

# Making the most of music

Teacher guidelines



# 9

## Mathematics

Queensland Comparable  
Assessment Tasks (QCATs)  
2010

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# The 2010 QCATs

## What are QCATs?

Queensland Comparable Assessment Tasks (QCATs) are designed to provide evidence of what students know, understand and can do in relation to a selection of [Essential Learnings](#) for English, mathematics and science in Years 4, 6 and 9, and to the [Standards](#).

QCATs are authentic, performance-based assessments that:

- engage students in solving meaningful problems
- emphasise critical thinking and reasoning
- provide teachers, students and parents/carers with information about student progress and a focus for future teaching and learning.

### *Consistency of teacher judgments*

QCATs support teachers in making consistent judgments about the quality of student work. Improved consistency of teacher judgments is achieved when teachers:

- engage in professional conversations about the quality of evidence in student responses
- reach consensus about the quality of student work
- adopt a consistent approach when using the [Guide to making judgments](#) (page 36).

Information gathered may be used by teachers to promote, assist and improve key learning area programs and help students achieve the highest standards they can.

### **Additional resources** [QCATs Information Statement](#)

[www.qsa.qld.edu.au](http://www.qsa.qld.edu.au) > Prep–Year 9 > QCATs (Years 4, 6 & 9)

[Essential Learnings](#) and [Standards](#)

[www.qsa.qld.edu.au](http://www.qsa.qld.edu.au) > Prep–Year 9 > Essential Learnings & Standards (Years 1–9)

## Important dates

Friday 25 June	QCATs packages have arrived in schools
Tuesday 13 July ↓ Friday 17 September	Schools: <ul style="list-style-type: none"><li>• administer QCATs at any time during the school weeks of this period</li><li>• grade QCATs</li><li>• select five student samples that are representative of grades awarded</li></ul>
Monday 4 October	Schools are notified if selected to submit student samples for QSA's random sampling process
Monday 1 November	Final day for schools to submit student data to QSA
Friday 10 December*	Schools must retain all <a href="#">Student booklets</a> until the end of the school year

\*This date may vary from school to school

# Getting ready

## Student preparation

Students should have the opportunity to do their best work. For this to occur, student preparation should include:

- opportunities to engage with the [Selected Essential Learnings](#) (page 25) well in advance of participating in QCATs. If students have not engaged with the [Selected Essential Learnings](#) recently, review and consolidation may be necessary. Preparation activities should not involve rehearsal of the actual or a similar assessment
- experience with the types of questions used within the QCAT.

The quality of information provided by the QCATs will depend on the level of interaction teachers have with their students before, during and after implementation.

**Additional resources** [Centrally-devised design brief](#)  
[www.qsa.qld.edu.au](http://www.qsa.qld.edu.au) > Prep–Year 9 > QCATs (Years 4, 6 & 9)

## Catering for diversity – special provisions

All students should have the opportunity to participate in school-based assessment. Schools are responsible for determining which students require special provisions.

The QCATs are designed to be part of a classroom assessment program, and principles of participation and equity apply. The QSA offers this general advice:

- Students who have been identified as having specific educational requirements may be assisted using those adjustments and supports usually available in the classroom. To make participation possible in all or part of the assessment task, such help may be in the form of inclusive learning technologies, reading support or the use of support personnel.
- Students for whom English is not their first language, and who are assessed as not achieving a reading level appropriate to complete the task, may be assisted by an interpreter or educational devices (e.g. pictures, electronic whiteboards, interactive devices) to allow participation in all or part of the task.
- In exceptional circumstances, where a student's learning difficulties have precluded them from engaging with the [Selected Essential Learnings](#), the principal (in consultation with specialist and support staff and parents/carers) may make a decision about the participation of that student in the task. Some students may be given an opportunity to complete some aspects of the assessment.

**Additional resources** [Inclusive strategies for implementing QCATs](#)  
[www.qsa.qld.edu.au](http://www.qsa.qld.edu.au) > Prep–Year 9 > QCATs (Years 4, 6 & 9)  
[Equity](#)  
[www.qsa.qld.edu.au](http://www.qsa.qld.edu.au) > P–12 approach > Equity

## Teacher preparation

### *Check contents of QCAT packages as soon as they arrive at your school*

- Check that you have the appropriate number of [Student booklets](#) (one per student) and [Teacher guidelines](#) (one per implementing teacher).
- Check for any defective [Student booklets](#).
- Contact the QSA if any additional copies are required.

### *Familiarise yourself with the assessment*

- Read all the documents provided.
- Review the [Selected Essential Learnings](#) (page 25).
- Complete a [Student booklet](#) yourself, and then refer to the [Model response](#) (page 27) so that you understand what students are required to do.
- Download and view [Sample responses](#) from the [QSA Assessment Bank](#) (see Additional resources below).

### *Plan implementation*

- Discuss the assessment with your colleagues, and plan any teaching or revision that may be required.
- Set the times and dates for the implementation:
  - teachers have flexibility to implement the QCATs at any time during the designated period
  - the QCATs may be completed in one, two or more sessions over one or more days
  - implementation times may differ for verified students, students with specific educational requirements or students who have English as a second language.
- Plan:
  - any support required to enable students to do their best work (e.g. teacher aides or other support personnel)
  - any materials or equipment needed to implement the assessment.
- Decide:
  - how you will implement this task for all classes at this year level
  - the processes you will use to achieve consistency of teacher judgment
  - how you will select student samples for the QSA's random sampling process
  - when, how and who will submit your school's data.

### **Additional resources** [Sample responses](#)

QSA Assessment Bank <<https://qcar.qsa.qld.edu.au/assessmentbank>>

[Using Queensland Comparable Assessment Tasks \(QCATs\) to support learning](#)  
[www.qsa.qld.edu.au](http://www.qsa.qld.edu.au) > Prep–Year 9 > QCATs (Years 4, 6 & 9)

# Implementation

## Working with the Student booklet

Use the [Annotated Student booklet](#) (page 8) to set the conditions that ensure all students have the opportunity to do their best work.

Students should be encouraged to interact with teachers to seek clarification when required, and with other students if appropriate to the task.

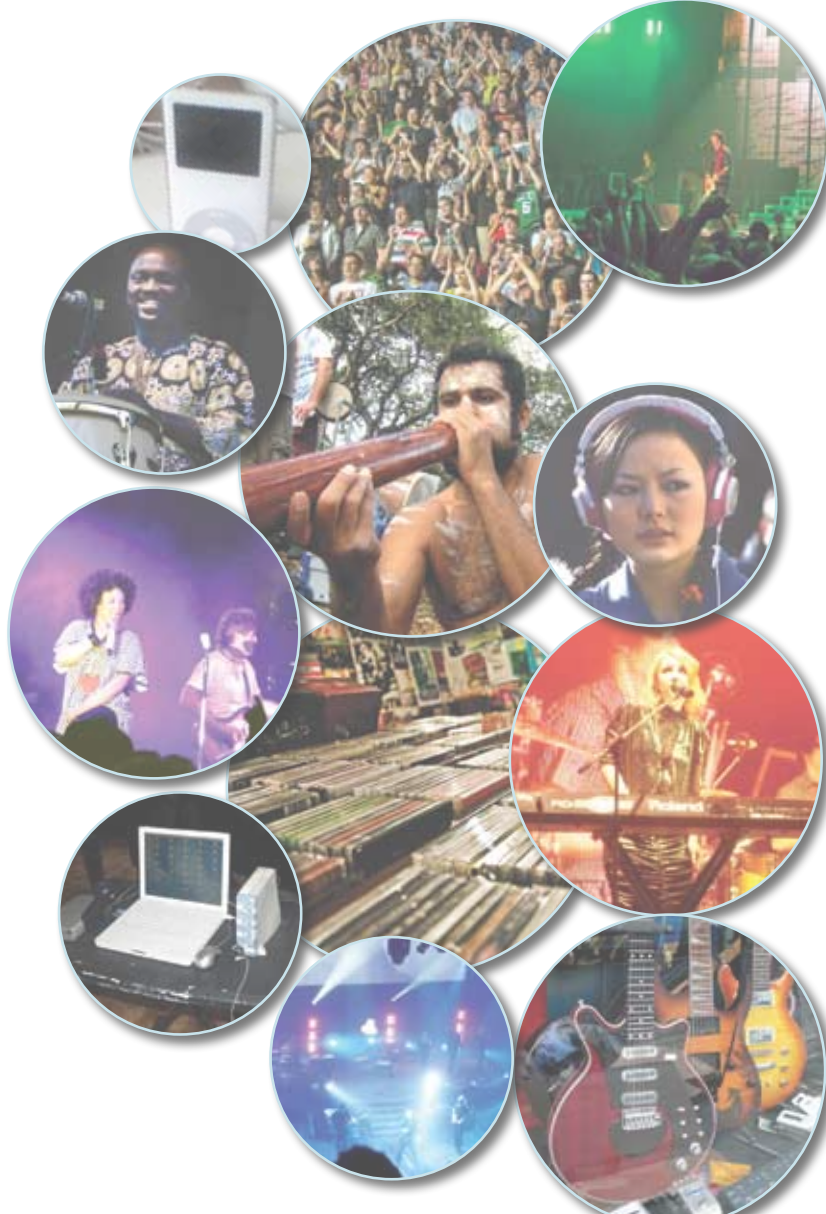
## *Suggested implementation timeline*

### Preparation

Setting the scene: Group discussion	15 minutes
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### The assessment task

Buying music	15 minutes
Buying recording equipment	20 minutes
Enjoying music — how loud is too loud?	15 minutes
Planning a charity concert	40 minutes



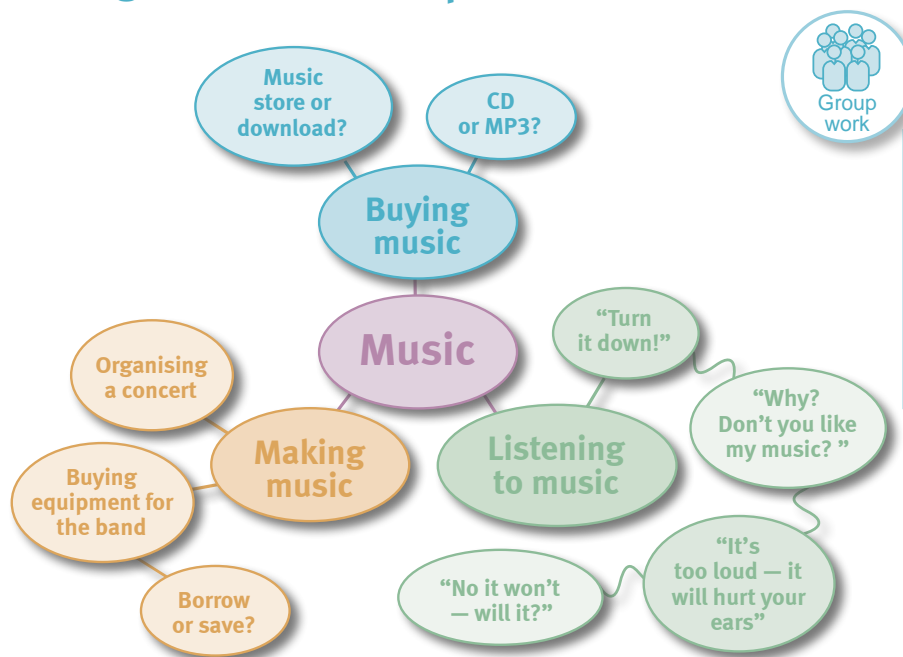
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iPod: jhderojas' photostream, "iPod Nano 2GB Refurbished", <<http://www.flickr.com/photos/jhderojas/462930668/>>. iPod Nano 2GB Refurbished, "Green Day Concert Crowd - Put Your Hands Up For Green Day", <<http://www.flickr.com/photos/simondk-ou/2734308895/>>. Green Day Concert: Aniludh Koul's photostream, "Green Day Concert Stage (Montreal)", <<http://www.flickr.com/photos/aniludh/3735171010/>>. African drummer: Sona Watson's photostream, "Celebrate Brooklyn, NY Brooklyn African Music Festival, Summer 2009, (34 723)", <<http://www.flickr.com/photos/sonawatson/3724481935/>>. Didgeridoo player: Bruce Turner's photostream, "Didgeridoo player", <<http://www.flickr.com/photos/bruce/355497080/>>. Girl with headphones: Sona Watson's photostream, "Girl with headphones", <<http://www.flickr.com/photos/sonawatson/3724481935/>>. Michael Spencer: Michael Spencer's photostream, "Michael Spencer's photostream", <<http://www.flickr.com/photos/papautz/195011773/>>. Concert: simononly's photostream, "Australasian Pink Floyd", <<http://www.flickr.com/photos/simononly/3444607556/>>. Guitars: psd's photostream, "Brian May's Signature Red Guitar", <<http://www.flickr.com/photos/psd/228272915/>>.



## Setting the scene: Group discussion



Use the images and mind map to promote discussion about how mathematics can be used to inform decisions when buying, listening to, or making music.

### In this assessment, you will use mathematical reasoning to:

- determine costs and times when buying and downloading music
- compare different payment options when buying recording equipment
- analyse data to determine safe loudness levels when listening to music
- reflect on your understandings to plan a charity concert.

### Show all working

It is important to show all your working so that your teacher can see what you know, understand and can do, even if you make a mistake in your calculations. Credit will be given if an incorrect answer is used correctly in a later question. Your teacher is looking for mathematical thinking and reasoning, not only correct answers.



Show all working

When you see a space like this, show all your working

Discuss the expectations of the task, listed here.

Work through the [Guide to making judgments](#) (page 36) with students to highlight the assessable elements for this QCAT. Explain, in student-friendly terms, the task-specific assessable elements. These identify what is being valued in the student responses.

Explain to students how showing working can improve their achievement and remind them that they will not be penalised for consequential errors — credit will be given if an incorrect answer is used correctly in a later question.



Suggested time: 15 minutes

Discuss the purpose of this section, i.e.

Calculate the costs of different methods of purchasing music, and the time needed to download a selection of music.

## Buying music

Use the CD cover below to answer Questions 1 and 2.



Photographic image: M.zeile Biscotti's photostream, "dancer...", <http://www.flickr.com/photos/biscotti/2863680794/>, a Creative Commons Attribution 2.0 Generic licensed photo, accessed 27 Dec, 2009.

Playing time of each song (minutes:seconds)

1. What is the cost of downloading all 14 songs at \$1.19 per track?



Show all working

Cost = .....

2. How much do you save by downloading rather than buying the CD for \$19.95?



Show all working

Amount saved = .....


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Questions 1–4 gather evidence of performing single-step calculations involving cost, time and quantity of data.

Use the playlist on the right to answer Questions 3 to 5.

Playlist	Playing time (minutes:seconds)
Sleeping in	4:40
She said ... like ...	4:20
Whatever!	2:30


3. What is the total playing time of the playlist above (in minutes and seconds)?

 Show all working

Playing time = .....

4. How many megabytes (MB) of data are contained in the playlist above?


Assume one minute of music = 1.2 megabytes (MB) of data

 Show all working

Amount of data = .....

5. How long would it take to download the playlist at a speed of 50 kilobytes per second (kB/sec)? Give your answer to the nearest minute.

Assume 1 MB = 1000 kB

 Show all working

Time to download = .....

Question 5 gathers evidence of solving a multi-step problem involving conversion of units.



Stop here: Wait for your teacher's directions

The “Stop here” direction marks a convenient point to break the task and introduce the next section.



Suggested time: 20 minutes

Discuss the purpose of this section, i.e.

Use your knowledge of discount, deposit and interest to determine the cost of purchasing recording equipment, and to compare borrowing to saving.

## Buying recording equipment

To record their next CD, the band **In My Shoes** need to buy the equipment shown in the online shopping trolley below.

6. Complete the table below to show the cost of the equipment.

Online Music Store			Shopping trolley	
Product	Price	Quantity	Cost	
 PA system	\$750.00	1	.....	
 Computer	\$1995.00	1	.....	
 Mixer	\$720.00	1	.....	
 Microphone	\$315.00	2	.....	
 Pack of 50 blank CDs	\$10.50	10	.....	
Total price			.....	

The band see the following advertisement, and decide to borrow money to buy the equipment this month.

**Online Music Store**  
**10% discount — this month only**  
 Don't have the cash? Borrow from us!  
 \$200 deposit and easy weekly repayments.

7. a) What will be the total price if **In My Shoes** buy the equipment this month?



Show all working

Discounted price = .....

- b) If the band has \$200 for a deposit, how much will they need to borrow to buy the equipment at the discounted price?



Show all working

Amount borrowed = .....

Questions 6–7 gather evidence of performing single-step calculations involving cost, deposit, discount and interest.

- c) What are the total repayments if the band make weekly payments of \$163 per week for 26 weeks (6 months)?



Show all working

Total amount paid = .....

- d) How much interest (in \$) will **In My Shoes** pay?



Show all working

Amount of interest paid = .....

8. Calculate the annual interest rate (%), using simple interest.



Show all working

Simple interest formula: .....

Annual interest rate = .....

Question 8 gathers evidence of manipulating a formula to calculate interest rate.

Provide students with the formula used to calculate simple interest, as you have taught it in class.

9. Do you think **In My Shoes** should have saved up and paid in cash instead of borrowing money? Why? (Refer to relevant answers in Questions 6 to 8.)

.....

.....

.....

.....

Question 9 gathers evidence of using mathematical reasoning to justify a decision to borrow or save.



Stop here: Wait for your teacher's directions



Suggested time: 15 minutes

Introduce and discuss the loudness scale.

## Enjoying music — how loud is too loud?

Loud sounds can cause permanent hearing damage. The louder a sound, the more quickly it can do damage. Table 1 shows examples of the loudness of common sounds in decibels (dB).

Table 1: Loudness of common sounds

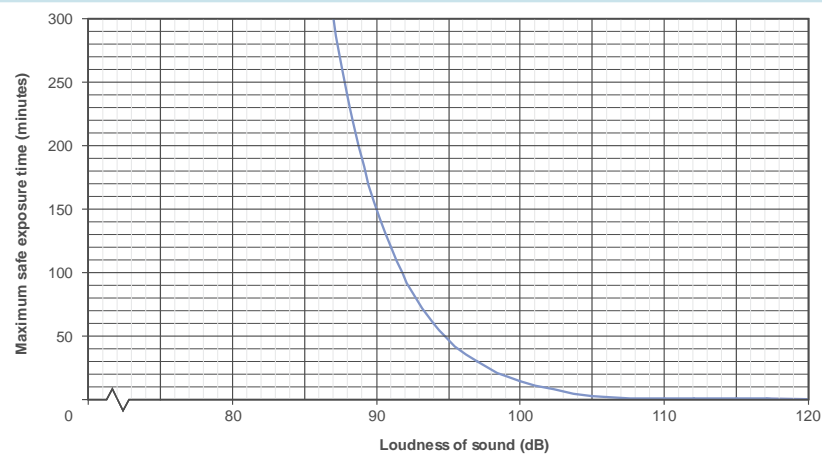
Loudness (dB)	Example of sound
0	Can just be heard
10	
20	Rustling leaves
30	
40	A whisper
50	
60	A normal conversation
70	A noisy classroom
80	Beside a busy street
90	Lawn mower, 1 metre away
100	
110	Chainsaw, 1 metre away
120	
130	Racing car, 1 metre away



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Graph 1 shows the recommended safe time limits for listening to loud sounds.

Graph 1: Time limits for safe exposure to loud sounds



Source of data: National centre for research resources, USA.

### Discuss:

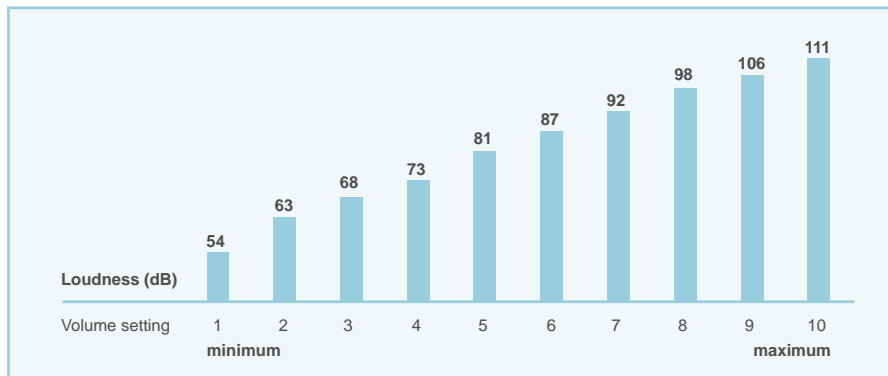
- The louder a sound, the more quickly it can cause hearing damage.
- Graph 1, which shows recommended safe limits for listening to loud sounds.

10. Use Graph 1 to answer the following:

- a) For how long could you safely listen to a sound at 90 dB? .....
- b) What is the maximum safe loudness for four hours' listening? .....

Table 2 shows loudness measurements taken from an MP3 player's earphones as the volume is increased.

**Table 2: Loudness of music in MP3 player earphones**



Question 10 gathers evidence of inferring from graphical data.

Discuss Table 2, which shows the loudness in the headphones at different volume settings for a particular brand of MP3 player.

11. Use Graph 1 and Table 2 to answer the following:

- a) What is the maximum safe volume setting (1 to 10) for listening to the MP3 player for one hour?

.....

Explain: .....

.....

.....

.....

- b) For how long can you safely listen to the MP3 player at the maximum volume?

.....

Explain: .....

.....

.....

.....

Question 11 gathers evidence of using multiple sources of data to make inferences.

**Discuss:**

- The loudness of the music at an outdoor concert drops by about 6 dB when you move twice as far away.
- This “rule of thumb” can be used to determine a safe listening distance.

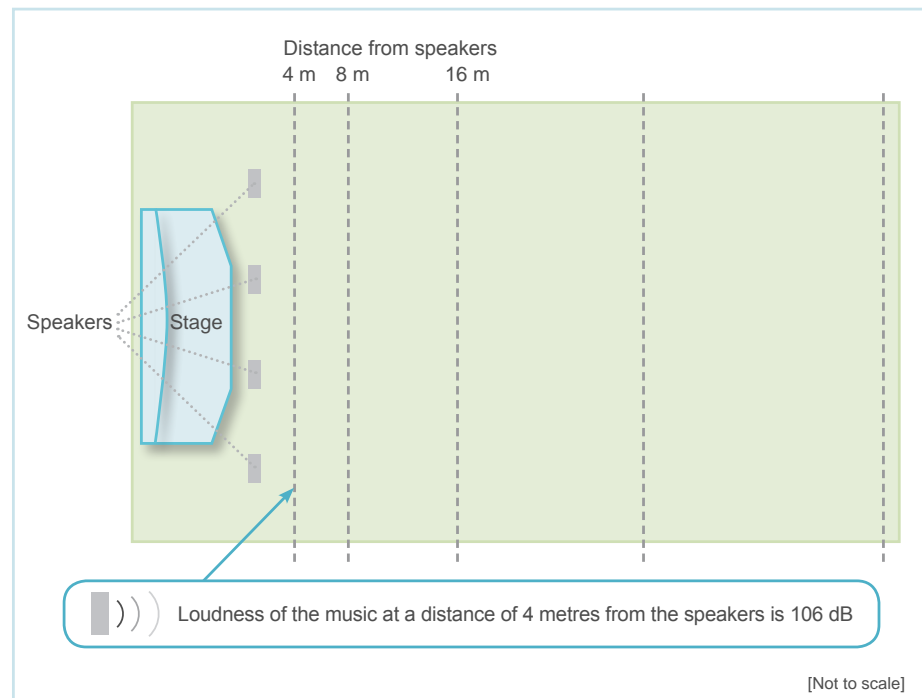
**How loud?**

At an outdoor concert, the loudness of the music decreases as you move further away from the speakers.

Wherever you are sitting, if you move to a seat twice as far away from the speakers, the loudness drops by about 6 decibels (dB).

i.e. When moving from 3 m to 6 m, or from 6 m to 12 m, the loudness drops by 6 dB.

**Diagram 1: Loudness of music at an In My Shoes concert**





12. What is the closest you could sit to the speakers to enjoy a three-hour (180 minute) concert without suffering hearing damage?

Complete the table below.

Distance from speakers (m)	Loudness of music (dB)
4	106
8	

**Refer to:**

- Graph 1 (page 8)
- How loud? (page 10)
- Diagram 1 (page 10).

Remind students to look at all given information sources.

The closest I could sit is ..... because .....

.....

.....

.....

.....

Question 12 gathers evidence of identifying a pattern to solve a problem.



Stop here: Wait for your teacher's directions



Suggested time: 40 minutes

Discuss the purpose of this section, i.e.

Use your mathematical understandings to plan aspects of a charity concert.

Go through the information included in Diagram 2 with the class.

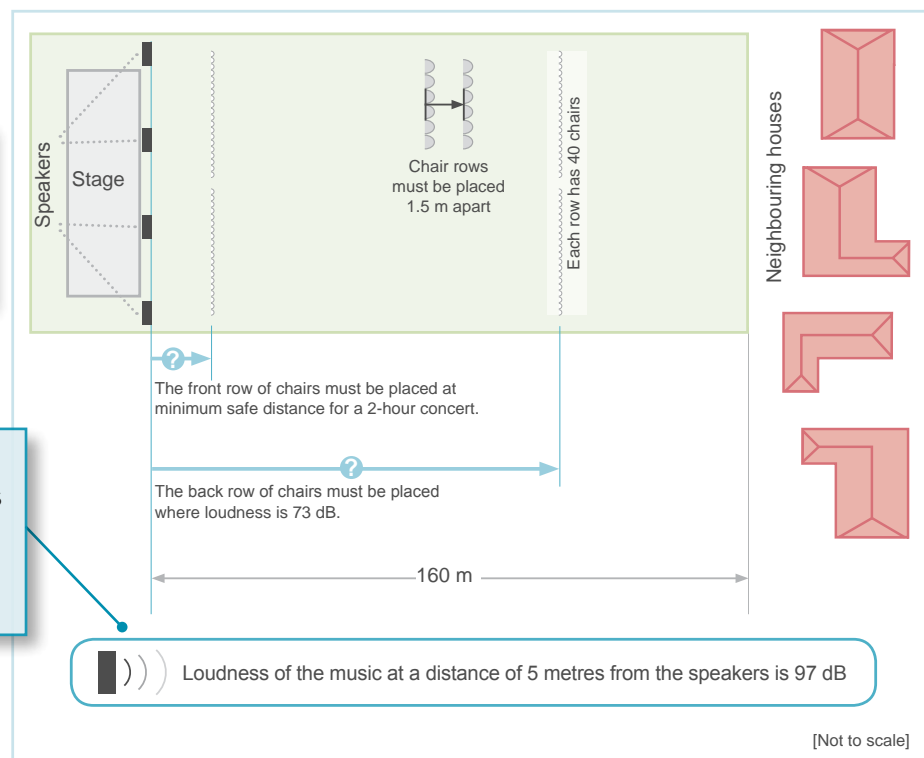
Make sure students are aware that the loudness of the music is different to that at the concert in Question 12.

## Planning a charity concert

Use mathematical reasoning to plan the following aspects of an outdoor charity concert on a sporting field.

- Number and placement of chairs for safe and enjoyable listening.
- The cost of running the concert.
- How much to charge for tickets.
- Impact of noise on neighbouring houses.

Diagram 2: Setting up an outdoor concert



Remind students to take their time to respond thoughtfully and to ask clarifying questions if necessary.

13. Calculate how many chairs you could place on the field so that:

- ☐ the front row is at the minimum distance for safe listening for 2 hours
- ☐ the music is loud enough for enjoyment (73 dB) in the back row
- ☐ rows of chairs are 1.5 m apart (from the front of one row to the front of the next)
- ☐ there is a total of 40 chairs in each row.

**Refer to:**

- Graph 1 (page 8)
- How loud? (page 10)
- Diagram 2 (page 12).

Remind students to look at all information sources.

State any assumptions you make and show your reasoning.



Show all working

It is important to state any assumptions and to show reasoning and working. Look at Question 15 to see examples of assumptions stated in a calculation.

Number of chairs = .....

If students do not manage to calculate a total number of chairs, suggest that they use an estimate (e.g. 1000 chairs) in the following questions.

Questions 13–16 gather evidence of:

- choosing mathematical strategies to plan physical, financial and safety aspects of a concert
- justifying reasoning by reflecting on learning and applying understandings.

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Use the information in Table 3 to answer Question 14.

Table 3: Costs and Times for concerts

Costs (All other services have been generously donated)	
Sports field hire	\$ 300 (includes insurance and cleaning)
Security	\$ 120 /hr
Electricity for lights	\$ 20 /hr
Speaker and amplifier hire	\$ 1800
Stage marquee hire	\$ 450
Chair hire	\$ 1.00 /chair for the first 500
	\$ 0.85 /chair for each chair over 500
Times	
Concert time	8 pm to 10 pm
Set-up time	2 hours before concert
Pull-down time	1 hour after concert
Sunset	6 pm

14. Calculate the total cost of running the concert.

State any assumptions you make and show your reasoning.



Show all working

Total cost = .....

**15. How much would you charge for each ticket?**

Assume that you:

- pay all running costs from the ticket sales
- hope to raise \$10 000 for charity
- expect to sell tickets for at least 70% of the seats.

State any assumptions you make and show your reasoning.



Show all working

Ticket price = .....

**16. The local council requires you to provide screening to protect the neighbouring houses if the music is annoyingly loud. Will you need to provide screening?**

State any assumptions you make and show your reasoning.



Show all working

Questions 13–16 gather evidence of:

- choosing mathematical strategies to plan physical, financial and safety aspects of a concert
- justifying reasoning by reflecting on learning and applying understandings.

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## Making judgments

Use the [Guide to making judgments \(GTMJ\)](#) on page 36 to grade student responses.

The [Model response](#) (page 27) and [Sample responses](#) are provided for reference purposes only. They each demonstrate possible responses and should be used to support the GTMJ.

Making judgments is not about determining whether one student's work is better than that of another. Rather, you should make standards-based judgments by matching evidence in student responses to descriptors in the GTMJ.

Read and consider all of the evidence in the student's responses before making and recording a judgment about the quality of the performance for each assessable element.

**Additional resources** [Sample responses](#)

QSA Assessment Bank <<https://qcar.qsa.qld.edu.au/assessmentbank>>

### Using the GTMJ

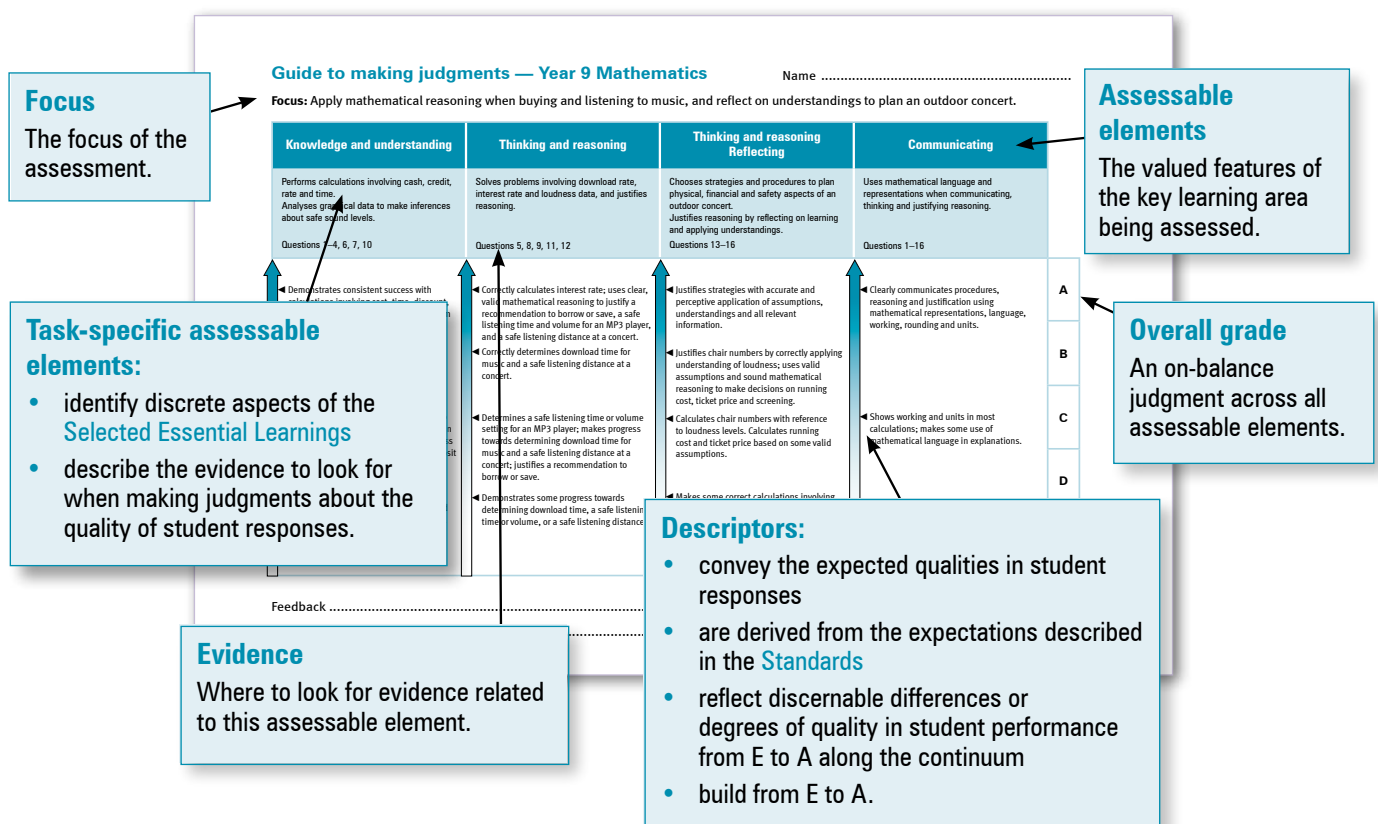
This QCAT uses a continua-style GTMJ, where descriptors are placed along a continuum within each column. The diagrams below show the different parts of the GTMJ continua model, and how to use the GTMJ when grading student responses.

Record a nil award of "N" only when there is insufficient evidence to make a judgment for an overall grade.

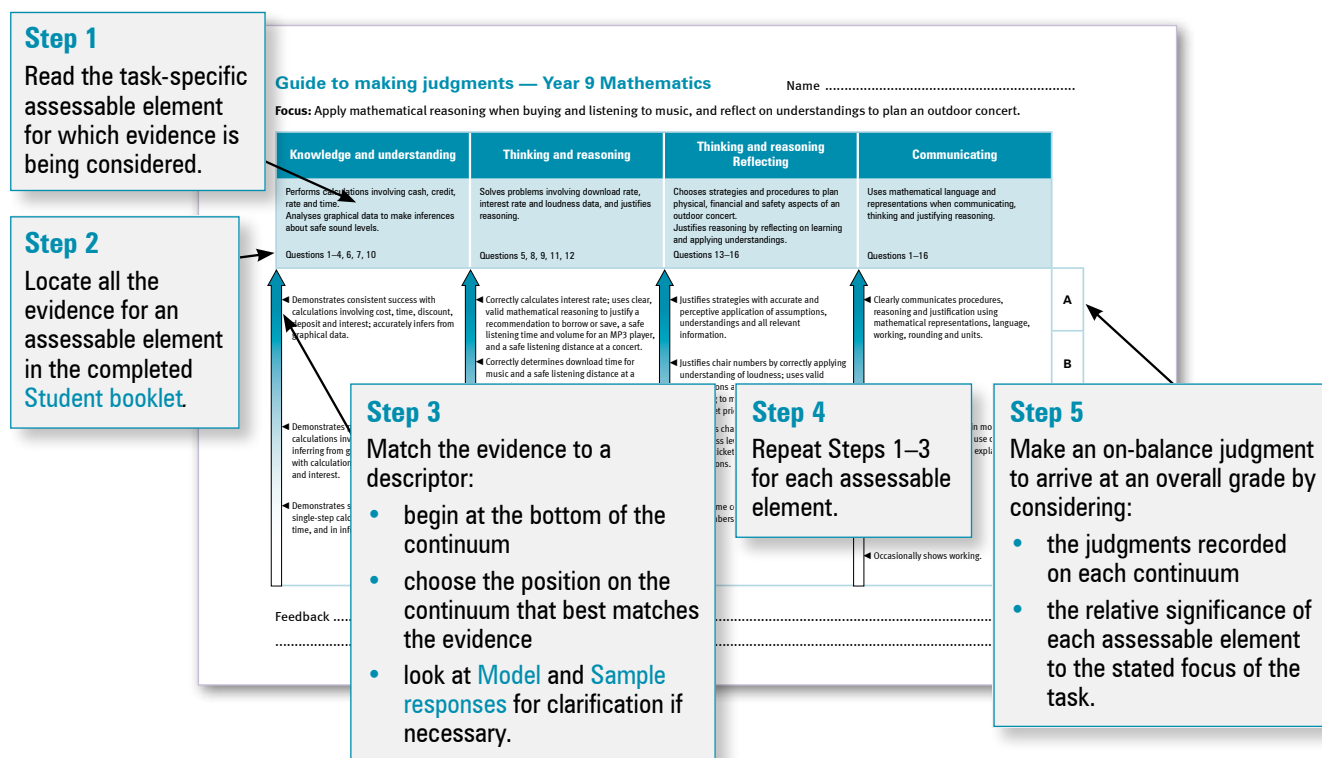
In the following diagrams:

- [Diagram 1: Understanding the GTMJ](#) points out the different parts of the GTMJ
- [Diagram 2: Using the GTMJ — the judgment process](#) gives steps to follow when grading student responses.

### Diagram 1: Understanding the GTMJ



**Diagram 2: Using the GTMJ – the judgment process**



## Using feedback

Assessment alone will not contribute significantly to improved learning — it is what teachers and students do with the information gathered that makes the difference. Providing quality and useful feedback is a crucial step in using assessment information to support future learning.

Assessment feedback goes beyond a simple mark or grade. Comments on the strengths of students' achievements, and on areas for improvement, provide quality feedback that can be used to inform future teaching and learning. Assessment feedback is most helpful if the specific elements of the knowledge and skills are identified and specific suggestions are provided.

The information gathered from the implementation, marking and moderation of QCATs should feed back into future planning of teaching and learning.

### *Feedback to help students learn*

Quality feedback to a student:

- focuses on their achievement in relation to either the assessable elements with their task-specific descriptors or the [Selected Essential Learnings](#) (page 25) and their associated questions
- includes strengths of achievements
- identifies areas for improvement and strategies for future learning
- is communicated in student-friendly language
- is appropriate (e.g. in quantity and detail) to the student's age and their capacity to respond
- includes the use of [Sample responses](#) to provide examples of the quality of work corresponding to each standard.

### *Feedback to help teacher planning*

Individual and collective student performance on QCATs, along with other school-based assessment, can be used to inform teaching and learning.

**Additional resources** [Using feedback to inform teaching and learning](#)

[www.qsa.qld.edu.au](http://www.qsa.qld.edu.au) > Prep–Year 9 > QCATs (Years 4, 6 & 9)

[Sample responses](#)

QSA Assessment Bank <<https://qcar.qsa.qld.edu.au/assessmentbank>>



# Resources

## Selected Essential Learnings

The 2010 QCATs will assess what students know, understand and can do in relation to the following selection of [Essential Learnings](#).

Mathematics Essential Learnings by the end of Year 9	
<b>Assessable elements</b> The valued features of the key learning area about which evidence of learning is collected and assessed.	<b>Ways of working</b> The processes students use to develop and demonstrate their <a href="#">knowledge and understanding</a> .  Students are able to:
<b>Thinking and reasoning</b>	<ul style="list-style-type: none"> <li>analyse situations to identify the key mathematical features and conditions, strategies and procedures that may be relevant in the generation of a solution</li> <li>select and use mental and written computations, estimations, representations and technologies to generate solutions and to check for reasonableness of the solution</li> <li>use mathematical interpretations and conclusions to generalise reasoning and make inferences</li> </ul>
<b>Communicating</b>	<ul style="list-style-type: none"> <li>communicate thinking, and justify and evaluate reasoning and generalisations, using mathematical language, representations and technologies</li> </ul>
<b>Reflecting</b>	<ul style="list-style-type: none"> <li>reflect on learning, apply new understandings and justify future applications.</li> </ul>
	<b>Knowledge and understanding</b> The essential concepts, facts and procedures.
<b>Knowledge and understanding</b>	<p><b>Number</b></p> <p><b>Number properties and operations and a range of strategies can be applied when working with integers and rational numbers.</b></p> <ul style="list-style-type: none"> <li>Rational numbers (integers, fractions and decimals) can be used to describe and solve problems involving rate, ratio, proportion and percentage.</li> <li>Financial decisions can be made based on the analysis of short- and long-term benefits and consequences of cash, credit and debit transactions.</li> </ul> <p><b>Measurement</b></p> <p><b>Units of measure, instruments, formulas and strategies can be used to estimate and calculate measurement and consider reasonable error.</b></p> <ul style="list-style-type: none"> <li>Instruments, technologies, strategies and formulas are used to estimate, compare and calculate measures and derived measures, including rate, area, duration and Australian time zone differences.</li> </ul> <p><b>Chance and data</b></p> <p><b>Judgments can be based on theoretical or experimental probability. Data can be displayed in various ways and analysed to make inferences and generalisations.</b></p> <ul style="list-style-type: none"> <li>Data interpretation is simplified through the use of suitable representations and descriptive statistics.</li> </ul>

Source: [www.qsa.qld.edu.au](http://www.qsa.qld.edu.au) > Prep–Year 9 > Essential Learnings & Standards (Years 1–9)

## Literacy and Numeracy Indicators

The [Literacy and Numeracy Indicators](#) are a resource that can be used when planning for teaching, learning, assessment and monitoring in all key learning areas.

This QCAT may provide opportunities to monitor and assess student progress in a selection of the [Literacy and Numeracy Indicators](#), and may provide further focus for feedback for teachers and students to support improved learning.

**Additional resources** [Literacy and Numeracy Indicators Information Statement](#)  
[www.qsa.qld.edu.au](http://www.qsa.qld.edu.au) › Prep–Year 9 › Literacy & Numeracy Indicators (P–Year 9)

## Model response

This **Model response** gives one example of a very high quality response for each question. The **Sample responses**, available for download from the **QSA Assessment Bank**, demonstrate the quality of student responses for each standard, A to E.

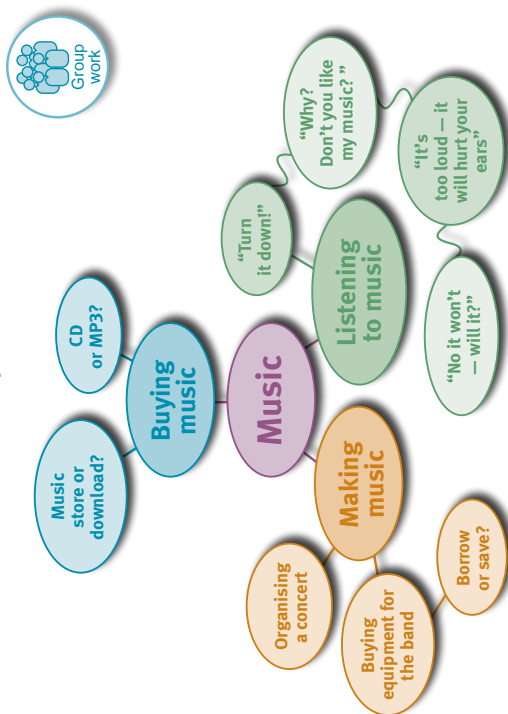


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## Setting the scene: Group discussion



**In this assessment, you will use mathematical reasoning to:**

- determine costs and times when buying and downloading music
- compare different payment options when buying recording equipment
- analyse data to determine safe budness levels when listening to music reflect on your understandings to plan a charity concert.

**Show all working**

It is important to show all your working so that your teacher can see what you know, understand and can do, even if you make a mistake in your calculations. Credit will be given if an incorrect answer is used correctly in a later question. Your teacher is looking for mathematical thinking and reasoning, not only correct answers.

[Show all working](#)

When you see a space like this, show all your working

## Model response

### Buying music

Use the CD cover below to answer Questions 1 and 2.



Song	Duration (min:sec)
Sleeping in	4:40
Grounded (again)	4:47
Hangin' out	2:52
Can't get outta bed	4:56
Mess? What mess?	4:48
Lazy Sunday morning	4:11
The girl next door	3:33
At the beach	5:09
She said ... like ...	4:20
Saturday morning job	4:54
Banana smoothie	3:33
Tidy my room?	3:35
They don't understand	3:14
Whatever!	2:30

Playing time of each song (minutes:seconds)

- What is the cost of downloading all 14 songs at \$1.19 per track?

1.19  
x 14  
-----  
16.66

Cost = ....\$16.66.....

Show all working

- How much do you save by downloading rather than buying the CD for \$19.95?

19.95  
- 16.66  
-----  
3.29

Amount saved = .....\$3.29.....

Show all working

Playlist	Playing time (minutes:seconds)
Sleeping in	4:40
She said ... like ...	4:20
Whatever!	2:30

Use the playlist on the right to answer Questions 3 to 5.

- What is the total playing time of the playlist above (in minutes and seconds)?

4:40  
4:20  
+ 2:30  
-----  
11:30

Playing time = 11 min 30 sec.....

Show all working

- How many megabytes (MB) of data are contained in the playlist above?

Assume one minute of music = 1.2 megabytes (MB) of data

Data = 11 m 30 s x 1.2 MB/m  
= 11.5 x 1.2 MB  
= 13.8 MB

Amount of data = ....13.8 MB.....

Show all working

- How long would it take to download the playlist at a speed of 50 kilobytes per second (kB/sec)? Give your answer to the nearest minute.

Assume 1 MB = 1000 kB

13.8 MB = 13.8 x 1 000 kB  
= 13800 kB

Time =  $\frac{13800 \text{ kB}}{50 \text{ kB/s}}$   
= 276 s  
= 4 mins 36 secs

Time to download = ..about 5 minutes.

Show all working






Stop here: Wait for your teacher's directions

## Model response

### Buying recording equipment

To record their next CD, the band **In My Shoes** need to buy the equipment shown in the online shopping trolley below.

6. Complete the table below to show the cost of the equipment.

Online Music Store			Shopping trolley	
Product	Price	Quantity	Cost	
 PA system	\$750.00	1	\$ 750.00	
 Computer	\$1995.00	1	\$ 1995.00	
 Mixer	\$720.00	1	\$ 720.00	
 Microphone	\$315.00	2	\$ 630.00	
 Pack of 50 blank CDs	\$10.50	10	\$ 105.00	
Total price			\$ 4200.00	

The band see the following advertisement, and decide to borrow money to buy the equipment this month.

**Online Music Store**  
10% discount — this month only  
Don't have the cash? Borrow from us!  
\$200 deposit and easy weekly repayments.

7. a) What will be the total price if **In My Shoes** buy the equipment this month?

$$\begin{aligned} \text{Price this month} &= 90\% \text{ of } \$4200 \\ &= 0.9 \times \$4200 \\ &= \$3780 \end{aligned}$$

$$\text{Discounted price} = \$3780$$

- b) If the band has \$200 for a deposit, how much will they need to borrow to buy the equipment at the discounted price?

$$\begin{array}{r} 3780 \\ - 200 \\ \hline 3580 \end{array}$$

$$\text{Amount borrowed} = \$3580$$

- c) What are the total repayments if the band make weekly payments of \$163 per week for 26 weeks (6 months)?

$$\begin{array}{r} 163 \\ \times 26 \\ \hline 4238 \end{array}$$

$$\text{Total amount paid} = \$4238$$

- d) How much interest (in \$) will **In My Shoes** pay?

$$\begin{array}{r} 4238 \\ - 3580 \\ \hline 658 \end{array}$$

$$\text{Amount of interest paid} = \$658$$

8. Calculate the annual interest rate (%), using simple interest.

Simple interest formula:  $I = \frac{PrT}{100}$

$$\begin{aligned} I &= PrT \\ r &= \frac{I}{PT} \\ &= \frac{658}{3580 \times 0.5} \\ &= 0.368 \end{aligned}$$

$$\text{Annual interest rate} = 36.8\%$$

9. Do you think **In My Shoes** should have saved up and paid in cash instead of borrowing money? Why? (Refer to relevant answers in Questions 6 to 8.)

Even though the band paid \$658 in interest, the total amount they paid was \$4238 including the deposit — only \$238 more than the cash price without the discount. I think it was OK to borrow as this is a small price to pay for the extra time to use the equipment.

Stop here: Wait for your teacher's directions

Either option is acceptable if provided it is justified.

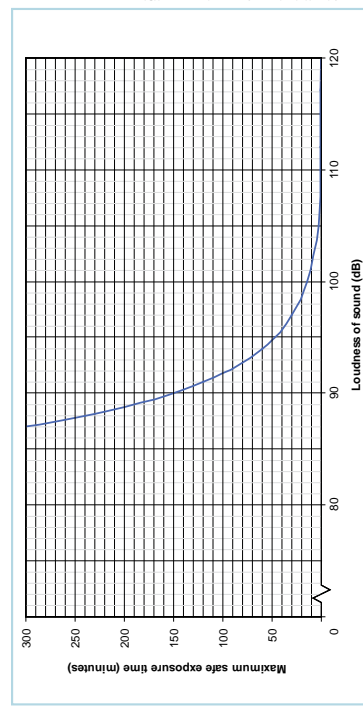
Loud sounds can cause permanent hearing damage. The louder a sound, the more quickly it can do damage. Table 1 shows examples of the loudness of common sounds in decibels (dB).

Loudness (dB)	Example of sound
0	Can just be heard
10	
20	Rustling leaves
30	
40	A whisper
50	
60	A normal conversation
70	A noisy classroom
80	Beside a busy street
90	Lawn mower, 1 metre away
100	
110	Chainsaw, 1 metre away
120	
130	Racing car, 1 metre away



Images (top to bottom) are Creative Commons Attribution 2.0 Generic licensed photos <<http://creativecommons.org/licenses/by/2.0>> accessed 27 Dec 2009. Leaves: Russell's bird's photo stream, "Autumn Leaves," <<http://www.flickr.com/photos/rf8153232516/>>. Group of Kids: Glingong's photo stream, <<http://www.flickr.com/photos/glingong2368979410/>>. Busy street: emmettanderson's photo stream, Melbourne Bus stop, <<http://www.flickr.com/photos/emmettanderson/5252726817/>>. Lawn mower: ansah's photo stream, <<http://www.flickr.com/photos/ansah/1549770771/>>. Racing car: oesley's photo stream, Formula 1, <<http://www.flickr.com/photos/oesley/1201880/>>.

### Graph 1: Time limits for safe exposure to loud sounds

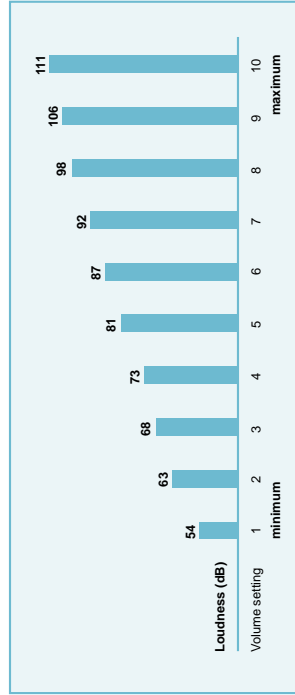


Source of data: National centre for research resources, USA.

a) For how long could you safely listen to a sound at 90 dB? ..... 150 minutes.....

b) What is the maximum safe loudness for four hours' listening? ..... 88 dB.....

### Table 2: Loudness of music in MP3 player earphones



Adapted from data obtained from Hearing Review, March 2006.

a) What is the maximum safe volume setting (1 to 10) for listening to the MP3 player for one hour?

7

**Explain:** The safe loudness for one hour is about 94 dB (from Graph 1). This occurs when the volume setting is about 7 (92 dB).

b) For how long can you safely listen to the MP3 player at the maximum volume?

0 minutes

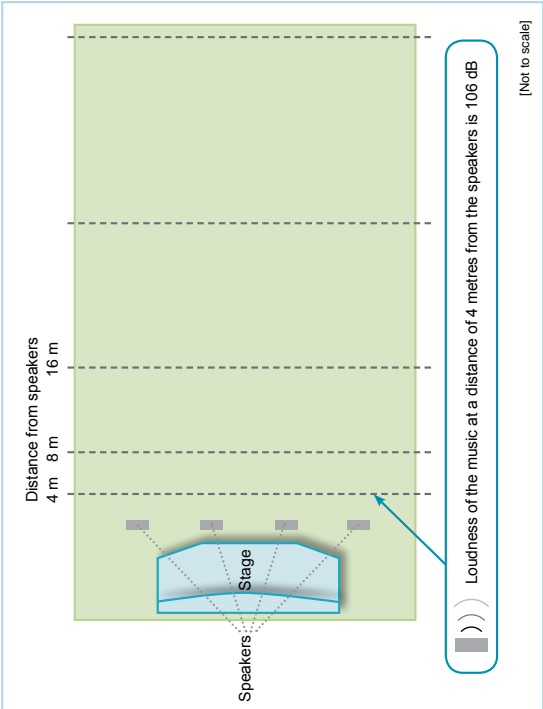
**Explain:** ..Graph...1 shows that there is no safe exposure time for sounds louder than about 107 dB (max volume of MP3 player = 111 dB).

Model response

How loud?

At an outdoor concert, the loudness of the music decreases as you move further away from the speakers.  
Wherever you are sitting, if you move to a seat twice as far away from the speakers, the loudness drops by about 6 decibels (dB).  
i.e. When moving from 3 m to 6 m, or from 6 m to 12 m, the loudness drops by 6 dB.

Diagram 1: Loudness of music at an In My Shoes concert



12. What is the closest you could sit to the speakers to enjoy a three-hour (180 minute) concert without suffering hearing damage?

Complete the table below.

Distance from speakers (m)	Loudness of music (dB)
4	106
8	100
16	94
32	88
64	82
128	76

Refer to:

- Graph 1 (page 8)
- How loud? (page 10)
- Diagram 1 (page 10).

The closest I could sit is ..... 32 metres ..... because ..... for a three-hour concert .....  
the loudest safe sound level is about 89 dB (from Graph 1).....  
This loudness occurs at about 32 metres.....  
.....  
.....



Stop here: Wait for your teacher's directions



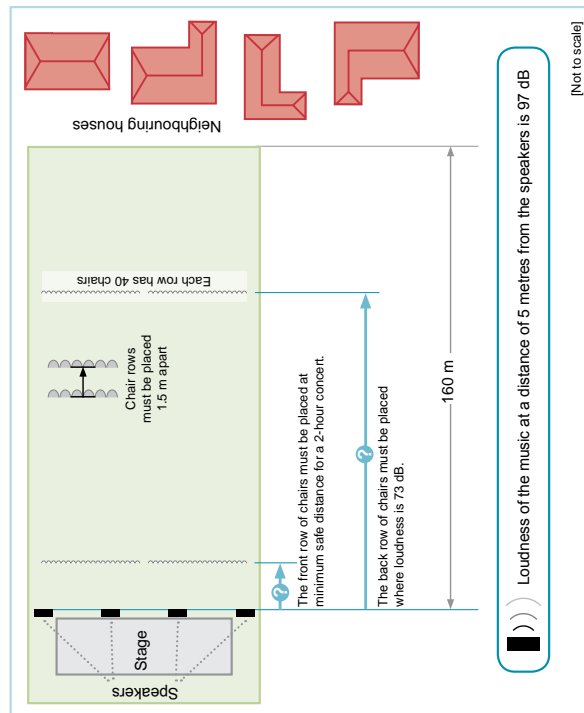
## Model response

### Planning a charity concert

Use mathematical reasoning to plan the following aspects of an outdoor charity concert on a sporting field.

- Number and placement of chairs for safe and enjoyable listening.
- The cost of running the concert.
- How much to charge for tickets.
- Impact of noise on neighbouring houses.

Diagram 2: Setting up an outdoor concert



13. Calculate how many chairs you could place on the field so that:

- ☒ the front row is at the minimum distance for safe listening for 2 hours
- ☒ the music is loud enough for enjoyment (73 dB) in the back row
- ☒ rows of chairs are 1.5 m apart (from the front of one row to the front of the next)
- ☒ there is a total of 40 chairs in each row.

#### Refer to:

- Graph 1 (page 8)
- How loud? (page 10)
- Diagram 2 (page 12).



Show all working

State any assumptions you make and show your reasoning.

Front row: maximum loudness for 2 hours is about 91 dB (from Graph 1).

Distance (m)	Loudness (dB)
5	97
10	91
20	85
40	79
80	73
160	67

The model responses to Questions 13–16 represent examples only. Students may justify different assumptions and arrive at equally valid answers.

91 dB occurs at a distance of about 10 metres from the speakers.

Back row: minimum loudness of 73 dB occurs at about 80 metres from the speakers.

Distance from front row to back row =  $80 \text{ m} - 10 \text{ m}$   
= 70 m

Number of rows  
=  $(70 \text{ m} \div 1.5) + 1$   
= 47.6 rows

Need 47 rows of chairs  
(48th row loudness is less than 73 dB minimum)

47 rows x 40 chairs/row = 1880 chairs

Number of chairs = .....1880.....



## Model response

Use the information in Table 3 to answer Question 14.

Table 3: Costs and Times for concerts

Costs (All other services have been generously donated)	
Sports field hire	\$ 300 (includes insurance and cleaning)
Security	\$ 120 /hr
Electricity for lights	\$ 20 /hr
Speaker and amplifier hire	\$ 1800
Stage marquee hire	\$ 450
Chair hire	\$ 1.00 /chair for the first 500
	\$ 0.85 /chair for each chair over 500
Times	
Concert time	8 pm to 10 pm
Set-up time	2 hours before concert
Pull-down time	1 hour after concert
Sunset	6 pm

14. Calculate the total cost of running the concert.

State any assumptions you make and show your reasoning.

Field hire \$ 300  
 Security (1 hour before to 1 hour after) 4 x 120 \$ 480  
 Electricity (lights from sunset to 11 pm) 5 x 20 \$ 100  
 Speaker and amp hire \$ 1800  
 Tent hire \$ 450  
 Chairs (500 x \$1 + 1380 x \$0.85)  
     + \$ 1673  
     \$ 4803  
 Total cost = ..... \$4803

Show all working

15. How much would you charge for each ticket?

Assume that you:

- pay all running costs from the ticket sales
- hope to raise \$10 000 for charity
- expect to sell tickets for at least 70% of the seats.

State any assumptions you make and show your reasoning.

Need to raise \$10 000 + \$4 803 = \$14 803  
 Number of seats = 1880  
 70% of 1880 seats = 1316 seats  
 Amount needed per seat =  $\frac{\$14803}{1316 \text{ seats}}$   
 = \$11.25 per seat  
 I would charge \$12 per seat, and would raise extra money for charity if I sold 70% of the seats.  
 Ticket price = ..... \$12

Show all working

16. The local council requires you to provide screening to protect the neighbouring houses if the music is annoyingly loud. Will you need to provide screening?

State any assumptions you make and show your reasoning.

The neighbouring houses are about 160 metres from the speakers, so the sound level would be about 67 dB, as shown in Question 13.  
 According to Table 1, 67 dB is above the level of a normal conversation so the neighbours would have to talk loudly to hear each other.  
 I would consider this annoying, so I would provide screening.

Show all working

## Notes

## Notes

# Guide to making judgments — Year 9 Mathematics

Name .....

**Focus:** Apply mathematical reasoning when buying and listening to music, and reflect on understandings to plan an outdoor concert.

Knowledge and understanding	Thinking and reasoning	Thinking and reasoning Reflecting	Communicating
<p>Performs calculations involving cash, credit, rate and time. Analyses graphical data to make inferences about safe sound levels.</p> <p>Questions 1–4, 6, 7, 10</p>	<p>Solves problems involving download rate, interest rate and loudness data, and justifies reasoning.</p> <p>Questions 5, 8, 9, 11, 12</p>	<p>Chooses strategies and procedures to plan physical, financial and safety aspects of an outdoor concert. Justifies reasoning by reflecting on learning and applying understandings.</p> <p>Questions 13–16</p>	<p>Uses mathematical language and representations when communicating, thinking and justifying reasoning.</p> <p>Questions 1–16</p>
<p>◀ Demonstrates consistent success with calculations involving cost, time, discount, deposit and interest; accurately infers from graphical data.</p> <p>◀ Demonstrates proficiency with single-step calculations involving cost and time, and in inferring from graphical data; some success with calculations involving discount, deposit and interest.</p> <p>◀ Demonstrates some success with single-step calculations involving cost and time, and in inferring from graphical data.</p>	<p>◀ Correctly calculates interest rate; uses clear, valid mathematical reasoning to justify a recommendation to borrow or save, a safe listening time and volume for an MP3 player, and a safe listening distance at a concert.</p> <p>◀ Correctly determines download time for music and a safe listening distance at a concert.</p> <p>◀ Determines a safe listening time or volume setting for an MP3 player; makes progress towards determining download time for music and a safe listening distance at a concert; justifies a recommendation to borrow or save.</p> <p>◀ Demonstrates some progress towards determining download time, a safe listening time or volume, or a safe listening distance.</p>	<p>◀ Justifies strategies with accurate and perceptive application of assumptions, understandings and all relevant information.</p> <p>◀ Justifies chair numbers by correctly applying understanding of loudness; uses valid assumptions and sound mathematical reasoning to make decisions on running cost, ticket price and screening.</p> <p>◀ Calculates chair numbers with reference to loudness levels. Calculates running cost and ticket price based on some valid assumptions.</p> <p>◀ Makes some correct calculations involving chair numbers, running cost or ticket price.</p>	<p><b>A</b></p> <p>◀ Clearly communicates procedures, reasoning and justification using mathematical representations, language, working, rounding and units.</p> <p><b>B</b></p> <p><b>C</b></p> <p>◀ Shows working and units in most calculations; makes some use of mathematical language in explanations.</p> <p><b>D</b></p> <p><b>E</b></p> <p>◀ Occasionally shows working.</p>

Feedback .....

.....