Mathematics Assessment Program *CCR-C1*

College and Career Readiness Mathematics

Time Allowed: 3 hours

These tasks give you a chance to show what you know and
how you reason, and to solve mathematical problems.

Please show your work and reasoning in the
spaces provided. Explain any assumptions you make.

**Try as many tasks as you can in the time given.
If you get stuck on a task, move on to the next task.**

Name: _____   Male Female

School: _____ City: _____

Teacher: _____ Grade: _____

Date: _____

Do not write in the box below:

CCR-C1	Short Tasks	Multiplying Cells	Sorting Functions	Charity Fair	Patchwork	Square	Circles and Squares	Funsize Cans	Multiple Solutions	Best Buy Tickets	Propane Tanks	Total
11												

These tests were developed with support from the Bill and Melinda Gates Foundation

Short Tasks

1. By factoring, find the zeros of $f(x) = x^2 + 3x - 4$.

_____

2. A rectangle has length $(x + 5)$cm and width $(x - 2)$ cm. Its area is 60 cm^2.
   Write a quadratic equation and solve it to find the length and width of this rectangle

_____

3. If $x^2 = 289$ what 2 values could x have?

_____

4. Find the equation of a line passing through the origin and parallel to the line $2x - y = 5$.

_____

5. A vendor has 15 helium balloons for sale: 9 are yellow, 4 are red, and 2 are green.
   A balloon is selected at random and sold. If the balloon sold is yellow, what is the probability that
   the next balloon, selected at random, is also yellow?

_____

Short Tasks (continued)

6. Write $2.7 \times 10^4 + 120$ in scientific notation.

_____

7. Simplify $\dfrac{a^2 - b^2}{a + b}$

_____

8. Dave sold 40 tickets for a concert. He sold x tickets at $2 each and y tickets at $3 each.
   He collected $88. Write down two equations connecting x and y.
   Solve these two equations to find how many of each kind of ticket he sold.

_____   _____   _____

9. If Sin A = $\dfrac{3}{5}$, and Cos A < 0, find Tan A

_____

10. Jane collected some red and yellow roses. She measured the lengths of their stems, and drew the
    following box plots.
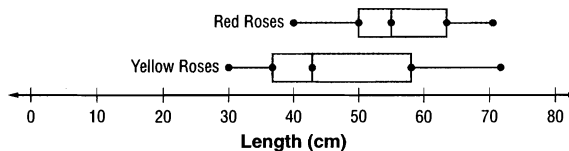
Write down the median lengths of both the yellow and red roses to the nearest centimeter.
Which color rose would you buy for a 40 cm tall vase?

_____   _____   _____

CCR-C1

Multiplying Cells

0 minutes	20 minutes	40 minutes	60 minutes or 1 hour
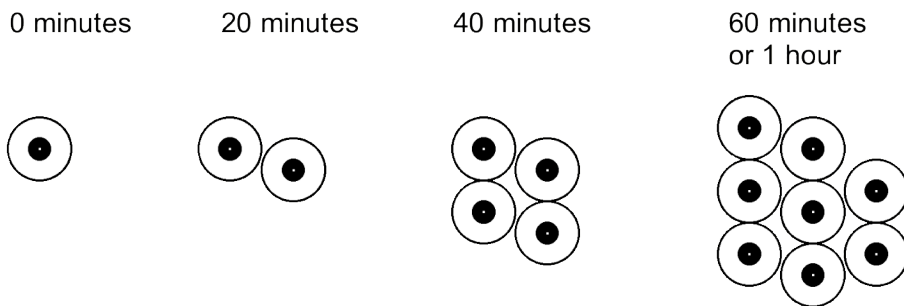
Mrs. Lucas's class has a 2-hour science lab.

She gives each student a dish with one cell in it.

She tells the class that in 20 minutes the cell will divide into two cells,

and each 20 minutes after that **each** cell in the dish will divide into two cells.

1. Complete the second row in this table to show how the number of cells increases during the lab.

Time (minutes)	0	20	40	60	80	100	120
Number of cells	1	2	4				
Number of cells as a power of 2	2^0	2^1					

2. Olan says that the numbers of cells can be written in the form 2^n.

   Complete the third row in the table to show how the number of cells can be written in this form.

CCR-C1

3. Linda says that the number of cells after 3 hours will be 2^7 (= 2x2x2x2x2x2x2)

   Is she correct? _____

   If not, then what is the correct number? _____

   Explain how you figured it out.

   _____

   _____

   _____

4. How many cells will be in the dish after 5 hours? _____

   Give your answer as a normal number, not as a power of 2.
   Show how you figured it out.

5. How long will it take for the number of cells to reach at least 100,000?

   Give your answer to the nearest 20 minutes. _____
   Show how you figured it out.

CCR-C1

Sorting Functions

On the next page are four graphs, four equations, four tables, and four rules.

Your task is to match each graph with an equation, a table and a rule.

1. Write your answers in the following table.

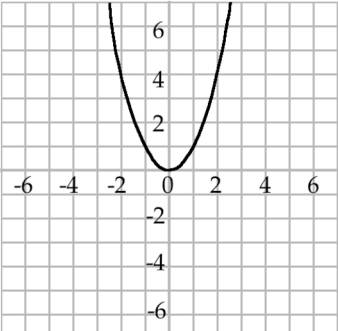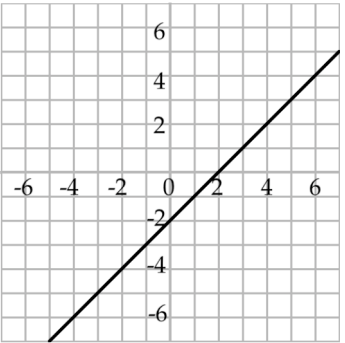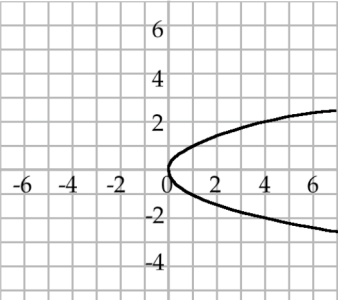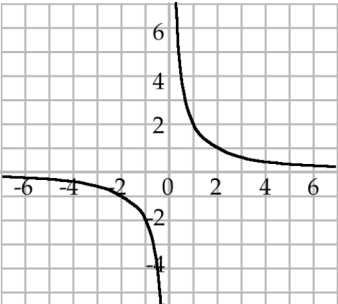| Graph	Equation	Table	Rule
A			
B			
C			
D			

2. Explain how you matched each of the four graphs to its equation.

Graph A _____

_____

_____

Graph B _____

_____

_____

Graph C _____

_____

_____

Graph D _____

_____

_____

CCR-C1

Graph A	Equation A	Table A	Rule A
	$xy = 2$	<table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y</td><td>-4</td><td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td></tr></table>	y is the same as x multiplied by x
Graph B	Equation B	Table B	Rule B
	$y^2 = x$	<table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y</td><td>4</td><td>1</td><td>0</td><td>1</td><td>4</td><td>9</td></tr></table>	x multiplied by y is equal to 2
Graph C	Equation C	Table C	Rule C
	$y = x^2$	<table><tr><td>x</td><td>0</td><td>1</td><td>4</td><td>9</td><td>16</td></tr><tr><td>y</td><td>0</td><td>±1</td><td>±2</td><td>±3</td><td>±4</td></tr></table>	y is 2 less than x
Graph D	Equation D	Table D	Rule D
	$y = x - 2$	<table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>4</td></tr><tr><td>y</td><td>-1</td><td>-2</td><td>±∞</td><td>2</td><td>1</td><td>0.5</td></tr></table>	x is the same as y multiplied by y

CCR-C1

Charity Fair

**LUCKY DIP
25¢ A CHANCE
3 balls the same color
WIN $5**

Ann is in charge of a **Lucky Dip** to raise money for charities.

Each barrel contains an equal number of red, green, white and black balls.

The balls are buried in sawdust so that you cannot see them before you pick one out.

To play the game, you give Ann your 25¢, then you pick one ball from each barrel.

You win $5 if all three balls are the same color.

1. Calculate the probability that you will win the $5 if you play once.

                _____

2. Do you think that the **Lucky Dip** will raise money for the local charities?

                _____

  Show your calculations.

CCR-C1

3. Ann wants to change the game so as to increase the amount of money it makes for the charities.

Describe two different kinds of change that she could make to the **Lucky Dip** and find how much is likely to be raised for the charities after each change.
Show all your calculations.

Change one

_____

_____

_____

_____

_____

Change two

_____

_____

_____

_____

_____

CCR-C1

Patchwork

A sheet of square dot paper is provided for use with this item.

Kate makes patchwork cushions.
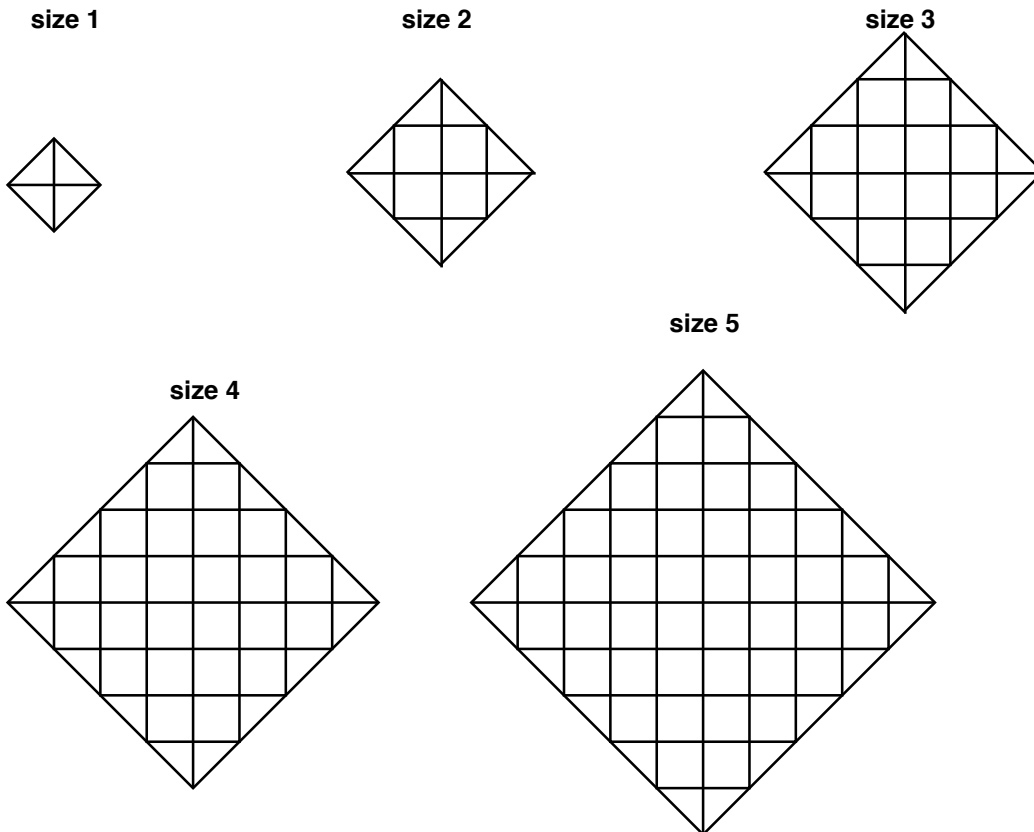She uses right triangles ◣ ◢ and squares. ☐

She uses triangles along the edges of each cushion. The rest is made from squares.

The backs of the cushions are made of plain material, not patchwork.

Here are the first five sizes of patchwork cushions.

size 1   **size 2**   **size 3**

size 5

size 4

Kate makes cushions in many other different sizes.

She begins to figure out how many triangles and squares she needs for each size.

For size 1, she needs 4 triangles and 0 squares.

For size 2, she needs 8 triangles and 4 squares.

1. Complete this table to show how many triangles and squares she needs for each of these five sizes?

Size *(n)*	Number of triangles *(t)*	Number of squares *(s)*
1		
2		
3		
4		
5		

2. Find a rule, or a formula, that will help Kate figure out the number of triangles that she needs for cushions of different sizes. Explain how you figured it out.

_____

_____

_____

_____

_____

3. Use the number patterns in the table to find a rule, or a formula, that will help Kate figure out the number of squares she needs for cushions of different sizes. Explain why your rule works.
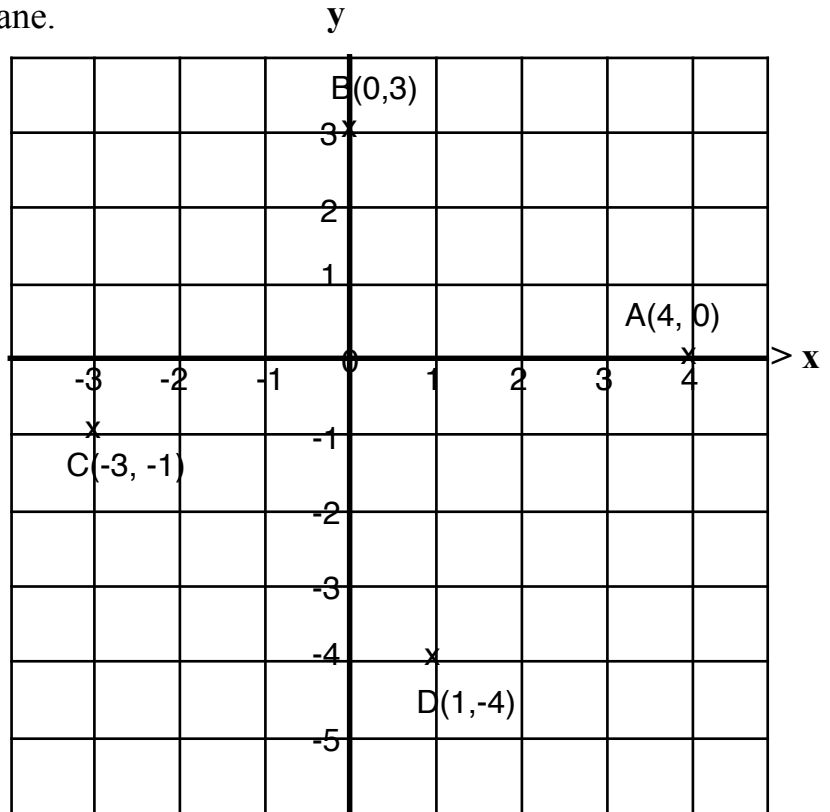
_____

_____

_____

_____

_____

4. Kate has a cushion made with 180 squares.
   How many triangles are in this cushion?   _____
   Show how you found the number of triangles.

CCR-C1

Square

Four points, **A(4, 0), B(0, 3), C(-3, -1), and D(1, -4)**
are drawn on the x/y co-ordinate plane.

1. Find the length of the line AB.

_____

2. Find the slope of the line AB.

_____

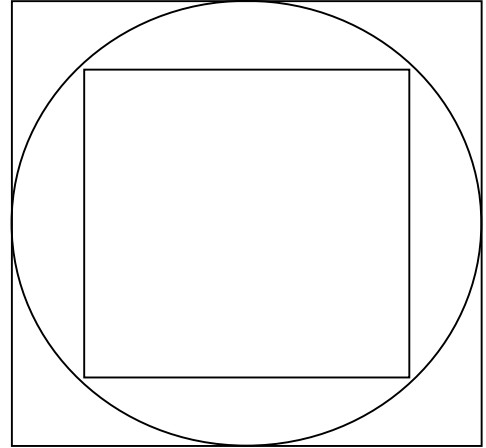3. Join the sides of the quadrilateral ABCD. Prove that ABCD is a square.

CCR-C1

Circles and Squares

This diagram shows a circle with one square inside and one square outside.

1. What is the ratio of the areas of the two squares?
   Show your work

   _____

2. If a second circle is inscribed inside the smaller square, what is the ratio of the areas of the two circles? Explain your reasoning.

   _____

CCR-C1

Funsize Cans

The volume of a cylinder is
$$V = \pi r^2 h$$

The surface area of a cylinder is
$$S = 2\pi r^2 + 2\pi r h$$

The Fresha Drink Company is marketing a new soft drink.

The drink will be sold in a `Fun Size' cylindrical can which holds 200 cm^3.

Here are two suggestions for the radius of the cylindrical can.

I'm designing a can with radius 2 cm.

My can has a radius of 5 cm.

1. Each of these cans holds 200 cm^3. Find the heights of these two cans.

Are the dimensions of the cans suitable? Explain your answer.

_____

_____

CCR-C1

2. Find the surface area of the two cans. Show your work

3. In order to keep costs low, the Fresha Drink Company wants to sell the drink in cylindrical cans that use the smallest amount of aluminum.

   Find the approximate radius and height of a can that holds 200 cm^3 and uses the smallest amount of aluminum. Show clearly how you figured out the size of the can.

   Make your dimensions correct to the nearest 0.5 centimeter.
   (You may find it helpful to use graph paper.)

CCR-C1

Multiple Solutions

1. For each of the following equalities and inequalities, find two values for x that make the statement true.

  a. $x^2 = 121$ _____ _____

  b. $x^2 = x$ _____ _____

  c. $x^2 < x$ _____ _____

  d. $(x-1)(5x^4 - 7x^3 + x) = 0$ _____ _____

  e. $1776x + 1066 \geq 365$ _____ _____

  f. $x^2 > x^3$ _____ _____

  g. $|x| = x$ _____ _____

CCR-C1

2. Some of the equations and inequalities on the page opposite have exactly two solutions; others have more than two solutions.

    a. Write two equations or inequalities that have exactly two solutions.
       Explain your answer.

_____

_____

_____

_____

    b. Write one equation or inequality that has more than two solutions, but not infinitely many solutions. How many solutions does it have?

_____

_____

_____

_____

    c. Write two equations or inequalities that have an infinite number of solutions.

_____

_____

_____

_____

CCR-C1

Best Buy Tickets

Susie is organizing the printing of tickets for a show her friends are producing.
She has collected prices from several printers and these two seem to be the best.

SURE PRINT
Ticket printing
25 tickets for $2

BEST PRINT
Tickets printed
$10 setting up
plus
$1 for 25 tickets

Susie wants to go for the best buy

She doesn't yet know how many people are going to come.

Show Susie a couple of ways in which she could make the right decision, whatever the number.

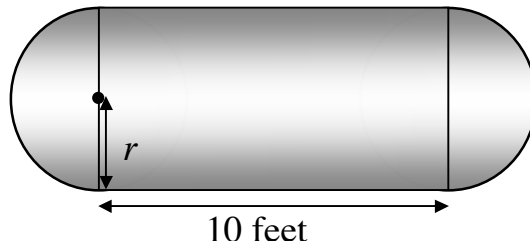Illustrate your advice with a couple of examples.

_____

_____

_____

_____

_____

_____

_____

Please continue your work on the page opposite

CCR-C1

Best Buy Tickets (continued)

_____

_____

_____

_____

_____

_____

_____

CCR-C1

Propane Tanks

People who live in isolated or rural areas have their own tanks of natural gas to run appliances like stoves, washers, and water heaters.

These tanks are made in the shape of a cylinder with hemispheres on the ends.

r

10 feet

The Insane Propane Tank Company makes tanks with this shape, in different sizes.

The cylinder part of every tank is exactly 10 feet long, but the radius of the hemispheres, r, will be different depending on the size of the tank.

The company want to double the capacity of their standard tank, which is 6 feet in diameter.

What should the radius of the new tank be?   _____

Explain your thinking and show your calculations.

_____

_____

_____

_____

CCR-C1

Propane Tanks (continued)

CCR-C1