

Making Math Meaningful in March Madness

Written by Lisa Owens, Sherry Tuttle, Paul Sprague

Class: Math

School: Morton Middle School

Approximate Timeline: Spring semester, approximately 9 days per grade level

School Level: Middle School

Area(s) of Core Content: Practical Living, Mathematics, Writing, and Reading

Organizer:

How can we use statistics to make sense out of March Madness?

Essential Questions:

What are statistics?

How do statistics relate to basketball?

How do statistics enhance the enjoyment of basketball?

What's the best way to display statistical data?

Targeted Standards:

Academic Expectation 1--Apply Communication and Math Skills:

-1.1 Students use reference tools such as dictionaries, almanacs, encyclopedias, and computer reference programs and research tools such as interviews and surveys to find the information they need to meet specific demands, explore interests, or solve specific problems.

- Use a variety of research tools and evaluate the effectiveness of each relevant to a specific need or problem.
- Analyze and compare information accessed from different sources.
- Use a variety of telecommunication resources to obtain information on a specific need or problem
- Question to obtain information on a specific need or problem.
- Gather information through observation on a specific need or problem.

-1.5 - 1.9 Students use mathematical ideas and procedures to communicate, reason, and solve problems.

- Select, apply, justify appropriate math procedures to solve real-life problems using rational numbers.
- Model problem solving situations using oral, written, concrete, pictorial, graphic, simple algebraic methods.
- Communicate the meanings of number, space, change, data, and measurement verbally, pictorially, symbolically, and concretely.
- Use deductive/inductive reasoning to synthesize information related to problems, making conjectures, exploring, validating, and convincing others.

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-1.11 Students write using appropriate forms, conventions, and styles to communicate ideas and information to different audiences for different purposes.

-Write for a variety of purposes and forms to a variety of audiences.

-1.16 Students use computers and other kinds of technology to collect, organize, and communicate information and ideas.

- Express information and ideas creatively using technology.
- Analyze relationships/patterns to draw inferences using technology.
- Integrate the use of a variety of technologies.
- Expand knowledge by identifying and using technology for a specific purpose.

Academic Expectation 2--Mathematics:

-2.7 Students understand number concepts and use numbers appropriately and accurately.

- Model, communicate, and apply multiple representations of rational numbers.
- Interpret and use appropriate mathematical notation for numbers.
- Use estimation to check the reasonableness of results.

-2.8 Students understand various mathematical procedures and use them appropriately and accurately.

- Interpret and organize information for logical deductions.
- Translate real-world proportional relationships into mathematical expressions.
- Apply and justify computational methods.

-2.11 Students understand mathematical change concepts and use them appropriately and accurately.

- Investigate patterns in number sequences and relate to real world experiences.

-2.13 Students understand and appropriately use statistics and probability.

- Determine the validity of the use of data.
- Collect, display, analyze and interpret the data from a selected population.
- Make predictions and evaluate conclusions based on statistical analysis.
- Analyze probabilities to make decisions involving real world situations.

Academic Expectation 5--Thinking and Problem Solving:

-5.1 Students use critical thinking skills such as analyzing, prioritizing, categorizing, evaluating, and comparing to solve a variety of problems in real-life situations.

- Examine ideas/objects/situations for patterns; discern discrepancies.
- Analyze information for bias/relevance/ambiguity.
- Analyze cause-and-effect relationships.

-5.3 Students organize information to develop or change their understanding of a concept.

- Gather information from multiple sources to derive meaning.
- Organize information into categories.
- Develop and test concepts based on new information and experience.

-5.4 Students use a decision-making process to make informed decisions among options.

- Recognize options; gather information; propose alternative options.
- Analyze and prioritize alternatives; select and defend a decision.

-5.5 Students use problem-solving processes to develop solutions to relatively complex problems.

- Define a problem; gather and organize information about the problem.

Secondary Academic Expectations:

- 1.2 Students make sense of the variety of materials they read.
- 1.3 Students make sense of the various things they observe.
- 1.4 Students make sense of the various messages to which they listen.
- 4.1 Students effectively use interpersonal skills.
- 4.2 Students use productive team membership skills.
- 4.3 Students individually demonstrate consistent, responsive, and caring behavior.
- 4.4 Students demonstrate the ability to accept the rights and responsibilities for self and others.
- 4.6 Students demonstrate an open mind to alternative perspectives.
- 6.1 Students connect knowledge and experiences from different subject areas.
- 6.2 Students use what they already know to acquire new knowledge, develop new skills, or interpret new experiences.
- 6.3 Students expand their understanding of existing knowledge by making connections with new knowledge, skills, and experiences.

Knowledge and Skills/Abilities: (These are being taught throughout the year, being put to use in the week of the actual unit.)

Middle School Core Content--Mathematics:

- MA-M-1.1.1 Rational numbers (integers, fractions, decimals, percents)
- MA-M-1.1.3 Meaning of proportion (equivalent ratios)

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- MA-M-1.1.6 Representation of numbers and operations in a variety of equivalent forms using models, diagrams, and symbols (e.g., number lines, 10 by 10 grids, rectangular arrays, number sentences)
- MA-M-1.2.1 Add, subtract, multiply, and divide rational numbers (fractions, decimals, percents, integers) to solve problems
- MA-M-1.2.3 Apply ratios, proportional reasoning, and percents (e.g., constant rate of change, unit pricing)
- MA-M-1.3.1 How whole numbers, natural numbers, integers, fractions, decimals, percents, and irrational numbers (square roots and p only) relate to each other (e.g., convert between forms of rational numbers, compare, order)
- MA-M-3.1.1 Meaning of central tendency (mean, median, mode)
- MA-M-3.1.2 Meaning of dispersion (range, cluster, gaps, outliers)
- MA-M-3.1.3 Characteristics and appropriateness of graphs (e.g., bar, line, circle), and plots (e.g., line, stem-and-leaf, box-and-whiskers, scatter)
- MA-M-3.2.1 Organize, represent, analyze, and interpret sets of data
- MA-M-3.2.2 Construct and interpret displays of data (e.g., table, circle graph, line plot, stem-and-leaf plot, box-and-whiskers plot)
- MA-M-3.2.3 Find mean, median, mode, and range; recognize outliers, gaps, and clusters of data
- MA-M-3.2.4 Calculate theoretical probabilities and tabulate experimental results from simulations
- MA-M-3.2.5 Make predictions and draw conclusions from statistical data and probability experiments
- MA-M-3.2.6 Use counting techniques, tree diagrams, area models, and tables to solve probability problems
- MA-M-3.2.7 Represent probabilities in multiple ways such as fractions, decimals, percents, and area models
- MA-M-3.3.1 How different representations of data (e.g. tables, graphs, diagrams, plots) are related
- MA-M-3.3.2 How theoretical probability and experimental probability are related
- MA-M-3.3.3 How data gathering, bias issues, faulty data analysis, and misleading representations affect interpretations and conclusions about data (e.g., changing the scale on a graph, polling only a specific group of people, using limited or extremely small sample size)
- MA-M-3.3.4 How probability and statistics are used to make predictions and/or draw conclusions
- MA-M-4.2.6 Write and solve equations that represent everyday situations
- MA-M-4.3.1 How everyday situations, tables, graphs, patterns, verbal rules, and equations relate to each other
- MA-M-4.3.2 How the change in one variable affects the change in another variable (e.g., if rate remains constant, an increase in time results in an increase in distance)

Middle School Core Content--Practical Living:

- PL-M-1.5.1 Body changes (e.g., body composition, decreased heart rate, reduced cholesterol level) occur following a regular exercise program.
- PL-M-1.5.2 Exercise benefits physical development (e.g., body shape, posture, coordination, muscle development).
- PL-M-1.5.3 Applying the principles of fitness training and conditioning (frequency, intensity, time/duration) are necessary to get the most from exercise.
- PL-M-1.5.4 Self-assessment of health status (e.g., strength, flexibility, cardiovascular endurance, body composition) contributes to health maintenance.
- PL-M-2.1.1 Principles of motor skills refinement (e.g., accuracy, technique, movement) require a logical and sequential approach.

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- PL-M-2.2.1 Physical, emotional/mental, and social benefits can be gained from regular participation in leisure/recreational and/or competitive physical activities. Physical benefits: increased energy, improved strength, fitness, improved control of body movements; Social benefits: self-esteem, friendship, self-expression; Emotional/mental benefits: improved confidence, increased self-esteem, stress reduction, self-expression
- PL-M-2.2.2 Techniques (e.g., practice, self-evaluation) used to develop skills are related to performance in games and/or sports.
- PL-M-2.2.3 Frequency, intensity, and time/duration are the principles of fitness training and conditioning.
- PL-M-3.1.3 There are positive and negative aspects of advertising strategies (e.g., providing accurate or misleading information, gimmicks).

Technology Standards:

- T3.1 Use proper citations
- T4.4 Locate information using the Internet
- T4.5 Navigate within an operating system or software
- T5.3 Evaluate information from the Internet
- T5.6 Enter and edit word processing information
- T5.7 Enter and edit spreadsheet information
- T6.1 Select appropriate software for a task.
- T6.2 Publish information on the Internet.
- T6.4 Use a Word Processor to present information.
- T6.5 Create a presentation or product using application software

Instructional/Assessment Activities and Critical Resources:

6th Grade Instructional Activities

DAY	MATH CONCEPT(S)	SUGGESTED ACTIVITIES	ASSESSMENT	CRITICAL RESOURCES
1	*Pre-Test *Review of Basic Skills (esp. measures of central tendency)	*General Review *Class Discussion	*Fayette Co. MST-6 (NC & PS sections only) or Pre-test compiled from ACCESS software *HW: Review WS of Measures of Central Tendency	*Fayette Co. MST-6 *ACCESS software
2	*Data Collection *Fraction to Decimal Conversions	*M&M (Color) Data Collection Activity to get a) individual data & b) class data	*Group Activity Checklist *HW: Convert raw data to percentages	*Small bag of M&Ms for each student *M&M Data Collection Sheet
3	*Measures of Central Tendency *Experimental & Theoretical Probability	*Compile M&M class data to get total team data and find measures of central tendency for each color category via spreadsheet or wall chart *Class discussion/ comparison of experimental vs. theoretical data	*Individual Data Sheet Completion *Class Participation	* www.global.mms.com *Microsoft Excel *Wall Chart
4	*Data Collection Strategies *Fraction to Percent Conversions	*Practice Run of Collecting Specified Data during a basketball game (relate M&M colors to players)	*Class Participation *HW: Convert raw data to percentages	*Videotaped Basketball Game *Basketball Player Data Collection Sheet

5	*Measures of Central Tendency *Post-Test	*Discussion of data gathered in class yesterday *Determine measures of central tendency for team	*Class Participation *Correct identification of measures of central tendency for team *Fayette Co. MST-6 (NC & PS sections only) <u>or</u> Post-test compiled from ACESS software	*Fayette Co. MST-6 *ACESS software
6	*Data Collection *Data Display	*View a Basketball Game	*Collect raw data of specified information on data sheet (in pairs) for one player	*Basketball Game - Live or Videotaped *Basketball Player Data Collection Sheet
7	*Data Display *Conversions	*Compile data for entire team during class discussion *Discuss final product possibilities	*Class Participation *Completion of Data Sheet for the Entire Team	*Basketball Team Data Collection Sheet
8	*Measures of Central Tendency	*Class Discussion	*In Class: Tigers Games Open Response Question	*Tigers Games CAQ
9	*Measures of Central Tendency *Real-Life Applications	*Student Presentations	*Final Products of Culminating Performance - graded with rubric provided	*Computer for PowerPoint presentations *Television/VCR for Video Presentations

7th Grade Instructional Activities

DAY	TOPIC(S)	SUGGESTED ACTIVITIES	ASSESSMENT	CRITICAL RESOURCES
1	<ul style="list-style-type: none"> *Pre-Test *Review of Basic Skills (esp. data displays) 	<ul style="list-style-type: none"> *General Review *Class Discussion 	<ul style="list-style-type: none"> *Fayette Co. MST-7 (NC & PS sections only) <u>or</u> Pre-test compiled from ACES software *HW: Review WS of Different Types of Graphs 	<ul style="list-style-type: none"> *Fayette Co. MST-7 *ACES software
2	<ul style="list-style-type: none"> *Graphs *Statistics *Misleading Presentations *Measures of Central Tendency 	<ul style="list-style-type: none"> *General Overview of Misleading Displays of Data *Review/Discuss Data Displays via Computer or Other Resources *In P.E., complete data collection sheet about target heart rate. 	<ul style="list-style-type: none"> *Class Participation in Critique of Data Displays *HW: Find a graph using research resources and discuss its display and any misleading information. *From P.E., complete data collection sheet percentages and measures of central tendency. 	<ul style="list-style-type: none"> *Computer *Newspapers *Magazines *Internet *P.E. teacher *Stop Watch *Individual Target Heart Rate Data Collection Sheet *Also See On-Line Resources
3	<ul style="list-style-type: none"> *Graphs *Misleading Presentations 	<ul style="list-style-type: none"> *Teacher will provide specific graphs for students to discuss in pairs. 	<ul style="list-style-type: none"> *Each pair will provide a written analysis of their assigned graph. 	<ul style="list-style-type: none"> *A Variety of Graphs *Microsoft Word *Microsoft Excel

4	<ul style="list-style-type: none"> *Graphs *Statistics *Misleading Representations *Measures of Central Tendency *Experimental & Theoretical Probability 	<ul style="list-style-type: none"> *Compile target heart rate data for entire class and determine measures of central tendency *Class discussion about heart rate and range for optimal benefits (weight loss, fat burning, aerobic, endurance) - 30%-70% 	<ul style="list-style-type: none"> *Class Target Heart Rate Data Collection Sheet *Class Participation *HW: Choose specific data (could possibly use average of male/female by % or raw data) and graph according to heart rate/time. 	<ul style="list-style-type: none"> *Class Target Heart Rate Data Collection Sheet *Microsoft Excel *Microsoft Word * Also See On-Line Resources
5	<ul style="list-style-type: none"> *Graphs *Misleading Statistics *Measures of Central Tendency 	<ul style="list-style-type: none"> *Class Discussion of Target Heart Rate Data Homework Graphs "Why did you choose to graph the data this way?" "What comparisons can you make between your individual data & the data you graphed?" "What conclusion might you make about the general population of students your age?" 	<ul style="list-style-type: none"> *Class Participation *Summarize your thoughts in individual paragraphs re: <ol style="list-style-type: none"> a) "What comparisons can you make between your individual data & the data you graphed?" b) According to the data & graphs, "What trends are evident between males & females?" 	<ul style="list-style-type: none"> *Microsoft Word *Microsoft Excel * Also See On-Line Resources
6	<ul style="list-style-type: none"> *Post-Test *Measures of Central Tendency *Misleading Statistics 	<ul style="list-style-type: none"> *Discussion of Unit Material emphasizing central tendency & misleading representations 	<ul style="list-style-type: none"> *Fayette Co. MST-7 (NC & PS sections only) <u>or</u> Post-test compiled from ACCESS software *In-Class: The Light Bulb Open Response 	<ul style="list-style-type: none"> *Fayette Co. MST-7 *ACCESS software *The Light Bulb Question CAQ

			Question	
7	<ul style="list-style-type: none"> *Data Collection *Measures of Central Tendency *Misleading Statistics 	*View a Basketball Game	<ul style="list-style-type: none"> *Collect raw data of specified information on data sheet (in groups of 3) for a basketball team *HW: Convert raw data into percentages and complete the remainder of the data sheet. 	<ul style="list-style-type: none"> *Basketball Game - Live or Videotaped *Basketball Team Data Collection Sheet
8	<ul style="list-style-type: none"> *Data Collection *Measures of Central Tendency *Misleading Statistics 	*Discuss findings and possible data displays.	<ul style="list-style-type: none"> *Compare group results to similar data found on the Internet, on television, or in the newspaper. HW: Rough draft of final product 	<ul style="list-style-type: none"> *Internet *Television *Newspapers Computer
9	<ul style="list-style-type: none"> *Data Displays *Statistics *Misleading Presentations 	*Student Presentations	<ul style="list-style-type: none"> *Final Products of Culminating Performance - graded with rubric provided 	<ul style="list-style-type: none"> *Computer for PowerPoint *Television for Videotapes *VCR *Microsoft Word *Microsoft Excel

8th Grade Instructional Activities

DAY	TOPIC(S)	SUGGESTED ACTIVITIES	ASSESSMENT	CRITICAL RESOURCES
1	*Pre-Test *Review of Basic Skills (esp. data displays)	*General Review *Class Discussion	*Fayette Co. MST-8 (NC & PS sections only) or Pre-test compiled from ACES software *HW: Review of Current Text, Alternative Text & study sheet from resource.	*Fayette Co. MST-8 *ACES software * <i>Math Teacher's Book of Lists</i>
2-3	*Measures of Central Tendency *Data Displays *Statistics as outlined in Math Standards-8	*Choosing activities to be analyzed *Initial discussion & analysis of chosen activities *Pre-Approval *Can include P.E. generated activities & activities/data from 6 th /7 th grades	*Class Participation *Teacher-generated activity analysis sheet/ template (categorize by chance or skill)	* <i>Math Teacher's Book of Lists</i> * <i>Math Yellow Pages</i> * <i>Children's Encyclopedia of Mathematics</i> * Also See On-Line Resources
4	*Measures of Central Tendency *Data Displays *Statistics	*Refinement of activity choices to identify mathematical elements of chosen activity *Continue to approve/offer guidance about choices	*Template-2 with detailed analysis of math content and connections	*Kentucky Core Content *NCTM Math Standards Books

5	<ul style="list-style-type: none"> *Measures of Central Tendency *Data Displays *Statistics as outlined in Math Standards 	<ul style="list-style-type: none"> *Follow-up/mastery learning corrections of pre-test *New skills including text & game theory resources 	*Finished Templates	<ul style="list-style-type: none"> *Textbook *ACCESS software
6	*Data Collection	*Computer lab for specific research	*Notes/information on activities that include statistical data.	<ul style="list-style-type: none"> *Internet *www.gametheory.net * Also See On-Line Resources
7-?	<ul style="list-style-type: none"> *Measures of Central Tendency *Data Displays *Statistics as outlined in Math Standards 	*Student Presentations with allowances for student-generated work or teacher-generated template	*Final Products of Culminating Performance - graded with rubric provided	<ul style="list-style-type: none"> *Microsoft Word *Microsoft Excel *Paint *PowerPoint *Television/VCR
Final Day	<ul style="list-style-type: none"> *Post-Test *Experimental & Theoretical Probability 	Discussion of Unit Material emphasizing central tendency, statistics, and other mathematical connections	Fayette Co. MST-8 (NC & PS sections only) <u>or</u> Post-test compiled from ACCESS software In-Class: Free Throw Shooter Open Response Question	*Free Throw Shooter CAQ

Grade 6: In pairs, collect statistical data (as specified by teacher) on a basketball player and display it in a table using percentages. Each student should compile a table of percentages for the entire team. Find the mean, median, mode, and range of the percentages in each chosen category. With your partner, pick a player based on your statistical information and promote him to an NBA team. Convince the team, via PowerPoint, written report, oral presentation, or other approved method, they should draft that player based on his statistics.

Score	Criteria
4	<ul style="list-style-type: none"> • Accurately collected sufficient data on one basketball player • Displayed data in a table using percentages • Accurately compiled data table for entire team • Accurately calculated mean, median, mode, and range for each category • Choose a player based on appropriate statistical information • Final product provides adequate statistical support for the player they chose
3	<ul style="list-style-type: none"> • Accurately collected data on one basketball player (may include minor error) • Displayed data in a table using percentages • Compiled data table for entire team • Accurately calculated mean, median, mode, and range for each category • Chose a player based on statistical information • Final product provides some statistical support for the player they chose
2	<ul style="list-style-type: none"> • Collected data on one basketball player (may include errors) • Displayed data in a table • Compiled data table for part of a team • Calculated mean, median, mode, and range for each category (may include errors) • Chose a player with minimal or incomplete supporting evidence • Final product provides little statistical support for the player they chose
1	<ul style="list-style-type: none"> • Collected data on one basketball player (may include errors) • Displayed data • Compiled data table • Attempted to calculate mean, median, mode, and range for each category • Chose a player with no supporting evidence • Final product provides very limited statistical support for the player they chose

Grade 7: In groups of 2 or 3, collect statistical data on a basketball team (specified on the provided data sheet). Analyze and display the data in three different ways. Choose the most appropriate mathematical way to display your data to a specific audience for a specific purpose. Your final product can be presented in any of the following forms: local newspaper article, magazine article, PowerPoint presentation, video, web page, etc.

Score	Criteria
4	<ul style="list-style-type: none"> • Accurately collected data on a basketball team • Accurately analyzed data on the basketball team • Creatively displayed the data in three different ways • Presentation included data for a specific audience and purpose • Data displayed in appropriate form • Final product presented data in a sophisticated form
3	<ul style="list-style-type: none"> • Accurately collected data on a basketball team • Analyzed data on the basketball team • Displayed the data in three different ways • Presentation included data for a specific audience and purpose • Data displayed in appropriate form • Final product presented data in a meaningful form
2	<ul style="list-style-type: none"> • Collected data on a basketball team • Attempted to analyze data on the basketball team • Displayed the data in at least two different ways • Presentation included data for an audience or purpose • Data displayed • Final product presented data
1	<ul style="list-style-type: none"> • Collected some data on a basketball team • Attempted to analyze data on the basketball team • Final product presented insufficient data

Grade 8: Collect statistical data on a team or recreational activity of your choice (You may *invent* your own activity and then collect data from it.) Analyze and present the data to support or defend a position of your choice. Present this information in a way that will convince your audience of the validity of your position. For example, if you wanted to promote any sport or recreational activity, already known or newly invented, how would you do this?

Score	Criteria
4	<ul style="list-style-type: none"> • Accurately collected data on a team or activity • Accurately analyzed the data collected • Creatively formulated and presented a position statement • Provided insightful reasoning to support their position • Final product is appropriate and complete with evidence of extensive research
3	<ul style="list-style-type: none"> • Accurately collected data on a team or activity • Analyzed the data collected • Formulated and presented a position statement • Provided reasoning to support their position • Final product is appropriate and complete with evidence of some research
2	<ul style="list-style-type: none"> • Collected data on a team or activity • Attempted to analyze the data collected • Presented a position statement • Provided reasoning to generally support their position • Final product is appropriate and complete with evidence of little research
1	<ul style="list-style-type: none"> • Collected data on a team or activity • Attempted to analyze the data collected • Presented a position statement • Final product is submitted with no evidence of research

On-Line Resources

Sports Statistics Resources

ESPN Men's College Basketball Statistics -

<http://sports.espn.go.com/ncb/statistics>

Lists top leaders in different categories, but can also look at by conference, and then by individual team and player

ESPN NBA Statistics - <http://sports.espn.go.com/nba/statistics>

Similar to above, also has links to stats from previous seasons, and a team by team comparison feature

ESPN NFL Statistics - <http://sports.espn.go.com/nfl/statistics>

Similar to NBA - also has stats from previous seasons

ESPN College Football Statistics - <http://sports.espn.go.com/ncf/statistics>

ESPN Women's College Basketball -

<http://sports.espn.go.com/ncw/statistics>

Give stats on leaders, but not on individual teams or players

ESPN Golf Statistics - <http://sports.espn.go.com/golf/statistics>

Lists top leaders, but can click on player's name to get more stats

CNNSI Hockey Statistics -

<http://sportsillustrated.cnn.com/hockey/nhl/stats/>

Sort by several categories or look at team stats by category

<http://sportsillustrated.cnn.com/hockey/nhl/players/>

Click on team and then player for individual player stats

CNNSI U.S. Soccer Statistics -

<http://sportsillustrated.cnn.com/soccer/us/stats/mls/>

Stats by category

<http://sportsillustrated.cnn.com/soccer/mls/>

Click on team and team stats for individual stats, also has links to stats from previous years

EXPN (Extreme Sports) Skateboarding -

<http://expn.go.com/athletes/skt/index.html>

Click on name of athlete for bio and info on where finished in competitions

Other sports follow same idea. Click on sport, then athletes to get to index for each sport. Sports included are snow boarding, bike stunt, and motocross.

Heart Rate Resources

Target Heart Rate Info -

<http://www.americanheart.org/presenter.jhtml?identifier=4736>

<http://www.med.umich.edu/1libr/primary/fit05.htm>

Target Heart Rate Calculators -

<http://www.stevenscreek.com/goodies/hr.shtml>

<http://www.healthchecksyste.ms.com/heart.asp>

<http://www.fitness2live.com.au/Default.asp?pg=calculators&spg=targetheart rate>

<http://health.discovery.com/tools/calculators/hrc/hrc.html>

Heart Rate Worksheet -

<http://www.healthfullyours.net/articles/moms-fitness/Target-Heart-Rate.doc>