Mathematics

Year 6
Satisfactory

WORK SAMPLE PORTFOLIO

Annotated work sample portfolios are provided to support implementation of the Foundation – Year 10 Australian Curriculum.

Each portfolio is an example of evidence of student learning in relation to the achievement standard. Three portfolios are available for each achievement standard, illustrating satisfactory, above satisfactory and below satisfactory student achievement. The set of portfolios assists teachers to make on-balance judgements about the quality of their students' achievement.

Each portfolio comprises a collection of students' work drawn from a range of assessment tasks. There is no pre-determined number of student work samples in a portfolio, nor are they sequenced in any particular order. Each work sample in the portfolio may vary in terms of how much student time was involved in undertaking the task or the degree of support provided by the teacher. The portfolios comprise authentic samples of student work and may contain errors such as spelling mistakes and other inaccuracies. Opinions expressed in student work are those of the student.

The portfolios have been selected, annotated and reviewed by classroom teachers and other curriculum experts. The portfolios will be reviewed over time.

ACARA acknowledges the contribution of Australian teachers in the development of these work sample portfolios.

THIS PORTFOLIO: YEAR 6 MATHEMATICS

This portfolio provides the following student work samples:

Sample 1	Number: Power
Sample 2	Number: How tall?
Sample 3	Number: Abstract design
Sample 4	Number: Fractions, decimals, percentages and integers
Sample 5	Number: Fifth term
Sample 6	Measurement: Area
Sample 7	Number: Calculations
Sample 8	Geometry: 3D structure
Sample 9	Number: Percentages
Sample 10	Geometry: Sam's square
Sample 11	Statistics and probability: Spinner mania
Sample 12	Measurement: Fill it up
Sample 13	Number: Brackets and the order of operations
Sample 14	Geometry: Understanding angles

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This portfolio of student work demonstrates multiplying and dividing decimals by a power of 10 (WS1, WS7) and solving problems involving length and area using decimals (WS2, WS6). The student connects fractions, decimals and percentages as representations of the same value (WS3, WS4). The student describes the use of positive and negative numbers in everyday life (WS4) and calculates the discounted price of sale items (WS9). The student creates a sequence using whole numbers and fractions and explains the rule (WS5). The student performs calculations with whole numbers and decimals using all four operations (WS7). The student draws nets and constructs a prism and a pyramid (WS8) and plots points on a Cartesian plane (WS10). The student uses reasoning to report probability using fractions, percentages and decimals (WS11). The student calculates the volume and capacity of a container (WS12) and creates number sentences using the order of operations and brackets (WS13). The student investigates the relationships between angles on straight lines (WS14).

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Mathematics

Year 6
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Number: Power

Year 6 Mathematics achievement standard

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> *Students locate fractions and integers on a number line. They calculate a simple fraction of a quantity. They add, subtract and multiply decimals and divide decimals where the result is rational. Students calculate common percentage discounts on sale items. They write correct number sentences using brackets and order of operations. Students locate an ordered pair in any one of the four quadrants on the Cartesian plane. They construct simple prisms and pyramids. Students list and communicate probabilities using simple fractions, decimals and percentages.*

Summary of task

Students had completed a unit of work on number involving multiplying decimals by multiples of powers of ten. Students were given an open-ended task to relate their reasoning skills to answer the posed problem. Students were given one class lesson to complete the task.

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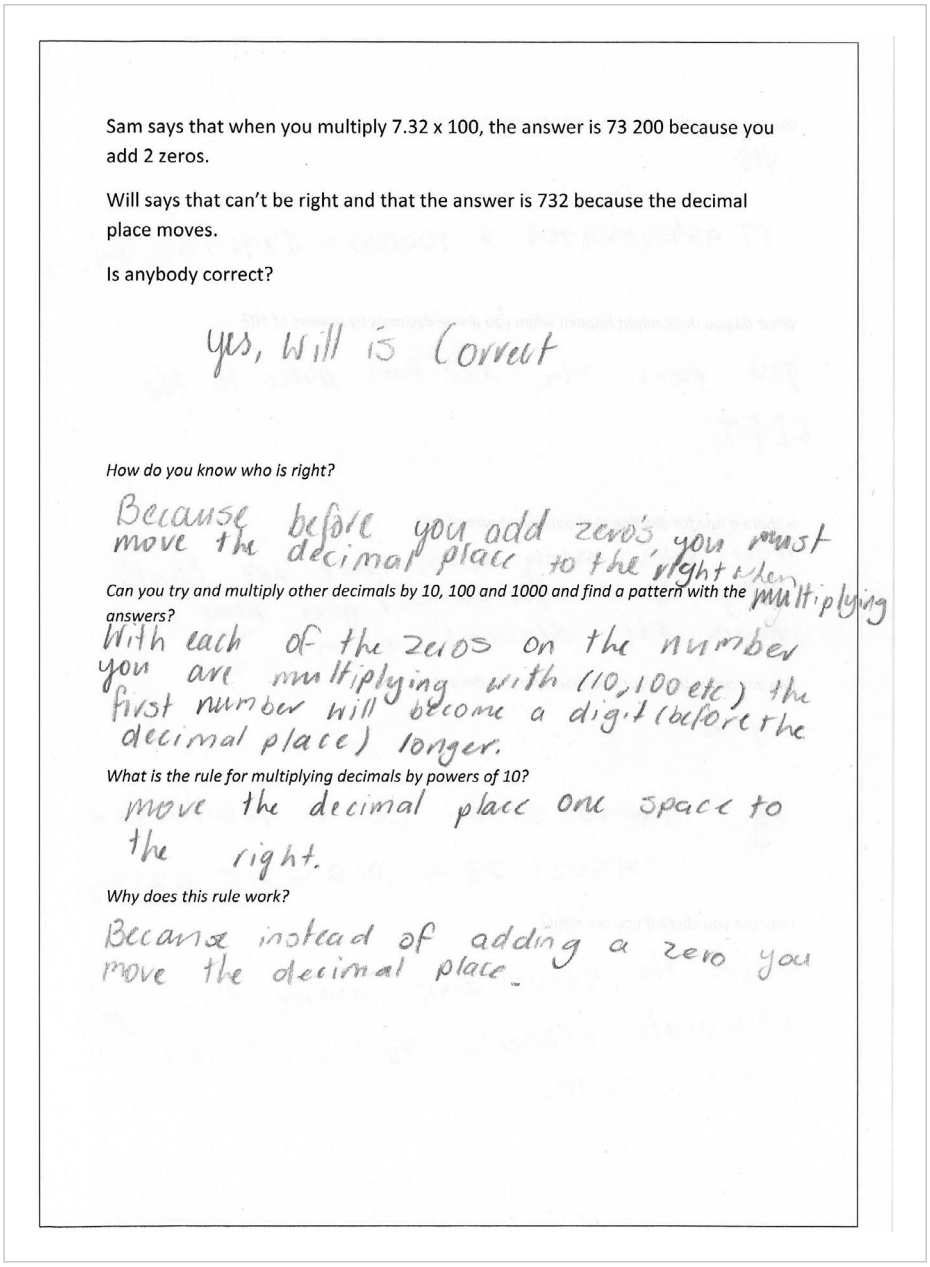
Satisfactory

Number: Power



Sam says that when you multiply 7.32 x 100, the answer is 73 200 because you add 2 zeros.

Will says that can't be right and that the answer is 732 because the decimal place moves.

Is anybody correct?

yes, Will is Correct

How do you know who is right?

Because before you add zero's you must move the decimal place to the right when multiplying

Can you try and multiply other decimals by 10, 100 and 1000 and find a pattern with the answers?

With each of the zeros on the number you are multiplying with (10, 100 etc) the first number will become a digit (before the decimal place) longer.

What is the rule for multiplying decimals by powers of 10?

move the decimal place one space to the right.

Why does this rule work?

Because instead of adding a zero you move the decimal place.

Annotations

Demonstrates an understanding of place value when multiplying decimals by a multiple of 10.

Explains simply how to multiply decimals by multiples of 10.

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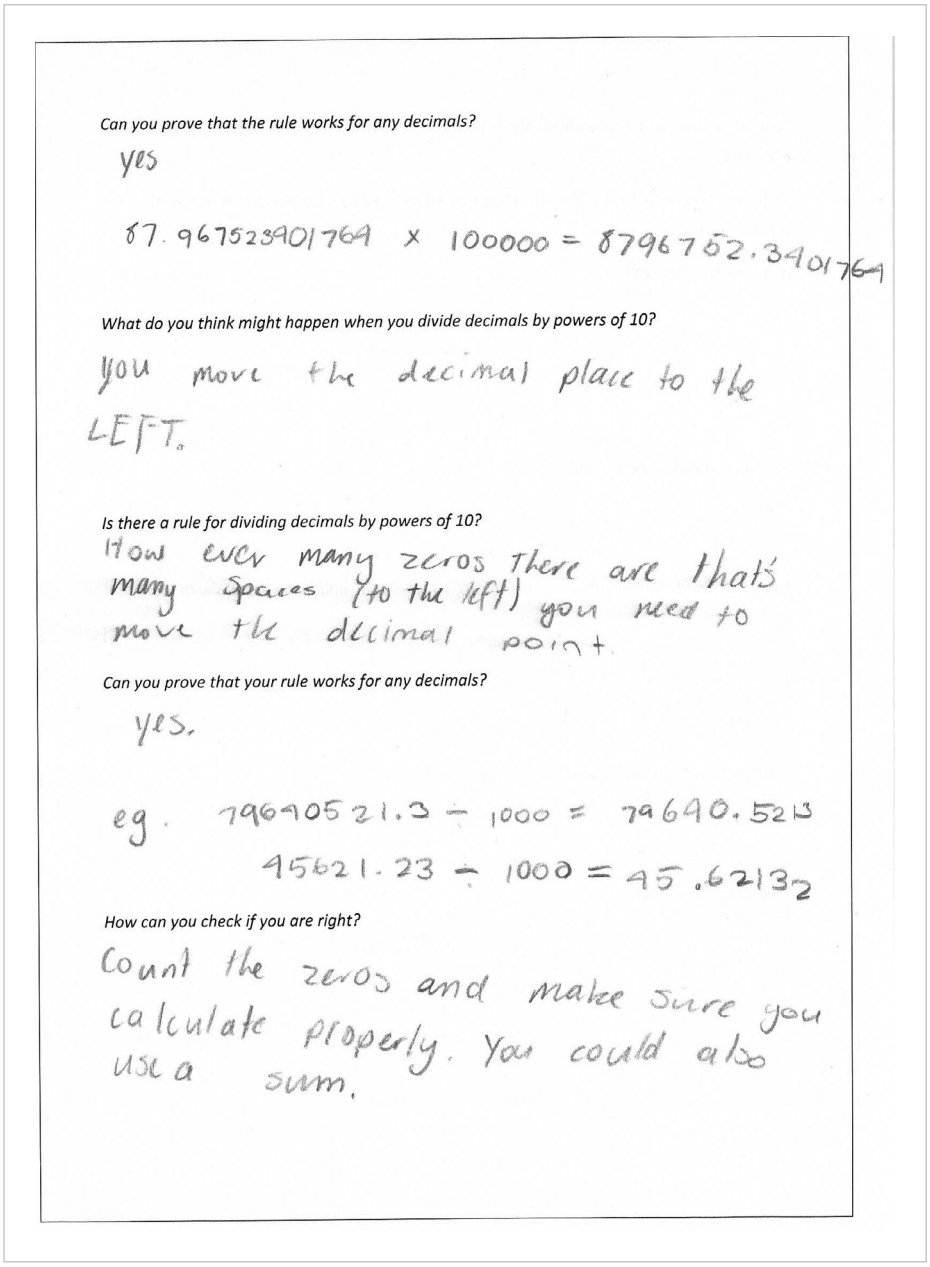
Number: Power



Can you prove that the rule works for any decimals?

yes

87.967523901769 x 100000 = 8796752.3901769

What do you think might happen when you divide decimals by powers of 10?

You move the decimal place to the LEFT.

Is there a rule for dividing decimals by powers of 10?

How ever many zeros there are that's many spaces (to the left) you need to move the decimal point.

Can you prove that your rule works for any decimals?

yes.

eg. 79690521.3 ÷ 1000 = 79690.5213

45621.23 ÷ 1000 = 45.62123

How can you check if you are right?

Count the zeros and make sure you calculate properly. You could also use a sum.

Annotations

Explains the rule for dividing decimals by multiples of 10.

Calculates division of a decimal by a power of 10.

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Number: How tall?

Year 6 Mathematics achievement standard

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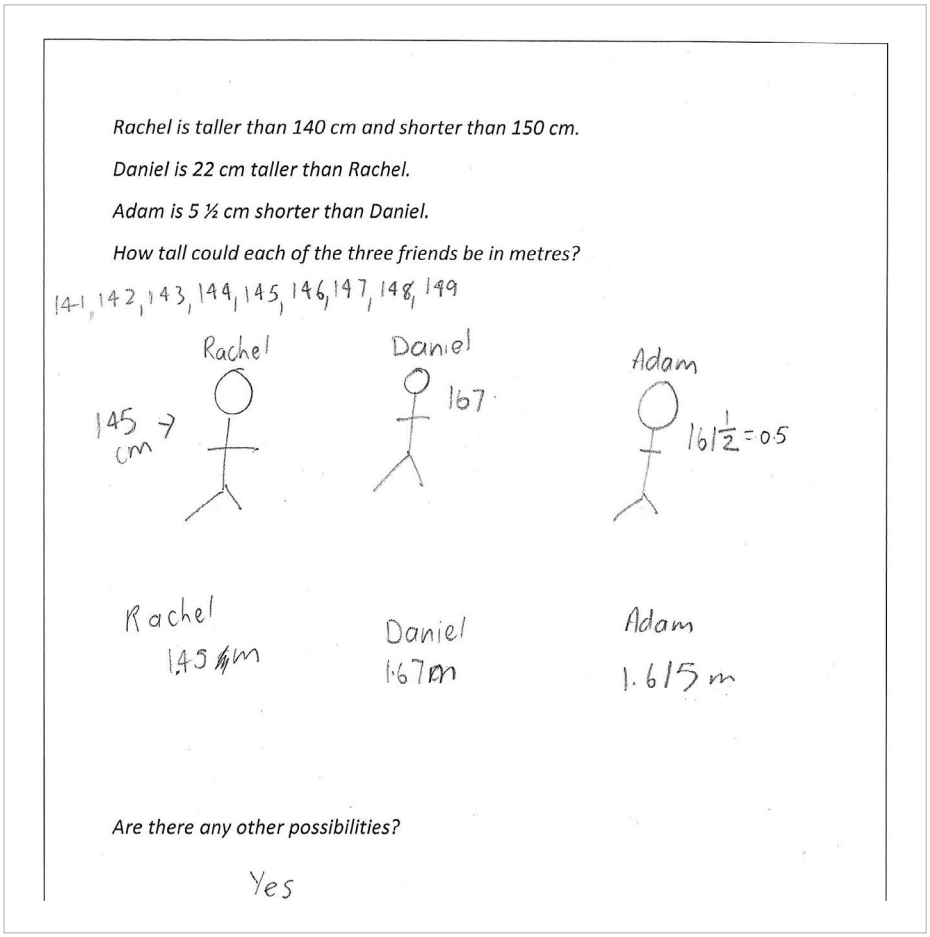
Summary of task

Students had completed a unit of work on decimals and their connection to the metric system. They had solved problems involving length and area using decimals. Students were asked to use their reasoning skills combined with their mathematical knowledge to solve several problems. They were given one lesson to complete the task as an assessment at the end of the unit.

Number: How tall?



Annotations

Calculates height in metres after considering given information.

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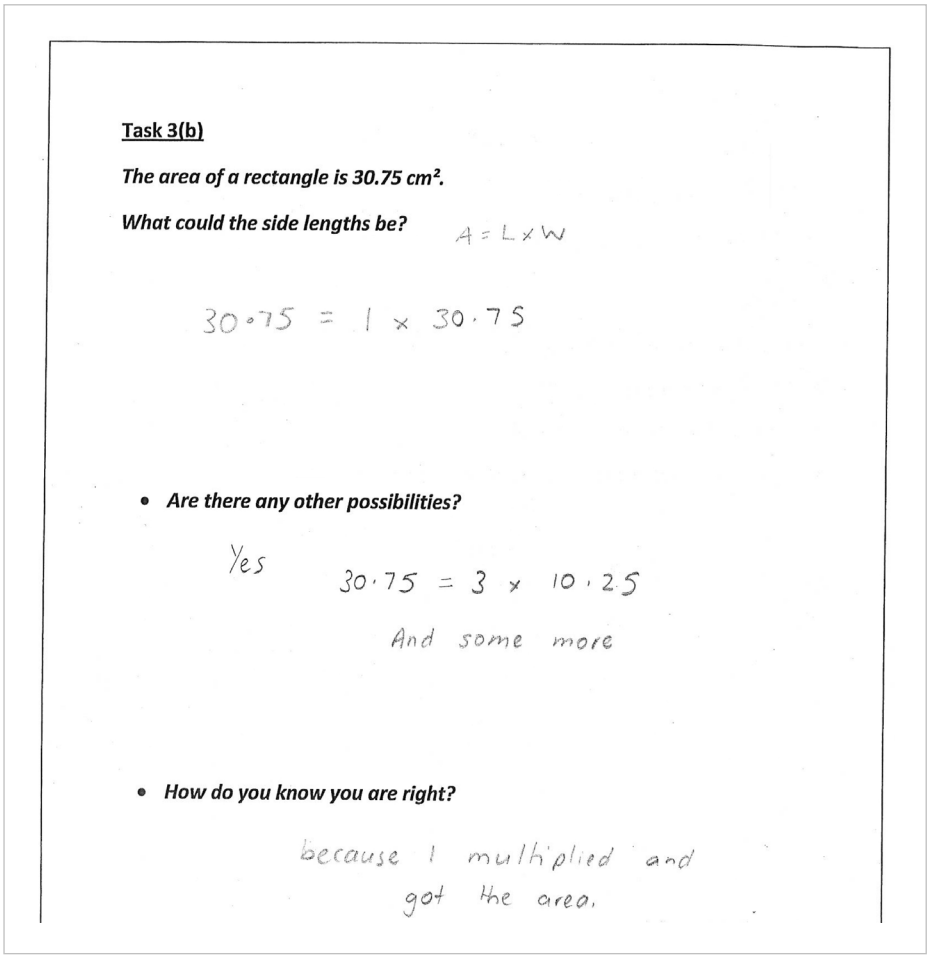

Task 3(b)

The area of a rectangle is 30.75 cm².

What could the side lengths be? A = L x W

30·75 = 1 × 30·75

- ***Are there any other possibilities?***

Yes 30·75 = 3 × 10·25

And some more

- ***How do you know you are right?***

because I multiplied and got the area.

Annotations

Calculates two sets of possible dimensions of a rectangle from a given answer.

Explains one step of the process of solving a problem.

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Number: Abstract design

Year 6 Mathematics achievement standard

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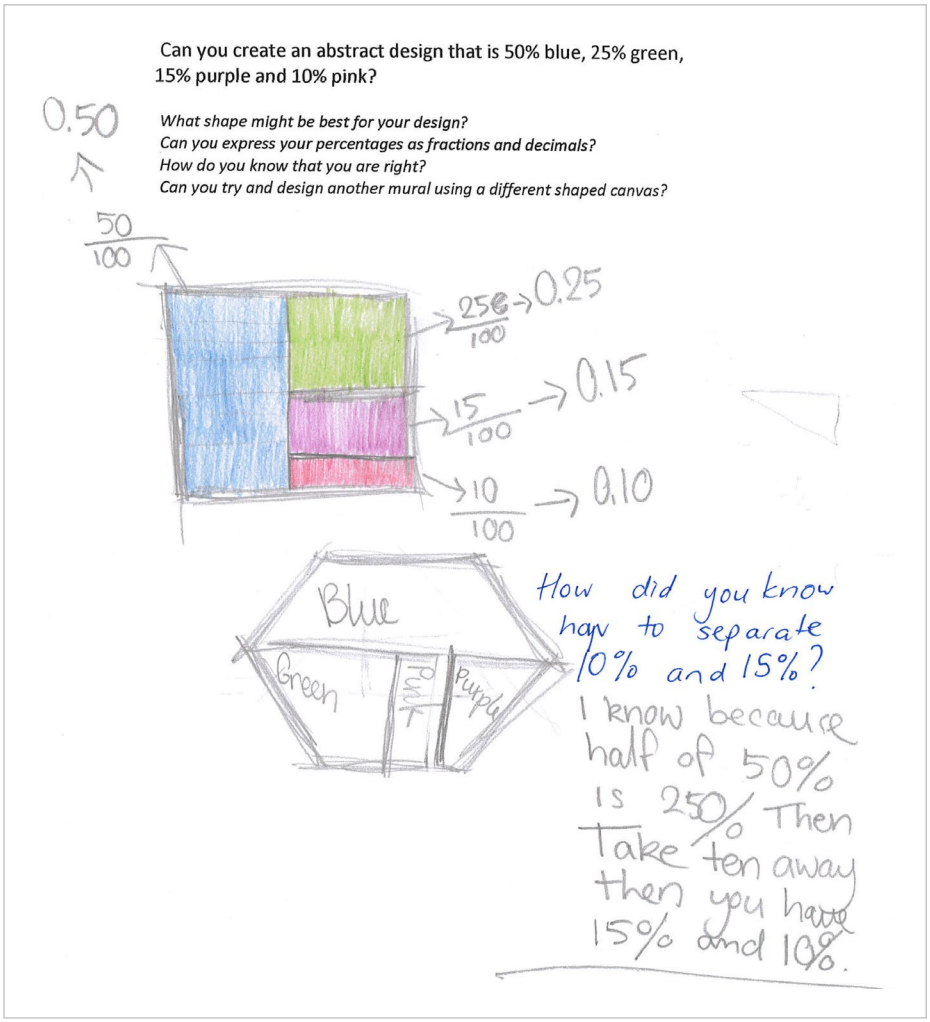
Summary of task

Students had completed a unit of work on equivalent fractions, decimals and percentages. Students were asked to create an abstract design, dividing it into percentage parts and demonstrating a connection with fractions and decimals. Questions were written for the students to help them direct their mathematical thinking.

Number: Abstract design



Annotations

Represents percentages as fractions and decimals.

Represents percentages in different two-dimensional shapes.

Compares the value of percentages.

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Number: Fractions, decimals, percentages and integers

Year 6 Mathematics achievement standard

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Summary of task

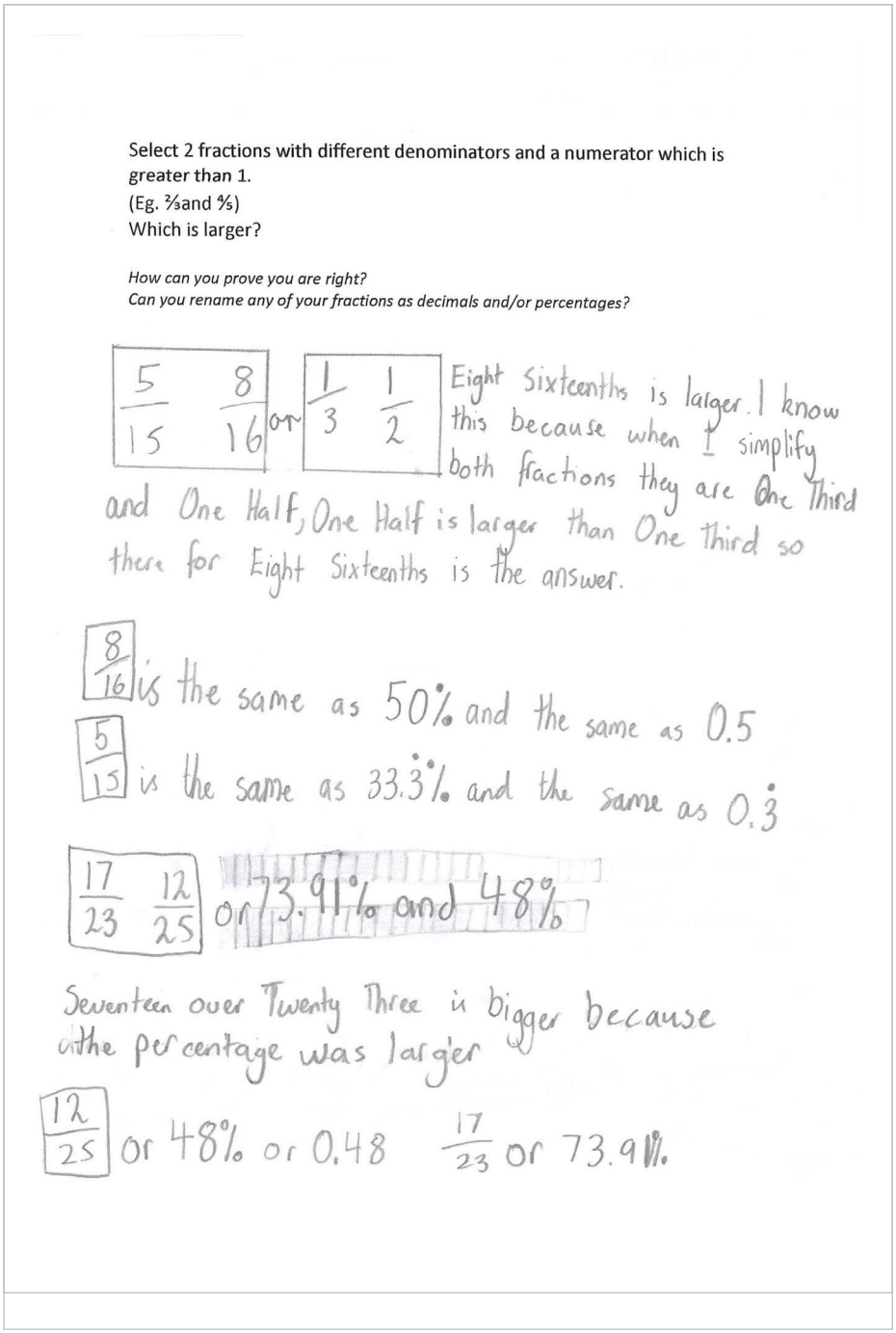
Students completed a unit of work on fractions, decimals, percentages and the connections between them. They also investigated positive and negative numbers in everyday contexts.

Students were given a task to assess their understanding that consisted of two parts:

Part 1: Select two fractions, determine which one has the larger value and explain why.

Part 2: Select three positive numbers and three negative numbers, place them on a number line and use <, >, = to create number sentences with them.

Number: Fractions, decimals, percentages and integers



Select 2 fractions with different denominators and a numerator which is greater than 1.
(Eg. ⅔and ⅘)
Which is larger?

How can you prove you are right?
Can you rename any of your fractions as decimals and/or percentages?

5/15 8/16 or 1/3 1/2 Eight Sixteenths is larger. I know this because when I simplify both fractions they are One Third and One Half, One Half is larger than One third so there for Eight Sixteenths is the answer.

8/16 is the same as 50% and the same as 0.5

5/15 is the same as 33.3̇% and the same as 0.3̇

17/23 12/25 or 73.91% and 48%

Seventeen over Twenty Three is bigger because of the percentage was larger

12/25 or 48% or 0.48 17/23 or 73.91%

Annotations

Compares fractions with unrelated denominators by simplifying.

Represents fractions as percentages and decimals.

Compares fractions by considering their percentage equivalents.

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Number: Fifth term

Year 6 Mathematics achievement standard

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Summary of task

Throughout the term students had completed several units of work, one on the addition and subtraction of fractions with different denominators and another on creating and identifying patterns in number sequences. Students were given the following question as an assessment of concepts at the end of both units of work.

> Kate created a subtraction pattern using fractions with different denominators. If the fifth term in Kate's pattern was 1, what could her pattern look like?

The teacher asked the following questions to guide students through their thinking and working:

- What is the rule for your pattern?
- How did you work it out?
- What other patterns can you create where 1 is the fifth term?
- Can you convert any of your fractions to decimals?

Mathematics

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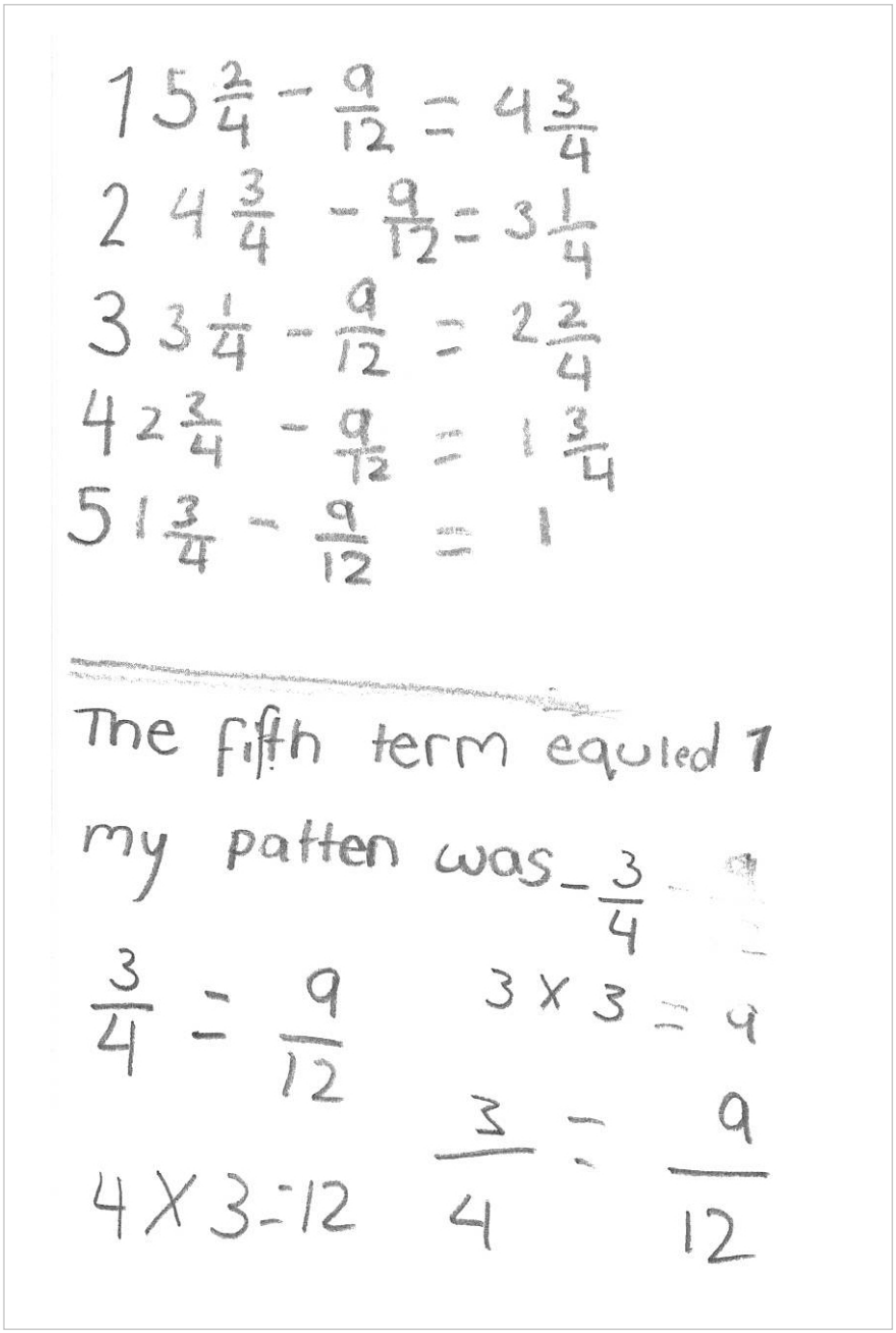
Satisfactory

Number: Fifth term



Annotations

Creates a subtraction pattern involving mixed numbers and proper fractions with denominators that are multiples of four.

Calculates the second term incorrectly and does not always write terms of the pattern in simplest form.

Explains pattern used to create the fifth term of 1.

Demonstrates an understanding of equivalent fractions.

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Mathematics

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Measurement: Area

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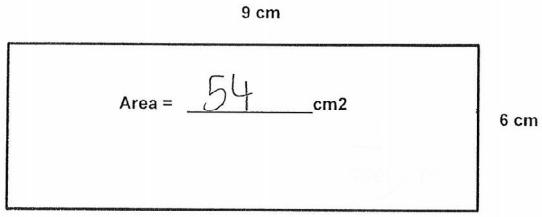
Summary of task

Students had started a unit of work on calculating the area of rectangles. The task was used to assess understanding during the unit so that it could be used to guide the next phase of teaching. The students were required to calculate the area of rectangles and explain their thinking when calculating an area that could be split into rectangles. The students were asked to complete the task in 10 minutes.

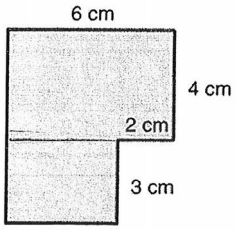
Measurement: Area

Calculate the area of the following shapes.

a.



b.



Working Space.

6x4=24
3x3=9
24+9=33

Explain how you solved the problem above.

firstly I made the compound shape into a square and a rectangle. Secondly I x the length by the width 6x4=24. Thirdly I did 3x3=9 I knew the width was 3 because a squares sides are all the same. lastly I added my answers together 24+9=33 and 33 would be the area.

Annotations

Calculates the area of a rectangle.

Partitions a composite shape into rectangles in order to find its area but does not calculate any unknown side lengths and mistakenly assumes that the smaller rectangle is a square.

Describes a process for calculating the area of a composite shape.

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Number: Calculations

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Summary of task

Students had completed several units of work involving problem-solving with addition, subtraction, multiplication and division of whole numbers and decimals. Students on this occasion were given a formal pen and paper test that covered many of the concepts in the unit. They were required to estimate answers and demonstrate their thinking, using addition, subtraction, multiplication and division in single and multi-step problems.

Number: Calculations

Solve these problems.

Addition

a. 47.20 + 26.07 = 73.27

b. 45.78 + 36.55 = 82.33

Subtraction

a. 42.5 − 34.4 = 08.1

b. 86.2 − 34.6 = 51.6

Multiplication

a. 23.7 × 4 = 14.8

b. 24.5 × 6 = 151.0

Division

a. 8 | 85.6 = 10.7

b. 5 | 47.20 = 9.4

Multiply these decimals by 10, 100 and 1000. Estimate first.

	×10	×100	×1000
0.5	5	50	500
0.25	2.5	25	250
0.37	3.7	37	370
1.2	12	120	1200
7.34	73.4	734	7340

Divide these numbers by 10, 100 and 1000. Estimate first.

	÷10	÷100	÷1000
50	5	0.5	0.05
25	2.5	0.25	0.025
37.2	3.72	0.372	00372
48.5	4.85	0.485	0.0485
542	54.2	5.42	0.542

Annotations

Calculates addition and subtraction problems involving decimals.

Performs calculations involving the multiplication of decimals by whole numbers but with an error.

Calculates answers to problems involving the division of decimals by whole numbers.

Uses knowledge of powers of 10 to multiply and divide decimals.

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Number: Calculations

For the following operations you are required to complete three steps.

1. Estimate an answer and explain how you arrived at your estimate.
2. Calculate an answer.
3. Comment on whether your answer appears reasonable.

Addition

a.

My estimate is $11

How did you get your estimate?

2+3+4+2

Is your answer reasonable? Explain

I find my answer reasonable because it is only $2.45 away from my Estimate

Subtraction

b. What is the difference between 3.4 and 7.171?

4.371 7.171
- 4 3.4
0.371 4.371

My estimate is 4

How did you get your estimate?

3-7

Is your answer reasonable? Explain.

I say that my answer is reasonable because my answer was only 371c away from my Estimate.

Annotations

Provides estimations when calculating with decimals.

Demonstrates strategy used in estimating the calculation of decimals.

Calculates the addition of numerous decimals.

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Mathematics

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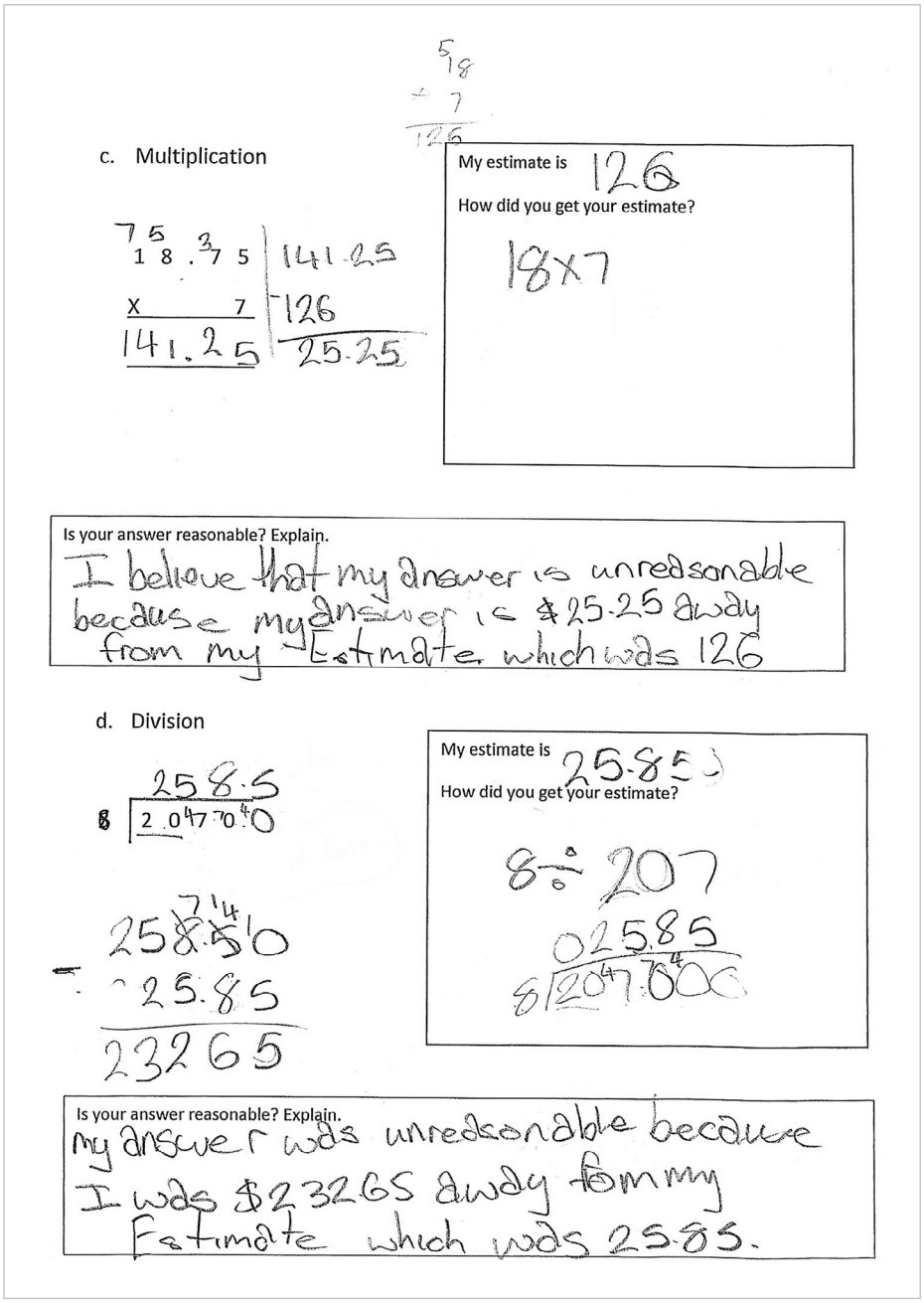
Satisfactory

Number: Calculations



Annotations

Estimates using whole numbers.

Multiplies a decimal by a single-digit whole number but makes an error.

Compares estimation and calculated answer and states the reasonableness of estimation.

Divides a four-digit whole number by a single-digit whole number to obtain a decimal answer but makes an error.

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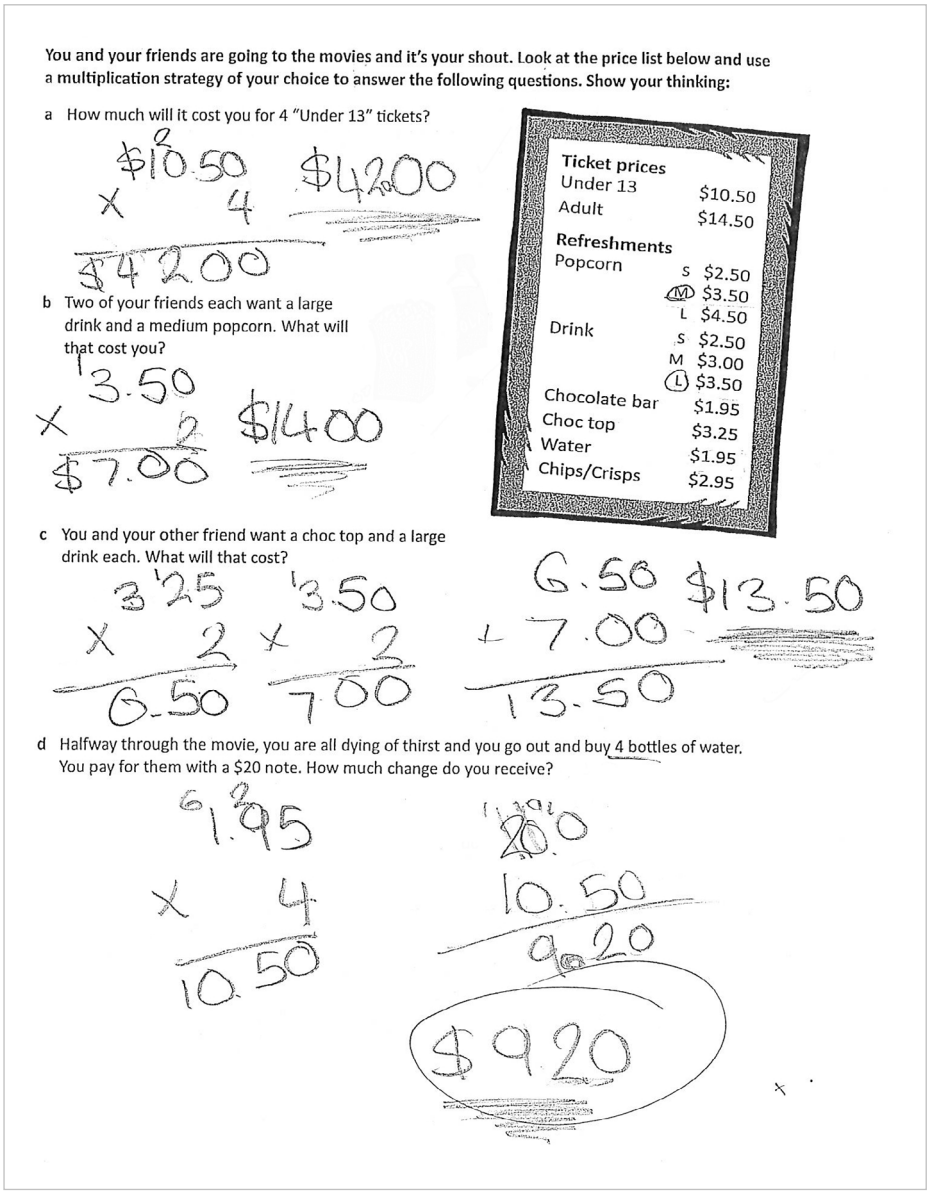
Mathematics

Year 6
Satisfactory

Number: Calculations



You and your friends are going to the movies and it's your shout. Look at the price list below and use a multiplication strategy of your choice to answer the following questions. Show your thinking:

a How much will it cost you for 4 "Under 13" tickets?

$10.50 × 4 = $42.00

$42.00

b Two of your friends each want a large drink and a medium popcorn. What will that cost you?

3.50 × 2 = $7.00

$14.00

Ticket prices	
Under 13	$10.50
Adult	$14.50
Refreshments	
Popcorn	S $2.50
	M $3.50
	L $4.50
Drink	S $2.50
	M $3.00
	L $3.50
Chocolate bar	$1.95
Choc top	$3.25
Water	$1.95
Chips/Crisps	$2.95

c You and your other friend want a choc top and a large drink each. What will that cost?

3.25 × 2 = 6.50

3.50 × 2 = 7.00

6.50 + 7.00 = 13.50

$13.50

d Halfway through the movie, you are all dying of thirst and you go out and buy 4 bottles of water. You pay for them with a $20 note. How much change do you receive?

1.95 × 4 = 10.50

20.00 − 10.50 = 9.20

$9.20

Annotations

Solves everyday multiplication problems involving decimals.

Solves written problems using multiple steps and operations.

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Geometry: 3D structure

Year 6 Mathematics achievement standard

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Summary of task

Students had completed a unit of work on shape that involved constructing nets, three-dimensional objects and identifying two-dimensional shapes within three-dimensional objects.

The task was given to the students the week after they had finished the unit of work to assess their knowledge of three-dimensional objects. Students were asked to construct the net of a prism and a pyramid and create the object using straws. This task took several lessons to complete.

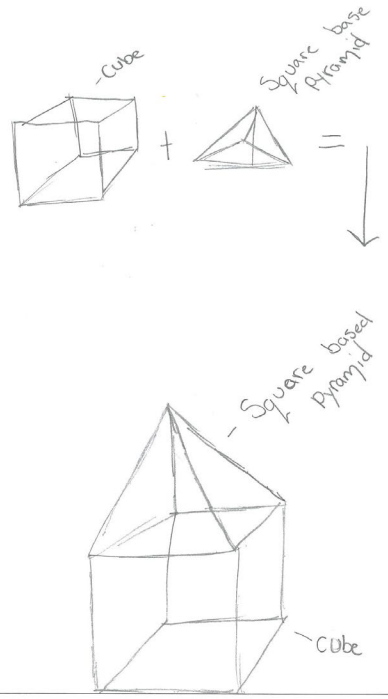
Mathematics

Year 6
Satisfactory

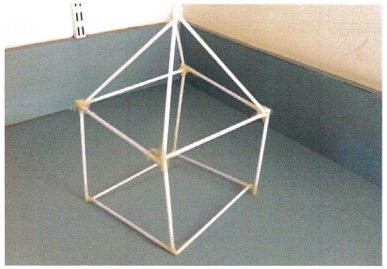
Geometry: 3D structure

Design and build a three dimensional structure

Design your structure here



Add a photo of your completed structure here



Describe the design features of your structure here

my structure is a three dimesional House, with a cube and a square based pyramid. my cube has 8 vertices and my square based pyramid has 5 vertices. my structure is made out of 16 straws and sticky tape.

Annotations

Identifies the number and type of three-dimensional objects to make their structure..

Constructs a three-dimensional object using a prism and a pyramid.

Identifies some features of the three-dimensional object.

Draws a two-dimensional representation of a three-dimensional object.

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Number: Percentages

Year 6 Mathematics achievement standard

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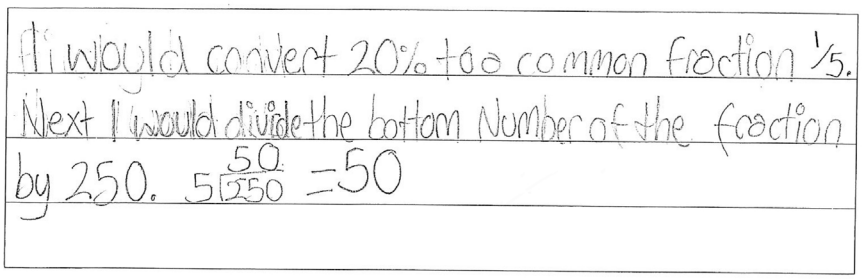
Summary of task

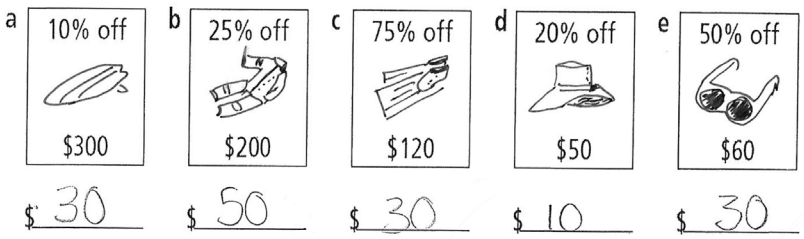
Students had completed several units of work on fractions, decimals and percentages. One component was to calculate percentages of whole numbers, typically using shopping items on sale. Students were given the task to complete during a lesson.

Number: Percentages

6. Explain how you would calculate 20% of 250.



7. Calculate the discounted prices for these items.



Annotations

Explains how to calculate a common percentage of a quantity with some accuracy.

Calculates the amount of sale discount using common percentages but makes some errors when calculating the new price after the discount.

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Geometry: Sam's square

Year 6 Mathematics achievement standard

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Summary of task

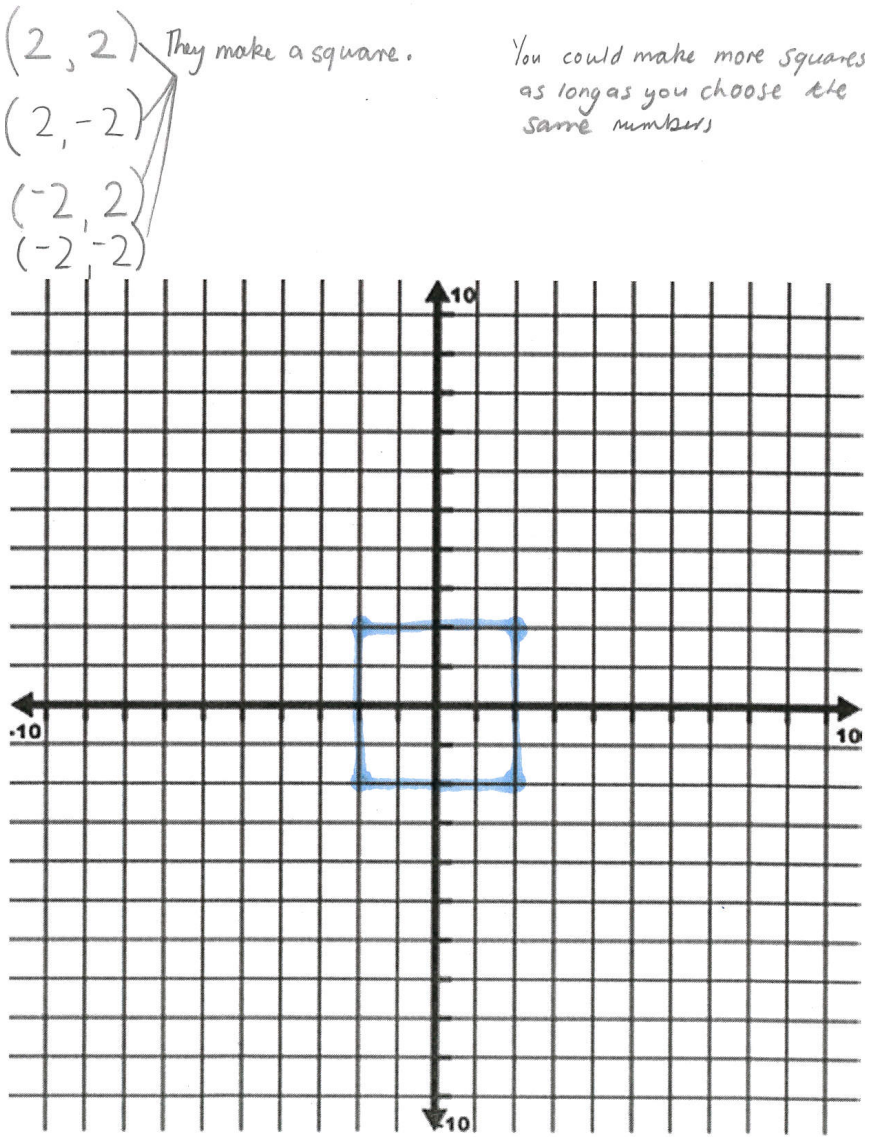
Students had completed a unit of work on integers and coordinates.

At the end of the unit they were given the task to complete during one lesson. Teacher questioning with task:

- Are there other possibilities?
- Is there a pattern in your answers?
- How will you record your responses?
- What if he created other types of quadrilaterals? What would the coordinates be?

Geometry: Sam's square

Sam plotted one point in each quadrant of a Cartesian plane. When he drew lines joining the points, they formed a square. What could the coordinates be?



Annotations

Calculates the coordinates for a square on the Cartesian plane.

Explains that there are more possible answers with simple logic.

Plots a square on the Cartesian plane.

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Statistics and probability: Spinner mania

Year 6 Mathematics achievement standard

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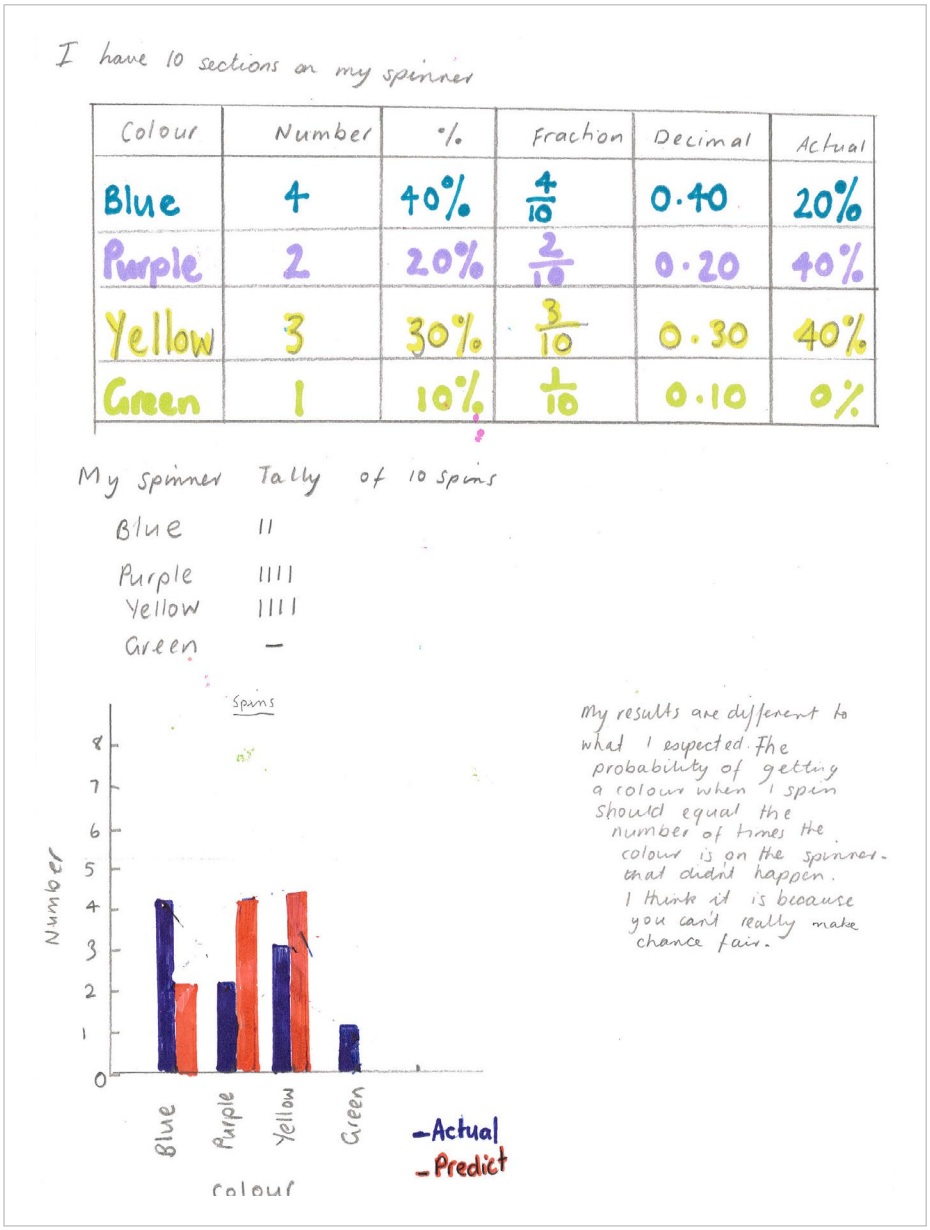
Summary of task

Students had completed lessons on relating probability to fractions, decimals and percentages so they could calculate the theoretical probability of an event occurring.

Students were asked to create a spinner using colours so that the colours had an unequal chance of occurring when it was spun. They were asked to calculate the probability of each colour being spun and then spin the spinner a number of times and record the observed frequency of each colour. Students were asked to graph the expected results and the observed results and then compare and explain any differences.

Statistics and probability: Spinner mania



I have 10 sections on my spinner

Colour	Number	%	Fraction	Decimal	Actual
Blue	4	40%	$\frac{4}{10}$	0.40	20%
Purple	2	20%	$\frac{2}{10}$	0.20	40%
Yellow	3	30%	$\frac{3}{10}$	0.30	40%
Green	1	10%	$\frac{1}{10}$	0.10	0%

My spinner Tally of 10 spins

Blue	II
Purple	IIII
Yellow	IIII
Green	–

My results are different to what I expected. The probability of getting a colour when I spin should equal the number of times the colour is on the spinner. that didn't happen. I think it is because you can't really make chance fair.

Annotations

Describes probability using percentages.

Connects percentages, fractions and decimals.

Uses tally marks to record results of a chance experiment.

Compares expected frequencies with observed frequencies and attempts to explain the results.

Draws a side-by-side column graph to compare expected frequencies with observed frequencies.

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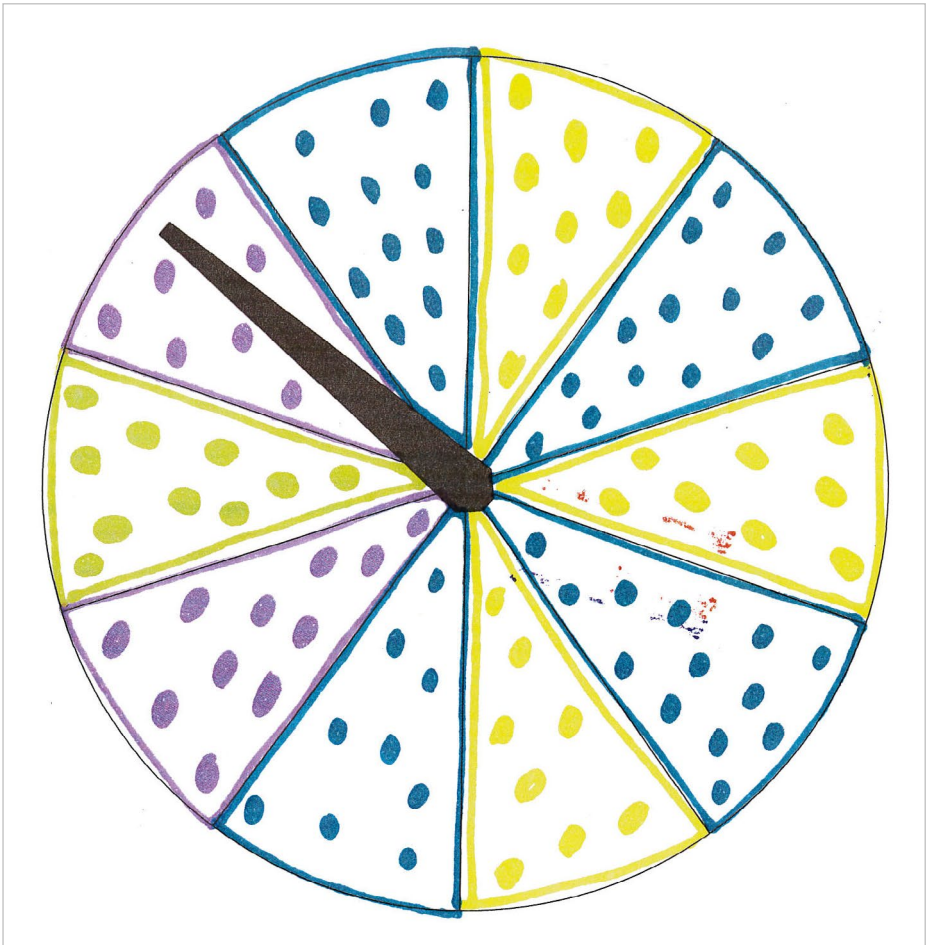
Statistics and probability: Spinner mania



Annotations

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Measurement: Fill it up

Year 6 Mathematics achievement standard

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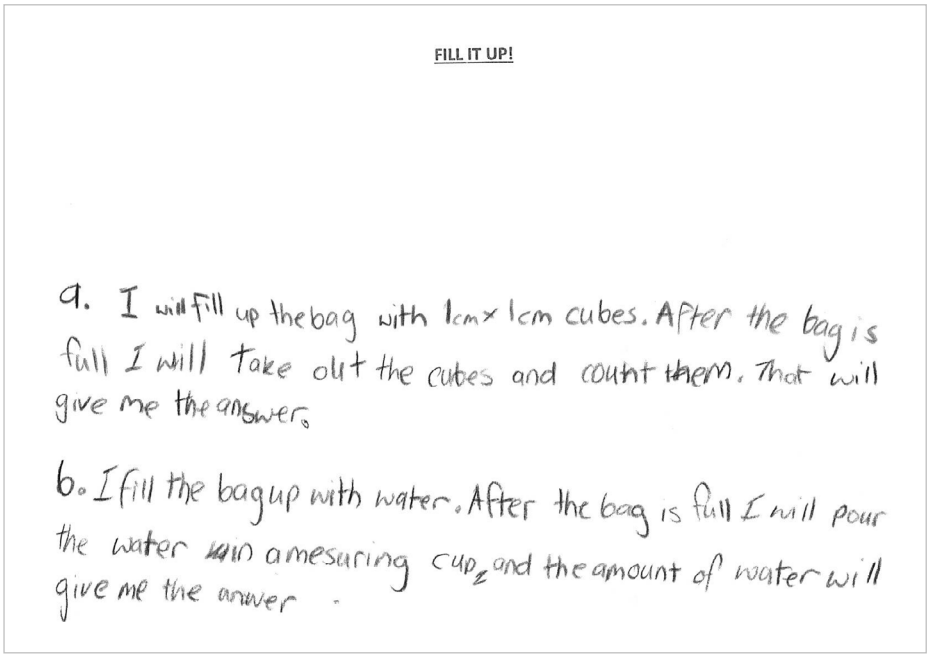
Summary of task

Students were asked to explain how to measure the capacity of a snap lock bag. When they had explained their reasoning, they were asked to measure the capacity and make a connection with volume.

Measurement: Fill it up



FILL IT UP!

a. I will fill up the bag with 1cm × 1cm cubes. After the bag is full I will take out the cubes and count them. That will give me the answer.

b. I fill the bag up with water. After the bag is full I will pour the water into a measuring cup, and the amount of water will give me the answer.

Annotations

Explains how to calculate the volume of a snap lock bag.

Explains how to measure the capacity of a snap lock bag.

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Number: Brackets and the order of operations

Year 6 Mathematics achievement standard

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Summary of task

Students had completed a unit of work on the order of operations and brackets. At the end of the unit, students were given an open-ended assessment task to demonstrate their understanding. The questions asked were:

- What different number sentences can you create that equal 35?
- Can you include brackets and order of operations in your number sentences?
- Can you explain the rules for the order of operations?
- Can you now try and create number sentences that equal 11?
- How do you know each of your number sentences is right?
- Can you use any decimals?

Mathematics

Year 6
Satisfactory

Number: Brackets and the order of operations

What different number sentences can you create that equal 35?

5 x 7 = 35
70 ÷ 2 = 35
30 + 5 = 35
60 − 25 = 35
40 − 5 = 35

Can you include brackets and order of operations in your number sentences?

(2 x 20) − (2.5 x 2) = 35
(6 x 4) + (5 x 2) + (7 − 1) = 35
(7 − 2) + (15 x 2) = 35

Can you explain the rules for order of operations?

Bracets
Orders
Division
Multiplication
Addition
Subtraction

1. Bracets - any number sentences in brackets
2. Orders - anything to the power of or square numbers
3. Division and/or multiplication
4. Addition and/or Subtraction

Can you now try and create number sentences that equal 11?

(2 x 20) − (11 x 2) − (5 ÷ 2) = 11
60 − (2 x 20) + 5 − (2 x 5) − (2 x 2) = 11

How do you know each of your number sentences is right?

The number sentences are correct if they are completed using BODMAS, like mine.

Can you use any decimals?

(2.5 x 2) + (15 x 2) = 35
(3.5 x 2) x (2.5 x 2) = 35
(4.5 x 2) + (0.5 x 4) = 11

Annotations

Generates number sentences using a range of different operations.

Uses brackets to indicate the order in which the operations must be performed in the number sentence.

Explains the order of operations.

Uses brackets to indicate which operations need to be performed first.

Explains a strategy to check that working is correct.

Uses brackets to indicate which operations must be performed first and multiples decimals by a one-digit number.

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Geometry: Understanding angles

Year 6 Mathematics achievement standard

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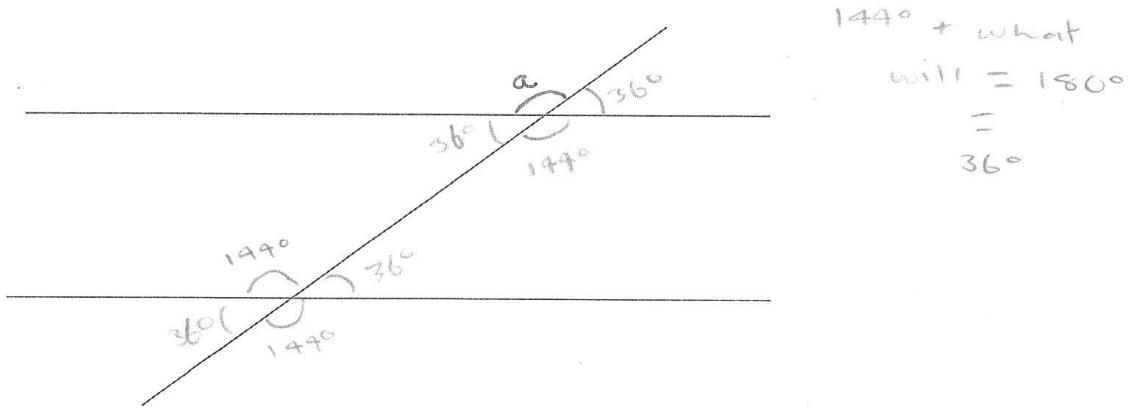
Summary of task

Students were given a diagram that consisted of a pair of parallel lines and another line that intersected the parallel lines. They were given the size of one of the angles formed and asked to calculate the size of all of the other angles without using measurement. They were asked to explain their reasoning.

Mathematics

Year 6
Satisfactory

Geometry: Understanding angles



In the above diagram angle a= 144°. Can you, without a protractor, work out the size of all the other angles?

Please explain your reasons.

Yes I can because I know 144° + has to equal 180° so I just figure out how much more I need. And I know that corresponding angles equal the same number. Alternate angles equal the same number and opposite angles equal the same number

Annotations

Demonstrates understanding that angles on a straight line add up to 180°.

Explains how to calculate the size of an unknown angle on a straight line when the size of the other angle is known.

Recognises that angles formed by two intersecting lines form pairs of vertically opposite angles that are equal.

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