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
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.
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.
Work sample 1: Financial mathematics – Analysing and choosing phone plans
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>
<thead>
<tr>
<th>Airtime (The actual time spent talking on the phone)</th>
<th>Total cost of call with a GOMO phone</th>
<th>Total cost of call with a competitor’s phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 minute</td>
<td>$0.40</td>
<td>$1.00</td>
</tr>
<tr>
<td>4 minutes</td>
<td>$2.60</td>
<td>$3.10</td>
</tr>
</tbody>
</table>

(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.

\[
\text{Gradient} = \frac{\Delta y}{\Delta x} = \frac{0.6 - 0.3}{1 - 0.5} = \frac{0.3}{0.5} = 0.6
\]

Show all working:

\[
\begin{align*}
\text{Gradient} &= \frac{0.6 - 0.3}{1 - 0.5} \\
&= \frac{0.3}{0.5} \\
&= 0.6
\end{align*}
\]

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

Question 2
(a) Rewrite the equation \( C = rt + f \), replacing \( r \) and \( t \) with the values you found when answering Question 1 for the call rate and connection fee for a GOMO phone.

\[ C = 600 + 20c \]

(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

\[ \begin{align*}
C &= rt + f \\
C &= 600 + 20c \\
C &= 600 + 20 \times 6 \\
C &= \text{6,200} \\
\end{align*} \]

(c) Using the equation you wrote in your answer to Question 2 (a), find how long you can talk (\( t \)) for \$16, using a GOMO phone.

Show all working

\[ \begin{align*}
C &= rt + f \\
C &= 600 + 20c \\
16 &= 60t \\
60t &= 6.1617 \\
t &= \text{0.1027 hours} \\
\end{align*} \]

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

\[ \begin{align*}
C &= rt + f \\
C &= a6 \times t + f \\
\end{align*} \]
Work sample 1:  
Financial mathematics – Analysing and choosing phone plans

<table>
<thead>
<tr>
<th>Number of months</th>
<th>Total cost including phone ($)</th>
<th>Ordered pair</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>C = 40n</td>
<td>(n, C)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>(0, 0)</td>
</tr>
<tr>
<td>6</td>
<td>240</td>
<td>(6, 240)</td>
</tr>
<tr>
<td>12</td>
<td>480</td>
<td>(12, 480)</td>
</tr>
<tr>
<td>18</td>
<td>720</td>
<td>(18, 720)</td>
</tr>
<tr>
<td>24</td>
<td>960</td>
<td>(24, 960)</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Contract</th>
<th>$960</th>
<th>$900</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepaid</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

(x, y) (4, 1200)

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

Until 12 months the contract plan is cheaper than the prepaid plan. But after that the contract plan starts to be more expensive.

After 24 months they both cost $370.

Question 4

<table>
<thead>
<tr>
<th>Cost of sending 60 text messages per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract plan</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>500</td>
</tr>
<tr>
<td>1000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of 2-minute calls available per month, using remaining credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract plan</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Available credit per month for calls ($ remaining after sending 60 text messages)</td>
</tr>
<tr>
<td>Cost of each 2-minute call</td>
</tr>
<tr>
<td>$0.25</td>
</tr>
<tr>
<td>$0.08</td>
</tr>
<tr>
<td>Number of 2-minute calls per month that could be made using the remaining credit</td>
</tr>
<tr>
<td>Number of 2-minute calls per month that could be made using the remaining credit</td>
</tr>
</tbody>
</table>

Annotations

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

Models an authentic problem using provided scaffold.

Justifies solution.
Work sample 1: 
**Financial mathematics – Analysing and choosing phone plans**

**Question 5**
Which of the two plans gives the best value for money? 

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.
Work sample 2:  
**Algebraic expressions – Equations**

**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 presented with a number of two-step equations to solve. They completed the solutions in one period.
Work sample 2: Algebraic expressions – Equations

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

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

As part of an extended task, students solved authentic problems relating to volume and surface area.
Work sample 3:
Using units of measurement – Rain on my roof

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.

\[ \text{Roof area} = 200 \text{ m}^2 \]
\[ \text{Rainfall} = 1 \text{ mm} \]

\[ 200 \times 1000 = 200000 \text{ L of rain can be held.} \]

\[ \frac{0.2 \times (0.004 \times 200)}{0.2 \times 1000} = 20 \text{ L} \]

Amount of rainwater collected by the roof when 1 mm of rain falls: 20
**Work sample 4:**
Data representation and interpretation – What makes a safe driver?

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

Topic Data Analysis

Guiding Question:
What makes a safe driver?

AREAS OF INTERACTION

Human Ingenuity
Environment
Health and Social Education

This investigation will focus on Criteria C and D.

Are You a Safe Driver?

Statistics 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.


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. (Give 3 in a short point)

1. Not experienced drivers
2. May not be as safe as it gives recklessness
3. Gay and care – a possibility how safely
4. Drink and drive in con. or mobile
5. If they are in their prime, want to show off

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

1. If your reaction time is better you are a safer driver.
2. If you can concentrate better than 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 database to investigate this claim.
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.
Work sample 4: Data representation and interpretation – What makes a safe driver?

Annotations

- Examine 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.
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.

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 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.
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

<table>
<thead>
<tr>
<th>Number of Reported accidents:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Last month</td>
<td>This month</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accidents by Type</th>
<th>Last month</th>
<th>This month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slips Trips and Falls</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Burns</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Cuts and Abrasions</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>Occupational Overuse syndrome</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Manual Handling</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>59</td>
</tr>
</tbody>
</table>
Work sample 5:
Data representation and interpretation – Analysing OHS risks
Work sample 5: Data representation and interpretation – Analysing OHS risks

Calculates mean, median, mode and range after organising data into a frequency distribution table.
Work sample 5: Data representation and interpretation – Analysing OHS risks

Calculates median and mean.

Creates a histogram of reported accidents.
Work sample 5:
**Data representation and interpretation – Analysing OHS risks**

Uses mathematics to justify conclusions.

1. a) I think the statistical measure that the manager used to claim that workplace safety was better is the increase of no reported accidents in the two months. The decrease of no report 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 94%. The decrease as a percentage for 7 reported accidents per day is 37%. 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

\[
\text{mean } 1.3 \rightarrow 1.97
\]
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.
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.
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
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.
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.
Work sample 7: Index laws

1. Write each of these in index form.
   \[ 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 = 5^9 \]
   \[ 11 \times 11 \times 11 = 11^3 \]

2. Write each of these multiplications in index form.
   \[ 7 \times 7 \times 9 \times 9 \times 9 \times 9 = 7^3 \times 9^4 \]
   \[ 3 \times 3 \times 5 \times 5 \times 5 \times 5 = 3^2 \times 5^6 \]

3. Write these in expanded form and provide solution.
   \[ 3^2 \times 9^4 \times 2^5 \times 4^3 \times 1^5 \]
   \[ 3 \times 3 = 9 \]
   \[ 9 \times 9 \times 9 \times 9 = 6,561 \]
   \[ 2 \times 2 \times 2 \times 2 \times 2 = 32 \]
   \[ 4 \times 4 \times 4 = 64 \]
   \[ 1 \times 1 \times 1 \times 1 \times 1 = 1 \]

4. Write each in expanded form and calculate its value.
   \[ 2^3 \times 4^2 \quad 3^4 \times 5^2 \quad 10^2 \times 3^3 \quad 6^2 \times 3^2 \]
   \[ 8 \times 16 \quad 81 \times 25 \quad 100 \times 27 \quad 36 \times 9 \]
   \[ = 128 \quad = 2,025 \quad = 2,700 \quad = 324 \]

Annotations

Applies index laws to simplify whole number expressions.

Applies index laws to expand an expression.
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.
Work sample 8: Discounts, profit and loss

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.
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.
Work sample 9: Venn diagrams and two way tables

1. Stephen asked 100 coffee drinkers whether they like milk or sugar in their coffee.
2. According to the diagram below, how many like
   a. Milk?
   b. Sugar?
   c. Sugar but not milk?
   d. Milk but not sugar?
   e. Milk and sugar?
   f. Milk or sugar?

   ![Venn diagram]

   \[
   \begin{align*}
   a) \quad & 16 + 20 = 36 \\
   b) \quad & 20 + 36 = 56 \\
   c) \quad & 35 \\
   d) \quad & 16 \\
   e) \quad & 20 \\
   f) \quad & 16 + 20 + 35 = 71 \\
   \end{align*}
   \]

3. From the Venn diagram below how many people study
   a. French and Spanish
   b. French, Spanish and Japanese
   c. French and Japanese

   ![Venn diagram]

   \[
   \begin{align*}
   a) \quad & 20 \\
   b) \quad & 4 \\
   c) \quad & 5 \\
   \end{align*}
   \]

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

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>34</td>
<td>16</td>
<td>50</td>
</tr>
<tr>
<td>Car</td>
<td>28</td>
<td>17</td>
<td>45</td>
</tr>
<tr>
<td>Bus</td>
<td>15</td>
<td>12</td>
<td>27</td>
</tr>
<tr>
<td>Cycle</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>32</td>
<td>84</td>
</tr>
</tbody>
</table>

Annotations

Interprets and uses information supplied in Venn diagrams.

Completes a two way table from the given information.