

MATH 325 Mathematical Problem Solving for Middle School Teachers

NOTE: Below is a sample schedule of topics and references. As the focus of this course is problem solving, instructors may choose a different set of topics and references to reach the course objectives.

Week	Overview	References / Examples of sources for classroom activities
1	A model approach to problem solving	R. Lesh and H. Doerr. (Eds.) 2003. Foundations of a model and modelling perspective on mathematics teaching, learning and problem solving. In R. Lesh and H. Doerr (Eds.), <i>Beyond constructivism: models and modelling perspectives on mathematics problem solving, learning, and teaching</i> . Mahwah, NJ: Lawrence Erlbaum. Pp. 3-33. Z. Usiskin, <i>Mathematical Modelling and Pure Mathematics</i> , 2015. <i>Mathematics Teaching in the Middle School</i> , 20 (8), pp. 476-482.
2-3	Modeling in biology: Population modeling of endangered species	Moore, T., Doerr, H., Glancy, A., & Forster, D. Preserving pelicans with models that make sense, 2015. <i>Mathematics Teaching in the Middle School</i> , 20(6), pp. 358-364. Fuentes, S. Estimating African elephant populations, Part 1, 2009. <i>Mathematics Teacher</i> , 102 (7), pp. 534-539. Fuentes, S. Estimating African elephant populations, Part 2, 2009. <i>Mathematics Teacher</i> , 102 (8), pp. 621-627.
4-5	Modeling in social science: Applications to voting	Shore, F. & Cooper, L. Map the race to the White House, 2010. <i>Mathematics Teaching in the Middle School</i> , 16(3), pp. 162-173. Caufield, M. What If? How apportionment methods choose our presidents, 2012. <i>Mathematics Teacher</i> , 106(3), Pp. 178-183. Colen, Y., Navarantna, C., Colen, J. & Kim, J. Power indices and US Presidential elections, 2012. <i>Mathematics Teacher</i> , 106(3), pp. 184-190.
6-7	Modeling in art	Cooper, L., Spitzer, S. & Tomayko, M. Become an Escher sleuth, 2013. <i>Mathematics Teaching in the Middle School</i> , 18(6), pp. 378-385. Cheng, D. & Thompson, D. From Blueprints to Labyrinths, 2016. <i>Mathematics Teacher</i> , 110(4), pp. 254-257. Davis, A. & Joswick, C. The fine art of teaching functions, 2018. <i>Mathematics Teacher</i> , 111(5), pp. 334-342.
8-9	Modeling in sports contexts	Cheng, D. & Twillman, M. Double the fun: Mathematics within pairs figure skating side by side jumps, 2018. <i>Mathematics Teacher</i> , 111(4), pp. 249-253. Leonard, A. & Bannister, N. Dancing our way to geometric transformations, 2018. <i>Mathematics Teaching in the Middle School</i> , 23(5), pp. 258-267.
10	Applications of the Pythagorean Theorem	Benson, C. & Malm, C. Bring the Pythagorean theorem full circle, 2011. <i>Mathematics Teaching in the Middle School</i> , 16(6), pp. 336-344. Barry, D. Mathematics in search of history, 2000. <i>Mathematics Teacher</i> , 93(8), pp. 647-650.
11	Modeling in astronomy	https://www.nasa.gov/audience/foreducators/5-8/index.html

12	Problem solving using children's books as a context	<p>Activities designed around books such as these may be used in class: Nagda, A. & Bickel, C. 2004. Polar Bear Math. Henry Holt & Co. Nagda, A. & Bickel, C. 2000. Tiger Math. Henry Holt & Co.</p> <p>Additional books will be presented by the students in an in-class activity presentation</p>
13-14	Modeling activity presentations	<p>Examples of contexts to be presented by students from GAIMME textbook:</p> <p>Big Foot [content foci: Measurement & Data, Ratios & Proportional Relationships] The Elevator Problem [content foci: Expressions & Equations, Functions] The Hot Dog Cart [content foci: Geometry, Statistics & Probability]</p>

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