OHIO
Mathematics Benchmarks and Indicators
Grade Eight
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BENCHMARKS AND INDICATORS	PAGE REFERENCES
Number, Number Sense and Operations Standard	
Number and Number Systems	
1. Use scientific notation to express large numbers and small numbers between 0 and 1.	SE: 186-190, 194 #62-#64, 195, 197 #21 TWE: DI 187 IE 187 OA 190 OH 14 #7
2. Recognize that natural numbers, whole numbers, integers, rational numbers and irrational numbers are subsets of the real number system.	SE: 441-445, 487 #1, 745 TWE: DI 442 IE 442
Meaning of Operations	
3. Apply order of operations to simplify expressions and perform computations involving integer exponents and radicals.	SE: 153-157, 181-185, 439 #54-#55 TWE: IE 154 OA 157 OH 9 #5, 15 #7, 25 #7
4. Explain and use the inverse and identity properties and use inverse relationships (addition/subtraction, multiplication/division, squaring/square roots) in problem solving situations.	SE: 12-16, 23-27, 49, 110, 115, 117, 121, 436, 440 #61, #62 *Algebra Activity* 63 TWE: IE 24, 216 OH 11 #2
Computation and Estimation	
5. Determine when an estimate is sufficient and when an exact answer is needed in problem situations, and evaluate estimates in relation to actual answers; e.g., very close, less than, greater than.	SE: 9 #21, 82, 99, 127, 294-297, 586, 684, 716-717 TWE: OH 9 #2, 17 #3, 21 #5, 22 #5
6. Estimate, compute and solve problems involving rational numbers, including ratio, proportion and percent, and judge the reasonableness of solutions.	SE: 264-268, 270-274, 276-280, 288-292, 293-297 *Reading Mathematics* 269 *Algebra Activity* 275 TWE: IE 265, 271, 277, 294 OH 18 #2, #6, 19 #3, 28 #4
7. Find the square root of perfect squares, and approximate the square root of non-perfect squares as consecutive integers between which the root lies; e.g., $\sqrt{130}$ is between 11 and 12.	SE: 436-440, 451 #1, 483, 745 TWE: DI 437 IE 437 OA 440 OH 25 #7

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8. Add, subtract, multiply, divide and compare numbers written in scientific notation.	SE: 186-190, 194, 195 #26 TWE: DI 187 IE 187 OH 14 #7
Measurement Standard	
Measurement Units	
1. Compare and order the relative size of common U.S. customary units and metric units; e.g., mile and kilometer, gallon and liter, pound and kilogram.	SE: 214 #49-#53, 267 #40-#41, 397 #19, 718-719 TWE: DI 385
2. Use proportional relationships and formulas to convert units from one measurement system to another; e.g., degrees Fahrenheit to degrees Celsius.	SE: 118 #48, 168, 263, 272, 397 #19 TWE: IE 272 DI 385
Use Measurement Techniques and Tools	
3. Use appropriate levels of precision when calculating with measurements.	SE: 590-594, 598 *Reading Mathematics* 589 TWE: DI 591 IE 591 OA 594 OH 10 #5
4. Derive formulas for surface area and volume and justify them using geometric models and common materials. For example, find: a. the surface area of a cylinder as a function of its height and radius; b. that the volume of a pyramid (or cone) is one-third of the volume of a prism (or cylinder) with the same base area and height.	SE: 568, 570 #1, #2, 571 #25, 573-577 *Geometry Activity* 562 TWE: DI 574, 580 OH 28 #2, #5, #6, 29 #1, #4, #7
5. Determine surface area for pyramids by analyzing their parts.	SE: 578, 580, 585 TWE: DI 586 OH 30 #6
6. Solve and determine the reasonableness of the results for problems involving rates and derived measurements, such as velocity and density, using formulas, models and graphs.	SE: 131, 135 #32, 264-268, 316, 321 #5 TWE: IE 265, 266 OH 15 #6
7. Apply proportional reasoning to solve problems involving indirect measurements or rates.	SE: 267 #47, #48, 270-274, 300, 472-473, 474 #17, 477-481 TWE: DI 472, 473 IE 472, 473 OH 18 #6
8. Find the sum of the interior and exterior angles of regular convex polygons with and without measuring the angles with a protractor.	SE: 528-531, 546 #19-#21, 547 #25-#27 TWE: IE 528, 529

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9. Demonstrate understanding of the concepts of perimeter, circumference and area by using established formulas for triangles, quadrilaterals, and circles to determine the surface area and volume of prisms, pyramids, cylinders, spheres and cones. (Note: Only volume should be calculated for spheres and cones.)	SE: 564, 567, 571, 575, 581 #20 TWE: IE 570, 575, 579
10. Use conventional formulas to find the surface area and volume of prisms, pyramids and cylinders and the volume of spheres and cones to a specified level of precision.	SE: 563-567, 568-572, 573-577, 578-582 TWE: IE 564, 565, 574
Geometry and Spatial Sense Standard	
Characteristics and Properties	
1. Make and test conjectures about characteristics and properties (e.g., sides, angles, symmetry) of two-dimensional figures and three-dimensional objects.	SE: 445 #68, 453, 471-472, 500-504, 545 #10-#15, 556-561, 563, 587 #22 *Geometry Activity* 554-555, 583 TWE: OH 27 #6
2. Recognize the angles formed and the relationship between the angles when two lines intersect and when parallel lines are cut by a transversal.	SE: 492-497 TWE: IE 493, 494 DI 496 OH 26 #6
3. Use proportions in several forms to solve problems involving similar figures (part-to-part, part-to-whole, corresponding sides between figures).	SE: 471-475, 486 TWE: DI 473 IE 472, 473 OH 29 #5
Spatial Relationships	
4. Represent and analyze shapes using coordinate geometry; e.g., given three vertices and the type of quadrilateral, find the coordinates of the fourth vertex.	SE: 506, 508-510, 512, 686 TWE: IE 508
Transformations and Symmetry	
5. Draw the results of translations, reflections, rotations and dilations of objects in the coordinate plane, and determine properties that remain fixed; e.g., lengths of sides remain the same under translations.	SE: 506-511, 512, 545-546, 686 #42, #43 *Algebra Activity* 532 TWE: DI 508 OH 26 #5
Visualization and Geometric Models	
6. Draw nets for a variety of prisms, pyramids, cylinders and cones.	SE: *Geometry Activity* 554-555, 574 Ex 2 TWE: DI 574 OA 582
Patterns, Functions and Algebra Standard	
Use Patterns, Relations and Functions	
1. Relate the various representations of a relationship; i.e., relate a table to graph, description and symbolic form.	SE: 35-37, 387-391, 393-397, 398-401, 406 *Algebra Activity* 386, 392 *Graphing Calculator Investigation* 402-403 TWE: DI 385 IE 35, 399

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2. Generalize patterns and sequences by describing how to find the *n*th term.	SE: 249-252, 258 #78-#81, 268 #54, #55 *Algebra Activity* 253 TWE: IE 250 OH 16 #1
3. Identify functions as linear or nonlinear based on information given in a table, graph or equation.	SE: 687-691, 700 #41-#43 TWE: DI 688 IE 688, 689 OH 32 #4
Use Algebraic Representations	
4. Extend the uses of variables to include covariants where *y* depends on *x*.	SE: 375-379, 394 TWE: IE 376, 394
5. Use physical models to add and subtract monomials and polynomials, and to multiply a polynomial by a monomial.	SE: 674-677, 678-681, 683-686 *Algebra Activity* 673, 682 TWE: DI 684 OA 685 OH 32 #6
6. Describe the relationship between the graph of a line and its equation, including being able to explain the meaning of slope as a constant rate of change and *y*-intercept in real-world problems.	SE: 387-391, 393-397, 398-401, 426, 429 #10 *Algebra Activity* 386, 392 TWE: DI 388, 395, 399, 400 IE 389, 394, 399 OH 22 #4, 23 #1, #2, 24 #5, 27 #4
7. Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.	SE: 118, 126-130, 142-143, 340-344, 404-408, 358-359 TWE: IE 111, 127 OH 13 #1, 20 #1, 22 #6 DI 341
8. Write, simplify and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.	SE: 17-21, 32, 38, 98-102, 103-107, 131-136, 213 *Spreadsheet Investigation* 22, 137 TWE: DI 104, 105 IE 18, 99 OH 13 #4, 32 #1
9. Solve linear equations and inequalities graphically, symbolically and using technology.	SE: 381-385, 419-422 *Graphing Calculator Investigation* 423 TWE: DI 385, 420 IE 420 OH 22 #6
10. Solve 2 by 2 systems of linear equations graphically and by simple substitution.	SE: 414-418, 422 #37-#39, 428 #47-#52 TWE: IE 415, 416 OH 26 #7
11. Interpret the meaning of the solution of a 2 by 2 system of equations; i.e., point, line, no solution.	SE: 414-418, 428 #47-#52 TWE: IE 415, 416 OH 26 #7
12. Solve simple quadratic equations graphically; e.g., $y = x^2 - 16$.	SE: 692-696, 700 #44-#49, 703 #20 *Graphing Calculator Investigation* 697 TWE: IE 693, 694 DI 695
13. Compute and interpret slope, midpoint and distance given a set of ordered pairs.	SE: 387-391, 466-470, 485 TWE: IE 388, 467, 468

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Analyze Change	
14. Differentiate and explain types of changes in mathematical relationships, such as linear vs. nonlinear, continuous vs. noncontinuous, direct variation vs. inverse variation.	SE: 393-397, 687-691, 700 *Algebra Activity* 392 TWE: DI 688 IE 688, 689 OH 22 #3, 32 #3, #4
15. Describe and compare how changes in an equation affects the related graphs; e.g., for a linear equation changing the coefficient of *x* affects the slope and changing the constant affects the intercepts.	SE: 393-397, 398-401 *Graphing Calculator Investigation* 402-403 TWE: IE 394, 399 OH 22 #3, 23 #3, 25 #3
16. Use graphing calculators or computers to analyze change; e.g., interest compounded over time as a nonlinear growth pattern.	SE: 396 #13 *Spreadsheet Investigation* 137, 303 *Graphing Calculator Investigation* 374, 402, 403, 697
Data Analysis and Probability Standard	
Data Collection	
1. Use, create and interpret scatterplots and other types of graphs as appropriate.	SE: 40-44, 411 #9-#11, 606-611, 617-621, 623-628, 708, 722-723 *Graphing Calculator Investigation* 45-46, 622, 629 TWE: DI 412 IE 41-42, 410, 607-608 OH 9 #1, 10 #1
2. Evaluate different graphical representations of the same data to determine which is the most appropriate representation for an identified purpose; e.g., line graph for change over time, circle graph for part-to-whole comparison, scatterplot for relationship between two variants.	SE: 40-44, 409-413, 722-723 *Algebra Activity* 237, 309 *Spreadsheet Investigation* 452 *WebQuest* 696 TWE: OH 9 #1, 10 #1, 19 #6
3. Differentiate between discrete and continuous data and appropriate ways to represent each.	TWE: TT 385
Statistical Methods	
4. Compare two sets of data using measures of center (mean, mode, median) and measures of spread (range, quartiles, interquartile range, percentiles).	SE: 82, 238-242, 612-616, 735 *Graphing Calculator Investigation* 243 *WebQuest* 242 TWE: DI 613 IE 239-240 OH 30 #4
5. Explain the mean's sensitivity to extremes and its use in comparison with the median and mode.	SE: 239, 241 #7, 261 #23 *Graphing Calculator Investigation* 243 TWE: IE 239
6. Make conjectures about possible relationship in a scatterplot and approximate line of best fit.	SE: 409-413, 427 #45-#46 *WebQuest* 412, 422 TWE: DI 412 IE 410 OH 22 #1

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7. Identify different ways of selecting samples, such as survey response, random sample, representative sample and convenience sample.	SE: 650-655 *Algebra Activity* 237, 253, 309, 656-657 *WebQuest* 136, 314, 603
8. Describe how the relative size of a sample compared to the target population affects the validity of predictions.	SE: 310-314, 635-636, 646-647 *Algebra Activity* 275, 309 TWE: IE 311
9. Construct convincing arguments based on analysis of data and interpretation of graphs.	SE: *Algebra Activity* 180, 237, 275, 386, 392, 640 *WebQuest* 136, 325, 412, 422
Probability	
10. Calculate the number of possible outcomes for a situation, recognizing and accounting for when items may occur more than once or when order is important.	SE: 310-311, 635-639, 641-645, 661, 646-648 *Algebra Activity* 656-657 TWE: IE 636, 642 OH 31 #1, #6
11. Demonstrate an understanding that the probability of either of two disjoint events occurring can be found by adding the probabilities for each and that the probability of one independent event following another can be found by multiplying the probabilities.	SE: 650-655, 662 #28-#30 *Algebra Activity* 656-657 TWE: IE 651, 652 DI 652 OA 655

Codes Used for TWE Pages

DI	Daily Intervention
IE	In-Class Examples
OA	Open-Ended Assessment
OH	Ohio tip-in pages (See the front of the textbook.)
TT	Teaching Tip