TEST BANK

Chapter 1: Teaching Mathematics in the 21st Century

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Which choice reflects two factors that influence the teaching of Mathematics effectively?
   a) Manipulatives and an overhead projector.
   b) Knowledge of standards and practices.
   c) Internet sites and computer software.
   d) Student records and interviews with experienced teachers.

2) The mathematical needs in society have changed and are influencing what should be taught in preK-8 mathematics classrooms. What statement below reflects a key factor in the change?
   a) Teacher accountability through increased use of standardized assessments.
   b) International perspective with ideas on how and what to teach.
   c) Data on the performance of U.S. students in national and international studies.
   d) Research on how students learn mathematics.

3) The National Assessment of Educational Progress
   a) Consists of data collected by individual school districts so they may assess their teachers.
   b) Reported in 2013 that less than half of all fourth- and eighth-graders performed on a standardized mathematics test at the desirable levels of "proficient" or "advanced."
   c) Showed dramatic decreases in U.S. mathematics scores over the last 30 years.
   d) Produced results in 2009 that indicated U.S. students would likely reach the goal required by No Child Left Behind legislation that all students perform at or above a proficient level by 2014.

4) The six *Principles and Standards for School Mathematics* articulate high-quality mathematics education. What statement below represents the **equity** principle?
   a) Mathematics today requires not only computation skills, but also the ability to think and reason.
   b) Calculators and computers should be seen as essential tools for doing and learning mathematics.
   c) Coherence speaks to the importance of building instruction around big ideas.
   d) The message of high expectations for all is intertwined with every other principle.

5) Which of the following can be said to be true about the **learning** principle?
   a) As long as students have their basic facts and procedures memorized, they do not have to understand how the mathematics works.

b) Due to technology, it is no longer necessary for students to practice computational skills.
c) Learning is strongly enhanced when students are encouraged to make and test their own mathematical conjectures.
d) To build confidence, students should be taught to focus on their own mathematical ideas and not the thinking of others.

6) What statement best reflects the Connectionsstandard of the Five Process Standardsfrom *Principles and Standards for School Mathematics?*
   a) Students should be given opportunities to see how various mathematical ideas relate to one another and to a variety of real-life experiences.
   b) Students should be able to interpret and create various symbolic representations of mathematical ideas.
   c) Students should be able to connect personally to their fellow classmates in order to fully enjoy the learning process.
   d) Students should be able to explain and justify the thought process behind their arguments.

7) One of the statements below represents a method for developing the Reasoning and proof process standard.
   a) Select meaningful mathematical tasks.
   b) Give students opportunities to share ideas so others can understand.
   c) Emphasize how mathematics is connected to students prior knowledge.
   d) Create opportunities for students to evaluate conjectures.

8) The following statements represent the "thinking" behind the creation of the *Common Core Standards for School Mathematics.* Which statement is also true of the NCTM *Principle and Standards for School Mathematics?*
   a) Represent the largest shift in mathematics content in the U.S in over 100 years.
   b) A focused set of Mathematics content standards and practices.
   c) Provide a coherent curriculum framework for content across the school year and grades.
   d) Comprised of learning progressions that can inform instruction.

9) The Standards for Mathematical Practiceare
   a) A component of the *Common Core State Standards* that outlines a series of important mathematical processes all students should be able to do regularly.
   b) Important for students to be able to do, but are not actually a part of the *Common Core State Standards.*
   c) A set of basic computation skills that students should have to enhance their problem-solving ability.
   d) A series of common summative assessments to help teachers better understand their students' individual needs.

10) Which statement below captures the big idea from one of the Eight Guiding Principles outlines in the NCTM *Principles to Action*

a) Assessments that include ongoing observation and student interaction.
b) Learning mathematics with understanding is essential.
c) Look for both horizontal and vertical alignment to build coherence.
d) Problem solving will target student learning gaps.

11) Identify the statement that completes this statement, "Learning progressions reflect current research and practice and they guide teachers in understanding…"
    a) The essential big ideas and mathematics concepts for preschool-aged children.
    b) What came before as well as what to expect next.
    c) Progressions that are identical for all students.
    d) What the vision is for the teachers their role in developing curriculum.

12) As a practicing or prospective teacher each face the challenge of teaching mathematics from a problem solving perspective. This often requires some to confront personal beliefs about;
    a) Teaching conceptual understanding and procedural fluency.
    b) Allowing all students an equal opportunity to learn.
    c) How technology can enhance student understanding.
    d) What is means to do mathematics

13) What are examples of effective assessmenttechniques that will guide your understanding ofstudent knowledge?
    a) Meaningful instructional tasks and practice.
    b) Partnership for Assessment of Readiness for College and Careers and Smarter Balanced Assessment Consortium.
    c) Feedback, on-going observation and continuous data gathering.
    d) Grade-level content standards and the standards for mathematical practice.

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

14) What are two ways that learning progressions can inform instructional planning?
15) What are the main tenets of the Curriculum principle in the NCTM *Principles to Action*?

Chapter 2: Exploring What It Means to Know and Do Mathematics

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Which of the following is an example of a statement spoken in the language of doing mathematics?
   a) "Memorize these steps."
   b) "Compute this answer."
   c) "Explain how you solved the problem."
   d) "Copy down these steps into your notebooks."

2) Which statement below best describes the idea of mathematics as *engaging in the science of pattern and order?*
   a) Mathematical processes and concepts follow logical patterns and have a logical order. Students are capable of and should be allowed to explore this regularity and make their own sense of mathematics.
   b) Students develop conceptual understanding and become less confused when they are given a specific set of logical, orderly steps to solve each type of math problem.
   c) Students best acquire efficient methods for computing with timed drills.
   d) To avoid confusion and be successful in all mathematics, students must develop conceptual understanding of topics in a very specific order.

3) Doing mathematics begins with posing worthwhile tasks. Which verbs align with activities that lead to higher-level thinking?
   a) Memorize, drill and practice.
   b) Investigate, construct and formulate.
   c) Listen, copy and compute.
   d) Recall, application and calculate.

4) To set up an environment for "doing" mathematics, teachers need to;
   a) Develop and demonstrate rules.
   b) Efficiently manage time and materials.
   c) Quickly provide corrected answers, so students are not embarrassed by mistakes.
   d) Allow students to make engage in "productive struggle.

5) There are many ways to model and solve problems and explore how others develop understanding. Which strategy would foster students examining multiple solutions to try other methods?
   a) Generalizing relationships.
   b) Experimenting and explaining.
   c) Search for a pattern.
   d) Analyzing a situation.

6) Which of the following represents an example of an effective way a teacher might help

facilitate students' construction of mathematical relationships?

a) Asking students, "How is today's topic related to the fraction multiplication we investigatedlast week?"
b) Prompting a student with a hint as soon as he pauses while offering an explanation of a process.
c) Conveying the message to families and students that, as long as the concepts are taught correctly, math is usually easy.
d) Never intervening in students' construction of meaning. The process is much more effective if they are just left alone.

7) What does it mean to be mathematically proficient? Identify the statement below that is true of students becoming mathematically proficient.
    a) The student will need to be mathematically proficient to graduate.
    b) The student will begin the process of mathematical proficiency in high school.
    c) The student will become mathematical proficient by following daily expectations for doing mathematics.
    d) The student becomes mathematically proficient by following the directives of just the mathematics teacher.

8) The standards for mathematical proficiency state that we should want students to not only know the concepts but also to how to use them to problem solve. What statement below reflects how a proficient mathematical student might think?
    a) I consider the traditional algorithm my go to solution strategy.
    b) When I encounter a wrong path I generally skip that problem.
    c) I always look for shortcuts and never consider alternative methods.
    d) When I complete a problem I wonder if there are other answers that could be right.

9) Identify the statement that reflects an educational implication of the learning theories discussed in Chapter 2 "Exploring What it Means to Know and Do Mathematics";
    a) Class activities and lessons should be designed with students' prior experiences in mind.
    b) Students' mistakes should be minimized in order to build their confidence and enjoyment in the mathematics classroom.
    c) New concepts should only be presented to students through teacher-centered presentations, in order to help them build the necessary background knowledge.
    d) Most students learn best in a quiet class that consists primarily of direct-instruction, so that they can focus and won't be distracted by others.

10) Which statement best represents a method to expose students to multiple approaches to problem solving?
    a) Students should see a variety of inferior methods so that they can better appreciate the one best method to solve a problem.
    b) Class discussions lead to confusion for students and inhibit alternative problem-solving strategies.
    c) Multiple strategies are not very useful for simple mathematical ideas, such as basic computation facts.

d) Exposure to multiple approaches and the subsequent connections help students to recall the steps to complete mathematical processes.

11) Your teaching of mathematics is controlled by what factor below?
    a) Behaviorism theory.
    b) Personal theory and beliefs.
    c) Cognitivism and constructivism.
    d) Sociocultural theory.

12) Identify the statement below that would represent a constructivist approach to a problem solving activity.
    a) Students are given resources that they can watch, touch and listen in order to build new understandings.
    b) Students are given the strategy and procedure to follow to connect to their prior knowledge
    c) Students are directed to follow a clear path to problem solve and develop new understanding.
    d) Students are given a specific time frame to complete the problem and a correct solution is given at the end of the time period.

13) Vygotsky believed that learning was better achieved through social interaction. What statement best identifies a learning environment that represents this belief?
    a) Students are seated in rows and given problems to solve in a quiet environment.
    b) Students are encouraged to work in groups and share problem solving strategies and solutions.
    c) Students are assigned problems as homework and directed not to talk with other classmates
    d) Students are not expected to solve all of the problems, only the ones that they have the knowledge to complete.

14) What theory(s) allow a classroom culture to access prior knowledge, use tools to build knowledge?
    a) Zone of proximal development (ZPD).
    b) Sociobehaviorist.
    c) Constructivist.
    d) Sociocognitivist.

15) Making connections among mathematical relationships improves student conceptual understanding. What statement is a tenet of this belief?
    a) Teacher requires a single strategy solution.
    b) Teacher does not want students to struggle in mathematics.
    c) Teacher provides solutions when students make errors.
    d) Teacher scaffolds new content through the use of tools and peer assistance.

16) Classroom culture influences the individual learning of students. What statement is an example of how a teacher can honor diversity?

a) Value student ideas and approaches.
b) Value only your method or approach.
c) Value traditional strategies over inventive strategies.
d) Value the teacher "telling" approach.

17) Complete this statement, "Classrooms where students are making sense of mathematics do not happen by accident they happen because…."
    a) The administration requires this of their teachers.
    b) The parents set high expectations for their child's learning.
    c) The teacher has practices and expectations that foster risk taking, reasoning and sharing.
    d) The students expect a classroom where they have control over their own learning.

18) The focus of connecting the dots between theory and practice require teachers to focus in opportunities. All of the statements below are true EXCEPT:
    a) Plan and design instruction based on prior learning.
    b) Designate time for student reflection.
    c) Plan tasks that reflect the social and cultural makeup of the classroom.
    d) Design tasks that will require students to use only the standard algorithm.

19) Manipulative materials have the potential to provide opportunities for connection and communication. What statement would be a non-example of how to utilize the materials?
    a) Distributing materials with guidance on how to use them to construct models.
    b) Demonstrating at least one connection between the model and the mathematical concept.
    c) Encouraging students to converse about the model without knowledge of what the mathematical goal they are working on.
    d) Maintaining a balance between the appropriate amounts of guidance and student exploration.

20) All of the following statements regarding teaching for mathematical proficiency are true EXCEPT:
    a) It requires students to memorize less.
    b) It allows students to more easily make connections to new concepts.
    c) It increases student enjoyment and attitudes towards mathematics.
    d) It takes much less effort and time than teaching traditionally.

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

21) Name at least two examples of classroom culture that could be an environment for students to do mathematics and gain relational understanding of a concept.

22) A mathematically proficient student would approach a challenging problem solving task with a certain disposition. Describe at least two examples of what that disposition would look and sound like in a classroom.

23) Conceptual understanding is a flexible web of connections and relationships within and between ideas, interpretations and images of mathematical concepts. Give two ways that a spinner could be used to guide the understanding of the concept of "chance".

24) **TEST BANK ANSWER KEY**

25)

26) **Chapter 1 Teaching Mathematics in the 21st Century**

27) 1) b

28) 2) c

29) 3) b

30) 4) d

31) 5) c

32) 6) a

33) 7) d

34) 8) b

35) 9) a

36) 10) c

37) 11) b

38) 12) a

39) 13) c

40) Answers will vary, but could include the following sample answers:

41) 14) The learning progressions can inform instructional planning by

42) - informing teachers of what came before

43) - what to expect next as students reach key points

44) - identify interim goals along the path to learning mathematical concepts

45) - inform the order of instructional experiences

46) 15) The tenets of the Curriculum Principle include a coherent curriculum built around big ideas in daily classroom instruction. The big ideas are links from one idea to another and help students see the integration and growth over grades versus an isolated series of bits and pieces.

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57) **Chapter 2 Exploring What it Means to Know and Do Mathematics**

58) 1) c

59) 2) a

60) 3) b

61) 4) d

62) 5) b

63) 6) a

64) 7) c

65) 8) d

66) 9) a

67) 10) d

68) 11) b

69) 12) a

70) 13) b

71) 14) c

72) 15) d

73) 16) a

74) 17) c

75) 18) d

76) 19) c

77) 20) d

78) Answers will vary, but could include the following sample answers:

79) 21) Name two examples of classroom culture for students to do mathematics and gain relational understanding:

80) 1. Persistence, effort and concentration are valued

81) 2. Sharing of ideas among students

82) 3. Students listen to each other

83) 4. Students look for and discuss connections

84) 22) Mathematically proficient students approaches a challenging problem with a certain disposition- two examples of what this disposition would look and sound like are

85) 1. Students asking questions not only of the teacher but each other

86) 2. Students trying multiple approaches when problem solving

87) 3. Students recognizing errors and continuing to try other methods
88) 4. Students that can communicate the how and why their answer makes sense
89) 5. Students that believe learning mathematics is worthwhile and useful
90) 23) Two ways that a spinner could be used with the concept of "chance".
91) 1. Models and compares possible outcomes
92) 2. Models the relationship between frequency and all possible outcomes
93) 3. Creates relative frequencies by observing the sections of the spinner
94) 4. Configuration of the sections of spinner from easy to more complex
95)