Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects. (Standards 1–2).

Standard 3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. *Solve word problems involving addition and subtraction of time intervals in minutes, for example, by representing the problem on a number line diagram.*

Concepts and Skills to Master

- Understand there are 60 minutes in an hour and view an hour in intervals of one, five, fifteen, and thirty minutes
- Represent and write time to the nearest minute on analog and digital clocks using a.m. and p.m.
- Understand the relationship between a clock and a number line and represent problems involving time on a number line diagram
- Measure time intervals (elapsed time) in minutes
- Solve word problems involving addition and subtraction of time intervals in minutes including between a.m. and p.m.
- Solve for unknowns in all places (start time, end time, time interval/elapsed time)

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
3.NF.2 Understand and represent fractions on a number line **3.MD.4** Measure lengths with halves and fourths of an inch **3.NBT.2** Fluently add and subtract	**4.MD.1** Know relative sizes of hours, minutes, and seconds. Express hours as minutes or seconds and minutes as seconds **4.MD.2** Solve word problems involving intervals of time

Critical Background Knowledge

- Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m. (2.MD.7)
- Skip-count by fives (2.NBT.2)
- Represent whole numbers on a number line (2.MD.6)
- Understand and tell time on analog and digital clocks to the hour and half hour (1.MD.3)

Academic Vocabulary

minute hand, hour hand, nearest minute, a.m., p.m., midnight, noon, elapsed time, time interval, number line

Suggested Models	Suggested Strategies
Example: At 7:00 a.m. Candace wakes up to go to school. It takes her 8 minutes to shower, 9 minutes to get dressed and 17 minutes to eat breakfast. How many minutes does she have until the bus comes at 8:00 a.m.? Use the number line to help solve the problem. 	• Apply time to real world situations (class schedule, school events, etc.) • Connect number lines to the analog clock by viewing a circular clock unfolded into a straight number line • Connect start time, end time, and time interval (elapsed time) to the number line • Determine the intervals and sizes of jumps on a number line (hour, half hour, quarter hour, five minute, one minute)

Image Source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/3.pdf

Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects. (Standards 1–2).

Standard 3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). (Excludes compound units such as cubic centimeters [cc or cm3] and finding the geometric volume of a container.) *Add, subtract, multiply, or divide to solve one-step word problems involving masses of objects or volumes of liquids that are given in the same units, for example, by using drawings (such as a beaker with a measurement scale) to represent the problem. (Excludes multiplicative comparison problems.)*

Concepts and Skills to Master

- Understand mass and weight as how heavy or light an object is
- Measure mass/weight of objects in standard units using spring scales, balance scales, and digital scales
- Understand liquid volume and capacity as how much space an amount of liquid takes up
- Measure volume of liquids in standard units using measuring cups, beakers, etc.
- Know relative sizes using benchmarks and mental images of grams (g), kilograms (kg), and liters (l)
- Solve one-step word problems involving measurement units with mass and liquid volume
- Understand conservation of matter and how it impacts estimation of liquid volume (different shaped vessels with the same capacity)

Teacher Note: The core standards do not differentiate between weight and mass. Scientifically for example, mass is the amount of matter in an object while weight is the force exerted on the body of gravity. On the earth's surface, the distinction is not important. Therefore, mass and weight may be used interchangeably in solving measurement problems related to the standard. Students may be, but are not expected to be exposed to the following units not explicitly listed in the core standards: fluid ounces, cups, pints, quarts, gallons, pounds, ounces.

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
3.MD.1 Solve word problems involving addition and subtraction of time intervals in minutes **3.OA.8** Solve two-step word problems using the four operations	**4.MD.1** Know relative sizes of measurement units and express units in a larger unit in terms of a smaller unit using a two-column table **4.MD.2** Solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money **5.MD.1** Use unit conversions in solving multi-step, real world problems

Critical Background Knowledge

- Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes (2.MD.1)
- Estimate lengths using units of inches, feet, centimeters, and meters (2.MD.3)
- Describe measureable attributes of objects and directly compare measureable attributes of two objects (K.MD.1–2)

Academic Vocabulary

Liquid volumes: liquid volume, capacity, liter (l), measuring cup, beaker, estimate
Masses of objects: mass, weight, kilogram (kg), gram (g), spring scale, balance scale, digital scale, estimate

Suggested Models	Suggested Strategies
	● Compare weights of items by holding an item weighing 1 kg and an item weighing 1 g ● Brainstorm events where exact measurement is necessary and times when an estimate is sufficient ● Identify common items labeled with mass and liquid volume (drink containers, food packages, etc.) ● Develop benchmark references by weighing objects of exactly 1 kg (a 1 kg bag of rice) and 1 g (a centimeter cube) ● Develop benchmark references by measuring liquids of volumes exactly 1 liter (juice bottle)

Image Source: https://www.illustrativemathematics.org/content-standards/3/MD/A/2/tasks/1929

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Represent and interpret data (Standards 3.MD.3–4).

Standard 3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent five pets.*

Concepts and Skills to Master

- Draw a scaled picture and scaled bar graph to represent data, with several categories
- Solve one and two-step problems using data from the scaled bar graph

Teacher Note: The Standards in Grades 1–3 do not require students to gather categorical data, just to represent it. Gathering data may be used as an instructional strategy, but it is not required of students. Third Grade is the first time students make scaled graphs.

Related Standards: Current Grade Level	Related Standards: Future Grade Level
3.0A.3 Solve and Represent Two-Step Word Problems	Standards in future grade levels are more focused on numerical data rather than categorical data

Critical Background Knowledge

- Draw picture and bar graph (2.MD.10)
- Organize, represent and interpret data (1.MD.4)

Academic Vocabulary

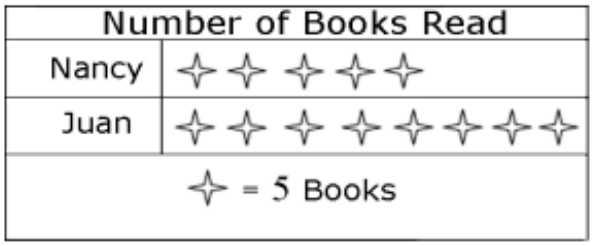
data, picture graph, bar graph, symbol, key, scaled, category, title labels, compare, how many more/less

Suggested Strategies

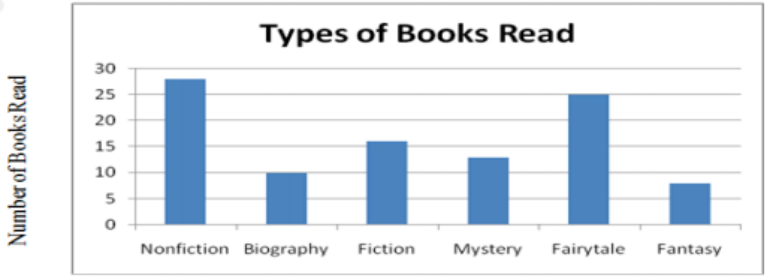
- Present clear data sets for students to draw a scaled bar graph
- Collect or give information to create horizontal and vertical bar graphs and picture graphs
- Ensure each student has the opportunity to explain analyze and interpret data

Suggested Models

Pictograph: Scaled pictographs include symbols that represent multiple units. Below is an example of a pictograph with symbols that represent multiple units. Graphs should include a title, categories, category label, key, and data. How many more books did Juan read than Nancy?



Single Bar Graph: Students use both horizontal and vertical bar graphs. Bar graphs include a title, scale, scale label, categories, category label, and data.



Analyze and Interpret data:

- How many more nonfiction books were read than fantasy books?
- Did more people read biography and mystery books or fiction and fantasy books?
- About how many books in all genres were read?
- Using the data from the graphs, what type of book was read more often than a mystery but less often than a fairytale?
- What interval was used for this scale?

Image Source: http: //www.dpi.state.nc.us/docs/curriculum/mathematics/scos/3.pdf

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Represent and interpret data (Standards 3.MD.3–4).

Standard 3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot where the horizontal scale is marked off in appropriate units-whole numbers, halves, or quarters.

Concepts and Skills to Master

- Measure lengths of several objects to the half inch and quarter inch
- Make a line plot using generated measurements; include a horizontal scale, title, labels, and straight columns of symbols (• or **X**) to represent the data points Make a line plot using generated measurements; include a horizontal scale, title, labels, and straight columns of data marks (For example: dot or X)
- Understand line plots represent measurement data, not categorical data
- Relate line plots to number lines, including representing fractions on a number line
- Teacher Note: Students do not have to generate the data each time they make line plots. That would be too time consuming. After some experiences in generating data, most work in producing line plots can be done by providing students with data sets. While scaffolds may be in place to support students in creating line plots when appropriate, students are expected to create the horizontal scale with tick marks when making line plots. While the emphasis of this standard is on generating data and making line plots, students can pose and answer simple questions about the data, such as how many students obtained measurements larger than 14 ½ inches.

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
3.NF.1 Understand that a unit fraction has a numerator of one and a non-zero denominator. **3.NF.2** Understand and represent fractions on the number line	**4.MD.4** Make a line plot to display a data set of measurements in fractions of a unit (halves, quarters, and eighths). Solve problems involving addition and subtraction with like denominators of fractions by using information presented in line plots **5.MD.2** Make a line plot to display a data set of measurements in fractions of a unit (halves, quarters, eighths). Use operations on fractions for this grade to solve problems involving information presented in line plots

Critical Background Knowledge

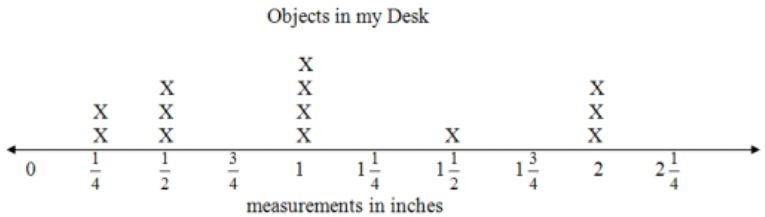
- Measure the length of an object using whole units (2.MD.1)
- Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2… Represent whole number sums and differences within 100 on a number line diagram. (2.MD.6)
- Generate measurement data and make line plots using whole number units (2.MD.9)

Academic Vocabulary

line plot, data, length, whole, half, quarter, fourth, inch (in.), “, ½”, ¼”, 2/4”, ¾”, tick mark, measurement scale

Suggested Models

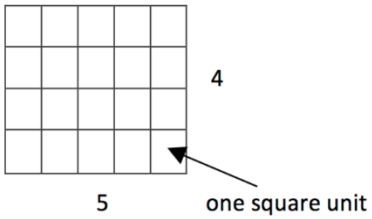
Example: Measure objects in your desk to the nearest ½ or ¼ of an inch, display data collected on a line plot. How many objects measured ¼? ½? etc…

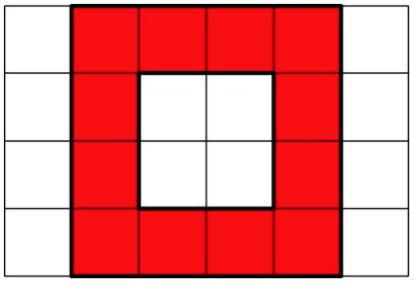


Suggested Strategies

- Use data tables to record measurements prior to creating a line plot
- Generate ideas about what measurement data could be generated and represented on a line plot
- Measure physical objects or distances varying in length; use data to create a line plot

Image Source: https://commoncoretools.files.wordpress.com/2011/06/ccss_progression_md_k5_2011_06_20.pdf

Understand concepts of area and relate area to multiplication and addition (Standards 3.MD.5–7).	
Standard 3.MD.5 Recognize area as an attribute of plane figures and understand concepts of area measurement. **a.** A square with side length one unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area. **b.** A plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units.	
Concepts and Skills to Master	
• Students recognize area as an attribute of two-dimensional regions • Understand “a unit square” and “one square unit” in relation to area • Measure the area by finding the total number of same size units to cover the shape without gaps or overlaps	
Related Standards: Current Grade Level	Related Standards: Future Grade Levels
3.MD.6 Measure area by counting unit squares (square centimeters, square meters, square inches, square feet, and improvised units) **3.MD.7** Relate area to the operations of multiplication and addition **3.MD.8** Solve real-world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters **3.OA.5** Apply properties of operations to multiply and divide	**4.MD.3** Apply the area and perimeter formulas for rectangles in real-world and mathematical problems **4.NBT.5** Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers. Illustrate and explain the calculation by using area models **4.NBT.6** Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors. Illustrate and explain the calculation by using area models **5.NF.4. b.** Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths **5.MD.3** Recognize volume as an attribute of solid figures and understand the concepts of volume measurement
Critical Background Knowledge	
• Compose two-dimensional shapes to create composite shapes (1.G.2) • Measure the length of an object by selecting and using appropriate tools (2.MD.1)	
Academic Vocabulary	
area, attribute, plane figure, unit square, a square unit, gaps, overlaps, side length	
Suggested Models:	**Suggested Strategies:**
	• Explore the concept of covering or tiling a region with “unit squares” which could include square tiles or shading on grid or graph paper. • Students should have ample experiences filling a region with square tiles before transitioning to pictorial representations on grid paper.
Image Source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/3.pdf	

Understand concepts of area and relate area to multiplication and addition (Standards 3.MD.5–7).	
Standard 3.MD.6 Measure area by counting unit squares (square centimeters, square meters, square inches, square feet, and improvised units).	
Concepts and Skills to Master	
• Identify square units • Count the square units to find the area	
Related Standards: Current Grade Level	Related Standards: Future Grade Levels
3.MD.5 Recognize area as an attribute of plane figures and understand concepts of area measurement **3.MD.7** Relate area to the operations of multiplication and addition **3.OA.5** Apply properties of operations to multiply and divide	**4.MD.3** Apply the area and perimeter formulas for rectangles in real-world and mathematical problems **5.NF.4. b.** Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths **5.MD.5** Relate volume to the operations of multiplication and addition and solve real-world mathematical problems
Critical Background Knowledge	
• Partition rectangles into rows and columns of same-size squares and count to find the total number of them (2.G.2) • Understand the relationship between numbers and quantities; connect counting to cardinality (K.CC.4)	
Academic Vocabulary	
area, array, square unit, square, square centimeter, square inch, square meter, square feet, ft2, ft, m, in	
Suggested Models	Suggested Strategies
Find the area of the colored figure. 	• Count the square units to find the area (This should be done in metric, customary, and non-standard square units) • Use different sized grid paper or 12x12 paper to explore the areas measured in square centimeters, square inches and square feet
Image Source: http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/306/original/public_task_1515.pdf?1462396036	

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Understand concepts of area and relate area to multiplication and addition (Standards 3.MD.5–7).
Standard 3.MD.7 Relate area to the operations of multiplication and addition (refer to 3.OA.5). **a.** Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. **b.** Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real-world and mathematical problems, and represent whole number products as rectangular areas in mathematical reasoning. **c.** Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths *a* and *b* + *c* is the sum of *a* x *b* and *a* x *c*. Use area models to represent the distributive property in mathematical reasoning. **d.** Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real-world problems.
Concepts and Skills to Master
• Recognize area as additive • Use tiling to find the area of a rectangle using whole numbers • Understand and explain why multiplying side lengths of a rectangle is the same as counting the tiles • Use real-world problems/context that multiply side lengths to find area using whole numbers • Use the area model to represent the distributive property • Understand and explain that the area of a rectangular region can be found either by multiplying the side lengths (5 x 8) or by adding two products (5 x 2)+ (5 x 6) which illustrates the distributive property • Decompose rectilinear figures into rectangles, find the area of each part then add the areas of the various rectangles together

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
3.MD.5 Recognize area as an attribute of plane figures and understand concepts of area measurement **3.MD.6** Measure area by counting unit squares (square centimeters, square meters, square inches, square feet, and improvised units). **3.MD.8** Solve real-world and mathematical problems involving perimeters of polygons, exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters	**4.MD.3** Apply the area and perimeter formulas for rectangles in real-world and mathematical problems **5.NF.4. b.** Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas. **6.G.1** Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing and decomposing into rectangles, triangles and/or other shapes;

Critical Background Knowledge
• See Related Standards: Current Grade Level • Partition rectangles into rows and columns of same-size squares and count to find the total number of them (2.G.2)
Academic Vocabulary
area, tiling, product, additive, distributive property, rectilinear, decompose

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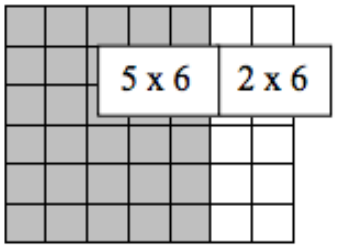
Suggested Models

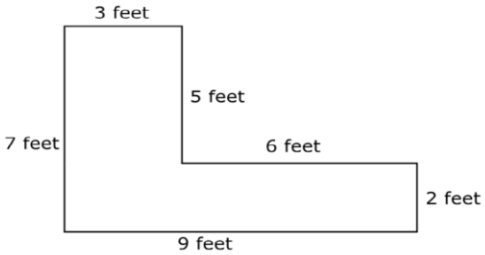
Tile the rectangle and then multiply the side lengths to show it is the same. To find the area one could count the squares or multiply 3 x 4 = 12.

1	2	3	4
5	6	7	8
9	10	11	12

This standard extends students' work with the distributive property. For example, in the model below the area of a 7 x 6 figure can be determined by finding the area of a 5 x 6 and 2 x 6 and adding the two sums.



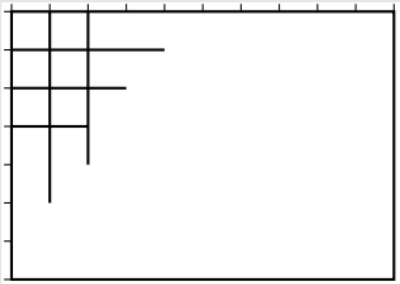
Find the area of the figure in square feet by decomposing the figure into rectangles and adding the areas of the rectangles.



Suggested Strategies

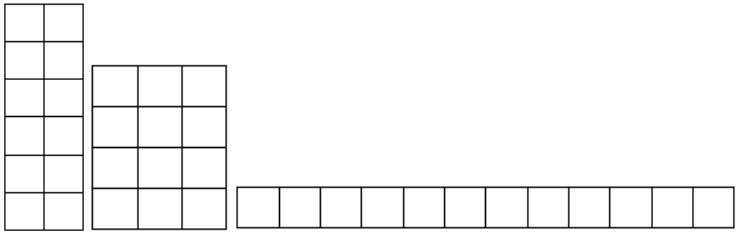
- Use square tile to tile a rectilinear figure; count, skip count, or multiply and/or add to find the total number of tiles
- Relate skip counting to multiplication to calculate the area of a rectilinear figure

Incomplete array



To determine the area of this rectangular region, students might be encouraged to construct a row, corresponding to the indicated positions, then repeating that row to fill the region. Cutouts of strips of rows can help the needed spatial structuring and reduce the time needed to show a rectangle as rows or columns of squares. Drawing all of the squares can also be helpful, but it is slow for larger rectangles. Drawing the unit lengths on the opposite sides can help students see that joining opposite unit end-points will create the needed unit square grid.

Image Sources:http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/3.pdf, https://commoncoretools.files.wordpress.com/2012/07/ccss_progression_gm_k5_2012_07_21.pdf

Recognize perimeter as an attribute of plane figures and distinguish between linear and area measures (Standard 3.MD.8).	
Standard 3.MD.8 Solve real-world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.	
Concepts and Skills to Master	
• Solve real-world and mathematical problems involving perimeter • Find the perimeter given the side lengths • Find an unknown side length given the perimeter • Find rectangles with the same perimeter and different area • Find rectangles with the same area and different perimeters	
Related Standards: Current Grade Level	Related Standards: Future Grade Levels
3.MD.5 Recognize area as an attribute of plane figures and understand concepts of area measurement **3.MD.6** Measure area by counting unit squares **3.MD.7** Relate area to the operations of multiplication and addition **3.OA.8** Solve two-step word problems using the four operations using whole numbers	**4.MD.3** Apply the area and perimeter formulas for rectangles in real-world and mathematical problems **5.NF.4. b.** Find the area of a rectangle with fractional side lengths
Critical Background Knowledge	
• Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all positions (2.OA.1) • Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends (2.OA.4) • See Related Standards: Current Grade Level	
Academic Vocabulary	
polygon, side length, area, perimeter, linear, plane figure	
Suggested Models	Suggested Strategies
 Each rectangle has an area of 12 square units, but the perimeters are 16 units, 14 units, and 26 units.	• Walk around the perimeter of a room discussing the measurements • Use rubber bands to represent the perimeter of a polygon on a geoboard or trace around a polygon on a whiteboard • Use addition to find perimeters; recognize the patterns that exist when finding the sum of the lengths and widths of rectangles • Use graph paper or square tiles to create rectangles with the same perimeter and different areas or with the same area and different perimeters, justify claims • Find the perimeters of all rectangles with an area of 12 square units
Image Source : http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/3.pdf	

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