Cats in the Community

CAT MATH

BCSPCA

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Cats in the Community:
A Community Problem We Can 'Fix'

Cat Math is one of four BC SPCA lessons in this series of *Cats in the Community*.

Cat Math requires students to use multiplication, estimation and graphing skills to calculate the numbers of cats that can be born over a two year period if they are not spayed or neutered.

There are three other lessons:

Community Cats and the Ecosystem is a science lesson about the food chain, invasive species and the effects on the ecosystem.

Catistics is a social studies lesson in which students interpret survey data and use critical thinking skills to come up with solutions to the pet overpopulation issue.

Catboy: **A Novel Study on Pet Overpopulation** is based on the novels *Catboy* and *Hunter* by Canadian author Eric Walters. Students will make connections to real situations in their community and think critically about the ideas and information presented to deepen and transform their understanding about community cats.

All four of the lessons are interactive and thought provoking, challenging students to come up with solutions to the community cat overpopulation problem.

⏶⏴ Core Competencies

△C Communication

Children are inherently interested in animals. In our programs, that natural curiosity fuels their engagement and inspires them to connect with others on topics that are relatable such as pets, wildlife and farm animals. Children practise acquiring new information about the animal world and sharing that information both formally and informally in groups or pairs, in presentations, or with the public as advocates. Through our interactive activities students collaborate with classmates to solve problems and create projects, and reflect on their own experiences and how their knowledge has evolved over time.

△T Thinking

Through our lessons and presentations students have the opportunity to practise creative thinking, generating and developing new ideas about real issues that affect their lives every day. They are challenged to create new ways to change and improve the world around them as they learn more about animal well-being. By exploring their own basic needs and comparing them to the needs of animals, students think critically about how their personal decisions also affect other lives, their community, and the environment. Older students can also begin to consider their own experiences, their culture and the media, and contemplate where their knowledge and opinions come from.

△PS Personal & Social

All of our programs have a basis in empathy building, compassion, and teaching young people to understand and care about themselves and others. Students learn to read the unspoken signals and emotions of animals and practise recognizing and regulating their own actions and emotions in accordance with their surroundings. They will begin to situate themselves in a broader environment that encompasses animals, other people, community and nature. Through games, activities and discussion they learn tangible strategies to peacefully solve problems and develop a sense of accountability that extends beyond the personal to the social.

Cat Math
A Solvable, Fixable Problem

Big Idea:

The BC SPCA takes in nearly 12,000 cats every year. Of those, 5,500 are stray or surrendered kittens. By comparison, the BC SPCA takes in 7,000 dogs each year, with 1,300 of those being puppies. Seeing these statistics, we know that cat overpopulation is much greater than dog overpopulation. To help solve the cat overpopulation problem, we need to look at how and why these animals end up in shelters, which includes examining society's attitudes towards cats, and then use education to create change. But first, it is important to understand the mathematical realities of unspayed and unneutered cats.

The lessons and presentation in this unit will help children understand the great impact and accountability that comes with the decision to get a pet, part of which is to spay/neuter the animal. Participants learn how quickly cats can reproduce and how this can affect other animals in our communities.

Cat Math incorporates many aspects of the new curriculum and presents them with applicable, real-life meaning.

Cat Math

n this math exercise, students will problem solve using multiplication and addition to see how quickly cats can repro-duce. The challenge is then to calculate the numbers of kittens born when one cat or one or two kittens from each litter is spayed.

Big Ideas	All living things sense and respond to their environment.
	Development of computational fluency and multiplicative thinking requires analysis of patterns and relations in multiplication and division.

Curricular Competencies

Math	▶ Model mathematics in contextualized experiences
	▶ Develop, demonstrate and apply mathematical understanding through play, inquiry and problem solving
	▶ Connect mathematical concepts to each other and to other areas and personal interests
	▶ Multiplication and division facts to 100
Science	▶ Compare results with predictions, suggesting possible reasons for findings
	▶ Make simple inferences based on their results and prior knowledge

What students will know	▶ Apply mathematical understanding of multiplication of two-digit numbers by one-digit numbers through problem solving.
	▶ Estimate the number of kittens born when no cats are spayed, when one cat is spayed and when one kitten from each litter is spayed through patterns using graphs.
	▶ Connect mathematical concepts to the real world problem of pet overpopulation.
	▶ Analyze the decrease of cat population numbers using a graph.
	▶ Develop mathematical understanding through pictorial, symbolic or concrete representation.
Materials	Worksheets on pages 3-6. Discussion questions pages 2-7. Answer Key page 8.
Activity	1. Introduce this lesson by asking the introductory discussion questions.
	2. Assign the students the Cat Math worksheets or have students demonstrate their answers using pictures or manipulatives as you read out the questions. Students can work individually or in groups.
	3. Have students do the math challenge on their own.
	4. Have students graph their answers for each scenario.
	5. Ask the class the follow-up discussion questions.
	6. More lessons on cat welfare issues for social studies, science and language arts lessons on cat overpopulation, available at spca.bc.ca/teacher.

CAT MATH

At the BC SPCA we take in almost twice as many cats as we do dogs and over a quarter of the cats are stray kittens. To help reduce the number of cats and kittens in our shelters we need to look at how and why these animals end up at the shelter, including society's attitudes towards cats, and then find ways to educate people in order to solve the problem.

First let's take a look at how quickly cats can reproduce.

Cats have an average of two litters of six kittens every year.

What many people don't know is that kittens can get pregnant as early as five to six months old.

The gestation period (length of pregnancy) for a cat is 65 days.

Warm weather triggers a female cat's body into being ready for pregnancy. This is called going into 'heat.' The first litter of kittens are born in the spring and a second litter in fall.

Can you guess how many kittens can be born in two years if we assume each litter has 3 females and 3 males and none are spayed? Let's do some math to find out.
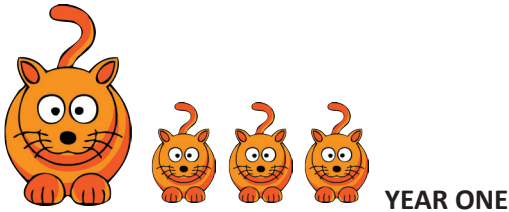
YEAR ONE

1. In the spring Ginger has a litter of 3 females and 3 males. _____

In the fall Ginger has another litter of 3 females and 3 males. _____

> **How many kittens does Ginger have in year one?**   **A** _____

2. Ginger's first litter was born in March. If kittens can get pregnant between five to six months of age, what month could they go into heat (get pregnant)?
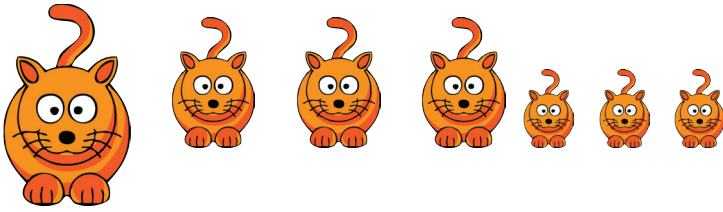
If pregnancy lasts 65 days, what month could their kittens be born?

Ginger's 3 female kittens born in the spring have their own litters of 6 kittens in fall.

> **How many kittens do Ginger's daughters have this year? B** _____

3. **How many kittens altogether do Ginger and her daughters have this year?**

> Gingers kittens **A** _____ + her daughters' kittens **B** _____ = **C** _____

YEAR TWO * remember half (female) of the total number of kittens will go on to have kittens of their own.

4. The next spring Ginger has her third litter of 6 kittens.   D _____

Her 6 daughters (from year one) each have a litter of 6 kittens.   E _____

Her 9 granddaughters (born in the fall in year one) each have 6 kittens.   F _____

   How many kittens are born in the spring of year two? D _____ **+ E** _____ **+ F** _____

   = G _____

5. In the fall of year two, Ginger has her fourth litter of 6 kittens. **H** _____

Her 9 daughters (6 born in year one and 3 more born in the spring of year two) each have a litter of 6. **I** _____

Her 27 granddaughters (9 born last fall and 18 in the spring) have 6 kittens. **J** _____

Her 27 great granddaughters (born in the spring) have 6 kittens. **K** _____

   How many kittens are born in the fall of year two?

   H _____ **+ I** _____ **+ J** _____ **+ K** _____ **= L** _____

6. Now let's add it all together.

   Year one total: **C** _____ + Spring year two total: **G** _____ + Fall year two total: **L** _____ =

   _____ **TOTAL FOR TWO YEARS:**

7. Now let's see what would happen if Ginger was spayed after her first litter.

Year One:
        spring - Ginger: (1 x 6)   _____

        fall - Ginger's 3 daughters: (3 x 6)   _____

Year Two:
        spring - Ginger: 0
        spring - Ginger's daughters: (3 x 6)   _____

        spring - Ginger's granddaughters (9 x 6)   _____

        fall - Ginger's daughters: (3 x 6)   _____

        fall - Ginger's granddaughters (9 x 6)   _____

        fall - Ginger's great granddaughter (27 x 6) _____

                TOTAL FOR TWO YEARS: _____

Math challenge

Using the same statistics for Ginger and her kittens, find out how many kittens would be born if Ginger was spayed after her first litter and one female cat from each litter was spayed before they were six months old.

Year One:
        spring - Ginger (1 x 6)   _____

        fall - 2 of Ginger's daughters each have a litter (2 x 6)   _____

Year Two:
        spring - Ginger: 0

        spring - 2 of Ginger's daughters (2 x 6)   _____

        spring - 2 granddaughters from the 2 litters born in the spring each have a litter (4 x 6)   _____

        fall - 2 of Ginger's daughters: (2 x 6)   _____

        fall - 2 granddaughters from the 2 litter born in the spring each have a litter (4 x 6)   _____

        fall - 2 great granddaughter born from 4 litters in the spring each have a litter (8 x 6)   _____

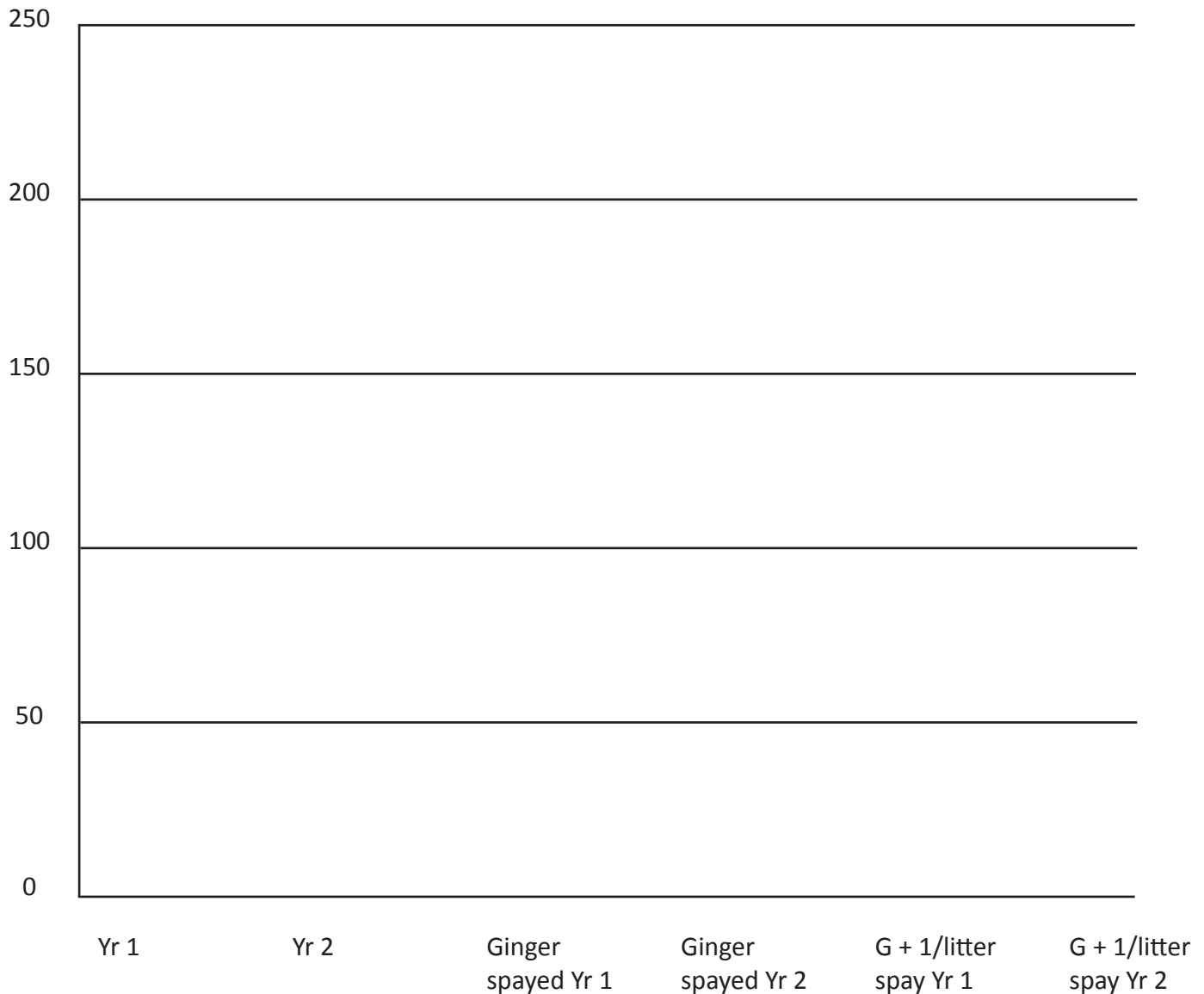   **TOTAL FOR TWO YEARS:**   _____

Using the graph below, create a bar graph for each scenario. Use a different colour for Ginger, her daughters, granddaughters and great granddaughters and the totals for each of them for year one and year two in your graph.

Predict how many kittens would be born if two kittens from each litter were spayed before they were six months old.

Draw an image or use blocks or beans to represent the number of kittens born for each scenario for the two years.

As you can see the prognosis for cats wouldn't be good if no cats were spayed or neutered. In reality not all of the kittens survive, half of all litters aren't always female and young cats having kittens don't often have six kittens in a litter but our math exercise was to demonstrate how the numbers can be greatly reduced by spay/neutering your pet.

250					
200					
150					
100					
50					
0					
Yr 1	Yr 2	Ginger spayed Yr 1	Ginger spayed Yr 2	G + 1/litter spay Yr 1	G + 1/litter spay Yr 2

Discussion Questions

Introduction Questions

What does it mean to spay or neuter an animal?

Do you think it is important to spay or neuter a cat? Dog? All pets? Why or why not?

Why do you think animal shelters always have more cats and kittens looking for homes than dogs and puppies?

Follow-up Questions

What things need to be considered before bringing a kitten into your home?

- *Does anyone have allergies?*
- *Do you have enough money to pay for vet bills, care etc.?*
- *Who will care for the cat when you are away on vacation?*
- *Can you tolerate some cat behaviour issues - vomit, need a clean litter box, like to scratch?*
- *Other pets - will they get along?*
- *What are your expectations for the cat?*

If your cat had a litter of kittens, how would you find good homes for all of them?

- It is difficult to find responsible guardians that will take care of a cat for his entire life.
- Every home that you find for the kitten is a home that may have adopted a cat or kitten from the shelter

Do you think the pet overpopulation problem is the same with dogs? Why or why not?

- There aren't as many puppies born because most often people don't let their dogs roam freely. Dogs that are stray get picked up by the city animal control department because there are bylaws for dogs at large.
- Accidental litters don't happen as often with dogs because they are kept inside and walked on a leash and therefore not given the opportunity to mate.

Dogs can start having puppies at the same age as cats. Why are there more kittens in shelters than puppies?

- People can often find homes for puppies because there aren't as many puppies in shelters as there are kittens.
- People have more difficulty finding homes for kittens and end up surrendering them to the shelter.

In shelters that have both cats and kittens, which are more likely to get adopted? Why?

- Kittens are more likely to get adopted because people are attracted to kittens.
- People often think that older cats end up at the shelter because they have behaviour issues.

How does having kittens in a shelter affect the number of days adult cats remain at the shelter?

- Adult cats are overlooked when kittens are available for adoption as well. This means that adult cats tend to stay in the shelter longer.

If you have a cat that wants to be outdoors but you know it isn't safe for the cat, what could you do?

- *Build a cat enclosure*

If you do have an outdoor cat, what time of day is it safest to be outside? Why?

- *At night they are more likely to get hit by cars because they are harder to see.*
- *At dusk and dawn they are more likely to be prey for a coyote.*
- *Raccoon altercations are more likely to happen at night when raccoons are out.*

What are some of the issues with keeping cats outdoors?

- *weather*
- *disease*
- *cat fights*
- *kill birds*
- *can get hit by a car*
- *killed by coyote, dog, person*
- *caught in a trap*

What are some issues that cats might have being indoors?

- *may get bored*
- *may be overweight*

How can we make an indoor life for a cat a good one?

- *play with them*
- *interactive toys*
- *have another cat to play with*
- *leash and harness train cat and take him for walks*
- *build a cat enclosure outdoors with a cat door so cat can access outdoors safely*

Answer Key

1. How many kittens does Ginger have in year one? 12

2. How many kittens do Ginger's daughters have this year? 18

3. How many kittens altogether do Ginger and her daughters have this year? 30

4. How many kittens are born in the spring of year two? 96

5. How many kittens are born in the fall of year two? 384

6. TOTAL FOR TWO YEARS: 510

7. TOTAL FOR TWO YEARS: 330

Math Challenge:

Year One:
       spring - Ginger: (1 x 6)
       fall - Ginger's 2 daughters: (2 x 6)
Year Two
       spring - Ginger: 0
       spring - Ginger's daughters: (2 x 6)
       spring - Ginger's granddaughters: (4 x 6)
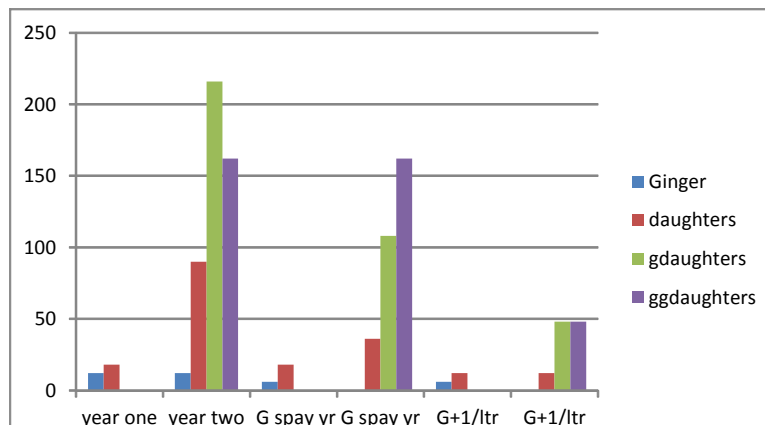   fall - Ginger's daughters: (2 x 6)
       fall - Ginger's granddaughters: (4 x6)
       fall - Ginger's great granddaughters: (8 x 6)

       TOTAL FOR TWO YEARS: 138

Additional activities:

1. Have the students create a graph of the numbers of kittens born for each year.

2. Have the students predict how many kittens could be born if two kittens from each litter were spayed before six-months old.