MARS Tasks | Grade 6

Page	Name of MARS Task	Year	Math Strand	Notes
*	Baseball Players	2003	PS	Mean, median, range in context
*	Gym	2003	PFA, NO	Analyze gym costs to solve problems
*	Square Elk	2003	GM	Find area, perimeter of letters on a grid
*	Spinners	2003	PS	Identify, evaluate likelihood of spins
*	Rabbit Costumes	2003	NO	Find material cost, fractions in context
*	Candy Bars	2004	NO, PFA	Compare 3 ways to buy, find best buy
*	Biggest	2004	NO, PFA	Great largest possible answer in fractions
*	Meals	2004	PS, PFA	Correctly label parts of circle graph
*	Parallelograms	2004	GM	Geometric shapes and their properties
*	School Days	2004	PS	Analyze board game outcomes
2	Crystal Earrings	2005	PFA	Describe, extend pattern, generalize
5	Money	2005	DA	Analyze, interpret bar charts
9	Winning Spinners	2005	PS	Find probability of winning prize
12	In The Playground	2005	GM	Find area of sandbox, design bigger one
15	How Much Money?	2005	NO	Determine fractions of \$ amounts
18	Overview of 2006 Tasks			
19	Smallest and Largest	2006	NP, NO	Place numbers in +-X/ sentences=lg/sm
22	Nuts	2006	PS	Circle graph, fractions, % to find amount
25	Sorting Shapes	2006	GM	Draw shape that meet given attributes
26	Tetra	2006	PS	Work out probabilities, change rules-fair
31	Bike Ride	2006	PFA	Distance/time graph, interpret slopes
34	Overview of 2007 Tasks			
35	Division	2007	NP, NO	Analyze quotient in variety of contexts
37	Card Game	2007	PS	Probability in context, changing sample sp
40	Factors	2007	NP	Describe patterns in # w/diff factor char.
43	Household Statistics	2007	DA	Interpret bar graph info, calculate %
46	Being Building Blocks	2007	GM	Calculate volume and surface area
48	Overview of 2008 Tasks			
49	Snail's Pace	2008	NO	Distance, time, rate, inches/min
51	Black and White	2008	PS	Probabilities, meaning of fractions
53	A Number Pattern	2008	PFA	Describe, extend a number pattern
55	Percent Cards	2008	NP	Fractions, decimals, % on numb. line
58	Area and Perimeter	2008	GM	Calculate area & perimeter, create rect.
60	Overview of 2009 Tasks			
61	Sewing	2009	NO	Work with rule, find cost, calculate % tax
63	Truffles	2009	PFA	Extend recipe, make a rule
66	Boxes	2009	PFA, GM	Weigh 9 boxes, using scale 2 times
69	Skateboarding Tricks	2009	GM	Angles, degree of rotation in context
72	A Board Game	2009	PS	Probability of win, determine if fair

NP=Number Properties NO=Number Operations PFA=Patterns Functions Algebra GM=Geometry & Measurement DA=Data Analysis ⁴ 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 the tasks via the Noyce Foundation website. Tasks from 2005 to 2009 are available here with permission from the Mathematics Assessment Resource Service (MARS).

6th grade

Student	Describe and extend a pattern of crystal earrings that is increasing in size.				
Task	Make generalizations around this pattern.				
C Ll					
Core Idea	Understand relations and functions, analyze mathematical situations,				
3	and use models to solve problems involving quantity and change.				
Algebra and	• Represent, analyze, and generalize a variety of relations and				
Functions	functions with tables, graphs, and words				
	 Model and solve contextualized problems using various 				
	representations such as graphs, tables, and equations				

Grade 6 – 2005

Crystal Earrings

This problem gives you the chance to: • describe, extend, and make generalizations about a number pattern

Rahul is a talented jeweler. He makes fantastic crystal earrings. He always makes them using this pattern.



- 1. Draw earring Pattern #4 next to Pattern #3.
- How many crystals will there be in earring Pattern #5? _______
 Show how you figured this out.

This table shows how many crystals are needed for each pair of earrings.

Pattern #	1	2	3	4	5	
Number of crystals	2	6	12			

- 3. Complete the table for pairs of earrings of Pattern #4 and Pattern #5.
- Each crystal costs \$1. Rahul says the crystals for a pair of earrings of Pattern #7 will cost \$50. Show how you know he is wrong.

How much will the crystals for a pair of earrings of Pattern #7 cost? \$_____

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Crystal Earrings Grade 6	Ru	bric
 The core elements of performance required by this task are: to describe, extend, and make generalizations about a number pattern Based on these, credit for specific aspects of performance should be assigned as follows 	points	section points
1. Draws Pattern #4 correctly:	1	1
2. Gives correct answer: 15	1	1
Shows work such as: 1 + 2 = 3, $3 + 3 = 6$, $6 + 4 = 10$, $10 + 5 = 15$	1	2
 3. Completes table to show: Pattern #4 has 20 crystals. Pattern #5 has 30 crystals. 	1 1	2
 4. Shows work such as: Pattern #7 will be 1 + 2 + 3 + 4 + 5 + 6 + 7 = 28 and 28 x 2 = 56, not 50 or (accept 7 x 8) 	1 1 or 2	3
Total Points	1	8

Grade 6 – 2005

6th grade

Student	Analyze and interpret bar chart information to determine how much					
Task	money was spent by four children. Write a description to fit a fifth child's					
	bar chart.					
Core Idea	Select and use appropriate statistical methods to display, analyze,					
5	compare and interpret different data sets.					
Statistics	• Interpret data to answer questions about a situation					
	• Compare data sets using measures of center and spread to					
	understand what each indicates about the data sets					
	Communicate mathematical thinking clearly and coherently					
	• Use representations to interpret physical, social, and mathematical					
	phenomena					

Grade 6 – 2005

Money

This problem gives you the chance to: • interpret bar charts

These bar charts show how much money four children, Ali, Ben, Chris and Danny, spent each week for five weeks.



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1.	This is what the four children said about what they had spent.
	Write the correct name next to each statement.

"I s	pent less and less money each week."	Name:
"I s	pent more in the last three weeks than in the first two."	Name:
"I s wee	pent about the same amount each week except one k when I bought an expensive present for my sister."	Name:
"I s	pent about the same amount each week."	Name:
a.	Which child spent the most money in the first week?	Name:
b.	Which child spent the most money altogether?	Name:
	Show how you know.	

 This bar chart shows how much Ernest spent during the five weeks. Write a description to fit Ernest's bar chart.





Money Test 6

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Grade 6 – 2005

2.

Money Grade 6	Ru	bric
 The core elements of performance required by this task are: interpret bar charts Based on these, credit for specific aspects of performance should be assigned as follows 	points	section points
1. Gives correct answers:		
Danny Chris Ben Ali		
All four answers correct	3	
Partial credit Three correct answers	(2)	
Two correct answers	(1)	3
2. a. Danny	1	
b. Ali	1	
Compares values on at least two graphs to show that the sum of Ali's bars is larger than the other bars	2	
<i>Partial credit</i> Makes a sensible verbal comment about the total amounts spent	(1)	4
3. Gives a reasonable description such as:		
"I spent more and more each week" or similar	1	1
Total Points		8

Grade Six – 2005

6th grade Task 3

Student	Work with two spinners to find the probability of winning a prize.						
Task	Design two new spinners that will increase the likelihood of winning.						
Core Idea	Demonstrate understanding and the use of probability in problem						
2	situations.						
Probability	 Determine theoretical probabilities and use these to make predictions about events Understand that the measure of the likelihood of an event can be 						
	represented by a number from 0 to 1						
	 Represent probabilities as ratios, proportions, decimals or percents 						
	• Represent the sample space for a given event in an organized way (e.g. table, diagram, organized list)						
	• Use representation to model and interpret mathematical phenomena						

Grade Six – 2005

Winning Spinners

This problem gives you the chance to: • work with probability

Bill is playing a game of chance at the School Fair.

He must spin each of these two spinners. If the sum of the numbers is an even number, he wins a prize.



1. Fill in the empty boxes in the addition chart below to show the possible totals.

		Spinner A							
	+	8	4	2	1				
	7	15	11	9	8				
Spinner B	9		13						
	5	13			6				
	3			5					

- What is the probability of Bill winning a prize?
- Using two new spinners, rearrange the same eight numbers to increase Bill's chances of winning.





What is the probability of Bill winning using his new spinners?

Show how you figured it out.

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Grade 6 – 2005

Winning Spinners Test 6

Winning Spinners Grade 6						Rubric			
The • w	The core elements of performance required by this task are:								
Bas	ed on these, credit for specific aspects of perform	ance	shou	ıld be	e assi	gned	l as follows	points	section points
1.	Fills in the table correctly:		Sp	inne	r A		_	2	
		+	8	4	2	1			
		7	15	11	9	8			
	Spinner B	9	17	13	11	10			
		5	13	9	7	6	-		
		3	11	7	5	4	J		
	<i>Partial credit</i> No more than 2 mistakes or no values, only "odd" or "even" given correctly.						(1)	2	
2.	• Gives a correct answer: $4/16 = 1/4$ or equivalent Accept correct decimals, percents and 'out of'.					2ft			
	Partial credit denominator 16							(1)	2
3.	3. Fills in spinners correctly:								
	The even numbers split so there is one even number on one spinner and two on the other (position of the numbers does not matter)				2				
	Gives a correct answer: $1/2$ or equivalent					2			
	Gives an explanation or table to show a correct method.					2			
	Special case								
	Correctly uses their own numbers: maximum	imu	m 2]	poin	ts				6
						T	otal Points		10

Grade Six – 2005

6 th grade	Task 4In The Playground
Student	Find the area of a playground sandbox and make a new design that
Task	will measure twice the area of the first sandbox.
Core Idea	Analyze characteristics and properties of two-dimensional
4	geometric shapes and apply the appropriate techniques, tools, and
Geometry and	formulas to determine measurements.
Measurement	• Develop, understand and use formulas to determine the area of quadrilaterals
	• Select and apply techniques and tools to accurately find length
	and area measures to appropriate levels of precision

Grade Six – 2005

In the Playground

This problem gives you the chance to: • work with areas

The playground committee decides to make a sandbox area for toddlers. For safety reasons, the sandbox must be surrounded by a strip of rubber matting that is 2 feet wide.

Here is a scale drawing of the sandbox.

RI	JBBE	R MA	TTIN	3
	S E A		8	
	, JA			



1. Find the area of the sandbox and the area of the rubber matting.

Sandbox area:	square feet	Rubber matting area:	square feet
Sandoon area.	square reer	reaction manning area.	

More children are using the playground, so the committee decides to double the area of the sandbox.

 Design a new rectangular sandbox that has double the area of the original sandbox. On the grid below, make a scale drawing of the new sandbox and the surrounding rubber matting.

SCALE:							
= 4 square feet							
2 feet							

3.	How many square feet of rubber matting will they ne	ed?	square	feet
4.	What is the length and width of the new sandbox?	length	feet	
		width	feet	8
Cop) Resc	right © 2005 by Mathematics Assessment suce Service. All rights reserved.		In the Playground	Test 6

In the Playground Grade 6	Ru	bric				
The core elements of performance required by this task are: • work with areas						
Based on these, credit for specific aspects of performance should be assigned as follows	points	section points				
 Gives correct answers: 24 square feet (Accept 80 square feet) 56 square feet 	1 1	2				
2. Draws a correct diagram:						
Rectangular area of sand, 48 square feet (12 squares)	2					
Surrounded by a row of squares of "rubber matting"	1	3				
 Gives correct answer: their number of squares x 4 (dependent on their diagram and following the one row rule) 	1ft	1				
80 or 72 (accept 120)						
4. Gives a correct answer dependent on their diagram for question 2:						
12 and 4	2x1ft	2				
or 8 and 6						
or 2 and 24						
Total Points		8				

Grade Six – 2005

6th grade

Student	Work with simple fractions to solve two money problems and use						
Task	representations to organize and record the thinking.						
Core Idea	Understand number systems, the meanings of operations, and ways						
1	of representing numbers, relationships. And number systems.						
Number and	and • Understand fractions as parts of unit wholes						
Operation	• Select appropriate methods and tools for computing with fractions						
	paper and pencil and apply selected methods						
	• Develop and analyze algorithms for operations on fractions and						
	develop fluency in their use						
	• Create and use representations to organize, record, and						
	communicate mathematical thinking						

Grade 6 – 2005

How Much Money?

This problem gives you the chance to:

- work with simple fractions
- figure out a money problem

Chuck has \$6 and he spends 1/5 of his money on candy.

1. How much money does Chuck have left?

_____dollars and ______cents

Show your work.

Rachelle buys a drink. She spends the same amount of money on her drink as Chuck spent on his candy. Rachelle now has only 1/3 of the amount of money that she had before she bought the drink.

2. How much money did Rachelle have before she bought the drink?

_____ dollars and ______ cents

Show how you figured it out.

6

How Much Money? Grade 6	Ru	bric
The core elements of performance required by this task are: • work with simple fractions • figure out a money problem		
Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answer: 4 dollars and 80 cents	1	
Finds $^{1}/5 \ge 86.00 = 1.20$	1	
Shows work such as: \$6.00 - \$1.20	1	
or 4/5 x \$6.00	2	3
2. 1 dollar and 80 cents	1	
or	or	
one and a half times the incorrect answer that replaced \$1.20	1 ft	
Shows correct work such as:		
Works out that \$1.20 represents $(1 - \frac{1}{3})$ or $\frac{2}{3}$ what Rachelle started wi	th 1	
Works out that Rachelle must have $0.60 = 1/2$ of 1.20 left (adding the $1.20 + .60 = 1.80$ is credited in the answer)	1	
		3
Total Point	nts	6

Grade 6 – 2005

Core Idea	Task						
Number Properties and	Smallest and Largest						
Operations							
This task asks students to an	alyze properties of numbers and operations to select numbers						
from a list to fit in equations	to make the largest and smallest values. Successful students						
use logic to pick numbers fro	om a set to make the largest answer using addition, subtraction,						
multiplication and division.	They could also use number properties to pick numbers from a						
set to make the smallest answ	wer using addition and multiplication.						
Statistics	Nuts						
This task asks students to us	e clues to match quantities to a circle graph and use						
calculations with fractions an	nd percents to find amount of nuts. Successful students could						
use relational clues about me	ost, least, twice as much, and fractional parts to identify and						
label data on a graph. Stude	nts could find one fourth of a quantity and use pictorial or						
numerical reasoning to talk a	about 80% of a circle graph.						
Geometry and	Sorting Shapes						
Measurement							
This task asks students to rec	cognize and name shapes and their properties and draw a shape						
to meet given attributes. Suc	cessful students could sort shapes by attributes such as						
symmetry and parallel sides.	They could design shapes to meet more than one constraint.						
Probability	Tetra						
This task asks students to co	This task asks students to complete scores in a table and work out probabilities from a table						
of possible scores. Students analyze probabilities and make a change in game rules to							
make a game fair. Successful students could find the total possibilities for a game using							
two dice and write probabilities in terms of that total.							
Algebra and Functions	Bike Ride						
This task asks students to int	erpret a distance/time graph about a bike ride and use a graph						
o calculate and compare speeds. Successful students could read a time/distance graph and							

determine speeds and interpret slopes on the graph.

Smallest and Largest

This problem gives you the chance to:

· choose numbers and operations to give largest and smallest results

1. In this question, make up calculations with answers that are as large as possible.

For each calculation, choose two different numbers from this list.



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Smallest and Largest Test 6

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For each calculation, choose two different numbers from this list.



3. Explain how to choose numbers to make the answer to a division question as small as possible.



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Smallest and Largest	Ru	bric
The core elements of performance required by this task are: • choose numbers and operations to give largest and smallest results Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answer: $50 + 20 = 70$	1	
Gives correct answer: $50 - \frac{1}{2} = 49^{1}/_{2}$ accept 49.5	1	
Gives correct answer: $50 \times 20 = 1000$	1	
Gives correct answer: $50 \div \frac{1}{2} = 100$	1	4
2. Gives correct answer: $1/2 + 1 = 11/2$ accept1.5	1	
Gives correct answer: $\frac{1}{2} - 50 = -49^{1}/_{2}$ accept -49.5	1	
Gives correct answer: $\frac{1}{2} \mathbf{x} 1 = \frac{1}{2}$ accept 0.5	1	
Gives correct answer: $1/2 \div 50 = 1/100$ accept 0.01	1	4
3. Gives correct explanation such as: The first number must be the smallest of the list, and the second must be the largest of the list.	e 2	
Partial credit		
Choose a small number and divide by a large number.	(1)	2
Total Poin	ts	10

Nuts

This problem gives you the chance to:

• work with interpretations of a circle graph

This circle graph shows the amounts of five different kinds of nuts grown in the U.S each year.



Here are some facts about the nuts grown.

- Most of the nuts are Almonds
- A quarter of the nuts are Walnuts
- The least grown nuts are Macadamias
- There are about twice as many Pistachios as Macadamias grown
- The fifth type of nuts is Hazelnuts

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Nuts Test 6

- 1. Write the correct kind of nut on each label.
- The total amount of all nuts grown is 956 thousand tons.
 What amount of walnuts is grown? ______ thousand tons Show your calculations.
- Iris says that 80% of all the nuts grown in the U.S. are almonds. Explain why Iris is wrong.

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Nuts Test 6

Nu	ts	Ru	bric
The o • wo Based	core elements of performance required by this task are: rk with interpretations of a circle graph d on these, credit for specific aspects of performance should be assigned as follows	points	section points
1.	Gives correct answers, clockwise from top:		
	Hazelnuts	1	
	Macadamias	1	
	Pistachios	1	
	Walnuts	1	
	Almonds	1	5
W	Gives correct answer: 239 thousand tons	1	
ork the 2.	Shows work such as: 956 ÷ 4	1	2
3.	Gives a correct and complete explanation, such as:		
	Walnuts are 25% So that only leaves 75%	3	
	or The graph shows that a bit more than 50% (or a half) are almonds.	or 3	
	Partial credit Incomplete quantitative explanation eg walnuts are 25% It doesn't look like it on the graph.	(2) (1)	3
	Total Points		10

Sorting Shapes

This problem gives you the chance to:

- recognize and name shapes and their properties
- draw a shape to meet given conditions

Here are some two dimensional shapes drawn on square grid paper.



1. What is the mathematical name of shape F? _____

2. How many lines of symmetry does shape D have?

3. Write the letter of each shape in the correct region of the diagram on the next page.

The first one has been done for you.

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4. Draw another shape that could go into the shaded region.

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Sorting Shapes Test 6



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Tetra

This problem gives you the chance to:

- complete scores in a table of results
- work out probabilities from a table of possible scores

Anna and Bill play the game Tetra.

In this game two four-sided dice numbered 1 to 4 are tossed.

The numbers on the base of each dice are then multiplied together to get a score.

When the score is even Anna gets a point.

When the score is odd Bill gets a point.

1. Complete this table of score results.



Number on base of blue dice

- 2. Explain why the probability of getting a score of 4 is $\frac{5}{16}$.
- Find the probability that Anna gets a point. Explain your work.

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Tetra Test 6

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4. This game is not fair.

Suggest a change to the way that Anna and Bill get points that would make the game fair.



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Tetra Test 6

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Tetra							Rubric		
 The core elements of performance required by this task are: complete scores in a table of results work out probabilities from a table of possible scores Based on these, credit for specific aspects of performance should be assigned as follows 							points	section points	
1.	1. Completes the table.								
	6 corre	ct result	S				2		
	<i>Partial</i> 5, 4, or	<i>credit</i> 3 corre	ct resul	ts			(1)		
	4	4	8	12	16				
	3	3	6	9	12				
	2	2	4	6	8				
	1	1	2	3	4				
	X	1	2	3	4	_		2	
2.	Gives a	l correct	t explan	ation, s	uch as:				
	There a	are 3 wa	iys of go	etting a	score o	f 4, and there are 16 possible outcomes.	1	1	
3.	Gives c	correct a	inswer:	12/16	or 3/4	(accept equivalent answers)	1ft		
Gives a correct explanation such as: 12 of the results are even, and there are 16 possible outcomes.							1ft	2	
4.	Sugges	ts a cha	nge suc	h as:		_			
	When t When t	he score	e is less e is moi	than 5 than 5	Anna g 5 Bill g	ets a point. ets a point.	1		
					0	Total Points		1 6	

Bike Ride

This problem gives you the chance to: • interpret a distance/time graph

Selina and Jack went for a bike ride today. They made this graph of their bike ride.





1.	How many miles did they travel in all	? miles

2. How long did their bike ride take? _____ hours

3. When were they cycling the fastest?

Explain your answer.

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Bike Ride Test 6

Sixth Grade – 2006

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4. What does the graph show that they did between 11:30 a.m. and 12 noon?

Explain your answer.

5. What was their speed between 12 noon and 1 p.m.?

miles an hour

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Bike Ride Test 6

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Bike Ride			Rubric	
The core elements of performance required by this task are: • interpret a distance/time graph Based on these, credit for specific aspects of performance should be assigned as follows		points	section points	
1. Gives cor	rect answer: 25	1	1	
2. Gives cor	rect answer: 3	1	1	
3. Gives cor	rect answer: from 10 a.m. to 10:30 a.m.	1		
Gives cor The graph Later they or	rect comparative statement such as: a shows that they were cycling at 20 mph. a cycled at 10 mph and 5 mph.	1		
It is the st	eepest line		2	
4. Gives cor	rect answer such as: They may have rested.	1		
Gives cor For half a	rect explanation such as: n hour, their distance did not increase.	1	2	
5. Gives cor	rect answer: 5	1	1	
	Total Points		7	

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Core Idea	Task	Score				
Rational Numbers	Division					
This task asks students to analyze the answer to a division problem in a variety of						
contexts. Students need to think about how to interpret the decimal and round it						
appropriately to answer the question for each situation. Students were also asked to						
write a word problem that would fit a given calculation and pick the appropriate						
answer to fit their own problem. Successful students could determine how to write the						
correct interpretation of the answer to each of the contexts from the same numerical						
answer and understood how to round money.						
Probability	Card Game					
This task asks students to use probability in the context of picking cards, numbered 1						
to 10. Students needed to think about a changing sample space. Some cards were no						
longer available after they have	ad been drawn. Successful students could give a					
numerical value for each pro	bability.					
Number Properties	Factors					
This task asks students to lis	t factors of numbers and think about types of num	bers				
with an odd number of facto	rs or an equal amount of even and odd factors.					
Successful students used the	factor list given to help them find and describe pa	tterns				
in the numbers with different factor characteristics.						
Data Analysis	Household Statistics					
This task asks students to use a bar graph about number of households and number of						
children per household and record the information in a table. Students were also						
asked to interpret information from the graph and calculate percentages. Successful						
students could think about total number of households, total number of children, or						
mean (or average) and match it to the correct computation.						
Geometry and	Building Blocks					
Measurement						
This task asks students to calculate volume of rectangular prisms, given a picture of						
the object and its dimensions. Successful students could also calculate the surface						
area.						

Division

This problem gives you the chance to: • relate a given division calculation to appropriate practical situations

When you calculate 100 ÷ 6 using a calculator, the result is 16.6666667.

This result can be used to give a **sensible** answer to all the following questions except one.

- 1. Write down the sensible answers and find the question that cannot be answered using this result.
 - a. How much does each person pay when 6 people share the cost of a meal costing \$100?
 - b. 100 children each need a pencil. Pencils are sold in packs of 6. How many packs are needed?
 - c. What is the cost per gram of shampoo costing \$6 for 100 grams?

d. How many CDs costing \$6 each can be bought for \$100?

- e. What is the average distance per day, to the nearest mile, travelled by a hiker on the Appalachian Trail, who covers 100 miles in 6 days?
- Write another question, together with its sensible answer, that can be answered using 100 ÷
 6.



Card Game Test 6

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Task 1: Division	R	Rubric	
The core elements of performance required by this task are: • relate a given division calculation to appropriate practical situations Based on these, credit for specific aspects of performance should be assigned as follows	points	section points	
1a. Gives correct answer: \$16.67 Accept \$16.70, \$16.75, \$17.00	1		
1b. Gives correct answer: 17	1		
1c. Gives correct answer such as: 'cannot be done using this result'	1		
1d. Gives correct answer: 16	1		
1e. Gives correct answer: 17	1	5	
2 Writes an appropriate question.	1		
Writes a sensible answer.	1	2	
Total Points			

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Card Game Test 6
Card Game

This problem gives you the chance to: • figure out and explain probabilities

Mrs Jakeman is teaching her class about probability.

She has ten cards, numbered 1 to 10.

She mixes them up and stands them on a shelf so that the numbers do not show.

	**		

Mrs. Jakeman turns the cards around one at a time.

Students have to guess whether the next card will have a higher or a lower number than the one just turned.

The first card turned is the number 3.

3	
---	--

1. Would you expect the next number to be higher than 3 or lower?

Explain why you made this decision.

The second card is number 10.

3	10				
---	----	--	--	--	--

 What is the probability that the next card will be a higher number than 10? Explain how you know.

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Card Game Test 6

The third card is number 4.

3 10 4	
--------	--

3. What is the probability that the next number is higher than 4? Show your work.

The f	ourth	card	is	number	7.
-------	-------	------	----	--------	----

3	10	4	7	
---	----	---	---	--

4. What is the probability that the next number is lower than 7? Show your work.

The fifth card is the number 1.

3	10	4	7	1	
---	----	---	---	---	--

When the sixth card is turned the probability that the next card is higher is the same as the probability that it is lower.

5. What must the sixth card be?

Explain how you figured it out.

9

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Task 2: Card Game	R	ubric
The core elements of performance required by this task are: • figure out and explain probabilities Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
 Gives a correct answer: higher and gives a correct explanation such as: There are more cards higher that 3 than lower than 3. 	1	1
2. Gives a correct answer: 0 or impossible	1	
Gives a correct explanation such as: All the cards are lower than 10 so it is impossible for the next card to be higher.	1	2
3 Gives a correct answer: 5/7 or equivalent (71%)	1	
Shows correct work such as: 5,6,7,8,9 There are five higher numbers	1	2
4. Gives a correct answer: 4/6 or equivalent (66.6%)	1	
Shows correct work such as: 1,2,5,6 There are four lower numbers	1	2
5. Gives a correct answer: 6	1	
Gives a correct explanation such as: The cards left are 2, 5, 6, 8 and 9 The middle one of these is the 6 leaving two higher and two lower.	1	2
Total Points		9

Factors

This problem gives you the chance to:work with factors of numbers up to 30

A factor of a number divides into the number exactly.

This table shows all the factors of most of the numbers up to 30.

Number	Factors	Number of factors	Number	Factors	Number of factors
1	1	1	16	1, 2, 4, 8, 16	5
2	1, 2	2	17	1, 17	2
3	1, 3	2	18	1, 2, 3, 6, 9, 18	6
4	1, 2, 4	3	19	1, 19	2
5	1, 5	2	20	1, 2, 4, 5, 10, 20	6
6	1, 2, 3, 6	4	21	1, 3, 7, 21	4
7	1,7	2	22	1, 2, 11, 22	4
8	1, 2, 4, 8	4	23	1, 23	2
9	1, 3, 9	3	24	1, 2, 3, 4, 6, 8, 12, 24	8
10	1, 2, 5, 10	4	25	1, 5, 25	3
11	1, 11	2	26	1, 2, 13, 26	4
12	1, 2, 3, 4, 6, 12	6	27		4
13	1, 13	2	28		6
14	1, 2, 7, 14	4	29		2
15	1, 3, 5, 15	4	30	1, 2, 3, 5, 6, 10, 15, 30	8

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Factors Test 6

- 1. Write the factors of the numbers 27, 28, and 29 in the table.
- 2. The numbers 1 and 4 have an odd number of factors.
 - a. Write down all the numbers up to 30 that have an odd number of factors.
 - 1, 4, ____, ____, ____
 - b. Complete this sentence:

All the ______ numbers up to 30 have an odd number of factors.

3. The number 10 has two odd factors (1 and 5). It also has two even factors (2 and 10).

The number 18 has three odd factors (1, 3 and 9). It also has three even factors (2, 6 and 10).

- a. Write down all the numbers up to 30 that have an equal number of odd and even factors.
 - 2, 6, 10, ____, 18, ____, ____, ____,
- b. Describe two patterns you can see in the above sequence of numbers.

Task 3: Factors	Ru	bric
 The core elements of performance required by this task are: work with factors of numbers up to 30 Based on these, credit for specific aspects of performance should be assigned as follows 	points	section points
1 Gives correct answers: 27: 1, 3, 9, 27 28: 1, 2, 4, 7, 14, 28 29: 1, 29	1 1 1	3
2 a Gives three correct answers with no extras: 9, 16, 25	2	
Bartial credit Gives two correct answers. b	(1)	3
3.a Gives correct answers: 14, 22, 26, 30	1	5
 b Describes two correct patterns such as: They are all even numbers. The sequence increases in fours. They are all twice an odd number 	2 x 1	3
Total Points		9

Factors Test 6

Household Statistics

This problem gives you the chance to:

• interpret a block graph and statistics in a real life context



This graph shows the number of children per household in a survey of 20 families.

1. Use the graph to complete this table.

Number of children per household	0	1	2	3	4	5
Number of households						

2. a. How many households have three or more children?

b. What percentage of households has two children? Show your calculation.

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3. For each of these descriptions, choose the calculation below that matches it.

Write the letter of the calculation you choose in the table.

Description	Letter
Total number of households	
Total number of children	
Mean number of children per household	

Calculations

А	0+1+2+3+4+5
В	$\frac{0+1+2+3+4+5}{6}$
С	$0 \times 1 + 1 \times 5 + 2 \times 8 + 3 \times 4 + 4 \times 1 + 5 \times 1$
D	1 + 5 + 8 + 4 + 1 + 1
Е	$\frac{1+5+8+4+1+1}{20}$
F	$\frac{0 \times 1 + 1 \times 5 + 2 \times 8 + 3 \times 4 + 4 \times 1 + 5 \times 1}{20}$

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Building Blocks Test 6

Task 4: Household Statistics	Ru	bric
The core elements of performance required by this task are: • interpret a block graph and statistics in a real life context Based on these, credit for specific aspects of performance should be assigned as follows		section points
1. Gives correct answers:		
Number of children per household012345Number of households158411	2	
Partial credit		
5, 4, 3 correct 1 point	(1)	2
2. Gives correct answers: 6	1	
40%	1	
Shows 8/20	1	3
3. Gives correct answers: D , C , F	3 x 1	
		3
Total Points		8

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Being Building Blocks

This problem gives you the chance to: work with area and volume

Barbara's baby brother, Billy, has a set of building blocks.

Each block is 2 inches long, 2 inches wide, and 2 inches high.

- 1. How many faces does the block have?
- 2. What is the volume of the block? Show how you figured this out.
- 3. Billy has built this shape from his $2 \times 2 \times 2$ blocks.
 - a. What is the surface area of the shape?

Show how you figured this out.

b. What is the volume of the shape? Explain how you figured this out.

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square inches



cubic inches

cubic inches



2 2



Task 5: Building Blocks		Rubric
 The core elements of performance required by this task are: work with area and volume Based on these, credit for specific aspects of performance should be assigned as follows 		section points
1. Gives correct answer: 6	1	1
2. Gives correct answer: 8 cubic inches	1	
Shows work such as:		
2 x 2 x 2 =	1	
or length x breadth x height		2
3 a. Gives correct answer: 64 square inches	1	
Shows work such as:		
2((4 x 4) + (4 x 2) + (4 x 2))	1	
b. Gives correct answer: 32 cubic inches	1	
Gives explanation such as:		
There are 4 cubes and each is 8 cubic inches. So 4 times 8 makes 32	1	4
or 4 x 4 x 2 =		
Total Point	S	7

Balanced Assessment Test – Sixth Grade 2008

Core Idea	Task	Score	
Number Operations	Snail's Pace		
This task asks students to work with distances, time and speeds in inches per minutes in the context of snails. Students are asked to find equivalent rates. Successful students were able to find a common unit to make a comparison of the rates for all			
four snails.	I I I I I I I I I I I I I I I I I I I		
Probability	Black and White		
This task asks students to us	e probability in the context of picking balls from a	bag.	
Students needed to think abo	out probabilities and the meaning of fractions for a	variety	
of contexts. Successful stude	ents understood the probability of "not" getting		
something.			
Algebra	A Number Pattern		
This task asks students to de	scribe and extend a number pattern. Successful st	udents	
recognized a pattern growing	g by an increasing amount each time.		
Rational Numbers	Percent Cards		
This task asks students to re-	late fractions, decimals, and percents and locate the	em on a	
number line. Successful stu	dents could work with decimals in the thousandths	place	
and locate 3/8 on a number line.			
Geometry and	Area and Perimeter		
Measurement			
This task asks students to calculate area and perimeter for rectangles. Successful			
students could keep a given area and create new rectangles with larger and smaller			
perimeters.			

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Snail Pace

This problem gives you the chance to: • work with distances, time and speeds in inches and minutes

These snails move very slowly. Here are their speeds.

Snail A 5 inches in 10 minutes

Snail B 3 inches in 20 minutes

Snail C 1 inch in 15 minutes

Snail D 6 inches in 30 minutes

1. How far can snail D travel in 1 hour?

2. How far can snail C travel in half an hour?

- 4. Which snail moves more quickly than the others? ______ Explain how you figured this out.

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inches

inches

inches

Snail Pace	Ru	bric
 The core elements of performance required by this task are: • work with distances, time and speeds in inches and minutes • Based on these, credit for specific aspects of performance should be assigned as follows 	points	section points
1. Gives correct answer: 12 inches or 1 foot	1	1
2. Gives correct answer: 2 inches	1	1
3. Gives correct answer: 18 inches or 1 foot 6 inches or 1 1/2 feet	1	
Shows correct work such as: 60 divided by $20 = 3$		
$3 \ge 3 = 9$ inches in 1 hour		
$9 \ge 2 = 18$ inches	2	3
4. Gives correct answer: Snail A Accept 5	1	
Gives correct explanation such as: In 1 hour Snail A travels 30 inches. In 1 hour Snail B travels 9 inches. In 1 hour Snail C travels 4 inches. In 1 hour Snail D travels 12 inches. <i>Partial credit</i> For 1 error	2 (1)	3
Total Points		8

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Black and White

This problem gives you the chance to: • show your understanding of fractions and probability

There are 4 black balls and 7 white balls in a bag. Jasper picks a ball without looking.

He says,

The probability of getting a black ball is $\frac{4}{7}$

Jasper is wrong!

1. What is the probability of getting a black ball?

Explain why Jasper is wrong.



2. The fractions $\frac{4}{7}$, $\frac{7}{4}$, $\frac{7}{11}$, $\frac{4}{11}$ are answers to the questions below.

Put each fraction in a correct place.

a. What is the probability of getting a white ball?

b. What is the probability of not getting a black ball?

c. What is the fraction of black balls in the bag?

d. What is the number of black balls as a fraction of the number of white balls?

e. What is the number of white balls as a fraction of the number of black balls?

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Bla	ack and White	Ru	bric
The o • sho Base	core elements of performance required by this task are: ow understanding of fractions and probability d on these, credit for specific aspects of performance should be assigned as follows	points	section points
1.	Gives correct answer: 4/11	1	
	Gives correct explanation such as: The probability of getting a black ball is the number of black balls divided by the total number of balls.	1	2
2.	Gives correct answer: 7/11	1	
	Gives correct answer: 7/11	1	
	Gives correct answer: 4/11	1	
	Gives correct answer: 4/7	1	
	Gives correct answer: 7/4	1	
			5
	Total Points		7

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A Number Pattern

This problem gives you the chance to:

describe and extend a numeric pattern

This is a number pattern. It can go on and on.



- 1. Which numbers appear just once in the part of the pattern that is shown above?
- 2. In this pattern, each row begins and ends with the number 1. The other numbers are the sum of the two numbers above it. For example, 10 = 6 + 4.

Continue the pattern, by writing numbers in the row of empty squares.

- 3. a. Find the sum of the numbers in each of the rows. The first two have been done for you. Write your answers on the diagram above.
 - b. What do you notice about the sequence of numbers in the Totals column?
- 4. Look at the numbers that have been shaded. What do you notice about the sequence of numbers that have been shaded?

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A Number Pattern	Ru	bric
 The core elements of performance required by this task are: describe and extend a numeric pattern Based on these, credit for specific aspects of performance should be assigned as follows 	points	section
1. Gives correct answer: 2 Accept 6 and 20	1	1
2. Gives correct answers: 1, 6, 15, 20, 15, 6, 1	2	
Partial credit One error	(1)	2
3.a. Gives correct answer: 1, 2, 4, 8, 16, 32 , 64	2	
Partial credit One error	(1)	
b. Gives correct answer such as: The numbers double each time. or Powers of 2	1	3
4. Gives correct answer such as:		
The difference between consecutive numbers $(2, 3, 4, 5)$ increases by one each time.	2	
<i>Partial credit</i> For one error or an incomplete statement.	(1)	2
Total Points		8

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Percent Cards

This problem gives you the chance to:

· relate fractions, decimals and percents

Mrs. Lopez makes sets of cards for her math class. All the cards in a set have the same value.





Simple fraction

 $\frac{3}{4}$

Decimal



Percent fraction



Percent

1. Complete these sets of cards.



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2. Show
$$\frac{2}{5}$$
, 65% and $\frac{3}{8}$ on the number line below.
0 100%
 $\frac{3}{4}$

7

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Percent Cards	Ru	bric
 The core elements of performance required by this task are: relate fractions, decimals and percents Based on these, credit for specific aspects of performance should be assigned as follows 	points	section points
1. Gives correct answers: Set B 0.40	1	
Set C 13/20, 65/100	2 x 1	
Set D 0.375, 37.5/100 (accept 375/1000), 37.5%	2	
Partial credit One error	(1)	5
2. Values correctly indicated on number line.		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2	
One error	(1)	2
Total Points		7

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Area and Perimeter

This problem gives you the chance to: • work with area and perimeter of rectangles

- 1. The perimeter of this rectangle is 2(5+2) = 14 inches. 2 inches The area of this rectangle is $2 \times 5 = 10$ square inches. 5 inches a. Draw a diagram of a rectangle with the same perimeter, but a larger area. Write down the area of your rectangle. b. Draw a diagram of a rectangle with the same perimeter, but a smaller area. Write down the area of your rectangle. 2. The perimeter of this rectangle is 22 inches. The area of this rectangle is 24 square inches a. Is it possible to draw a rectangle with the same area as the one on the right, but a larger perimeter? 3 inches Explain your reasoning. 8 inches
- b. Is it possible to draw a rectangle with the same area, but a smaller perimeter? Explain your reasoning.



Area and Perimeter		bric
The core elements of performance required by this task are: • work with area and perimeter of rectangles		
Based on these, credit for specific aspects of performance should be assigned as follows	point s	sectio n points
1.a Draws a rectangle with sides such as: 3 inches x 4 inches	1	
. area = 12 square inches	1	
Draws a rectangle with sides such as: 1 inch x 6 inches	1	
area = 6 square inches	1	
b.		4
2.a Gives correct answer: Yes and		
Gives correct explanation such as: $Area 2 \times 12 = 24$ Perimeter $2(2 \pm 12) = 28$ inches	3	
Area 2 x $12 - 24$, remneter $2(2 + 12) - 26$ menes or	or	
Area 1 x $24 = 24$, Perimeter $2(1 + 24) = 50$ inches	3	
<i>Partial credit</i> Allow partial credit for a partially correct answer.	(2)	
Gives correct answer: Yes and		
b. Area 4 x 6 = 24, Perimeter $2(4 + 6) = 20$ inches	3	
Partial credit	(2)	
Allow partial credit for a partially correct answer.	(2)	6
Total Po	oints	10

Core Idea	Task	Score	
Number and Operations	Sewing		
This task asks students to the	nk about buying fabric and supplies. Students nee	eded to	
work with a rule to find the	amount of fabric, find the cost, and calculate an 8%	6 tax.	
Successful students could ro	und the amount of fabric to the nearest quarter yar	d and	
round the tax to the nearest of	cent.		
Algebra	Truffles		
This task asks students to we	ork with equivalent ratios to extend the amount of		
ingredients in a recipe. Stud	ents are asked to read a graph to help them reason	about	
extending the recipe. Succes	ssful students could make a rule to help them find	the	
amount of chocolate needed	given any amount of cream.		
Algebra and	Boxes		
Measurement			
This task asks students to rea	ason about weighing boxes to find the heaviest box	c. The	
challenge was how to weigh	9 boxes by only using the scale two times. Succe	ssful	
students could use the inform	nation about weights from pictures to make conclu	isions	
and find the second step in v	veighing the objects.		
Geometry	Skateboarding		
This task asks students to rea	ason about angles and degree of rotation in the cor	itext of	
skateboarding tricks. Succes	ssful students could also reason about the angles ir	ı a ramp	
given one of the angles and a right angle.			
Probability	A Board Game		
This task asks students to rea	ason about probabilities in the context of rolling a	number	
cube in a board game. Successful students could find the probability of a student			
winning in a given situation	and determine if the game was fair.		

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Sewing

This problem gives you the chance to: • use mathematics in a real life situation

Amy is sewing some pants for herself.

This is the rule for how much fabric she needs to buy.

- Measure from your waist to the finished length of the pants
- Double this measurement
- Add 8 inches
- 1. Amy's measurement from her waist to the finished length of the pants is 35 inches.

How many inches of fabric does she need?

2. Fabric is actually sold not in inches, but in yards. Each yard is 36 inches. The smallest amount you can buy is a quarter of a yard. So, if you want one yard and 25 inches you have to buy one and three quarter yards.

How much fabric must Amy buy for the pants?

3. Chris is also making some pants for herself. She buys fabric, thread, buttons and a zipper. Complete Chris's bill

	\$
$2^{1}/_{4}$ yards of fabric at \$5 a yard	
2 spools thread at 35¢ a spool	
3 buttons at 25¢ each	
Zipper 60¢	
Total before sales tax	
Sales tax at 8%	
(round this to nearest cent)	
Total	

10

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Sewing	Ru	bric
The core elements of performance required by this task are:use mathematics in a real situationBased on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answer: 78 inches	1	1
2. Gives correct answer: $2^{1}/_{4}$ yards Partial credit $2^{1}/_{6}$ or 2 yards 6 inches	2ft (1)	2
 3. 2 ¹/₄ yards of fabric at \$5: \$11.25 Thread: \$0.70 Buttons: \$0.75 (Zipper \$0.60) Total before tax: \$13.30 8% sales tax: \$1.06 <i>Partial credit</i> Not rounded (1.064) Total: \$14.36 	1 1 1ft 2ft (1) 1ft	7
Total Points		10

Truffles

This problem gives you the chance to: • do calculations in a real situation

Linda makes chocolate truffles.

The recipe for 20 dark chocolate truffles is

1 cup cream 2 cups dark chocolate

1. Complete the recipe for 40 dark truffles

_____ cups cream

_____ cups dark chocolate



2. One day, Linda has 8 cups of dark chocolate and plenty of cream.

How many truffles can she make? Explain how you figured it out.

3. The recipe for Super Truffles is different. The graph on the next page shows how much cream and

chocolate to use.

How much chocolate does Linda need for two cups of cream?

4. How much cream does she need for 15 cups of chocolate?

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Super Truffles



5. Write a rule that Linda can use to figure out how many cups of chocolate she needs for any number of cups of cream when making Super Truffles.

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Truffles			Rubric	
 The core elements of performance required by this task are: • do calculations in a real situation Based on these, credit for specific aspects of performance should be assigned as follows 		points	section points	
1.	Gives correct answers: 2	1		
	4	1	2	
2.	Gives correct answer: 80	1		
	Gives correct explanation such as: She can make four times as many as the recipe.	2	3	
3	Gives correct answer: 5 cups	1	1	
4.	Gives correct answer: 6 cups	1	1	
5.	Gives correct rule such as: Multiply the number of cups of cream by two and a half. <i>Partial credit</i> Shows a 2.5: 1 ratio or equivalent.	2 (1)	2	
	Total Points		<u>2</u> 9	

Boxes

This problem gives you the chance to:

- show understanding of a mathematical situation
- explain your reasoning

There are nine small boxes.

They all look exactly the same but one is a bit heavier than the others.

Jake says,



This is what Jake does first.



1. Explain what Jake now knows about the heavy box.

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4. Suppose the scales showed this the first time instead.



What should Jake do now to find the heavy box?

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Boxes	Rubric	
 The core elements of performance required by this task are: show understanding of a mathematical situation explain your reasoning Based on these, credit for specific aspects of performance should be assigned as follows 		section points
1. Gives correct answer: It is 4, 5, or 6	2	
Accept RHS or lower scale pan.		2
2. Gives correct answer: 6	1	1
3. Gives correct answer: 4 and 5 weigh the same so 6 is the heavy one.	2	
Partial credit 4 and 5 are the same weight.	(1)	2
4. Gives correct answer such as: Weigh 7 and 8 and leave 9 out. If 7 and 8 weigh the same, 9 is the heavy one. If the scales do not balance, the heavy parcel is in the lower scale pan.	3	
Incomplete explanation.	(2)	
Weighs 7 and 8 and nothing else.	(1)	3
Total Points		8

Skateboarding Tricks

This problem gives you the chance to:

use geometry in everyday life

Tom loves skateboarding. He can do lots of tricks.

1. When he begins his first trick, the skateboard is in this position.



He spins clockwise.

When he has completed the trick, the skateboard is in this position.

Through how many degrees has the skateboard turned?

- 2. Tom can do a second trick. The skateboard does a complete turn. Through how many degrees does his skateboard turn?
- 3. In his third trick the skateboard makes a 180° turn. Draw the end position of Tom's skateboard.

Start position

End position

4. Tom's fourth trick shows that he can skateboard around a square fish pond.

When he starts at point A, this is the position of his skateboard.



He skateboards in a straight line until he reaches point B. He spins clockwise until he faces point C. He skateboards in a straight line until he reaches point C.

He spins clockwise until he faces point D.

He skateboards in a straight line until he reaches point D. He spins clockwise until he faces point A.

He skateboards in a straight line until he reaches point A.

Through how many degrees has his skateboard turned in all?







5. Tom's newest trick uses a ramp. The ramp looks	like this.
What are the other two angles of Tom's ramp?	
Explain how you figured this out.	



Grade 6 Copyright © 2009 by Mathematics Assessment Resource Service. All Rights Reserved. Skateboarding Tricks

Skateboarding Tricks	Rubric	
 The core elements of performance required by this task are: use geometry in everyday life. 	nointo	section
Based on these, credit for specific aspects of performance should be assigned as follows		points
1. Gives correct answers such as: 90 $^{\circ}/450^{\circ}/a$ quarter turn.	1	1
2. Gives correct answer: 360 degrees.	1	1
3. Draws correct end position of the skateboard.	1	1
4. Gives correct answer: 270 degrees	1	1
5. Gives correct answer: 90° and 25°	1	
Gives correct explanation such as: I know that there are 180 degrees in a triangle. 90 plus 65 is 155. I took 155 from 180.	1	2
Total Points		6

A Board Game

This problem gives you the chance to: • work with probabilities

Jake and Annia are playing a board game using an ordinary cube numbered 1 to 6.

Players take turns to throw the cube, but only the player with the higher score moves. The player with the higher score moves the number of places shown on their cube. If the scores are equal neither player moves.

1. On his first throw Jake got a 3. Annia was the one to move.

What numbers could she have thrown? List all the possible numbers.

2. On his second throw Jake got a 4.

What is the probability that Annia was the one to move?

3. On another throw, after Jake has thrown, the probability that Annia moves is $^{2}/_{3}$.

What number did Jake throw?

4. Towards the end of the game Annia needs to move two places to win. She must throw exactly 2.

What would Jake need to throw for Annia to have a chance of winning? Explain how you decided.

5. Annia thinks it unfair for Jake to go first each time. She thinks it gives him an advantage.

Is she correct?	
Explain how you decided.	

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A Board Game
A Board Game			Rubric	
The core elements of performance required by this task are: work with probabilities 				
Based on these, credit for specific aspects of performance should be assigned as follows		points	section points	
1.	Gives correct answer: 4, 5 and 6	1		
			1	
2.	Gives correct answer: 2/6 or equivalent	1		
			1	
3.	Gives correct answer: 2	1		
			1	
4.	Gives correct answer: 1	1		
	Gives a correct explanation such as: To be able to move she has to score			
	more than Jake and she needs to score 2 to move 2 so he must get only 1.	1		
			2	
5.	Gives correct answer: No	1		
	Gives a correct explanation such as: They each throw before they decide	1		
	the order does not matter.	1		
			2	
	Total Points		7	