Instructional Routines-Elementary

1. **Number Talks and Number Strings**. 5 to 10 min. No writing. Individual. 100% engagement. Only volunteers. No correcting, filtering, disagreement signals, agreement signals, etc.
   How to: http://www.movingtocommoncore.com/number-talks.html
   https://elementarynumbertalks.wordpress.com/
   https://elemath.hallco.org/web/number-talks/
   https://numberstrings.com/what-is-a-number-string/
   http://www.sfusdmath.org/math-talks-resources.html
   https://www.tes.com/lessons/x5oB20vHV30vbQ/number-talk-resources
   http://www.k-5mathteachingresources.com/kindergarten-math-activities.html
   http://mathforlove.com/2016/12/warm-ups-number-talks-and-more/
   https://www.teachingchannel.org/videos/number-talks-for-assessments

2. **Counting Collections.** This can be using slides or real objects under a document camera. The idea is to help students begin with “count all” and then move to other strategies. In order to encourage other strategies the collections might be on a ten frame, or oriented in specific configurations (doubles, doubles plus 1, fives, three’s, etc. https://drive.google.com/open?id=12u0lLJUvKGxO-2xegDE36n3rLoBKOfPo has a folder of images

3. **Open Middle** problem posed at onset of class. Students work in pairs or individually. These are great, but sometimes students need post-its with the digits written on them so they can move them around.
   These should take no more than 5 min. Pose-think-work-share
   Start simple and move to complex.
   https://www.openmiddle.com/

4. **Which One Doesn’t Belong** posed at onset. Shared Number-Talk style-5 min. 100% engagement, individual with no pencil/paper, totally voluntary shares, no filtering/correcting.
   https://wodb.ca/

5. **Would you Rather**. Shared Number-Talk style-5 min. 100% engagement, individual with no pencil/paper, totally voluntary shares, no filtering/correcting.
   http://www.wouldyourathermath.com/

6. **Visual Patterns**. Students work in groups. Describe verbally. Use color to show change. Share different ways to see change. 10 min routine.
   http://www.visualpatterns.org/

7. **Math Arguments**. Pose the question. Trios build an argument. Class is the jury while both sides are heard. 10 min routine max-usually need to stop the argument. More than 500 of these exist.
   http://matharguments180.blogspot.com/2014/01/

8. **Estimation 180**. This can take 10-15 min. It is like a 3 act task, but with a quick act 2.
   http://www.estimation180.com/

9. **Math Mistakes**. This site is by standard. Pose the mistake. Why is it a mistake? What thinking caused the mistake? Teams of 3-4 work on these. 10-15 min.
   http://mathmistakes.org/

10. **Fraction Talks**. Shared Number-Talk style-5 min. 100% engagement, individual with no pencil/paper, totally voluntary shares, The difference is that responses can be questioned to understand more. The questioning must come from other students and **cannot** be in the form, "I disagree because"
    http://fractiontalks.com/
    How to use: http://fractiontalks.com/how-to/ (especially note the additional questions to pose)

11. **Same But Different.** Ask, how are these the same, but different. Follow a Number Talk routine.
    https://www.samebutdifferentmath.com/

12. **Notice/Wonder**. Put up a graph, stat plot, infographic, anything visual. Pose 2 questions: What do you notice? What do you wonder? Students chat, then share out and info gets recorded. This can be a great launch into a topic, or a curiosity builder. See directions at link below. These images are all over twitter.
    https://www.nctm.org/Classroom-Resources/Problems-of-the-Week/I-Notice-I-Wonder/
    http://www.5280math.com/creative-math-prompts

13. **Mash Up Math Puzzles**. Use 1 a week as a challenge for groups or partners, or as a launch. These are visual puzzles that encourage algebraic thinking and number sense.
    https://mashupmath.com/freemathpuzzles

14. **Contemplate the Calculate**
    https://curriculum.newvisions.org/math/course/getting-started/contemplate-then-calculate-instructional-routine-introduction/

15. **Connecting Representations**
    https://curriculum.newvisions.org/math/course/getting-started/instructional-routine-connecting-representations/

16. **Always Sometimes Never**

https://curriculum.newvisions.org/math/course/getting-started/group-learning-routines/

17. **Compare and Improve**
    https://curriculum.newvisions.org/math/course/getting-started/group-learning-routines/

1. **Other Group Learning Routines**:
   https://curriculum.newvisions.org/math/course/getting-started/group-learning-routines/

2. **Other Instructional Routines**
   https://curriculum.newvisions.org/math/course/getting-started/other-instructional-routines/

3. **Close, Far, In Between.** Goal is for developing number sense, especially for comparing, estimating, recognizing friendly numbers, preparing for rounding, etc. Used at the beginning of class for just a few minutes. Utilize sample questions to ask students. Change the included presentation to include numbers appropriate to grade level.
   https://hcpss.instructure.com/courses/106/pages/close-far-in-between

4. **Kinder routines.** These routines are designed to support Grade K standards, but are not specific to an individual state's standards. Many routines are included.
   https://hcpss.instructure.com/courses/124/pages/routines

5. **Grade 1 routines**. These routines are designed to support Grade 1 standards, but are not specific to an individual state's standards. Many routines are included.
   https://hcpss.instructure.com/courses/9414/pages/grade-1-routines

6. **Grade 2 routines**. These routines are designed to support Grade 2 standards, but are not specific to an individual state's standards. Many routines are included.
   https://hcpss.instructure.com/courses/106/pages/grade-2-routines

7. **Grade 3 routines.** These routines are designed to support Grade 3 standards, but are not specific to an individual state's standards. Many routines are included.
   https://hcpss.instructure.com/courses/97/pages/routines

8. **Grade 4 routines.** These routines are designed to support Grade 4 standards, but are not specific to an individual state's standards. Many routines are included.
   https://hcpss.instructure.com/courses/107/pages/routines

9. **Grade 5 routines.** These routines are designed to support Grade 5 standards, but are not specific to an individual state's standards. Many routines are included. https://hcpss.instructure.com/courses/108/pages/routines

10. **Splat** Great for subitizing, finding number combinations, fractions, subtraction, division https://stevewyborney.com/2018/09/splat-for-google-slides-40-lessons/ (Nancy)

11. **Slow Reveal Graphs**. This is a highly engaging instructional routine that promotes sensemaking about data. https://slowrevealgraphs.com/

12. **Math is Visual.** This resource assists in building a better conceptual understanding of mathematics through the use of visuals. The images, videos and resources shared here are intended to help all teachers, parents and students understand that Math Is Visual and we should take every opportunity to teach it that way. https://mathisvisual.com/about/

Online Manipulatives:
https://www.didax.com/math/virtual-manipulatives.html

https://www.mathlearningcenter.org/apps

Instructional Routines-Secondary

1. **Number Talks and Number Strings**. 5 to 10 min. No writing. Individual. 100% engagement. Only volunteers. No correcting, filtering, disagreement signals, agreement signals, etc.
   https://fivetwelvethirteen.wordpress.com/2017/06/12/number-talks-in-high-school/
   https://fivetwelvethirteen.wordpress.com/category/number-talks/
   https://www.saravanderwerf.com/secondary-number-talks-ill-convince-you-with-ducks/
   http://ntimages.weebly.com/
   https://numberstrings.com/category/algebra/
   https://padlet.com/cschwartzmath/secondarynumbertalks (this has MANY resources, not just NTs)
   https://www.prealgebrateachers.com/wp-content/uploads/2019/02/Math-Talks.pdf
   http://mathsolutions.com/wp-content/uploads/14_NCTM_KCohen_NumberTalks.pdf
   middle school
   https://www.theresawills.com/math-routines Teresa Wills Remote Math Routines
   ...and many more…

2. **Open Middle** problem posed at onset of class. Students work in pairs or individually.
   https://www.openmiddle.com/
   These are great, but sometimes students need post-its with the digits written on them so they can move them around.
   These should take no more than 5 min. Pose-think-work-share
   Start simple and move to complex.
   https://www.theresawills.com/math-routines Teresa Wills Remote Math Routines
   https://drive.google.com/file/d/17hMAR3cyENxbzijhrs4aUe7ud0CmnmF6/view?usp=sharing Dan Shuster Open Middle Math Virtual Activities in Google Slides

13. **Which One Doesn't Belong** posed at onset. Shared Number-Talk style-5 min. 100% engagement, individual with no pencil/paper, totally voluntary shares, no filtering/correcting.
    https://wodb.ca/

14. **Would you Rather**. Shared Number-Talk style-5 min. 100% engagement, individual with no pencil/paper, totally voluntary shares, no filtering/correcting.
    http://www.wouldyourathermath.com/

15. **Visual Patterns**. Students work in groups. Describe verbally. Use color to show change. Share different ways to see change. 10 min routine.
    http://www.visualpatterns.org/

16. **Cube Conversations** Pose the question - How many cubes? Shared Number-Talk style-5 min. 100% engagement, individual with no pencil/paper, totally voluntary shares, no filtering/correcting. **https://stevewyborney.com/2017/12/cube-conversations/**

17. **Estimation Clipboard**. Pose the question - How long? Or how many? Shared Number-Talk style-5 min. 100% engagement, individual with no pencil/paper, totally voluntary shares, no filtering/correcting. Share strategies as you go. Use the 2nd, 3rd, 4th clipboards to streamline, try new strategies, and adjust estimations. https://stevewyborney.com/2018/04/the-estimation-clipboard/

18. **Math Arguments**. Pose the question. Trios build an argument. Class is the jury while both sides are heard. 10 min routine max-usually need to stop the argument. More than 500 of these exist. http://matharguments180.blogspot.com/2014/01/

19. **Estimation 180**. This can take 10-15 min. It is like a 3 act task, but with a quick act 2. http://www.estimation180.com/

20. **Math Mistakes**. This site is by standard. Pose the mistake. Why is it a mistake? What thinking caused the mistake? Teams of 3-4 work on these. 10-15 min. http://mathmistakes.org/

21. **Fraction Talks**. Shared Number-Talk style-5 min. 100% engagement, individual with no pencil/paper, totally voluntary shares, The difference is that responses can be questioned to understand more. The questioning must come from other students and **cannot** be in the form, "I disagree because" http://fractiontalks.com/
    How to use: http://fractiontalks.com/how-to/ (especially note the additional questions to pose)

22. **Notice/Wonder**. Put up a graph, stat plot, infographic, anything visual. Pose 2 questions: What do you notice? What do you wonder? Students chat, then share out and info gets recorded. This can be a great launch into a topic, or a curiosity builder. See directions at link below. These images are all over twitter.
    https://www.nctm.org/Classroom-Resources/Problems-of-the-Week/I-Notice-I-Wonder/
    http://www.5280math.com/cmp-later-grades high school
    http://www.5280math.com/creative-math-prompts-1 middle school

23. **Graphing Stories**. Pass out paper. Watch the video. Have students graph the story they see. Strategically share. 5 min routine. http://www.graphingstories.com/

24. **Mash Up Math Puzzles**. Use as a challenge for groups or partners, or as a launch. These are visual puzzles that encourage algebraic thinking and number sense.

https://mashupmath.com/freemathpuzzles

25. **Three Act Tasks:** Real World Math Problems to Make Math Contextual, Visual and Concrete - broken down into 3 small “acts” that drive the lesson
    https://tapintoteenminds.com/3act-math/
    https://whenmathhappens.com/3-act-math/
    https://docs.google.com/spreadsheets/d/1jXSt_CoDzyDFeJimZxnhgwOVsWkTQEsfqouLWNNC6Z4/edit#gid=0

26. **Contemplate the Calculate**
    https://curriculum.newvisions.org/math/course/getting-started/contemplate-then-calculate-instructional-routine-introduction/

27. **Connecting Representations**
    https://curriculum.newvisions.org/math/course/getting-started/instructional-routine-connecting-representations/

28. **Always Sometimes Never**
    https://curriculum.newvisions.org/math/course/getting-started/group-learning-routines/

29. **Compare and Improve**
    https://curriculum.newvisions.org/math/course/getting-started/group-learning-routines/

30. **Other Group Learning Routines**:
    https://curriculum.newvisions.org/math/course/getting-started/group-learning-routines/

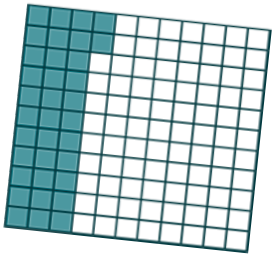
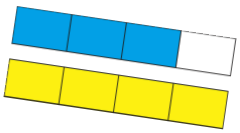
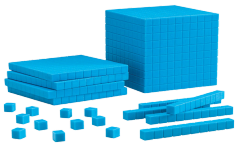
31. **Other Instructional Routines**
    https://curriculum.newvisions.org/math/course/getting-started/other-instructional-routines/

32. **Slow Reveal Graphs**. This is a highly engaging instructional routine that promotes sensemaking about data.
    https://slowrevealgraphs.com/

33. **Math is Visual.** This resource assists in building a better conceptual understanding of mathematics through the use of visuals. The images, videos and resources shared here are intended to help all teachers, parents and students understand that Math Is Visual and we should take every opportunity to teach it that way.
    https://mathisvisual.com/about/

Virtual Manipulatives, Tools & Resources

6th-8th Grade Math

Frequently Used Manipulatives			
 Unifix Cubes	 Pattern Blocks	 Cuisenaire Rods	 FDP 100s Grid
 Square Tiles	 Bar Models/Strip Diagrams	 Base 10 Blocks	 Geoboard
 Number Line - Whole Number Intervals	 Algebra Tiles	 Integer Chips	 Number Line - Rational Number Intervals

Additional Manipulatives, Tools, and Resources		
Strand/Unit	**Could Be Used For:**	**Manipulatives, Tools, & Resources**

Numbers and Operations	Whole Number Operations	Virtual Manipulatives: Whole # Multiplication - Array Model Whole # Multiplication - Area Model Interactive Activities: Factors of Numbers Game
	Prime Factorization	Virtual Manipulatives: Factor Trees Prime Factor Tiles Models/Exploration: Visualizing Prime Factorization
	Integers	Virtual Manipulatives: Integer Chips - No Numbers Integer Chips - With Numbers Rekenrek Models/Exploration: Locating and Comparing Integers on a # Line Visualizing Absolute Value Modeling Integer Addition/Subtraction with Chips Exploring Integers with Temperature Integer Addition on Number Line Subtracting Integers on Number Line Modeling Integer Multiplication - # Line Directed Number Patterns Interactive Activities: Digital "Walk it Out"

	Rational Number Operations	Virtual Manipulatives: Number Bonds with Integers and Decimals Fraction, Decimal, and Percent Strips Models/Exploration: Multiplying Fractions with an Area Model Multiplying Fractions with Overlays Dividing Fractions by a Whole # with Arrays Modeling Dividing Fractions Identifying Common Denominators - Visual Converting between Improper and Proper Fractions
	Ordering Numbers	Virtual Manipulatives: Double Number Line Interactive Activities: Locating and Ordering Rational Numbers on a # Line Ordering Irrational Numbers on a # Line Ordering Real Numbers on a # Line Ordering Rational and Irrational #s Locating Numbers on a Number Line Order Scientific Notation

	Real Numbers	Virtual Manipulatives: Interactive Place Value Models/Exploration: Visualizing Perfect vs. Non Perfect Squares Building Perfect Squares Visualizing Square Roots Interactive Activities: Classifying Real Numbers - Venn Diagram Classifying Real Numbers - All that Apply
Fraction, Decimal, Percent Conversions	Fractions, Decimals, and Percents	Virtual Manipulatives: FDP Strips Fractions and Percents Scale Fraction and Ratio Shading Models/Exploration: Interactive 10x10 Grid with FDP Equivalent Fractions on a Number Line Visual Percents Interactive FDP Interactive Activities: Interactive Fill in Blank FDP
Multiple Representations	Graphing Coordinate Pairs	Virtual Manipulatives: XY Geoboard Interactive Activities: Locate Points in the Coordinate Plane Plot Points in the Coordinate Plane Write Coordinates Given a Point Virtual Battleship

	Linear Relationships	Models/Exploration: Input Output Table Function Machine Interactive y=mx+b on a Coordinate Plane Graphing Lines in y=mx+b Finding Slope from a Line Building Slope with Right Triangles Building Rate of Change Exploring Rate of Change and Initial ValueSolving Systems Graphically Interactive Activities: Open Middle - Graphing Linear Relationships
	Proportional Relationships	Models/Exploration: Unit Rate Explore Proportional Relationships in Tables and Graphs Connecting Direct Variation to Slope Direct Variation Exploration
	Scatterplots	Virtual Manipulatives: Data Grapher - Scatterplots Estimating Trendlines Models/Exploration: Making Predictions with Scatterplots Interactive Activities: Interactive Correlation and Trend Lines

Proportional Reasoning	Rates and Ratios	Virtual Manipulatives: Fraction Grid Interactive 100s Grid Models/Exploration: Adjustable Ratio Table Grid Equivalent Ratios from Graph
	Parts, Whole and Percents	Virtual Manipulatives: Adjustable Percent Bar Model Percents with Double Number Line Models/Exploration: Adjustable Percent Bar with Proportion and Table Finding Parts Given Whole and Percent Percent Increase & Decrease Bar Model Example Interactive Activities: Percent Change Interactive Bar Model
Probability	Independent and Dependent Events	Virtual Manipulatives: Spinner Marble Jar Dice Tangrams
	Theoretical and Experimental Probability	Models/Exploration: Adjustable Spinner for Theoretical/Experimental Probability
Expressions and Equations	Equations & Inequalities	Virtual Manipulatives: Equation Solver with Algebra Tiles

		Modeling and Solving Inequalities with Algebra Tiles Models/Exploration: Graphing Basic Inequalities
	Combining Like Terms	Virtual Manipulatives: Algebra Discs
Data and Graphing	Central Tendency	Models/Exploration: Mean and Median Outliers Effect on the Mean and Median Effect of Outlier on Box Plot and Dot Plot Central Tendency with Graphs
	Graphing	Virtual Manipulatives: Graphing Tool - Box Plot, Histogram, Stem and Leaf, and Scatterplot Graphing Tool - Bar Graph, Line Graph, Pictograph Graphing Tool - Dot Plot Graphing Tool - Circle Graph Circle Graph Generator Models/Exploration: Box Plot Exploration Interactive Dot and Box Plot Interactive Activities: Interactive Game with Bar Graphs and Box Plots

2D Geometry	Area of Parallelograms, Triangles, and Trapezoids	Interactive Models/Exploration: Area Tool Desmos - Exploring Areas of Triangles
	Triangle Relationships	Models/Exploration: Lengths of Sides of a Triangle Triangle Angle Sum
	Circumference and Area of a Circle	Models/Exploration: Circle Tool Discovering the Formula for Area of a Circle Approximating Pi
	Composite Area Introduction	Virtual Manipulatives: Pentominoes Composite Figure Template
	Similar Figures	Models/Exploration: Scale Factor & Effects on Perimeter and Area Attributes of Similar Figures Exploring Scale Factor
	Angle Measures	Models/Exploration: Angle Measures - Discovery Tools

	Pythagorean Theorem	Interactive Models/Exploration: Pythagorean Theorem Tool Visualizing Pythagorean Theorem Interactive Pythagorean Theorem Discover the Pythagorean Theorem Interactive Activities: Desmos - Taco Truck
	Transformations	Models/Exploration: Dilations & Algebraic Representation Dilations & Scale Factor Translations Rotations Reflections
3D Geometry	Surface Area	Virtual Manipulatives: Surface Area of Rectangular Prisms - Nets & 3D Surface Area of Rectangular Prisms in Augmented Reality Models/Exploration: Interactive Surface Area of Rectangular Prisms Unwrapping a Cylinder
	Volume	Virtual Manipulatives: Building a Rectangular Prism with Layers Volume of Rectangular Prisms - Nets & 3D 3D Solids Snap Cubes Models/Exploration: Volume of Cylinders

		Volume of Spheres Animation Interactive Activities: Desmos - Volume of Cylinders
Financial Literacy	Financial Literacy	Models/Exploration: Comparing Compound and Simple Interest Exploring Compound Interest Simple Interest Graphical Display Car Payment Calculator Budgeting Spreadsheet
Additional Manipulatives & Resources	Want More? Want to Explore? Go Here →	Math Learning Center Brainingcamp (paid) Desmos JH Math Collection Toy Theatre Didax Maths Bot Phet Simulations NCTM Illuminations Geogebra Glencoe