

Mathematics

WORK SAMPLE PORTFOLIOS

These work sample portfolios have been designed to illustrate satisfactory achievement in the relevant aspects of the achievement standard.

The December 2011 work sample portfolios are a resource to support planning and implementation of the Foundation to Year 10 Australian Curriculum in English, Mathematics, Science and History during 2012. They comprise collections of different students' work annotated to highlight evidence of student learning of different aspects of the achievement standard.

The work samples vary in terms of how much time was available to complete the task or the degree of scaffolding provided by the teacher.

There is no pre-determined number of samples required in a portfolio nor are the work samples sequenced in any particular order. These initial work sample portfolios do not constitute a complete set of work samples - they provide evidence of most (but not necessarily all) aspects of the achievement standard.

As the Australian Curriculum in English, Mathematics, Science and History is implemented by schools in 2012, the work sample portfolios will be reviewed and enhanced by drawing on classroom practice and will reflect a more systematic collection of evidence from teaching and learning programs.

THIS PORTFOLIO – YEAR 8 MATHEMATICS

This portfolio comprises a number of work samples drawn from a range of assessment tasks, namely:

Sample 1	Financial mathematics – Analysing and choosing phone plans
Sample 2	Algebraic expressions – Equations
Sample 3	Using units of measurement – Rain on my roof
Sample 4	Data representation and interpretation – What makes a safe driver?
Sample 5	Data representation and interpretation – Analysing OHS risks
Sample 6	Circumference and area of circles
Sample 7	Index laws
Sample 8	Discounts, profit and loss
Sample 9	Venn diagrams and two way tables

Mathematics

This portfolio of student work shows the efficient use of mental and written strategies to carry out the four operations with integers (WS1) and the ability to construct, analyse and interpret graphs of linear functions (WS1). From given information the student constructs linear equations to solve problems and graphs linear relationships on the Cartesian plane (WS1, WS2, WS5). The student uses understanding of the index laws to simplify numerical expressions (WS7), solves everyday problems involving rates and percentages (WS8), calculates percentage discounts and profits of items and uses mathematical reasoning to make financial decisions. The student makes connections between expanding and factorising algebraic expressions (WS2) to simplify a variety of algebraic expressions and solves problems involving the volume and surface area of prisms based on authentic information (WS3). The student identifies parts of a circle and uses information to calculate the area and circumference of a variety of circles (WS6). The student uses real data to interpret and represent information taken from a variety of sources, uses statistical reasoning to draw conclusions and uses Venn diagrams (WS9) and two way tables to model information and extrapolate on their findings (WS1, WS5).

The following aspects of the achievement standard are not evident in this portfolio:

- *describe rational and irrational numbers*
- *make sense of time duration in real applications*
- *identify conditions for the congruence of triangles and deduce the properties of quadrilaterals*
- *choose appropriate language to describe events and experiments*
- *perform calculations to determine perimeter and area of parallelograms, rhombuses and kites*
- *determine complementary events and calculate the sum of probabilities.*

Mathematics

Work sample 1: Financial mathematics – Analysing and choosing phone plans

Relevant parts of the achievement standard

By the end of Year 8, students solve everyday problems involving rates, ratios and percentages. They recognise index laws and apply them to whole numbers. They describe rational and irrational numbers. Students solve problems involving profit and loss. They make connections between expanding and factorising algebraic expressions. Students solve problems relating to the volume of prisms. They make sense of time duration in real applications. They identify conditions for the congruence of triangles and deduce the properties of quadrilaterals. Students model authentic situations with two-way tables and Venn diagrams. They choose appropriate language to describe events and experiments. They explain issues related to the collection of data and the effect of outliers on means and medians in that data.

Students use efficient mental and written strategies to carry out the four operations with integers. They simplify a variety of algebraic expressions. They solve linear equations and graph linear relationships on the Cartesian plane. Students convert between units of measurement for area and volume. They perform calculations to determine perimeter and area of parallelograms, rhombuses and kites. They name the features of circles and calculate the areas and circumferences of circles. Students determine complementary events and calculate the sum of probabilities.

Summary of task

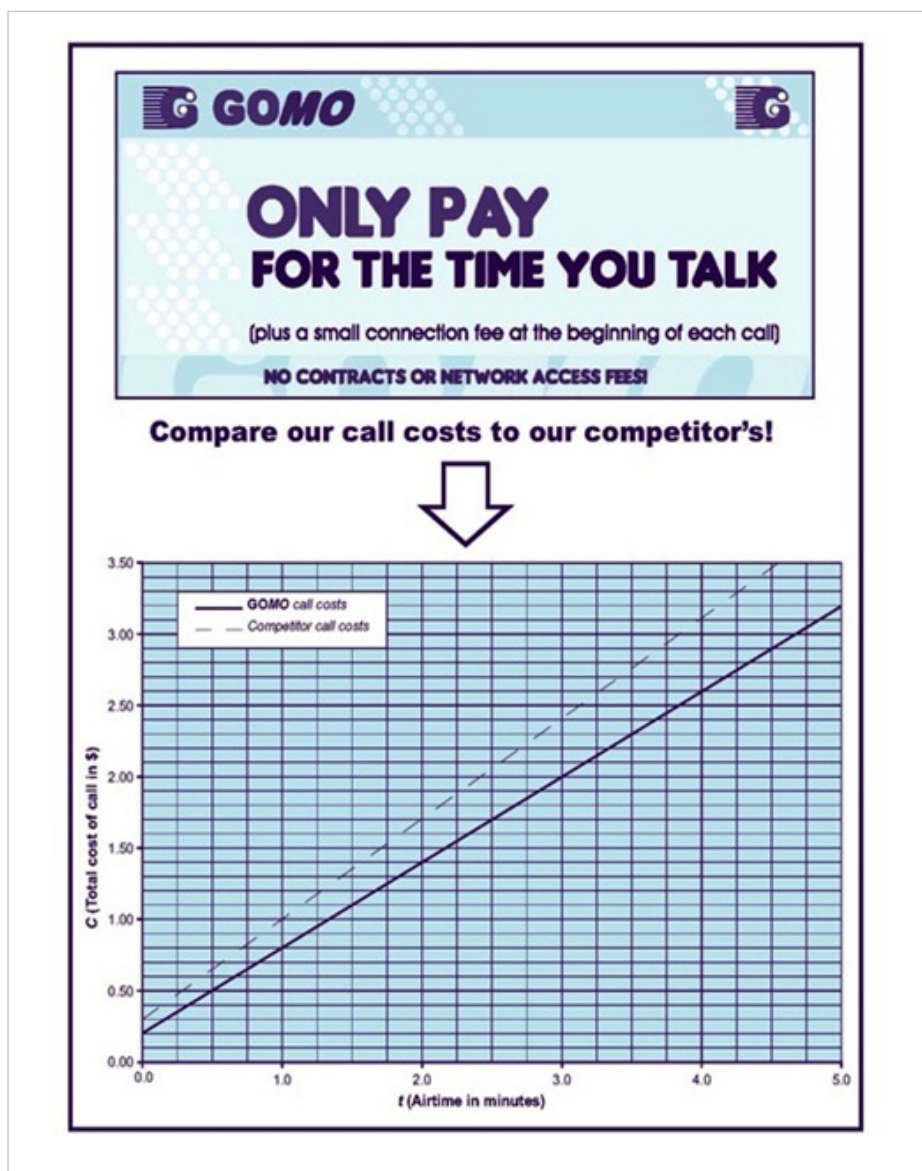
Students were asked to use data on mobile phone plans to make judgements and decisions about the most suitable plan. Following pre-determined questions they were required to:

- construct, analyse and interpret graphs of linear functions
- construct, manipulate and solve linear equations
- use mathematical strategies to calculate call costs, compare payment plans, and inform financial decisions related to mobile phone use.

The task took one lesson to complete.

Mathematics

Work sample 1: Financial mathematics – Analysing and choosing phone plans



Mathematics

Work sample 1: Financial mathematics – Analysing and choosing phone plans

Question 1

- (a) Complete Table 1 using data from the graph in the GOMO advertisement to compare the cost of using a GOMO phone and a competitor's phone.

Table 1:

Airtime (The actual time spent talking on the phone)	Total cost of call with a GOMO phone	Total cost of call with a competitor's phone
1 minute	\$ 0.80	\$ 1.00
4 minutes	\$ 2.60	\$ 3.10

- (b) The cost of each call includes a connection fee, which is charged at the beginning of each call (i.e. at 0 minutes).

From the graph, how much is the GOMO connection fee?

\$ 0.20

- (c) The gradient of the graph is equal to the call rate (in \$ per minute of airtime). Calculate the call rate for a GOMO phone.

Show all working

gradient $\frac{\text{rise}}{\text{run}}$ $5) \frac{0.6}{30}$

$$\frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{0.6 - 0.3}{1 - 0.5}$$

$$= \frac{0.3}{0.5}$$

$$= 0.6$$

the call rate = \$0.6/min

Annotations

Interprets a linear graph to find the values of the dependant variable for given values of the independent variable.

Calculates a rate from a graph.

Mathematics

Work sample 1: Financial mathematics – Analysing and choosing phone plans

Question 2

- (a) Rewrite the equation $C = rt + f$, replacing r and f with the values you found when answering Question 1 for the call rate and connection fee for a GOMO phone.

$$C = 60c \times t + 20c$$

- (b) Using the equation you wrote in your answer to Question 2 (a), find the cost C of a 10-minute call using a GOMO phone.

Show all working

$$\begin{aligned} C &= rt + f & c &= 10 & f &= 20c \\ C &= (60c \times 10) + 20c & r &= 60c & & \\ C &= \$6 + 20 = \$6.20 & C &= \$6.20 & & \\ & & \$6.20 &= (60c \times 10) + 20c & & \end{aligned}$$

- (c) Using the equation you wrote in your answer to Question 2 a), find how long you can talk (t) for \$10, using a GOMO phone.

Show all working

$$\begin{aligned} C &= rt + f & C &= \$10 \\ & & r &= 60c \\ \$10 &= (60c \times t) + 20c & & \\ \$10 \div 60c &= 6.60 + 20c \div 60c & & \\ &= 6.60m & & \end{aligned}$$

Question 3

- (a) Using reasoning similar to that used in answering Question 2 a), write an equation for the cost of a call using the competitor's phone.

Show all working

$$\begin{aligned} C &= rt + f \\ &= 60c \times t + f \\ r &= \text{gradient} \\ &= \frac{\text{rise}}{\text{run}} \\ &= \frac{42 - 4}{22 - 2} \\ &= \frac{1 - 0.5}{1.5 - 0.75} \\ &= \frac{0.5}{0.75} \end{aligned}$$

Annotations

Finds linear equations for a graph.

Solves linear equations for both dependent and independent variables.

Mathematics

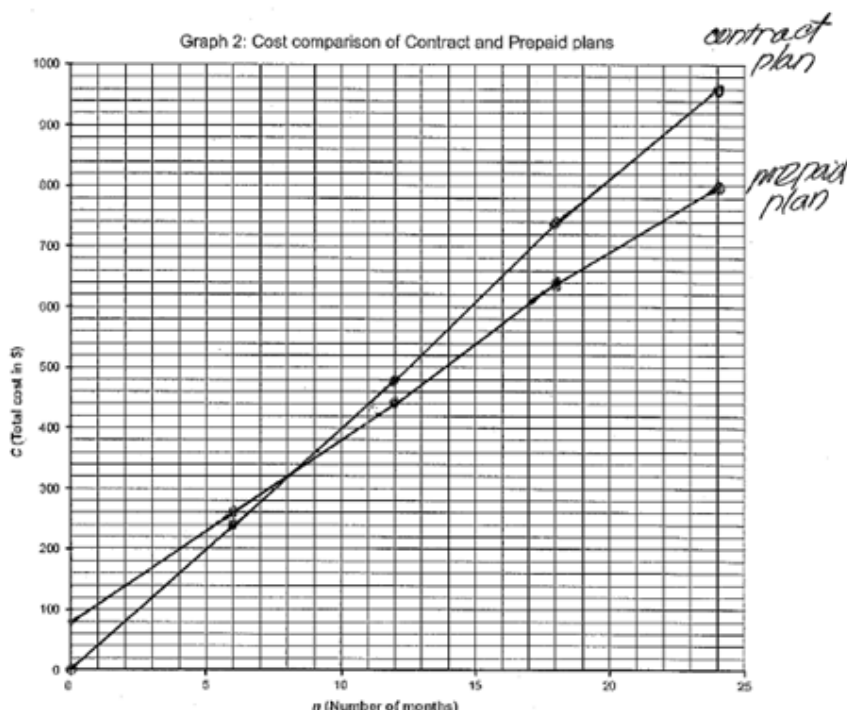
Work sample 1: Financial mathematics – Analysing and choosing phone plans

Table 2

Contract Plan		
Number of months	Total cost including phone (\$)	Ordered pair
n	$C = 40n$	(n, C)
0	0	(0, 0)
6	240	(6, 240)
12	480	(12, 480)
18	720	(18, 720)
24	960	(24, 960)

Contract Plan		
Number of months	Total cost including phone (\$)	Ordered pair
n	$C = 30n + 80$	(n, C)
0	80	(0, 80)
6	260	(6, 260)
12	440	(12, 440)
18	620	(18, 620)
24	800	(24, 800)

- (b) Use the data in Table 2 to plot a set of ordered pairs for each plan on the Graph 2 grid.
- (c) Complete the graph by drawing a line through each set of ordered pairs, and labelling each line.



Annotations

Completes table of values for a given linear relationship.

Lists ordered pairs from table of values.

Graphs linear relationships on the Cartesian plane.

Mathematics

Work sample 1: Financial mathematics – Analysing and choosing phone plans

- (d) What is the total cost of each plan after 24 months?

Contract \$ 960 Prepaid \$ 800

- (e) Write the co-ordinates (the ordered pair) of the point where the lines cross.

(8, 320)

- (f) What information about the two plans does the point of intersection provide?

*Until 8 months, contract plan is cheaper than
pre-paid plan. But after that contract plan starts
to be more expensive.
After 8 months they both cost \$320.*

Question 4

Cost of sending 60 text messages per month	
Contract plan	Prepaid plan
<i>0.20 it would cost \$10 x 50 for 50 SMS because 1000 10 are free</i>	<i>0.20 it costs \$12 x 60 for 60 SMS 12.00 per month</i>
Number of 2-minute calls available per month, using remaining credit	
Contract plan	Prepaid plan
Available credit per month for calls (\$ remaining after sending 60 text messages) <i>+30</i>	Available credit per month for calls (\$ remaining after sending 60 text messages) <i>\$18</i>
Cost of each 2-minute call <i>70c/min \$0.35 0.70 x 2 x 2 0.70 \$1.4 \$1.4/2 min</i>	Cost of each 2-minute call <i>4(40 + 20) .80 \$3.20/2 min x 4 3.20</i>
Number of 2-minute calls per month that could be made using the remaining credit <i>1.4 x 2 1.8 21 calls can be made</i>	Number of 2-minute calls per month that could be made using the remaining credit <i>6 3 18 0.25 10 6 calls can be made</i>

Annotations

*Uses an effective written strategy to carry
out subtraction and division.*

*Models an authentic problem using
provided scaffold.*

Justifies solution.

Mathematics

Work sample 1: Financial mathematics – Analysing and choosing phone plans

Question 5

Which of the two plans gives the best value for money? *Prepaid*

Explain how you made this decision by referring to your answers to Questions 4 and 5.

I made this decision because it costs less overall for the exact same amount of calls and texts with credit.

Annotations

Justifies solution.

Acknowledgment

ACARA acknowledges the contribution of the Queensland Studies Authority for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.

Mathematics

Work sample 2: Algebraic expressions – Equations

Relevant parts of the achievement standard

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Summary of task

Students were presented with a number of two-step equations to solve. They completed the solutions in one period.

Mathematics

Work sample 2: Algebraic expressions – Equations

Annotations

$$\begin{array}{l} o) 9(d+6) = 63 \\ \div 9 \quad \div 9 \\ d+6 = 7 \\ -6 \quad -6 \\ d = 1 \end{array}$$

$$\begin{array}{l} r) 2(3t+5) = 10 \\ \div 2 \quad \div 2 \\ 3t+5 = 5 \\ -5 \quad -5 \\ 3t = 0 \\ \div 3 \quad \div 3 \\ t = 0 \end{array}$$

$$\begin{array}{l} u) 3(2k-9) = 15 \\ \div 3 \quad \div 3 \\ 2k-9 = 5 \\ +9 \quad +9 \\ 2k = 14 \\ \div 2 \quad \div 2 \\ k = 7 \end{array}$$

$$\begin{array}{l} p) 8(y+5) = 80 \\ \div 8 \quad \div 8 \\ y+5 = 10 \\ -5 \quad -5 \\ y = 5 \end{array}$$

$$\begin{array}{l} k) 7(x-4) = 56 \\ \div 7 \quad \div 7 \\ x-4 = 8 \\ +4 \quad +4 \\ x = 12 \end{array}$$

$$\begin{array}{l} f) 3(3a-1) = 42 \\ \div 3 \quad \div 3 \\ 3a-1 = 14 \\ +1 \quad +1 \\ 3a = 15 \\ \div 3 \quad \div 3 \\ a = 5 \end{array}$$

$$\begin{array}{l} s) 6(f-10) = 18 \\ \div 6 \quad \div 6 \\ f-10 = 3 \\ +10 \quad +10 \\ f = 13 \end{array}$$

$$\begin{array}{l} n) 3(4x+3) = 93 \\ \div 3 \quad \div 3 \\ 4x+3 = 31 \\ -3 \quad -3 \\ 4x = 28 \\ \div 4 \quad \div 4 \\ x = 7 \end{array}$$

$$\begin{array}{l} i) 5(2x+3) = 55 \\ \div 5 \quad \div 5 \\ 2x+3 = 11 \\ -3 \quad -3 \\ 2x = 8 \\ \div 2 \quad \div 2 \\ x = 4 \end{array}$$

$$\begin{array}{l} b) 5(m-1) = 10 \\ \div 5 \quad \div 5 \\ m-1 = 2 \\ +1 \quad +1 \\ m = 3 \end{array}$$

$$\begin{array}{l} g) 10(2a-3) = 50 \\ \div 10 \quad \div 10 \\ 2a-3 = 5 \\ +3 \quad +3 \\ 2a = 8 \\ \div 2 \quad \div 2 \\ a = 4 \end{array}$$

$$\begin{array}{l} e) 4(p+7) = 32 \\ \div 4 \quad \div 4 \\ p+7 = 8 \\ -7 \quad -7 \\ p = 1 \end{array}$$

$$\begin{array}{l} e) 4(x+9) = 56 \\ \div 4 \quad \div 4 \\ x+9 = 14 \\ -9 \quad -9 \\ x = 5 \end{array}$$

$$\begin{array}{l} j) 4(x+2) = 40 \\ \div 4 \quad \div 4 \\ x+2 = 10 \\ -2 \quad -2 \\ x = 8 \end{array}$$

$$\begin{array}{l} h) 8(4y-3) = 72 \\ \div 8 \quad \div 8 \\ 4y-3 = 9 \\ +3 \quad +3 \\ 4y = 12 \\ \div 4 \quad \div 4 \\ y = 3 \end{array}$$

$$\begin{array}{l} c) 7(2z+1) = 21 \\ \div 7 \quad \div 7 \\ 2z+1 = 3 \\ -1 \quad -1 \\ 2z = 2 \\ \div 2 \quad \div 2 \\ z = 1 \end{array}$$

Solves an equation using various techniques including order of operation, expansion and simplification.

Acknowledgment

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Mathematics

Work sample 3: Using units of measurement – Rain on my roof

Relevant parts of the achievement standard

By the end of Year 8, students solve everyday problems involving rates, ratios and percentages. They recognise index laws and apply them to whole numbers. They describe rational and irrational numbers. Students solve problems involving profit and loss. They make connections between expanding and factorising algebraic expressions. Students solve problems relating to the volume of prisms. They make sense of time duration in real applications. They identify conditions for the congruence of triangles and deduce the properties of quadrilaterals. Students model authentic situations with two-way tables and Venn diagrams. They choose appropriate language to describe events and experiments. They explain issues related to the collection of data and the effect of outliers on means and medians in that data.

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Summary of task

As part of an extended task, students solved authentic problems relating to volume and surface area.

Mathematics

Work sample 3: Using units of measurement – Rain on my roof

Annotations

Determines how to convert area and depth to amount of rainfall, creating valid expressions, despite calculation error.

Typical roof areas	
Home type	Roof area (m ²)
2 bedroom home	100
3 bedroom home	150
4 bedroom home	200
4 bedroom home	250

Assume the roof is flat.
(This makes little difference to the amount of rain collected)

From the table, choose a home that most closely matches the one you live in (or would like to live in).

My choice of home: 4 Bedroom home

Calculate the amount of rainwater in litres (L) collected by the roof of your chosen home when one millimetre (1 mm) of rain falls.

Roof area = 200 m².
Rainfall = 1 mm.
0.001 m's worth of rain falls.

1 mm = 0.001 m
1 m² holds = 1000 L

200 × 1000 = 200000 L of rain can be held.

$\frac{0.2}{0.2} (0.001 \times 200) = 1 \text{ mm}$
 $0.2 \times 1000 \text{ L} = 20 \text{ L}$



Amount of rainwater collected by the roof when 1 mm of rain falls 20

Acknowledgment

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Mathematics

Work sample 4: Data representation and interpretation – What makes a safe driver?

Relevant parts of the achievement standard

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Summary of task

Students have studied median mode and median data sets.

Students were required to collect data from the Census at Schools database and use it to perform some analysis.

Students were asked to create a stem-and-leaf plot to interpret the data. Students compared the two values (mean and median) and decided which is the best value to use and why.

Mathematics

Work sample 4: Data representation and interpretation – What makes a safe driver?

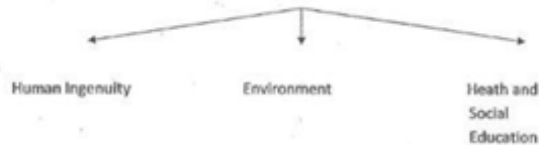
Annotations

Topic Data Analysis

Guiding Question:

What makes a safe driver?

AREAS OF INTERACTION



This investigation will focus on Criteria C and D.

Are You a Safe Driver?

Statisticians collect and analyse data to help plan for the future and solve problems. In 2011 Australia will undertake an enormous data collection called the Census. On the evening of August 9th all households in Australia are required to do a survey to collect information on our population size and characteristics.

In this investigation you are required to collect some data from the Census at Schools database and use it to perform some analysis. Census at Schools collects information from thousands of students across Australia and makes it accessible to students through a sampling process. You can find out more about the Census at Schools by following the link below.

<http://www.abs.gov.au/censusatschool>

In most Australian states and territories young people complete their school

studies in Year 12 when they are 17 or 18 years of age. At this time many of these students are also learning to drive to enable them to operate a motor vehicle.

- Statistics suggest that young drivers are more at risk to having motor vehicle accidents and hence being fatally or seriously injured in such accidents. Give some reasons why this is so. (written in bullet points)
 - not experienced drivers
 - may not be as safe as it gives protection
 - buy cool cars - possibly too safely
 - talk to friends in car or mobile
 - if they are in their "prime" - want to show off

It is often suggested that young females are better drivers than males and hence have fewer road accidents. Two factors that make better drivers are suggested below.

- If your reaction time is better you are a safer driver.
- If you can concentrate better then you are a better driver.

It is suggested that females outperform males in both of these factors and this helps them become better drivers.

You will use the Census at Schools data base to investigate this claim.

Comments on data provided

Mathematics

Work sample 4: Data representation and interpretation – What makes a safe driver?

Annotations

Highlights outliers in the data.

Collects data from a secondary source.

Calculates means and medians of data.

- Use the Random Sampler found on the Census at School site to take a random sample of 20 male students in Year 12 from across Australia. In the space below write down the reaction times for dominant hand and the concentration times. Look at your data carefully to note values that may be abnormal. Circle these values.

reaction time
dominant hand

0.28 0.36
0.26 0.36
0.31 0.34
0.32 0.36
0.28 0.31
0.42 0.42
0.45 0.29
2.31 0.32
0.26 0.7
0.26 0.29

concentration

21 60
29 60
63 did not do
76 47
24 59
27 30
28 38
270 32
41 53
21
52

- Use the Random Sampler found on the Census at School site to take a random sample of 20 female students in Year 12 from across Australia. In the space below write down the reaction times for dominant hand and the concentration times. Look at your data carefully to note values that may be abnormal. Circle these values.

reaction time
dominant hand

0.31 0.46
0.12 0.25
0.28 0.34
0.48 0.35
0.25 1.77
0.57 0.35
0.33 0.32
0.33 0.28
0.35 0.28
0.62 0.57

concentration

35 46
32 44
26 41
52 26
22 28
39 54
37 49
24 49
40
30
39
52

- Calculate the mean and median for the reaction times for male and

males		females	
mean	median	mean	median
0.28	0.28	0.32	0.32
34	34	31	31

- Calculate the mean and median times for the concentration times for male and females.

See above...

Mathematics

Work sample 4:

Data representation and interpretation – What makes a safe driver?

- Use the data in the table to compare the results for males and females. Comment on the proposition that girls are better drivers because they have faster reaction times and better concentration.

	Reaction	Concentration	
male	3.015	195.3286	= better time
female	1.759	196	

I have added the means for each category to give me a clear idea of times for each sex. The Reaction time was extremely faster for women. The Concentration time is actually faster for men. Although it is faster, it is not by very much at all.

- Identify some other factors that could account for differences between the driving abilities of males and females.
 - there may have been distractions when they did this test
 - people may have had different amounts of sleep.
 - different abilities (reflexes etc.)

- Prepare a back to back stem and leaf plot for the reaction times. Compare and contrast the plots for the male and female students. Make sure your scale is indicated.

male	↑	female
4.01	.3	0.1, 6, 64
	.4	25
40.13	.5	
	.6	
	.7	
	.8	
	.9	
32	1.0	
	1.1	
(mean numbers) plotted above		

The female students were all fairly similar reaction times whilst the males were spread out. The males also had a lot higher readings.

Annotations

Examines the data and draws some conclusions on compared reaction and concentration times.

Presents data in a stem-and-leaf plot and draws similar conclusions.

Acknowledgment

ACARA acknowledges the contribution of the Department of Education WA for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.

Mathematics

Work sample 5: Data representation and interpretation – Analysing OHS risks

Relevant parts of the achievement standard

By the end of Year 8, students solve everyday problems involving rates, ratios and percentages. They recognise index laws and apply them to whole numbers. They describe rational and irrational numbers. Students solve problems involving profit and loss. They make connections between expanding and factorising algebraic expressions. Students solve problems relating to the volume of prisms. They make sense of time duration in real applications. They identify conditions for the congruence of triangles and deduce the properties of quadrilaterals. Students model authentic situations with two-way tables and Venn diagrams. They choose appropriate language to describe events and experiments. They explain issues related to the collection of data and the effect of outliers on means and medians in that data.

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Summary of task

Students had been collecting and analysing data. Students were required to complete the task below to demonstrate their understanding. The data is provided as part of the sample.

Mathematics

Work sample 5: Data representation and interpretation – Analysing OHS risks

Task A: Organising and interpreting data

- 1) a) Organise the data into two frequency distribution tables (one for each month).
b) Calculate the range, mode, median, and mean for each month.
c) Draw a frequency histogram for each month.
d) You will have to decide which statistical measure your manager used to claim it was safer, and decide which measure should have been used to give a better indication of current workplace safety.
- 2) You also need to investigate his claim that burns have decreased by 12%. How has he made this claim, and is he correct?

Task B: Your Feedback

Using your findings from Task A, produce a written report to the manager and your co-workers explaining the findings of your investigation.

You will need to include all the data and results necessary to demonstrate and explain who was correct, the manager or the workers.

Task C: In-class Task

For this section you will need to revise Frequency Polygons and Stem-and-leaf plots as well as the skills used in this assignment.

Data

Number of Reported accidents:
Last month

1 2 0 0 1
1 1 3 2 1
4 3 0 1 0
3 0 1 1 0
0 1 1 1 7
2 0 2 0 1
1

Number of Reported accidents:
This month

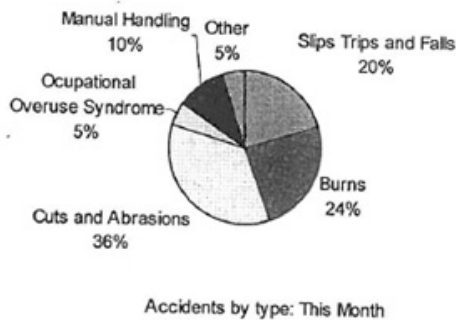
0 0 0 0 0
4 0 0 0 4
0 4 0 0 5
0 0 2 4 1
0 0 0 0 0
0 0 2 0 0

Accidents by Type	Last month	This month
Slips Trips and Falls	6	12
Burns	15	14
Cuts and Abrasions	15	21
Occupational Overuse syndrome	2	3
Manual Handling	2	6
Other	1	3
Total	41	59

Mathematics

Work sample 5: Data representation and interpretation – Analysing OHS risks

Background



Mathematics

Work sample 5: Data representation and interpretation – Analysing OHS risks

Annotations

Task A

1 a) Reported accidents last month

Score	Tally	Frequency	fx
0		4	$0 \times 4 = 0$
1		5	$1 \times 5 = 5$
2		4	$2 \times 4 = 8$
3		3	$3 \times 3 = 9$
4		1	$4 \times 1 = 4$
5			
6			
7		1	$7 \times 1 = 7$
Total		21	33

Summary:

31 days last month.
41 accidents last month.

Score	Tally	Frequency	fx
0		5	$0 \times 5 = 0$
1		1	$1 \times 1 = 1$
2		1	$2 \times 1 = 2$
3		4	$3 \times 4 = 12$
4		4	$4 \times 4 = 16$
5		1	$5 \times 1 = 5$
6		2	$6 \times 2 = 12$
7			
8			
Total		20	58

Summary

30 days this month
59 accidents this month.

1.2

1.6) Reported Accidents Last month.

Range (Difference between highest and lowest scores): $7 - 0 = 7$ Range = 7

Mode (Score with highest frequency): 1 (with 13 occurrences)

Median (Middle Score): 1
 00000000 11111111 2222 333 4 7
 Median = 1

Mean (Average): $\frac{\sum fx}{\sum f}$
 $= \frac{51}{31}$
 $= 1.32$

Calculates mean, median, mode and range after organising data into a frequency distribution table.

Mathematics

Work sample 5: Data representation and interpretation – Analysing OHS risks

Annotations

Task B (cont).

b) Reported Accidents this month

Range (Difference between highest and lowest score): $8 - 0 = 8$ Range = 8

Mode (Score with highest frequency): 0 (with 15 occurrences)

Median (Middle Score): 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 3 3 3 3 4 4 4 4 5 6 6 8

$$\text{Median} = \frac{0+1}{2}$$

$$= \frac{1}{2}$$

$$= 0.5$$

$$= 0.5$$

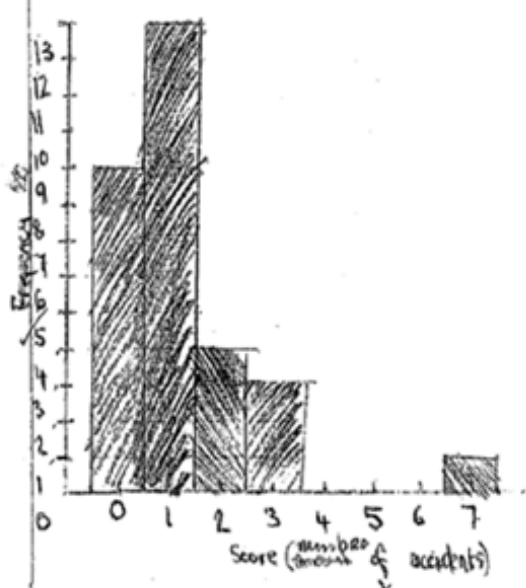
$\therefore$ median is 0.5

Mean (Average): $\frac{\sum x}{\sum f}$

$$= \frac{59}{31}$$

$$= 1.9$$

c) Reported Accidents last month



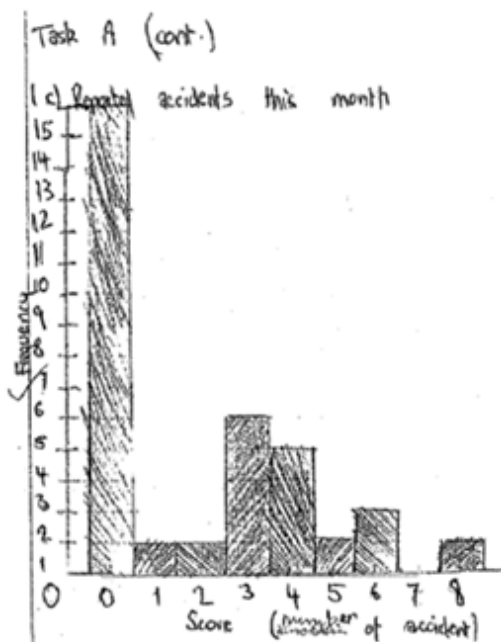
Calculates median and mean.

Creates a histogram of reported accidents.

Mathematics

Work sample 5: Data representation and interpretation – Analysing OHS risks

Annotations



1.d) I think the statistical measure that the manager used to claim that work place safety was better is the increase of no reported accidents in the two months. The increase of no reported accidents is 67%. I think a better way of representing that it is now safer to work at Burger Barn would have been the decrease of the amount of accidents per day, in particular the decrease in 1, 2 and 7 reported accidents per day over a month. The decrease as a percentage for 1 accident per day is 92% the decrease as a percentage for 2 reported accidents per day is 75%. The decrease for 7 accidents per day as a percentage is 100%. If I was the manager I would have used these figures because they would be more convincing than the 67% increase of no reported accidents.

It is not safer
mean $1.3 \Rightarrow 1.97$

Uses mathematics to justify conclusions.

Mathematics

Work sample 5: Data representation and interpretation – Analysing OHS risks

Annotations

Expresses one quantity as a percentage of another.

Uses percentages to compare data sets.

Task A (cont.)

Q2. The manager's claim is incorrect, burns have not decrease by 12%. I think the manager didn't do one of his calculations right which resulted in his incorrect claim. It is $93\frac{1}{3}\%$.

15. The way to figure this out is this: $\frac{14}{15} = 93.3 \times 100 = 93.3 = 93\frac{1}{3}\%$

To figure out how much the amount of burns decrease by is: $15 - 14 = 1$

$\frac{1}{15} = 0.06$
 $0.06 \times 100 = 6.6 = 6\frac{2}{3}\%$

Therefore the amount of burns only decrease by 6.6% or $6\frac{2}{3}\%$ not 12% .

Acknowledgment

ACARA acknowledges the contribution of trial school teachers and students for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.

Mathematics

Work sample 6: Circumference and area of circle

Relevant parts of the achievement standard

By the end of Year 8, students solve everyday problems involving rates, ratios and percentages. They recognise index laws and apply them to whole numbers. They describe rational and irrational numbers. Students solve problems involving profit and loss. They make connections between expanding and factorising algebraic expressions. Students solve problems relating to the volume of prisms. They make sense of time duration in real applications. They identify conditions for the congruence of triangles and deduce the properties of quadrilaterals. Students model authentic situations with two-way tables and Venn diagrams. They choose appropriate language to describe events and experiments. They explain issues related to the collection of data and the effect of outliers on means and medians in that data.

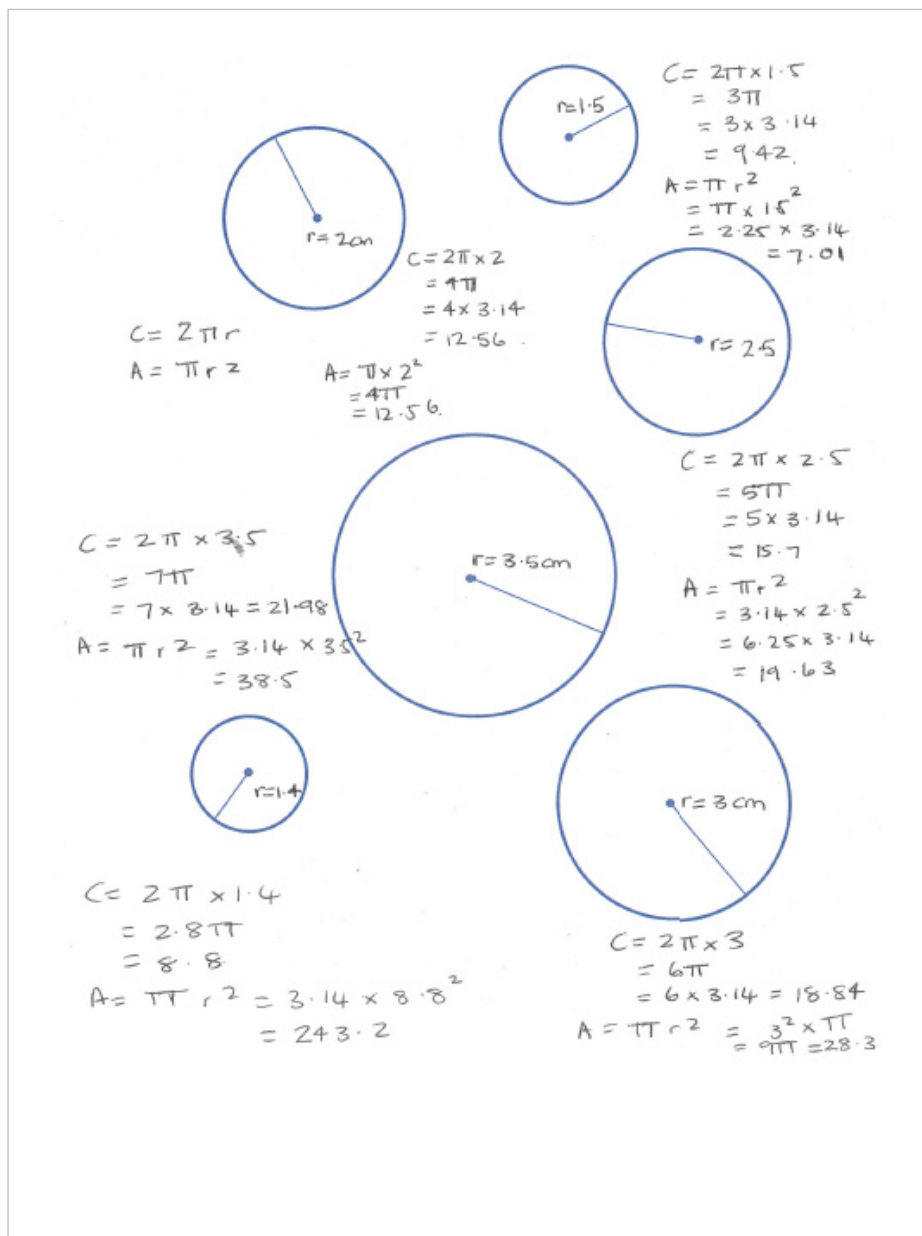
Students use efficient mental and written strategies to carry out the four operations with integers. They simplify a variety of algebraic expressions. They solve linear equations and graph linear relationships on the Cartesian plane. Students convert between units of measurement for area and volume. They perform calculations to determine perimeter and area of parallelograms, rhombuses and kites. They name the features of circles and calculate the areas and circumferences of circles. Students determine complementary events and calculate the sum of probabilities.

Summary of task

Students were required to complete a practice sheet of calculations for the circumference and area of different circles.

Mathematics

Work sample 6: Circumference and area of circle



Annotations

Calculates to 2 decimal places the areas and circumferences of different circles without mention of units.

Identifies the radius by correct substitution.

Acknowledgment

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Mathematics

Work sample 7: Index laws

Relevant parts of the achievement standard

By the end of Year 8, students solve everyday problems involving rates, ratios and percentages. They recognise index laws and apply them to whole numbers. They describe rational and irrational numbers. Students solve problems involving profit and loss. They make connections between expanding and factorising algebraic expressions. Students solve problems relating to the volume of prisms. They make sense of time duration in real applications. They identify conditions for the congruence of triangles and deduce the properties of quadrilaterals. Students model authentic situations with two-way tables and Venn diagrams. They choose appropriate language to describe events and experiments. They explain issues related to the collection of data and the effect of outliers on means and medians in that data.

Students use efficient mental and written strategies to carry out the four operations with integers. They simplify a variety of algebraic expressions. They solve linear equations and graph linear relationships on the Cartesian plane. Students convert between units of measurement for area and volume. They perform calculations to determine perimeter and area of parallelograms, rhombuses and kites. They name the features of circles and calculate the areas and circumferences of circles. Students determine complementary events and calculate the sum of probabilities.

Summary of task

Students were required to answer questions relating to the use of index laws to simplify number sentences

Mathematics

Work sample 7: Index laws

1. Write each of these in index form.

$$5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 = 5^9$$

$$11 \times 11 \times 11 = 11^3$$

2. Write each of these multiplications in index form.

$$7 \times 7 \times 7 \times 9 \times 9 \times 9 \times 9 = 7^3 \times 9^4$$

$$3 \times 3 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 = 3^2 \times 5^6$$

3. Write these in expanded form and provide solution.

$$3^2 \quad 9^4 \quad 2^5 \quad 4^3 \quad 1^5$$

$$3 \times 3 = 9$$

$$9 \times 9 \times 9 \times 9 = 6561$$

$$2 \times 2 \times 2 \times 2 \times 2 = 32$$

$$4 \times 4 \times 4 = 64$$

$$1 \times 1 \times 1 \times 1 \times 1 = 1$$

4. Write each in expanded form and calculate its value.

$$2^3 \times 4^2 \quad 3^4 \times 5^2 \quad 10^2 \times 3^3 \quad 6^2 \times 3^2$$

$$8 \times 16 \quad 81 \times 25 \quad 100 \times 27 \quad 36 \times 9$$

$$= 128 \quad = 2025 \quad 2700 \quad = 324$$

Annotations

Applies index laws to simplify whole number expressions.

Applies index laws to expand an expression.

Acknowledgment

ACARA acknowledges the contribution of trial school teachers and students for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.

Mathematics

Work sample 8: Discounts, profit and loss

Relevant parts of the achievement standard

By the end of Year 8, students solve everyday problems involving rates, ratios and percentages. They recognise index laws and apply them to whole numbers. They describe rational and irrational numbers. Students solve problems involving profit and loss. They make connections between expanding and factorising algebraic expressions. Students solve problems relating to the volume of prisms. They make sense of time duration in real applications. They identify conditions for the congruence of triangles and deduce the properties of quadrilaterals. Students model authentic situations with two-way tables and Venn diagrams. They choose appropriate language to describe events and experiments. They explain issues related to the collection of data and the effect of outliers on means and medians in that data.

Students use efficient mental and written strategies to carry out the four operations with integers. They simplify a variety of algebraic expressions. They solve linear equations and graph linear relationships on the Cartesian plane. Students convert between units of measurement for area and volume. They perform calculations to determine perimeter and area of parallelograms, rhombuses and kites. They name the features of circles and calculate the areas and circumferences of circles. Students determine complementary events and calculate the sum of probabilities.

Summary of task

Students were required to complete a summative task which asked them to calculate the costs of items including GST, calculate the percentage discount on items, and justify financial decisions.

Mathematics

Work sample 8: Discounts, profit and loss

1. Add the GST (10%) to the following items to calculate the actual cost:

- a. A hammer that costs \$10.00 = $\$10 + \$1 = \$11.00$
 b. An iPad that costs \$697.00 = $\$697 + \$69.70 = \$766.70$
 c. A bike that costs \$923.50 = $\$923.50 + \$92.35 = \$1015.85$

2. The following items are on sale and you are in charge of marking the new prices taking away the discount. Your boss allows you to use a calculator for this task. Please show your calculations.

- a. Shirt that costs \$25.00 at 20% off
 $\frac{20}{100} \times 25.00 = 0.2 \times 25 = 5$
 $\$25 - 5 = \20
 b. A pair of boxer shorts that cost \$16.50 at 25% off
 $0.25 \times \$16.50 = \4.13
 $\$16.50 - \$4.13 = \$12.37$
 c. A dress that costs \$79.97 at 30% off
 $0.30 \times \$79.97 = \23.99
 $\$79.97 - \$23.99 = \$55.98$

3. Costco is having a sale on bananas where you can buy 50 for \$8 or you can buy 15 bananas for \$3.50. Which option do you believe to be the best value and why?

$$\begin{array}{r} 15 \text{ up } \$3.50 / 15 \\ \hline = 0.233 \text{ c each} \end{array} \quad \begin{array}{r} \$8 / 50 \\ \hline = 0.16 \text{ c each} \end{array}$$

The best value would be 50 for \$8. They are only 16c each while if you buy 15 bananas they are 23c each. You get a better discount the more you buy.

4. A Shopkeeper buys gadgets for \$25. He wants to make a 30% profit on the gadgets. For what price does he need to sell the gadgets?

$$\begin{array}{r} \text{Profit} = 30\% \text{ of } \$25 \\ = \$7.50 \\ \text{Selling price} = \$25 + \$7.50 \\ \hline = \$32.50 \end{array}$$

Annotations

Calculates percentages and correctly calculates GST.

Calculates new price after discount.

Calculates the best process and justifies answer using reasoning.

Accurately calculates profit and selling price.

Acknowledgment

ACARA acknowledges the contribution of trial school teachers and students for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.

Mathematics

Work sample 9: Venn diagrams and two way tables

Relevant parts of the achievement standard

By the end of Year 8, students solve everyday problems involving rates, ratios and percentages. They recognise index laws and apply them to whole numbers. They describe rational and irrational numbers. Students solve problems involving profit and loss. They make connections between expanding and factorising algebraic expressions. Students solve problems relating to the volume of prisms. They make sense of time duration in real applications. They identify conditions for the congruence of triangles and deduce the properties of quadrilaterals. Students model authentic situations with two-way tables and Venn diagrams. They choose appropriate language to describe events and experiments. They explain issues related to the collection of data and the effect of outliers on means and medians in that data.

Students use efficient mental and written strategies to carry out the four operations with integers. They simplify a variety of algebraic expressions. They solve linear equations and graph linear relationships on the Cartesian plane. Students convert between units of measurement for area and volume. They perform calculations to determine perimeter and area of parallelograms, rhombuses and kites. They name the features of circles and calculate the areas and circumferences of circles. Students determine complementary events and calculate the sum of probabilities.

Summary of task

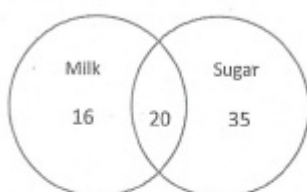
Students have been using Venn diagrams and two way tables to model information and hence draw conclusions. Students were required to complete the activity involving Venn diagrams.

Mathematics

Work sample 9: Venn diagrams and two way tables

- Stephen asked 100 coffee drinkers whether they like milk or sugar in their coffee.
- According to the diagram below, how many like

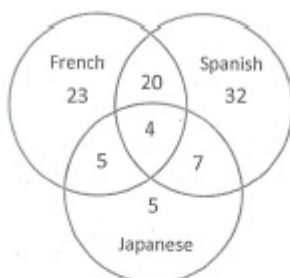
- Milk?
- Sugar?
- Sugar but not milk?
- Milk but not sugar?
- Milk and sugar?
- Milk or sugar?



- a) $16 + 20 = 36$
 b) $20 + 35 = 55$
 c) 35
 d) 16
 e) 20
 f) $16 + 20 + 35 = 71$

- From the Venn diagram below how many people study

- French and Spanish
- French, Spanish and Japanese
- French and Japanese



- a) 20
 b) 4
 c) 5

- Copy and complete the two-way table for Year 9 transport survey

	Male	Female	Total
Walk	34	46	80
Car	28	17	45
Bus	13	12	27
Cycle	52	17	69
Total	129	92	221

Annotations

Interprets and uses information supplied in Venn diagrams.

Completes a two way table from the given information.

Acknowledgment

ACARA acknowledges the contribution of trial school teachers and students for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.