MARS Tasks | Grade 7

Page	Name of MARS Task	Year	Math Strand	Notes
*	Mixing Paints	2003	NO	Ratios, percents fractions, decimals
*	Hexagons	2003	AF	Give rule, formula for growing pattern
*	Pattern	2003	GM	Find length, angles in symmetrical figure
*	Fair Game?	2003	PS	Determine fairness of coin and dice game
*	Yogurt	2003	NO	Fractions, percents in context of profits

*	Quiz	2004	AF, NO	Interpret data, calc. scores on quiz
*	Cereal	2004	NO	Which cereal has higher ratio of protein
*	Special Offer	2004	NO	Percentage of savings off reg. price
*	Counters	2004	PS	Design money making game of prob.
*	Which Is Bigger?	2004	GM	Compare height of cylinder to circumference

2	Lawn Mowing	2005	GM	Find ratios, square yards per minute
5	Necklaces	2005	AF	Growing pattern, formulas for beads
9	Trapezoids	2005	GM	Identify prop. of shapes, draw diff. designs
13	Ducklings	2005	PS	Freq. chart, calculate mean number
17	Sneakers	2005	NO	Percentage problem involving sale prices

20	**Overview of 2006 Tasks**			
21	Square Tiles	2006	NO, GM	Interpret pattern, determine ratios
23	Photographs	2006	NO, GM	Proportional reasoning in geometry context
26	Pizza Crusts	2006	GM	Find area, perimeter, circumference
29	Buying a Camera	2006	NO	Percent increase/decrease in sales tax
32	Mean, Median, Mode …	2006	PS	Match bar graphs to statistical tables

35	**Overview of 2007 Tasks**			
36	Work	2007	NO, AF	Connect units of time in rate problem
38	Suzi's Company	2007	PS	Mean, median, mode of salaries
41	Journey	2007	AF	Draw distance-time graph, find avg. speed
44	Parallelogram	2007	GM	Use cm ruler, find area, perimeter
47	Mystery Letters	2007	AF	Form/solve equations in number puzzle

49	**Overview of 2008 Tasks**			
50	Will It Happen?	2008	PS	Likelihood, numerical probability of # cube
52	Odd Numbers	2008	AF, NO	Extend pattern, square numbers
55	Pedro's Tables	2008	NP	Multiples, factors, prime numbers
58	Winter Hat	2008	GM	Area of circle, rectangle, trapezoid
60	Sale!	2008	NO	Sales discount, percent, fractions

62	**Overview of 2009 Tasks**			
63	Toy Trains	2009	AF	Growing pattern, write algebraic expression
65	Buses	2009	AF	Distance-time graph, add line to graph
68	Sequoia	2009	GM	Circumference, volume of cone, cylinder
71	Archery	2009	DA, PS	Draw a box plot, mean, median
74	Cat Food	2009	NO	Fractions, cost with items sold in packs

NP=Number Properties
NO=Number Operations
PFA=Patterns Functions Algebra
GM=Geometry & Measurement
DA=Data Analysis

* Tasks from 2003 and 2004 are not included in this packet due to copyright restrictions. However, if you click on the name of the task, you can access it via the Noyce Foundation website. Tasks from 2005 to 2009 are available here with permission from the Mathematics Assessment Resource Service (MARS).

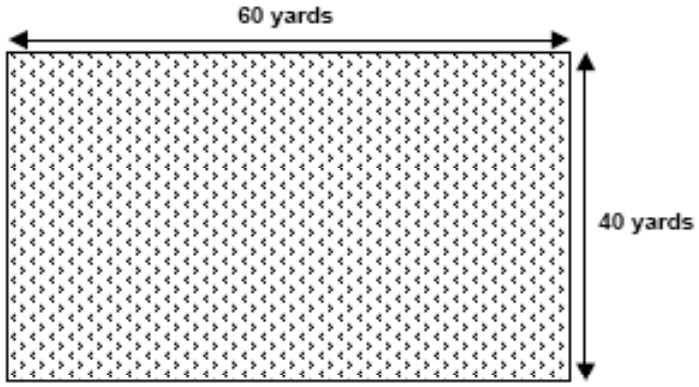
7th grade Task 1 Lawn Mowing

Student Task	Use proportional reasoning and ratios to solve a problem involving lawn cutting.
Core Idea 4 Geometry and Measurement	**Analyze characteristics and properties of two-dimensional geometric shapes; develop mathematical arguments about geometric relationships and apply techniques, tools, and formulas to determine measurements.** • Solve problems involving similarity and scale factors, using proportional reasoning • Use representations to model and interpret physical, social and mathematical phenomena

Grade 7 – 2005

Lawn Mowing

This problem gives you the chance to:
- solve a practical problem involving ratios
- use proportional reasoning



Dan and Alan take turns cutting the grass.
Their lawn is 60 yards long and 40 yards wide.

1. What is the area of the yard? _____ square yards

Dan takes an hour to cut the lawn using an old mower.

2. How many square yards does Dan cut in a minute? _____
   Show your work.

Alan only takes 40 minutes using a new mower.

3. How many square yards does Alan cut in a minute? _____
   Show your calculation.

4. One day they both cut the grass together.
   How long do they take? _____
   Show how you figured it out.

Lawn Mowing **Grade 7** Rubric		
The core elements of performance required by this task are: • solve a practical problem involving ratios • use proportional reasoning Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answer: **2,400** square yards	1	1
2. Gives correct answer: **40** square yards per minute Shows work such as: (60 x 40) ÷ 60	1 1ft	2
3. Gives correct answer: **60** square yards per minute Shows work such as: (60 x 40) ÷ 40	1 1ft	2
4. Gives correct answer: **24 minutes** Shows correct work such as: In one minute together they mow 40 + 60 = 100 square yards (60 x 40) ÷ 100	1 2ft	3
Total Points		**8**

Grade 7 – 2005

7th grade Task 2 Necklaces

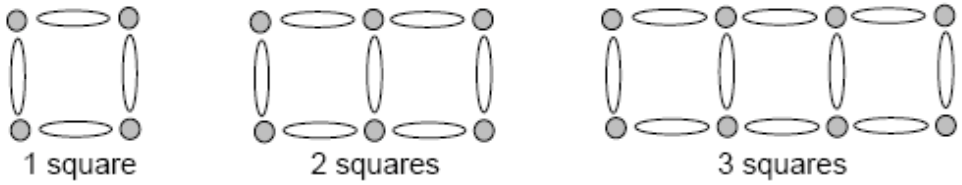
Student Task	Work with a sequence of bead patterns to describe how the sequence changes, what its size might be given a certain number of beads, and then write a formula to determine how many of each kind of bead would be needed for any size necklace.
Core Idea 3 Algebra and Functions	**Understand relations and functions, analyze mathematical situations, and use models to solve problems involving quantity and change.** • Relate and compare different forms of representation for a relationship including words, tables, and symbols • Express mathematical relationships using expressions and equations • Develop conceptual understanding of different uses of variables • Use symbolic algebra to represent situations to solve problems

Grade 7 – 2005

Necklaces

This problem gives you the chance to:
- work with a sequence of bead patterns
- write a formula

Janice is making necklaces with colored beads.
She makes them into square patterns like this:



1. Fill in the table showing the number of round and long beads needed.

Number of squares	Long beads	Round beads
1	4	4
2	7	
3		
4		
8		

2. Explain how you figured out how many long beads are needed to make 4 and 8 squares.

_____

_____

_____

3. Explain how you figured out how many round beads are needed to make 4 and 8 squares.

_____

_____

_____

4. Janice uses 37 long beads to make some squares.

   a. How many squares does she make? _____

   Show your work.

   b. How many round beads will she need to make these squares? _____

5. Write a rule or an algebraic formula for finding the **total** number of round and long beads, **B**, Janice needs to make **n** squares.

_____

Necklaces Grade 7 Rubric

The core elements of performance required by this task are:
- work with a sequence of bead patterns
- write a formula

Based on these, credit for specific aspects of performance should be assigned as follows

		points	section points
1.	Gives seven correct answers:	3	
	Partial credit 6 or 5 correct answers 4 or 3 correct answers	(2) (1)	3
2.	Gives a correct explanation such as: Add 3 extra long beads for each extra square.	1	1
3.	Gives a correct explanation such as: Add 2 extra round beads for each extra square.	1	1
4(a)	Gives correct answer: **12**	1	
	Shows correct work such as: $(37 - 1) \div 3$	1	
(b)	Gives a correct answer: **26**	1	3
5.	Gives a correct formula such as: **B = 5n + 3** Accept equivalent formulae.	2	
	Partial credit B = 5n + … or Gives correct formulae for round and long beads separately.	(1)	2
	Total Points		**10**

Number of squares	Long beads	Round beads
1	4	4
2	7	**6**
3	**10**	**8**
4	**13**	**10**
8	**25**	**18**

Grade 7 – 2005

7th grade Task 3 Trapezoids

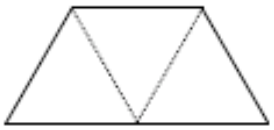
Student Task	Identify the properties of two two-dimensional shapes (trapezoid and parallelogram) and draw three different shapes made from two trapezoids.
Core Idea 4 Geometry and Measurement	**Analyze characteristics and properties of two-dimensional geometric shapes; develop mathematical arguments about geometric relationships.** • Understand relationships among the angles, side lengths, perimeters, and areas of shapes • Develop and critique inductive and deductive arguments concerning geometric ideas and relationships

Grade 7 – 2005

Trapezoids

This problem gives you the chance to:
- identify the properties of shapes
- draw shapes made from others

Here is a trapezoid made from three equilateral triangles.



The shape below is made from two of the trapezoid shapes joined together along one side.

1. a. What is the mathematical name for the second shape?

   _____

   b. In the second shape, draw the line where the two trapezoid shapes are joined together.

2. a. In the table opposite, check the statements that are true for the trapezoid.
   b. In the third column of the table, check the statements that are true for the second shape.

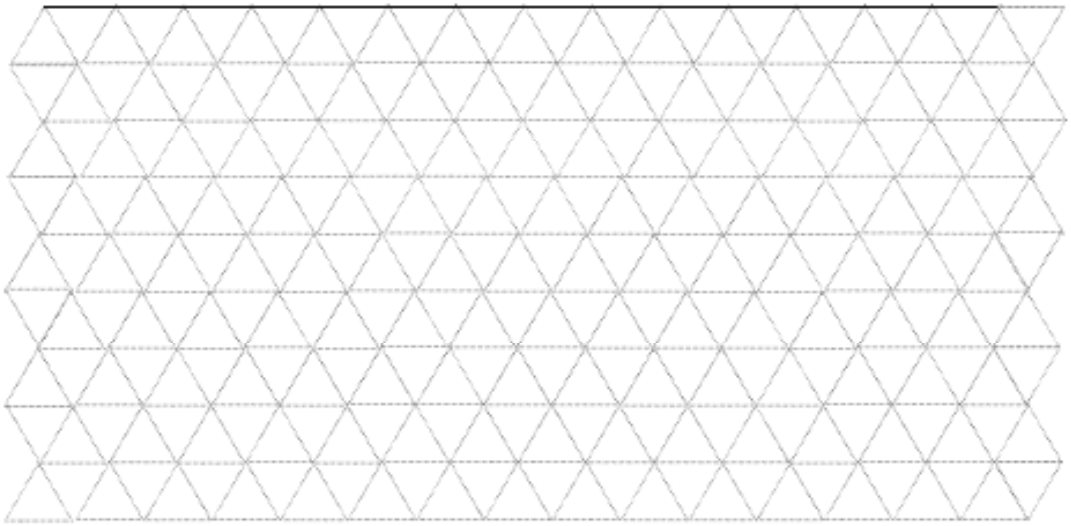
Use the symbols:

√ to indicate that the statement is true

X to indicate that the statement is not true

Statement	Trapezoid	Second shape
It is a quadrilateral		
It has just one pair of parallel sides		
It has two pairs of parallel sides		
It has three equal sides		
It has two pairs of equal sides		
It has one line of symmetry		
It has two lines of symmetry		

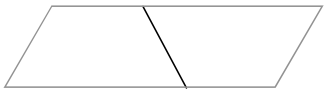
3. On the triangle grid below, draw three different shapes that are made using two of the trapezoid shapes joined together along one side.



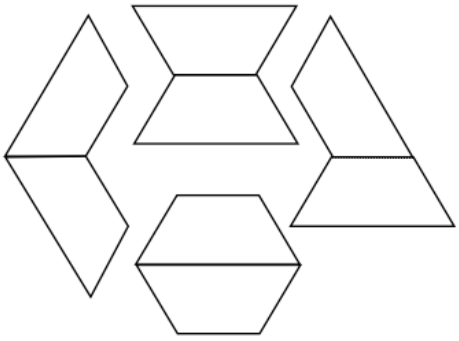
Trapezoids Grade 7 Rubric

The core elements of performance required by this task are:
- identify the properties of shapes
- draw shapes made from others

Based on these, credit for specific aspects of performance should be assigned as follows

	points	section points
1. a. Gives correct answer: **parallelogram**	1	
b. Draws a correct line: 	1	
		2
2. Gives correct answers:		

Statement	Trapezoid	Second shape
It is a quadrilateral	√	√
It has just one pair of parallel sides	√	X
It has two pairs of parallel sides	X	√
It has three equal sides	√	X
It has two pairs of equal sides	X	√
It has one line of symmetry	√	X
It has two lines of symmetry	X	X

7 correct rows	4	
Partial credit		
6 correct rows	(3)	
5 or 4 correct rows	(2)	
3 or 2 correct rows	(1)	
		4
3. See below for some of the correct possibilities. Do not accept the shape given. Allow 1 point for each correct shape. 	3x1	
		3
Total Points		**9**

Grade 7 – 2005

7th grade Task 4 Ducklings

Student Task	Fill in a frequency chart showing the results of a duckling survey taken by a nature club. Calculate twp measures of center and then determine how to change the number of ducklings surveyed but not change the mean number of ducklings in the sample.
Core Idea 5 Statistics	**Students deepen their understanding of statistical methods used to display, analyze, compare and interpret different data sets** • Make predictions and justify conclusions that are based on data • Construct a frequency distribution for a given set of data • Analyze data, including finding measure of center and spread, presented in a frequency distribution • Organize and consolidate mathematical thinking through communication

Grade 7 – 2005

Ducklings

This problem gives you the chance to:
- fill in a frequency chart
- work with median and mean

The local nature club is carrying out a survey of the number of ducklings in each family of ducks in the lake.

Here are the results of their survey:

4, 7, 6, 5, 8, 7, 5, 4, 10, 4, 9, 6, 5, 4, 4, 5, 9, 8, 4

1. Write the results of the survey in the table. The first box has been completed for you.

Number of ducklings in a family	4	5	6	7	8	9	10
Number of families	6						

2. Find the median number of ducklings in a family. _____ ducklings

   Show your work.

3. Calculate the mean number of ducklings in a family. _____ ducklings

   Show your calculations.

4. Another family of ducks, that had been missed in the survey, is seen.
   When this family is put into the survey the mean number does not change.

   How many ducklings are there in this newly identified family? _____ ducklings

   Explain how you know this.

   _____

   _____

   _____

   _____

   _____

Ducklings Grade 7 — Rubric

The core elements of performance required by this task are:
- fill in a frequency chart
- work with median and mean

Based on these, credit for specific aspects of performance should be assigned as follows

	points	section points
1. Gives correct answer:	1	1
2. Gives correct answer: **5**	1	
Shows correct work such as: There are 19 families. The middle family (the 10th one) has 5 ducklings.	1	2
3. Gives correct answer: **6**	1	
Shows correct work such as: **114 ÷ 19**	1 1	3
4. Gives correct answer: **6**	1	
Gives a correct explanation such as: For the mean to stay the same, the extra number has to equal the mean. or Shows a correct calculation	1	2
Total Points		**8**

Number of ducklings in a family	4	5	6	7	8	9	10
Number of families	6	4	2	2	2	2	1

Grade 7 – 2005

7th grade Task 5 Sneakers

Student Task	Determine the retail price of sneakers when given the sale price. Explain how to correctly and incorrectly calculate the retail price before the sale. Communicate why adding ten percent to a price and then subtracting ten percent from the new price does not give the original price.
Core Idea 1 Number and Operation	**Understand number systems, the meanings of operations, and ways of representing numbers, relationships, and number systems.** • Understand and use the inverse relationships of operations to solve problems • Work flexibly with fractions, decimals, and percents to solve problems • Analyze and evaluate the mathematical thinking and strategies of others • Communicate their mathematical thinking clearly and coherently

Grade 7 – 2005

Sneakers

This problem gives you the chance to:
• solve reverse percentage problems

Kate and Jane are shopping for sneakers. They see this special offer.

Kate and Jane both want to find out how much they will save.

Kate says, "20% of $44 is $8.80. That's a good saving."

Jane says, "I think the sneakers are reduced by $11."

Who is right? _____

1. Explain what each girl has done to figure out her answer and say what mistake led to the wrong answer.

_____

_____

_____

_____

2. Explain why, if the price of something is increased by 10% and then the new price is reduced by 10%, the final price is less than the original price.

_____

_____

_____

_____

Sneakers Grade 7		Rubric
The core elements of performance required by this task are: • solve reverse percentage problems Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answer: **Jane** Gives a correct explanation including: 2) Kate was wrong because she calculated 20% of the reduced price not 20% of the original price. b) Jane saw that \$44 was 80% of the original price \$44 is the reduced price, which is 80% of the original price To get both explanation points, either a or b must make reference to the original price.	1 1 1	3
2. Gives a correct verbal explanation such as: 10% of a the increased price is bigger than 10% of the original price. **or** a specific example such as: \$100 + 10% = \$110 \$110 – 10% = \$99	2 or 2	2
Total Points		**5**

Grade 7 – 2005

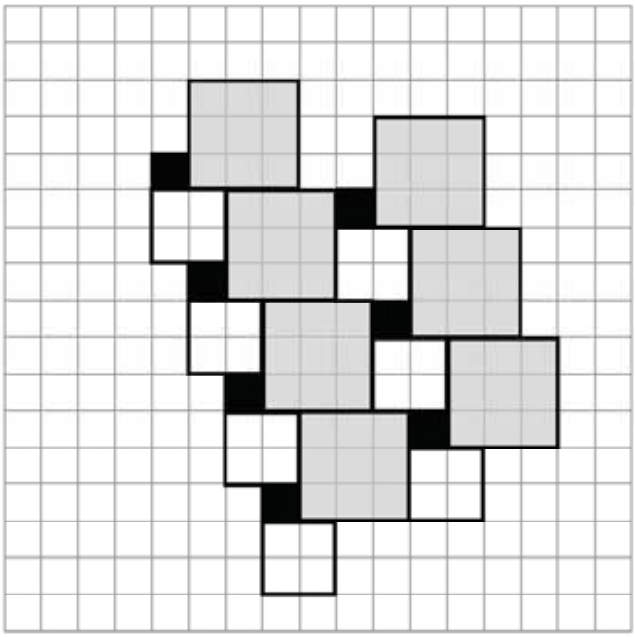
Overview of Exam

Core Idea	Task
Number and Operation	**Square Tiles**
This task asks students to recognize and interpret geometric patterns, compare areas and use ratios in the context of a visual pattern. Successful students could extend the pattern and write a ratio for the area of the tiles and a ratio comparing the number of different colored tiles in the pattern.	
Number and Operations	**Photographs**
This task asks students to reason about geometric relationships in a diagram and use proportions to find missing dimensions of a photograph. Successful students could use proportional reasoning to find the dimensions of photographs that had been reduced in size and use those dimensions to find the size of the paper containing multiple photographs.	
Geometry and Measurement	**Pizza Crusts**
This task asks students to find areas and perimeters of rectangular and circular shapes in a practical context. Successful students could reason about the area and perimeter of squares and rectangles. Students working at a high level could find the area of a circle and work backwards from the area to find the diameter and circumference of the circle.	
Number and Operations	**Buying a Camera**
This task asks students to work with percentage increase and decrease in the context of tax on buying a camera. Develop mathematical arguments for finding the tax when total price and tax rate are given. Successful students use percents to calculate sales tax. Students could also work backwards to find the percent of tax given the tax and original cost.	
Statistics	**Mean, Median, Mode and Range**
This task asks students to identify mean, median, mode and range of a distribution from its bar graph. Successful students could calculate mean and mode from data on a bar graph and match the graph to a statistical table.	

Square Tiles

This problem gives you the chance to:
- recognize and interpret geometric patterns
- work with ratios

Here is a tile pattern with 3 different sizes of square tiles.



Key

One black tile:

One white tile:

One gray tile:

1. Draw 2 more black tiles, 2 more white tiles and 2 more gray tiles to show how the pattern continues.

2. Imagine the pattern goes on forever.

   (a) What is the ratio of the
   number of black tiles : number of white tiles : number of gray tiles?

   _____ : _____ : _____

   (b) What is the ratio of the
   area covered by black tiles : area covered by white tiles : area covered by gray tiles?

   _____ : _____ : _____

   (c) What fraction of the total area of the pattern is covered by gray tiles? _____

Grade Seven – 2006

Square Tiles	Rubric	
The core elements of performance required by this task are: • recognize and interpret geometric patterns • work with ratios Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Draws 6 correct squares: no extra incorrect tiles	1	1
2. (a) Gives correct answer: **1 : 1 : 1** accept n:n:n	1	
(b) Gives correct answer: **1 : 4 : 9** accept multiples	2	
(c) Gives correct answer: $^{\mathbf{9}}/_{\mathbf{14}}$ accept $^{81}/_{126}$ or 0.642(8)	2	5
Total Points		**6**

Grade Seven – 2006

Photographs

This problem gives you the chance to:
- use proportion in a real life geometric context

A photographer wants to print a photograph and two smaller copies on the same rectangular sheet of paper. The photograph is 4 inches wide and 6 inches high.

Here are two ways he could do it. (Note: the diagrams are not drawn to actual size.)

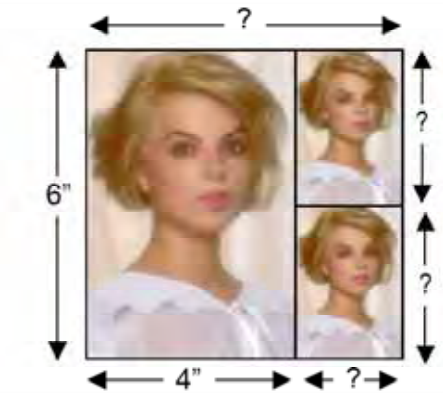


Diagram 1

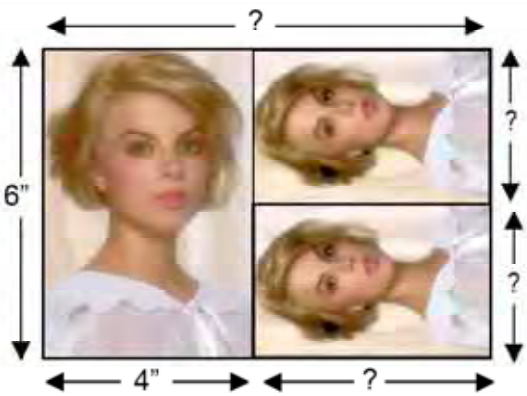


Diagram 2

1. Find the measurements of the small photographs for each arrangement.
   Show your calculations and explain how you figured it out.

   Diagram 1

Diagram 2

_____

_____

_____

_____

2. Find the size of the sheet of paper for each arrangement.

Diagram 1

The measurements of the sheet of paper are _____ wide and _____ high.

Diagram 2

The measurements of the sheet of paper are _____ wide and _____ high.

Photographs		Rubric
The core elements of performance required by this task are: • use proportion in a real life geometric context Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Diagram 1: The height of the smaller copy = 1/2 of 6 inches = **3** inches Uses proportional reasoning correctly: Height/width = 6/4 = 3/width **or** Size of photo/Size of copy = 6/3 = 4/width Width = **2** inches Accept verbal reference to scaling if answer correct. Diagram 2: The width of the smaller copy = 1/2 of 6 inches = **3** inches Uses proportional reasoning correctly: Height/width = 6/4 = height/3 Height = **4 1/2** inches Accept verbal reference to scaling if answer correct.	1 1 1 1 1 1	6
2. Gives correct answers: Diagram 1: **6** inches wide, **6** inches high Diagram 2: **8.5** inches wide, **6** inches high	1 1	2
	Total Points	**8**

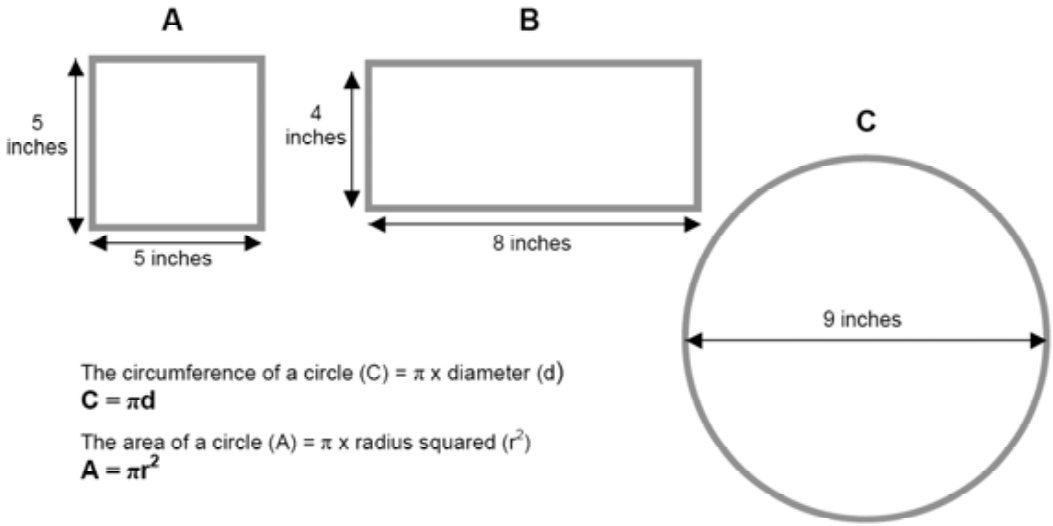
Grade Seven – 2006

Pizza Crusts

This problem gives you the chance to:

- find areas and perimeters of rectangular and circular shapes in a practical context

Robbie loves the stuffed crusts on pizzas.
Here are some stuffed crust pizza shapes that are baked.



The circumference of a circle (C) = π x diameter (d)
$C = \pi d$

The area of a circle (A) = π x radius squared (r^2)
$A = \pi r^2$

1. How many inches of stuffed crust are put around the edge of each of these pizzas?

   A _____ inches **B** _____ inches **C** _____ inches

   Show your calculations.

2. Here is a square pizza with an area of 36 square inches.

(a) What length of stuffed crust will be around the edge?

_____ inches

(b) Design two rectangular pizzas, each with an area of 36 square inches, with different perimeters, so that Robbie will have more crust than on the square pizza.
In each case calculate what the perimeter will be.

Pizza 1

Perimeter of Pizza 1 _____ inches

Pizza 2

Perimeter of Pizza 2 _____ inches

3. What is the circumference of a round pizza with an area of 36 square inches?

_____ inches

Explain how you figured this out.

_____

_____

_____

8

Pizza Crusts	Rubric	
The core elements of performance required by this task are: • find areas and perimeters of rectangular and circular shapes in a practical context Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answers: A: **20** inches and shows work such as: 5 x 4 B: **24** inches and shows work such as: 8 x 2 plus 4 x 2 C: **28.3** inches accept 28 - 29 and shows work such as: 9 x π = *Partial credit* Three correct answers –no work shown	 1 1 1 (1)	 3
2. (a) Gives correct answer: **24** inches (b) Labels a rectangular pizza with dimensions such as: 12 x 3 = 36 This has a perimeter of 30 inches. 9 x 4 = 36 This has a perimeter of 26 inches.	1 1 1	 3
3. Gives correct answer: **21.4** inches (accept **21** inches) Gives correct explanation such as: If $\pi r^2 = 36$ r = 3.4 C = π x 2 x 3.4 = 21.4 *Partial credit* Finds radios r = 3.4	1 1 (1)	 2
Total Points		**8**

Grade Seven – 2006

Buying a Camera

This problem gives you the chance to:
- work with percentage increase and decrease

A company sells a camera for $54.

Sales tax varies in different states, so the total amount people pay for the camera varies.

1. Louis pays 6% sales tax when he buys the camera.
   What is the total amount he pays?

   $_____

   Show your calculations.

2. Sharon pays $58.05 for the same camera.

   (a) How much sales tax does she pay? $_____

   Show your calculations.

   (b) What percentage sales tax does she pay when she buys the camera?

   _____%

   Show your calculations.

3. Tony bought a similar camera.
He paid a total price of $56.16 in a state where the sales tax was 8%.

He attempts to figure out what the camera cost before the sales tax.
He carries out the following calculation:

$$56.16 \times \frac{8}{100} = 4.4928$$

$$56.16 - 4.49 = 51.67$$

Tony says that the camera cost $51.67 before the sales tax.

This cost is not correct.

(a) Explain why Tony's answer is not correct.

_____

_____

_____

_____

_____

(b) What was the cost of the camera before tax? $_____

Show your calculations.

Buying a Camera	Rubric	
The core elements of performance required by this task are: • work with percentage increase and decrease Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives a correct answer: $**57.24** Shows correct work such as: 54 x 0.06 = 3.24 and 54 + 3.24 or 54 x 1.06	1 1	2
2. (a) Gives a correct answer: $**4.05** **and** Shows correct work such as: 58.05 - 54 (b) Gives a correct answer: **7.5**% Shows correct work such as: 4.05 ÷ 54 x 100	1 1 1	3
3. (a) Gives a correct explanation such as: $56.16 is 108% of the price before tax, so you divide by 108 and multiply by 100. (b) Gives a correct answer: $**52** Shows a correct calculation such as: 56.16 ÷ 108 x 100	1 1 1	3
Total Points		**8**

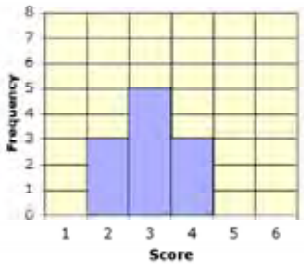
Seventh Grade – 2006

Mean, Median, Mode and Range

This problem gives you the chance to:
- identify mean, median, mode and range of a distribution from its bar graph

Andy rolled a dice eleven times. He drew a bar graph to show his results.
Then he made a table showing the mean, median, mode and range of his results.

Bar graph



Statistics table

Mean	3
Median	3
Mode	3
Range	From 2 to 4

Each of Andy's four friends also rolled a dice eleven times.
Bar graphs and tables showing their statistics are on the opposite page.
For each bar graph, calculate its mean value and note its median, mode and range.
Your task is to match each bar graph with the correct statistics table.
Fill in the missing values in Statistics tables C and D.

1. The mean value of the results shown in Bar graph A = _____

   Bar graph A matches Statistics table _____

2. The mean value of the results shown in Bar graph B = _____

   Bar graph B matches Statistics table _____

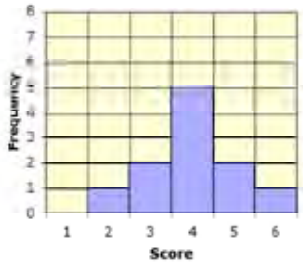
3. The mean value of the results shown in Bar graph C = _____

   Bar graph C matches Statistics table _____

4. The mean value of the results shown in Bar graph D = _____

   Bar graph D matches Statistics table _____

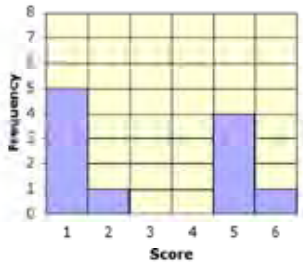
Bar graph A



Statistics table A

Mean	4
Median	3
Mode	3
Range	From 2 to 6

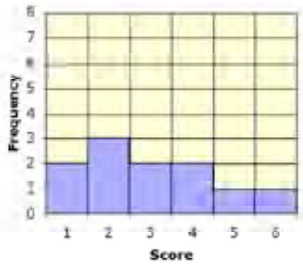
Bar graph B



Statistics table B

Mean	4
Median	4
Mode	4
Range	From 2 to 6

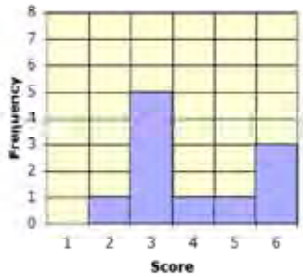
Bar graph C



Statistics table C

Mean	3
Median	2
Mode	
Range	From 1 to 6

Bar graph D



Statistics table D

Mean	3
Median	3
Mode	
Range	From 1 to 6

Mean, Median, Mode and Range	Rubric	
The core elements of performance required by this task are: • identify mean, median, mode and range of a distribution from its bar graph Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Finds that for Bar graph A the mean is **4** Gives correct answer: Bar graph A matches Statistics table **B**	1 1	2
2. Finds that for Bar graph B the mean is **3** Gives correct answer: Bar graph B matches Statistics table **C**	1 1	2
3. Finds that for Bar graph C the mean is **3** Gives correct answer: Bar graph C matches Statistics table **D**	1 1	2
4. Finds that for Bar graph D the mean is **4** Gives correct answer: Bar graph D matches Statistics table **A**	1 1	2
Finds that the mode of Statistics table C is **1** Finds that the mode of Statistics table D is **2**	1 1	2
Total Points		**10**

Grade Seven – 2006

Seventh Grade Mars 2007 Task Descriptions
Overview of Exam

Core Idea	Task	Score
Number and Operation	**Work**	
This task asks students to recognize and interpret the meaning of calculations in a realistic context. Students needed to think about how to calculate dollars earned per minute, per day, and per week. Students were also asked how to calculate the time to earn one dollar, the number of hours worked per year, and how to find the cost of a 10% raise.		
Statistics	**Suzi's Company**	
This task asks students to calculate mean, median, and mode using a table of data about number of employees, annual salary, and total salaries. Successful students understood that these measures needed to be calculated by thinking about both the number of employees and their individual salaries, not from the types of salaries or the totals.		
Algebra and Functions	**Journey**	
This task asks students to read information about speeds and time traveled on a journey to make a table of elapsed time and graph the data from the table. Students were also asked to read information from their graph. Successful students could also use the data and the formula d=rt to find the average speed for the entire journey.		
Geometry and Measurement	**Parallelograms**	
This task asks students to use a ruler to measure sides and heights of parallelograms and triangles. Students were asked to use these measurements to find and compare areas and perimeters. Successful students could also draw a right triangle with the same area as a given triangle.		
Algebra	**Mystery Letters**	
This task asks students to form and solve equations about variables in the context of a number puzzle. Successful students were able to use logic to determine which letters would be easiest to solve for first from the given clues.		

Work

This problem gives you the chance to:
• understand the meaning of some calculations in a realistic context

Jake works for 7 hours a day, 5 days a week, 48 weeks a year.

He is paid $15.64 an hour.

1. Draw a line to match each statement with its calculation.

Statements	**Calculations**
Number of dollars earned each minute	$7 \times 5 \times 48$
Number of dollars earned each day	$\frac{60}{15.64}$
Number of dollars earned each week	$\frac{15.64}{60}$
Time taken to earn one dollar	$15.64 \times 7 \times 5$
Number of hours worked each year	15.64×7

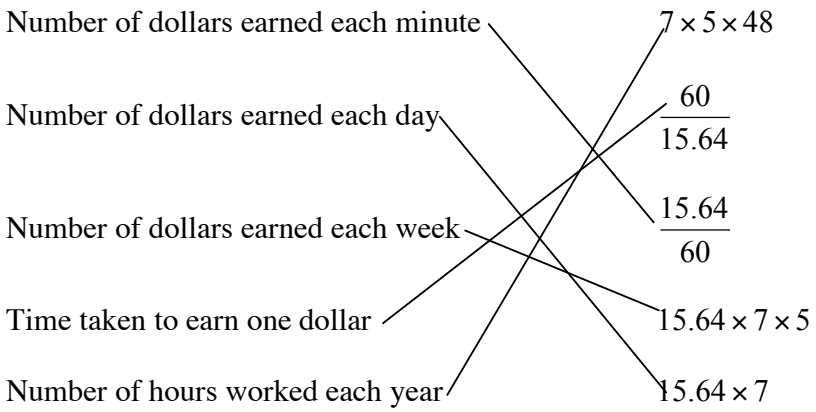
2. Jake gets a 10% raise.

Write a calculation for his pay per hour after the raise.

_____

7

Work		Rubric
The core elements of performance required by this task are: • understand the meaning of some calculations in a realistic context Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1 Correct matching – see below	5 x 1	5
2 Gives a correct calculation such as $\frac{110}{100} \times 15.64$ Accept $\frac{\mathbf{10}}{\mathbf{100}} \times 15.64 + 15.64$ or equivalent *Partial credit* Gives answer \$17.20 but does not show calculation. **or** shows 15.64 x 0.1	2 (1)	2
	Total Points	**7**



Suzi's Company

This problem gives you the chance to:
• calculate and interpret mean, medium and mode in a given table of realistic data

Suzi is the chief executive of a small company, TechScale, which makes technical instruments. Fifteen people, including Suzi, work in the company. The table shows the jobs and their annual salaries.

Job Title	*Number of people*	*Annual salary*	*Total*
Chief Executive	1	$100 000	$100 000
Marketing Manager	1	$80 000	
Production Manager	1	$80 000	
Technician	3	$50 000	$150 000
Office worker	2	$40 000	$80 000
Assembly worker	5	$30 000	
Cleaner	2	$20 000	
Total	**15**	***Total***	

1. a. Complete the final column of the table to find the total annual salary bill for TechScale.

b. Use your answer to question 1a to calculate the mean annual salary for the 15 employees in the company. Give your answer correct to the nearest $.

$_____

Show your calculations.

2. John looks at the table and says, "The mode of the salary at TechScale is eighty thousand dollars a year."

a. What mistake has John made?

b. What is the correct mode of the salary?

3. a. What is the median annual salary at TechScale?

b. Explain how you figured it out.

4. Which of the three averages, mean, median or mode, would you use to show that the average wage at TechScale is very good?

Explain your answer.

5. Last year, TechScale did not do very well so Suzi decided not to pay herself any salary for a year.

Which of the averages (mean, median and mode) will **not** change?

Suzi's Company — Rubric

The core elements of performance required by this task are:
- calculate and interpret mean, median and mode in a given table of realistic data

Based on these, credit for specific aspects of performance should be assigned as follows

		points	section points
1.a	Table completed correctly. Gives correct answer: total **$680 000** b Gives correct answer: **$45 333** and shows calculation $\frac{680000}{15}$	1 1 1ft	3
2.a	Gives correct explanation such as: He has not looked at how many people earn each salary	1	
b	Gives correct answer: **$30 000**	1	2
3.a	Gives correct answer: **$40 000**	1	
b	There are 15 people. The middle person, the 8th person, gets $40 000. This point is dependent on giving a correct answer to 3.a.	1	2
4.	Gives correct answer: **Mean** Gives correct explanation such as: That is the highest of the three.	1ft 1ft	2
5.a	Gives correct answer: **Mode**	1	1
	Total Points		**10**

Total
$100 000
$80 000
$80 000
$150 000
$80 000
$150 000
$40 000
$680 000

Journey

This problem gives you the chance to:
• draw and interpret a graph of speed, distance and time

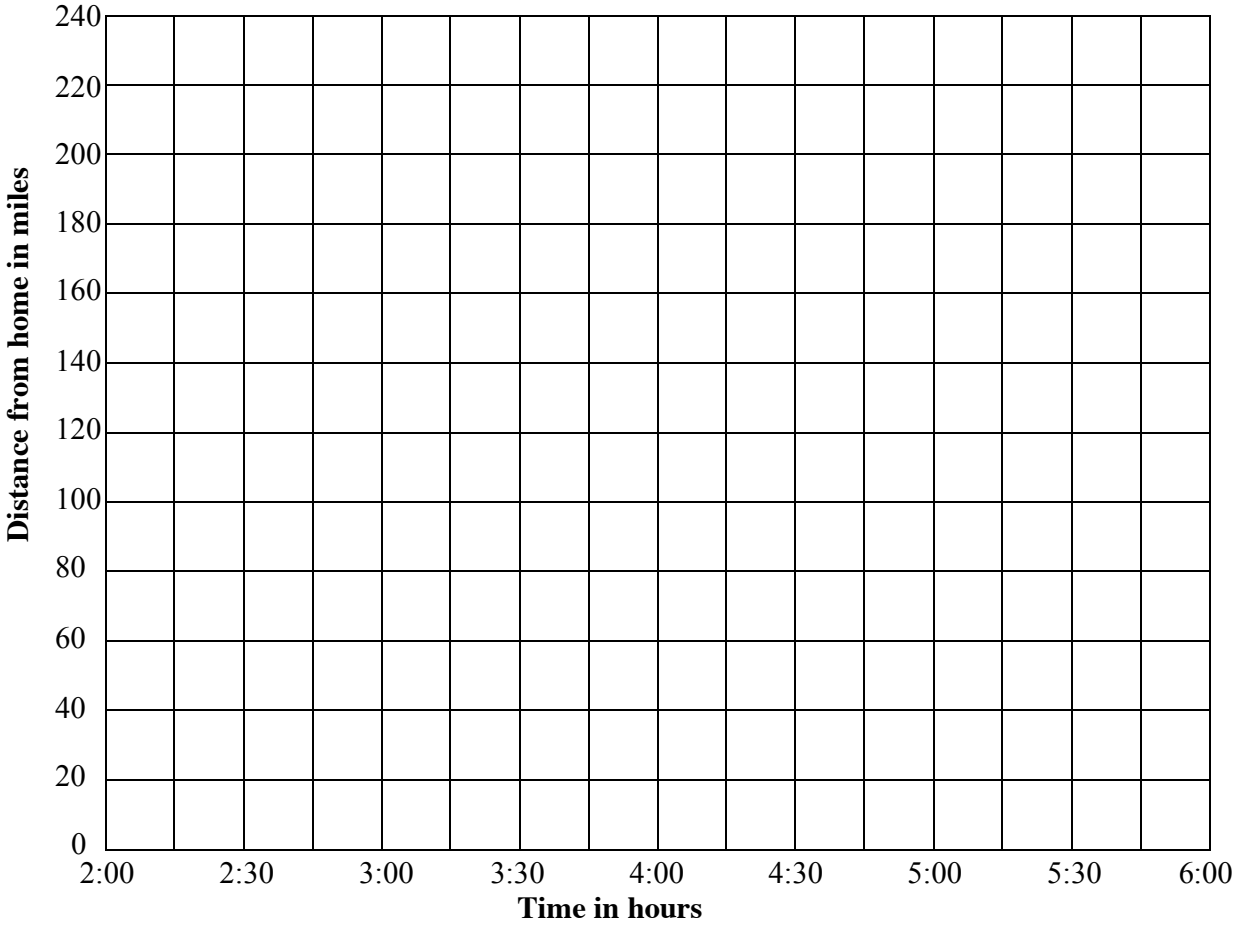
Here is a description of a car journey.

> "I left home at 2:00 hours. I traveled for half an hour at forty miles an hour, then for an hour at fifty miles an hour. I had a half hour stop for lunch, then I travelled for two hours at fifty-five miles an hour."

1. Complete this table showing the distances traveled by the end of each stage of my journey.

Time in hours	2:00	2:30	3:30	4:00	6:00
Distance from home in miles	0				

2. Draw a distance-time graph for this journey on the grid below.



3. What is the average speed for the whole journey? _____

Explain how you figured it out.

_____

_____

4. Use your graph to find:

a. How far from home I had traveled by 5:15.

_____ miles

b. At what time I had traveled 60 miles from home.

_____

7

Journey	Rubric	
The core elements of performance required by this task are: • draw and interpret a graph of speed, distance and time Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Table correctly completed: 	Time in hours	2:00	2:30	3:30	4:00	6:00
---	---	---	---	---	---
Distance travelled in miles	0	20	70	70	180 | *Partial credit* 1 error	2ft (1)	2
2. Graph correctly drawn *Partial credit* 1 or 2 errors	2ft (1)	2
3. Gives correct answer: **45** mph and shows 180 ÷ 4	1ft	1
Gives correct answers: 4.a **About 140** miles b **About 3:20.** In the correct interval on graph.	1ft 1ft	2
Total Points		**7**

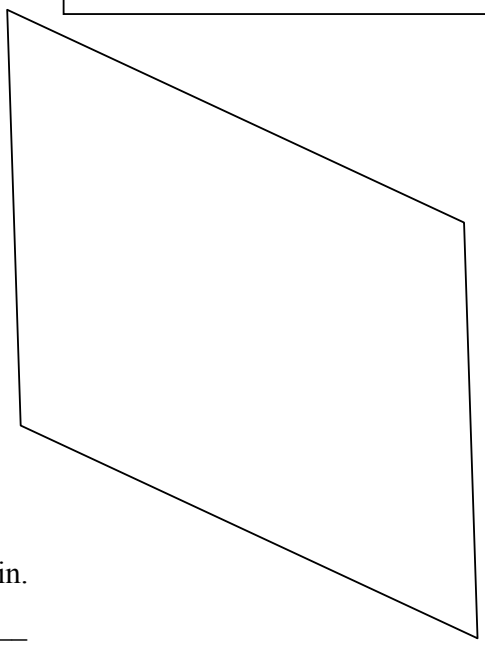
Parallelogram

This problem gives you the chance to:
- use measurement to find the area and perimeter of shapes

The area of a parallelogram = base x height

1. This parallelogram is drawn accurately.

   Make any measurements you need, in centimeters, and calculate:



a. The area of the parallelogram. _____
   Show your calculations.

b. The perimeter of the parallelogram. _____
   Show your calculations.

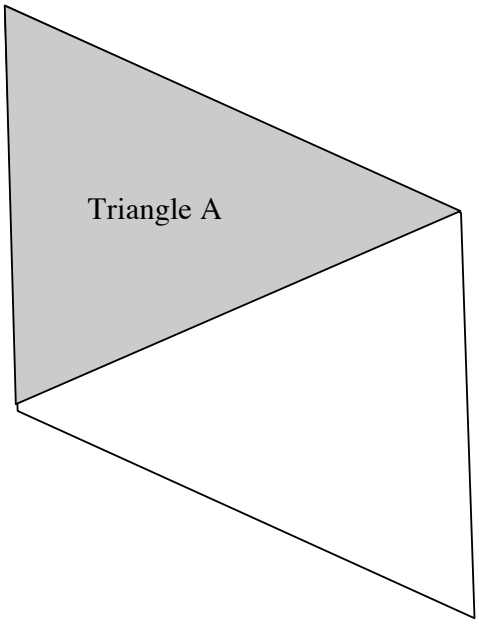
2. The diagram below shows the same parallelogram again.

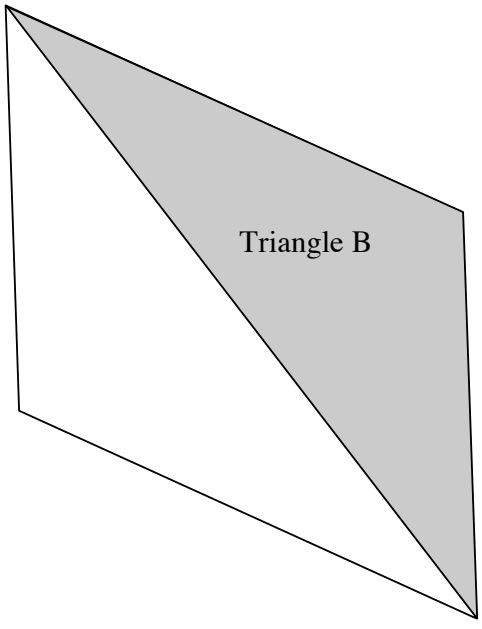
   a. Find the area of Triangle A. _____

   b. Find the area of Triangle B. _____

   c. Explain how you found your answers. _____

   _____





3. Which triangle has a larger perimeter, Triangle A or Triangle B?

Explain how you can tell without measuring.

4. Sketch a right triangle with the same area as Triangle A.
Your diagram does not need to be accurate.

Show how you figured it out.

Task 4: Parallelogram	Rubric	
The core elements of performance required by this task are: • use measurement to find the area and perimeter of shapes Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1.a Gives correct answer in the range 33-39 square centimeters. Shows correct work such as: 7 x 5 or 6 x 6. Accept reasonable measurements shown on diagram. b Gives correct answer in the range 24-28 centimeters **and** shows work such as 2(6 + 7). Accept reasonable measurements shown on diagram.	1 1 1	3
2.a Gives correct answer 17.5 square centimetres. Accept half of 1.a b Gives correct answer: 17.5 square centimetres. Accept half of 1.a c Gives correct explanation such as: They are both equal to half the area of the parallelogram	1ft 1ft 1	3
3. Gives correct answer such as: Triangle B: both triangles have sides that match the two sides of the parallelogram. The third side of B is longer than the third side of A.	1	1
4. Sketches a correct triangle and shows correct work such as: The area of the triangle = 1/2 base x height = 17.5. base x height = 35 So if the base = 7 cm then the height = 5 cm	2ft	2
Note: Deduct 1 point for missing or incorrect units. (Need to show some evidence that are is measured in square units and that perimeter is a linear measure.		
Total Points		**9**

Mystery Letters

This problem gives you the chance to:
- form and solve equations

A	**A**	**A**	**A**	**8**
E	**B**	**F**	**C**	**17**
A	**D**	**A**	**D**	**16**
B	**A**	**G**	**C**	**11**
9	**11**	**14**	**18**	

In this table, each letter of the alphabet represents a different number.

The sum of the numbers in each row is written on the right hand side of the table.

The sum of the numbers in each column is written below the table.

Find the number represented by each letter.

A = ____ B = ____ C = ____ D = ____ E = ____ F = ____ G = ____

Show how you figured it out.

7

Task 5: Mystery Letters	Rubric	
The core elements of performance required by this task are: • form and solve equations Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
Gives correct answers: **A = 2, B = 1, C = 5, D = 6, E = 4, F = 7, G = 3** **Partial credit** 6 or 5 correct values 4 points 4 or 3 correct values 3 points 2 correct values 2 points 1 correct value 1 point Shows some correct work.	5 (4) (3) (2) (1) 2	7
Total Points		**7**

Core Idea	Task	Score
Probability	**Will it Happen**	
This task asks students to describe events as likely or unlikely and calculate numerical probabilities for simple and compound events. Students need to explain their thinking and show a sample space for the situation. Successful students understand all the ways to get a favorable outcome, recognizing that getting a number on one die is different from getting the same number on the other die.		
Algebra and Functions	**Odd Numbers**	
This task asks students to draw and extend geometric patterns. Students need to also recognize and extend numeric patterns involving odd numbers and square numbers. Students should recognize the relationship between the number squared and the number of elements in the pattern. Successful students could also work backward from a total to describe the elements of the pattern for that result.		
Number Properties	**Pedro's Tables**	
This task asks students to work with number properties including divisibility. Students need to use properties of numbers, such as factors, multiples, prime numbers, odd, and even to develop logical reasons for why numbers do or do not match a set of constraints. Successful students could solve problems with multiple constraints, such as factors of 12 less than 25, which are multiples of 3, to find solutions.		
Geometry and Measurement	**Winter Hat**	
This task asks students to calculate the dimensions of material needed for a hat. They need to be able to find circumference of a circle, and area of a rectangle, circle, and trapezoid in order to find the surface area of a complex shape. Successful students had strategies for organizing their work to make sure all the pieces in the pattern were calculated and understood how to use the dimensions of a trapezoid to calculate its area.		
Number Operations	**Sale!**	
This task asks students to reason about sales discounts and percents. Students need to find a common unit to compare offers and develop a comparison of the different options. Successful students were able to pick a single measure for comparing all the options.		

Will it Happen?

This problem gives you the chance to:
- describe events as likely or unlikely as appropriate
- find the numerical probability of various outcomes of rolling a number cube

What does the future hold?
Select just one of these five words and write it after the following statements.

impossible	unlikely	equally likely	likely	certain

1. a. If today is Monday, tomorrow will be Tuesday. _____

   b. Today you will meet President Lincoln on the way home from school. _____

   c. When you flip a coin it will land head up. _____

2 a. When you roll a number cube with faces numbered 1, 2, 3, 4, 5, 6, what is the **numerical** probability of getting the number 4?

_____

   b. When you roll a number cube with faces numbered 1, 2, 3, 4, 5, 6, what is the **numerical** probability it will land on an odd number?
   Explain how you figured it out. _____

_____

_____

3. The faces of one red number cube and one blue number cube are labeled 1, 3, 5, 7, 9, 11.
   The two cubes are rolled and the results are added.

   What is the **numerical** probability of getting a total of 20? _____
   Show how you figured it out.

Will it Happen?		Rubric
• The core elements of performance required by this task are: • describe events as likely or unlikely as appropriate • find the numerical probability of various outcomes of rolling a number cube. • Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answers: a. **certain** b. **impossible** c. **equally likely** *Partial credit* 2 correct	2 (1)	2
2.a. Gives correct answer **1/6** b. Gives correct answer: **3/6 or 1/2** Gives correct explanation such as: there are 3 of 6 equally likely possibilities	1 1 1	3
3. Gives correct answer **2/36** or **1/18** Shows work such as: there are 36 equally likely outcomes. and 20 = 9 + 11 and 11 + 9 *Partial credit* Allow partial credit for some correct work.	1 2 (1)	3
Total Points		**8**

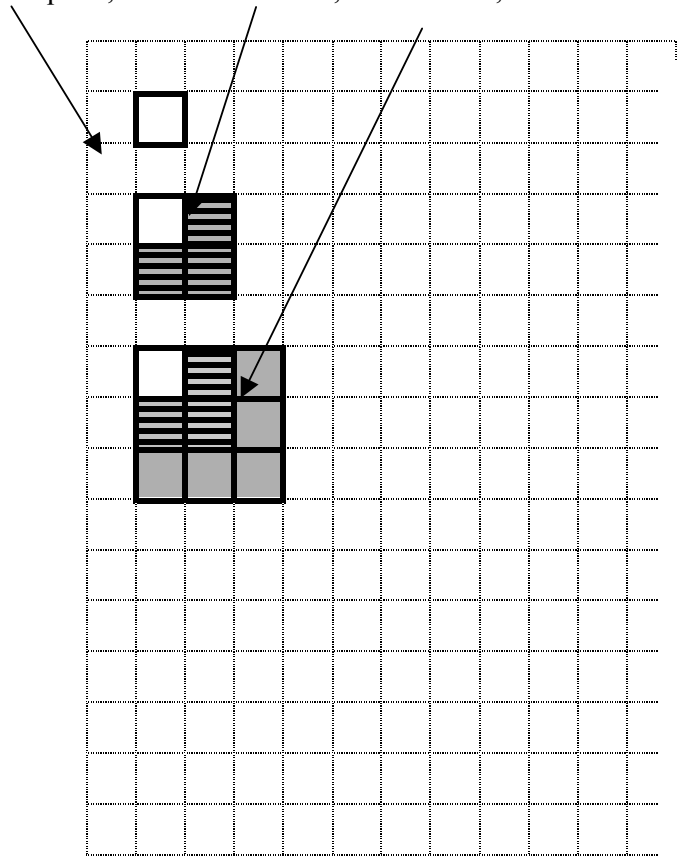
Grade 7 – 2008

Odd Numbers

This problem gives you the chance to:
• work with shapes to make a number pattern

Kate makes a pattern of squares.

She starts with 1 square, then adds 3 more, then 5 more, and so on.



1 x 1 square

2 x 2 square

3 x 3 square

1. Draw the next shape in Kate's pattern.

2. How many new squares did you add? _____

3. What size square did you make? _____

Grade 7 – 2008

The numbers of squares make a number pattern.

$$1 = 1 \times 1 = 1$$
$$1 + 3 = 2 \times 2 = 4$$
$$1 + 3 + 5 = 3 \times 3 = 9$$

4. Write the next two lines of the number pattern.

_____

_____

5. Use the number pattern to total the numbers.

$1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19$ _____

Show your work.

6. Write down the number pattern that gives a total of 169.
Explain your work.

_____

_____

_____

_____

Odd Numbers	Rubric	
The core elements of performance required by this task are: • work with shapes to make a number pattern Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Draws a correct shape.	1	1
2. Gives correct answer: **7**	1	1
3 Gives correct answer: **4 x 4** Accept 16	1	1
4. Writes correct lines: **1 + 3 + 5 + 7 = 4 x 4 = 16** **1 + 3 + 5 + 7 + 9 = 5 x 5 = 25**	1 1	2
5. Gives correct answer: **100** **and** Shows correct work = 10 x 10	1	1
6. Gives correct answer: **1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23 + 25** **and** Gives correct explanation such as: $169 = 13^2$ so the number pattern contains the sum of 13 odd numbers>	1	1
Total Points		**7**

Grade 7 – 2008

Pedro's Tables

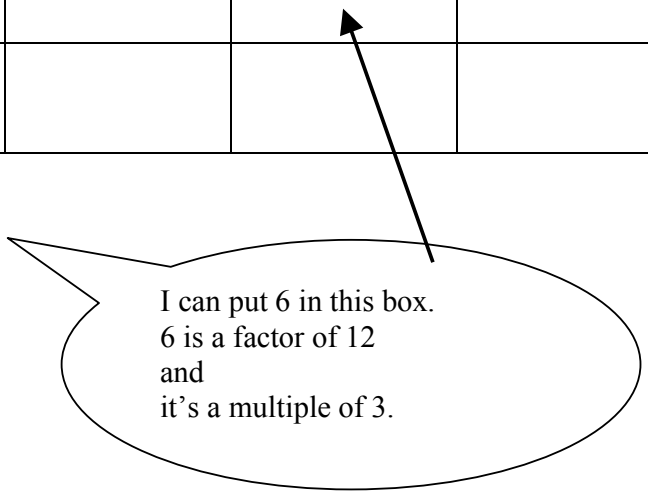
This problem gives you the chance to:
- work with number properties including divisibility
- explain your reasoning

Pedro chooses numbers to go in a table.

He can choose any whole number from 1 to 25.

	Multiples of 5	Multiples of 3	Square numbers
Even numbers			
Factors of 12		6	
Prime numbers			

Pedro says,



1. What other numbers could Pedro put in this box? _____

2. The number 4 can go in two different boxes in the table.
   Write 4 in these two boxes.

3. Give a description of numbers that can go in the Even numbers and Multiples of 3 box.

_____

Grade 7 – 2008

4. Explain why there are no numbers that can go in the Factors of 12 and Multiples of 5 box.

_____

_____

5. Explain why there is only one number that can go in the middle box on the bottom row.

_____

_____

_____

_____

7

Grade 7 – 2008

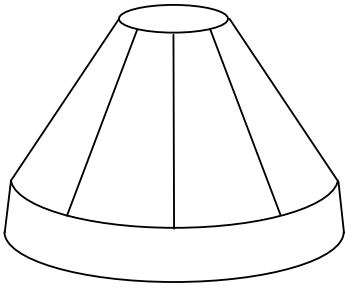
Pedro's Tables	Rubric	
The core elements of performance required by this task are: • work with number properties including divisibility • explain your reasoning Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answers: **3, 12** (deduct 1 mark if additional numbers listed)	2x1	2
2. Writes 4 in the correct boxes: Right hand column, first and second rows	1	1
3 Gives correct answer such as: Multiples of 6	1	1
4. Gives correct explanation such as: 'The factors of 12 are 1, 2, 3, 4, 6 and 12. None of these are multiples of 5. 12 is not divisible by5. *Partial credit* for a partially correct explanation	2 (1)	2
5. Gives correct explanation such as: 3 is a prime number and a multiple of 3. All other multiples of 3 have more than two factors so are not prime numbers.	1	1
Total Points		**7**

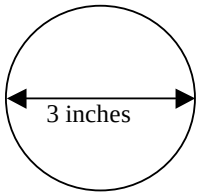
Grade 7 – 2008

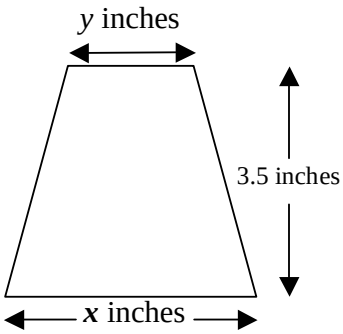
Winter Hat

This problem gives you the chance to:
- calculate the dimensions of material needed for a hat
- use circle, circumference and area, trapezoid and rectangle

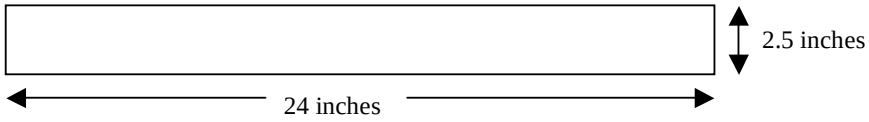
Marie has a winter hat made from a circle, a rectangular strip and eight trapezoid shaped pieces.







Circumference of circle $= \pi d$
Area of circle $= \pi r^2$



1. The rectangular strip is 24 inches long. Eight trapezoids fit together around the rectangular strip. Find the width (x) of the base of each trapezoid

_____ inches

2. The circle at the top of the hat has a diameter of 3 inches.
   a. Find the circumference of the circle. Show your calculation. _____ inches

   b. Eight trapezoids fit around the circle. Find the width (y) of the top of each trapezoid?

_____ inches

3. Find the surface area of the outside of the hat. Show all your calculations.

_____square inches

Winter Hat	Rubric	
• The core elements of performance required by this task are: • • calculate the dimensions of material needed for a hat • • use circle, circumference and area, trapezoid and rectangle • Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answer: **3** inches	1	1
2.a. Gives correct answer: 9.4 **or 3π** inches	1	
Shows correct work such as: π x 3	1	
b. Gives correct answer: 1.2 **or** $^{3}/_{8}\pi$ inches	1ft	3
3. Gives correct answer: 126 square inches Allow 125 to 129	1	
Shows correct work such as: 24 x 2.5 = 60 (rectangle)	1	
$\pi \times 1.5^2 = 2.25\,\pi = 7.1$ (circle)	1	
(3 + 1.2) / 2 x 3.5 = 7.35 (trapezoid)	1ft	
7.35 x 8 = 58.8 (8 trapezoids)	1ft	5
Total Points		**9**

Grade 7 – 2008

Sale!

This problem gives you the chance to:
- work with sales discount offers and percents

The following price reductions are available.

Two for the price of one	**Buy one and get 25% off the second**
Buy two and get 50% off the second one	**Three for the price of two**

1. Which of these four different offers gives the biggest price reduction?

_____

Explain your reasoning clearly.

_____

_____

_____

_____

_____

2. Which of these four different offers gives the smallest price reduction?

_____

Explain your reasoning clearly.

_____

_____

_____

_____

Sale!	Rubric	
The core elements of performance required by this task are: • work with sales discount offers and percents Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answer **Two for the price of one.**	2	
Gives an explanation distinguishing which is the best buy.	1	
Ranks all items by sample cost per item, % reduction per item, or fractional cost per item, such as: If the original price of one item is \$100, then Two for the price of one means that each item costs \$50 or 50% of the original price. Buy one and get 25% off the second means that each item costs \$87.50 or 87.5% of the original price Buy two and get 50% off the second means that each item costs \$75 or 75% of the original price Three for the price of two means that each item costs \$66.67 or 66.7% of the original price	3	6
2. Gives correct answer: **Buy one and get 25% off the second**	2	
Gives an explanation distinguishing between the two lowest reductions or explains why this is the worst choice.	1	3
Total Points		**9**

Grade 7- 2008

Core Idea	Task	Score
Algebra and Functions	**Toy Trains**	
This task asks students to extend a geometric pattern using tables and number patterns about wheels on a train of different sizes. Successful students could explain why it was impossible to make a train with a certain number of wheels and write an algebraic expression for finding the total wheels on any size train.		
Algebra Representations	**Buses**	
This task asks students to read and interpret a time/distance graph. Students needed to be able to add lines to the graph to represent additional buses traveling between two cities leaving every ten minutes. Successful students could apply their knowledge to solve a nonroutine problem about the number of buses that one bus driver would see or meet on the route.		
Geometry and Measurement	**Sequoia**	
This task asks students to work with given geometric formulas to find circumference and volume of trees. Students also needed to use proportional reasoning to estimate the height of a tree. Successful students knew that the radius was half the diameter and could calculate accurately using square numbers, fractions, and decimals. Successful students could also work backwards from the circumference to find the radius of a circle.		
Data and Statistics	**Archery**	
This task asks students to make a box and whisker plot from a given set of data and identify the key points used in such a plot. Students were also asked to compare and contrast two different plots and make conclusions about the data. Successful students were accurate about scale and understood that the median not the mean was the number for the middle of the box plot.		
Number and Operations	**Cat Food**	
This task asks students to reason about buying cat food given information about the amount of food the cats eat per day, the number of days, the fact that cat food only comes in 3-packs, and the cost of the food. Students needed to organize the work and think about the meaning of each calculation. Successful students could use rates, round numbers in context, and interpret their answers.		

Grade 7

Toy Trains

This problem gives you the chance to:
- find and use a number pattern
- find an algebraic expression for a number pattern

Brenda's toy shop sells toy trains.

A *size 1* set is just an engine, a *size 2* has an engine and 1 carriage, a *size 3* has an engine and 2 carriages and so on.

Size 1 *Size 2* *Size 3*

The engine has 8 wheels, 4 on each side, and each carriage has 6 wheels, 3 on each side.

The table shows the number if wheels on each size of train set.

Size of train set	1	2	3	4	5
Number of wheels	8	14			

1. Fill in the table to show how many wheels sets 3, 4 and 5 have.

2. The biggest set in the shop is size 12.

   How many wheels does the size 12 set contain?
   Show how you figured it out.

   _____

3. Mick says his train set has 42 wheels.

   Can Mick be correct? _____
   Explain how you know.

   _____

4. The factory where the trains are made needs a rule for the number of wheels in any size set so that it can use this in its computer.

   Write an algebraic expression for the number of wheels in a size n set.

   _____

7

2009 Rubrics Grade 7

Toy Trains	Rubric	
The core elements of performance required by this task are: • finding and using a number pattern • finding an algebraic expression for a number pattern Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answers: Size of train set: 1 | 2 | 3 | 4 | 5 Number of wheels: 8 | 14 | **20** | **26** | **32** *Partial credit* One error	2 (1)	2
2. Gives correct answer: **74** Shows correct work such as: 8 + 11 x 6 or continues table.	1 1	2
3. Gives correct answer: **No** Gives correct explanation such as: 42 – 8 = 34 is the number of wheels for the carriages and this does not divide by 6. Accept: set 7 has 44 wheels and set 6 has 38 wheels.	1 1	2
4. Gives correct answer such as: **6n + 2** or equivalent	1	1
Total Points		**7**

Grade 7

Buses

This problem gives you the chance to:
- interpret and use a travel graph

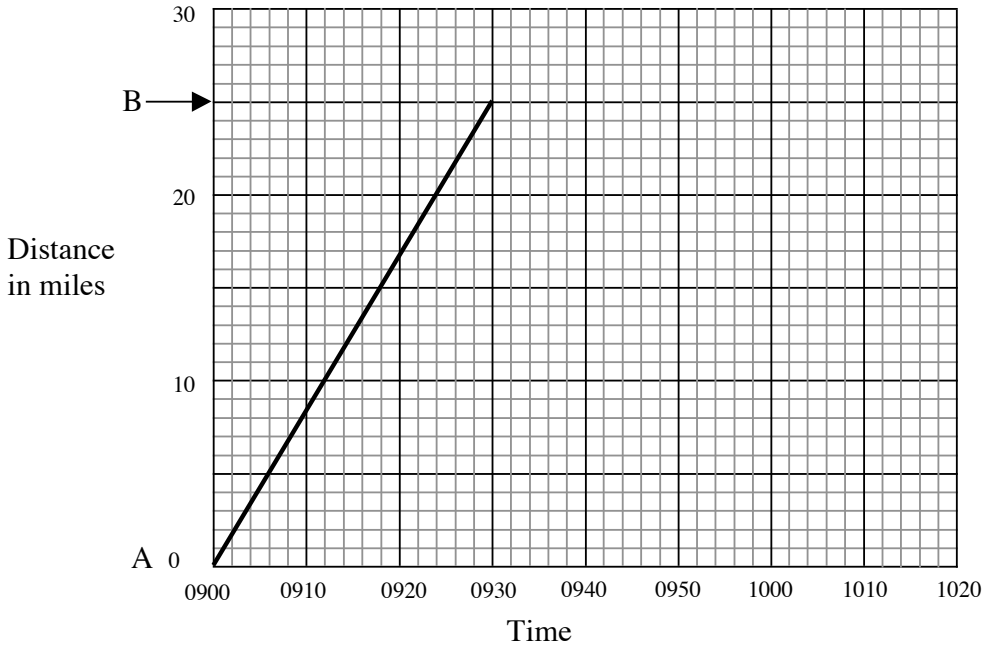
The diagram below is a distance-time graph.

1. The sloping line shows the journey of a bus from City A to City B.

   The bus leaves City A at 9am (0900) and arrives at City B at 9:30am (0930)

   a. How far is it from City A to City B? _____miles

   b. How long does the bus journey take? _____minutes



2. Another bus leaves City B at 0900 and arrives at City A at 0930.

   a. Draw a line on the diagram to show the journey of this second bus.

   b. At what time do the two buses pass each other? _____

3. Buses leave City A and City B every 10 minutes during the morning, repeating the two journeys shown on your graph.

a. On your graph, draw a line to show the bus that leaves City A at 0920.

b. How many buses traveling in the opposite direction will this bus meet before it reaches City B?

_____

Explain how you figured it out.

_____

_____

c. How far is the bus from City A when it meets the first bus travelling in the opposite direction?

_____

8

Buses	Rubric	
The core elements of performance required by this task are: • interpret and use a travel graph Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1.a. Gives correct answer: **25** miles b. Gives correct answer: **30** minutes	1 1	2
2.a. Draws correct line. b. Gives correct answer: **0915** +/- 2 minutes	1 1	2
3.a. Draws correct line. b. Gives correct answer: **5** Accept 6 or 7 with correct reasoning May explain that it crosses graphs 5 times**.** c. Gives correct answer: **4** miles	1 1 1 1	4
Total Points		**8**

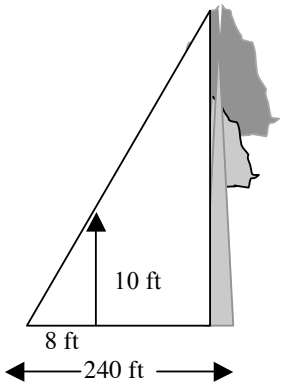
Grade 7

Sequoia

This problem gives you the chance to:
- use circumference of a circle
- use volume of a cone and cylinder

Some students are at Summer Camp.

Sequoia trees grow near the camp and a team challenge is set to calculate the approximate volume of one of the trees.



1. The students estimate the height of a tree using a stick 10 feet high.

   One member of the team lies on the ground 240 feet away from the foot of the tree.

   He lines up the top of the tree with the top of the stick when he is 8 feet away from the stick, as shown in the diagram.

   Estimate the height of the tree.
   Show your work.

   _____ feet

2. The team measures the distance, 56 feet, around the tree, near the base.

Circumference of a circle = $2\pi r$

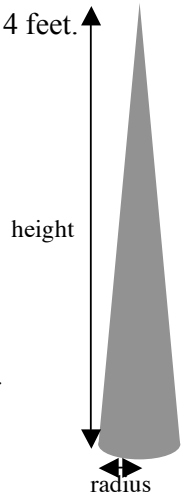
   Calculate the radius of the tree near the base.
   Show your work.

   _____ feet

3. The students estimate the height of a smaller tree is 240 feet with a diameter of 14 feet.

The 'Eagles' team decides that the tree is approximately cone shaped.

Volume of a cone $= {}^{1}/_{3}\pi r^2 h$



Use the estimates of the height and diameter to calculate the volume of the tree.
Show your work.

_____cubic feet

4. The 'Owls' team uses the formula for the volume of a cylinder to calculate the volume of the tree.

Calculate the volume of the tree using their method.

Volume of a cylinder $= \pi r^2 h$

Sequoia		Rubric
The core elements of performance required by this task are: • circumference of a circle • volume of a cone and cylinder Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answer: **300**	1	
Shows correct work such as: 10/8 = h/240	2	
Partial credit: some correct work	(1)	3
2. Gives correct answer: 8.9 Accept 8.8 – 9.0	1	
Shows correct work such as: $56 = 2\pi r$ $r = 56/2\pi$	2	
Partial credit: some correct work	(1)	3
3. Gives correct answer: 12315 or 3920π Accept 12,000 – 12,400 or $3,900\pi$	1	
Shows correct work such as: $1/3 \times \pi \times 7^2 \times 240$	1	2
4. Gives correct answer: 36945 or 11760π Accept 36, 000 – 37,000	1	1
Total Points		**9**

Archery

This problem gives you the chance to:
- draw a box plot
- compare sets of data

Guy and Sagar both enjoy archery and hope to be picked for their college team.

There have been 15 matches in college this year.
These are the scores for Guy.

1192	1258	1038	1208	956	1052	1262	994	1128	1066	1286	1174	1050	926	1240

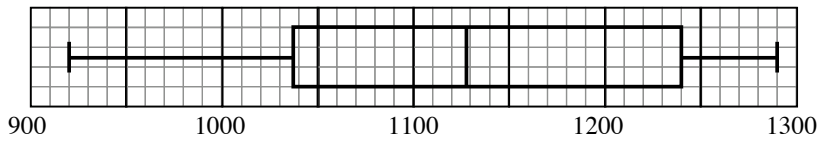
Guy's mean score is 1122.

These are the scores for Sagar.

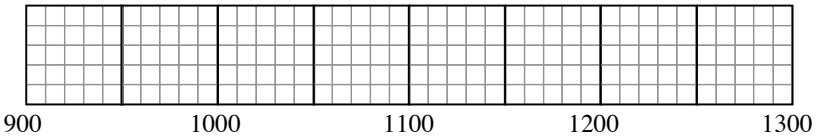
1134	1098	1182	1126	1066	1204	1052	1072	1156	1102	1088	1220	1168	1106	1164

Sagar's mean score is 1129.

Here is a box plot for Guy's scores.



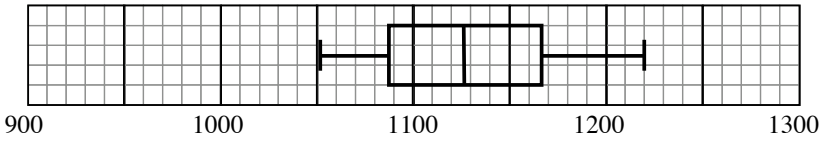
1. Draw a box plot for Sagar's scores.



2. Explain the main points on your box plot.

3. Who is the more consistent archer?
   Explain how you know.

4. If you were picking the college team would you choose Guy or Sagar?
   Explain why you would make this choice.

Archery	Rubric	
The core elements of performance required by this task are: • draw a box plot • compare sets of data Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Draws a correct box plot:  Minimum and maximum correct. (1052, 1220) Lower quartile correct: (1088 or 1093) and upper quartile: (1168 or 1166) Median correct (1126)	 1 1 1	 3
2. Explains that: the maximum and minimum points are Sagar's highest and lowest scores. the box corresponds to the quartiles with the median indicated	 1 1 1	 3
3. Gives correct answer: **Sagar** Gives a correct explanation such as: The range and interquartile range of Sagar's scores are much smaller than those of Guy.	1 1	 2
4. Gives correct answer: **Sagar** **and** explains that Sagar is more consistent. Or has a higher mean. or Gives correct answer: **Guy** **and** explains that Guy sometimes gets very high scores which might win them the match.	1 or 1	 1
Total Points		**9**

Grade 7

Cat Food

This problem gives you the chance to:
• solve numerical problems in a real life situation

Carol has two cats, Rover and Bobo.

1. Rover eats 3/4 of a can of cat food each day and Bobo eats 1/2 of a can of cat food each day. Cat food costs $5.00 for three cans. **It is only sold in 3 can packs**.

   How much does it cost Carol for a 60-day supply of cat food for her two cats? $_____
   Show your work.

2. Find the cost of cat food for a 29-day supply, a 30-day supply, and a 31-day supply.

   $_____ $_____ $_____

   Show your work.
   29-day

   30-day

   31-day

   What do you notice about your answers?

   _____

   _____

7

Cat Food	Rubric	
The core elements of performance required by this task are: • solve numerical problems in a real life situation Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answer: **$125** Shows work such as: number of cans = 60 60 x 1.25 = 75 cost in $ = 75 ÷ 3 = $25 25 x 5 =	2 1	3
2. Gives correct answers: **$65, $65, $65** **and** Shows work such as: number of cans = 29 29 x 1.25 = 36.25 (round to 39) cost in $ = 39 ÷ 3 = $13 13 x 5 = number of cans = 30 30 x 1.25 = 37.5 (round to 39) cost in $ = 39 ÷ 3 = $13 13 x 5 = number of cans = 31 31 x 1.25 = 38.75 (round to 39) cost in $ = 39 ÷ 3 = $13 13 x 5 = Comments that all these answers are the same because the number of cans needs to be rounded to a number that can be divided by 3. *Special case* Does not round, Gets answers $60.42, $62.50, $64.58	3 x 1 1 (2)	4
Total Points		**7**