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 10 MATHEMATICS

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

- Sample 1: Maths assignment
- Sample 2: Number plane graphs
- Sample 3: Linear equations – Taxi fares
- Sample 4: Similar or congruent triangles
- Sample 5: Trigonometry assignment
- Sample 6: Algebraic expressions
- Sample 7: Algebraic fractions

This portfolio of student work shows the completion of tables of values and the ability to draw graphs of linear and non-linear relationships and explain the features of the graph (WS3). They make the connections between algebraic and graphical representation of relations (WS1, WS2, WS3). The student collects data from an experiment, uses mathematical knowledge and skills to investigate the data and uses reasoning to draw conclusions (WS4, WS7). The student identifies similar and congruent triangles and demonstrates understanding of similarity and congruence (WS4). The student solves simple algebraic fractions with the four operations (WS7) and expands binomial expressions (WS6). The student understands basic right-angled triangle trigonometry (WS5), labeling sides of a triangle and writing the ratios for a given triangle. The student applies knowledge to problems involving angles of elevation and depression and three figure bearings (WS5). The student describes bivariate data where the independent variable is time and the relationships between two continuous variables and evaluates statistical reports (WS5).
Mathematics

The following aspect/s of the achievement standard is not evident in this portfolio:

- recognise the connection between simple and compound interest
- solve surface area and volume problems relating to composite solids
- recognise the relationships between parallel and perpendicular lines
- solve pairs of simultaneous equations
- use trigonometry to calculate unknown angles in right-angled triangles
- list outcomes for multi-step chance experiments and assign probabilities for these experiments
- calculate quartiles and inter-quartile ranges.
Work sample 1: Maths assignment

Relevant parts of the achievement standard

By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports.

Students expand binomial expressions and factorise monic quadratic expressions. They find unknown values after substitution into formulas. They perform the four operations with simple algebraic fractions. Students solve simple quadratic equations and pairs of simultaneous equations. They use triangle and angle properties to prove congruence and similarity. Students use trigonometry to calculate unknown angles in right-angled triangles. Students list outcomes for multi-step chance experiments and assign probabilities for these experiments. They calculate quartiles and inter-quartile ranges.

Summary of task

This group assignment was completed at the end of a semester. It assessed several topics including quadratic equations, bivariate data, statistics and algebraic graphical representations.

In this assignment students collected data from an experiment. The assignment measured the student's understanding of the interrelationships of mathematical concepts and reasoning to draw conclusions based on the data. The students were given one week to complete the task.
Mathematics

Work sample 1: Maths assignment

Annotations

Demonstrates the ability to design investigations and plan their approach to answering a question.

Interrogates their solutions and uses a number of different approaches to subject them to rigorous scrutiny, successfully verifying that their answers are reasonable.

Chooses appropriate methods and approximations.

Identifies a variety of variables that impact upon the results of trials.

Presents meticulous records of trials and working.
Work sample 1: Maths assignment

Annotations

Collects, records and graphs data.

Determines averages.
Work sample 1: Maths assignment

Annotations

Interprets data to draw reasonable conclusions.

Constructs a scatter graph of data (using appropriate technology).
Draws a curve of best fit for data, using appropriate technology.

Finds the equation of parabola, using appropriate technology.

Uses the equation to find the ‘x’ coordinate of the turning point and so answers the original question about length of whirly bird that gives maximum time in the air.
Work sample 1: Maths assignment

predictions the whirlybird did in fact stay in the air for the longest period of time on an average of 2.21 seconds.

Part B

a) Can a different number of regions be formed with two tangents? How?
b) What is the least number of regions that can be formed with three tangents?
c) What is the greatest number of regions and the least number of regions that can be produced?
d) Using more tangents, investigate the greatest and least number of regions that can be produced. Display your results in a table.

Knowledge and Procedures

a) Yes a different number of regions can be formed with two tangents. This can be done by putting two parallel lines next to a circle so they do not join, since this would result in more regions. See picture below.

b) The least number of tangents that can be formed with three tangents is 9. See picture below.

Annotations

Uses the concept of tangents and regions.
Investigates systematically the relationship between the number of tangents and the number of regions.

Tabulates data.

Describes processes of investigation.
Mathematics

Work sample 1:
Maths assignment

Annotations

Links to other contexts by referring to triangular numbers and Pascal’s triangle.

Uses functions to predict later results.

Finds a quadratic expression to describe the relationship between the tangents and regions.

Connects data, algebraic functions and graphs.
Work sample 1: Maths assignment

Using the relationship that was discovered above (\(n = 0.5n^2 + 1.5n + 1\)) one could now determine how many tangents would be needed to form 253 regions. By rearranging my formula one could find that:

Number of regions (R) = 0.5n^2 + 1.5n + 1

When R=253: 253 = 0.5n^2 + 1.5n + 1

Therefore: 0.5n^2 + 1.5n - 252 = 0

(By using the quadratic formula)

\[x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}\]

I found that a = 0.5, b = 1.5, c = -252

therefore \(x = \frac{-1.5 \pm \sqrt{1.5^2 - 4(0.5)(-252)}}{2 \times 0.5}\)

Therefore \(x = -1.5 \pm \sqrt{506.25}\)

so \(x = -1.5 + 22.5\) or \(x = -1.5 - 22.5\)

So \(x = 21\) or \(x = -24\)

Therefore \(x = 21\) (Ignore negative)

As a result 21 tangents formed a maximum of 253 regions. I checked my answer by subbing 21 into the question \(n = 0.5n^2 + 1.5n + 1: 21 = 0.5(21)^2 + 1.5(21) + 1\)

21 = 253

The answer was double checked by going through the table below (Figure 10) and the answer is correct. Refer to table below.

(Figure 10)

<table>
<thead>
<tr>
<th>Tangents</th>
<th>Maximum number of regions</th>
<th>Increased by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>28</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>36</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>45</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>55</td>
<td>10</td>
</tr>
</tbody>
</table>

Uses knowledge of quadratic functions to solve problems.
Investigates and models an authentic situation and formulates a general formula.
Mathematics

Work sample 1:
Maths assignment

Appendix 1:

By checking the answers for the maximum number of regions for tangents ranging from 1 to 6 one must sub the tangent and maximum number of regions into the equation $n = 0.5n^2 + 1.5n + 1$. With $n$ representing the tangents and the number equalling the regions.

For 1 tangents and 3 maximum number of regions:

$n = 0.5n^2 + 1.5n + 1$

$1 = 0.5(1)^2 + 1.5(1) + 1$

$1 = 3$ so therefore answer is correct

For 2 tangents and 6 maximum number of regions:

$n = 0.5n^2 + 1.5n + 1$

$2 = 0.5(2)^2 + 1.5(2) + 1$

$2 = 6$ so therefore answer is correct

For 3 tangents and 10 maximum number of regions:

$n = 0.5n^2 + 1.5n + 1$

$3 = 0.5(3)^2 + 1.5(3) + 1$

$3 = 10$ so therefore answer is correct

For 4 tangents and 15 maximum number of regions:

$n = 0.5n^2 + 1.5n + 1$

$4 = 0.5(4)^2 + 1.5(4) + 1$

$4 = 15$ so therefore answer is correct

For 5 tangents and 21 maximum number of regions:

$n = 0.5n^2 + 1.5n + 1$

$5 = 0.5(5)^2 + 1.5(5) + 1$

$5 = 21$ so therefore answer is correct

For 6 tangents and 28 maximum number of regions:

$n = 0.5n^2 + 1.5n + 1$

$6 = 0.5(6)^2 + 1.5(6) + 1$

$6 = 28$ so therefore answer is correct

By checking the answers for the minimum number of regions for even numbers (2, 4, 6) one must sub the tangent and minimum number of regions into the equation $x = 0.5x^2 + 1x + 1$. With $x$ representing the tangents and the number equalling the regions.

For 2 tangents and 5 minimum number of regions:

$x = 0.5x^2 + 1x + 1$

$2 = 0.5(2)^2 + 1(2) + 1$

$2 = 5$ so therefore the answer is correct

For 4 tangents and 13 minimum number of regions:

$x = 0.5x^2 + 1x + 1$

$4 = 0.5(4)^2 + 1(4) + 1$

$4 = 13$ so therefore the answer is correct

For 6 tangents and 25 minimum number of regions:

$x = 0.5x^2 + 1x + 1$

$6 = 0.5(6)^2 + 1(6) + 1$

$6 = 25$ so therefore the answer is correct

Tests formula rigorously.
Work sample 1: Maths assignment

Annotations

Provides evidence of investigative process.
Annotations

Provides evidence of investigative process.
Work sample 1: Maths assignment

Annotations

Provides evidence of investigative process.

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 2: 
Number plane graphs

Relevant parts of the achievement standard

By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports.

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Summary of task

Students have been learning about non-linear relationships. In this task with guided questions they were asked to:

- complete tables and values
- draw graphs of non-linear relationships using their tables of values
- explain features of graphs and equations
- match graphs to their equations
- use the correct names for non-linear relations.
1.
(a) Complete the table of values for the graph $y = x^2 - 5$.

<table>
<thead>
<tr>
<th>$x$</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) Plot the points from the table above to graph $y = x^2 - 5$.

(c) Explain using words and/or the number plane above how the graph with equation $y = x^2 - 5$ would differ from the graph of $y = 2x^2 - 5$.

<table>
<thead>
<tr>
<th>$x$</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>13</td>
<td>3</td>
<td>-2</td>
<td>5</td>
<td>-3</td>
<td>3</td>
<td>13</td>
</tr>
</tbody>
</table>

The 2 before the $x^2$ makes the graph steeper.
Work sample 2: Number plane graphs

2 (a) Complete the following table of values and use it to graph \( y = \frac{6}{x} \) on the set of axes below.

<table>
<thead>
<tr>
<th>( x )</th>
<th>-6</th>
<th>-4</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>-1</td>
<td>-1.5</td>
<td>-2</td>
<td>-3</td>
<td>-6</td>
<td>---</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>1.5</td>
<td>1</td>
</tr>
</tbody>
</table>

(a) What is the name given to this type of graph?

(b) Explain what an asymptote is.

(c) Indicate an asymptote on the graph above.

(d) What is the equation of the asymptote you indicated above?

\[ x = 0 \quad , \quad y = 0 \]

Annotations

Completes tables for values for \( y = \frac{6}{x} \).

Names the graph as a hyperbola.

Explains what the asymptote is for this hyperbola.

Shows asymptotes on this hyperbola.

Gives equations for asymptotes for this hyperbola.
Work sample 2: Number plane graphs

Annotations:

Matches graphs of parabolas to their equations.

Translates the graph $y = x^3$ up 2 units to give the graph of $y = x^3 + 2$.
Work sample 2: **Number plane graphs**

4. Match these equations to their graphs shown below.
   
   (a) \( y = 2(x-3)^2 + 1 \quad \text{C} \)  
   (b) \( y = 3^x \quad \text{F} \)  
   (c) \( y = -x^3 \quad \text{A} \)  
   (d) \( x^2 + y^2 = 9 \quad \text{B} \)  
   (e) \( y = -\frac{2}{x} \quad \text{E} \)  
   (f) \( y = -3^x \quad \text{D} \)

**Annotations**

Matches graphs of a variety of relations to their equations.

Matches graphs to their correct name.
Work sample 3: 
Linear equations – Taxi fares

Relevant parts of the achievement standard

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Summary of task

Students were required to use their knowledge of linear functions to answer questions about the fares charged by two taxi companies. They were asked to:

- represent the relationship between cost and distance travelled in different forms, including algebraic equations
- use appropriate strategies to solve problems based on taxi fares.
Complete all the questions on your own paper and show all your working.

ANNIE’S TAXI

Useful definitions

• Flag fall — a fixed cost to hire the taxi.
• Distance charge — a charge for each kilometre travelled.

Annie’s Taxi uses the following schedule for calculating fares:

<table>
<thead>
<tr>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flag fall</td>
</tr>
<tr>
<td>Distance charge ($/km)</td>
</tr>
</tbody>
</table>

1. a. Copy the table below onto your own paper.

b. Complete the row labelled Cost ($) by calculating the cost of trips for different distances, using the information in the table above.

<table>
<thead>
<tr>
<th>Distance (km)</th>
<th>1</th>
<th>5</th>
<th>12</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost ($)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Write a word equation for how you calculated the cost in Question 1b.

3. Write an algebraic equation for the cost of travel with Annie’s Taxi.
   State what the symbols you use represent.

4. Graph the data from the table you completed in Question 1b.
   Place distance on the x-axis.

5. a. Use your graph to estimate how far you can travel for $82.00.

b. Use a different method to check the accuracy of your estimate.
Work sample 3: 
Linear equations – Taxi fares

TED’S TAXI

Ted’s Taxi offers a fare schedule different from that of Annie’s Taxi. The graph below shows the cost for trips of different distances.

6. a. Write an equation for this function.

   b. Determine the flag fall and distance charge ($/km) for Ted’s Taxi.

7. Annie’s Taxi and Ted’s Taxi are the only two taxi companies in town. Ted’s Taxi uses the advertising slogan “Travel with Ted — the best taxi fare in town”. Is this claim true? Justify your answer mathematically.
Work sample 3:
Linear equations – Taxi fares

Annotations

Completes table of values using given information.

Finds the equation of a linear relationship.

Graphs a linear relationship from a table of values.

Finds independent variable from given dependent variable, using a graph.

Checks accuracy of an answer read from a graph using the equation of the linear relationship.

Identifies ‘y’ intercept as the constant term (flag fall) and gradient as the rate charged per km.
Work sample 3: Linear equations – Taxi fares

Annotations

Models an authentic situation to solve a problem.

Supports conclusions using appropriate mathematical reasoning.
Mathematics

Work sample 4:
Similar or congruent triangles

Relevant parts of the achievement standard

By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports.

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Summary of task

Students were given a worksheet showing a variety of triangles, and they indicated which triangles were similar and which triangles were congruent, giving reasons. Students then answered several questions to demonstrate their understanding of similarity and congruence.
Mathematics

Work sample 4:
Similar or congruent triangles

Annotations

Identifies pairs of congruent triangles.

Identifies pairs of similar triangles.
Work sample 4: Similar or congruent triangles

2. Draw a pair of similar triangles that are NOT congruent.

3. Can you draw a pair of congruent triangles that are NOT similar? Why? Why not?

4. Charlie said, "All isosceles triangles are similar." Kristina replied, "That's not true."

   Who is correct? Give reasons, using examples, to justify your answer.

5. Explain why any two equilateral triangles, or any two squares, are similar. In what circumstances would they be congruent?

Annotations

Demonstrates a clear understanding of congruency and similarity.

Uses appropriate mathematical reasoning, including informal deductive reasoning, to support statements regarding isosceles triangles, regular polygons and similarity.
Work sample 5:
Trigonometry assignment

Relevant parts of the achievement standard

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Summary of task

Students demonstrated their understanding of basic right-angled triangle trigonometry by labelling parts sides of a trigonometric and writing out the ratios for a given triangle. They applied their knowledge to problems involving angles of elevation and depression and three figure bearings.
Work sample 5: Trigonometry assignment

Annotations

Labels sides of a right-angled triangle in relation to a marked angle.

States trigonometric ratios in terms of sides in right-angled triangles.

Finds the sin, cos and tan ratios for a specific right-angled triangle.

Completes diagram from a written description.

Marks side lengths.

Chooses correct trigonometric ratios.

Finds a required angle.

Approximates an angle correct to the nearest degree.
Work sample 5:  
Trigonometry assignment

Annotations

Uses geometric reasoning to explain a given fact.

Identifies correct trigonometric ratio.

Finds a required side length.

Recognises the need for subtraction to answer a question without recognising the need to calculate another side length to find total distance travelled.
Relevant parts of the achievement standard

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Summary of task

Students completed a worksheet on expanding algebraic expressions using the four operations.
Work sample 6: **Algebraic expressions**

**ALGEBRA**

Expand and simplify these expressions. Look at the example first which shows you how to set them out. Show working.

**EXAMPLE**

\[
5(x + 3) - 2(x - 7) - 12 \\
= 5x + 15 - 2x + 14 - 12 \\
= 3x + 29 - 12 \\
= 3x + 17
\]

**Questions**

1. \[5(x + 3) - 2(x - 7) = 65x + 15 + 2x - 14 = 7x + 1\]
2. \[3(x - 5) + 4(x + 6) = 8x - 15 + 4x + 24 = 7x + 9\]
3. \[3(2x - 1) + 2(3x + 6) \times 6x - 3 + 6x + 9 = 12x + 5\]
4. \[4(2x + 2) + 3(2x - 1) - 3x + 15 = 2x + 2q + 2\]
5. \[7(x + 1) - 5(x + 3) \times x + 7 - 6x \times 15 = 2x - 8\]
6. \[3(x + 5) - 2(x - 7) = 3x + 15 + 2x + 14 = 12x + 2q\]
7. \[4(2x - 3) - 3(2x - 1) - 12x - 8 - 10x + 5 = 2x - 3\]
8. \[7(2x + 1) - 2(3x + 4) = 14x + 7 - 10x - 8 = 4x - 1\]
9. \[3(5x - 7) - 7(2x - 3) = 15x - 21 - 14x + 21 = 1x\]
10. \[6(2x - 2) - 9(2x - 1) = 18 - 12x - 18 + 9 = 21\]
11. \[5(x + 4) - (x - 8) = 6x + 20 + x - 8 = 6x + 14\]
12. \[8(x + 1) - 2(3x - 2) = 8x + 8 - 6x + 4 = 12x - 12\]
13. \[3(2x - 3) + 4(3x + 2) = 6x - 15 + 12x + 8 = 18x - 7\]
14. \[2(3x - 5) - (x + 3) = 6x - 10 - x + 3 = 5x - 7\]
15. \[4(x - 1) - (x - 8) = 6x - 8 - x + 8 = 7x\]
16. \[5(3x - 4) - (8x - 4) = 15x - 20 - 9x + 4 = 6x + 24\]
17. \[7(2x - 1) - 3(x - 7) = 14x - 7 - 3x + 7 = 11x\]
18. \[5(2x - 3) - 6(3x + 5) \times 2x - 12 + 8 = 5x + 5 = 17\]
19. \[7 + 4(3x - 4) - 7 + 4x - 4 = 4x + 3\]
20. \[5x - 2(3x - 1) - 5x - 6 + x + 2 = -x + 2\]

The next 5 questions should be completed in exactly the same way but they are long so set your work out carefully.

21. \[3(x + 2) + 7(x - 3) - 5(x - 4) = 8x + 14 + 7x - 21 - 5x + 4 = 10x + 15\]
22. \[9 - 4(1x - 2) + (x - 8) = 9 + 4x - 30 - 3x - 8 = 9x - 2\]
23. \[2(x + 3) - 3(2x - 1) = 4x + 15 + 2x + 6 - 7x + 7 - 4x = 18 = 9x - 2\]
24. \[2(5x - 2) - 2(x + 7) + 10x + (6x + 2) + 2x + 7) - 40 = 6x + 1\]
25. \[6(3x - 5) - (3x - 4) - (2x - 7) + 2x = 12x + 30 - 12x + 14 - 2x - 14 + 2x = 32\]

**Annotations**

Correctly expands and simplifies algebraic expressions.
Work sample 7: 
**Algebraic fractions**

**Relevant parts of the achievement standard**

By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports.

Students expand binomial expressions and factorise monic quadratic expressions. They find unknown values after substitution into formulas. They perform the four operations with simple algebraic fractions. Students solve simple quadratic equations and pairs of simultaneous equations. They use triangle and angle properties to prove congruence and similarity. Students use trigonometry to calculate unknown angles in right-angled triangles. Students list outcomes for multi-step chance experiments and assign probabilities for these experiments. They calculate quartiles and inter-quartile ranges.

**Summary of task**

Prior to this task, students had practice at manipulating algebraic fractions.

Students were required to simplify the algebraic fractions worksheet in a lesson.
Work sample 7: 
Algebraic fractions

Complete the following calculations:

1. Simplify the following:
   
   (a) \( \frac{5}{x} + \frac{3}{x} \)
   
   (b) \( \frac{2}{2y} + \frac{4}{xy^2} \)
   
   (c) \( \frac{2x+1}{2} - (6x + 5) \)
   
   (d) \( \frac{3}{x+1} - \frac{4}{x-2} \)
   
   (e) \( \frac{2x+2}{x^2} \)
   
   (f) \( \frac{3}{2x^2+4x} + \frac{4}{x+4} \)
   
   (g) \( \frac{1}{x-1} \)
   
   (h) \( \frac{1}{x+1} - \frac{1}{x+2} + \frac{1}{x+3} \)
   
   (i) \( \frac{4}{x} + \frac{3x+6}{2} - \frac{3(x+1)}{4} \)
   
   (j) \( \frac{3x}{12} - \left( \frac{3}{2} - \frac{3}{4} + \frac{5}{6} \right) \)

2. Simplify the following:

   (a) \( \frac{4(x+1)}{3} - \frac{5(x-2)}{2} \)
   
   (b) \( \frac{x^2-3x}{x+4} \times \frac{2x+8}{5x} \)
   
   (c) \( \frac{2x-24}{4} \div \frac{x+7}{12} \)
   
   (d) \( \frac{x^2-6x}{y+5} \times \frac{3x+15}{2y-12} \)
   
   (e) \( \frac{5m-7}{4m+8} \div \frac{m+3}{3m+6} \)
   
   (f) \( \frac{6y-3}{4} \div \frac{4y+12}{15} \)
Work sample 7: **Algebraic fractions**

<table>
<thead>
<tr>
<th>Algebraic Fractions</th>
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</thead>
<tbody>
<tr>
<td>1) ( \frac{x}{3} + \frac{x}{4} )</td>
<td>( \frac{2x + 2}{y} )</td>
</tr>
<tr>
<td>( = \frac{4x + 3x}{12} )</td>
<td>( = \frac{x+1}{xy} )</td>
</tr>
<tr>
<td>( = \frac{7x}{12} )</td>
<td>( )</td>
</tr>
<tr>
<td>2) ( \frac{2}{xy} + \frac{4}{xy} )</td>
<td>( \frac{2y^2 + 4}{xy^3} )</td>
</tr>
<tr>
<td>( = \frac{2(y^2 + 3)}{xy^3} )</td>
<td>( = \frac{2x + 2}{y} \times \frac{x}{x+1} )</td>
</tr>
<tr>
<td>( = \frac{2(x+1)}{y} \times \frac{x}{x+1} )</td>
<td>( = 2x )</td>
</tr>
<tr>
<td>3) ( \frac{x}{2} )</td>
<td>( \frac{x^2-4x}{x^2-4} )</td>
</tr>
<tr>
<td>( = \frac{x^2-4x+4}{(x+4)(x-4)} )</td>
<td>( = \frac{2}{x(x-4)} + \frac{4}{(x+4)(x-4)} )</td>
</tr>
<tr>
<td>( = \frac{2(x+1)}{x(x-4)} \times \frac{x}{x+4} )</td>
<td>( = )</td>
</tr>
<tr>
<td>4) ( \frac{3}{b-1} - \frac{4}{b-2} )</td>
<td>( \frac{3b-6-4b+4}{(b-1)(b-2)} )</td>
</tr>
<tr>
<td>( = \frac{3b-b-4b+4}{(b-1)(b-2)} )</td>
<td>( = \frac{1}{x+1} \times \frac{1}{2-1} )</td>
</tr>
<tr>
<td>( = \frac{b-2}{(b-1)(b-2)} )</td>
<td>( = )</td>
</tr>
</tbody>
</table>

**Annotations**

Correctly simplifies the algebraic fractions with numerical denominators.

Factorises algebraic expressions by taking out a negative common factor.

Correctly factorises algebraic expressions to enable cancelling down of algebraic fraction.
Work sample 7: Algebraic fractions

Annotations

Factorises algebraic expressions correctly and expands binomial products.

Expands out brackets with negative numbers correctly.
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: Algebraic fractions

Annotations

Factorises and cancels correctly.

Uses the inversion of the divisor to multiply out algebraic fraction correctly.