

Mathematics

Year 8

Below 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 8 MATHEMATICS

This portfolio provides the following student work samples:

- Sample 1 Number and measurement: Food pyramids
- Sample 2 Number: Feed the family
- Sample 3 Statistics: Books, cricket and pets
- Sample 4 Algebra: Linear relationships in the real world
- Sample 5 Geometry: Sorting quadrilaterals
- Sample 6 Number: Ratios
- Sample 7 Number: Halfway
- Sample 8 Algebra: Solving linear equations
- Sample 9 Statistics: Venn diagrams and two-way tables
- Sample 10 Measurement: Circumference and area
- Sample 11 Measurement: Rain on the roof
- Sample 12 Number and measurement: Investigating circles
- Sample 13 Geometry: Congruence
- Sample 14 Measurement: Perimeter and area
- Sample 15 Number: Integers
- Sample 16 Measurement and geometry: Lawn sprinklers

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Mathematics

**Year 8**

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This portfolio of student work shows the solving of everyday problems involving rates, ratios and percentages (WS1, WS2, WS6). The student uses efficient mental and written strategies to carry out the four operations with integers (WS15) and describes rational numbers (WS7). The student explains issues related to the collection of data and the effect of outliers on means and medians in that data (WS3). The student solves linear equations (WS8) and graphs linear relationships on the Cartesian plane (WS4). The student deduces the properties of quadrilaterals (WS5), names the features of circles and calculates the areas and perimeters of plane shapes including circles (WS10, WS12, WS14, WS16). The student solves problems relating to the volume of prisms (WS11). The student investigates the conditions for congruence and applies these conditions to triangles (WS13). The student models authentic situations with two-way tables and Venn diagrams (WS9).

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Mathematics

Year 8

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Number and measurement: Food pyramids

Year 8 Mathematics achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

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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 given this task to consolidate previously studied units on rates, ratios and percentages.

Mathematics

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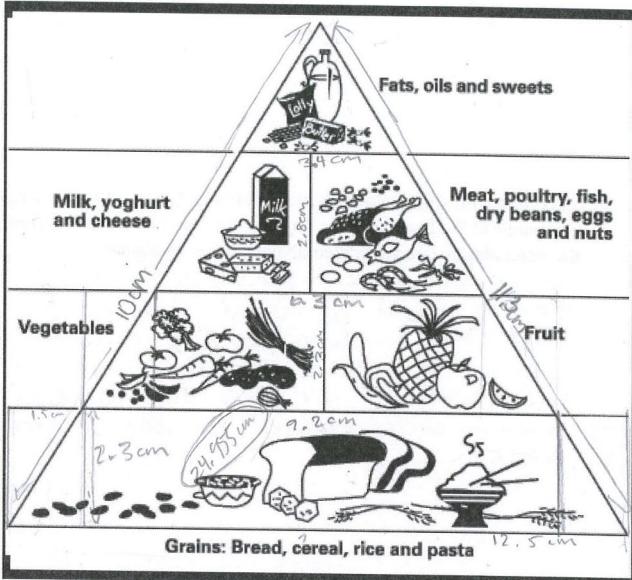
Number and measurement: Food pyramids

9. Food Pyramids

This “pyramid” is used to offer advice to people about what amounts of different kinds of food they should eat each day.

The larger the area of the region, the more of that kind of food is recommended.

So, for example, people are encouraged to eat lots of grains, but very little fats, oils and sweets.



1. By finding the area of particular sections of the “pyramid”, state the recommended percentages of the total daily diet which should be allocated to:

- fats, oils, and sweets;

$\approx 7\%$

$$\text{Area} = \frac{a+b}{2} \times h$$

of a trapezium

$$\frac{3.4 + 4.8}{2} \times 2.3 \text{ cm}$$

- vegetables;

$\approx 14\%$

Annotations

Measures and records lengths, but with some unnecessary and/or incorrect measurements.

Splits the sections into triangles and rectangles in order to calculate their areas.

Answers both percentage problems with reasonable accuracy but provides no reasoning or calculations.

Recognises that the formula for the area of a trapezium can be used to calculate one of the necessary areas.

Food Pyramids used by kind permission of NSW Department of Education and Communities.
Note: For the purpose of the work sample portfolio, the image has been reduced in size.

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Mathematics

Year 8

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Number: Feed the family

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Summary of task

Students were given a task to complete in class time relating to the unit of work they had completed on ratios and scales.

Mathematics

Year 8

Below satisfactory

Number: Feed the family

Annotations

FEED THE FAMILY ON FATHERS DAY

Remember:
1kg = 1000g

The whole family are coming to your house for Father's Day and you have to cook pancakes for everyone!

This is the recipe to make enough pancakes for **4** people

Ingredients

Plain Flour – 200g
Self Raising Flour – 300g
Milk – 200g (200mL)
Egg – 1

- Write down the **simplified** ratio of

Plain Flour : Self Raising Flour	Milk : Dry ingredients
2 : 3	1 : 2

Simplifies a simple ratio of given quantities.

- If this feeds a family of 4, show how you would calculate what quantities you would need for **20 people**. Put your answers in the table below
(WORKING SPACE)

$$\begin{aligned} 200 \times 20 &= 4,000 \\ 300 \times 20 &= 6,000 \\ 200 \times 20 &= 4,000 \\ 20 \times 1 &= 20 \end{aligned}$$

Demonstrates understanding that more of each ingredient is required to feed 20 people but is not able to scale the recipe in the ratio specified.

Number of people	Flour	SR Flour	Milk	Eggs
20	4,000	6,000	4,000	20

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Number: Feed the family

3. Pricing
Items can only be bought in the following quantities

Flour \$3.50 per kg	Flour \$3.50 per kg	Milk \$1 per 1kg (1 litre)	Eggs: packs of 6 for \$4
---------------------	---------------------	----------------------------	--------------------------

- a) How many packets of each item will you have to buy?
(WORKING SPACE)

$$\begin{aligned}1\text{kg} &= 1000\text{g} \\4 \times 3.50 &= 14 \\6 \times 3.50 &= 21 \\4 \times 1 &= 4\end{aligned}$$

$$4 \times 6 = 24$$

	Flour	SR Flour	Milk	Eggs
packets	4	21	4	4

- b) What is the total cost?

$$14 + 21 + 4 + 24 = 63$$

- c) What quantity of each item will be left over?

$$\begin{aligned}\text{Flour} &- 0 & \text{Milk} &- 0 \\ \text{SRF} &- 0 & \text{Eggs} &- 4\end{aligned}$$

4. How many people could you feed for \$50? (WORKING SPACE)

$$63 \div 50 = 1.26$$

50 people

5. How would you change the recipe to feed

a) 60 people

b) 2 people

Number of people	Flour	SR Flour	Milk	Eggs
160	42	63	12	60
2	1	1.5	1	0.5

How will you manage this?



Annotations

Uses incorrectly scaled quantities from question 2 to correctly reason the number of packets and cost of plain flour, milk and eggs for those quantities.

Reasoning in applying ratios is inconsistent. The number of packets from the table in question 3a was trebled to calculate SR flour and milk but this reasoning was not applied to the calculations for plain flour and eggs.

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Statistics: Books, cricket and pets

Year 8 Mathematics achievement standard

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Summary of task

Students were given a task to complete in class time relating to the unit of work they had completed on statistical analysis of data and the effects of outliers on the interpretation of data.

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Below satisfactory

Statistics: Books, cricket and pets

BOOKS, CRICKET AND PETS

1. Ten students were asked how many books they read last year. Their replies were

12	10	15	20	16
9	13	13	18	14

- a) Calculate the mean (average) number of books read. SHOW WORKING

$$\begin{aligned} & 12+10+15+20+16+9+13+13+18+14=140 \\ & 140 \div 10 = 14 \end{aligned}$$

- b) Calculate the median number of books read (you may need to re-order the scores)

$$9, 10, 12, 13, 13, 14, 15, 16, 18 = \frac{13+14}{2} = 13.5$$

- c) What is the mode of the scores? Why?

-13 coz it occurs the most

- d) two more students join the group and are asked how many books they read last year. Their answers are 13 and 30.

WITHOUT calculating, would you expect the

Mean to DECREASE STAY ROUGHLY THE SAME

INCREASE

Median to DECREASE

STAY ROUGHLY THE SAME

INCREASE

Mode to DECREASE

STAY ROUGHLY THE SAME

INCREASE

- e) Complete this sentence:

An outlier will have its biggest effect on the _____

Annotations

Calculates the mean for a list of discrete data.

Shows a correct process for calculating the median but does not obtain the correct value.

Identifies the mode.

Recognises the outlier would increase the mean and would have no effect on the median.

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Statistics: Books, cricket and pets

2. In a cricket match, Australia scored a total of 347 runs. There were 11 batters.
- a) What was the mean number of runs per player?

$$347 \div 11 = 31.5$$

- b) Do you know how many runs each batter scored? Why/Why not?

It Didn't say what

- c) If you are told that the median score was 36, write down a possible score for each player in the table below.

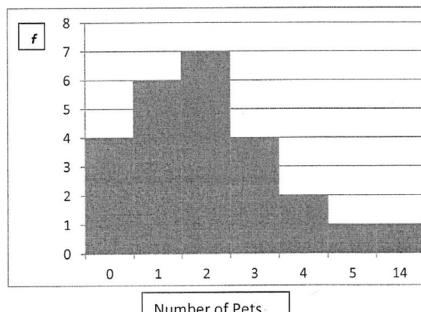
31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5
Batter 1	Batter 2	Batter 3	Batter 4	Batter 5	Batter 6	Batter 7	Batter 8	Batter 9	Batter 10	Batter 11

3. A survey was taken in a year 8 class asking each student how many pets they had at home.

A frequency distribution histogram was drawn of the results.

- a) Fill out the frequency distribution table

x	f	fx
0	111	0
1	4411	6
2	1111	14
3	111	12
4	11	8
5	1	5
14	1	14



How many students were surveyed?

59

How many pets were there all together?

25

What is the mean number of pets?

3.6

What is the effect of the outlier?

10k

WHO MIGHT BE THIS INFORMATION BE USEFUL FOR?

Annotations

Calculates the mean, showing working.

Unable to recognise the outlier in the data or to predict its effect.

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Algebra: Linear relationships in the real world

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Summary of task

Students were asked to research the peak rates for taxi hire in the ACT and NSW. The rates at the time are shown in the table below.

	ACT	NSW
Flag fall	\$4.70	\$3.50
Price/km	\$1.90	\$2.14

Students were asked to use their knowledge of graphing and equations to make comparisons between the two sets of information and to use mathematical reasoning to draw conclusions from the investigation.

Mathematics

Year 8

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Algebra: Linear relationships in the real world

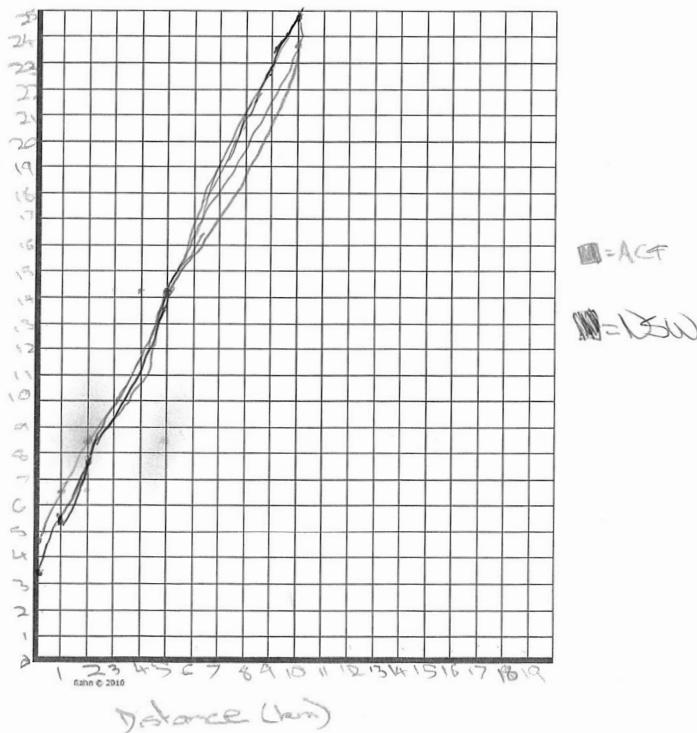
Comparing rates

1. Fill in the following tables to compare the Peak rates of NSW and ACT

ACT				
Flag rate	Flag + 1km	Flag + 2km	Flag + 5km	Flag + 10km
\$14.70	\$16.50	\$18.50	\$20.50	\$23.70

NSW				
Flag rate	Flag + 1km	Flag + 2km	Flag + 5km	Flag + 10km
\$13.50	\$15.64	\$17.78	\$19.92	\$24.90

2. Plot the two tables on the graph provided, using a different colour for each.



Annotations

*Completes tables of values.**Plots cost against distance, labelling the axes, units and a key.***Copyright**

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Algebra: Linear relationships in the real world

Annotations

3. Write an Algebraic equation to suit the ACT Taxi rates.
(Hint: flag rate + price per km = Cost of ride)

$$4.70 + 10 \times 1.9 = p = 1.9$$

4. Write an Algebraic equation to suit the NSW Taxi rates

$$3.50 + 10p = 10 \times 2.14 = p = 2.14$$

5. Explain how your equations work, in words:

My equations work by adding the flag rate and $10 \times$ the distance rate. The letter represents the distance rate.

Demonstrates limited understanding of the role of the variable representing distance in the equation.

6. At which distance does NSW become more expensive than ACT taxis and why?

It becomes more expensive in NSW at the 10km mark probably because in Sydney NSW it's busier, meaning it'll take longer to get somewhere.

7. If you had \$20, how far could you travel in a taxi in the ACT?

Probably about 7km

Estimates an answer without using an equation to model and solve the problem.

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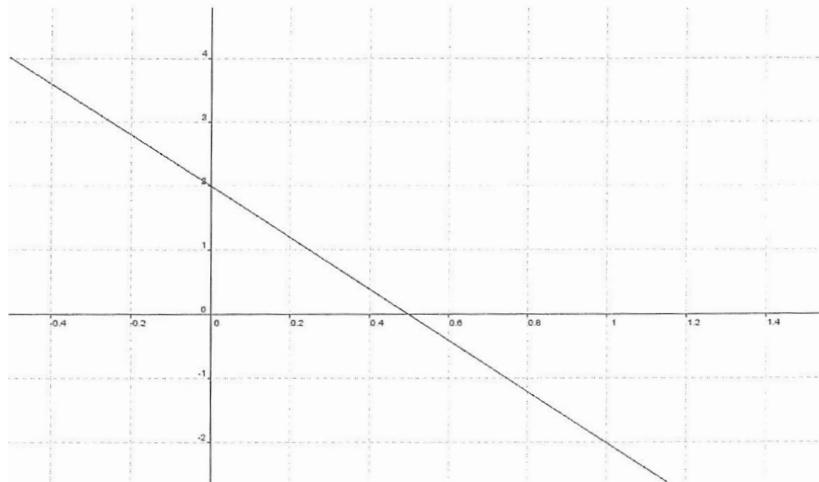
Mathematics

Year 8

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Algebra: Linear relationships in the real world

8. Explain why this graph could not represent the rate of a taxi?



Because there are minuses in the graph, taxi costs don't go into minuses.

Annotations

Explains why the graph is not a valid representation.

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Mathematics

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Geometry: Sorting quadrilaterals

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Summary of task

Students were given a task to complete in class time relating to the unit of work they had completed on quadrilaterals. They were required to indicate their reasoning when drawing conclusions.

Mathematics

Year 8

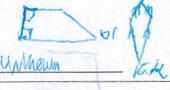
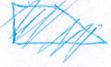
Below satisfactory

Geometry: Sorting quadrilaterals

19. Sorting Quadrilaterals

In the table below, sketch a quadrilateral with the properties indicated by each box in the table. Label all right angles and sides that are parallel.
 If it is impossible to fill a particular box in the table, write “impossible” and a brief justification for this.
 (Two cells in the table have already been completed for you.)
 If a particular case is possible, write in the most specific name you can for the quadrilateral you have drawn underneath your drawing (e.g. rectangle, trapezium, etc.)

Number of pairs of parallel sides (exactly)

	0	1	2
0	 Unknown	 Trapezium	 Parallelogram
1	 Unknown		
2	 Unknown or kite		
3	 Unknown		
4	If a quadrilateral has 4 right angles, it must be a square or a rectangle, and that can't have 0 parallel sides. Impossible	if it has → right angle require a straight line and if there are four right angles there must be two parallels IMPOSSIBLE	 Square

Annotations

Demonstrates limited understanding and recognition of quadrilaterals.

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Number: Ratios

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Summary of task

Students were given a task to complete in class time relating to the unit of work they had completed on reasoning using problem-solving strategies.

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Number: Ratios

The ratio of the number of adults to the number of children in a group is 2:5. The ratio of males to females is 10:11.

Explain how this group could be made up, presuming that the group includes at least 1 adult, 1 child, 1 male and 1 female. Use diagrams where appropriate.

2 Adults every 5 children \times 22
10 males every 11 females 44 Adults every 110 children
 $= 154$ people in group

Adults	Children
14	14

9:23

$$\begin{array}{r}
 44 \text{ and } 110 \\
 \text{multiply} \\
 \text{of} \\
 11 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 10 \text{ and } 11 \\
 \text{multiply} \\
 \text{of} \\
 10 \text{ and } 11 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 11 \cancel{\times} 105 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 \underline{36} \\
 159
 \end{array}
 \quad
 \begin{array}{r}
 14 \quad 11's \\
 \text{in} \\
 154
 \end{array}$$

$$\begin{array}{r}
 21 \\
 \times 5 \\
 \hline
 110
 \end{array}
 \quad
 \begin{array}{r}
 154 \div 2 = 77
 \end{array}$$

Annotations

Attempts to find necessary equivalent ratios using tally marks but only makes limited progress in finding a solution to the problem.

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Number: Halfway

Year 8 Mathematics achievement standard

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Summary of task

Students were given a task to complete in class time relating to the unit of work they had completed on rational numbers. The task required students to demonstrate their reasoning and problem-solving skills to answer the questions.

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Number: Halfway

A teacher asks "what number is half way between 4 and 6 on the number line?"

Kurt answers "5".

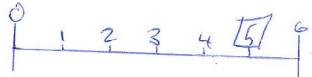
"Yes" says the teacher. "So what number is half way between $\frac{1}{4}$ and $\frac{1}{6}$?"

" $\frac{1}{5}$ " answers Chantelle.

"Think again" says the teacher!

Why was Kurt correct and Chantelle wrong? Explain your answer fully, using your understanding of fractions. What should Chantelle's answer have been? Show this on a number line.

Kurt was right by answering 5 because on the number line 5 is in between 4 and 6.



Chantelle was wrong by answering $\frac{1}{5}$ because on the number line $\frac{1}{5}$ isn't between $\frac{1}{4}$ and $\frac{1}{6}$ but $\frac{5}{12}$ is.

Annotations

Attempts to consider the problem using equivalent fractions.

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Mathematics

Year 8

Below satisfactory

Algebra: Solving linear equations

Year 8 Mathematics achievement standard

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Summary of task

Students were given a task to complete in class time after a unit of work on algebraic expansions and solving equations.

Mathematics

Year 8

Below satisfactory

Algebra: Solving linear equations

Algebraic Expressions – Equations

Please expand the expression to solve the equation

$9(d + 6) = 63$ $\begin{array}{r} \div 9 \\ d+6 = 7 \\ +6 \\ \hline d = 13 \end{array}$	$8(y + 5) = 80$ $\begin{array}{r} \div 8 \\ y+5 = 10 \\ -5 \\ \hline y = 10 \end{array}$
$6(f - 10) = 18$ $\begin{array}{r} \div 6 \\ f-10 = 3 \\ +10 \\ \hline f = 13 \end{array}$	$5(m - 1) = 10$ $\begin{array}{r} \div 5 \\ m-1 = 2 \\ +1 \\ \hline m = 3 \end{array}$
$4(x + 9) = 56$ $\begin{array}{r} \div 4 \\ x+9 = 14 \\ +9 \\ \hline x = 5 \end{array}$	$8(4y - 3) = 72$ $\begin{array}{r} \div 8 \\ 4y-3 = 9 \\ +3 \\ 4y = 12 \\ \div 4 \\ \hline y = 3 \end{array}$
$2(3t + 5) = 10$ $\begin{array}{r} \div 2 \\ 3t+5 = 5 \\ +5 \\ \hline 3t = 10 \end{array}$	$7(x - 4) = 56$ $\begin{array}{r} \div 7 \\ x-4 = 8 \\ +4 \\ \hline x = 12 \end{array}$
$3(4x + 3) = 93$ $\begin{array}{r} \div 3 \\ 4x+3 = 31 \\ -3 \\ 4x = 28 \\ \div 4 \\ x = 7 \end{array}$	$10(2a - 3) = 50$ $10/2a-3 = 5$
$4(x + 2) = 40$ $\begin{array}{r} \div 4 \\ x+2 = 40 \\ -2 \\ x = 8 \end{array}$	$7(2z + 1) = 21$ $\begin{array}{r} \div 7 \\ 2z+1 = 3 \\ -1 \\ 2z = 2 \\ \div 2 \\ z = 1 \end{array}$
$3(2t - 9) = 15$ $\begin{array}{r} \div 3 \\ 2t+9 = 5 \\ -9 \\ 2t = -4 \\ \div 2 \\ t = -2 \end{array}$	$3(3a - 1) = 42$
$5(2x + 3) = 55$	$4(p + 7) = 32$

Annotations

Solves simple equations but does not follow instruction to expand the expression first and then solve.

Attempts to solve the equations but makes errors.

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Mathematics

Year 8

Below satisfactory

Statistics: Venn diagrams and two-way tables

Year 8 Mathematics achievement standard

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Summary of task

Students had 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 and a two-way table.

Mathematics

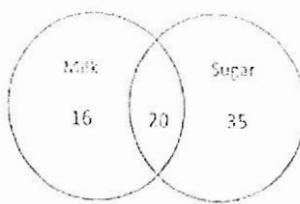
Year 8

Below satisfactory

Statistics: Venn diagrams and two-way tables

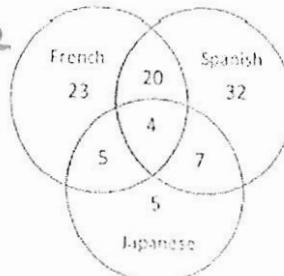
1. Stephen asked 100 coffee drinkers whether they like milk or sugar in their coffee.
 2. According to the diagram below, how many like

- a. Milk? **36**
- b. Sugar? **55**
- c. Sugar but not milk? **20**
- d. Milk but not sugar? **16**
- e. Milk and sugar? **51**
- f. Milk or sugar? **20**



3. From the Venn diagram below how many people study

- a. French and Spanish **20**
- b. French, Spanish and Japanese **12**
- c. French and Japanese **4**



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

	Male	Female	Total
Walk	24	46	80
Car	28	17	45
Bus	12	12	27
Cycle	42	17	69
Total	129	92	221

Annotations

Interprets and uses some information supplied in a Venn diagram.

Calculates most missing entries in a given two-way table.

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Mathematics

Year 8

Below satisfactory

Measurement: Circumference and area

Year 8 Mathematics achievement standard

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Summary of task

Students were given a task to complete in class time after a unit of work on circles.

Mathematics

Year 8

Below satisfactory

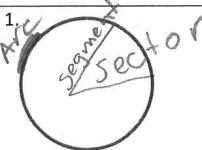
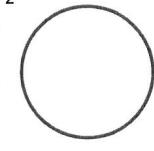
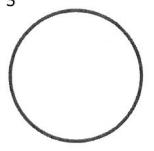
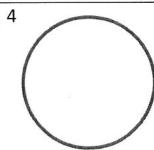
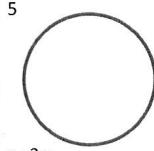
Measurement: Circumference and area

Circumference and area of circles

a) on one of the circles label:

- I. an arc
- II. a sector
- III. a segment

b) Calculate the circumference and area of each of the given circles

	$C = 2 \times \frac{22}{7} \times 2 = \frac{88}{7}$
$r=2 \text{ cm}$	$A = \frac{22}{7} \times 2^2 = \frac{22}{7} \times 4 = \frac{88}{7}$
	$C = 2 \times \frac{22}{7} \times 1.5$
$r=1.5 \text{ cm}$	$A = \frac{22}{7} \times 1.5$
	$C = 2 \times \frac{22}{7} \times 1.4$
$r=1.4 \text{ m}$	$A = \frac{22}{7} \times 1.4$
	$C = 2 \times \frac{22}{7} \times 3.6$
$r=3.6 \text{ mm}$	$A = \frac{22}{7} \times 3.6$
	$C = 2 \times \frac{22}{7} \times 3 = \frac{132}{7}$
$r=3 \text{ m}$	$A = \frac{22}{7} \times 3^2 = \frac{66}{7}$

Annotations

(C) $2\pi r$
(A) πr^2

*Labels an arc of the circle correctly.**Attempts the calculations but does not complete the answer or use the correct units.*

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Mathematics

Year 8

Below satisfactory

Measurement: Rain on the roof

Year 8 Mathematics achievement standard

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Summary of task

Students were given a task to complete in class time after a unit of work on volume.

Mathematics

Year 8

Below satisfactory

Measurement: Rain on the roof

Rain on My Roof

Typical roof areas:

Home Type	Roof area(m^2)
2 bedroom home	100
3 bedroom home	150
4 bedroom home	200
5 bedroom home	250

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

From the table, choose a home.

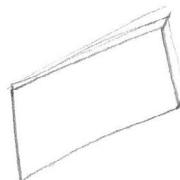
Using your choice of home, calculate the amount of rainwater in litres (L) collected by the roof of your chosen home when one millimetre (1mm) of rain falls.

My choice of home: 2 bedroom

Calculations:

$$\begin{aligned}
 1\text{mm} &= 0.001\text{m} \\
 &= 0.001 \times 100 \\
 &= 0.1 \div 1000 \\
 &= 0.0001
 \end{aligned}$$

$$\begin{aligned}
 1\text{mm} &= 0.001\text{m} \\
 1\text{m}^3 \text{ holds} &= 1000\text{L}
 \end{aligned}$$



Amount of rainwater collected by the roof when 1mm of rain falls is..... less than a mm.

Annotations

Calculates the volume of water on the roof in cubic metres but does not show units or set out working clearly.

Attempts to convert the volume in cubic metres to litres but divides instead of multiplying by a factor of 1000.

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Mathematics

Year 8

Below satisfactory

Number and measurement: Investigating circles

Year 8 Mathematics achievement standard

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Summary of task

Students had been learning about the concept of irrational numbers, including π , and the relationship between the circumference of a circle and the radius.

The students were asked to investigate the relationship between the circumference and the diameter of a circle by measuring a variety of circular objects. They were given one week to complete the task.

Mathematics

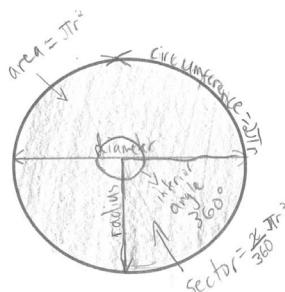
Year 8

Below satisfactory

Number and measurement: Investigating circles

Year 8 Task One: Investigating Circles

1. Label the diagram of the circle to the right including all the important features you know.



2. (a) Use an appropriate method to measure the circumference and the diameter of the circular objects below.
 (b) Represent the ratio circumference : diameter in the form of a:1
 (c) Summarize your findings

Object	Circumference	Diameter	Circumference:Diameter
	180 cm	53 cm	180.53 3.396:1
	191 cm	60 cm	191:60 3.183:1
	620 cm	175 cm	620:175 3.542857:1

Annotations

Names and indicates some parts of a circle.

Measures the circumference and diameter of a variety of circular objects but with several inaccuracies.

Forms the ratio of the circumference to the diameter but does not write it in the form a:1 to allow comparison.

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Mathematics

Year 8

Below satisfactory

Number and measurement: Investigating circles

Is Circular Drive Circular?

Design and conduct an investigation to determine whether the concrete boundary of Circular Drive is a perfect circle.



Circumference = 7
diameter = 22m 33cm

$$2\pi r = 2 \times \pi \times 11.15$$

$$\approx 70.15\text{cm}$$

\therefore not a perfect circle otherwise our found circumference would be equal to $2\pi r$. This however, could be wrong if our measurements were not accurate which is possible.

Annotations

Measures the circumference inaccurately.

Applies the circumference formula to calculate the expected circumference using their measurement of the diameter.

Concludes that the drive is not circular by observing that the calculated value of the circumference is not close to their measurement of the circumference.

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Mathematics

Year 8

Below satisfactory

Geometry: Congruence

Year 8 Mathematics achievement standard

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Summary of task

Students had completed a unit of work on congruence in which they used transformations to create congruent figures and investigated the conditions for the congruence of triangles.

Students were asked to demonstrate and apply their knowledge of transformations and the conditions for the congruence of triangles. They completed the task in class under exam conditions.

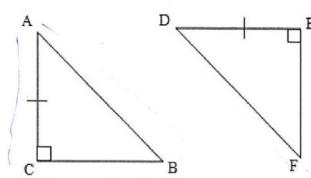
Mathematics

Year 8

Below satisfactory

Geometry: Congruence

- 1 Identify the matching side and angles in these congruent triangles.

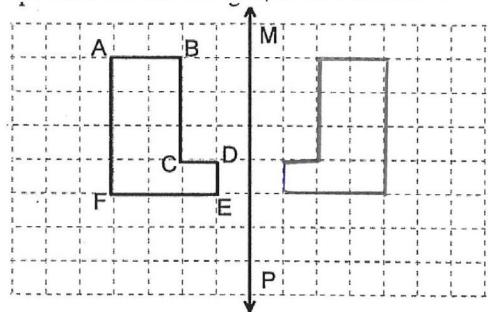


$$\text{BC} = \underline{\text{EF}}$$

$$\angle \text{ABC} = \underline{\text{DFE}}$$

$$\angle \text{ACB} = \underline{\text{DEF}}$$

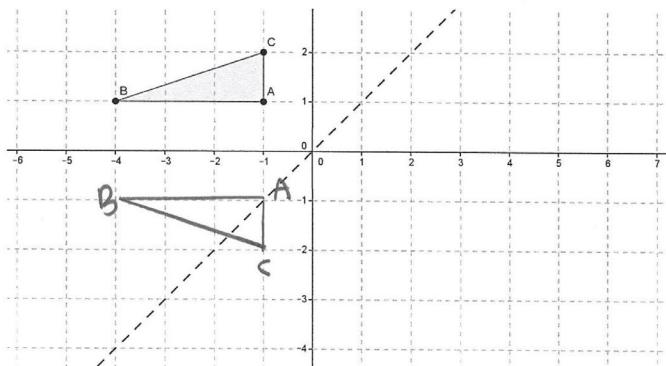
- 2 Construct the reflection of the shape ABCDEF in the line MP.



Annotations

Identifies corresponding sides and angles of congruent triangles and names corresponding angles of congruent triangles in matching order.

- 3 Construct the reflection of the triangle ABC in the dotted line. Label your new vertices A', B' and C'.



Reflects a figure in a vertical axis.

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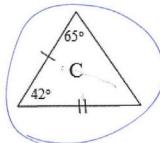
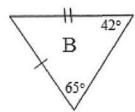
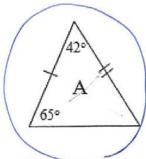
Mathematics

Year 8

Below satisfactory

Geometry: Congruence

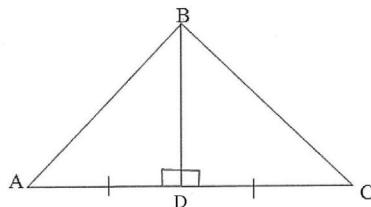
- 4 a Which of the following triangles are congruent? (Circle two triangles; diagrams are not to scale.)



- b Which test shows they are congruent?

SAA

- 5 Consider the following diagram.



- a Which of the following congruence statements has the correct vertex order?

 $\Delta ABD \equiv \Delta DCB$ $\Delta ABD \equiv \Delta DCB$ $\Delta ABD \equiv \Delta CDB$ $\Delta ABD \equiv \Delta CBD$

- b Which congruence test shows that the two smaller triangles are congruent?

RHS

- c Explain your answer to (b).

The triangles both have a right angle and the bottom lines are congruent which must mean the hypotenuse is as well.

- d What kind of triangle is ΔABC ? Explain your answer.

right angled triangle . It has a right angle

Annotations

Selects a pair of congruent triangles.

States a test that can be used to show that the triangles are congruent.

Identifies correct vertex order for congruent triangles.

Attempts to identify the correct test for congruency but makes an incorrect assumption.

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Mathematics

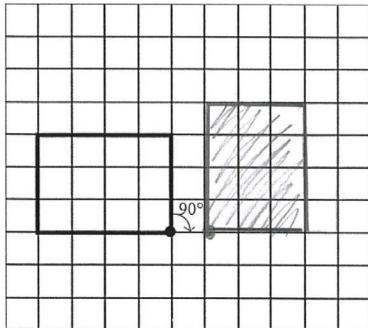
Year 8

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Geometry: Congruence

Annotations

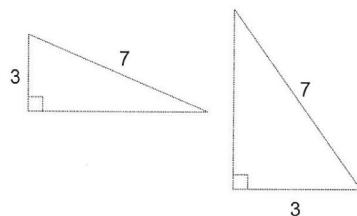
- 6 The rectangle in the diagram is to be rotated 90° clockwise about the marked point.



Draw the resulting rectangle inside the diagram.

Rotates a figure by the desired angle but does not use the correct centre of rotation.

- 7 a State the congruence test that applies to the following two triangles. (The diagram is not to scale.)

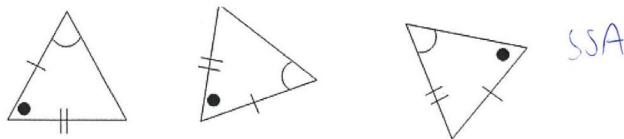


- b Explain how the two triangles above could instead be proved congruence by the SSS test.

by using pythagoras' theorem

Recognises the connection to Pythagoras' Theorem.

- 8 Circle the two congruent triangles below, and state the applicable congruence test.



Attempts to state a test that can be used to show that the triangles are congruent but does not identify which triangles are congruent or acknowledge the importance of the included angle in writing the abbreviation of the test.

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Mathematics

Year 8

Below satisfactory

Measurement: Perimeter and area

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Summary of task

Students completed a unit of work on finding the perimeter and area of a range of two-dimensional shapes.

The task required students to answer a number of questions related to the perimeter and area of a range of two-dimensional shapes, including circles. Students were asked to apply their skills to some real-world problems. They completed the task under exam conditions in class time.

Mathematics

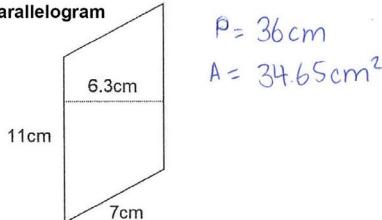
Year 8

Below satisfactory

Measurement: Perimeter and area

- 1 Calculate the perimeter and area of these shapes. Be sure to include units. Make your answers clear.

Unless otherwise specified, all measurements given are in centimetres.

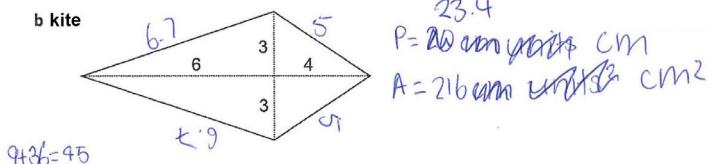
a Parallelogram

$$P = 36 \text{ cm}$$

$$A = 34.65 \text{ cm}^2$$

Annotations

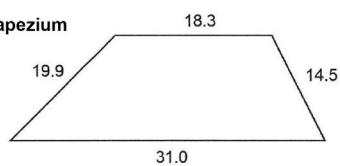
Determines the perimeter of various plane shapes.

b kite

$$P = 23.4$$

$$A = 21.6 \text{ cm}^2$$

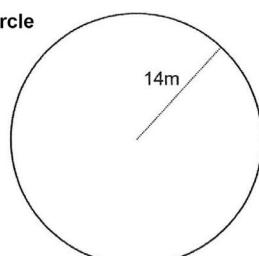
Uses Pythagoras' Theorem to calculate the lengths of unknown sides in order to determine the perimeter.

c Trapezium

$$A = 176.7 \text{ cm}^2$$

$$P = 83.7 \text{ cm}$$

Unable to correctly determine the area of typical plane shapes.

d Circle

$$87.96 \text{ m}^2$$

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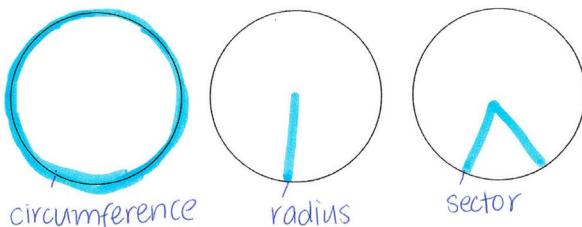
Mathematics

Year 8

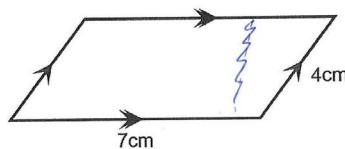
Below satisfactory

Measurement: Perimeter and area

- 2 Using the three circles below, draw and label all the parts of a circle that you know.

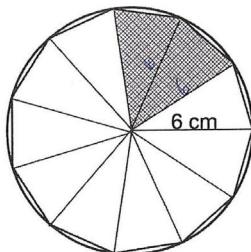


- 3 Explain why it is not possible to find the area of this shape.



Because the height of the shape is not given ~~as the height is not given~~
~~as the height is not given~~
~~as the height is not given~~

- 4



A reasonable estimate for the shaded area is (in cm^2 – circle one)

12

16

20

25

Explain your answer.

Because the base of one of the circles is 6cm so the other two combined makes 12.

Annotations

Draws and names a small number of parts of a circle.

Provides an explanation for why an area cannot be determined.

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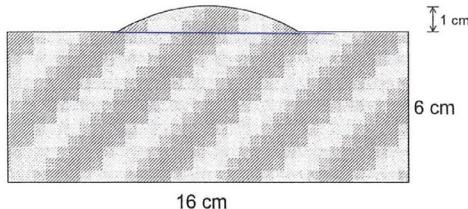
Mathematics

Year 8

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Measurement: Perimeter and area

- 5 The following diagram is drawn to scale.



Estimate the shaded area (nearest cm^2), explaining your answer (with words and/or diagrams).

97 cm^2 ? The area of the square is $16 \times 6 = 96$
and then you find the answer of 96, then you
plus the 1 from the circle bit to make
97.

- 6 a The Earth is approximately a sphere. Its diameter is 12 755 km. Find the distance around the equator.

40,0071.0143 km

- b The Earth spins on its axis once every 24 hours. If you stand on the equator, you are moving through space very fast because of the Earth's rotation. Calculate this speed.

16669.6256 km/h

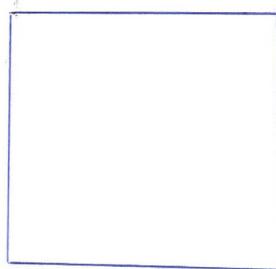
- 7 Draw a diagram of a figure (neat, shaded, but not to scale) that has:

- a an area of $(6\text{cm} \times 4\text{cm}) - \pi(2\text{cm})^2$

11.4 cm^2

- b a perimeter of $\frac{47}{360} \times 2\pi(13\text{cm}) + 13\text{cm} + 13\text{cm}$

36.7 cm



Annotations

Determines the area of the rectangle but does not provide an appropriate estimate for the area of the segment.

Recognises that circumference is needed.

Evaluates the given expression to determine the perimeter but is not able to connect the given information to an appropriate diagram.

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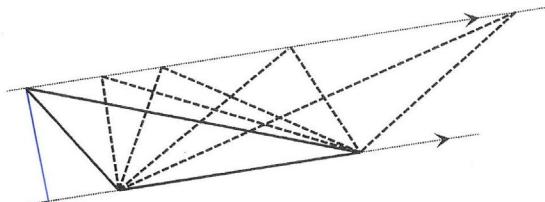
Mathematics

Year 8

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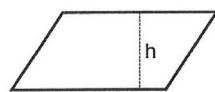
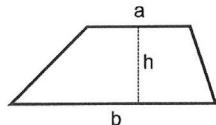
Measurement: Perimeter and area

- 8 Several triangles are drawn inside two parallel lines in the diagram below.



- Explain why all the triangles shown have the same area.
Because the triangles have been drawn between the parallel lines this means that they have the same area between them.
- Using appropriate measurements with your ruler, calculate their area.
10@ units²
- Of all the possible triangles you could draw that are like those above, one triangle has the smallest perimeter. Draw this triangle in the diagram above, and briefly explain your answer.

- 9 The trapezium and the parallelogram shown have the same area. How long is the base of the parallelogram?



$$A = \frac{1}{2}(a+b)h$$

The base of the parallelogram is the same as
the base of the trapezium. ~~so the base of the trapezium is the same as the base of the parallelogram~~
make

Annotations

Attempts to explain why the triangles have the same area but does not refer to the base or perpendicular height of the triangles.

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Mathematics

Year 8

Below satisfactory

Number: Integers

Year 8 Mathematics achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

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 completed a unit of work on integers.

Students were asked a series of questions that involved calculation and reasoning with integers. The use of calculators was not permitted and students were given 20 minutes of class time to complete the task.

Mathematics

Year 8

Below satisfactory

Number: Integers

Integers

Calculators are NOT permitted

1) Evaluate:

a) $5 - 10 = -5$
 b) $20 + -5 = 15$
 c) $-14 + -5 = -19$
 d) $-4 - -7 = 3$

e) $-8 - 12 = -20$
 f) $5 - 11 - 7 = -23$
 g) $9 + 3 - 12 = 0$
 h) $-10 - +4 + 16 = 2$

2) Evaluate:

a) $3 \times -5 = -15$
 b) $-4 \times -10 = 40$
 c) $7 \times (-3) = -21$
 d) $-5 \times 2 \times -4 = -40$

e) $8 \times -1 \times 10 = -80$
 f) $-2 \times -5 \times -7 = -70$
 g) $(-2)^3 = -8$
 h) $(-5)^2 = -10$

3) Evaluate:

a) $60 \div -6 = -10$
 b) $-45 \div -5 = 9$
 c) $-24 \div 4 = -6$
 d) $\frac{-40}{4} = -10$

e) $\frac{30}{-6} = -5$
 f) $\frac{-100}{-20} = 50$
 g) $\frac{-48}{2} = -24$
 h) $-100 \div -20 \div 5 =$

4) Calculate:

a) $3 \times 12 \div -6 = -6$
 b) $(7 - 13) \times 4 = -24$
 c) $-5 + [20 \times (14 - 6)] = -155$
 d) $-12 - 30 \div -6 = 8$
 e) $(-4 \times 11) - (5 \times -7) = -7$

f) $(5 - 7) - (12 - 9) = -5$
 g) $5 + \frac{18}{6} - 12 =$
 h) $\frac{2 - 5 \times 4}{-6 \div -2} =$
 i) $3 - \frac{100 + 8 \times -8}{12 \times -3} = \frac{-864}{-36}$

Annotations

Adds and subtracts integers but with one error.

Multiples integers but with a few errors.

Divides integers but with a few errors.

Applies the order of operations to evaluate expressions involving integers but with several errors.

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Mathematics

Year 8

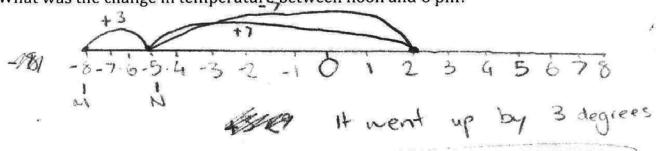
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Number: Integers

Annotations

- 5) At 12 am on Monday, the temperature in Vladivostok was recorded as -8°C . By 6 am the temperature had risen by 3°C . By noon the temperature had risen by a further 7°C . At 6 pm the temperature was -5°C .

What was the change in temperature between noon and 6 pm?



- 6) Is the value of $(-46)^{86}$ positive or negative? Give a reason for your answer.
[Note: You do no need to find the value of $(-46)^{86}$].

I think the value of $(-46)^{86}$ is still negative because it has a -1 at the beginning and that keeps it negative even if you are multiplying it.

- 7) Place a number in each box to make the statements true:

a) $20 + \boxed{-80} = -60$

b) $35 - 5 \times \boxed{2.025} = 75$

- 8) Tom wrote:

'If a question with integers involves exactly two minus signs, one plus sign, and no other operations, then the answer is positive.'

Is Tom's statement always correct or sometimes correct or never correct? Provide at least one example to support your decision.

Tom's statement isn't correct, although it can sometimes be positive. e.g. $10 + -5 - 7 = -2$ while $10 + 5 - -7 = 22$.

Attempts to solve a real-world problem involving integers by using a number line.

Determines the correct solution to a number sentence involving the addition of integers.

Comments on the validity of a given statement, justifying their decision with appropriate examples.

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Mathematics

Year 8

Below satisfactory

Measurement and geometry: Lawn sprinklers

Year 8 Mathematics achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

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 calculating the area and circumference of circles. Students were given the task below to complete as an assignment over three days.

You have been asked to assist with the installation of a sprinkler system on a flat grassed rectangular area measuring 30 metres by 21 metres. You need to determine a design for the placement of the sprinklers so that the maximum area of grass receives water with no overlap allowed. Conditions:

- The sprinklers only spread water from a central point in a circular pattern but may be adjusted to spray in half or quarter circles.
 - The radius of the circle watered is adjustable so that you can use as many or as few sprinklers as you like but you must use the same radius for all sprinklers in any one design.
1. Draw some designs to show what the sprinkler arrangement might look like.
 2. Calculate the total area that is watered in each design.
 3. Collate your results in a suitable table.
 4. Suggest the best possible arrangement of sprinklers that would water the maximum area of grass. Make sure you explain your choice.
 5. Write a conclusion for your investigation.

Mathematics

Year 8

Below satisfactory

Measurement and geometry: Lawn sprinklers

Calculation	Annotations
<p>Design 1</p> $A = 2\pi r$ $A = 2 \times 3.142857143 \times 8.75$ $A = 55\text{m}.$	$A = 17.28$ $\begin{array}{r} \times 12 \\ \hline 207.36 \end{array}$ $207.36\text{m}.$
<p>The total area which is watered is 207.36m.</p>	<p>The total area which is watered is 207.36m</p>
<p>Design 2</p> $A = 2\pi r$ $A = \frac{22}{7} \times 2 \times 4.15$ $A = 26.08$ $\begin{array}{r} \times 6 \\ \hline 156.48 \end{array}$	$A = 2\pi r$ $A = 2 \times 3.142857143 \times 2.25$ $A = 14.14\text{m}$ $\begin{array}{r} \times 24 \\ \hline 339.36 \end{array}$
<p>The total area which is watered is 156.48m.</p>	<p>The total area which is watered is 339.36m</p>
<p>Design 3</p> $A = 2\pi r$ $A = 2 \times 3.142857143 \times 2.75$ $A = 17.28\text{m}$	$A = 2\pi r$ $A = 2 \times 3.142857143 \times 4.25$ $A = 26.71\text{m}$ $\begin{array}{r} \times 6 \\ \hline 160.26 \end{array}$
<p>The total area which is watered is 160.26m.</p>	<p>The total area which is watered is 160.26m.</p>

Annotations

Confuses formula for circumference of circle with that for area.

Uses the radius of circle correctly in circumference formula and uses metres as the unit of linear measure.

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Mathematics

Year 8

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Measurement and geometry: Lawn sprinklers

Design Number	Circumference of every circle	Total of area watered	Area not watered
Design 1	55 m	110 m	520 m
Design 2	26.08 m	156.48 m	473.52 m
Design 3	17.28 m	207.36 m	422.64 m
Design 4	14.14 m	339.36 m	290.64 m
Design 5	26.71 m	160.26 m	409.74 m

Annotations

Uses simple but logical analysis based on comparison of area covered and area left uncovered of the five sprinkler arrangements.

Demonstrates limited understanding of the appropriate use of the circumference and area in the analysis.

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