistics				
• use a spreadsheet to construct a frequency histogram				
• describe a set of data using summary statistics, clusters, gaps and outliers				
• compare two or more sets of data referring to summary statistics, clusters, gaps and outliers				
• determine the most appropriate measure of location (mean, median or mode) for the context				
I understand:	Not at all	Sometimes	Often	Always
• that different samples from a population will have different summary statistics				
• the importance of a random (unbiased) sample to obtain statistics that are representative of the population				
• the effect of outliers, if any, on the mean, median, mode and range				
• that some measures of location may be more appropriate depending on the context				

Sample peer- and self-assessment form for participation in the team

The team member/I:	Never	Sometimes	Often	Always
• participated constructively in the activity				
• listened carefully to the ideas of others				
• provided helpful feedback to keep the team 'on task' when needed				
• contributed equally to the team's work				
• completed assigned tasks on time				
• treated others in the team with respect				