# Kansas State Mathematics Standards and Assessment Guide

Based on the 2005 Kansas State Curricular Standards for Mathematics
adopted by the Kansas State Board of Education on July 8, 2003

# Grade 7

Developed by the Kansas State Department of Education
and
Mathematics Specialists in the Private Sector
from Kansas

2005

| Standard/Benchmark/Indicator |
| --- |

**Standard/Benchmark/Indicator**
M.7.1.4.K2a-d N
Standard: Number and Computation
Benchmark: Computation
Indicator: Performs and explains these computational procedures: a) adds and subtracts decimals from ten millions place through hundred thousandths place; b) multiplies and divides a four-digit number by a two-digit number using numbers from thousands place through thousandths place; c) multiplies and divides using numbers from thousands place through thousandths place by 10; 100; 1,000; .1; .01; .001; or signal-digit multiples of each; d) adds, subtracts, multiplies, and divides fractions and expresses answers in simplest form

**Explanation of Indicator**
a)



b) 1.698 ÷ 25 or 1.698 x 25

c) 54.3 ÷ .002 or 54.3 x .002

d)⅔ x ⅝
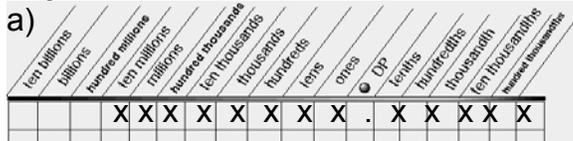
**Instructional Example**
1. Using an atlas, compare the population of New York City and Los Angeles
2. Compares monthly bills for electricity, water, etc.
3. Using a recipe, double or half the required ingredients to double the recipe of half it.

**Item Specification**
**Category 2: Perform procedures: 2b.** Do computational procedures or algorithms
**Category 3: Demonstrate Understanding or Mathematical Ideas: 3a.** Communicate mathematical ideas or rules and/or explain the process

**Assessment Item Example**
Alan hiked 0.7 kilometers (km) on Monday, 2.089 km on Tuesday, and 1.02 km on Wednesday. What is the total number of kilometers that Alan hiked on all three days?

A.    2.188 km

B.    2.198 km

C.    3.709 km

D.    3.809 km

Correct Answer: D

| Indicator | | | | |
| --- | --- | --- | --- | --- |
| M7.1.4.K2a-d | | | | |

| Standard/Benchmark/Indicator |
|---|
| M.7.1.4.K5 |

Standard:    Number and Computation
Benchmark: Computation
Indicator:       Finds percentages of rational numbers

**Explanation of Indicator**

Rational number is any number that can be written as a fraction.
Percent is based on an amount out of 100.

**Instructional Example**

When shopping, have your child figure the cost when the sale is a percent off of the original price. Ex. A pair of shoes costs $49.99. The sale is 25% off. What is the new sale price?

**Item Specification**

**Category 2:  Perform Procedures: 2b.** Do computational procedures or algorithms

**Assessment Item Example**

What is 200% of 78?


A.    15.6

B.    39

C.    93.6

D.    156


Correct Answer: D

| | Indicator | | | | |
|---|---|---|---|---|---|
| | M.7.1.4.K5 | | | | |

| Standard/Benchmark/Indicator |
|---|
| M.7.2.1.K1a-b |
| Standard: Algebra |
| Benchmark: Patterns |
| Indicator: Identifies, states, and continues a pattern presented in various formats including numeric (list or table), algebraic (symbolic notation), visual (pictures, table, or graph), verbal (oral description), kinesthetic (action), and written using these attributes: |
| a) counting numbers including perfect squares, cubes, and factors and multiples (number theory); b) positive rational numbers including arithmetic and geometric sequences (arithmetic: sequence of numbers in which the difference of two consecutive numbers is the same, geometric: a sequence of numbers in which each succeeding term is obtained by multiplying the preceding term by the same number) |

| **Explanation of Indicator** |
|---|
| I identifies and extends a variety of patterns |

| **Instructional Example** |
|---|
| 1. If a square has 3 in. sides, the area is 3 x 3 = 9 sq. in. If a square has 4 in. sides, the area is 4 x 4 = ? sq. in. |
| 2. Your child's allowance doubles each week? If they start with $2, how much will they receive the 4th week? |

| **Item Specification** |
|---|
| **Category 4: Conjecture/Generalize/Prove: 4c.** Recognize, generate, or continue patterns |

**Assessment Item Example**

The table below shows the total number of bacteria in a colony on each of 4 days.

**Bacteria Growth**

| Day | Number of Bacteria |
|---|---|
| 1 | 4 |
| 2 | 32 |
| 3 | 256 |
| 4 | 2,048 |
| 5 | ? |

The bacteria growth follows a pattern. Based on this pattern, what will be the **total** number of bacteria in the colony on day 5?

A. 2,076 bacteria

B. 3,840 bacteria

C. 16,384 bacteria

D. 131,072 bacteria

Correct Answer: C

| | | Indicator | | | |
|---|---|---|---|---|---|
| | | M.7.2.1.Ka-b | | | |

| Standard/Benchmark/Indicator |
| --- |
| M.7.2.1.K4 <br> Standard:     Algebra <br> Benchmark: Patterns <br> Indicator:     States the rule to find the $n^{th}$ term of a pattern with one operational change (addition or subtraction) between consecutive terms |

| Explanation of Indicator |
| --- |
| The nth term is an arbitrary term ina sequence or pattern of numbers which can be found by with the rule for the pattern. |

| Instructional Example         x |
| --- |
|                      xxx <br>                   xxxxx <br>                 xxxxxxx <br> 1. How many x's would be in the fifth row, sixth row, nth row? <br> 2. Using this example, have your kids determine how many cans will be needed to form a pyramid that is four rows high to be used at the school carnival where the participants throw balls to knock over the cans. |

| Item Specification |
| --- |
| **Category 4: Conjecture/Generalize/Prove: 4d.** Find a mathematical rule to generate a pattern or number sequence |

| Assessment Item Example |
| --- |
| The first four numbers of a number pattern are shown below. <br><br> 89   78   67   56 <br><br> Which rule could be used to find the nth term of the pattern? <br><br> A.     11n + 1 <br><br> B.     11n + 56 <br><br> C.     -11n + 89 <br><br> D.     -11n + 100 <br><br> Correct Answer: D |

| | | | Indicator | | |
| --- | --- | --- | --- | --- | --- |
| | | | M.7.2.1.K4 | | |

| Standard/Benchmark/Indicator |
|---|
| M.7.2.2.K7 |
| Standard:     Algebra |
| Benchmark:  Variable, Equations, and Inequalities |
| Indicator:     Knows the mathematical relationship between ratios, proportions, and percents and how to solve for a missing term in a proportion with positive rational number solutions and monomials |

| **Explanation of Indicator** |
|---|
| Knows that ¾ (ratio)  is equal to 75% |
| Knows that ¾ = 6/8 (a proportion), and are both equal to 75% |

| **Instructional Example** |
|---|
| With your child, go over one of their graded homework papers and calculate the percentage by dividing the number correct out of the number possible. This will give you a decimal that needs to be multiplied by 100 to give you the percent. |

| **Item Specification** |
|---|
| **Category 2:  Perform Procedures:  2d.** Solve equations, formulas, or routine word problems |
| **Category 3:  Demonstrate Understanding of Mathematical Ideas:  3a.** Communicate mathematical ideas or rules and/or explain the process |

| **Assessment Item Example** |
|---|
| A proportion is shown below. |

$$\frac{6}{8} = \frac{x}{4}$$

What is the relationship between the values of $x$ and 6 in the proportion?

  **A.**     $x$ is equal to one-fourth of 6

  **B.**     6 is equal to one-fourth of $x$

  **C.**     $x$ is equal to one-half of 6

  **D.**     6 is equal to one-half of $x$


Correct Answer: C

| Standard/Benchmark/Indicator |
|---|
| M.7.2.2.K8 |
| Standard:     Algebra |
| Benchmark:  Variable, Equations, and Inequalities |
| Indicator:      Evaluates simple algebraic expressions using positive rational numbers |

| **Explanation of Indicator** |
|---|
| Replacing variables (what's unknown) with given numbers and finding the value. |

| **Instructional Example** |
|---|
| Have your child figure your age based on the age you were when they were born. |

| **Item Specification** |
|---|
| **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms |

**Assessment Item Example**

An expression is shown below.

$3(x + b)$

What is the value of the expression when x =3.5 and b =2.8?

   A.     6.3

   B.     9.3

   C.     18.9

   D.     29.4

Correct Answer: C

| Standard/Benchmark/Indicator |
|---|
| M.7.3.1.K3.a-g |
| Standard:    Geometry |
| Benchmark:  Geometric Figures and Their Properties |
| Indicator:     Identifies angle and side properties of triangles and quadrilaterals: a) sum of the interior angles of any triangle is 180°; |
| b) sum of the interior angles of any quadrilateral is 360°; c) parallelograms have opposite sides that are parallel and congruent; |
| d) rectangles have angles 90° opposite sides are congruent; e) rhombi have all sides the same length, opposite angles are congruent; |
| f) squares have angles of 90°, all sides congruent; g) trapezoids have one pair of opposite sides parallel and the other pair of opposite sides are not parallel |

| **Explanation of Indicator** |
|---|
| Recognize that shapes have specific characteristics such as; triangle has three angles that add up to 180°, parallelograms have opposite sides that are parallel and congruent (same size, same shape), rectangles have four right angles (90°), rhombi have four congruent sides, squares have four congruent angles and sides, trapezoids are quadrilaterals (four-sided figures) that have exactly one pair of parallel sides. |

| **Instructional Example** |
|---|
| Have your child identify parallelograms around your home. Have them measure the sides and angles to determine if it is a rectangle, square, rhombus, or trapezoid. |

| **Item Specification** |
|---|
| **Category 1:  Memorize Facts/Definitions/Formulas:  1b.** Recall or recognize mathematical terms, definitions, or concepts |

| **Assessment Item Example** |
|---|
| The three angles in triangle FGH, shown below, are all congruent. |



What is the measure of $\angle FGH$ ?

  **A.**    30°

  **B.**    60°

  **C.**    120°

  **D.**    180°

Correct Answer: B

| Indicator | | | | | |
|---|---|---|---|---|---|
| M.7.3.1.K3a-g | | | | | |

| Standard/Benchmark/Indicator |
| --- |
| M.7.3.2.K4<br>Standard:    Geometry<br>Benchmark:  Measurement and Estimation<br>Indicator:    Knows and uses perimeter and area formulas for circles, squares, rectangles, triangles, and parallelograms |
| **Explanation of Indicator** |
| Find perimeter (distance around the outside) and area (square units of space inside) of various shapes |
| **Instructional Example** |
| Have your child find the area and perimeter of rooms in your house. |
| **Item Specification** |
| **Category 1:  Memorize Facts/Definitions/Formulas:  1c.** Recall formulas or computational procedures<br>**Category 2:  Perform Procedures:  2d.** Solve equations, formulas, or routine word problems |
| **Assessment Item Example** |
| A triangular road sign has a height of 4.2 feet and a base of 5.4 feet. What is the area of the road sign in square feet ($ft^2$)?<br><br>**A**  11.34 $ft^2$<br><br>**B**  13.80 $ft^2$<br><br>**C**  19.20 $ft^2$<br><br>**D**  22.68 $ft^2$<br><br>Correct Answer: A |

| | Indicator | | | |
| --- | --- | --- | --- | --- |
| | M.7.3.2.K4 | | | |

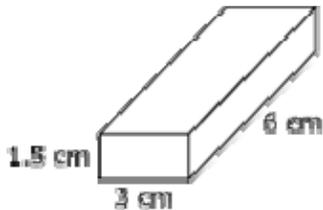| Standard/Benchmark/Indicator |
|---|
| M.7.3.2.K6a-b<br>Standard:    Geometry<br>Benchmark:  Measurement and Estimation<br>Indicator:     Uses given measurement formulas to find: a) surface area of cubes; b) volume of rectangular prisms |
| **Explanation of Indicator** |
| Find surface area (the area of all six sides of a three dimensional object) and the volume of rectangular prisms (the amount of space inside of a box). |
| **Instructional Example** |
| 1. Have your student figure the area in square units (e.g. square inches, centimeters, etc.) of the construction paper needed to cover the sides of a cube.<br>2. Have your student figure the volume in cubic units (e.g. cubic inches, centimeters, etc.) a box will hold.<br>3. Have your student figure the amount of sugar cubes can fit in a box of cubes after it is empty using just a few cubes. |
| **Item Specification**<br>**Category 2:  Perform Procedures:  2d.** Solve equations, formulas, or routine word problems |
| **Assessment Item Example**<br>A rectangular prism is shown below.<br><br><br><br>What is the volume of this prism in cubic centimeters ($cm^3$)? ($V= lwh$)<br><br>  **A.**    9 $cm^3$<br><br>  **B.**    18 $cm^3$<br><br>  **C.**    27 $cm^3$<br><br>  **D.**    54 $cm^3$<br><br>Correct Answer: C |

| | | Indicator | | | |
|---|---|---|---|---|---|
| | | M.7.3.2.K6a-b | | | |

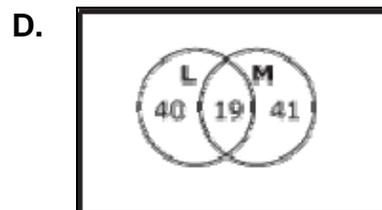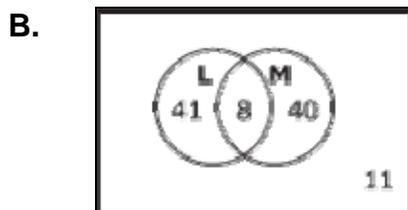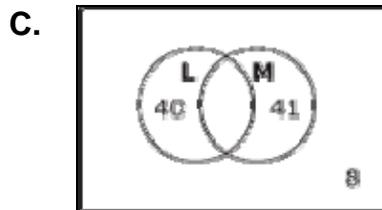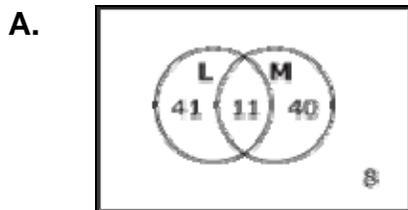| Standard/Benchmark/Indicator |
| --- |
| **Standard/Benchmark/Indicator**<br>M.7.4.2.K1a-g<br>Standard:    Data<br>Benchmark:  Statistics<br>Indicator:      Organizes, displays, and reads quantitative (numerical) and qualitative (non-numerical) data in a clear, organized, and accurate manner including a title, labels, categories, and rational number intervals using these data displays: a) frequency tables and line plots; b) bar, line, and circle graphs; c) Venn diagrams or other pictorial displays; d) charts and tables; e) stem-and-leaf plots (single); f) scatter plots; g) box-and whiskers plots |
| **Explanation of Indicator**<br>Read and make a. vertical and horizontal tables and charts, b. line, circle, and picture graphs, and c. scatter, stem-and-leaf, and box-and-whisker plots. |
| **Instructional Example**<br>1.  Have your student use newspaper to find and identify a variety of graphs (USA Today is famous for a variety of graphs daily).<br>2.  Have your student collect data such as daily high temperatures for two weeks and graph with a line graph.<br>3.  Have your student collect data such as amount of time spent on a variety of daily tasks and graph with a circle graph.<br>4.  Have your student collect data on amount spent on groceries, gas, and other weekly expenses and graph with picture graph (example would be using a picture of a ten dollar bill). |
| **Item Specification**<br>**Category 2:  Perform Procedures:  2e.** Organize or display data |
| **Assessment Item Example**<br>A poll of 100 people was taken to find which political candidate was preferred, L or M. The poll showed that 8 people did not prefer either candidate, 11 people preferred both candidates equally, 41 people preferred only candidate L, and 40 people preferred only candidate M. Which Venn diagram correctly shows the results of the poll?<br><br>A.     C. <br><br>B.     D. <br><br><br>Correct Answer: A |

| | | | Indicator | | |
| --- | --- | --- | --- | --- | --- |
| | | | M.7.4.2.K1a-g | | |

| | |
|---|---|
| **Standard/Benchmark/Indicator** | |
| M.7.1.1.A1a | |
| Standard:    Number and Computation | |
| Benchmark:  Number Sense | |
| Indicator:     Generates and/or solves real-world problems using: a) equivalent representations of rational numbers and simple algebraic expressions: a) addition, subtraction, multiplication, and division of rational numbers with a special emphasis on fractions and expressing answers in simplest form | |

**Explanation of Indicator**

Student realizes that there are a variety of ways to represent expressions such as 2x is the same as x + x or $.50 can be represented with two quarters ($.25 = $.25) or five dimes ($.10 + $.10 + $.10 + $.10 + $.10). Use equivalent representations for fractional operations such as 2/4 + 2/4 which equals 1 is the same as 1/2 + 1/2, or 2/4 ● 3/4 which equals 3/8 is the same as 1/2 ●3/4 .

**Instructional Example**

1. Have your student count out change for a given amount using several different sets of coins.
2. Have student write out an expression for the price of three cans of soda in several different ways (x + x + x or 3x).
3. Have student write several different ways to add, subtract, multiply, or divide fractions in equivalent forms.

**Item Specification**

**Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas

**Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)

**Assessment Item Example**

A triangular road sign has a height of 4.2 feet and a base of 5.4 feet. What is the area of the road sign in square feet ($ft^2$)?

**A**   11.34 $ft^2$

**B**   13.80 $ft^2$

**C**   19.20 $ft^2$

**D**   22.68 $ft^2$


Correct Answer: A

| Standard/Benchmark/Indicator |
| --- |
| M.7.2.2.A1 |
| <u>Standard</u>:    Algebra |
| <u>Benchmark</u>:  Variables, Equations, and Inequalities |
| <u>Indicator</u>:     Represents real-world problems using variables and symbols to write linear expressions, one- or two-step equations |

| **Explanation of Indicator** |
| --- |
| Write expressions (2.89x) and equations (2.89x = 12). An Expression does not contain an equal sign while an equation does. |

| **Instructional Example** |
| --- |
| Have student write an expression for the cost of x cans of pop at $.89 per can (.89x) and an equation for the number of cans of pop x that can be purchased for $5 (.89x = 5). |

| **Item Specification** |
| --- |
| **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas |
| **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals |

| **Assessment Item Example** |
| --- |
| Dinah has some packs of gum. Gary has one less than twice as many packs of gum as Dinah. Which equation represents the relationship between the number of packs of gum Dinah has (*d*) and the number of packs of gum Gary has (*g*)? |
|   |
| A.     $g = 2d - 1$ |
| B.     $g = 1 - 2d$ |
| C.     $g = 2d + 1$ |
| D.     $g = 2 + 2d$ |
|   |
| Correct Answer: A |

|  |  |  |  |  | Indicator |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | M.7.2.2.A1 |

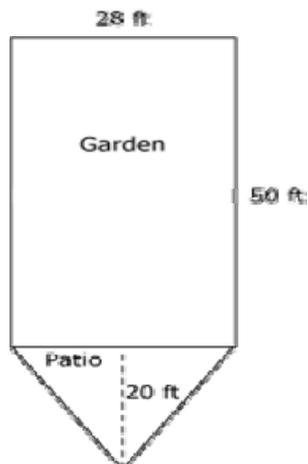| Standard/Benchmark/Indicator |
|---|
| M.7.3.2.A1c <br> Standard:    Geometry <br> Benchmark:   Measurements and Estimation <br> Indicator:     Solves real-world problems: c) finding perimeter and area of two-dimensional composite figures of squares, rectangles, and triangles |
| **Explanation of Indicator** <br> Find distance around (perimeter) and space inside of (area) of figures made with squares, rectangles and triangles. |
| **Instructional Example** <br> 1. Have your student find the amount of ribbon needed (in inches centimeters, etc.) to go a rectangle or square with a triangle on top. <br> 2. Have your student draw a rectangle or square on paper with a triangle on top and then find the amount of spaghetti needed to paste around the edges of the figure. <br> 3. Have student find the amount of paper needed (in square inches, centimeters, etc.) to cover a rectangle or square with a triangle on top. |
| **Item Specification** <br> **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems <br> **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals |
| **Assessment Item Example** <br> A rectangular garden has a triangular patio next to it, as shown below. <br><br>  <br><br> What is the **area**, in square feet (ft$^2$) of both the garden and the patio combined? <br><br>    **A.**     1,120 ft$^2$ <br><br>    **B.**     1,400 ft$^2$ <br><br>    **C.**     1,680 ft$^2$ <br><br>    **D.**     1,960 ft$^2$ <br><br> Correct Answer: C |

| Indicator | | | | | |
|---|---|---|---|---|---|
| M.7.3.2.A1c | | | | | |

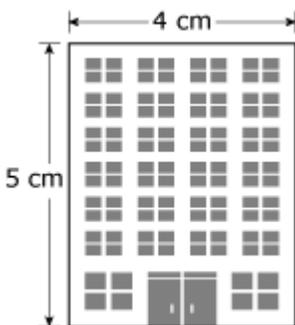| Standard/Benchmark/Indicator |
| --- |
| M.7.3.3.A3 |
| Standard:     Geometry |
| Benchmark:  Transformational Geometry |
| Indicator:     Determines the actual dimensions and/or measurements of a two-dimensional figure represented in a scale drawing |

| Explanation of Indicator |
| --- |
| Determine actual measurement of a distance given the scale of a drawing (e.g. 1 in = 20 miles on a map). |

| Instructional Example |
| --- |
| 1.  Have your student figure the actual size of an airplane given the scale of the model airplane. 2.  Use a map to figure the distance of a trip given the scale of the map being used for the trip. 3.  Use a scale of a drawing to figure the actual dimensions of the completed object. |

| Item Specification |
| --- |
| **Category 3:  Demonstrate Understanding of Mathematical Ideas:  3b.** Use representations to model mathematical ideas **Category 5:  Solve Non-routine Problems/Make Connections:  5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals). |

| Assessment Item Example |
| --- |
| Sean drew a scale drawing of a building, as shown below. |



If the width of the actual building is 60 feet across, what is the height of the actual building?

A.     48 feet  **C.**   65 feet

B.     61 feet  **D.**   75 feet

Correct Answer: D

|  | Indicator |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | M.7.3.3.A3 |  |  |  |  |

| Standard/Benchmark/Indicator |
| --- |
| M.7.4.2.3a-b <br> Standard:   Data <br> Benchmark: Statistics <br> Indicator:   Recognizes and explains: a) misleading representations of data; b) the effects of scale or interval changes on graphs of data sets |
| **Explanation of Indicator** <br> Find misrepresentations of data that distorts the appearance of the data. How changing the vertical and horizontal parts (axis) of a graph can distort the appearance of the graph. |
| **Instructional Example** <br> 1. Have your student identify misrepresentations of data in commercials, newspapers, or other media. <br> 2. Have student draw graphs of data with a variety of scales and compare to see which scale change may distort data. |
| **Item Specification** <br> **Category 3: Demonstrate Understanding of Mathematical Ideas: 3a.** Communicate mathematical ideas or rules and/or explain the process <br> **Category 4: Conjecture/Generalize/Prove: 4f.** Identify faulty arguments or identify misrepresentations of data |
| **Assessment Item Example** |

The scatter plot below shows the relationship between two variables.
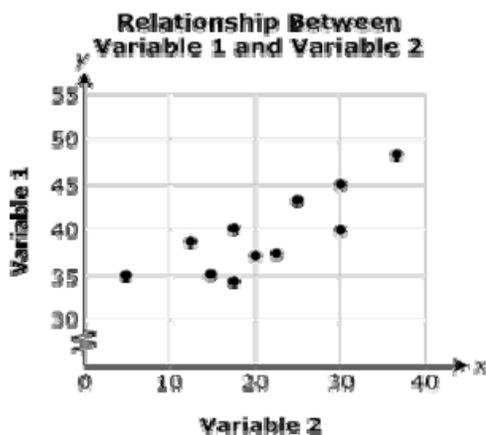


The *y*-axis scale is **changed** to include 5, 10, 15, 20, and 25 on the scale. Which statement describes the effect this scale change has on the appearance of the scatter plot?

A.    There is no effect on the appearance of the scatter plot.

B.    The spread of the data points will widen to cover the entire scatter plot.

C.    The spread of the data points will become more concentrated in the top half of the scatter plot.

D.    The spread of the data points will become more concentrated in the bottom half of the scatter plot.

Correct Answer: C

|  |  | Indicator |  |  |
| --- | --- | --- | --- | --- |
|  |  | M.7.4.2.A3a-b |  |  |