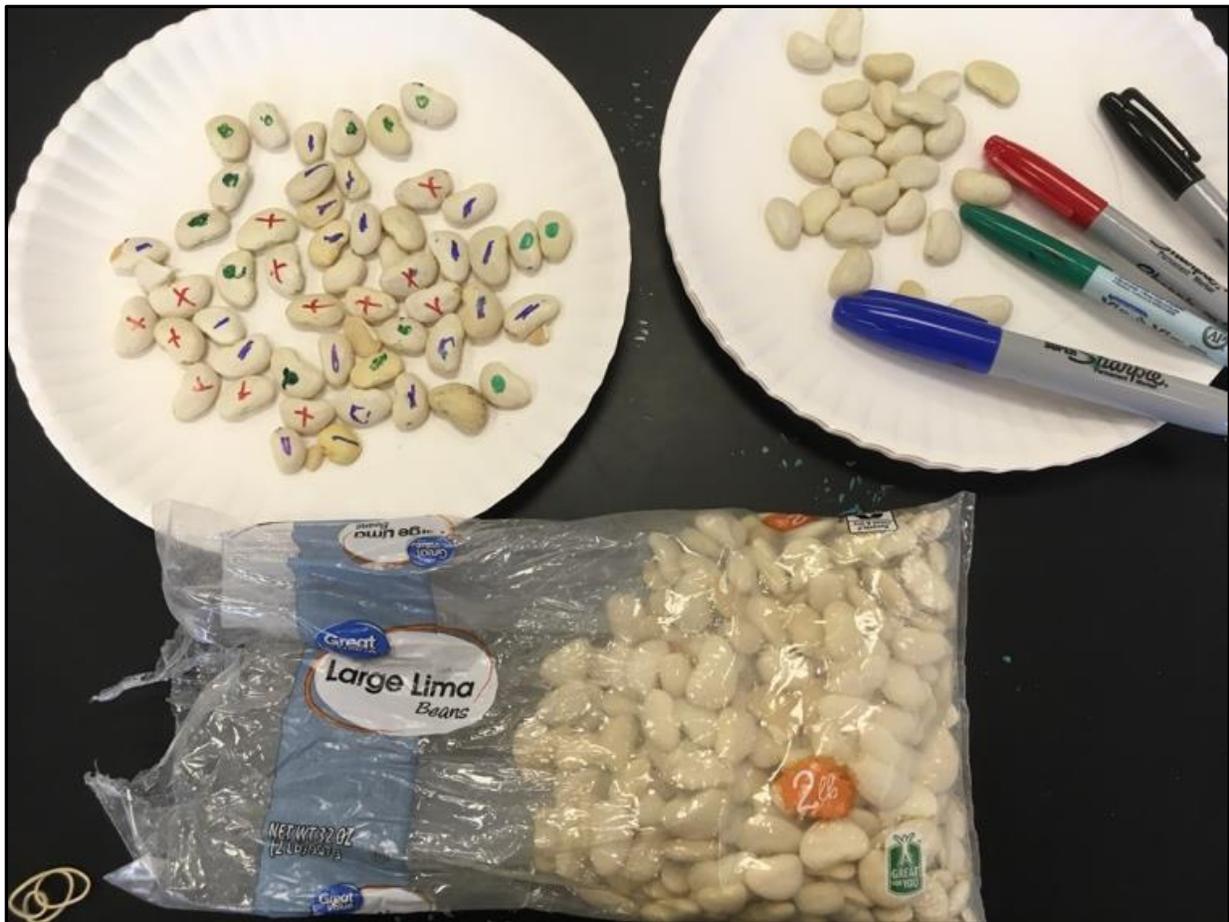


The MathMate



*The Official Journal of the
South Carolina Council of Teachers of Mathematics*

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Mission Statement: The mission of The MathMate is to feature articles about innovative mathematical classroom practices, important and timely educational issues, pedagogical methods, theoretical findings, significant mathematical ideas, and hands-on classroom activities and disseminate this information to students, educators and administrators.

The MathMate, the official journal of the South Carolina Council of Teachers of Mathematics, is published online two times each year – May and January.

Submission Requirements: Submissions for The MathMate should be no more than 15 pages in length not counting cover page, abstract, references, tables, and figures. Submissions of more than 15 pages will be reviewed at the discretion of the editorial board. Submissions should conform to the style specified in the *Publications Manual of the American Psychological Association* (6th ed.). All submissions are to be emailed to scmathmate@gmail.com as attachments with a completed Submission Coversheet as page 1 and the article starting on page 2. The coversheet can be found at <http://scctm.org/The-MathMate>.

Submitted files must be saved as MSWord, RTF, or PDF files. Pictures and diagrams must be saved as separate files and appropriately labeled according to APA style. Copyright information will be sent once an article is reviewed but authors should not submit the same article to another publication while it is in review for The MathMate.

Submission Deadlines: Submissions received by November 1 will be considered for the January issue and March 1 for the May issue.

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About the Cover: Dried Beans being used in a Capture / Recapture lab from Lisa Pike's article starting on page 7

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Message from the SCCTM President

Dear SCCTM Members,

On behalf of the SCCTM Board, I would like to express appreciation to all the authors for sharing their knowledge and expertise by writing for The MathMate. I would also like to recognize and thank Chris Duncan for his leadership as The MathMate Editor and the reviewers for their careful reviews and consideration of the authors' work. We hope you will continue to share with our membership by writing about your successful lessons, memorable and engaging activities, and most effective classroom-based strategies.

The MathMate serves as our vehicle to connect us and help us learn from one another as we collectively strive to ensure all students have access to high quality mathematics education. Without your submissions, we lose this wonderful opportunity to share and learn from one another.

Here's to making a difference in the teaching and learning of mathematics.

Sincerely,
Marc

Announcements

Award Nomination Deadlines:

Outstanding Contributions to Mathematics Education Award

Nomination deadline: July 15
scctm.org/Awards

Richard W. Riley Award

Nomination deadline: July 15
scctm.org/Awards

Scholarship Deadlines:

Preservice Scholarship

Applications deadline: September 15
scctm.org/scholarships

Educator's Scholarship

Application deadline: September 15
scctm.org/scholarships

Membership News:

[Renew your NCTM membership online](#) and designate *South Carolina Council of Teachers of Mathematics* for the affiliate rebate.

If you would like your announcement to appear in the next issue of The MathMate, please email all information to SCMathMate@gmail.com. Announcements will be published at the discretion of The MathMate Editorial Board.

Estimating Population Size: Connecting Math with Other Disciplines

Lisa Pike
Francis Marion University

Abstract

Giving students the opportunity to use math in real world settings promotes student engagement and understanding. Not only is it important to put math into real-world contexts, it also answers the age-old question of “what good will this do me in ‘real’ life”? Here is an example of mathematics used in life science, where students estimate the population size of live mealworms. Using live animals in the classroom isn’t just for science class!

Introduction:

The recent (May 2018) issue of *The MathMate* featured an article (Duncan, 2018) describing the benefits of hands-on modeling exercises and specific mathematical applications that connect math with other STEM fields. Giving students the opportunity to use math in real world settings, Duncan argues, promotes student engagement and understanding. Not only is it important to put math into real-world contexts, doing math in science (or other disciplines) also answers the age-old questions of “Why do I need to learn this? What good will this do me in ‘real’ life”? Here is an example of mathematics being used in life/environmental science, social science, and business (actuarial science). Students will learn an equation used by biologists to estimate population size then use living organisms in the classroom, a surefire way to pique student interest as they try the formula out. Population size estimates are important not only to ecologists, but also in the field of sociology (human demography) and actuarial science, a field that spans mathematics, statistics, finance, economics, and life science. Students who want to know “How will this help me in real life?” will find some very real, and relevant, answers. Teachers who like to connect content with real life will find an exercise that can readily be incorporated into a unit on populations in social studies, or life science, or math class.

First, let us start off by scrapping the premise that living organisms are just for life science classes. We know it is important to bring math into science classes – but sometimes it is just as important in reverse, bringing science into math. Want to get students excited and ready to dive in to math? Give them some creepy crawly insects and ask them to use a formula to estimate population size. This teaches data collection, data analysis, and the assumptions behind a formula: what things must be true for your formula to give an accurate answer? Then, discuss why it is important to be able to estimate population sizes, for example, how could the data be use to enact protections for an endangered species, or to set a hunting quota. For this exercise, students need to know how to add, subtract, multiply, and divide; they also need to understand absolute value.

Population Size Estimates using the Lincoln – Peterson Mark Recapture Formula:

Population ecologists look at many types of descriptive data, including population size and density, age structure, sex ratio, and survivorship. When the population being studied is human, we call this demography, and the population estimate is a census. With wild populations however, it isn’t as easy as knocking on a door and asking questions like “how many white-tailed deer live here?”. There are many other ways to collect this data, but, remembering that wild animals tend to run from humans, it is often hard to get a good population size estimate. Plants are a little easier in that respect, but if you have a large area to cover it can be daunting to think you have to count every single member of a species of, say,

ragweed in a 10-acre park. The Lincoln-Peterson method (also called 'mark-recapture') is a statistical measure used to estimate an animal's population size (Molles, 2010; Southwood and Henderson, 2000). Basically, if some animals in a given area are caught and marked, then released, and later a second round of captures is done: the number of marked animals found in the second round can be used to generate an estimate of the total population.

There are some important assumptions, though, for this estimate to be accurate.

1. All individuals in the population have an equal and independent chance of being captured.
2. No change in the ratio of marked to unmarked animals (i.e. no significant additions or deletions from the population between capturing events - either by births, deaths, immigration, or emigration).
3. The marking technique must not increase the chance of either death, survival or recapture.
4. Marked individuals distribute themselves randomly with the unmarked individuals (so there is the same opportunity for recapture).

Think about it: would your Mexican Brown-Nosed Bat population estimate be accurate if, in between the first and second captures, the females gave birth? Or, what if the mark you put on the fiddler crab population made it easier for predators to see them? Or if that fiddler crab molts, the mark is lost with the shed exoskeleton? No technique for population size estimation is foolproof and many either underestimate or overestimate population sizes. To reduce bias, the assumptions (above) must be as true as possible. Also, the larger the sampling effort (or sample size), the more accurate the population estimate.

Ask your students how you would capture, and then mark, white-tailed deer? What about butterflies? Fish? Scientists often use mist nets to capture birds and bats, dip nets for fish, and either butterfly nets or blacklights for insects. Bears and deer are caught with tranquilizer darts then marked with ear or gum tattoos. Fish are often marked with a thin plastic tag through their dorsal fin. Frogs are sometimes marked by clipping a toe. Sometimes snakes have pit tags surgically inserted into their body cavities (which can be detected via radio-telemetry), and sometimes birds are banded with a metal bracelet around their legs. Now, introduce them to the Lincoln-Peterson formula ($N_E = M_t / R$), and define your variables. Next, put it into practice, using either live mealworms and paint pens or dried white navy beans and permanent markers (Figures 1, 2 and 3).

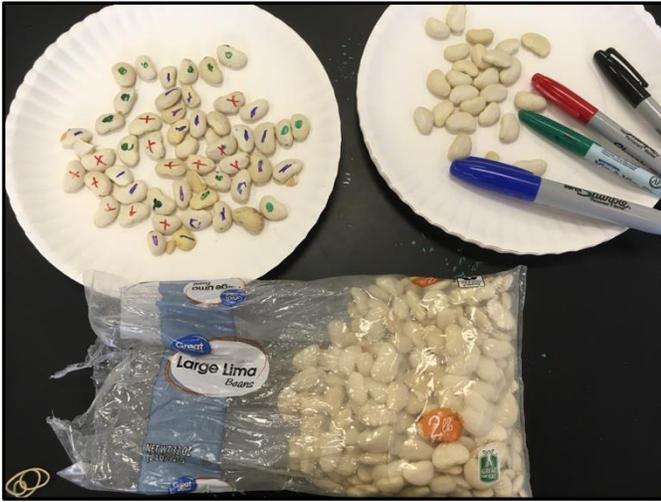


Figure 1: Using beans for the mark-recapture lab

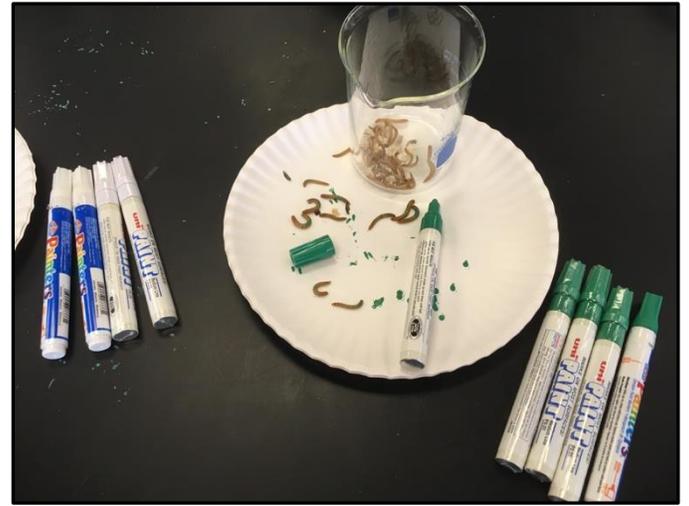


Figure 2: Using mealworms for the mark-recapture lab



Figure 3: A close-up of the painted mealworms. Mealworms are approximately 1 inch long. You need just enough paint (from a paint marker) to discern the green color versus other colors on other mealworms. Painting on old newspaper or paper plates is helpful.

If going the live mealworm route, get about 400 live mealworms (from a pet store, or biological supply company – you want the larval stage of the Darkling Beetle (genus *Tenebrio*) which look like little caterpillars). They don't bite, but will crawl around trying to find something to hide under. We use plastic cups, and have several for students to use, to put ones in that have been counted, to put the painted mealworms in, etc. This, plus newspapers and paper plates, help keep not-quite-dry paint from getting on desks. Mealworms are in the phylum Arthropoda, Subphylum Hexapoda, Class Insecta. The larvae mealworm (about an inch long) will undergo repeated molting between bouts of eating various vegetation or dead insects. This takes place 9-20 times (instars) during 12-54 days, as it gets too big for its current exoskeleton. During its last molt, it discards its exoskeleton (like a locust does) before curling into its pupal form. The pupa, about 3/4 inch long, starts off a creamy white color, and changes slowly to brown during its pupation. The adult is a beetle about 1/2 inch long, and eats decaying leaves, sticks, grasses and

occasionally new plant growth. As general **detritivores**, they also eat dead insects, feces and stored grains. Many predators eat mealworms/beetles including rodents, lizards, predatory beetles, spiders, and birds.

Procedure for Mark Recapture Example (Pike, et al., 2017): This exercise takes about an hour to complete (less if you use navy beans). In class, **first** divide up all of the mealworms into cups with each lab group receiving one cup of mealworms, with approximately the same amount of mealworms (you can estimate this by eye, or weigh them). Note: you can do this with 400 or so white navy beans as well, following the same procedure, dividing the beans up among the groups and having students in each group mark their beans with their color with a permanent marker.

Each group will count all of their mealworms, and then mark them with a paint marker (each group gets a different color – if you have 5 groups, you will want 5 colors). Record the data in the data table (Table 1).

Group	M	t	R	N _E	%E
Blue	109	71	14	552.7	34.1
Red	36	51	4	459	11.4
Green	90	72	20	324	21.4
Purple	89	99	21	419.6	1.8
Black	51	64	8	408	0.97
White	37	51	10	185	54.2
N _A = Total (actual size of population)	412				

Table 1. Data table with sample data for the Lincoln-Peterson Mark-Recapture estimator. You want a separate (different) color for each group, with as many colors as you have groups. Groups of 4 work well.

Now collect the mealworms back and place all marked mealworms - from all groups - into a large bin (plastic shoebox) and mix them up.

Next, “recapture” some mealworms – again divide the mealworms among the groups. Each group counts their mealworms again, to get a total number of mealworm “recaptures” per group and then they count how many of the total have their mark (your color of paint).

Then have the groups calculate a population size estimate using the **Lincoln - Peterson estimator**:

$$N_E = Mt / R,$$

where N_E = population size **estimate**, M = # marked when first caught, t = total number caught in second sampling, R = number of recaptures in the second sample (those bearing your color mark).

The **Percent Error** is: $\% E = \left| \frac{(N_E - N_A)}{N_A} \right| * 100$, where N_E = population estimate (from the Lincoln-Peterson estimator) and N_A = the actual (known) population count.

After completing the exercise set aside some time for class discussion: first, how did we know the actual population size – and will this be possible to know with wild populations? We know the actual population because we had every single member of the population of mealworms (or navy beans) divided up among the groups, meaning we could just add each group's totals to get the actual population size. In nature this is impossible – you won't be capturing every member of the population, just a sub-sample. You won't be able to know if your estimate is an over estimate, or an underestimate, or what the percent error is. Ask students how this can affect decisions made by wildlife biologists, when setting protections, or bag limits.

With the ratio of first captures, marked, and recaptures you can make a population size estimate. Did any group have an estimate that was spot-on, the same as the true population size? Did any group have an extremely large percent error? If so, why? Did they do anything wrong? Not usually – it was mostly luck of the draw, and due to a small sample size. What would be the problems of underestimating a population of white-tailed deer (an animal that most states allow hunting for, and issue permits for how many can be taken per hunter per season)? What would be the problems of overestimating a population of an endangered species, such as the blue whale (also a commercial, hunted, species)? How can this mathematical formula aid in making scientific, resource, decisions?

In the end, here is a real application of math in life science classrooms – the answer to the question of “Why do I need to know this?” The exercise engages and excites, especially if you use the chance to bring live insects into the math classroom, and take the opportunity to interact with your life science and social studies teachers for an interdisciplinary or combined lesson. Assessment opportunities are varied, and include word problems, oral reports, and research on the census or on population size and growth rates of different countries.

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NGSS Standards	
<p>MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.</p> <p>MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth’s systems.</p>	
Common Core Standards	
<p>6.NS-2&3 Fluently divide multi-digit numbers using the standard algorithm. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.</p> <p>6.NS-7C Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.</p> <p>7.EE Solve real-life and mathematical problems using numerical and algebraic expressions and equations.</p>	
South Carolina College-and-Career-Ready Standards for Mathematics	
<p>6.NS.7 Understand and apply the concepts of comparing, ordering, and finding absolute value to rational numbers.</p> <p>6.NS.3 Fluently add, subtract, multiply and divide multi-digit decimal numbers using a standard algorithmic approach.</p> <p>6.NS.1 Compute and represent quotients of positive fractions using a variety of procedures (e.g., visual models, equations, and real-world situations).</p> <p>6.NS.2 Fluently divide multi-digit whole numbers using a standard algorithmic approach.</p> <p>7.NS.3 Apply the concepts of all four operations with rational numbers to solve real-world and mathematical problems.</p>	
Science and Engineering Practice	Classroom Connection
<p>Planning and Carrying Out Investigations</p> <p>Analyzing and Interpreting Data</p> <p>Using Mathematics and Computational Thinking</p> <p>Constructing Explanations and Designing Solutions</p>	<ul style="list-style-type: none"> • Collect, transform, and analyze data. • Use a mathematical formula to estimate population size. • Using data collected in the classroom, argue that the population size estimate can be biased, and can be an over – estimate, or an under – estimate.

Using Cemetery Data to Calculate Survivorship: The Interdisciplinary Nature of Mathematics

Lisa Pike

Abstract

Giving students the opportunity to use math in real world settings promotes student engagement and understanding, as well as helping students realize that math is actually used in “real life” in a variety of fields not generally seen as “mathematical”. Here is an example of mathematics as used in environmental science, human geography, and the social and actuarial sciences: students calculate and graph human survivorship curves from obituary data.

Introduction

As a science teacher I often struggle when I give students problems that require math – though the math isn’t difficult it seems that they hit the “off” switch once they step outside the math classroom, and they don’t seem to realize that calculating their grade, a weighted average, is the same as calculating a weighted average when in math class, or that taking the percentage of a cells on a slide that are undergoing metaphase of mitosis and then translating that percentage into minutes just takes a simple formula. The conclusions they can then make from doing simple math in science are stronger when backed up by math, and math can clarify these conclusions as raw data gets transformed and presented graphically. Duncan (2018) argued that giving students the opportunity to use math in real world settings, promoted student understanding, and I find this to be true. Not only is it important to put math into real-world contexts, doing math in science (and other disciplines) also answers the age-old questions of “Why do I need to learn this?” Here is an example of mathematics being used in environmental science, social science, and business (actuarial science), where students use data from local cemeteries or obituaries to create survivorship curves. Survivorship / mortality data is important not only to ecologists and demographers, but also in the field of sociology, and in actuarial science, a field that spans mathematics, statistics, finance, economics, and life science. Students who want to know “How will this help me in real life?” will find some very real, and relevant, answers. Teachers who like to connect content with real life will find an exercise that can readily be incorporated into a unit on populations in social studies, or life science, or math class.

Ecologists and Social Scientists use math to calculate population sizes and also life expectancy, survivorship and mortality rates, and population growth rates. While this data is incredibly useful to population ecologists and sociologists, it is also very useful in the business field of actuarial science.

This exercise has students calculate average life expectancies and survivorship using data from obituaries. Ecologists use survivorship and mortality curves to predict population growth (or decline) of a variety of plant and animal species. Census takers do the same, as do insurance agents, and you can discuss actuarial science, and its use in the banking and insurance industries. Actuaries are the people that focus on the analysis of mortality and survivorship, doing so by creating life history tables. Life insurance and pension plans are the two main applications of actuarial science. Why is it so hard (or expensive) to get life insurance when you are over 65 years of age? Actuaries can determine how likely you are to die from a heart attack depending on your age, sex, history of smoking, etc. Knowing your probability of death at a given age is how an insurer makes these decisions. Insurance companies won’t insure you if the risk of their having to pay out is too high (or, the cost of insurance will be too high to afford!).

This is also a great opportunity to connect with your social studies teacher and do a comparison on life span and life expectancy, in different regions of the world, or among different ethnic groups or socio-cultural-economic groups right here in the United States (it is pretty eye-opening!). You can extend this to a lesson on population growth rates which ties in well with the environmental science theme of overpopulation and carrying capacity, or the monitoring of an endangered species.

Creating Survivorship Curves from Mortality Data

The classic example of the use of mortality data to create survivorship curves in ecology is one that focuses on Dall mountain sheep (Molles, 2010; Deavy, 1947). From 608 skulls, ecologists estimated age at death (as indicated by the size of the horns) to create a life history table and thus calculate mortality rates and survivorship rates. The life history table can be converted into a graph, or survivorship curve. Different species may have different shaped survivorship curves, but in general there are three patterns of survivorship (Figure 1, (Molles, 2010; Southwood and Henderson, 2000). Humans have a type 1 curve (Figure 2), with low infant mortality and most members of the population surviving until old age at which point the probability of death increases. Type 1 animals generally are larger, have a longer lifespan, have fewer offspring and perform some parental care. A type three curve, typical of marine invertebrates and fish, is the opposite, with high infant mortality – however, if you can make it past your infancy you have a low probability of dying until you get old. These animals are short-lived, small, and have a large number of offspring that they do little to care for. Type two curves have an equal probability of dying at any age (for example, song birds).

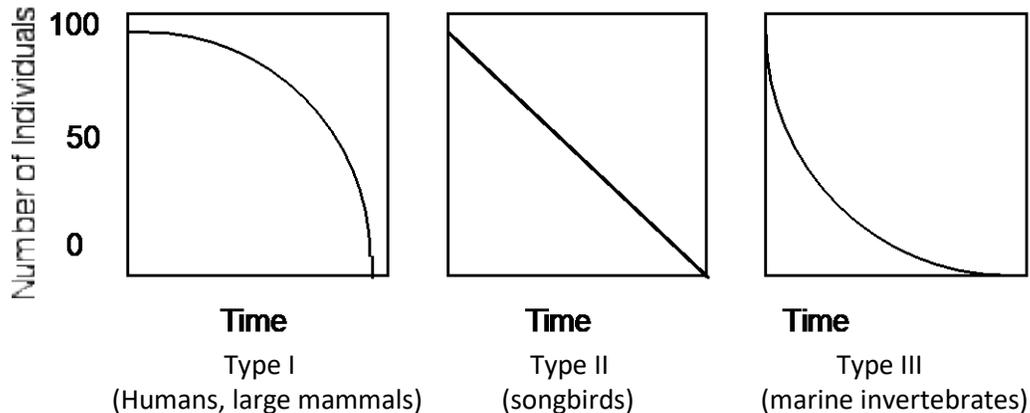


Figure 1: Three types of survivorship curves.

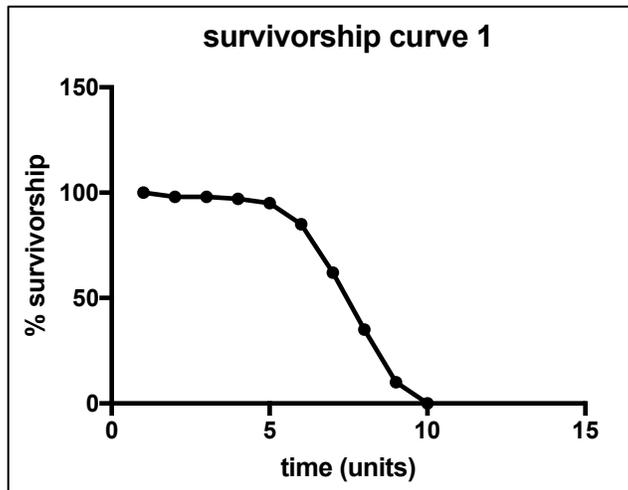


Figure 2: A survivorship curve indicative of humans, and other large mammals, where infant mortality is low and survivorship is high until near the end of the expected lifespan.

In this exercise, students will create a life history table for humans, and graph a survivorship curve. We can use obituary data to answer a variety of questions, for example: Do people living in modern times have a longer life expectancy versus people living in the past? In a certain time period, who had a longer life expectancy, men or women? Here, in this example, we will look at humans who were born and lived in the 1800s (died before 1900), and humans who were born and lived in the 1900's (died after 2000). You will need obituaries from a recent newspaper as well as some from the mid-late 1800s (either on-line at www.findmypast.com, where you can search in your local area or compare two areas, states, or countries, or using old newspapers often available on microfiche at your library, though you will need to browse the microfiche to find death data (there are a lot of interesting notices and ads in an 1800s newspaper). Alternatively, I photocopied and enlarged several late 1800 death notices and attached them as a .pdf in the SCMathMate resources section).

Procedure for Survivorship Curve example (Pike, et al., 2017; Pike and Fox, 2002):

Choose 100 people (50 males and 50 females) that died before 1900 (so, they lived in the 1800's) and record their ages at death and the sex of the individual.

Next, choose 100 people (50 males and 50 females) who died after 2000 (living the bulk of their life in the 1900's) and record their ages at death and the sex of the individual.

Then, construct a life table from these data using the attached data sheet (see additional resources). Determine values for the number of individuals who would have been alive at age 0-9 years (interval 1), 10 - 19 years (interval 2), 20 - 29 years and so on. Also, determine the number of individuals who died during each interval (the opposite of a survivorship curve is a mortality curve). A survivorship curve is normally prepared by plotting the logarithm of the number of survivors against age; you can use the \log_{10} function if you have advanced students but this data displays well when you simply graph percent survivorship versus age interval.

Finally, plot the % survivorship versus age interval for the different populations.

The class discussion for this one is interesting. First, it is pretty neat to look at obituaries from the 1800's – the newspapers were not set up in the same way, and there are a lot of ads, and fun articles. Second, students will remark on the large number of infant deaths in the 1800's. Look for patterns. A large number of twenty-thirty something males in 1863? Ask your social studies teacher what major events were occurring at that time (the Civil War!). Why did the 1918 flu epidemic kill so many? Again, your social studies teacher has insights on how things like refrigeration, sanitation, vaccinations (the first flu vaccination wasn't until 1938), antibiotics (penicillin was discovered in 1928), and just simple practices like washing your hands in medical wards (which was not really done prior to 1840) changed human survivorship and mortality. You can even use this website (<http://www.lifespancalc.com>.) to enter data to estimate your personal life expectancy. Then discuss male versus female patterns, and ask students what kinds of jobs, or medical care, or maternity care, did people living in the 1800s have? How could this have influenced ages at death? Here, we can really delve into explanations of the data the students find which is a skill needed in all STEM fields. In fact, assigning student groups to do a 10 minute oral presentation on the groups they compared and why, the assumptions involved, and their conclusions, is a good way to end the activity.

Extensions on this activity can include estimating population growth rates using this formula: $\text{population growth rate} = (\text{crude birth rate} - \text{crude death rate}) \times 100$, or you could estimate the number of years it will take to double your population size (this is the "rule of 70", where $\text{population doubling time} = 70 / \% \text{ growth rate}$).

In the end, this is a real application of math in life science, business, and even social science – the answer to the question of "Why do I need to know this?" The exercises engage and excite, especially if you take the opportunity to interact with your life science and social studies teachers for an interdisciplinary or combined lesson. Assessment opportunities are varied, and include data sets that the students can graph and interpret in order to draw conclusions (additional resources), on-line data sets to interpret, including a great comparison of 1900 versus 2010 with interactive graphics in the New England Journal of Medicine (Jones, et al., 2012), and oral reports (individual or group) on different species and their survivorship - students can read the scientific article 'Diversity of ageing across the tree of life' (Jones, et al., 2014) which has survivorship curves for a variety of species, then select a species and report out. It is a neat article, and shows survivorship curves of many animals; you may be surprised to find that a lot of plants show a type 2 curve and that the survivorship curves of lions, killer whales, and *Daphnia* (the water flea) are very similar to that of humans.

Resources

www.findmypast.com

<http://www.lifespancalc.com>

Additional Resources

Student handouts follow the references. Obituary scans are at the end of the issue.

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NGSS Standards

MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Common Core Standards

6.NS-2&3 Fluently divide multi-digit numbers using the standard algorithm. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

6.SP-4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

7.EE Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

7.SP-4 Draw informal comparative inferences about two populations.

South Carolina College-and-Career-Ready Standards for Mathematics

6.NS.7 Understand and apply the concepts of comparing, ordering, and finding absolute value to rational numbers.

6.NS.3 Fluently add, subtract, multiply and divide multi-digit decimal numbers using a standard algorithmic approach.

6.NS.1 Compute and represent quotients of positive fractions using a variety of procedures (e.g., visual models, equations, and real-world situations).

6.NS.2 Fluently divide multi-digit whole numbers using a standard algorithmic approach.

6.DS.4 Select and create an appropriate display for numerical data, including dot plots, histograms, and box plots.

6.DS.5 Describe numerical data sets in relation to their real-world context.

7.NS.3 Apply the concepts of all four operations with rational numbers to solve real-world and mathematical problems.

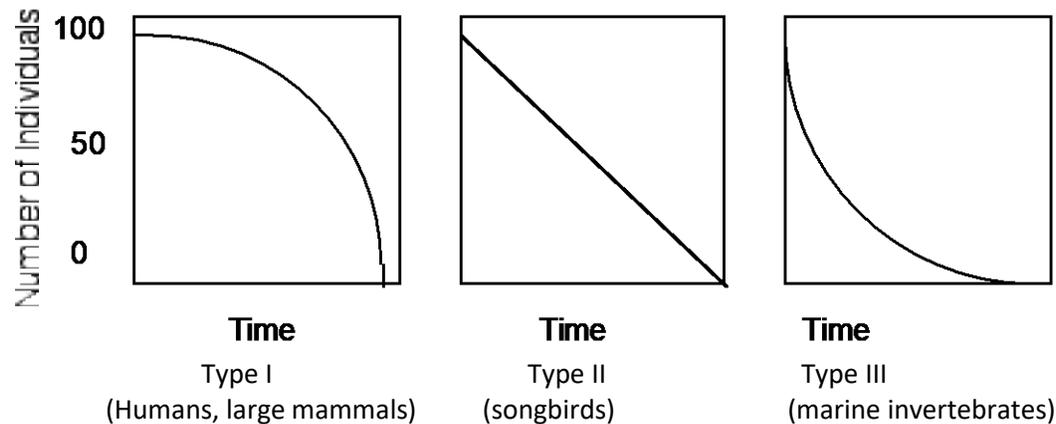
7.RP.3 Solve real-world and mathematical problems involving ratios and percentages using proportional reasoning (e.g., multi-step dimensional analysis, percent increase/decrease, tax).

Science and Engineering Practice	Classroom Connection
<p>Planning and Carrying Out Investigations</p> <p>Analyzing and Interpreting Data</p> <p>Using Mathematics and Computational Thinking</p> <p>Constructing Explanations and Designing Solutions</p>	<ul style="list-style-type: none"> • Identify independent, dependent, and controlled variables for the survivorship exercise. • Collect, transform, and analyze data. • Calculate mean and range of the survivorship data sets. • Graph % survivorship versus age interval. • Using data collected in the classroom argue that human inventions such as vaccines, antibiotics, hospital care equipment, and sanitary equipment have lengthened average human lifespans.

Today we will look at survivorship / mortality curves. This implies that you have a database including ages of death of a cohort of individuals. A **survivorship curve** traces the decline in number, over time, of a group of individuals born at the same time (a **cohort**). It can be thought of as the probability of an individual surviving to various ages, or the average **Life Expectancy**. **Life expectancy** is different from the **Maximum Life Span** (i.e. the American robin, *Turdus migratorius*, can live to be 7 years old but the probability of a newly hatched robin doing so is less than 1 %. Many live only a year or two. Life **expectancy** is 1-2 years, but the **maximum** life span is 7 years).

The **life expectancy** of human populations has increased significantly in the past 100 - 300 years due to improved nutrition, preventative medicine, life-style changes, improved sewage control and hygiene and new technologies such as refrigeration and pasteurization. In the early days of Rome, life expectancy was only 22 years! In America in 1900, the life expectancy was about 48 years; in 2002 it was 77.4 years. A Dominican woman lived to a ripe old age of 127 (the maximum human life span). In brief, survival rates are up and mortality rates, especially infant mortality rates, are down: this leads to population growth.

There are **three typical population survivorship curves**: Type I, Type II and Type III. Humans have a Type I growth rate, with low infant mortality and a high probability of living until you are old (at which time the probability of death increases).



To determine age specific mortality and survivorship curves for a population, ecologists will follow a **cohort** - a group of individuals born within the same time interval (for example, a year, 5 years, or a month, depending on the species we are looking at). The cohort is followed until all members of the cohort are dead; gender and age at death is recorded for each individual. We find that each species has a characteristic life span, although few may reach the maximum age.

Purpose: In this exercise we will construct survivorship curves for humans who were born and lived in the 1800s, and humans who were born and lived in the 1900's (died after 1980). Our primary purpose is to compare the survivorship and life expectancies of humans living in the 1800's and humans living in the 1900's. Our secondary purpose is to look at differences between male and female survivorship in each time period.

Question 1: Do people living in modern times (1900's) have a longer life expectancy versus people living in the 1800's?

Hypothesis: _____

Question 2: In the 1800's, who had a longer life expectancy, men or women?

Hypothesis: _____

Now let's see if we can get some data / evidence to support our hypothesis.

Procedure: Choose 100 people (50 males and 50 females) that died before 1900 (so, they lived in the 1800's) and record their ages at death and the sex of the individual.

Next, choose 100 people (50 males and 50 females) who died after 2000 (living the bulk of their life in the 1900's) and record their ages at death and the sex of the individual.

Then, construct a life table from these data using the attached data sheet. Determine values for the number of individuals who would have been alive at age 0-9 years (interval 1), 10 - 19 years, 20 - 29 years and so on. Also, determine the number of individuals who died during each interval (the opposite of a survivorship curve is a mortality curve). A survivorship curve is prepared by plotting the logarithm of the number of survivors against age.

Finally, Plot the % survivorship (%S) versus age intervals for the different populations. You may also choose to plot $\log_{10}(\%S)$. A logarithmic scale (using semi-log paper) allows you to visualize exponential data as a linear relationship - it takes the exponential curve and straightens / smooths it out.

EXAMPLE DATA SHEET & CALCULATIONS

Data Table - MALES who died before 1900:

Age Interval (years)	Age at Death (years) (List the separate ages of death for each individual who died in this age interval)	# who died during interval	Survivorship (total # still alive) 50 total:	% Survivorship ((# still alive / total number of people in cohort) x100)	Log ₁₀ (%S)
0-1	2 months	1	49	98%	1.99
2-9	3, 5	2	47	94	1.97
10-19	11	1	46	92	1.96
20-29	20	1	45	90	1.95
30-39	31, 32, 38	3	42	84	1.92
40-49	48, 48	2	40	80	1.90
50-59	50, 57	2	38	76	1.88

And so on till you have 50 ages at death

All ages added together =		x	x	x	x
Average life Expectancy = total of all ages / 50 names		x	x	x	x
Total	50 ages	50	0	0	x

You may find it useful to tabulate your data like this:

Men who died after 1900

#	Year of Birth	Year of Death	Age at Death	#	Year of Birth	Year of Death	Age at Death
1				26			
2				27			
3				28			
4				29			
5				30			
6				31			
7				32			
8				33			
9				34			
10				35			
11				36			
12				37			
13				38			
14				39			
15				40			
16				41			
17				42			
18				43			
19				44			
20				45			
21				46			
22				47			
23				48			
24				49			
25				50			

Data Table - MALES who died before 1900 (Lived in 1800s):

Age Interval (years)	Age at Death (years) (List the separate ages of death for each individual who died in this age interval. The total goes in the next column).	# who died during interval	Survivorship (# still alive)	% Survivorship (# still alive / total number of people in cohort) x100	Log ₁₀ (%S)
0-1					
2-9					
10-19					
20-29					
30-39					
40-49					
50-59					
60-69					
70-79					
80-89					
90-99					
100+					
TOTAL	50	50	0	0	

What was the average age of death (average life expectancy)? _____

Maximum life span ? _____

Data Table - FEMALES who died before 1900 (Lived in 1800s):

Age Interval (years)	Age at Death (years) (List the separate ages of death for each individual who died in this age interval. The total goes in the next column).	# who died during interval	Survivorship (# still alive)	% Survivorship (# still alive / total number of people in cohort) x100	Log ₁₀ (%S)
0-1					
2-9					
10-19					
20-29					
30-39					
40-49					
50-59					
60-69					
70-79					
80-89					
90-99					
100+					
TOTAL	50	50	0	0	

What was the average age of death (average life expectancy)? _____

Maximum life span ? _____

Now, **Plot** the survivorship versus age intervals for both males and females who died before 1900 on ONE graph.

Data Table: MALES who died after 2000 (Lived in 1900s):

Age Interval (years)	Age at Death (years) (List the separate ages of death for each individual who died in this age interval. The total goes in the next column)	# who died during interval	Survivorship (# still alive)	% Survivorship (# still alive / total number of people in cohort) x100	Log ₁₀ (%S)
0-1					
2-9					
10-19					
20-29					
30-39					
40-49					
50-59					
60-69					
70-79					
80-89					
90-99					
100+					
TOTAL	50	50	0	0	

What was the average age of death (average life expectancy)? _____

Maximum life span ? _____

Data Table: FEMALES who died after 2000 (Lived in 1900s):

Age Interval (years)	Age at Death (years) (List the separate ages of death for each individual who died in this age interval. The total goes in the next column).	# who died during interval	Survivorship (# still alive)	% Survivorship (# still alive / total number of people in cohort) x100	Log ₁₀ (%S)
0-1					
2-9					
10-19					
20-29					
30-39					
40-49					
50-59					
60-69					
70-79					
80-89					
90-99					
100+					
TOTAL	50	50	0	0	

What was the average age of death (average life expectancy)? _____

Maximum life span ? _____

Now, **Plot** the survivorship versus age intervals for both males and females who died after 2000 on ONE graph.

Review Questions:

1. What type of survivorship curve (I, II, or III) did you find for your data? Was there a different type curve in the 2 data sets (1800 versus 1900s)? Or in men versus women?

What does this reflect?

2. Did your data show a difference in age at death between males and females?

Which sex lived longer in the 1800s? _____

Which sex lived longer in the 1900s? _____

Why do you think this happened?

3. Did your data show a difference in age at death between people (males and females together) living in the 1800s versus people living in the 1900s?

Which group (1800s or 1900s) lived longer? _____

What was the average life expectancy for people living in the 1800's? _____

for people living in the 1900's? _____

Why do you think this happened?

4. Why did American families living in the colonial period want and need to have large families?

5. What are some factors that led to low life expectancies in the American Colonial period?

6. Humans typically have a type 1 survivorship curve. What are the distinguishing characteristics of type 1 organisms?

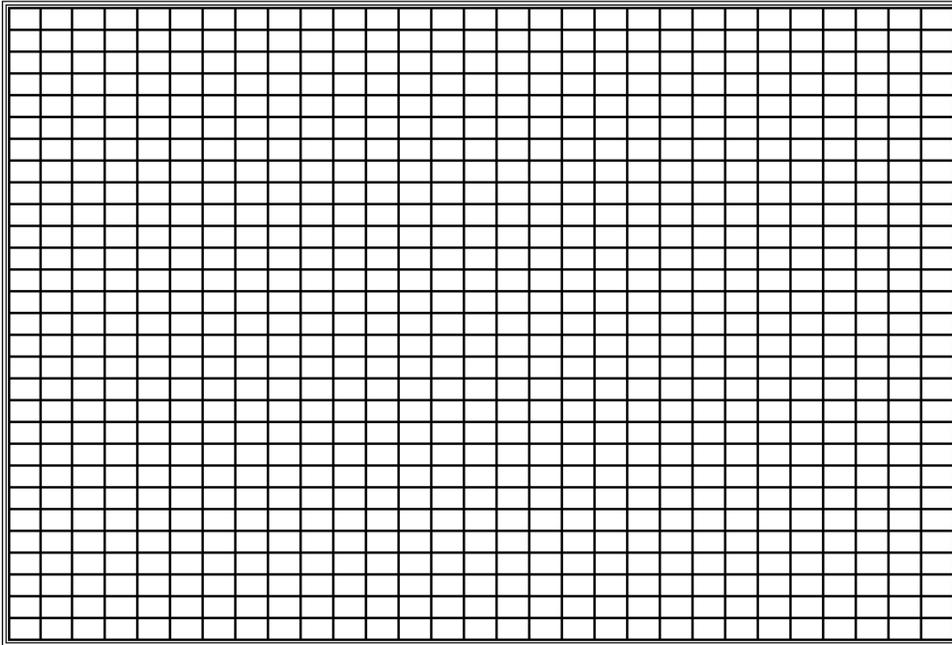
7. What are some other animals that also have a type 1 curve?

8. Oysters, mosquitos, and many marine fish have a type 3 survivorship curve. What are their distinguishing characteristics?

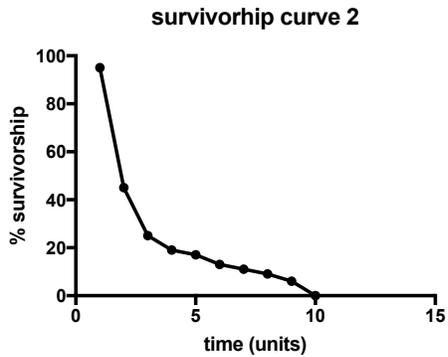
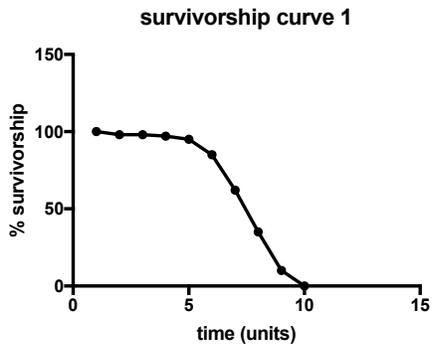
9. If a third of the world population is now below the age 15, what effect will this age distribution have on the growth rate of the human population? What sort of humane recommendations would you make to encourage this age group to limit the number of children they plan to have?

10. Take the Black Bear life table and create a survivorship curve:

Age Interval (years)	# who died during interval	Survivorship (total # still alive) 1000 total	% Survivorship ((# still alive / total number in cohort) x100)	Log ₁₀ (%S)
0 - 1	6			
1.1 - 2	14			
2.1 - 3	4			
3.1 - 4	9			
4.1 - 5	3			
5.1 - 6	7			
6.1 - 7	16			
7.1-8	8			
8.1-9	17			
9.1-10	16			
Total	100			



11. Predict which animal is indicated in the following survivorship curves:



- a. Elephant
- b. Cardinal (songbird)
- c. Squirrel
- d. Blue Crab

Lines and Circles and Points, Oh My!

Gail Kaplan
Towson University

Abstract

This article provides a stimulating, discovery approach that enables students to gain an in depth understanding of the formal mathematical definition of a parabola. Along the way students make and test conjectures about various transformations of the parabola that result by keeping the given fixed point and moving the given line. The journey is challenging, filled with potential frustration and excitement until the “Aha!” moment arrives! Get out the highlighters and have fun doing mathematics

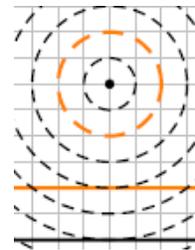
When confronted with precise mathematical definitions of conic sections, many students feel a bit like Dorothy, the Tin Man, and the Scarecrow walking through the scary forest in *The Wizard of Oz* – lost and apprehensive. For example, a parabola is defined as the set of all points that are equidistant from a fixed point and a fixed line, but when given this definition many students will have no clue what the shape looks like. There are many wonderful activities to connect quadratics to real world situations. For instance a quadratic describes the path of the water in a water fountain, or the path of the ball when it is thrown, or a pumpkin shot from a supersized sling shot. In this article we will explore how mathematics students can use their understanding of the distance from any point in the xy plane to a given horizontal line and the definition of a circle as the set of all points a fixed distance from a given point called the center to explore parabolas. The discovery experience enables students to gain an in-depth understanding of the formal mathematical definition.

Working in groups students are encouraged to implement many of the SC Mathematical Process Standards including

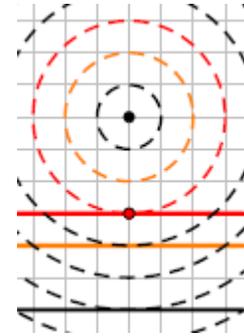
- a. Make sense of problems and persevere in solving them.
- b. Reason both contextually and abstractly.
- c. Use critical thinking skills to justify mathematical reasoning and critique the reasoning of others.
- d. Communicate mathematically and approach mathematical situations with precision.
- e. Identify and utilize structure and patterns.

Throughout the process students gain an understanding of the formal definition of a parabola. This activity directly addresses the content standard GGPE.2 – Use the geometric definition of a parabola to derive its equation given the focus and directrix.

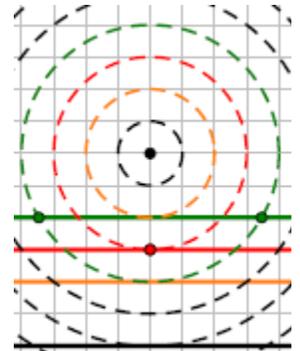
To begin students are given a grid of black concentric circles and a bold black horizontal line. The first task is for students to highlight all points that are exactly 2 units from the center of the circle and all points that are exactly 2 units from the horizontal line. The diagram shows the expected student response. The next prompt is to draw a solid dot for every point that is **both** exactly 2 units from the center point of all the circles **and** exactly 2 units from the bold line. Note that for the given diagram there are no points that satisfy both conditions since the orange circle and the orange line do not intersect.



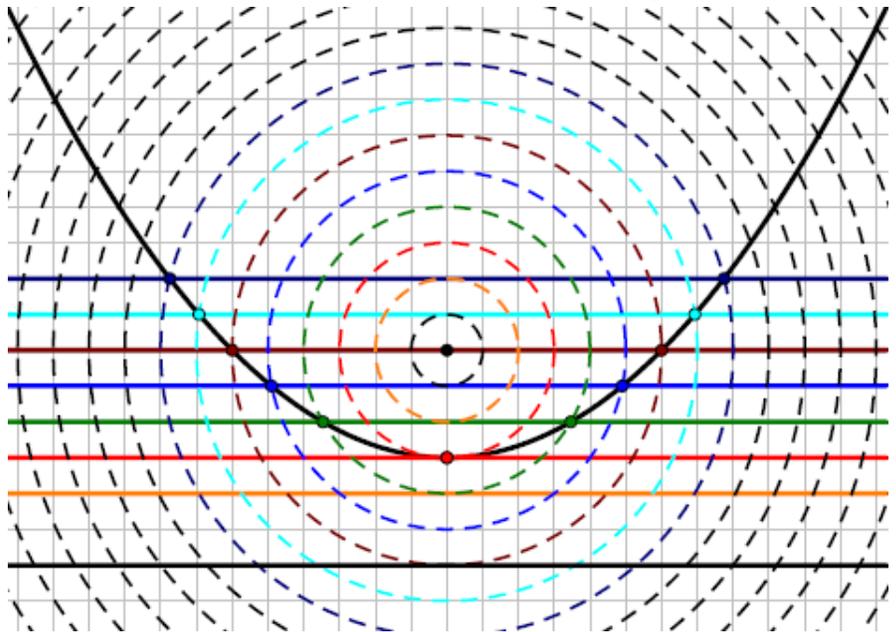
Students are asked to repeat the same process and determine if there are any points that are exactly 3 units from the center point of all the circles **and** 3 units from the bold line. Since the red circle and the red line intersect at one point, there is one point that satisfies this condition



Next, students find 2 points that are exactly 4 units from the center point of all the circles **and** 4 units from the bold line as shown by the intersections of the green circle and line.



Students continue to find points of intersection until there are seven circles and lines highlighted. The next prompt is “Connect the dots with a smooth curve. What do you notice? What do you wonder?” This is an excellent time for a teacher to conduct a class discussion with students about their conclusions, to share what they noticed and what they wondered. Students might reference decreasing and increasing using terms like “going down” and “going back up” They might reference end behavior by mentioning how the two sides “go up and out forever.” At the end of the discussion the teacher can introduce the students to the term “parabola” if students have not heard it before and it does not come up during the discussion.



In the next section students make conjectures about how translations of the bold horizontal line will affect the resulting parabola. For example what happens to the shape if the bold line is above the center of the circle? What happens to the shape when the bold line gets further and further away from the center of the circle? Students then test their conjectures using the graphs provided, and record the actual results in the last column of the chart. This is an ideal time for a teacher to conduct a class discussion where each group shares their conjectures, or, depending on the size of the class, the teacher visits with each group for this conversation.

The final section of the activity connects the geometric relationships to the algebraic representation with the inclusion of the coordinate system. Students label the center of the circles as point $(0, 3)$, the bold line as $y = -3$, and draw the x and y axes in the appropriate locations. Next students write an expression for the distance from a point (x, y) to the center of the circle, and an expression for the distance from the point (x, y) to the bold line. Finally, students assume that (x, y) is any point in the plane satisfying that the distance from (x, y) to the center of the circles $(0, 3)$ is exactly the same as the distance from (x, y) to the bold line, $y = -3$, and express this relationship as an equation to see that a quadratic is formed.

$$\sqrt{x^2 + (y-3)^2} = |y+3|$$
$$\text{so } x^2 + (y-3)^2 = (y+3)^2$$

By expanding and simplifying, the equation of the parabola is $y = \frac{1}{12}x^2$. This is an ideal time for the teacher to lead a class discussion with students on how the geometric relationships relate to the algebraic representation, encouraging students to appreciate how geometry and algebra can be intertwined to enhance understanding of mathematical concepts.

There are many potential extensions. For example, students might consider what happens to the shape of the parabola as the distance from the bold line to the center of the circle gets very small, and conversely, what happens when the bold line moves further and further away from the center of the circle. Exploring these concepts either by hand or with technology can lead to discussions about limits, a topic that students will encounter later in Calculus.

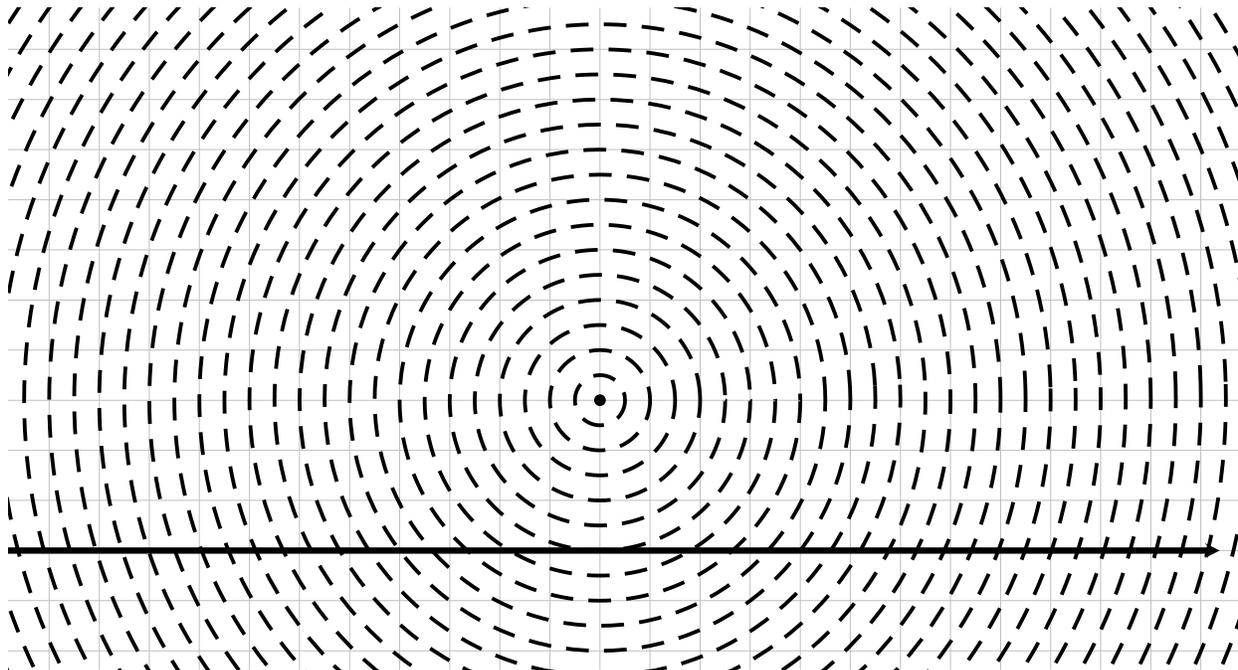
As educators we are well aware that student learning styles differ dramatically. This hands on-approach to explore the formal definition of a conic section, the parabola, provides a stimulating experience to enable students to develop a deeper understanding of this mathematical relationship. Get out the highlighters and have fun while mastering theoretical concepts!

Lines and Circles and Points, Oh My!

I. Plotting and Noticing

Note: On each graph provided the smallest circle has a radius of 1 unit and each circle has a radius that is exactly 1 unit larger than the radius of the circle before it.

Graph 1



- a. Use a highlighter, colored pencil, crayon, or marker.
Highlight all of the points that are 2 units from the center point of all the circles.
Highlight all of the points that are 2 units from the bold line.
If possible, draw a solid dot to indicate every point that is exactly 2 units from the center point of all the circles **and** exactly 2 units from the bold line.
How many solid dots did you draw? _____

- Pick a different color.
Highlight all of the points that are 3 units away from the center point.
Highlight all of the points that are 3 units from the bold line.
Draw a solid dot to indicate every point that is exactly 3 units from the center point **and** exactly 3 units from the bold line.
How many solid dots did you draw? _____

Repeat this process until it is no longer reasonable to draw any more points that are **both** the same number of units away from the center point of all the circles and the bold line.

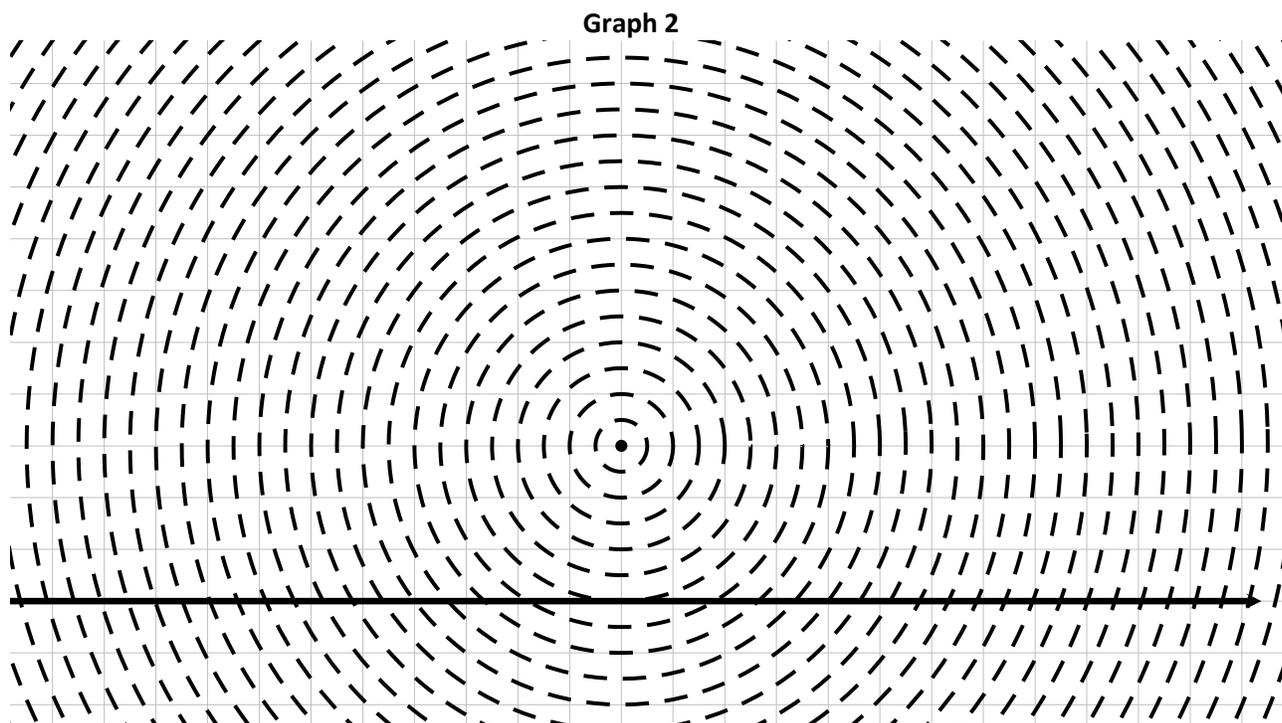
- b. Connect the dots to obtain a smooth curve, C_1 . What do you notice? What do you wonder?

II. Exploring with Different Bold Lines

a. The following table describes how to create new curves by using a new bold line. Make a conjecture (guess) as to what will happen to the resulting smooth curve for each of the following translations of the bold line and complete the middle column of the table below.

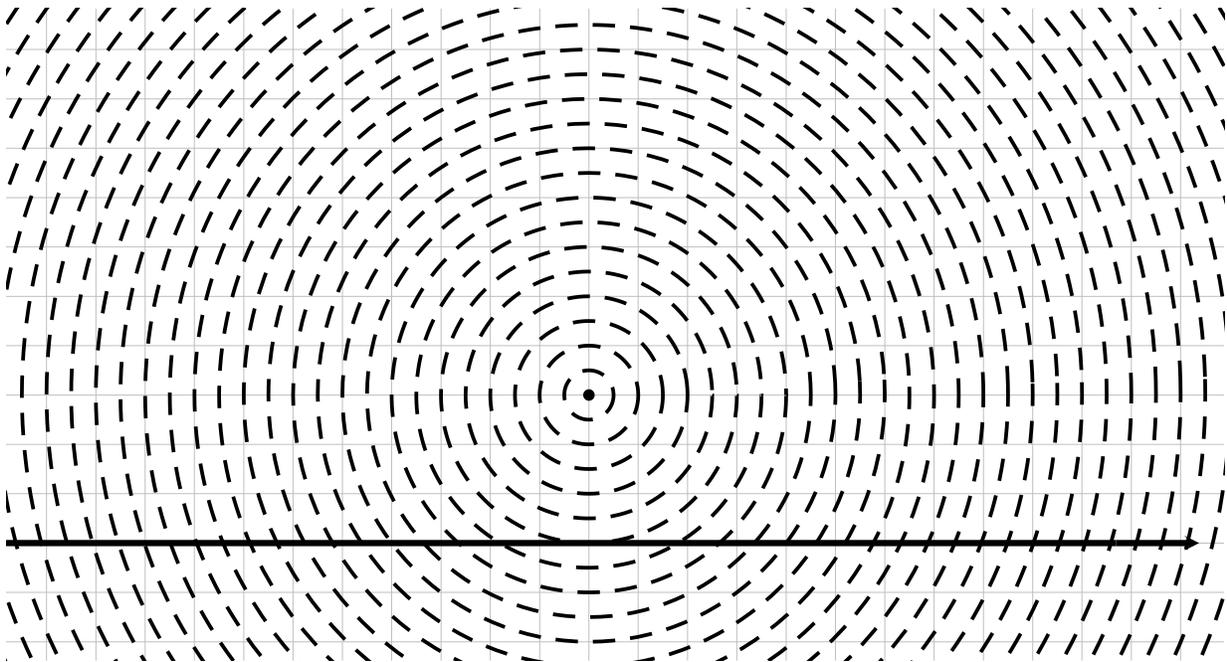
Translation Description	Description of how you think the Translation will change the Shape	Description of how the Translation actually changes the Shape
Curve C_2 Move the original bold line <u>2 units lower.</u>		
Curve C_3 Move the original bold line <u>2 units higher</u>		
Curve C_4 Move the original bold line <u>4 units above the center of the circles.</u>		

b. Create curve C_2 by drawing the horizontal bold line that is 2 units lower than the original bold line, and repeating the same process as in Part I. When the curve is created, complete the first row of the table above.



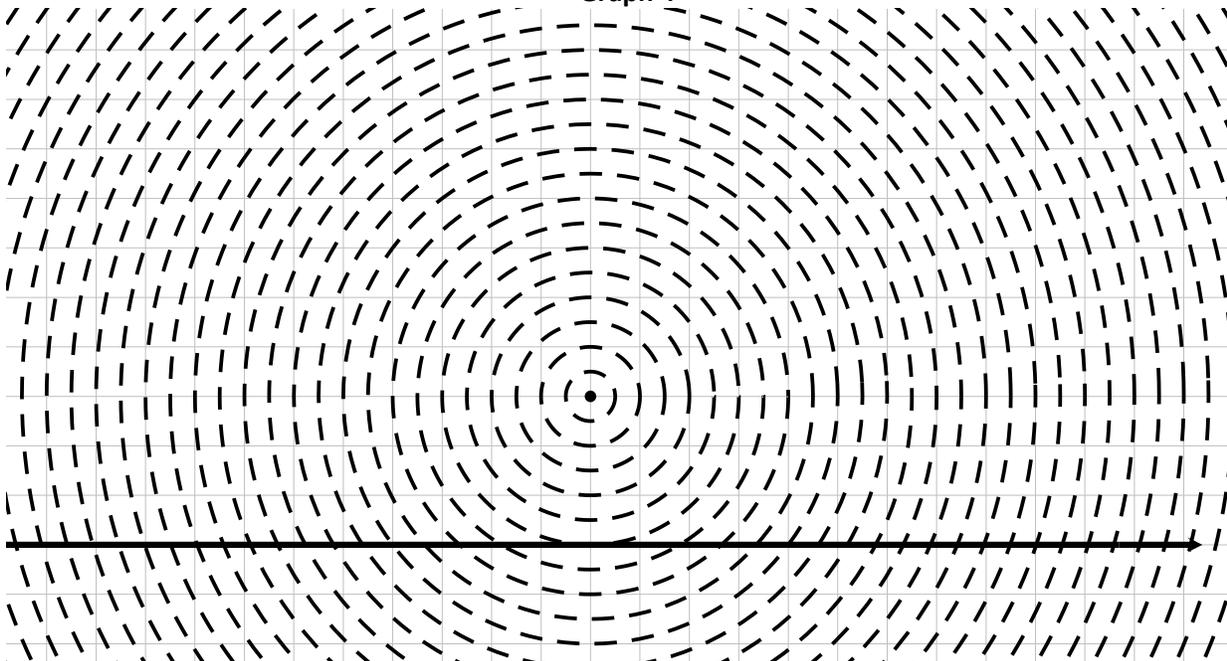
c. Create curve C_3 by drawing the horizontal bold line that is 2 units higher than the original bold line, and repeating the same process as in Part I. When the curve is created, complete the second row of the table in part a.

Graph 3



d. Create curve C_4 by drawing the horizontal bold line that is 4 units above the center of the circles, and repeating the same process as in Part I. When the curve is created, complete the last row of the table in part a.

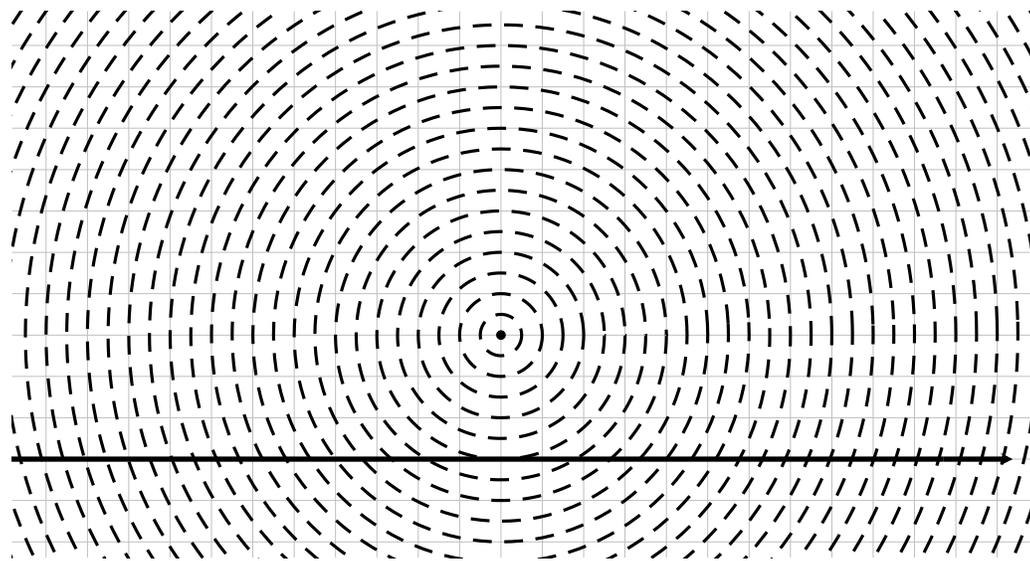
Graph 4



III. In well-written sentences explain how the location of the bold line changes the shape of the parabola.

IV. Finding an Equation

a. Assume the coordinates of the center of all the circles below is $(0, 3)$ and the equation representing the bold line is $y = -3$. Use this information to draw the x and y axis in the appropriate location.



b. Write an expression that represents the distance from (x, y) to the center of the circle.

c. Write an expression that represents the distance from the point (x, y) to the bold line.

d. Assume (x, y) is any point in the plane satisfying that the distance from (x, y) to the center of the circles $(0, 3)$ is exactly the same as the distance from (x, y) to the bold line. Express this relationship as an equation. Simplify your equation. What type of function is this?

The Attitudinal Effect, in Terms of Gender, of Week-Long Graphing Handheld In-Service/Pre-service Training Institutes on Mathematics Teachers

Gail M. Gallitano and JoAnn Kump
West Chester University

Abstract

This study deals with the attitudinal effects, in terms of gender, of graphing calculator summer institutes on teachers of mathematics. All institutes used one or more of the Texas Instruments graphing handhelds/mini-computers along with other technologies, such as the CBR and the CBL2. In a cooperative spirit the teachers learned to effectively incorporate these technologies into their teaching. This study involved a total of 226 teachers and incorporates summers, 2009 to 2012, inclusive. The same attitudinal survey was administered both before the workshop and again at the conclusion of the workshop. The study was conducted at West Chester University of Pennsylvania. The findings showed that male teachers initially held more positive attitudes and confidence in using technology in the mathematics classroom than did female teachers. Post attitudinal results show that female teachers exhibited enhanced positive attitudes toward integrating technology into the classroom after participation in the Professional Development Workshops, while male teachers also showed this but to a somewhat lesser extent. The positive attitudes and confidence in using technology in the mathematics classroom for males were upheld and somewhat enhanced. These results support previous findings (Zhou & Xu, 2007; Yildirim, 2000) that technology experience is gender-based; PD training can remedy gender differences in technology use in the classroom; and differing needs of teachers, by gender, should be considered for future PD programs.

Introduction

The graphing handheld in the mathematics classroom is now a mainstay and is, typically, one of the Texas Instruments (TI) models. The TI 84 Plus series, the TI 89 Titanium Graphing Calculator, and the TI-Nspire series are currently all very popular. The graphing handheld first started being used in the mathematics classroom in the 1970s in a limited fashion and mostly for number crunching. These early handhelds began to change methods of instruction (Clutter, 1999). Then in the 1980s the graphing handhelds became more sophisticated and were programmable and had more functions. Teachers could now use the graphing handheld to show relationships, discover patterns and draw conclusions. Today there are many very sophisticated graphing handhelds. This tool has changed how we teach and assess students in mathematics. The role of the teacher remains crucial to the effective use of educational technologies (Zhao, Hueyshan & Mishra, 2001).

The rapid evolution of new technologies influencing education in the last two decades is changing the ways teachers are teaching and how students are learning. Teachers' perceptions and attitudes towards these new technologies play an important role in the effective use of such technologies within the teaching and learning process (Groff & Mouza, 2008). The teachers' role has changed and is now that of a "facilitator" as opposed to a "master." As facilitators, teachers introduce tasks, answer questions, prompt discussions, and summarize/present outcomes (Yank, 2004). There are important advantages of using technology to teach mathematics. It allows one to use: 1) dynamic video as opposed to static media, 2) new representational infrastructure which, in turn, allows for the reintegration of previously achieved knowledge, and 3) new systems of knowledge by employing infrastructure based on technology (Jaradat & Hoagland, 2009). Teacher attitudes, both males and females, are important and are the driving force in instruction. It's important that mathematics educators, both males and females, educate our students and enable them to have the mathematical power necessary to function in today and tomorrow's society.

Statement of the Problem

Studies show that incorporating technological resources into instruction, such as the graphing handheld, leads to higher levels of student engagement (MacBribe & Luehmann, 2008), student achievement (Engel & Green, 2011), and student performance (Shirley, Irving, Sanalan, Pape, & Owens, 2011). It improves students' math skills, improves math test scores, with or without student calculator use during testing, leads to better student attitudes toward mathematics, and promotes higher student achievement when incorporated into the curriculum (Ruthven, 1990; Smith and Shotsberger, 1997; Tolia, 1993). It is beneficial to students if their teachers are well versed in graphing handheld methodology, have positive attitudes towards their use, and frequently and effectively make use of graphing handhelds during their mathematics instruction. A large number of studies show that there is a gender disparity in the perception and use of technology. A study at a large Canadian university found that females had lower confidence and less experience in using computers as a part of their teaching strategies (Zhou and Xu, 2007). Another study surveyed 186 pre-service teachers and found the level of perceived usefulness, perceived ease-of-use, and intention to use computers in the classroom was much lower for females than for male teachers (Yuen and Ma, 2002). Lack of knowledge and experience in using technology is one of the most common reasons reported by female teachers for their negative attitudes towards technology. In investigating changes in pre-service and in-service teachers' attitudes towards computers, and other technologies, it was found that teachers' confidence and preference for using technology significantly improved after participation in a computer literacy course (Yildirim 2000). It is imperative that both male and female mathematics teachers take part in professional development programs that help them to sharpen their technology skills for use in the classroom and enhance their attitudes toward such use.

Methodology

The West Chester University Teachers Teaching with Technology In-service/Pre-service Training Program was founded in 1995. Under the aegis of this program all day week-long graphing handheld institutes are hosted for mathematics teachers, mostly in the summers. These institutes are instructed by Texas Instruments professionals who are well trained in graphing handheld methodology and technology. The institute's curriculum is written by mathematicians and mathematics educators who are well versed in the integration of the graphing handheld into the mathematics curriculum. The graphing handhelds used are one of the TI models, such as the TI-84 Plus Series, the TI-89 Titanium, or the TI-Nspire Series. The institute's instructors also use many other modes of technology during the institutes, including the CBR, the CBL2, the computer, TI-interactive software, and so forth. Since the Program's inception thousands of teachers have attended one or more graphing handheld institute.

The workshops have been offered many summers since 1995. The Program's director has collected data from many of the years using an attitudinal survey which is filled out by the participants both at the beginning and at the end of the institute. The survey questions deal with graphing handheld usage in the mathematics classroom and also with the teacher's attitudes concerning graphing handheld usage in the mathematics classroom. The purpose of the graphing handheld institutes is not only to provide in-service/pre-service training for mathematics teacher but also to enhance their attitudes toward graphing handheld usage in the mathematics classroom so as to encourage them to appropriately use the graphing handheld in their classroom instruction.

The Results

Questionnaires were evaluated from 226 participants to help determine attitudes toward the use of graphing handhelds in the classroom. The questions of interest for this study were the 22 attitudinal questions. Other questions on the survey dealt with years of college education, demographics, years of experience, and so forth. All of the workshop participants were middle school or high school mathematics

teachers, and a few science teachers, from various states with the largest percentage coming from the state of Pennsylvania.

Demographic/Characteristic	Category	Count	Percentage
Year	2009	63	28%
	2010	70	31%
	2011	64	28%
	2012	29	13%
Age	20-29	42	19%
	30-39	52	23%
	40-49	55	24%
	50-59	63	28%
	60 or above	13	6%
Gender	Male	80	36%
	Female	145	64%
Year of teaching experience	5 or less	51	23%
	6-10	42	19%
	11-15	47	21%
	16-20	40	18%
	21 or more	44	20%
Highest degree completed	BA/BS	70	31%
	MA/MS	38	17%
	MA/MS+	111	49%
	Doctorate	6	3%
Certification Area	Elementary Education	15	7%
	Secondary mathematics	190	87%
	Secondary other	14	6%
Current teaching assignment	Algebra I	47	29%
	Algebra II	59	36%
	Both	58	35%
School	Middle/Junior high school	47	22%
	Senior high school	171	78%
Estimated enrollment in school	0-200	11	5%
	201-500	36	17%
	501-1000	68	31%
	1001 or more	103	47%
Average class size in algebra classes	11-15	19	9%
	16-20	29	14%
	21-25	76	36%
	26-30	73	35%
	31 or more	12	6%
County school location	Bucks	4	5%
	Chester	31	38%
	Delaware	26	32%
	Montgomery	16	20%
	Philadelphia	5	6%

Table 1: Demographics / Characteristics of participants

The results show that male teachers held more positive attitudes and confidence in using technology than did female teachers and this difference became less significant after the professional development workshops. Female teachers exhibited an enhanced level of integrating technology in the classroom after participation in the professional development workshops, while male teacher's level of integrating technology in the classroom remained positive and somewhat enhanced.

Participant's attitudes toward the use of graphing handhelds in the classroom were assessed before commencing the workshop and after completing the workshop to determine the effect of the workshop on one's attitudes toward the use of graphing handhelds in the classroom. Participants' attitude was measured as an ordinal variable on a 5-point Likert scale, ranging from 1 = Strongly Agree to 5 = Strongly Disagree.

A one-way ANOVA test, with an alpha level of 0.05, was conducted to assess any attitudinal differences between males and females. The results show a significant difference ($p < 0.05$) for some questions between males and females for both the pre-test questionnaire and post-test questionnaire. The one-way ANOVA is a good fit for this study since the Central Limit Theorem allows for it. The pre-test one-way ANOVA test findings can be found in Table 2. The post-test one-way ANOVA test findings can be found in Table 3. The questions are listed after the references.

Question	Estimate (Male-Female)	Std Err	DF	t-value	Lower	Upper	p-value
q35	-0.04	0.128	219	-0.336	-0.296	0.210	0.7376
q36	-0.36	0.129	219	-2.774	-0.614	-0.104	0.0060*
q37	-0.17	0.111	219	-1.555	-0.392	0.046	0.1213
q38	0.18	0.159	219	1.109	-0.137	0.490	0.2687
q39	0.65	0.174	219	3.717	0.304	0.990	0.0003*
q40	0.02	0.148	219	0.153	-0.270	0.315	0.8784
q41	-0.20	0.133	218	-1.499	-0.463	0.063	0.1352
q42	0.04	0.128	219	0.293	-0.215	0.290	0.7701
q43	0.15	0.112	223	1.372	-0.067	0.373	0.1715
q44	0.14	0.127	223	1.130	-0.106	0.393	0.2597
q45	0.08	0.113	222	0.689	-0.145	0.300	0.4918
q46	-0.01	0.095	222	-0.117	-0.198	0.176	0.9068
q47	-0.18	0.120	222	-1.481	-0.414	0.059	0.1401
q48	-0.13	0.147	223	-0.892	-0.422	0.159	0.3736
q49	0.07	0.123	223	0.551	-0.175	0.311	0.5819
q50	-0.35	0.156	223	-2.246	-0.659	-0.043	0.0257*
q51	-0.19	0.128	223	-1.504	-0.445	0.060	0.1340
q52	-0.14	0.097	222	-1.415	-0.329	0.054	0.1583
q53	-0.17	0.120	220	-1.432	-0.408	0.065	0.1537
q54	0.25	0.115	222	2.174	0.023	0.477	0.0308*
q55	-0.26	0.127	221	-2.052	-0.513	-0.010	0.0413*
q56	0.08	0.157	221	0.493	-0.232	0.387	0.6222

Table 2: Pre-test ANOVA results

Question	Estimate (Male-Female)	Std Err	DF	t-value	Lower	Upper	p-value
q35	0.00	0.123	221	-0.008	-0.243	0.241	0.9938
q36	0.00	0.108	221	-0.021	-0.215	0.211	0.9832
q37	-0.02	0.090	221	-0.228	-0.197	0.156	0.8200
q38	0.13	0.149	221	0.874	-0.164	0.425	0.3832
q39	0.29	0.164	221	1.755	-0.036	0.613	0.0807
q40	0.07	0.149	219	0.484	-0.222	0.367	0.6285
q41	-0.18	0.132	221	-1.357	-0.439	0.081	0.1761
q42	-0.12	0.138	221	-0.890	-0.394	0.149	0.3744
q43	0.29	0.096	223	3.021	0.101	0.478	0.0028*
q44	0.01	0.124	223	0.104	-0.232	0.258	0.9173
q45	-0.04	0.111	223	-0.397	-0.262	0.174	0.6920
q46	-0.07	0.091	223	-0.774	-0.251	0.109	0.4398
q47	-0.30	0.119	223	-2.487	-0.532	-0.062	0.0136*
q48	-0.28	0.128	223	-2.214	-0.535	-0.031	0.0278*
q49	-0.03	0.105	223	-0.258	-0.234	0.180	0.7963
q50	-0.06	0.117	223	-0.515	-0.291	0.171	0.6073
q51	-0.20	0.135	223	-1.477	-0.465	0.067	0.1410
q52	-0.24	0.091	223	-2.593	-0.416	-0.057	0.0101*
q53	-0.08	0.108	221	-0.759	-0.295	0.131	0.4489
q54	0.09	0.110	220	0.798	-0.129	0.305	0.4255
q55	0.04	0.077	221	0.467	-0.116	0.189	0.6408
q56	-0.23	0.144	221	-1.601	-0.515	0.053	0.1108

Table 3: Post Test ANOVA results

The following multi bar graphs display the results for questions 36, 39, 50, 54 and 55, both pre-test and post-test. These questions were found to have a significant difference in terms of gender on the pre-test. Questions 50 and 55, point to the possibility that females, from the onset, felt as though they lacked the knowledge and competency to effectively use graphing handhelds in the mathematics classroom.

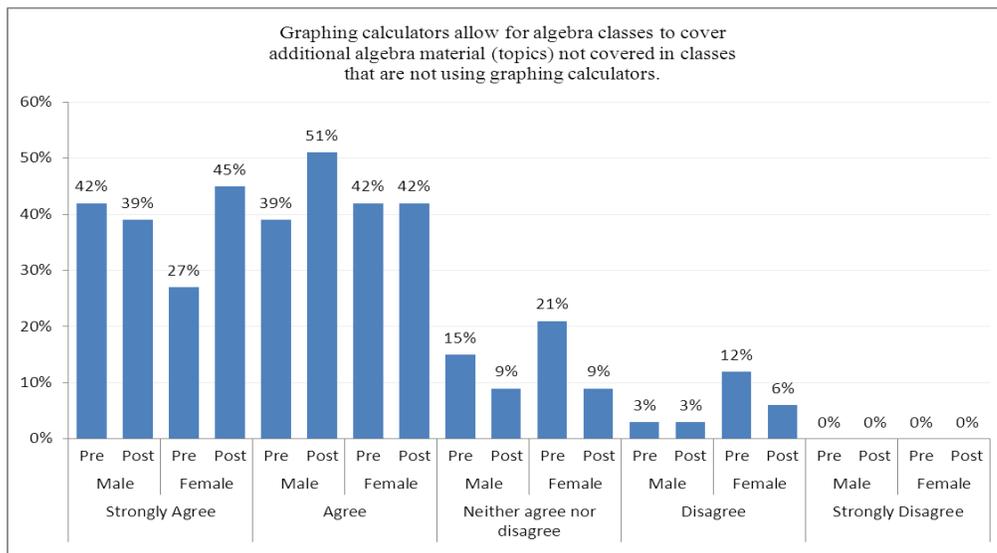


Fig. 1. Multi Bar Graph for Question 36 showing both pre and post percentages for males and females.

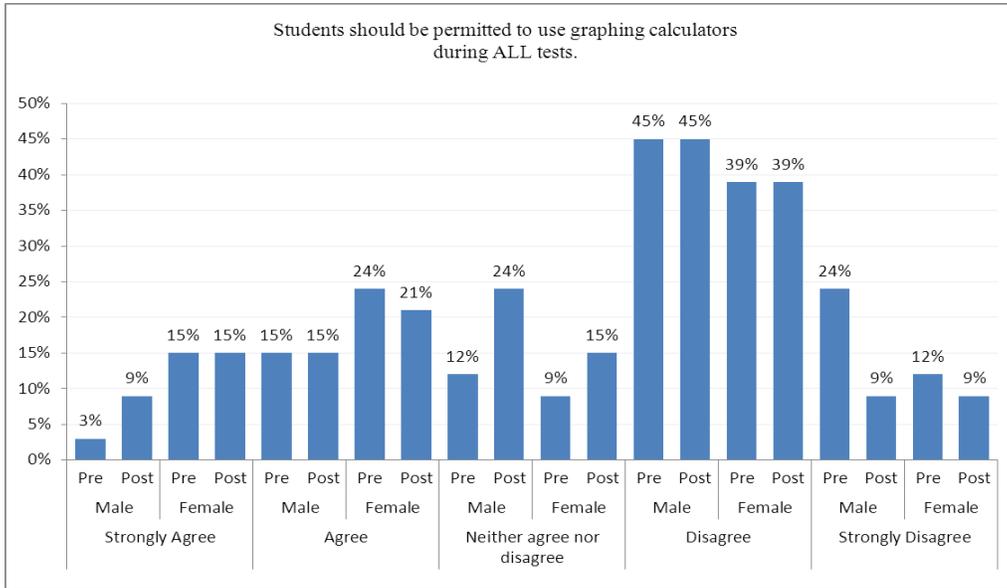


Fig. 2. Multi Bar Graph for Question 39 showing both pre and post percentages for males and females.

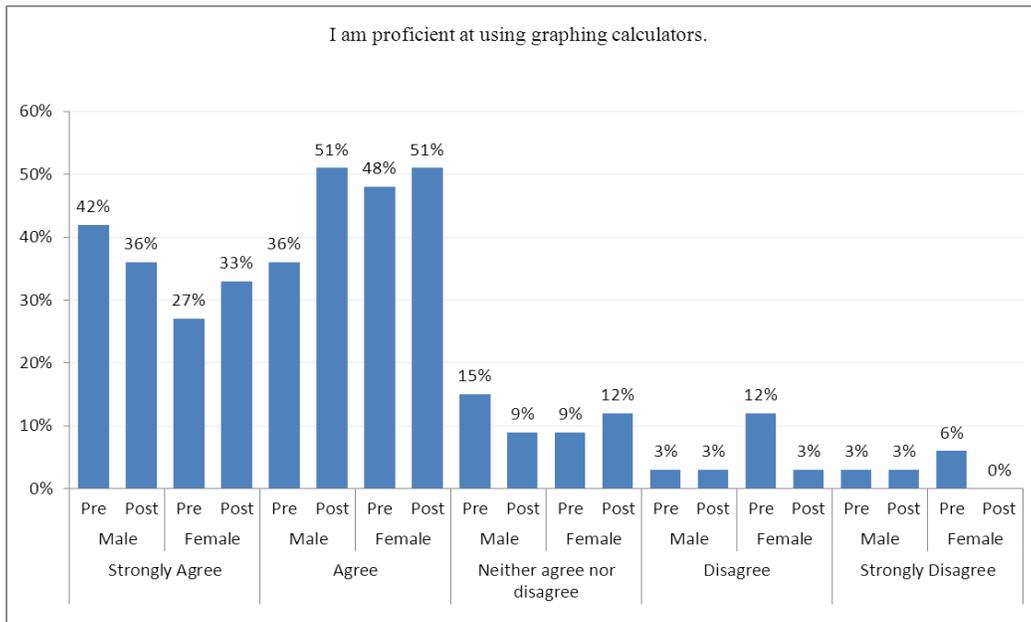


Fig. 3 Multi Bar Graph for Question 50 showing both pre and post percentages for males and females.

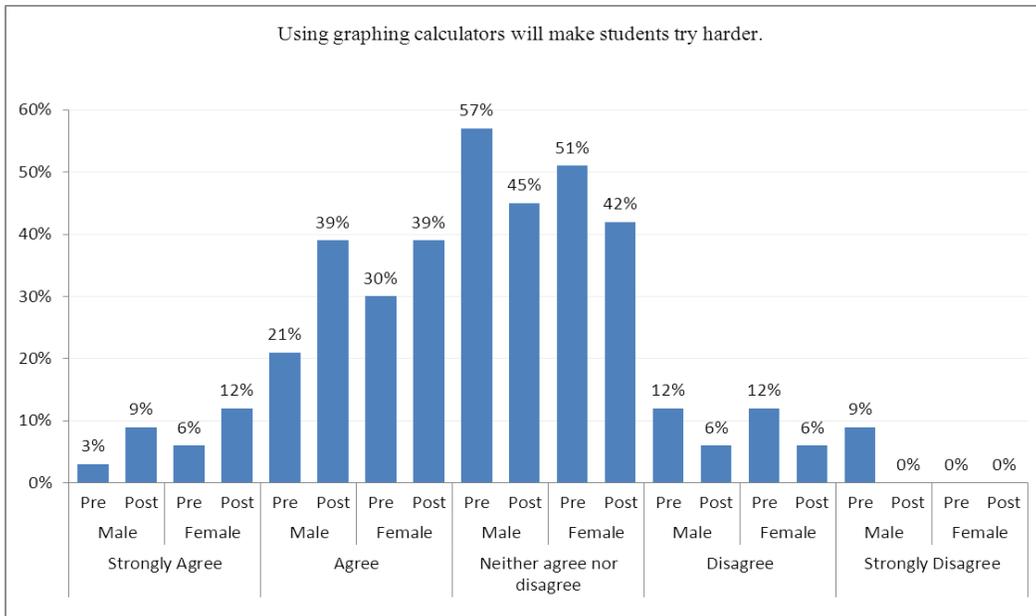


Fig. 4 Multi Bar Graph for Question 54 showing both pre and post percentages for males and females.

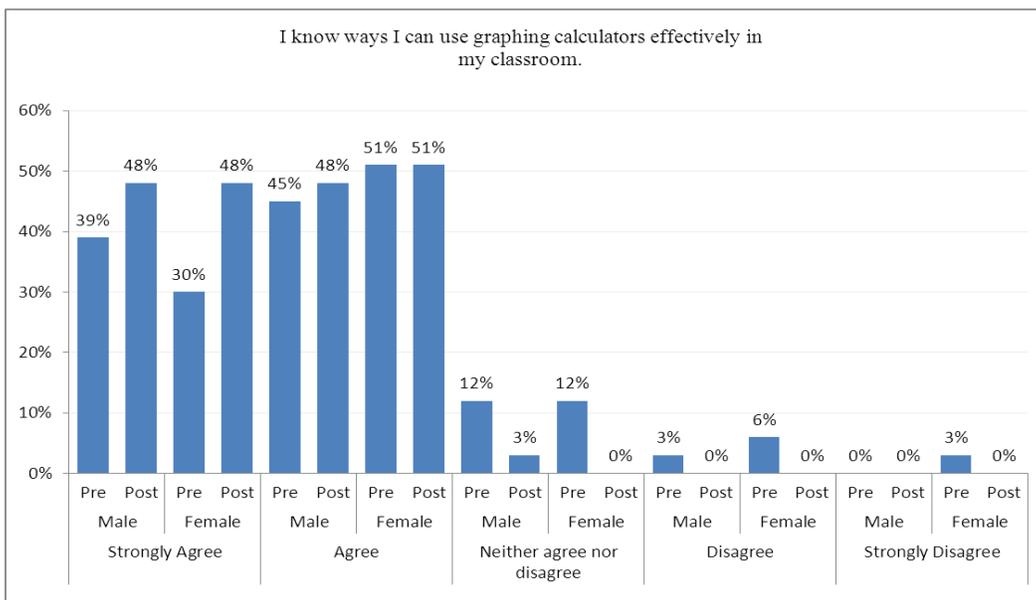


Fig. 5 Multi Bar Graph for Question 55 showing both pre and post percentages for males and females.

The following multi bar graphs display the results for questions 43, 47, 48 and 52 both pre-test and post-test. These questions were found to have a significant difference in terms of gender on the post-test. Question 43 suggests enhanced positive attitudes for both males and females after the PD.

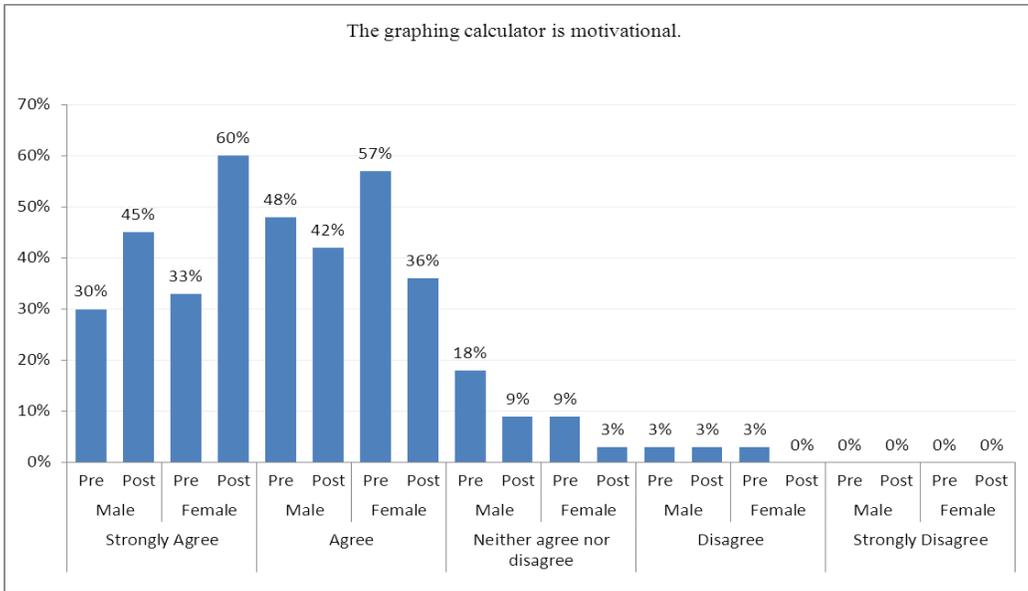


Fig. 6. Multi Bar Graph for Question 43 showing both pre and post percentages for males and females.

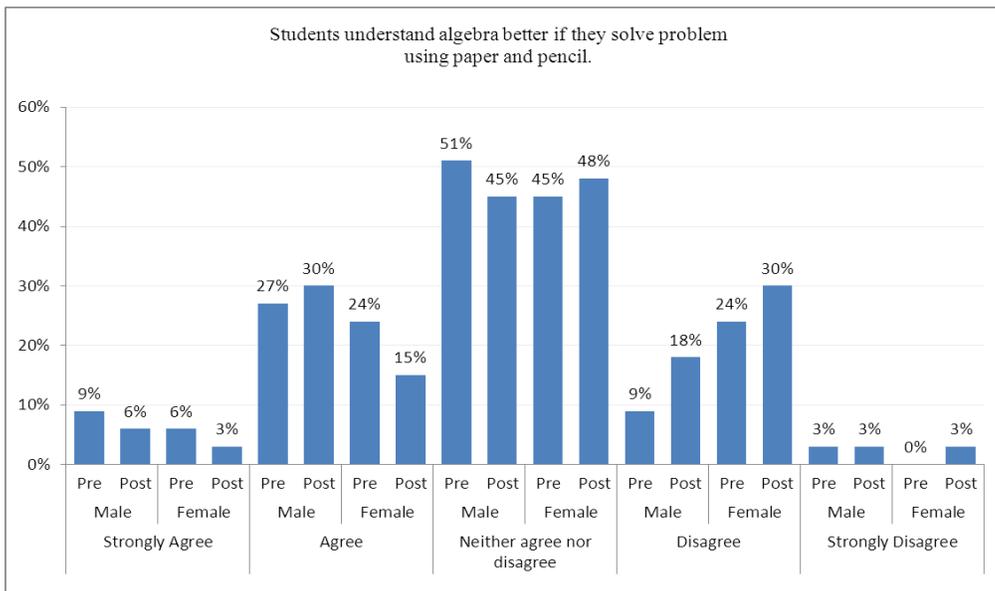


Fig. 7. Multi Bar Graph for Question 47 showing both pre and post percentages for males and females.

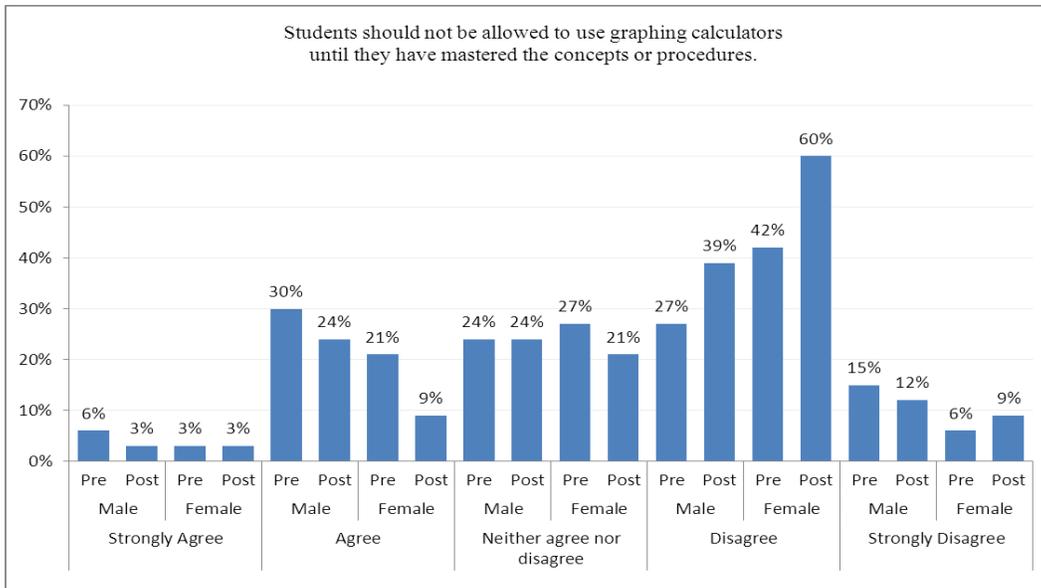


Fig. 8 Multi Bar Graph for Question 48 showing both pre and post percentages for males and females.

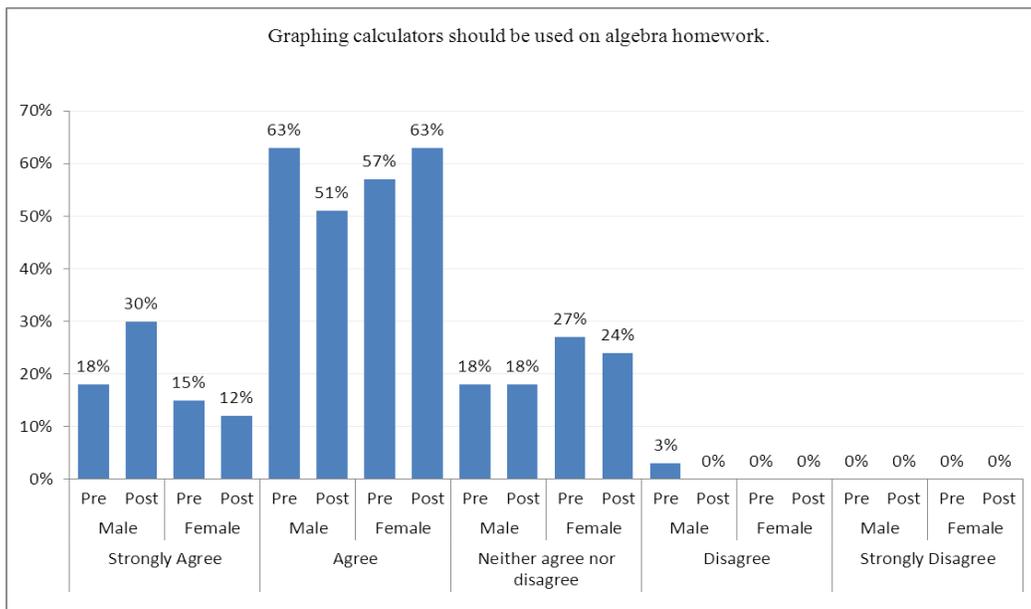


Fig.9 Multi Bar Graph for Question 52 showing both pre and post percentages for males and females.

The following side-by-side bar graphs further display the results for questions 36, 39, 50, 54 and 55. These questions were found to have a significant difference in terms of gender on the pre-test.

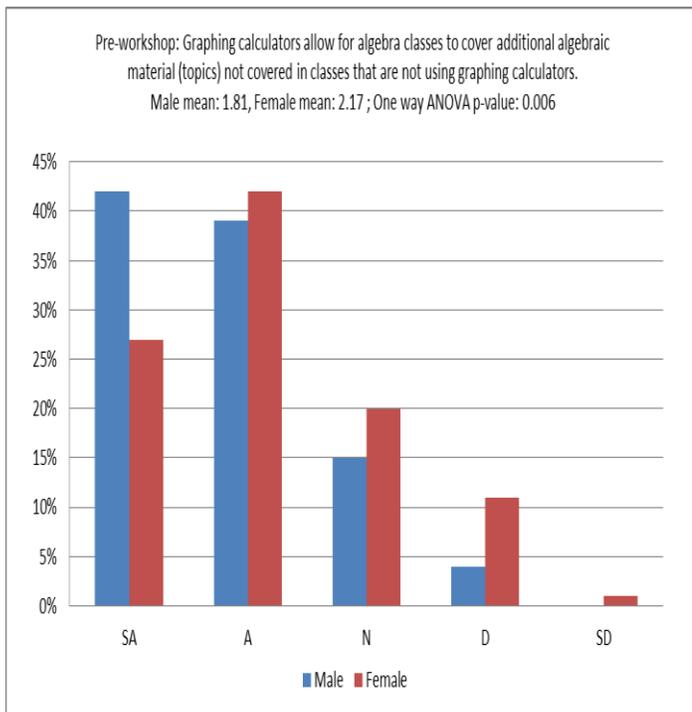


Fig. 10 Side-by-side bar graph Question 36 (pre-test)

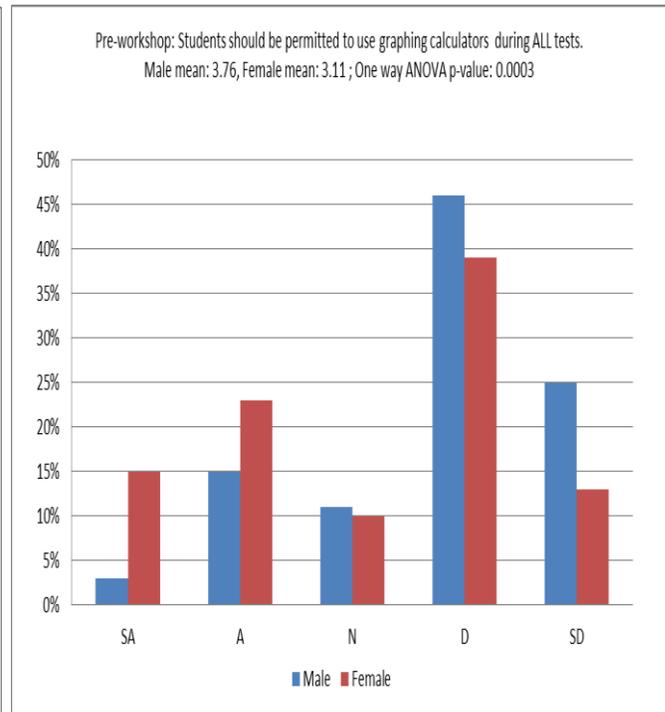


Fig. 11 Side-by-side bar graph Question 39 (pre-test)

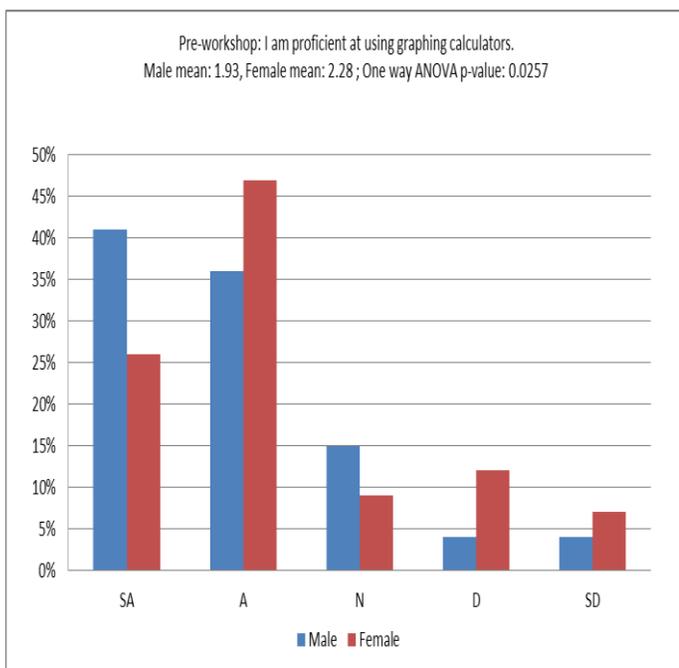


Fig. 12 Side-by-side bar graph Question 50 (pre-test)

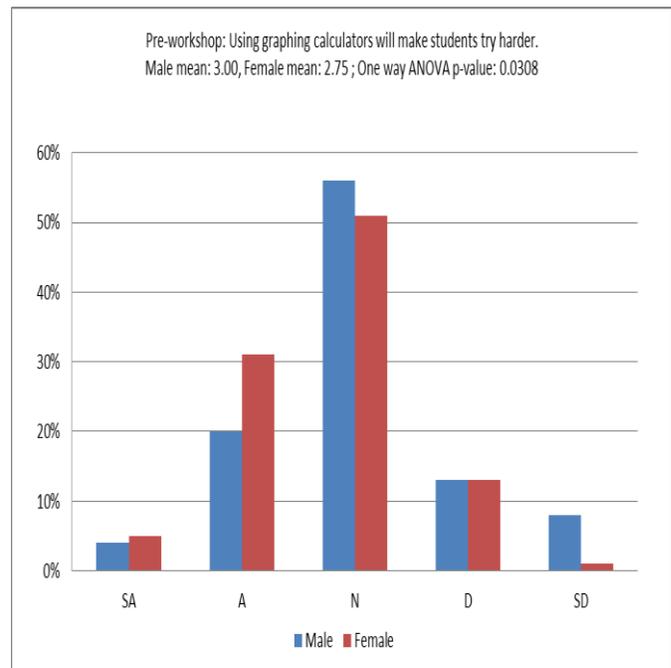


Fig. 13 Side-by-side bar graph Question 54 (pre-test)

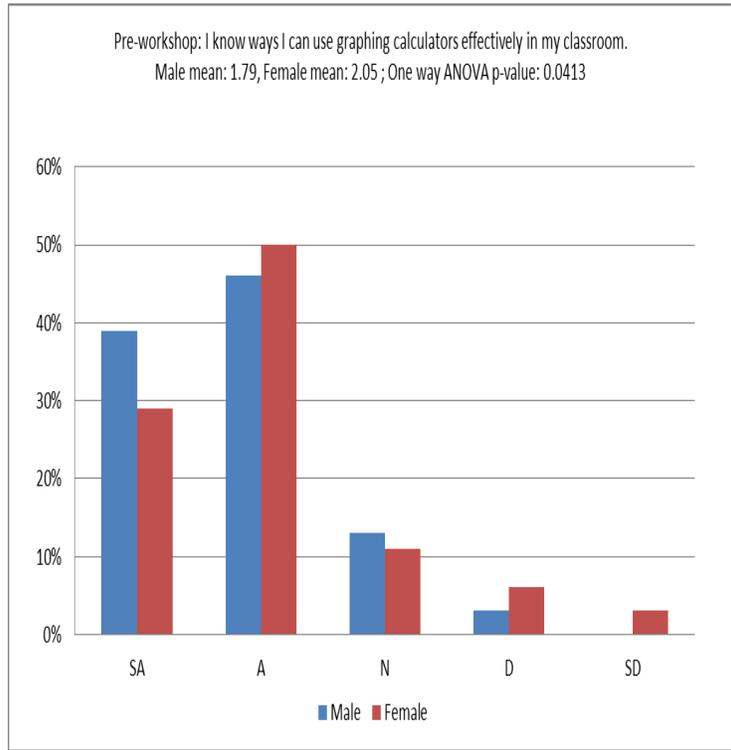


Fig. 14 Side-by-side bar graph Question 55 (pre-test)

The following side-by-side bar graphs further display the results for questions 43, 47, 48 and 52. These questions were found to have a significant difference in terms of gender on the post-test.

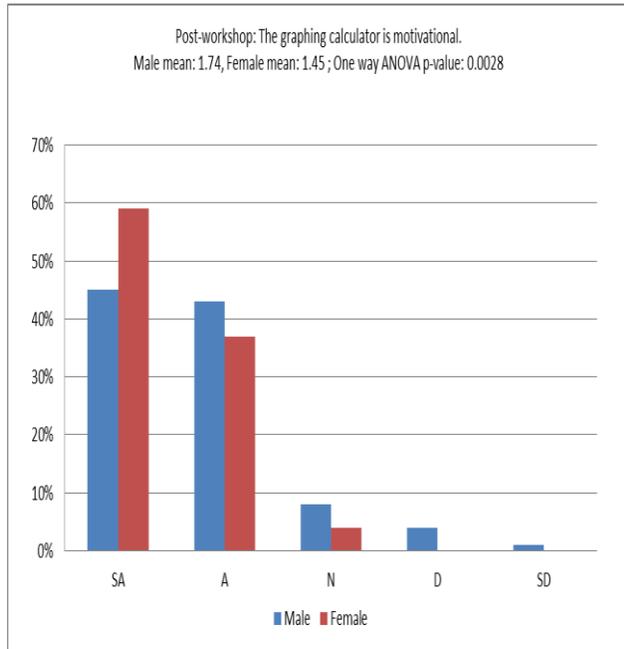


Fig. 15 Side-by-side bar graph Question 43 (post-)

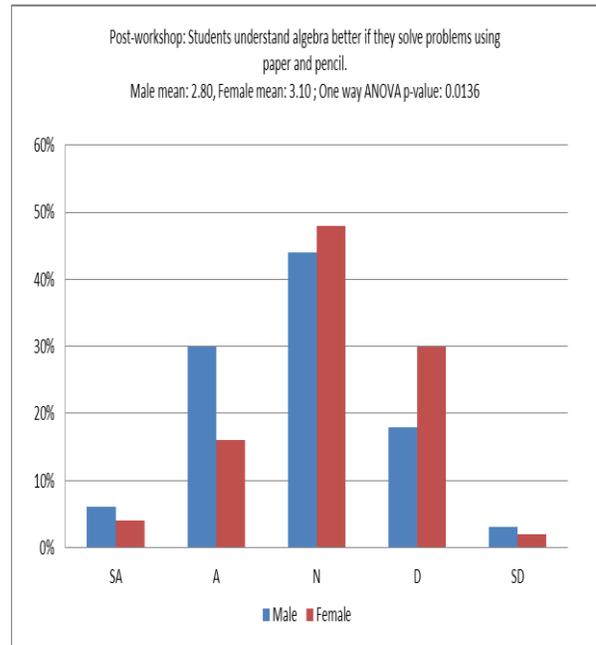


Fig. 16 Side-by-side bar graph Question 47

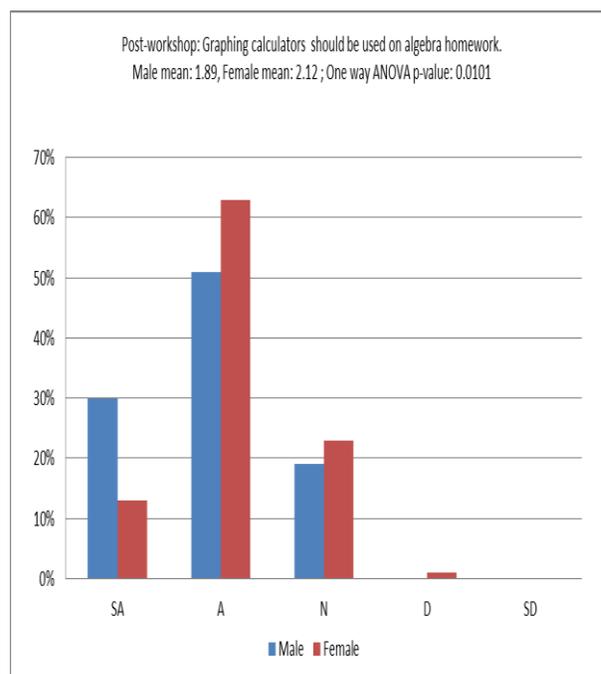
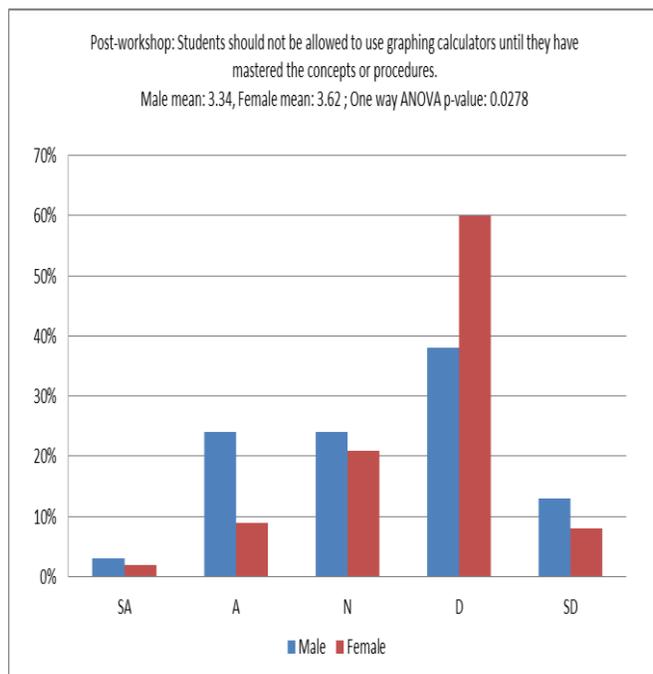


Fig. 17 Side-by-side bar graph Question 48 (post-test)

Fig. 18 Side-by-side bar graph Question 52 (post-

Discussion

Incorporating graphing handhelds into the mathematics classroom is very beneficial to students. Students using handhelds perform better, score higher on tests, and have more positive attitudes toward mathematics. It is important therefore that teachers, both males and females, feel comfortable using graphing handhelds in the classroom and that they are well instructed on how to effectively incorporate graphing handhelds into the mathematics classroom.

This study shows that in-service training workshops serve as a very valuable experience for teachers. The results found are similar to those found by Li (2016). Professional development training programs in technology appear to benefit female teachers more than male teachers. Male teachers had more positive perceptions towards technology prior to and in the beginning of the PD program. However, they still improved their skills to some degree regarding integration of technology into the classroom after participating in the PD training. Future PD program designs and corresponding curriculum should be developed to take into account the particular needs of female and male teachers in order to help facilitate equality and effectiveness in these types of PD programs.

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The following are the survey questions q35 through q56:

35. Students should be introduced to graphing calculators at the algebra I level.
36. Graphing calculators allow for algebra classes to cover additional algebraic material (topics) not covered in classes that are not using graphing calculators.
37. Graphing calculators allow for greater detail and/or difficulty of algebra topics than in classes that are not using graphing calculators.
38. Graphing calculators allow for omission or de-emphasis of certain algebraic topics.
39. Students should be permitted to use graphing calculators during ALL tests.
40. Students should be permitted to use the newest graphing calculators (like the Ti-92 –an algebraic symbolic manipulator) in algebra classes.
41. When graphing calculators are used in instruction, students should first solve algebraically and support graphically.
42. When graphing calculators are used in instruction, students should solve graphically only when algebraic methods are too difficult.
43. The graphing calculator is motivational
44. When students work with graphing calculators, they do not need to show their work on paper.
45. Algebra is easier to learn if graphing calculators are used.
46. More interesting algebra problems can be done when students have access to graphing calculators.
47. Students understand algebra better if they solve problems using paper and pencil.
48. Students should not be allowed to use graphing calculators until they have mastered the concepts or procedures.
49. Graphing calculators should be required of all algebra students assuming that they would be made available to those who could not afford one.
50. I am proficient at using graphing calculators.
51. Graphing calculators should be used only to check work once the problem has been worked out on paper.
52. Graphing calculators should be used on algebra homework.
53. I have used graphing calculators in my classroom before.

54. Using graphing calculators will make students try harder.
55. I know ways I can use graphing calculators effectively in my classroom.
56. There is a lot I do not know about the use of the graphing calculator.

MARRIED.

MUCHMORE-FITCH.—On Tuesday, Sept. 8, at the residence of the bride's parents, New-Hartford, Conn., by the Rev. Mr. Hawley, WALTER E. MUCHMORE of Astoria, N. Y., to NELLIE J., daughter of Orrin Fitch, Esq.

DIED: Sept. 10, 1890

- BAKER.—On Saturday, Sept. 8, at his residence in this city, BENJAMIN A. BAKER, aged 72 years. Funeral will take place from the Church of the Transfiguration, ("The Little Church Around the Corner," 20th St., near 6th Av., on Wednesday, Sept. 10, at 11 A. M.
- DOCTOR.—On Sunday night, the 7th inst, MAX DOCTOR, in the 63d year of his age. Funeral from his late residence, 83 East 75th St., southwest corner of Park Av., on Wednesday morning, Sept. 10, at 11 o'clock.
- ELSWORTH.—Suddenly, Tuesday, Sept. 8, at his residence, No. 20 West 40th St., HENRY, son of the late Edward Elsworth. Notice of funeral hereafter.
- HILL.—Suddenly, at Orange, N. J., Sept. 8, BREAKER, infant daughter of Frank and Marano Hill.
- KISSAM.—On Sept. 8, DANIEL W. KISSAM, M. D., oldest son of the late James A. and Adeline Kissam. Funeral services will take place at the Memorial Church, 7th Av. and St. John's Place, Brooklyn, on Thursday, at 2:30 P. M.
- METCALFE.—SARAH CONNELLY, wife of Robert Metcalfe, at South Orange, N. J., on Sept. 7, 1890. Funeral services at the First Presbyterian Church, South Orange, N. J., Wednesday, Sept. 10, 1890, on the arrival of the 1:30 train from New-York.
- MILLER.—In Stamford, Conn., on Sunday, Sept. 7, 1890, at the residence of her son-in-law, Edwin P. Gorham, JANE, widow of John Miller, M. D. Funeral services in Trinity Chapel, West 25th St., on Thursday morning, the 11th inst., at 10 o'clock. Interment private.
- NORTHRUP.—At Crawford House, White Mountains, Sept. 8, WILLIAM B. NORTHRUP, in the 76th year of his age. Relatives and friends are invited to attend the funeral from his late residence, 8 East 40th St., on Thursday, Sept. 11, at 10 A. M. Kindly omit flowers.
- PATERSON.—Sept. 8, 1890, JULIA M., widow of Robert J. L. Paterson of this city and daughter of the late Richard Coxo of Sidney, N. J.
- PINCONEY.—On Monday, Sept. 8, at her late residence, 86 Gramercy Park, MARIETTA, widow of James L. Pinckney. Funeral private.
- RICHARDS.—At the residence of his brother, J. J. Richards, 66 West 127th St., on Monday, Sept. 8, THOMAS B. RICHARDS, son of the late Thomas B. and Sarah M. Richards, in his 68th year. Relatives and friends are respectfully invited to attend the funeral on Thursday, Sept. 11, at 10:30 A. M.
- RIDDELL.—On Thursday, Sept. 8, 1890, JENNIE, wife of Henry W. Ridgell. Funeral services at the Church of the Heavenly Rest, 6th Av., Thursday, Sept. 11, at 11 o'clock A. M. Interment in Greenwood. Kindly omit flowers.
- ROCKWELL.—CHARLES ROCKWELL, at Southport Conn., Sept. 8, 1890, aged 60. Funeral Sept. 11, at 2:30, from Trinity Church, Southport, Conn.
- WOOD.—At Flushing, L. I., on Tuesday, Sept. 8, MARY HEKATH WOOD, daughter of the late John Heath and widow of John Wardell Wood of this city, aged 88 years. Relatives and friends are invited to attend the funeral from her late residence, Juniper Av., on Thursday, 11th inst., at 10:30 A. M. Train leaves Long Island City at 10 o'clock.

DIED.

1892

- BRAYERS.**—On Tuesday, Nov. 1, at New-York Hospital, WILLIAM BRAYERS of Belfast, Ireland, and Timaru, New-Zealand.
Funeral services at Noble Street Presbyterian Church, Brooklyn, E. I., on Saturday, Nov. 5, at 11 o'clock A. M. Informant at Greenwood.
For New-Zealand papers, please copy.
- COLTON.**—Entered into rest, Wednesday, Nov. 3, MARRIE A. W., daughter of Abigail R. and the late Isaac W. Colton.
Funeral services at her residence, No. 457 West 151st St., on Saturday afternoon, 5th inst., at 3 o'clock. Interment at Greenwood on Sunday.
- ELTON.**—At her residence, in Waterbury, Conn., on Wednesday, Nov. 2, Mrs. OLIVE M. ELTON, widow of John D. Elton, aged 74 years.
- HATCHER.**—On Nov. 3, at her residence, in this city, SARAH LORISA, widow of Edward Haight and daughter of the late Dr. William Bourgeois.
Funeral from the Church of the Holy Trinity, 5th Av. and 45th St., on Saturday, Nov. 5, at 2 o'clock in the afternoon.
- KELLOGG.**—Of heart failure, on Tuesday, Nov. 1, at the Clarendon Hotel, JANE E., wife of George Kellogg and mother of Clara Louisa Kellogg-Strauss.
Funeral services at Birmingham, Conn., on Friday, Nov. 4, on the arrival of the 10 A. M. train from New-York.
- LUDLAM.**—On Thursday, Nov. 3, 1892, SHAS LUDLAM, in the 87th year of his age.
Relatives and friends are invited to attend the funeral services at his late residence, 170 Remsen St., Brooklyn, on Saturday, 5th inst., at 3 P. M.
- MARON.**—On Thursday, Nov. 3, Rev. WM. VAN WANKER MARON, in his 71st year.
Funeral from his late residence, Seminary Place, New-Branswick, N. J., Saturday, Nov. 5, at 2:30 P. M. Trains via the Pennsylvania R. R. leave New-York at 1 P. M. Interment at the convenience of the family.
- MACLAY.**—Suddenly, on Tuesday, Nov. 1, 1892, Dr. ARCHIBALD MACLAY, in the 81st year of his age, of pneumonia.
Funeral services at his late residence, 115 East 10th St., on Friday morning, 4th inst., at 10:30 o'clock. Relatives and friends invited. Interment at Woodlawn. Please omit flowers.
- MASON.**—Suddenly, of heart failure, Wednesday, Nov. 2, 1892, JAMES MACONNELL, son of J. Freese and Nettie M. Mason, aged 11 years.
Funeral services at No. 1, 651 Washington Av. Friday, Nov. 4, at 7 P. M.
- ROBERT.**—At Gravesend, T. I., on Wednesday, Nov. 2, 1892, after a short illness, CHRISTOPHER D. ROBERT, in his 62d year.
Friends are invited to attend the funeral services at St. Paul's Episcopal Church, Flatbush, on Saturday, the 5th inst., at 2:30 P. M.
- ST. JOHN.**—At Lakewood, N. J., Nov. 2, 1892, EVASTIC ROBERT ST. JOHN of Brooklyn, aged 29 years.
Funeral services to be held Friday, Nov. 4, at 10:30 A. M., at the Church of the Reformation, Gates and Franklin Aves., Brooklyn. Friends of his family and of his mother, Mrs. J. L. Adams, are invited to attend.
- WILDE.**—At Glen Ridge, Montclair, N. J., Wednesday, Nov. 2, 1892, JAMES WILDE, beloved son of Helen A. and Edward S. Wilde.
Funeral services at his late residence, Glen Ridge, on Saturday, at 11:30 A. M. Informant at Greenwood. Train leaves New-York via Delaware, Lackawanna and Western R. R., Barclay and Christopher Sts., for Glen Ridge station at 10:30. Carriages will be in attendance.
- YOUNG.**—On Wednesday, Nov. 2, 1892, JOHN DAY YOUNG, eldest son of Ann S. and the late John S. Young.
Interment, Greenwood.

DIED. Sept. 5, 1890

COOLEY.—Suddenly, on Thursday, Sept. 4, of apoplexy, at Inka Mahopac, JOSEPH T. COOLEY, late of New-York-City, in the 83d year of his age.
Notice of funeral hereafter.

DEPO.—At Great Neck, L. I., on Sept. 3, JAMES DEPO, aged 70.
Funeral from his late residence, 13 Third Place, Brooklyn, 2 P. M. Sunday. Immediate members of family and Constitution Lodge, F. and A. M., invited. Please omit flowers.

GILBERT.—On Sept. 1, in Gainesville, Ga., aged 18 months and 23 days, JASPER WILLIAMS, only child of James H. and Fanny G. Gilbert of Atlanta, Ga., and grandson of Jasper W. Gilbert of Brooklyn.

GRIMSTEAD.—On Sept. 3, after a lingering illness, CYRILIA BURTON, widow of Henry Grimstead, in her 80th year.
Relatives and friends are respectfully invited to attend the funeral from her late residence, 151 State St., Brooklyn, on Saturday, Sept. 6, at 3 P. M.

HENRY.—At Short Hills, N. J., Wednesday, Sept. 3, GEORGE M., widow of Rev. James V. Henry and daughter of the late Edward Kemoye, in the 77th year of her age.
Funeral services at her late residence, Short Hills, N. J., on Friday, Sept. 5, at 4 o'clock.

HERRICK.—On Thursday, Sept. 4, 1890, at the residence of her brother-in-law, R. H. Thomas, Morristown, N. J., SARAH ELIZABETH, daughter of Jane Eliza and the late John J. Herrick.
Funeral services from St. John's Church, St. John's Place, near 7th Av., Brooklyn, 4:30 Saturday afternoon, Sept. 5.

LOW.—At her home, Newport, R. I., on Thursday, Sept. 4, 1890, ANNE DAVISON BEDELL, wife of A. A. Low.
Notice of funeral hereafter.

LYON.—On Sept. 3, at Cranford, N. J., JAMES D. LYON.
Funeral from his late residence, Saturday, Sept. 5, at 2:30 P. M. Carriages will be in waiting on arrival of 1 o'clock train from foot of Liberty St., New-York.

MARSHALL.—Suddenly, on Wednesday, Sept. 3, ROBERT MARSHALL, in the 82d year of his age.
Relatives and friends are respectfully invited to attend the funeral services at his late residence, corner 104th St. and 9th Av., Friday, Sept. 5, at 4:30 P. M.

RAYMOND.—At Carmel, N. Y., Sept. 4, 1890, Mrs. JULIA RAYMOND, wife of the late James Raymond, aged 80 years.
Relatives and friends are invited to attend the funeral services at the Presbyterian Church, Carmel, on Saturday, Sept. 5, at 12 o'clock noon. Carriages will meet the train leaving 150th St. by New-York and Northern Railroad at 9:15 A. M.

REMBSEN.—At Flulands, L. I., on Wednesday, Sept. 3, 1890, STEPHEN W. REMBSEN, eldest son of L. Bohynck Remsen, aged 45 years.
Relatives and friends are invited to attend the funeral at his late residence on Saturday, the 5th inst., at 2:30 P. M.

SCHMIDT.—In Brooklyn, Sept. 3, 1890, LOUISE ERNESTINE, wife of Charles L. D. Schmidt, M. D.
Funeral private. Interment at Woodlawn.

SCHNADER.—On Sept. 4, LINA SCHNADER, aged 72, wife of Augustus Schnader.
Funeral from residence, 48 West 128th St., at 2 P. M. on Saturday, Sept. 5.

SHEPHERD.—At East Orange, N. J., Sept. 3, AUGUSTA D., wife of the late Mr. G. Shepherd and daughter of the late Benj. Starr Taylor.
Funeral services on Friday, Sept. 5, at 4 P. M., from her late residence, 118 Washington St. Interment private. Kindly omit flowers. Carriages in waiting at Brick Church Station on arrival of train leaving foot of Barclay and Christopher Sts. at 8:10 P. M.

STILLWELL.—At Gravesend, Sept. 3, NICHOLAS R. STILLWELL, in his 72d year.
Relatives and friends are invited to attend his funeral, Saturday, at 2:30 P. M., from his late residence, Gravesend.

TURNER.—Of Asiatic cholera, at Yokohama, Aug. 30, WILLIAM O. TURNER, First Lieutenant U. S. M. C., in his 37th year, son of Rear Admiral Thomas Turner, U. S. N.

WEBSTERVILLE.—Suddenly, at Greenwich, Conn., on Sept. 3, CATHERINE, widow of James M. Websterville.
Funeral services will be held at the residence of her brother, John Vauhtles, on Saturday, Sept. 5, at 10:30 o'clock. Carriages will be in waiting on arrival of 9:03 A. M. train from Grand Central Depot. Interment at convenience of the family.

MARRIED.

SHERRY-DAYTON.—At Home, in East Hampton, N. Y., on Tuesday evening, March 3, by Rev. J. D. Baker, DAVID H. SHERRY to ROSE, daughter of Edward Dayton, Esq., all of East Hampton.

DIED. March 9, 1868

BLADEMAN.—Suddenly, of scarlet fever, on Sunday afternoon, March 8, EMILY MONTGOMERY, daughter of Birdsey and Anna M. T. Blademan, aged 4 years and 6 months.

Funeral services at their residence, No. 60 South Oxford-street, Brooklyn, on Monday, March 9, at 4 P. M. Friends are invited without further notice.

CARPENTER.—On Friday, March 6, of membranous croup, IRVING RICHARDS CARPENTER, aged 1 year, 7 months and 9 days.

Relatives and friends are respectfully invited to attend the funeral from the residence of his parents, Hackensack, N. J., on Monday afternoon at 2 o'clock. Train leaves New-York at 12 o'clock M., via Bayonne Ferry, foot of Chambers-st.

FOSTER.—On Friday, March 6, at the residence of her father, No. 80 Macdougal-st., FLORENCE A., daughter of Rev. R. S. Foster, aged 28 years.

The friends are respectfully invited to attend the funeral service at Washington-square M. E. Church, 4th-st., near City-av., on Monday, the 9th inst., at 3 P. M., without further invitation.

CLAUSON.—In Brooklyn, on Sunday, March 8, MARTHA CLAUSON, wife of John Clauson, aged 83 years.

Funeral will take place on Tuesday, March 10, at 9 o'clock, from No. 298, DeGraaf-st., to which the friends of the family are invited.

GLACIOS.—On Saturday, March 7, of croup, CLARENCE E. GLACIOS, aged 3 years and 4 months.

The relatives and friends of the family, also the members of Morrisania Lodge No. 171, L. O. O. F., are respectfully invited to attend her funeral from the residence of her parents, East Morrisania, on Tuesday, March 10, at 10 A. M.

HENRY.—On Saturday morning, March 7, HARMON B. HENRY, in the 46th year of his age.

His relatives and friends are respectfully invited to attend his funeral from his late residence, No. 238 East 18th-st., on Monday, the 9th inst., at 3 P. M.

JACKSON.—At his residence in Fishkill Village, Dutchess County, N. Y., on Sunday, March 8, CHARLES A. JACKSON, in the 78th year of his age.

The friends of the family are invited to attend his funeral on Tuesday, March 10, at 2 o'clock P. M. Carriages will be in attendance at Fishkill Depot to meet the 10 o'clock train from New-York. The remains will be taken to Greenwood Cemetery for interment on Wednesday, 11th inst.

JUDSON.—At New-Orleans, on Sunday, March 8, MILES JUDSON, aged 58 years, for many years a resident of New-Orleans, and formerly of this City.

LEVERICH.—On Saturday, March 7, of membranous croup, LOUISE VAN PELT, only child of Edward B. and Estelle E. Leverich, aged 23 months.

The relatives and friends of the family are invited to attend the funeral services at No. 101 Washington-st., Brooklyn, on Tuesday, at 2 1/2 P. M.

MANHETZEL.—On Saturday, March 7, AUGUSTUS H. MANHETZEL, of the firm of Haviland, Lindley & Co.

Relatives and friends are respectfully invited to attend the funeral from his late residence, No. 188 120th-st., on Monday, March 9, at 1 P. M.

SLAUGHT.—At Nice, France, on Thursday, Feb. 12, NATHANIEL O. SLAUGHT, of Jersey City, N. J., in the 51st year of his age.

The steamer in which his remains are being brought to New-Jersey for interment is due at New-York Tuesday, the 10th inst.

Notice of the funeral hereafter.

SELLAR.—On Saturday, March 7, WILLIAM ALEXANDER, second son of David P. Sellar, Esq.

The relatives and friends of the family are invited to attend the funeral on Monday morning at 9 o'clock, at Grace church, Broadway and 10th-st.

SMITH.—At Monsey, N. Y., on Wednesday, March 4, SAMUEL DAVIDSON, eldest son of Alexander, Jr., and Elizabeth Smith, aged 7 years and 28 days.

The relatives and friends of the family are invited to attend the funeral on Monday, the 9th inst., at 2 o'clock P. M.; from the residence of his grandmother, No. 123 Washington-st., Jersey City.

MARRIED.

BENEDICT-CODDINGTON.—Monday, Dec. 19, at Calvary Chapel, by the Rev. Dr. Emery, **ARTHUR W. BENEDICT** to **ELLA A. CODDINGTON**, both of this city.

DIED. Jan 2, 1893

BATES.—On Dec. 29, 1892, **ALFRED W. BATES**, in his 57th year.
Funeral from his residence, 113 West 72d St., on Monday, Jan. 4, at 10:30 A. M. Kindly omit flowers. Interment at convenience of family.

CHALM.—On Dec. 31, 1892, after a short illness, **EMILIE**, beloved wife of Dr. Morris L. Chalm, in the 47th year of her age, at her late residence, 137 East 72d St.
Funeral from Temple Emanu-El, 49d St. and 6th Av., on Monday at 9:30 A. M. Friends and acquaintances are invited to attend. Kindly omit flowers.

COOPER.—Mrs. **ELIZA COOPER**, widow of John W. Cooper.
Notice of funeral hereafter.

GRAFT.—On Dec. 30, of pneumonia, **MARGARET M. CRAFT**, widow of William D. Craft.
Relatives and friends are invited to attend her funeral at her late residence, No. 54 East 84th St., on Tuesday, Jan. 3, 1893, at 10:30 A. M.

FERRIER.—On Thursday, Dec. 29, of diphtheria, **NATALIE**, aged 7 years and 18 days, and on Saturday, Dec. 31, **LORRAINE**, aged 5 years 10 months and 16 days, only children of A. Fillmore Ferrier and Jennie Beam Ferrier.

GREGORY.—Entered into rest at Vineland, N. J., Dec. 30, 1892, **DANIEL H. GREGORY**.
Funeral services will be held from his late residence, at Albany, N. Y.; Tuesday afternoon at 2 o'clock.

HARRIS.—At East Orange, on Jan. 1, **JULIANA**, widow of the Rev. N. Hayro Harris and daughter of the late James A. Stevens of Hoboken, N. J.
Funeral services at the Reformed Episcopal Church, Halsey St., Newark, N. J., Tuesday morning at 11 o'clock. Interment at Trenton, N. J., private.
Boston papers please copy.

HENDERSON.—On Sunday, Jan. 1, 1893, at Far Rockaway, N. Y., **ANN HENDERSON**, widow of James Henderson, late of Westchester, N. Y., in her 76th year.
Funeral Wednesday, Jan. 4, at 11 o'clock A. M., from her late residence at Far Rockaway. Interment at Woodlawn Cemetery. Friends will please omit flowers.

HOGG.—On Friday, Dec. 30, **THOMAS HOGG**, in the 73d year of his age.
Relatives and friends, also the members of the Torrey Botanical Club, are invited to attend the funeral services at the Central Baptist Church, 220 West 42d St., on Monday, Jan. 2, at 1:30 P. M.

HUNT.—At New Rochelle, Saturday, Dec. 31, suddenly, of pneumonia, **THOMAS**, only child of Thomas and Helen Jewett Hunt, aged 13 months.
Funeral private.

KETCHAM.—On Saturday, Dec. 31, **ELIZA BARK DOLPH**, wife of Enoch Ketcham and daughter of the late Jesse Van Arken.
Funeral services from her late residence, No. 7 East 85th St., on Wednesday, the 4th inst., at 10 o'clock A. M. Kindly omit flowers.

PLUM.—At El Paso, Texas, on Jan. 1, 1893, **JAMES R. PLUM, JR.**, son of James R. and the late Margaret Townsend Plum, in the 27th year of his age.
Notice of funeral hereafter.

SOCHAUS.—On Dec. 20, **WILLIAM SOCHAUS**, in the 72d year of his age.
Funeral from his late residence, 90 East 38th St., on Monday, Jan. 3, at 10 A. M. Funeral private. It is requested no flowers be sent.

SEGGE.—At her late residence, **REUBENA BOHR**, wife of B. M. Segge and daughter of the late John G. Bohr.
Funeral private.

SIMON.—On Thursday, Dec. 30, **EDWARD B. SIMON**, age 47.
Funeral on Monday, Jan. 3, at 9:30 A. M., from his late residence, 40 East 70th St. Please omit flowers.

STURGIS.—On Tuesday, Nov. 22, **DORIS ELLIOT**, wife of Appleton Sturgis of this city and daughter of the late Hon. T. D. Elliot of New Bedford.
Boston papers please copy.

TAYLOR.—On Saturday morning, **CATHERINE ANNE**, widow of Moses Taylor, in the 83d year of her age.
Funeral services will be held at her late residence, No. 122 6th Av., on Wednesday Jan. 4, at 11 A. M. Relatives and friends are invited to attend.

TOWNSEND.—At Mattituck, L. I., Dec. 30, **MARY ELIZABETH**, wife of Isaac Townsend, in the 75th year of her age.
Funeral services at St. Paul's Church, Gian Cove, on Monday, at 12:30 P. M., on arrival of 11 o'clock train from Long Island City.

WHITNEY.—On Saturday, Dec. 31, 1892, **ELLIS J. WHITNEY**.
Friends are invited to attend the funeral services at his late residence, 138 St. James's Place, Brooklyn, on Tuesday evening, Jan. 3, at 8 o'clock.

DIED. March 1868

BEAM.—On Monday, March 16, of membranous croup, ALBERT FOOK BEAM, aged 8 years, only child of Jesse C. and Marika Beam.

The relatives and friends of the family are invited to attend the funeral from his late residence, No. 8 Humpden-st., this (Tuesday) afternoon at 3 o'clock.

CAHILL.—On Monday, March 16, AMELIA E. CAHILL, only daughter of Thomas G. and Amelia E. Cahill, of scarlet fever, aged 2 years, 7 months and 8 days.

The funeral will take place at the residence of her parents, Factoryville, S. I., at 2 o'clock to-day. Relatives and friends are respectfully invited to attend.

CLARKE.—In Brooklyn, on Monday, March 16, BESSIE, daughter of S. T. and Charlotte A. Clarke, aged 8 years and 8 months.

The funeral will take place on Wednesday at 2 P. M., from No. 17 1st-place, to which friends are invited without further notice.

CROOK.—In Brooklyn, on Saturday morning, March 14, RUFUS CROOK, aged 62 years.

The relatives and friends of the family are invited to attend his funeral on Tuesday, 17th inst., at 9 o'clock P. M., from his late residence, corner of Layayette-av. and Oxford-st.

FARMCHILD.—At Flushing, L. I., on Sunday, March 16, EMILY, infant daughter of Rev. and Mrs. E. S. Fairchild.

Funeral this day, (Tuesday,) 17th inst., at 2 P. M.

GILES.—In Brooklyn, on Monday, March 16, JOS. CARREN, son of James H. and Mary C. Giles, aged 6 months.

The funeral will take place on Wednesday at 2½ P. M., from No. 218 Raymond-st.

LEYERICH.—Suddenly, on Sunday morning, March 16, JANE E., daughter of the late Col. Edward Leyerich, of Newtown, L. I.

The relatives and friends and those of her brothers, Henry B. and Charles F. Leyerich, are invited to attend her funeral on Wednesday morning, the 18th inst., at 11 o'clock, from her late residence, No. 49 East 18th-st. The remains will be taken to the Presbyterian Church at Newtown, L. I., where funeral services will be performed at 8 o'clock P. M. The Flushing Railroad cars leave Hunter's Point at 2½ o'clock; returning at 5 o'clock P. M.

LINFORD.—On Sunday, March 16, GEORGINA, youngest daughter of George and the late Mary Ann Linford, aged 28 years, 6 months and 12 days.

The relatives and friends of the family are respectfully invited to attend the funeral from her late residence, No. 207 East 52d-st., this (Tuesday) afternoon at 1 o'clock, without further invitation. Her remains will be taken to Cypress Hills for interment.

LYLE.—On Sunday evening, March 16, HARRIET DUMBLEY VAN NESS, widow of the late John V. A. Lyle, and daughter of the late Jacob Van Ness, of Dutchess County, aged 56 years.

Notice of funeral hereafter.

~~Orange~~ Dutchess and Columbia County papers please copy.

MILLER.—On Sunday, March 16, EMMA, eldest daughter of John T. and Catherine E. Miller, aged 17 years and 20 days.

The relatives and friends of the family are respectfully invited to attend the funeral from St. Michael's Church, Bloomingdale, this afternoon at 1 o'clock.

~~Orange~~ Orange County papers please copy.

MORSE.—On Saturday, March 14, JAMES W. MORSE, in the 89th year of his age.

The relatives and friends of the family are respectfully invited to attend the funeral from his late residence, corner of 84th-st. and Madison-av., on Thursday, March 19, at 1 o'clock P. M.

PALMER.—In Brooklyn, on Sunday, March 16, of apoplexy, Rev. JOSEPH PALMER, in the 69th year of his age.

The relatives and friends of the family are invited to attend the funeral from his late residence, No. 45 Tompkins-place, on Wednesday, March 18, at 1 o'clock P. M.

PLUMMER.—In Brooklyn, N. Y., on Sunday, March 16, ROSEWELL PLUMMER, in the 64th year of his age.

The relatives and friends of the family are respect-

DIED - Nov. 1, 1887

- BARCLAY.**—In Hartford, Conn., Oct. 20, 1887, A. ADALBERT E. W. BARCLAY, son of Anna Waldberg and the late Anthony Barclay, aged 53 years.
 Remains date, ANNA WALDBERG, widow of Anthony Barclay, in her 83d year.
 Funeral services in Hartford this (Tuesday) afternoon at 3 o'clock. Committal services of both at St. Mark's Church, this city, on Wednesday afternoon at 12:30 o'clock.
- BRIGGS.**—At his residence, Mamaroneck, Friday, Oct. 28, LEWIS BRIGGS.
 Relatives and friends are invited to attend the funeral services at the Methodist Episcopal Church, Rye Neck, on Tuesday afternoon, Nov. 1, at 2:30. Carriages will be in waiting at Mamaroneck station on arrival of train leaving Grand Central Depot at 1:20.
- CHAMBERLAIN.**—At Summit, New Jersey, on Monday, Oct. 31, WILLIAM M. CHAMBERLAIN, M. D., of New York City.
 Funeral services will be held on Wednesday, Nov. 2, at 8 o'clock, at the West Presbyterian Church, 42d-st., between 5th and 6th avs. Interment at Manover, N. H. It is kindly requested that no flowers be sent.
- CLAPP.**—In Brooklyn, suddenly, Oct. 31, SOPHIA R., wife of Herbert W. Clapp and daughter of the late John and Margaret Sawyer.
 Funeral from her late residence, 152 Bergen-st., Thursday at 3 P. M. Relatives and friends respectfully invited.
- FOSTER.**—On Monday, Oct. 31, of pneumonia, ALONZO A. FOSTER.
 Funeral services at his late residence, 231 Carlton-av., Brooklyn, on Wednesday, Nov. 2, at 2 P. M. Friends are invited to attend. Interment at convenience of family. Please omit flowers.
- GER.**—At his residence, King's Bridge, New York City, Oct. 30, WILLIAM HAROLD GER.
 Funeral services at the Church of the Mediation, King's Bridge, Wednesday, Nov. 2, at 2 P. M. Trains leave the Grand Central Depot at 1 P. M.
- GLEASON.**—Oct. 30, Mrs. AUGUSTA M. GLEASON, daughter of the late Chas. A. G. Depow.
 Funeral services at her late residence in Peekskill, on Wednesday, Nov. 2, at 1:30. Please omit flowers.
- GEORGE.**—At his place near Lexington, Ky., Oct. 30, JOHN W. GEORGE, in the 54th year of his age.
 Interment at Lexington, Ky.
- HOWE.**—On Monday, Oct. 31, STEWART D. HOWE, 212 West 124th-st.
 Notice of funeral hereafter.
- LOW.**—Suddenly, on Oct. 29, at the Victoria Hotel, JOHN LOW, in the 68th year of his age.
 Funeral on Wednesday morning, Nov. 2, at 10 o'clock, from Trinity Chapel, West 25th-st., near Broadway.
- MELVILLE.**—At St. Louis, on Monday, Oct. 31, of pneumonia, CAROLINE A., widow of Theodorolphus Melville, in the 86th year of her age.
- MILES.**—In London, England, on Oct. 17, CATHERINE, daughter of the late Dr. A. Miles.
 Funeral services will be held at St. James's Church, Madison-av. and 71st-st., on Wednesday, Nov. 2, at 10:30 A. M.
- NAZRO.**—Suddenly, Oct. 29, JOHN PAINE NAZRO, aged 80 years.
 The funeral service will be held at Trinity Chapel, West 25th-st., on Tuesday, Nov. 1, at 4:15 o'clock. Interment at Troy, N. Y.
 Troy papers please copy.
- THOMAS.**—On Sunday, Oct. 30, suddenly, LYDIA G., widow of M. H. Thomas, in her 84th year.
 Funeral services at her late residence, 107 West 47th-st., Tuesday, Nov. 1, 11 A. M. Kindly omit flowers.
- WILSON.**—On Sunday, Oct. 30, MURRAY WILSON, infant son of Edward W. and Jennie Rumrill Wilson, aged 5 months.
 Funeral services (private) will be held at the residence of Alexander Rumrill, Esq., No. 47 West 82d-st., on Tuesday morning.

MARRIED.

JOSEPHI - HAMMERSLOUGH.—On Tuesday evening, Nov. 1, at the residence of the bride's parents, by the Rev. Dr. Gotthell, SYLVIA, eldest daughter of Edward Hammerslough, to ISLAH JOSEPHI.

LYMAN-SMITH.—On Tuesday evening, Nov. 1, at the residence of the bride's parents, by the Rev. Dr. S. B. Rossiter, and the Rev. Dr. S. J. Horton, ALICE SMITH to Dr. Jas. WALTER LYMAN, all of New-York City.

DIED.

1887.

BARCLAY.—In Hartford, Conn., Oct. 29, 1887, A. ADALBERT E. W. BARCLAY, son of Anna Waldberg and the late Anthony Barclay, aged 53 years.

Home date, ANNA WALBURG, widow of Anthony Barclay, in her 88th year.

Funeral services in Hartford this (Tuesday) afternoon at 3 o'clock. Committal services of both at St. Mark's Church, this city, on Wednesday afternoon at 12:30 o'clock.

CHAMBERLAIN.—At Summit, New-Jersey, on Monday, Oct. 31, WILLIAM M. CHAMBERLAIN, M. D., of New-York City.

Funeral services will be held on Wednesday, Nov. 2, at 3 o'clock, at the West Presbyterian Church, 42d-st., between 5th and 6th avs. Interment at Manover, N. H. It is kindly requested that no flowers be sent.

CLAPP.—In Brooklyn, suddenly, Oct. 31, SOPHIA H., wife of Herbert W. Clapp and daughter of the late John and Margaret Sawyer.

Funeral from her late residence, 152 Bergen-st., Thursday at 8 P. M. Relatives and friends respectfully invited.

COX.—At Mobile, Ala., on the 27th ult., HENRY COX, son of Henry H. and Louisa Cox, formerly of Brooklyn.

GARDENIER.—Suddenly, Monday, Oct. 31, RANOLDH GARDENIER, at his late residence, 192 South 5th-st.

Funeral private.

FOSTER.—On Monday, Oct. 31, of pneumonia, ALONZO A. FOSTER.

Funeral services at his late residence, 281 Carlton-av., Brooklyn, on Wednesday, Nov. 2, at 2 P. M. Friends are invited to attend. Interment at convenience of family. Please omit flowers.

GORMLEY.—At Constableville, New-York, on Saturday, Oct. 29, JANE ELIZA GORMLEY, widow of T. E. Gormley and daughter of the late Jacob Brunner, of New-York City. Interment at Constableville.

HOWE.—On Monday, Oct. 31, STEWART D. HOWE. Funeral services 212 West 124th-st., Wednesday, Nov. 2, 3 P. M. Interment at convenience of the family. Please omit flowers.

LOW.—Suddenly, on Oct. 29, at the Victoria Hotel, JOHN LOW, in the 88th year of his age. Funeral on Wednesday morning, Nov. 2, at 10 o'clock, from Trinity Chapel, West 25th-st., near Broadway.

MILES.—In London, England, on Oct. 17, CATHARINE, daughter of the late Dr. A. Miles. Funeral services will be held at St. James's Church, Madison-av., and 71st-st., on Wednesday, Nov. 2, at 10:30 A. M.

PINCKNEY.—On 1st of November, in his 95th year, EUGENE, son of Charles C. and J. A. Pinckney.

Services at 45 New-York-av., Brooklyn, on Thursday evening, 3d inst., at 8 o'clock. Interment private.

SCHEUBART.—HENRY SCHEUBART, on Nov. 1, in his 74th year.

Funeral from his late residence, 301 West 125th-st., on Thursday, Nov. 3, at 9:30 A. M. Please omit flowers.

STODDARD.—Dr. HAMMOND STODDARD, of Brooklyn, N. Y., Oct. 30, 1887.

Funeral from the church of West Cornwall, Conn., on Thursday at 1 o'clock. Trains leave Grand Central Depot at 8 o'clock A. M.

STOOFFHOFF.—At Jamaica, L. I., on Nov. 1, SARAH W., widow of William C. Stoeffhoff, in the 86th year of her age.

Relatives and friends are invited to attend the funeral on Thursday afternoon at 2 o'clock, from her late residence, without further invitation. Carriages will be at Jamaica depot on arrival of trains leaving Long Island City and Flatbush-av. at 11 and 1 o'clock.

TODD.—At Katonah, N. J., on Tuesday, Nov. 1, MARY A., wife of Abraham H. Todd, in the 74th year of her age.

Funeral will take place on Friday at the M. E. Church, Katonah, at 2 P. M.

WALLER.—At his residence in Chicago, on Saturday, Oct. 29, EDWARD WALLER, formerly of the late firm of Loos & Waller.

DEATHS REPORTED JULY 2.

Manhattan and Bronx.

Ages of one year or under are put down one year.

Name and Address.	Age in Yrs.	Date of July.
ADINOLLE, Albertina, 818 5th Av.	2	1
ARLINO, Maria G., 82 Mulberry St.	1	1
BOHNERBERGER, Annie, 39 7th St.	60	1
BRITZLER, Elizabeth, 610 E. 14th St.	1	1
BRENNHART, Margaret, 204 E. 44th.	88	1
BERNOUTH, Nigel, Brooklyn.	21	1
BATTISON, Marcella, 435 W. 50th St.	54	1
BARKER, Josephine, 311 W. 29th St.	28	1
BARNES, Margaret, Almshouse.	81	1
BENNEY, Joseph W., 1,205 Boston Av.	81	1
BURRINGER, Caroline, 660 E. 15th.	64	1
CALOCCHA, Raffaela, 140 Elizabeth.	1	1
*CLEARY, Bridget, 2,800 Broadway.	49	30
COMERTFORD, Lizzie, 544 W. 68th St.	3	1
*COSTER, Louise, Manh. State Hosp.	20	30
*CUGAN, Catherine, 2,228 5th Av.	69	30
CONLON, Madeline, 120 Lawrence St.	2	1
COATE, David, 212 Sullivan St.	1	1
CALEN, John, 601 W. 87th St.	43	1
CROSS, Samuel H., 218 E. 81th St.	68	1
COYNE, Mary, 600 E. 10th St.	2	1
*CUMMINGS, George P., 187 St. Nich- ols Av.	25	30
DIA CESARA, Amalia, 220 Sullivan.	12	1
DONNELLY, Catherine, 120 Leroy St.	72	1
DALTON, Joseph, 21 W. 101st St.	77	1
DUGHERTY, Catherine, 151 Ludlow.	68	1
*FINNEGAN, James, 323 E. 46th St.	4	30
*FILLARDIST, John J. E., 308 W. 30th St.	25	30
FANELLO, Frances, 17 Spring St.	64	1
FELISCO, Patrick, 401 E. 60th St.	24	28
*FANNING, Edward, 541 W. 20th St.	61	30
FUTZPATRICK, Edward A., 30 Attor- ney St.	42	30
*FINNEGAN, Joseph, 81 Carmine St.	2	1
GALVEY, Della, 533 W. 40th St.	20	1
GOLDFINGER, Rose, 881 E. 4th St.	1	1
HILL, Albert H., 534 W. 12th St.	20	1
*HARVEY, Elizabeth M., 2,438 8th Av.	1	30
*HAAS, Helen L., 258 W. 128th St.	27	30
HAYWARD, Sarah L., Providence, I. I.	82	1
*HARVIG, Hubert, Isabella Home.	70	30
HANNBY, William, 31 Charlton St.	67	1
HONNETT, Honor, 157 E. 20th St.	72	1
HOWARTH, Stephen, 812 W. 85th St.	1	1
HULL, Henry H., 519 E. 148th St.	1	1
HOLTER, Madeline, 820 Broadway.	68	2
HARRIS, Velchor, 10 Lawrence St.	63	1
JOEKE, Joseph, St. Joseph's Hospital	42	1
KELLY, John, 200 E. 44th St.	19	1
KILREDDY, Mary C., 331 E. 30th St.	1	1
*KLOCKMANN, Doris, 680 Summit St.	72	30
KELLY, Katie, 135 Worth St.	3	1
*LINVILLE, Oatman, 418 E. 115th.	27	30
LAUGHLIN, Thomas, 608 2d Av.	64	1
LELOX, Doris, 233 E. 51st St.	77	1
LEWIS, Johann, 400 W. 43th St.	63	2
*MELORNT, Pasquale, 225 E. 9th St.	2	30
*MULLOFFER, Margaret, 313 W. 80th.	18	30
MOULISSBY, John, 11 N. Moore St.	17	1
MEHEAN, Margaret, 658 1st Av.	1	1
*MELODY, John E., 113 W. 62d St.	22	20
METZ, Benjamin, 402 E. 60th St.	33	1
MURPHY, Margaret, 20 Greenwich St.	67	1
*MURPHY, Winifred, 67 W. 30th St.	6	30
*MALLON, Eliza J., 83 2d Av.	60	30
MULLANS, William, 408 E. 24d St.	2	1
MASON, Margaret, 813 W. 40th St.	14	1
*McGOVERN, Catherine, 250 10th Av.	66	30
*McCAHILL, Michael, 278 W. 12th St.	44	20
McCAFFERY, Paul, 658 11th Av.	1	1

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*NELSON, Oscar, 238 E. 121st St.	27	30
*NEWMETZ, Frank, St. Joseph's Hosp.	27	30
*O'BRIEN, Mary, 47 Market St.	61	30
*O'BRIEN, Frank, 234 W. 60th St.	60	26
*O'CONNOR, Mary, 685 1st Av.	1	2
O'MANLON, Mary, 25th St. 1st and 2d Avs.	68	1
FRITZSEN, William B., 300 E. 44th.	1	1
PIGOT, John, 145 8d Av.	80	1
POLJACHAK, Estella, 1,007 2d Av.	42	1
POLITO, Filomena, 67 Oliver St.	1	1
ROSOSA, Elizabeth, 650 3d Av.	43	1
*ROWAN, Juliana J., 145 W. 88th St.	1	30
RINOTTO, Pasquale, Briggs Av.	62	1
REID, Mary E., 218 W. 61st St.	1	1
ROTHSCHEID, Salina, 108 W. 90th St.	60	1
RYAN, Frank J., 230 W. 10th St.	60	1
SMITH, Sarah, 709 2d Av.	44	1
SPINDLER, Vincenza, 6 Mulberry St.	81	2
SCOTT, Mary, Catholic Protectory.	1	1
SARFATY, Corn, 1,003 E. 105th St.	19	1
SLATKIN, George, Nazareth Hospital.	2	1
SMITH, Bernard, 7 W. 85th St.	62	1
*THOMPSON, William, 650 E. 143d St.	64	1
*VIENMEISTER, Frederick A., 548 Broome St.	64	30
WEINER, Annie, 440 3d Av.	64	1

*Date of death in June.

DEATHS REPORTED JULY 1.

Manhattan and Bronx 1898

Ages of one year or under are put down one year.

Name and Address.	Age in Yrs.	Date of Dea.
BRADY, Thomas, 1013 Park Av.	28	29
BEOLBY, John, 311 E. 105th St.	3	30
BRADY, John, Marcher Av. and 173d.	65	28
BENDER, Edward, City Prison.	48	30
BUSCH, Lizzie, 1,118 1st Av.	12	29
*BATTISTA, Angelo, 405 W. 18th St.	39	1
COSTEMALE, Jenn, 135 W. 27th St. ...	22	29
CLANCY, Joseph, 418 W. 53rd St.	1	29
CARUCCI, Tommaso, 2,055 1st Av.	53	30
CRANSON, Nora, Bellevue Hospital.	35	1
COFFEY, Julius M., 1,508 3d Av.	48	28
CASHMAN, Thomas P., 740 10th Av. ...	22	30
DORCY, William, 553 W. 55th St.	1	29
DORAN, Bridget, 291 E. 121st St.	75	29
EBAN, Dominica, Foundling Hospital.	2	27
BRISCOLL, Annie, 30 Jerome St.	20	30
DALNO, Elizabeth, Man. State Hos. ...	34	27
DANDIES, Eva, Man. State Hos.	75	28
*EGAN, Teresa, 635 W. 52d St.	1	1
FLANAGAN, Thomas, 232 E. 78th St.	2	29
FISCHER, Daniel, 63 Columbia St.	43	30
*FROELICH, Sarah, 340 E. 121st St. ...	38	1
GREGGIO, Antonio, 200 E. 44th St. ...	32	30
GRINDLEY, Mary L., 345 W. 87th St.	65	30
*GAUGHAN, Anthony, Almshouse. ...	58	1
GREENE, Edward, 149 E. E. River.	40	30
HART, Margaret, 317 E. 30th St.	71	30
HASKELL, Annie, 414 E. 80th St.	22	30
*IONER, Isidore, 351 E. Houston St. ...	1	1
JACOBS, Samuel, 632 E. 188th St.	60	29
KARPER, Morris, 150 Jerome St.	1	30
KELLY, Christian J., 308 E. 70th St.	25	30
KACKER, Paul, 232 E. 65th St.	38	25
KYLE, William, 2,342 2d Av.	61	24
LEEMAN, Mary, Almshouse.	42	29
LORRINO, Francesco, 4 Varlek Place.	29	30
LUND, Thomas, Almshouse.	73	30
MILBET, John, 132 E. 34 St.	9	30
MISSELI, Mary, 223 E. 97th St.	12	30
MIRPHY, Felix, 182 E. 117th St.	62	30
METZGER, Richard, 110 W. 137th St.	65	30
McKINNEY, William H., 60 Prospect Place.	79	29
McMILLLEN, John, 210 W. 33d St.	63	30
OLPARSKI, Annie, 73 Market St.	2	30
PAULS, Herman, 400 W. 41st St.	64	30
PETERS, John, 362 W. 26th St.	8	27
*PHILLIPS, Henry, 408 W. 42d St.	1	1
PERLMAN, Abraham, 348 Madison St.	8	30
ROSENZWEIG, Samuel, 342 E. 121st.	25	30
ROTHENBERG, Hyman, 418 E. 75th.	45	30
LUNG, Julia, 804 3d Av.	67	30
ROSENKIN, Anna, 304 Cherry St.	45	29
ROBINSON, Aaron, 144 Av. A.	25	30
STROSSBERG, Hannah, 1,146 2d Av. ...	57	29
SINCOFF, Myer, 177 Ludlow St.	4	30
SEIDENBERG, Abraham, 204 Clinton St.	66	29
STAATS, William J., 648 Hudson St. ...	2	28
SNYDER, Agnes, 332 W. 10th St.	85	29
STERCKWELD, Mary, 501 W. 31st.	69	29
STOVELL, John I., 200 E. 97th.	1	29
SKLUNDO, Mary, 236 Av. D.	38	30
VOLENTE, Concetta, 401 E. 108th St.	27	30
WITZEL, Bernhard, 829 9th Av.	79	29
WIEBER, Anton, 540 W. 64th St.	64	30
YOKL, Sen, 238 Monroe St. A. V.	41	30
ZILLER, Lena, 232 E. 24th St.	91	30
ZUNNO, Roberto, 220 W. Broadway. ...	1	30

Brooklyn.

*ASHER, William, 179 Javn St.	10	1
*BERNARDI, A., 105 Bedford Av.	32	1
BRAIN, A. B., 323 St. and Avenue F.	67	30
BENKA, Robert, 235 Pacific St.	45	29
BACHER, Eva, 705 Park Av.	78	29
BILLEN, John, 110 Kingsland Av.	72	29
BORSCHOW, William, 230 Sackett St.	54	1
*CAMPBAY, Walter, 301 Water St. ...	10	1
CAMMINO, Catherine, 497 Warren St.	62	30
CITLY, Thomas, 70 Talman St.	28	30
CONYER, W., 701A Monroe St.	4	29
COLLIE, Rudolph, 220 Johnson Av. ...	55	29
CONNELL, Katherine, St. Mary's Hosp.	27	30
*CONNELLY, P., 820 Atlantic Av. ...	60	1
DRESSEL, Mary, 238 Troutman St. ...	72	29
DEGROOT, Charles, 1,128 40th St. ...	7	29
DOYLE, Mary, 183 Front St.	1	30
*FACHERT, Emilie, 100 Elmyr St.	33	1
IPPOLITO, Philomona, 1,472 Myrtle Av.	8	30
FLANNERY, James, 191 Prince St. ...	18	30
GREEN, Julia, 40 Benet St.	1	30
GARDNER, Theodor, 216 Bedford Av.	1	28
GORDANO, Maria, 42 Front St.	1	30
HARTBERT, John, 342 Central Av. ...	47	29
HART, Phyllis, 42 Howard Av.	1	29
HENDER, Edwin, Kings County Hosp.	40	30
HENRY, T., Kings County Hosp.	1	27
HOLT, Walfred, Methodist Episcopal Hosp.	27	29
JOHNSON, Charles, 208 N. 7th St. ...	31	29
KELLY, Jane, 141 Jefferson Av.	44	29
KLEBY, Ludwig, 108 Smith St.	60	30
LARSEN, Kund, Jr., 127 Eagle St. ...	1	29
MONICHO, Romano, 478 Adelphi St.	1	30
MEEHAN, Francis, 180 6th St.	1	30
MAIKOVITZ, Nella, 107 Myrtle Av.	40	30
MARSHALL, G., 105 Lenox Place.	54	30
MERZ, C., 315 Stuyv. St.	67	30
MORTT, Wenzel, 1,043 Flushing Av.	73	29
MERRIS, Jacob, Brooklyn Hospital. ...	48	29
MARSHALL, Helen, 605 Clinton Av. ...	25	30
MCNEIL, Ethel, 30 Erasmus St.	1	30
McFEELEY, James, 42 Talman St. ...	35	30
McCAHILL, John, 87 Rockhill St. ...	1	30
McDONALD, Elizabeth, 104 Prospect Av.	48	29
*NOLSON, Nellie, 325 Henry St.	1	1
REYNOLDS, T., 821 De Kalb Av.	67	28
REMECLE, Catherine, 14 Jersey St. ...	20	30
*ROGERS, Kate, 70 Willets St.	1	1
ROSENBER, Harry, 604 Flushing Av.	60	29
SHORT, Terence, 108 N. 8th St.	1	29
STANGE, August, 64 Wyckoff St.	72	30
STEVENEY, Edward, 71 Carroll St. ...	28	27
THIBS, Frederick, 870 Marey Av. ...	60	28
TAYLOR, T., 44 Pierrepont St.	73	30
*WAGNER, George, 142 Graham Av. ...	37	1
WILKIN, W., Washington, corner 1st.	70	30
WHITE, John, Brooklyn Hosp.	48	30

*Date of death July 1.

DIED. Nov 14, 1887

- ADAMS.**—On Friday, Nov. 12, Mrs. SARAH A. ADAMS, in her 70th year.
Funeral Tuesday, 16th inst., at 12 o'clock, from her late residence, 240 East 118th-st.
- BARTLES.**—On Sunday, Nov. 13, MARY D. BARTLES.
Funeral services at her late residence, 136 Flayward-st., Brooklyn, on Tuesday, Nov. 15, at 11 A. M. Interment private.
- BOYNTON.**—Friday, Nov. 11, HENRY C. BOYNTON, aged 30 years.
Funeral at his late residence, 388 Jefferson-av., Brooklyn, Monday, 2 o'clock.
- CASAMAJOR.**—Suddenly, Nov. 13, 1887, PAUL CASAMAJOR, of Brooklyn, in the 37th year of his age.
Notice of funeral hereafter.
- CHATAIN.**—On Wednesday, Nov. 9, ASLAND CHATAIN, at his residence, 142 West 71st-st., in the 61st year of his age.
Relatives and friends are respectfully invited to attend the funeral services at the Church of St. Vincent de Paul, West 23d-st., on Tuesday, Nov. 15, at 10 A. M.
- CONOVER.**—On Saturday, Nov. 12, ALFRED BRONX, son of John S. and Ella E. Conover, aged 8 years.
Interred privately same day.
- FERRIS.**—Nov. 12, 1887, ADA STUART, wife of Oscar C. Ferris.
Funeral at her late residence, 752 Madison-av., on Tuesday, Nov. 15, at 11 A. M.
- MARCELLUS.**—At Brooklyn, Sunday, Nov. 13, 1887, KATHARINE JULIA, wife of J. Lawrence Marcellus.
Friends and relatives are invited to attend the funeral services at her late residence, No. 330 Throop-av., on Tuesday, Nov. 15, at 2 o'clock P. M. Interment private. Kindly omit flowers.
- MCCABE.**—A solemn high mass of requiem (month's mind) will be celebrated at the Church of the Assumption, Peaskill, N. Y., on Monday, 14th inst., at 9:30 A. M., for the repose of the soul of Rev. THOMAS A. MCCABE.
Reverend clergy and friends are invited to attend.
- PATTERSON.**—Sunday, Nov. 13, MARY, widow of Henry Patterson, in the 80th year of her age.
Funeral services at the residence of her son, William H. Patterson, 228 Koebling-st., Brooklyn, E. D., at 8 o'clock P. M., Tuesday, Nov. 15. Burial at convenience of the family.
- REDMOND.**—At Newport, R. I., Nov. 11, MARY LAWRENCE, wife of Wm. Redmon and daughter of the late W. Preston Grille.
Funeral at Trinity Church, Newport, Tuesday next, at 12 M.
- SANXAY.**—In Brooklyn, Sunday, Nov. 13, AGNES, wife of Joseph F. Sanxay.
Funeral services from her late residence, 533 Washington-av., Brooklyn, on Wednesday, Nov. 15, at 2 P. M.
- SMITH.**—On Nov. 12, ALBERT W. SMITH, in the 43d year of his age.
Funeral services at his late residence, 62 West 126th-st., Monday evening at 8 o'clock.
- WHITE.**—On Sunday morning, at her residence, 89 East 70th-st., LURANA DENISON, wife of Samuel H. White, aged 73 years.
The funeral services will be held at the Church of the Holy Spirit, 88th-st. and Madison-av., on Wednesday morning at 10:30 o'clock.
- WILLIAMS.**—On Sunday, Nov. 13, 1887, at the residence of her parents, of Alphithria, SCHOTTY, only daughter of Clara M. and Edward E. Williams, aged 4 years.
Funeral private.
- WILLIAMS.**—Sunday, Nov. 13, at the residence of her son-in-law, C. H. Darrow, 61 Bank-st., JANE WILLIAMS, in the 75th year of her age.
Funeral services at Maudsland-Street Baptist Church, Tuesday, Nov. 15, at 1 P. M. Friends are invited.

DIED. Jan 9, 1893

BARBOUR.—On Thursday, Jan. 6, in the 73d year of her age, ELIZABETH C., widow of William Barbour.
 Relatives and friends are invited to attend the funeral services at her late residence, 21 West 82d St., New-York, on Monday, Jan. 9, at 10 A. M.

BAXTER.—Entered into rest, on Thursday, Jan. 6, 1893, ANNA, widow of Timothy Baxter, in the 86th year of her age.
 Friends are invited to attend funeral services at her late residence, No. 139 Fort Greene Place, Brooklyn, N. Y., on Monday, 9th Inst., at 8 o'clock P. M.

BERRY.—At Woodbridge, N. J., Jan. 6, 1893, MARGARET BERRY, widow of William H. Berry, aged 70 years.
 Funeral services at her late residence on Monday, Jan. 9, 1893, at 2 o'clock P. M. Train leaves New-York via Pennsylvania Railroad at 12:50 P. M.

BURT.—On Sunday, Jan. 8, 1893, JANE BURT, widow of William B., in the 88th year of her age.
 Funeral services at her late residence, 244 West 22d St., on Monday evening at 7:30 o'clock. Interment at Yonkers, N. Y., on Tuesday morning.

CHASTENEY.—Suddenly, at Passaic Bridge, N. J., on Sunday, Jan. 8, EDWARD AUGUSTUS CHASTENEY, in the 44th year of his age.
 Funeral services at St. John's Church, Passaic, N. J., Tuesday, the 10th, at 8 P. M. Train leaves foot of Chambers St. at 7 P. M.
 Boston and Philadelphia papers please copy.

COOK.—Suddenly, Sunday, Jan. 8, JOHN W. COOK, in the 65th year of his age.
 Notice of funeral hereafter.

DASPARD.—On Saturday, Jan. 7, 1893, at Hawthurst, Ardenbar, S. I., of dysentery, KATHARINE GRANTONIX, twin daughter of Clement Lyndon and Caroline Russell Daspard, in the 4th year of her age.
 Interment at the convenience of the family.
 Boston papers please copy.

DURVEA.—At Flushing, N. Y., on Wednesday, Jan. 4, 1893, suddenly, MRS. CHARLOTT ELLISON DURVEA, eldest daughter of the late Elijah T. Brown.
 Funeral from the house of her sister, Mrs. Stanton, 103 First Place, Brooklyn, on Monday, Jan. 9, 1893, at 8 o'clock P. M.

ELDER.—In Philadelphia, Jan. 7, of heart failure, HULKH H., wife of the late Dr. L. W. Elder.
 Funeral Monday, Jan. 9, 1893, 12 A. M., Trinity Church, 7th and Washington Sts., Hoboken, N. J. Interment at convenience of the family.

FALCONER.—On Thursday, Jan. 6, 1893, WILLIAM W., son of W. M. Falconer, in the 41st year of his age.
 Funeral services from his late residence, 105 West 131st St., Monday evening, Jan. 9, at 8 o'clock. Relatives and friends are respectfully invited to attend. Interment at convenience of the family.

FOSTER.—At New-Brunswick, N. J., early Sunday morning, Jan. 8, JOHN FOSTER, in the 61st year of his age.
 Funeral on Tuesday, Jan. 10, at 3 P. M., from the residence of his daughter, Mrs. Theodore B. Boersom, 62 Bayard St., New-Brunswick, N. J.

KELP.—On Jan. 7, MARGARET VOYLING, daughter of the late Richard T. Halbes, Esq., and wife of Robert F. Kuep.
 Funeral at Norwich, Conn., Monday, 9 P. M.

KNIGHT.—On Jan. 8, GEO. W. KNIGHT.
 Funeral services will be held at his late residence, 184 Lewis Av., Brooklyn, on Wednesday, Jan. 11, at 8 P. M.

LOW.—On Saturday, Jan. 7, 1893, AMIEL AUGUST LOW, in the 82d year of his age.
 Funeral services at the Church of the Saviour, Pierpoint St., corner Marrou Place, Brooklyn, on Tuesday, Jan. 10, at 10 A. M. Kindly omit flowers.

MILLER.—On Saturday morning, Jan. 7, 1893, EUGENE MILLER, age 41.
 Funeral from his late residence, 519 West End Av., on Monday, Jan. 9, at 1:30 o'clock P. M. Kindly omit flowers.

OWEN.—On Jan. 6, RICHARD OWEN, at his late residence, 828 East 138th St.
 Funeral services at the Methuon Presbyterian Church, 137th St., east of Willis Av., Monday, 10:30 A. M. Take Fort Morris cars at Harlem Bridge.

POLYMAUS.—Suddenly, on Saturday, Jan. 7, MARIA TIENOUT, widow of Theodore Polymaus, in the 78th year of her age.
 Funeral services will be held at her late residence, No. 60 Houston St., Brooklyn, Tuesday morning, Jan. 10, at 11 o'clock. Please omit flowers.

SMITHEY.—On Sunday, Jan. 8, ANNA M., youngest daughter of Alfred and Mary T. Smithey, in the 10th year of her age.
 Funeral from residence of her parents, 585 1/2 Lafayette Av., Brooklyn, on Monday, Jan. 9, 7:30 P. M.
 Buffalo papers please copy.

WHITEHEAD.—WILLIAM WHITEHEAD, Captain, United States Navy, suddenly, of pneumonia, at Jeangu Island Navy Yard, on Sunday morning, Jan. 8.
 Funeral services at St. James's Church, Philadelphia, on Wednesday, Jan. 11, at 11:30. Interment at St. James the Less.

WINDSOP.—Jan. 7, suddenly, RICHARD E. WINDSOP, formerly of Buffalo.
 Buffalo papers please copy.

WOODRUFF.—On Thursday, Jan. 6, at Datchworth, Surrey, England, JESSIE D. WOODRUFF, widow of Capt. John R. Woodruff, R. N., and mother of John H. P. Woodruff of New-York, in the 77th year of her age.
 VETERANS OF THE SEVENTH REGIMENT, N. G. N. Y.—The death of our comrade, C. A. GARZA, on the 6th Inst. is hereby announced with deep regret. Members of the organization are requested to meet in the lecture room of the Fourth Presbyterian Church, No. 118 West 84th St., on Monday, Jan. 9, at 12:45 o'clock P. M., to attend the funeral services.
 EDWARD O. ARTHUR, Colonel

DIED. *Nov 10, 1887*

- BAILEY**.—At Norwalk, Conn., Tuesday, Nov. 8, SAMUEL S., son of the late Samuel H. and Georgiana Bailey, in the 39th year of his age. Funeral services at the home of his mother, 148 Main-st., Thursday, Nov. 10, at 3:30 o'clock P. M.
- CALDWELL**.—Stamford, Conn., on Monday, Nov. 7, ANITA SMITH, wife of Josiah Caldwell and daughter of the late Richard Dimock Smith, of Cuba. Relatives and friends of the family are invited to attend the funeral at St. Michael's Church, Bristol, R. I., on Friday, 11th inst., at 10:30 A. M.
- COOK**.—On Tuesday, Nov. 8, CATHARINE, wife of the late Edward Cook and daughter of the late George Ireland, aged 82 years and 11 months. Funeral services at her late residence, 104 East 39th-st., on Friday, Nov. 11, at 2 o'clock P. M.
- DE FOREST**.—At his residence, No. 17 East 47th-st., Wednesday evening, Nov. 9, after a lingering illness, CONNELLUS V. DE FOREST. Funeral services Friday, Nov. 11, at 9 o'clock P. M.
- DUFF**.—At his home, on Tuesday evening, Nov. 8, 1887, EDWARD MORTIMER, son of Mary Wilton and the late John G. Duff, in the 29th year of his age. Funeral services at his late residence, 321 East 85th-st., on Friday evening at 8 o'clock. Please omit flowers. Interment private.
- EDWARDS**.—On Tuesday P. M., 8th inst., suddenly, of apoplexy, JAMES M. EDWARDS, late of 23 West 48th-st., in his 83d year. Friends are invited to attend the funeral services at residence, 133 West 127th-st., on Friday, 11th inst., at 12 o'clock M. Please omit flowers.
- HAYS**.—On Nov. 8, 1887, SARAH F., daughter of the late Mr. A. B. Hays. Relatives and friends are respectfully invited to attend her funeral services at the Scotch Presbyterian Church, 14th-st., east of 8th-av., on Thursday afternoon, Nov. 10, at 8 o'clock. Interment, Marble Cemetery.
- JACOBS**.—At No. 255 West 54th-st., on Wednesday, Nov. 9, 1887, ELIZA JANE, wife of Val H. Jacobs, aged 81 years. Notice of funeral hereafter.
- LEWIS**.—At Lookout Mountain, Tenn., on Nov. 3, 1887, DAVID D. LEWIS, son of the late Rev. Edward Z. Lewis, in the 29th year of his age.
- MEHRBACH**.—On Wednesday, Nov. 9, in his 89th year, ABRAHAM MEHRBACH. Funeral services at the residence of his daughter, Mrs. Th. Gottschalk, 145 East 45th-st., on Friday, Nov. 11, at 10 A. M. Relatives and friends, also Chovra Anacho Emanuel, are invited to attend. Please omit flowers.
- MOORE**.—On Nov. 8, JOHN ELIOT MOORE, after a lingering illness, in the 70th year of his age. Funeral from his late residence, 80 Clifton-place, Brooklyn, this day at 1:30 P. M. Interment at Mount Auburn Cemetery, Cambridge, Mass.
- PURDY**.—At Los Angeles, Cal., Oct. 28, EMEUC L. PURDY. Funeral services at 77 West 55th-st., Thursday, 10th inst., at 11:30 A. M. Burial at Greenwood at convenience of family.
- STEWART**.—At Flushing, L. I., Nov. 6, 1887, CHARLES J. STEWART, in the 46th year of his age. Funeral services at St. John's Church, Cold Spring Harbor, Long Island, on Thursday, Nov. 10, at 2 P. M. Carriages will be in attendance at Syosset on arrival of train leaving Long Island City at 9 o'clock.
- VAN DERHOOP**.—At Norwood, N. J., on Sunday night, Nov. 6, CONNELIG S. VAN DERHOOP, aged 77 years. Funeral services in the Presbyterian Church, Norwood, Thursday, Nov. 10, at 9:30 A. M., and at the residence of his daughter, Mrs. Edward Van Oplen, 21 Park-av., New York, at 2 P. M. Relatives and friends invited to attend. Interment at Woodlawn.
- WOODRUFF**.—On Monday evening, Nov. 7, ALONZO P. WOODRUFF. Relatives and friends are invited to attend the funeral at No. 8 West 50th-st., Thursday morning at 10 o'clock. Please omit flowers.

DIED. Nov. 1887

- BONNER.**—In Brooklyn, on Thursday, Nov. 3, 1887, **MARLETTINE J.**, widow of Lionel T. Bonner. Relatives and friends are respectfully invited to attend the services at her late residence, 371 Jefferson-av., Brooklyn, on Saturday, Nov. 5, at 2:30 P. M. Interment private.
- COATES.**—On the 2d inst., **ABRAHAM COATES**, in the 84th year of his age. Relatives and friends are invited to attend the funeral services at his late residence, 1,514 Arch-st., Philadelphia, on Saturday afternoon punctually at 2 o'clock. Interment private. Please omit flowers.
- ELGAR.**—On Wednesday morning, Nov. 2, **JAMES ELGAR**, in the 88th year of his age. Relatives and friends of the family are invited to attend the funeral services on Friday evening, Nov. 4, at 8 o'clock, at his late residence, 324 West 32d-st. Interment at convenience of the family.
- HADDEN.**—On Wednesday evening, Nov. 2, at her residence, No. 18 East 33d-st., **ELIZABETH FARKQUIER HADDEN**, youngest daughter of the late David Hadden. Funeral services at the Church of the Heavenly Host at 10 A. M. Saturday, the 5th inst.
- MANNING.**—On Wednesday morning, Nov. 2, **RICHARD H. MANNING**, in the 70th year of his age. Funeral on Friday, Nov. 4, at 2 o'clock P. M., from his late residence, 305 Clinton-av. Kindly omit flowers.
- MELVILLE.**—At St. Louis, on Monday, Oct. 31, of pneumonia, **CAROLINE A.**, widow of Theodolpus Melville, in the 88th year of her age. Relatives and friends are invited to attend the funeral services from the residence of her son-in-law, 41 Linden-st., Brooklyn, on Friday at 2:30 P. M.
- PRJOR.**—In Brooklyn, Nov. 1, **JOHN PRJOR**, in his 88th year, born in Trowbridge Wils, England. Funeral services at the residence of his daughter, Mrs. Walgrove, 710 Nostrand-av., on Friday, Nov. 4, at 7:30 P. M. Relatives and friends invited.
- RENINGTON.**—On Thursday, Nov. 3, **NORMA HORTWICK**, wife of Stephen C. Rensington, aged 87 years. Friends and relatives are invited to attend the funeral from the residence of Mr. H. P. Hildreth, 50 New-York-av., Brooklyn, on Sunday, Nov. 6, at 2 P. M.
- RYON.**—On Thursday morning, Nov. 3, **FREDERICK S. RYON**, son of the late Mary A. Ryon, in the 20th year of his age. Funeral services will be held from his late residence, 187 Rose-st., Brooklyn, Friday, 4th inst., at 7:30 P. M. Interment Saturday, at New-London, Conn.
- BILLOCK.**—On Wednesday, Nov. 2, in her 68th year, **A. CAROLINE**, widow of John J. Billock. Funeral from her late residence, 234 West 21st-st., on Saturday, Nov. 5, at 1 o'clock. Relatives and friends invited.
- TODD.**—At Katonah, N. Y., on Tuesday, Nov. 1, **MARY A.**, wife of Abraham H. Todd, in the 74th year of her age. Funeral will take place on Friday at the M. E. Church, Katonah, at 2 P. M.
- TYLER.**—On Thursday, Nov. 3, **IRAZEEA P.**, wife of Samuel J. Tyler, at her late residence, 1,337 4th-av. Relatives and friends are respectfully invited to attend the funeral Sunday, 10 A. M., from St. Mark's Church, 10th-st. and 2d-av. Interment, Jamaica, Long Island.
- QUINTARD.**—In Brooklyn, on Thursday, Nov. 3, **MARY A. QUINTARD**, wife of John A. Quintard, aged 47 years. Funeral services in the lecture room of the Central Congregational Church, Hancock-st., near Franklin-av., Brooklyn, on Saturday morning, Nov. 5, at 10 o'clock. Interment at Stamford, Conn.

DIED. 1892.

- BLUM.**—On Monday, Oct. 31, in the 85th year of his age, ABRAHAM BLUM, father of Hyman, Isaac, and Aaron Blum and Mathilde Cahin.
Relatives and friends are invited to attend the funeral from his late residence, 1,185 Lexington Av., on Wednesday, Nov. 2, 1892, at 9:30 A. M. THE MOUNT SINAI HOSPITAL, NEW-YORK, NOV. 1, 1892.—The Directors and members of the Mount Sinai Hospital and respectfully requested to attend the funeral of ABRAHAM BLUM, (father of Mr. Hyman Blum, President of the hospital,) on Wednesday, Nov. 2, at 9:30 o'clock A. M., from the late residence of the deceased, No. 1,185 Lexington Av. By order of the Vice President, LEOPOLD WEILL, Honorary Secretary.
- BRICK.**—Suddenly, on Nov. 1, at her late residence, 25 East 28th St., MARIAN STONE, widow of Riley A. Brick.
Notice of funeral hereafter.
- CUTTING.**—At St. Augustine, Fla., Oct. 29, of heart failure, HENRY MASON CUTTING, only son of Lydia Stringer and the late Hayward Cutting.
Funeral services at Grace Church, Broadway, on Wednesday morning, Nov. 2, at 11 o'clock. Relatives and friends are invited to attend.
- DAVIS.**—On Tuesday, Nov. 1, of pneumonia, EDWARD W. DAVIS, in the 72d year of his age.
Funeral services from his late residence, No. 25 East 83d St., on Thursday, Nov. 3, at 4 P. M. Interment at Mount Auburn, Cambridge, Mass., on Friday, Nov. 4, at 1 P. M.
- DODD.**—At Glen Ridge, Bloomfield, N. J., Oct. 31, 1892, ANNE ELIZA, widow of Thomas C. Dodd, in her 71st year.
Funeral from her late residence on Wednesday, Nov. 2, at 2:15 P. M., on arrival of the 1:30 train from New-York via L. J. & W. R. R.
- GARDINER.**—On Monday, Oct. 31, 1892, of heart failure, OLIVER G. GARDINER, aged 79 years.
Funeral services from chapel of the Broadway Tabernacle, Broadway and 34th St., on Wednesday, Nov. 2, at 2:30.
- HINES.**—In Brooklyn, on Monday, Oct. 31, MARIA LOUISA, widow of Stephen S. Hines.
Relatives and friends respectfully invited to attend the funeral from her late residence, 72 Second Place, on Thursday, Nov. 3, at 11 A. M. Please omit flowers.
- LICHTENSTEIN.**—Monday morning, Oct. 31, IDA BLAY, daughter of Seaman and Catharine Lichtenstein, in her 19th year.
Funeral services at the residence of her parents, 14 West 74th St., this (Wednesday) afternoon, Nov. 2, inst., at 2 o'clock. Interment private. (Savannah (Ga.) and San Francisco (Cal.) papers please copy.)
- LYMAN.**—At her residence, Riverside, Cal., on Sunday, Oct. 30, 1892; MARY L. PHILLIPS, wife of Rev. George Lyman, formerly of Amherst, Mass.
- MEAD.**—At Dupont Home, Oct. 31, CATHARINE MEAD.
Funeral at Home, Wednesday, 2 P. M.
- MYERS.**—On Monday, Oct. 31, 1892, of pneumonia, MATTHEW M., son of Sarah M. and the late John K. Myers.
Relatives and friends are invited to attend the funeral services at 110 East 37th St., on Wednesday, Nov. 2, 1892, at 11 A. M. Kindly omit flowers.
- PARKER.**—On Oct. 30, MARY ANN, widow of Joseph Parker, in the 89th year of her age.
Relatives and friends are respectfully invited to attend her funeral from 411 E. 110th St., and Amsterdam Av., on Wednesday, Nov. 2, at 10 A. M.
- PORTER.**—On the 31st October, 1892, ANNA WOODRUFF PORTER, daughter of the late Mortimer Porter.
Funeral services at All Angels' Church, corner of 61st St. and West End Av., on Wednesday, Nov. 2, at 11 o'clock. Kindly omit flowers.
- POST.**—At Westbury, N. Y., on the afternoon of Sunday, Fourth month, 31st, MAARY W., wife of the late Joseph Post, in the 81th year of her age.
Relatives and friends are invited to attend the funeral from Friends' Meeting House on Fifth day, Eleventh month, 3d, at 11 o'clock. Carriages will be in waiting at Westbury on the arrival of the train leaving Long Island City at 9 o'clock.
- RANDOLPH.**—At Elizabeth, N. J., Tuesday morning, Nov. 1, ELIZABETH R., daughter of Harriet Horné R. and Elizabeth H. Randolph.
Relatives and friends are invited to attend the funeral from the residence of her parents, 722 South St., Elizabeth, on Thursday afternoon, Nov. 3, at 2 o'clock.
- RICE.**—Monday, Oct. 31, JOA BOLOISE RICE, only daughter of Edward C. and Laura Emmons Rice, aged 18 years.
Relatives and friends are respectfully invited to attend the funeral services Wednesday, afternoon, 5:30 o'clock, 356 West 57th St.
- ROBERTS.**—JAMES ROBERTS, late of 420 8th St., Brooklyn, suddenly, at Edinburgh, Scotland, on Oct. 29, in the 41st year of his age.
Interment at his native home, Stirling, Scotland.
- STARR.**—At Red Bank, N. J., Oct. 31, KATE G., wife of O. Winthrop Starr, M. D.
- WALLACE.**—On Monday, Oct. 31, ELIZABETH WALLACE, in the 61st year of her age.
Funeral services from her late residence, 2/361 41st St., Fordham, New-York City, on Wednesday, Nov. 2, at 4 P. M. Train leaving Grand Central Depot at 3:07 P. M. Carriages in waiting at Fordham Station.

MARRIED.

POWERS-MOCCUTOBBON.—On Thursday, Dec. 16, 1893, by Rev. Wm. Justin Barsha, **JESSE W. POWERS, Jr.**, to **CLARIK LEISE MOCCUTOBBON**, daughter of Mrs. Catherine Kane.

DIED. Jan. 4th 1893

ARMS.—At Elizabeth, N. J., Jan. 2, 1893, **BENEDICTA**, widow of the late William M. Arms, M. D., in her 80th year.

Funeral services from her late residence, 66 Cherry St., Wednesday, Jan. 4 inst., at 11 A. M.

COFFEY.—On Tuesday, Jan. 3, **HENRIETTA**, wife of Rev. W. S. Coffey of East Chester, N. Y.

Notice of funeral hereafter.

COOPER.—Suddenly, on Monday, Jan. 2, 1893, **ROBERT J. COOPER**.

Friends are invited to attend the funeral services at his late residence, Avenue A, Flatbush, L. I., on Thursday morning, the 6th inst., at 10:30 o'clock.

COOPER.—Sunday, Jan. 1, 1893, Mrs. **ELIZA COOPER**, widow of John W. Cooper.

Funeral from her late residence, 910 West 60th St., on Wednesday, the 4th inst., at 10:30 o'clock. Interment private.

FURMAN.—Suddenly, at New-Rochelle, on Tuesday, Jan. 3, 1893, **ALBINA REYER FURMAN**, adopted daughter of the late John M. Furman.

Funeral services will be held at Trinity Church, New-Rochelle, on Thursday at 4 o'clock. Train leaves Grand Central Depot at 2:00 P. M.

GRIERSON.—Tuesday evening, Jan. 3, at the St. George Hotel, **JOHN GRIERSON**, in the 67th year of his age.

Funeral from 188 Lexington Av., Thursday morning, Jan. 5, at 10 o'clock.

HALLOCK.—Entered into rest, Jan. 1, **EMMA LOUISA HALLOCK**, wife of Dr. Lewis Hallock, in the 81st year of her age.

Relative and friends are invited to attend the funeral at her late residence, 34 East 39th St., on Wednesday, Jan. 4, at 4 P. M.

HENDERSON.—On Sunday, Jan. 1, 1893, at Far Rockaway, N. Y., **ANN HENDERSON**, widow of James Henderson, late of Westchester, N. Y., in her 78th year.

Funeral Wednesday, Jan. 4, at 11 o'clock A. M., from her late residence, at Far Rockaway. Interment at Woodlawn Cemetery. Friends will please omit flowers.

KETCHUM.—On Saturday, Dec. 31, **ELIZA KETCHUM**, wife of Enoch Ketchum and daughter of the late Jesse Van Arken.

Funeral services from her late residence, No. 1 East 60th St., on Wednesday, the 4th inst., at 10 o'clock A. M. Kindly omit flowers.

LAMB.—Entered into rest, Jan. 2, 1893, Mrs. **MARtha J. Lamb**.

Funeral services from Madison Square Church, on Wednesday, 4th inst., at 4 P. M.

MORRILL.—At Clinton, S. I., Jan. 3, of pneumonia, **FRANCES T.**, wife of James A. Morrill.

Funeral private.

PAULMIER.—Suddenly, at Lakewood, N. J., on Sunday, 1st inst., **CORNELIA B.**, widow of Jesse Paulmier.

Relative and friends are invited to attend the funeral services at the residence of her son-in-law, Robert W. Stuart, 85 Park Av., on Wednesday afternoon, the 4th inst., at 4:30 o'clock.

REILLY.—At his home, 691 Carlton Av., Brooklyn, Jan. 2, 1893, **CHARLES H. REILLY**.

Funeral from his late residence at 10 o'clock A. M. Thursday, Jan. 5.

REYNOLDS.—On Tuesday, Jan. 3, **JAMES RAYMOND REYNOLDS**, in the 50th year of his age.

Funeral services at the Chapel of St. Luke's Hospital on Thursday morning at 4:30 o'clock.

SANDS.—At Los Angeles, Cal., Saturday, Dec. 31, 1893, **JOSHUA SANDS**, second son of the late Rear Admiral Joshua R. Sands, U. S. N.

Interment at Los Angeles.

SKIDMORE.—Jan. 2, 1893, of pneumonia, **WILLIAM ROBERT SKIDMORE**, older son of John D. Skidmore and the late Elizabeth Wetmore Skidmore. Funeral services will be held at his late residence, No. 71 West 60th St., on Thursday, Jan. 5, at 4:30 P. M.

ST. JOHN.—Monday, Jan. 2, 1893, **JOANNA L. ST. JOHN**, daughter of the late Gen. Peter Van Zandt. Funeral services from her late residence, 109 West 84th St., on Thursday, 10 A. M. Relatives and friends are invited. Interment, Norwalk, Conn.

TAYLOR.—On Saturday morning, **CATHARINE ANNE**, widow of Moses Taylor, in the 83d year of her age.

Funeral services will be held at her late residence, No. 122 6th Av., on Wednesday, Jan. 4, at 11 A. M. Relatives and friends are invited to attend.

TOMLINS.—Suddenly, Jan. 2, 1893, **CHARLES M.**, eldest son of Merton C. and Maria West Tomlins, at his residence, 4 Marquella Av.

Funeral services from Grace Church, corner Erie and 2d Sts., Jersey City, on Wednesday, Jan. 4, at 2 P. M.

By Baltimore papers please copy.

WHEELER.—On Tuesday, Jan. 3, at his late residence, 163 East 72d St., **THOMAS M. WHEELER**.

Notice of funeral hereafter.

WOODLAWN CEMETERY,
Woodlawn Station, (23th Ward,) Harlem Railroad,
Office, No. 20 East 23d St.