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Integrating the WASL into the High School Algebra Curriculum

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INTEGRATING THE WASL INTO THE
HIGH SCHOOL ALGEBRA CURRICULUM

A Project

Presented to

The Graduate Faculty

Central Washington University

In Partial Fulfillment

of the Requirements for the Degree

Master of Education

Master Teacher

by

Kent Stafford Pearsons

November 2007

ABSTRACT

INTEGRATING THE WASL INTO THE HIGH SCHOOL ALGEBRA CURRICULUM

by

Kent Stafford Pearsons

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Most Algebra courses in Washington are supplemented with Washington Assessment of Student Learning (WASL) material. However, in the last two years, little more than half of Washington sophomores passed the math portion of the WASL; for about half of tenth graders the extra worksheets did little to no good. Students need relevant WASL material that correlates with the current math they are studying. In this manner, even though questions may be phrased differently, the material is familiar and so answering questions are more possible. Also, since new worksheets have multiple choice, teachers can discuss how most wisely to answer this type of question.

The Project is made up of twelve worksheets each correlating to a chapter out of College Preparatory Mathematics (CPM), Algebra Connections. Each worksheet consists of multiple choice, short answers, and extended response questions and are in the same format as the WASL. Students, then, being familiar with the content have only to decipher the structure of the questions.

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CENTRAL WASHINGTON UNIVERSITY

Graduate Studies

Final Examination of

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for the Degree of

Master of Education

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Courses presented for the Master's degree

Course No.	Course Title	Number of Credits	Instructor	Quarter Completed
EDCS 571	Continuing Progress Schools	3	L. Fitch	Summer, 2004
EDF 505	Educational Measurement For Teachers	3	L. Fitch	Summer, 2004
EDCS 513	Creative Teaching	3	L. Plourde	Fall, 2004
EDCS 543	Teacher Counseling	3	L. Fitch	Winter, 2005
EDCS 597	Graduate Research	3	L. Plourde	Spring, 2005
EDF 501	Educational Foundations	3	L. Plourde	Summer, 2005
EDF 508	Comparative Education	3	L. Fitch	Summer, 2005
EDF 510	Education Research-Development	3	L. Fitch	Fall, 2005
EDF 507	Studies & Problems in Intercultural Education	3	D. Woodcock	Winter, 2006
EDCS 545	Classroom Teaching Problems	3	L. Plourde	Spring, 2006
EDF 511	Planning for Learning	3	L. Pearl	Summer, 2006
EDCS 597	Graduate Research	3	L. Plourde	Fall, 2006
EDCS 597	Graduate Research	3	L. Plourde	Winter, 2007
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EDCS 700	Thesis/Project Study/Exam	2	L. Plourde	Summer, 2007
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CHAPTER I

INTRODUCTION

In 2002, Congress approved the legislation *No Child Left Behind* (NCLB) that required all students—no matter their background nor the school's inadequacies— to be grade level proficient by the year 2014. Schools were held accountable for achievement in reading / language arts and mathematics by giving standardized tests from third to eighth grade as well as once between tenth and twelfth grade. This legislation demanded that all cell areas show yearly growth. A cell area refers to a specific group of students—including Hispanic, poverty and special education students—that take the particular test. Schools were also responsible for tracking student progress and participation. Individual states decided what tests to use to measure their academic success as long as they lined up with the state standards (Spellings, 2005).

In 1993—nine years before NCLB—the Washington Legislature passed the *Basic Education Act* (BEA, also called the Educational Reform Act) due to Washington School's poor performance on national exams. "The legislature finds that student achievement in Washington must be improved to keep pace with societal changes, changes in the workplace, and an increasingly competitive international economy" (Washington State Legislature, 1993). The goal of that act was to give all students the chance to become responsible citizens, to add to their own and their family's economic security, and to enjoy industrious and worthwhile lives.

The Basic Education Act eventually dictated what Washington State schools should look like. Therefore, in 1993 the Commission on Student Learning identified the essential academic learning requirement skills (EALRs); standards for reading, writing, mathematics and other skills. The Commission needed a way to measure these skills and in 1993 developed the Washington Assessment of Student Learning (WASL) (Finne, 2006). In the subsequent five years the commission on Student Learning worked on developing the standards with benchmarks in grades 4, 7, and 10 (Partnership for Learning, {no date}).

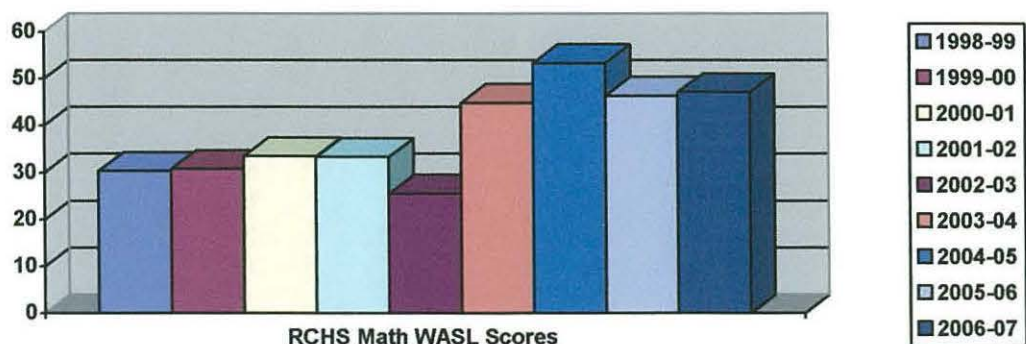
Since 1998, Washington students in the public school have taken the WASL to measure their ability in basic skills. Unfortunately, many students are not prepared properly and cannot pass this assessment; only 47.2% of sophomores at River Canyon High School passed the math WASL in 2007. Originally, from the pressure of the BEA and NCLB, The Commission on Student Learning will make passing the WASL in reading, writing and mathematics a requirement for graduation in the year 2008 and a requirement. However, Washington legislature postponed that requirement until 2013.

STATEMENT OF THE PROBLEM

Tenth grade River Canyon High School (RCHS) students have taken the math portion of the WASL each year since 1998 with marginal improvements in those who passed with a 3 or 4. Students receive a raw score, such as 395, and then that score places them in one of four levels: Level 4 (above 434 – 575,

exceeds standard), Level 3 (400 – 433, meets standard), Level 2 (375-399, below standard) or Level 1 (200 – 374, well below standard).

In 1998-99, 30.3% of the tenth grade students at RCHS passed compared to 47.2% in 2006-07 which is only a 16.9% increase in nine years. In 2005, the principal understood that the school did not have to test Pre-Algebra students until they were enrolled in Algebra. For example, a student in tenth grade enrolled in Pre-Algebra would not have to take the WASL until he was enrolled in Algebra (in eleventh grade) so he would be prepared to take the WASL. Unfortunately by 2006 this policy changed and the tenth grade students in Pre-Algebra had to take the WASL as well as those eleventh graders who did not take the WASL in 2005. So in 2005 the lowest scores were dropped and 2006 had two sets of low scores from the tenth grade Pre-Algebra students who took the WASL in 2006 and from the eleventh grade students who did not take it in 2005 but for the first time in 2006. This change in policy made 2005 scores look better and 2006 scores look worse (OSPI Washington State Report Card, 2007).



River Canyon must dramatically improve if more than 50% of students are to graduate by 2013 since it will be a requirement for graduation by then. The problem lies in the fact that the testing methods of the WASL tend to be different than the testing methods of most teachers. For instance, an Algebra test on equations would mostly consist of solving those equations while a WASL type question would be concerned with why or how, with the students giving reasons. Students are not conditioned to explain their reasoning. Also, WASL material is often supplemented with no correlation to the rest of the curriculum which confuses students.

James Slosson (2004) gives various reasons why students are not more successful in passing the WASL. These include poor math skills, lack of the needed curriculum, the worst performing students tend to have the least experienced teachers, and the teaching style of most math teachers differs from that of the testing style of the WASL. The WASL is testing students in ways that they are not currently tested in their math class.

PURPOSE OF THE PROJECT

The purpose of the project was to develop supplemental WASL material that correlates with each chapter of River Canyon's Algebra 1 text, Preparatory College Mathematics (CPM). When students complete this material it will not seem like extra WASL worksheets "thrown in" but rather it should help tie the chapter together and therefore the students will be able to become successful in passing the WASL. For example, for a chapter on equations, a WASL worksheet

would be formulated that asks questions about equations or that needs the knowledge of equations in a WASL format. Students may not be used to the format but they would at least recognize the content. WASL questions would also accompany tests.

SIGNIFICANCE OF THE PROJECT

The significance of the project will be demonstrated in an increase in the number of students passing the math WASL. Using the relevant supplemental material students take what knowledge they already have and apply it to a WASL testing situation. Also, some of these questions could be added to a chapter test so that the students are familiar with that style of questioning and answering in a testing situation. By the time students take the WASL they will be used to this format and answer the questions properly. As students become more familiar with the WASL format, their scores will increase and lessen the necessity for having to repeat the test later.

Also, much of the WASL has application problems. In most math classes students learn how to execute theoretical problems without mastering the application ones. Since this WASL material has application material, its implementation would help to bridge the gap between theory and application. Even those students not taking the WASL (11th or 12th graders in Algebra) will have their math application skills increased – a helpful skill for any high school student.

Since most Algebra textbooks follow a similar order of instruction, the supplemental material could possibly be used in different Algebra classes throughout Washington State. It would give the students in those schools yet another possible resource to increase WASL scores in their district as well as help these students to understand math application problems.

Most high school math classes do not use multiple choice on homework or taking tests. Giving these worksheets to students will give teachers the opportunity to give testwiseness clues on multiple choice (Patricia Kuntz, 3/82). Often, possible answers have a low and high; if the student has to guess he should pick a number between those. To illustrate this point, if four choices are given—say 23, 12, 56, and 1—and the student has no idea on any of those, his best bet is to eliminate the highest (56) and the lowest (1) and pick either 12 or 23. Often test makers will have extreme values that are incorrect answers.

LIMITATIONS OF THE PROJECT

Obviously, adding extra material to the class will take more time and therefore teachers may not choose to use the material, since they would have to give up some material they have been teaching. At this point, only teachers at River Canyon High School would be involved. Only students in Algebra 1 would receive the material since those who are in Geometry or Algebra 2 tend to do better on the WASL. Also, at some point the math department will need to purchase new Algebra 1 textbooks which may not exactly line up with my supplemental material.

DEFINITION OF TERMS

Cell Area: specific group of students identified by race, poverty or special education (Spellings, 2005)

Correlate: to emulate the chapter's material

Math Application Problems: math problems that require reasoning as well as mathematical computation

Properly: executed in such a manner that would score well from a WASL grader.

Supplemental Material: math material inserted in an Algebra 1 course that corresponds to the chapter being taught and is also in WASL format.

Washington Assessment of Student Learning (WASL) format: A format in which questions are asked in the same manner as on the WASL: multiple choice, short answer, and essay.

PROJECT OVERVIEW

Chapter I gives the premise of the problem: students at River Canyon High School (RCHS) are passing the WASL with only about a 50% success rate. The project is significant because it should increase students' scores on the test and therefore helping more pass. The scope is only limited to this high school or possibly to others using the CPM Algebra books.

Chapter II gives some of the history of education including No Child Left Behind (NCLB), A Nation at Risk, the National Council of Teachers of Mathematics (NCTM), the Education Reform Act. Also, it includes the idea of

testwiseness and how it relates to Mathematics, standardized tests, and multicultural education.

Chapter III gives the background of the project—the history of the WASL at RCHS. This chapter also gives the procedure plans—the sources for the material of the project. Also included is the project development, and how the math department will be involved implementing it.

Chapter IV goes through a chapter by chapter summary of what the project includes.

Chapter V gives the summary and conclusions of Chapters I–IV.

CHAPTER II

REVIEW OF LITERATURE

Across the United States, states have set new rigorous standards, identifying what schools require students to know. States have been planning and executing new assessment models so students can meet these standards. Standards are specific goals that clarify what students need to attain, providing targets for teachers and students (Education Commission of the States, 2002). Although a relatively new idea, the push for standards-based assessment began as early as 1957.

In 1957, the Russians launched Sputnik which encouraged the Federal Government to be involved in public education. Previously, schools were only run by the state and local governments. In 1958, Congress passed the billion dollar National Defense Education Act which authorized college loans, scholarships and scientific equipment for schools as well as involved the federal government in education. This act stressed the study of math, science and foreign languages through the 1960's and the 1970's. Also, university professors and scientists had the option to play a part in determining education policy and curriculum (Devitt, 1997).

In 1981, Secretary of Education T. H. Bell established the National Commission on Excellence in Education and two years later in 1983 Chairman David Gardner sent *A Nation at Risk: The Imperative for Educational Reform* (Gardner, 1983) back to Mr. Bell. This report recommended that high school

graduation requirements be strengthened by requiring 4 years of English, 3 years of math, 3 years of science, 3 years of social studies and half a year of computer science. A Nation at Risk also advocated implementing more demanding and quantifiable standards and "higher expectations for academic performance" (National Commission on Excellence in Education, 1983, p. 3).

Standards-based assessment is relatively a new phenomenon. "Up until the 1990's, what got taught in individual classrooms typically evolved from a mix of textbook selections, course requirements, local preferences, teachers' lessons, and standardized tests" (Barth, 2006, p. 2). In other words, two Algebra classes in the same school could teach and focus on different material depending on the factors listed above. Grades could also vary; one teacher's A could be equivalent to another teacher's C.

President George H. W. Bush called the country's governors together to the 1989 Educational Summit to form a national, bipartisan plan to improve American education (U.S. Department of Education, 1996). This meeting resulted in the development of national educational goals which required increased "levels of: student achievement and citizenship; high school completion; teacher education and professional development; parental participation in the schools; literacy and lifelong learning; and safe, disciplined, and alcohol- and drug-free schools" (Barth, 2006, p. 1). The goals also called for all students to be prepared to learn upon entering school and for the U.S.

mathematics and science students to be the top in the world by 2000 (Barth, 2006).

The National Council of Teachers of Mathematics (NCTM) used their model of mathematic goals to give schools an example of how to write goals for other subjects: language arts, social studies, physical education, and health (Rhoads, Sieber, and Slayton, 1996). Throughout the 1990's, states created their own sets of standards (Barth, 2006). In March of 1994, Goals 2000: Educate America Act was signed into law. The Act provided resources to states so that all students could learn to their full capability (North Central Regional Educational Laboratory, 2004).

The No Child Left Behind Act (NCLB) passed in 2001 and made all states accountable for their students to be proficient by 2014. By this measure, states were also held responsible for Title 1 dollars which are used to supplement low-income families which affected almost 90% of all U.S. school districts. Schools need to show adequate yearly progress (AYP) for all subgroups based on "race, ethnicity, family income, or special educational needs" (Barth, 2006, p. 1). Failure to meet any subgroup for five years would result in the government taking over the school.

In the past, standardized tests were administered without students being held accountable for their scores. There was no penalty for students not trying and performing poorly. However, as of 2006, twenty-five states required all high

school students to pass a standardized test before they could graduate from high school (Barth, 2006).

NCTM Standards

In 1915 the American Mathematics Society (AMS) created the Math Association of America (MAA) which helped form the NCTM in 1920. NCTM was mainly created to help “preserve mathematics in the public schools” (Askey, Milgram, and Wu, nd, p. 1).

In 1923 American mathematicians and distinguished high school math teachers published *The Reorganization of Mathematics in Secondary Education*. This report reflected six years of study and had very similar goals to a report written in 2007. For example, it compares education in America to that of foreign countries and devises a plan for students to learn higher math at an earlier age. For fifty years the AMS and the NCTM worked closely together with many shared common goals. However, since the 1970’s the two groups have functioned more independently. According to Askey and his team, “...the long isolation of NCTM from the professional mathematics community has resulted in many errors and questionable practices creeping into the accepted mathematics that is taught in K–12 ” (Askey, Milgram, and Wu, nd, p. 1).

In 1989 the NCTM—by now an international association of teachers committed to the excellence in mathematics—released *Curriculum and Evaluation Standards for School Mathematics* which articulated goals for mathematics teachers and “provided focus, coherence, and new ideas to mathematics

education (NCTM, 2000-2004, p. 1). By 1991 the NCTM published *Professional Standards for Teaching Mathematics*, which explained effective elements for teaching math. Four years later in 1995 the NCTM established objectives with assessments in *Assessment Standards of School Mathematics*. "These three documents have given focus, coherence, and new ideas to mathematics education," (NCTM, 2000-2004, p. 1).

In 1997 the NCTM's Board of Directors selected the Commission on the Future who started the Standards 2000 project and appointed a Writing Group to create updated standards. The Commission attained input from different sources including a variety of "curriculum materials, state and provincial curriculum documents, research publications, policy documents, and international frameworks and curriculum materials" (NCTM, 2000-2004, p. 1). In 1998, the Writing Group wrote the book *Principles and Standards for School Mathematics* which has been used to develop mathematics curricula, instruction, and assessment.

The current NCTM standards are an exhaustive list of standards including Number & Operation, Algebra, Geometry, Measurement, and Probability. The standards also identify Process, Problem Solving, Reasoning & Proofs, Communication, Connections, and Representation. The grade grouping for each standard is Pre-K-2nd, 3rd-5th, 6th-8th, and 9th-12th. Basically students are sectioned into younger elementary, older elementary, middle school, and high school, (NCTM, 2000-2004).

Washington State Standards

In 1985 Washington State created a Temporary Committee on Educational Policies, Structure, and Management which recommended many educational changes such as goal setting, stiffer graduation requirements, and achievement testing in all grades. The State also advised changes in teacher preparedness and salaries. From 1991–1993 Washington Governor Booth Gardner issued three Annual Progress Reports on the states' educational goals. According to the governor, little progress had been made toward national goals (Evergreen Freedom Foundation, 2006).

To “ensure that every child in Washington can read, write, and do math and science,” in 1993 the legislature adopted HB 1209, the Education Reform Act. (Partnership for Learning, nd, p. 1) This Act set up standards that assured all students graduating from a Washington High School had mastered math, reading, writing, and eventually science. From 1993-96 standards were developed with benchmarks in grades 4, 7, and 10 (Partnership for Learning, nd).

In 1996, the Washington State Legislature implemented the Washington Assessment of Student Learning (WASL) for 4th, 7th and 10th grades, testing reading, writing, and math. By 1998, all schools in Washington State assessed those grades using the WASL. In 2000 the State Board of Education determined that the class of 2008 would need to “pass 10th-grade WASL, complete culminating project, create High School & Beyond Plan and earn minimum class credits” (Partnership for Learning, nd, p. 1). By 2010, passing the 10th grade

Science WASL would also be a requirement for graduation. However, due to consistent low scores in math throughout the state, the math and science requirement was extended to 2013 (Blankinship, 2007). Teachers and community members help to maintain and improve the WASL (Partnership for Learning, nd.).

Testwiseness

Illinois State Board of Education defines testwiseness as, "The possession of skills independent of subject-matter knowledge that make it possible for students to score higher on an assessment" (Illinois State Board of Education, 1995, p. 58). These skills can be taught—but often are not—and will usually give students a slight improvement in scores. Teachers often assume their students know how to take tests whether multiple choice or essay.

Testwiseness not only helps a student *take* a test but also *prepare* for a test. For example, testwiseness calls for students to review early, take sample tests, make summary notes, and to familiarize themselves with the type of test. Emotionally, a student should keep a positive attitude, relax, avoid distractions, sleep well and eat well. General items for test-taking include knowing how they have to complete the test, looking over the entire test first, reading directions carefully, pacing, and skipping difficult questions and coming back to them (Crestwood Junior High School, 2003).

There are many different types of assessments such as essay, short answer, completion, multiple choice, matching, and true-false. Therefore, there are many hints testwiseness has for each type of test.

With writing assessments—such as essay or short answer—students should prepare by knowing the details of the material. Students should plan it out with an outline and know where they are going with their conclusion. Also, students should reread their final product to see if it flows. When writing short answers for tests, pupils need to make sure that they respond clearly and concisely. After answering, they should reread the question asked and verify that their answer makes sense (Crestwood Junior High School, 2003).

With completion tests, pupils should study factual material and read the test item carefully (an answer may be in another question). Students taking multiple choice assessments need to read all choices eliminating those that do not belong and try to answer the question before seeing the possible answers. They should also look for extreme answers—often those can be discarded. For matching exams the test taker should read directions carefully (can one item be used more than once?), read both columns (any unused answers), and keep track of which items have been chosen. For assessments with true-false questions/statements, the student should mark true only if the statement is true without exception. He also ought to recognize such words as all, never, always which usually imply a false statement whereas usually, generally, and most often imply a true statement (Crestwood Junior High School, 2003).

Dr. Sobaskie (nd.), Professor at the University of Wisconsin in Marathon County, had his own testwiseness strategies. Studying should happen daily—not the day before the test. All directions on the test should be read—nothing should be assumed. The exam should be reviewed before attempting and that the easiest questions answered first to build confidence. Every question should be answered with all work shown; partial credit may be awarded. With multiple choice, wrong answers should be eliminated immediately. Answers to different questions can often be gained from the exam itself (Sobaskie, nd).

Testwiseness for Mathematics

Specifically for mathematics, *Study Guides and Strategies* offers tips for testing, including reading through the exam, reading the instructions, checking, rewriting of the problems, writing out each step clearly, double checking math including calculator work not to waste time on any problem, and rechecking work. (Landsberger, 2006).

To prepare for a test, one should prepare early. All homework should be done on a daily basis since “math is a building process and in order to understand the next step you need to comprehend the present, and previous ones,” (Landsberger, 2006, p. 1).

A second tip is that test conditions should be simulated. In order to be affective test takers, people must practice taking exams in similar conditions with no notes or music, and restricting the time limit. Often if students can work

though their homework problems they feel they should ace the test. They have practiced content but not context (Landsberger, 2006).

Thirdly, students should also study the teacher's tests by either finding a test from a previous year or talking to colleagues who previously took the class. To know the instructor's exams is very helpful in knowing what is expected on test day. This same idea of knowing the exam can be extremely helpful in taking the Washington Assessment of Student Learning (Landsberger, 2006).

Lastly, students need to form study groups of three or four. The obvious advantage of this idea is that one of the others may be able to explain material. The hidden benefit is that the better one can explain material the better he will understand it (Landsberger, 2006).

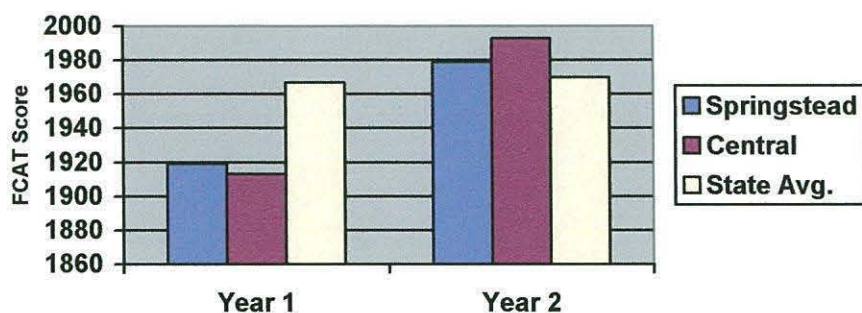
Testwiseness and Standardized Tests

Messick and Jungblut (1981) show the use of testwiseness specifically with students preparing for the Scholastic Aptitude Test (SAT). In this study, 19 hours of coaching receives an estimated 20 point increase; 107 hours receives an estimated 40 point increase. In another study, with the Preliminary Scholastic Aptitude Test (PSAT), 75 hours testwiseness instruction over a 6-week period increases what would be the equivalent of 42 points on an SAT, (Kenny & Faunce, 2004). In both cases, the scores of students preparing for a test are increased dramatically.

Many schools show evidence of testwiseness by use of Buckle Down workbooks and diagnostic tests. Springstead High School and Central High

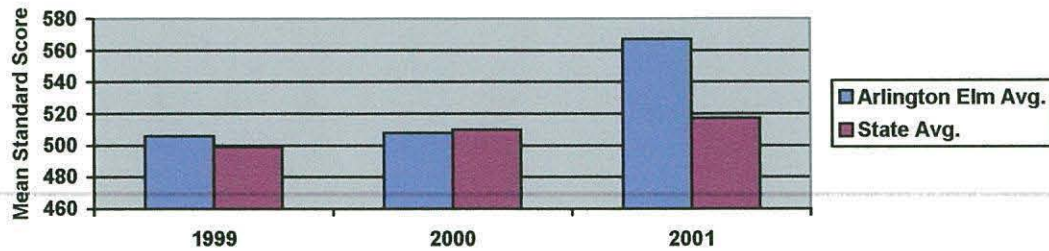
School in Florida showed dramatic changes with Buckle Down. Springstead High School increased their scores on Florida's Comprehensive Assessment Test (FCAT) from 1919 to 1979 (3% increase), Central High School increased their FCAT scores from 1913 to 1993 (3.3% increase), while the state average barely increased 0.15% from 1967 to 1970 (Buckle Down, nd).

Hernando County FCAT scores



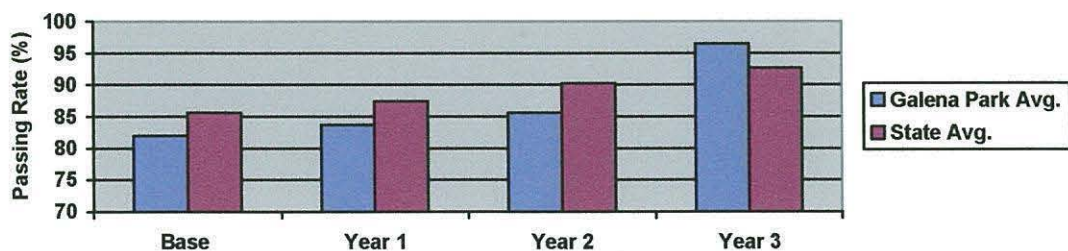
Bethlehem School in Taylorsville, North Carolina had its Math scores increase by about 6% on its Elementary End-of-Grade Test from one year to the next. Arlington Elementary in Arlington, Arizona had its third grade scores improve from 506 out of 600 (84.3%) in 1999 to 567 (94.5%) in 2001. This shows an increase of about 10.2% over two years whereas the state average was only up by about 3% (Buckle Down, nd).

Arizona Grade 3 Math Results



Finally, over a four year period the Reading Scores of Galena Park High School in Texas raised their scores 14.5% over four years, from 82% to 96.5%. Over that same time period, Texas State increased only 7.1%, from 85.6% to 92.7%. Testwiseness has helped many states (Buckle Down, nd).

Texas High School Reading Results



Testwiseness and the WASL

In order to be successful on the WASL, schools have had to increase their testwiseness, some even changing their curriculum and style of teaching to better match the WASL. In 2002, only 42% of Kamiakin High School sophomores in Kennewick, Washington passed the math on the WASL. In 2003 they changed their math curriculum to the Academy of MATH which gives students in their math class additional support. The curriculum also lines up well

with the NCTM standards. By 2005, 73% of the students had passed the math WASL. This is a 31% improvement over three years, the largest gain in all of Southeastern Washington (AutoSkill, 2006).

In 2003, only 24.3 % of Kalama High School students passed the mathematics portion of the WASL. Realizing the deficiency, the District made changes to the curriculum such as aligning the curriculum to the standards and changing how math was taught. In 2006, Kalama High had 72% pass the math portion of the WASL. That is a 47.7% in 4 years! Both are a form of testwiseness because the WASL is based on the standards; the curriculum is preparing students for the test. Also, if teachers ask questions in accordance with WASL questions, pupils will be successful.

Testwiseness and Multicultural Education

“Multicultural education is a philosophical concept built on the ideals of freedom, justice, equality, equity, and human dignity as acknowledged in various documents such as the U.S. Declaration of Independence, constitutions of South Africa and the United States, and the Universal Declaration of Human Rights adopted by the United Nations” (National Association for Multicultural Education (NAME), 2003, p. 1). It identifies the part schools can play in developing socially aware citizens to eventually run our nation. It values cultural diversity and confronts all forms of discrimination (NAME, 2003).

Although to completely remove the bias from a traditional test is nearly impossible, testwiseness will make tests more multicultural since it gives hints to

all races taking an exam (Lam, 1994). Samuel Carter's *No Excuses: Lessons from 21 High-Performing, High-Poverty Schools* involved 21 successful minority schools. At least one answer to success in these schools is that the students understand testwiseness. They are taught *how* to take exams (Carter, 2000).

In the last forty years, the United States has developed many programs that pushed for standards-based instruction. In 1983, the National Commission on Excellence established *A Nation at Risk: The Imperative for Educational Reform* which stiffened the high school graduation requirements and began to implement more demanding and quantifiable standards. In 1989, the Educational Summit formed a plan to improve American education which required increased levels of student achievement, literacy, lifelong learning and many other goals. By the 1990's the NCTM created standards that schools began to base the content of their classes. In 1994, Goals 2000 provided resources to states so students could learn to their full potential. Finally, in 2001, NCLB made all states accountable for their students' proficiency.

Washington State was soon to follow implementing standards in its schools. By 1998 the WASL was introduced and eventually instituted as a requirement for graduation in 2008. At least partly because of the different testing style, math scores have been less than 50%. To overcome this fact and have students be successful on the WASL, math teachers must offer testwiseness in their classes.

CHAPTER III

BACKGROUND OF PROJECT

Ever since 1999, River Canyon High School has been taking the Washington Assessment of Student Learning (WASL). Originally only 30.3% passed the math portion with a three or four and still in 2007 47.2% passed with an increase of only 16.9% in nine years. Unfortunately, in 2013 the WASL is required for graduation and more than half the class will not graduate because of this fact.

Students are lacking the preparation they need to pass the math section of the WASL which contains multiple choice, short, and long answers. In most math classes, pupils are accustomed to *answering* questions but not having to justify them. The WASL requires students to show their reasoning; just *giving* the answer will only receive partial credit.

WASL worksheets can be helpful for students to practice this type of material. However, these worksheets are often given at random times and have no connection to the content being studied. Students need to practice WASL material that relates directly to what chapter is being taught. In this way, the only thing new is the question format.

PROJECT PROCEDURE

The WASL material for this project came from four basic sources: math teachers at RCHS, the internet, *WASL Power!*, and ones created by the author. All four have given plenty of choices to help assemble the worksheets.

Many math teachers at River Canyon have been collecting WASL material ever since the assessment was introduced. Some examples are actual WASL questions used before while other ones are made up in the same WASL format.

The internet offers many different resources for WASL material. The Office of Superintendent of Public Instruction (OSPI) has many examples and solutions from previous WASL exams. Also, different High Schools throughout Washington State post WASL examples on their website.

WASL Power!, by New Readers Press, gives examples of WASL problems listed by the Essential Academic Learning Requirements (EALRs). This publication was extremely helpful in creating worksheets.

Even with all this material, there was not enough examples for a particular chapter or a chapter that needed more basic questions. In either case, the author needed to create some questions for the worksheets in the WASL format.

PROJECT DEVELOPMENT

Once all the information had been gathered, it needed to be sorted depending on the chapter of the textbook which corresponded to the material. For example, chapter 1 includes interpreting graphs and finding patterns and therefore WASL questions that concern those topics were put on to worksheets. On subsequent chapters the worksheets included work from previous chapters since WASL questions often contain more than one EALR (Essential Academic Learning Requirement). These worksheets will also help to review for the final exam.

PROJECT IMPLEMENTATION

Each set of worksheets will be distributed to all of the Algebra 1 teachers at RCHS. They can be implemented in the classroom in three ways. First, teachers that cannot spend extra days on this material can use various problems as openers during the first part of class. Also, the worksheets can be used as homework in the class. Lastly, any numbers of these problems could appear on a chapter test. Of course, the more of these methods the teacher uses the better practice his students will have in preparing for the WASL.

CHAPTER IV

DESCRIPTION OF THE PROJECT

This project is intended for High School math teachers who teach Algebra 1 and use College Preparatory Mathematics (CPM) Algebra Connections as a basis for their curriculum. Every chapter of the textbook has supplementary WASL material that fits in with the chapter concepts being taught.

The first part of Chapter 1 deals with problem solving and in a variety of topics: interpreting graphs; graphing, collecting, organizing and analyzing data; and finding and generalizing patterns. The second part is mainly Guess and Check. Therefore, the WASL worksheet has question items dealing with analyzing graphs, making sense of data, patterns, and problems that must be solved by guessing and checking.

Half of Chapter 2 is associated with variables: combining like terms, writing algebraic expressions, and solving equations. The other half stresses proportions. This is a good chapter to include some multiple choice as a variety of basic problems addressed.

Chapter 3 emphasizes graphing and equations. To help understand graphing, the book utilizes patterns, rules, and tables. CPM also stresses problem solving as the student learns to solve equations. This WASL worksheet obviously includes questions in identifying patterns and filling in tables which lead to graphing as well as word problems that need the knowledge of equations to solve.

Chapter 4 delves deeper into graphing techniques with use of slope intercept. Using this knowledge, the student can solve systems of equations which leads to solving systems algebraically. At this point and with future chapters as WASL questions for the worksheet get more difficult, earlier strands from previous chapters are included on the WASL worksheet intertwined with Chapter 4. For example, a question about graphing includes information about using patterns from chapter 3.

Multiplication and Proportions is the thrust of Chapter 5. Using multiplication includes the use of area, binomials, distributive property, and multi-variable equations. The setting up, solving, and applying proportions in this chapter are more complex than when introduced in Chapter 2. Proportions offer many possible WASL scenarios for multiple choice and free response.

Chapter 6 deals with system of equations, first by practicing writing equations and using that process to solve word problems. Secondly, CPM explores the different manners of solving systems of equations: substitution, graphing, and elimination. Although not always necessary, word problems often need two equations to solve so this knowledge is helpful for the WASL problems of this worksheet.

Chapter 7 describes linear relationships: slope intercept, prediction equations, and using slope as rates. WASL questions include writing prediction equations in the form of $y=mx+b$ from data points.

Factoring, quadratic representations, and the quadratic formula are mentioned in Chapter 8. WASL questions are simply some of the questions asked in the chapter as well as word problems using factoring and quadratics.

Chapter 9 consists of solving, graphing, and systems of inequalities. Linear, one-variable, two-variable, non-linear, graphing, absolute value, systems of, and applying inequalities to solve problems are some the specific types covered. Inequalities offer a whole new venue of WASL questions asked from the straight algebra questions to word problems.

This textbook does not include probability, so at about this time WASL worksheets using probability will be distributed.

The first part of Chapter 10 deals with simplifying by multiplying, dividing, adding, subtracting, and solving rational expressions. The second part consists of solving rational equations and inequalities and applications. In the third and fourth section, students will complete the square and explore the law of exponents. The WASL does not have many of these topics so a worksheet on statistics would be more appropriate.

Chapter 11 entertains the idea of functions and relations. It uses functions to describe graphs, define domain and range, and introduce transformations of a function. This chapter also uses intercepts and intersections of functions. The WASL review contains items of domain and range as well as transformations.

Chapter 12 has a combination of rational expressions, work and mixture problems, and more patterns and complex functions. Again, much of this chapter

is not covered on the WASL. However, this would be a good time to go over probability since it is not covered in anywhere else in the textbook.

Summary

As a result of this project, Canyon River High School teachers – and others using CPM – will be able to assign worksheets with WASL material that correspond to each chapter of that text. Questions may also be used for tests or quizzes either as solo items or inclusive with the chapter test. This practice will help students practice WASL items while at the same time reviewing class material. Reviewing WASL material in this manner will make students more successful in understanding, interpreting, and answering questions on the Washington Assessment of Student learning since it will be part of the curriculum.

CHAPTER V CONCLUSION

Summary

Ever since 1958 – just after the Russians launched Sputnik – there has been a push in the United States to increase mathematics scores. Later in 1983, *A Nation at Risk: The Imperative for Education Reform* came out and created more stringent requirements for high school graduation. Standards based education became more prevalent in the 1990's, so that the grades of different school systems would be more consistent.

In 1993, the Washington Legislature passed the Basic Education Act in order for students to keep up with societal, workplace, and economic changes. Eventually, from this act, the Washington Assessment of Student Learning (WASL) was developed in 1996. With the *No Child Left Behind Act* (NCLB) passing in 2001, all states were to be accountable for the proficiency of its students. Therefore Washington State mandated all students to pass the WASL with a three or four by the graduating class of 2008. However, due to low scores, the math requirement for graduation was extended until 2013. Students graduating between the years of 2008 and 2013 may show proficiency in math in other ways.

In 2007, only 47.2% passed the WASL at River Canyon High School (RCHS) which is only a 16.9% increase in nine years. The students at RCHS need to be better prepared for the WASL; they need to practice answering WASL

type questions more. The WASL worksheets created for this project were created such that each chapter in the College Preparatory Mathematics (CPM) Algebra Connections—the textbook for Algebra 1 at RCHS—matches up with a WASL worksheet. Therefore students will be familiar with the content and only need worry about the different WASL format. Most worksheets have multiple choice, short answers, and extended responses matching the WASL test.

Conclusions

RCHS needs to do something for their students to help them better prepare for the WASL. Besides Special Education math classes, Algebra 1 is the lowest math class that freshman can take. Therefore it makes sense that this is the place to target. In the past, WASL worksheets have been passed out to students, but the handouts do not match the current material being studied. Students need to practice WASL questions with what they are already studying. In this way, they only have to concentrate on the new WASL questioning since the material should be fairly familiar.

Recommendations

It is important that WASL review is not something that *only* takes place for the week before WASL testing. Therefore, all of the math classes using the CPM textbook for Algebra 1 need to be supplied with these WASL worksheets that correlate with every chapter in the CPM curriculum. The worksheets can be administered right before or after the chapter test.

There are many ways the students could be assessed. The teacher could put one of those slightly modified questions on the chapter test or short quiz. The students should save the WASL worksheets so at the end of the year they could be tested on that information. Again, the test questions would only need to be slightly adjusted. Both practices would insure students that they must learn to answer this type of questioning because it will be build into their grade. Most pupils in Algebra 1 are ninth graders so by the time they take the WASL they would have received a year's worth of practice. And they have the option of having their own review packet.

There is no one magic fix to increase WASL scores at RCHS. However, different procedures – changing curriculum, offering additional math classes, and giving students individual attention – are just some of the ways that will help see the scores steadily rise. Another method for success would be to offer CPM math teachers these WASL worksheets that will help connect the WASL to their curriculum in Algebra 1.

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Appendix I

CPM WASL Worksheets

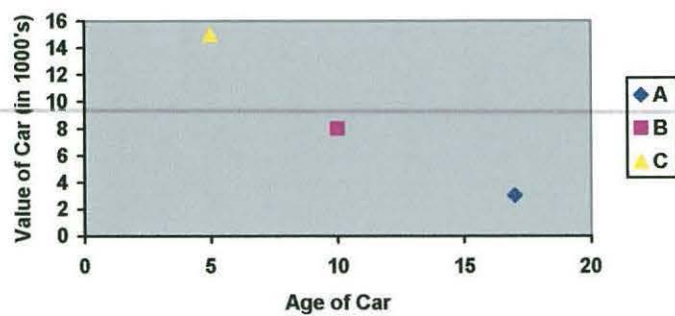
The material of the following WASL worksheets corresponds to each chapter of the College Preparatory Mathematics (CPM), Algebra Connections textbook. Each worksheet should be administered at the end of each chapter and is designed to reinforce the ideas in the chapter as well as ask questions from a WASL perspective. Additionally, one or two problems could be assigned as openers each day at the appropriate time. Chapters 10 and 12 contain information that for the most part is not covered on the WASL. Therefore, chapter 10S reviews statistics and chapter 12P reviews probability. Each chapter comes with a key and explanations to answers.

TABLE OF CONTENTS

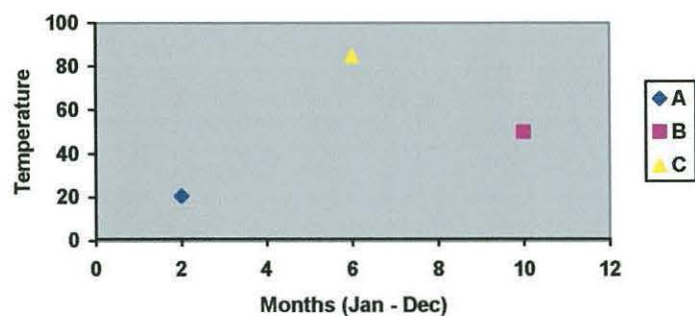
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Explain what points A, B, and C represent on each of these graphs, how they relate, and list their coordinates.

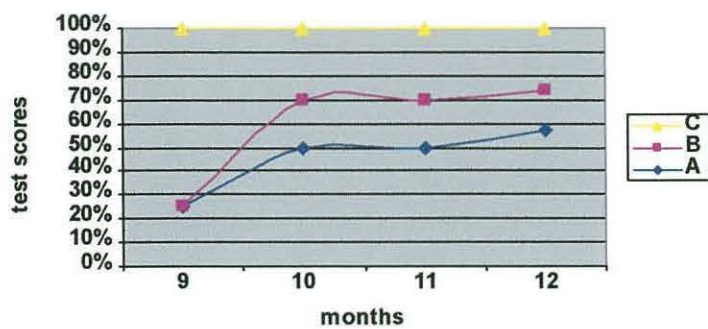
3.



4.



5. Compare the following lines below. How do they relate?



Name _____
Per. _____ Date _____

Chapter 2W – Equations and Proportions

Multiple Choice

- Which of the following choices shows an equation equivalent to $\frac{1}{3}n = -2 + \frac{1}{2}n$?
A. $2n = -2 + 3n$ B. $2n = -12 + 3n$ C. $3n = -6 + 2n$ D. $5n = -12$
- The perimeter of a rectangle is 50 inches. The width is given by w and the length is given by $2w+1$. What is the length of the rectangle in inches?
A. 8 B. 15 C. 17 D. 25
- Tim spends 2 hours each school day doing his homework. Of this time, he estimates 45 minutes is spent reading. In lowest terms, what is the ratio of time spent reading to time spent on homework?
A. 2 : 45 B. 3 : 4 C. 3 : 5 D. 3 : 8
- A cyclist has to travel the distance shown below. If the cyclist travels at a rate of 15 mph, she will travel the distance in 3 hours. If the cyclist increases her speed to 20 mph, how long will it take her to complete the same route?
A. 1 hr. 30 min. B. 2 hr. 15 min C. 3 hr. 45 min D. 4 hr.

Short Answer

- Amy, Ben, and Cynthia ran for junior class president. Amy received 100 more votes than half the number that Cynthia received. Fifty more students voted for Ben than voted for Cynthia. There were 265 votes cast in all. How many votes did Cynthia get?

6. Tickets to a concert are three different prices. The seats in Section A are three times the price of the seats in the balcony. The seats in Section B are \$12 less than the seats in Section A. Three seats, one from each section, cost a total of \$100. What is the ticket price for a seat in Section B?

7. Zaida is making a scale drawing of a room using the scale 1 inch = 12 feet. The length of the room is 33 feet. How many inches long will the wall be on the scale drawing?

8. The table shows the total cost (C) of a number of items (n).

N	1	2	3	4	5
C	\$2.25	\$4.50	\$6.75	\$9.00	\$11.25

Is the relationship between number of items and total cost an example of direct or indirect variation? Explain in detail using words.

What is the cost of 8 items?

Extended Response

9. Using a digital camera, Samantha took a picture of a friend. She printed it out on paper that is 4 inches by 6 inches. Samantha would like to enlarge it to make an 8- by 10-inch portrait. Can she enlarge the picture as it is without cropping, or trimming, any part of the picture?

Write a proportion to model this situation.

Are the ratios in the proportion equal?

Explain in detail how this helps you answer the question stated in the problem.

What is the largest enlarged picture she could end up with assuming it was on 8- by 10-inch paper and may have to be trimmed?

Name _____
 Per. _____ Date _____

Chapter 3W – Graphs and Equations

Multiple Choice

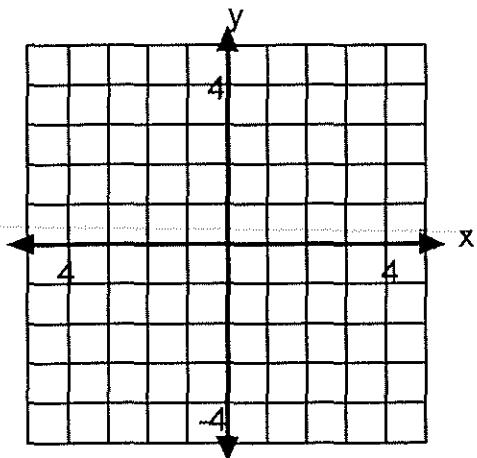
1. Which point makes the following linear equation true? $y = \frac{1}{2}x + 2$
 A. (2, 1) B. (2, 0) C. (-2, 1) D. (-6, -5)
-
2. If the equation $y - 4 = \frac{1}{2}x$ were graphed on the coordinate plane, at what point would the line cross the y-axis?
 A. (-4, 0) B. (0, -4) C. (0, 4) D. (4, 0)
3. A line passes through points E and F. Point E is located at (0, -4) and point F is located at (3, -4). What point does EF pass through?
 A. (3,2) B. (5,-4) C. (1.5,0) D. (3,-8)
4. An equation of a line is defined as $y = -x + b$. The point (2, 3) lies on this line. Which other point below is also on this line?
 A. (2, -1) B. (0, 1) C. (-1, 4) D. (0, 5)

Short Answer

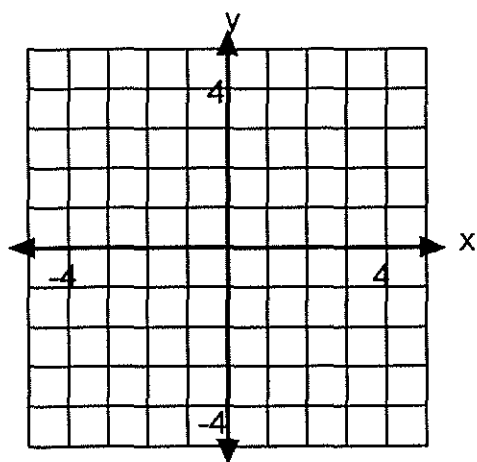
5. Harold is graphing the solution to the equation $x + 4y = 2$. He begins by making the table below. What is the missing number?

x	y
-4	$\frac{3}{2}$
-2	1
0	

6. Graph of the equation of the line $x - y = -3$.



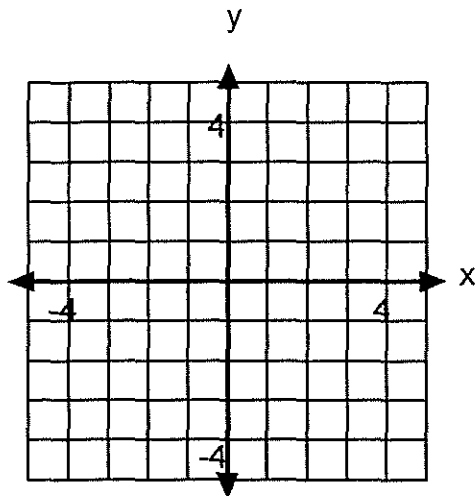
7. Graph the equation of the line $y = -2x + 3$.



Extended Response

8. Mark is graphing the equation $3y - x = 4$. He found three points: $(-4, 0)$, $(-1, 1)$, and $(0, 4)$. Graph those points on the coordinate plane below. Give two reasons why you know he made a mistake.

Which of the points is not a solution of the equation?

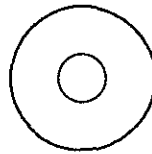


Name _____
 Per. _____ Date _____

Chapter 4W – Multiple Representations

Multiple Choice

1. Bob and John are playing a dart game using the target below. Bob threw three darts in the inner circle and one dart in the outer ring for a total of 44 points. John threw 2 darts in each section for a total of 40 points. How many points is the inner circle worth?



- A. 4 B. 8 C. 12 D. 16
2. On a digital display, light A flashes every 6 minutes, light B flashes every 4 minutes, and light G flashes every 5 minutes. All three lights flash together at 8:45 am. When is the next time they will all flash at the same time?



- A. 9:00 am B. 9:45 am C. 10:15 am D. 10:45 am
3. If you draw three circles on a piece of paper, what is the greatest number of points of intersection that can occur? All circles' radii must be different.
- A. 3 B. 4 C. 5 D. 6
4. In a group of 40 high school students, 25 took Spanish and 30 took French. How many students must have taken both languages?

- A. 10 B. 15 C. 20 D. 25

Short Answer

5. The length and width of a rectangle are consecutive odd numbers. The perimeter of the rectangle is 48 inches. What is the area, in square inches, of the rectangle? Explain your answer using words, numbers, and/ or diagrams.

6. Lance has taken five tests in his Algebra class, each worth 100 points. His average score for the five tests was 85 points. The teacher dropped his lowest test grade and his new average is 88. What is his lowest test grade?

Extended Response

7. A *triangular number* is a number that can be arranged into an equilateral triangle. The first 3 triangular numbers are 1, 3 and 6. Make a chart that shows the first 6 triangular numbers, find a rule for the pattern, and give the tenth triangular number.

	1	2	3	4	5	6
Triangular number						

Rule: _____ Tenth Triangular Number _____

8. Suppose the numbers from 1 to 900 are arranged in column eight as shown below. In what column would the number 900 appear?

A	B	C	D	E	F	G	H
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19					

Explain in detail using words, numbers, and/or diagrams

In what column would the number 900 appear?

Name _____
Per. _____ Date _____

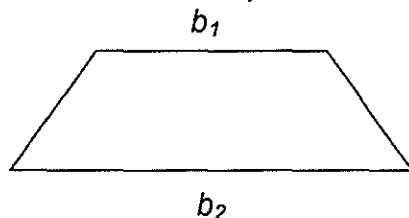
Chapter 5W – Multiple Representations

Multiple Choice

1. A soccer field has the length of 120 yards and a width of 80 yards. What is the ratio of its length to width?

A. 2 : 1 B. 2 : 3 C. 3 : 1 D. 3 : 2

2. The length of b_2 of a trapezoid is two times the length of b_1 . Which of the following expressions could represent the height of the trapezoid? (A =area)

A. $\frac{A}{6b_1}$ B. $\frac{2A}{3b_1}$ C. $\frac{3A}{2b_1}$ D. $\frac{A}{3b_1}$

3. The ratio of perimeters of two square picture frames is 6 : 1. What is the ratio of the areas?

A. 3 B. 24 : 1 C. 36 : 1 D. 48 : 1

4. In his spare time, Jeffrey can read a 200-page book in three days. At this rate, how many days will it take him to read a 300-page book?

A. 4 B. $4\frac{1}{2}$ C. $5\frac{1}{2}$ D. 5

Name _____
 Per. _____ Date _____

Chapter 6W – Systems of Equations

Multiple Choice

1. Which point below makes this system of equations true? $\begin{cases} 2x = 7 - y \\ -x + 3y = 14 \end{cases}$
- A. (-2, 4) B. (0, 7) C. (1, 5) D. (2, 1)
2. The sum of two years is 88. The second number is three times the first. Which of these systems could be used to find the two numbers if x is the first and y is the second?
- A. $\begin{cases} x + y = 88 \\ x = 3y \end{cases}$ B. $\begin{cases} x + y = 88 \\ 3x = y \end{cases}$ C. $\begin{cases} x = 88 - y \\ 3y = 3x \end{cases}$ D. $\begin{cases} 3x + y = 88 \\ 3x = y \end{cases}$
3. The sum of two consecutive odd integers is 76. If m is the first number, what equation would be used to solve for m ?
- A. $m + (m + 1) = 76$ B. $m + 1 = 76$ C. $m + (m + 2) = 76$ D. $m + 2 = 76$
4. Holmes Junior High School has x students. Harper Middle School has y students, 125 fewer students than Holmes. When the two schools are merged there will be 809 students. Which system of equations will help to solve for the number of students in each school?
- A. $\begin{cases} x + y = 809 \\ y = x - 125 \end{cases}$ B. $\begin{cases} x + y = 809 \\ x = y - 125 \end{cases}$ C. $\begin{cases} x + y = 809 \\ x - y = 125 \end{cases}$ D. $\begin{cases} x + y = 809 \\ y - x = 125 \end{cases}$

Short Answer

5. A theater charges \$6 for students and \$9 for adults. For one showing, 200 tickets were sold for a total of \$1,380. How many tickets were sold to adults? Write a system of equations to solve the problem and define the variables.

6. Chandra thinks that the system of equations below has an infinite number of solutions. Do you agree with her thinking? Why or why not?

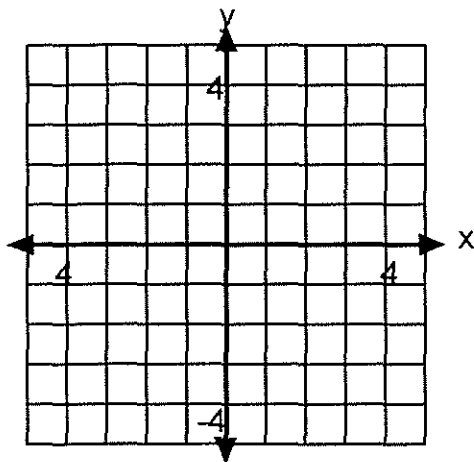
$$\begin{cases} 2y = x - 4 \\ -2x = -4y - 8 \end{cases}$$

Extended Response

7. Graph this system of equations on the coordinate plane below.

$$\begin{cases} 2x + y = 4 \\ x - 2y = -3 \end{cases}$$

Write the solution below and explain how you can check your work.



Name _____
Per. _____ Date _____

Chapter 7W – Linear Relationships

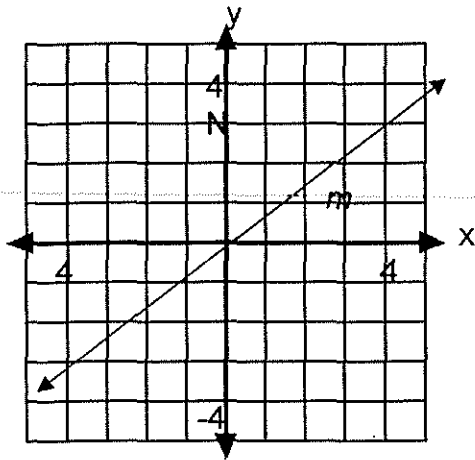
Multiple Choice

- The slope of a line is $\frac{1}{3}$. If the line passes through point A at (0,-4), what is the equation of the line?
A. $y = -\frac{1}{3}x + 4$ B. $y = \frac{1}{3}x + 4$ C. $y = \frac{1}{3}x - 4$ D. $y = \frac{1}{3}x$
- A line with the slope of 4 passes through point B at (1,-3). Which of the following is the equation of the line?
A. $y = 4x + 13$ B. $y = 4x - 7$ C. $y = -4x + 7$ D. $y = -4x - 13$
- A line passes through points E and F. Point E is located at (0, -4) and point F is located at (3, -4). What is the slope of the line?
A. -1 B. 0 C. 1 D. undefined
- The slope of a line is -1. The point (2, 3) lies on this line. Which other point below is also on this line?
A. (2, -1) B. (0, 1) C. (-1, 4) D. (0, 5)

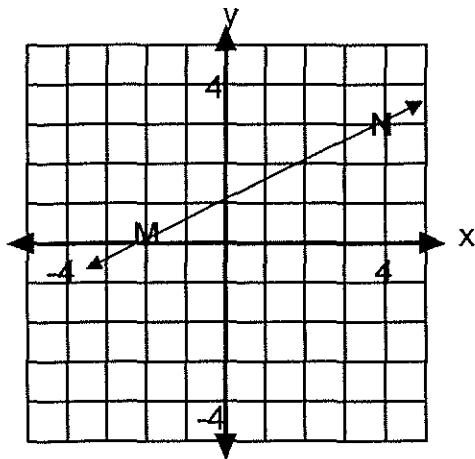
Short Answer

- Two points on a line are located at (-3,2) and (3,4). What is the equation of the line that crosses through these two points?

6. Explain in detail using words how to write the equation of the line that passes through point N and parallel to line m .



7. Find the equation of the line for MN .



Extended Response

8. Lines a and b lie in the same plane. The equation for line a is $y = -5x + 3$. Line b is parallel to line a . On the coordinate plane, line b passes through -3 on the y -axis. Explain in detail using words and numbers how you use the equation for line a to write the equation for line b .

Name _____
Per. _____ Date _____

Chapter 8W – Quadratics

Multiple Choice

1. If the area of a rectangle is $x^2 - 5x - 6$, what is a possible length and width?

- A. $(x-2)(x+3)$ B. $(x+2)(x-3)$ C. $(x-1)(x+6)$ D. $(x+1)(x-6)$

2. Write $\frac{2x^2 + 15x - 8}{x + 8}$ in the simplest form.

- A. $2x - 1$ B. $2x^2 + 15$ C. $2x + 1$ D. $\frac{2x + 15 - 8}{8}$

3. The equation $4x^2 - 12x = -9$ has these types of solutions:

- A. No Integers B. 1 Integer C. 2 Integers D. No Reals

4. What value of k would give the equation $x^2 + kx + 4 = 0$ two integer solutions?

- A. $k = -5$ B. $k = 5$ C. $k = 0$ D. $k = 4$

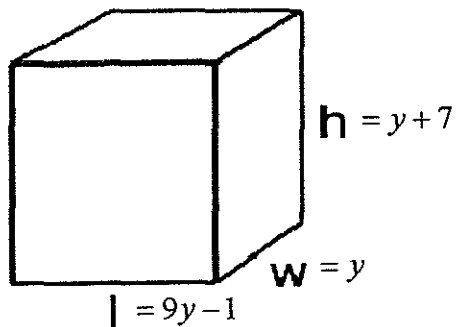
Short Answer

5. In the equation $x^2 - 3x = 10$, what is the only positive solution?

6. The product of two consecutive odd integers is 63. Give two possible pairs of integers that satisfy this condition. Explain your answer using words, numbers, and/or diagrams.

Extended Response

7. Write an expression that represents the surface area in the figure below. Explain your answer using words, numbers, and/or diagrams.



Find the surface area of the figure when $y = 2$ cm and when $y = 3$ cm. Show all work.

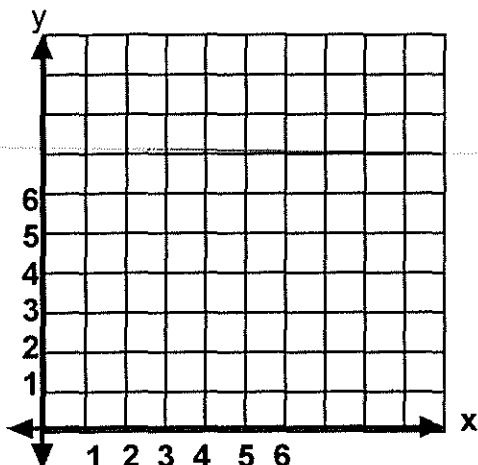
Name _____
Per. _____ Date _____**Chapter 9W – Inequalities****Multiple Choice**

1. Which of the following represents the solution to the inequality $5(x-8) \leq -3x$?
- A. $x \geq 5$ B. $x \leq 5$ C. $x \geq -5$ D. $x \leq -5$
2. Which inequality represents a dashed line passing through (0,-1) and (3,0) and shaded above that line?
- A. $y > \frac{1}{3}x - 1$ B. $y < \frac{1}{3}x - 1$ C. $y > 3x - 1$ D. $y < 3x - 1$
3. In the linear inequality $-5y \leq 10 - 2x$, the values of x and y must be whole numbers that are greater than or equal to 1. What is the least possible value of x that fulfills these conditions?
- A. $7\frac{1}{2}$ B. 1 C. 7 D. Not possible
4. Name a point that is a solution for the linear inequality $x + 4y > 8$.
- A. (0,0) B. (4,1) C. (0,2) D. (1,2)

Short Answer

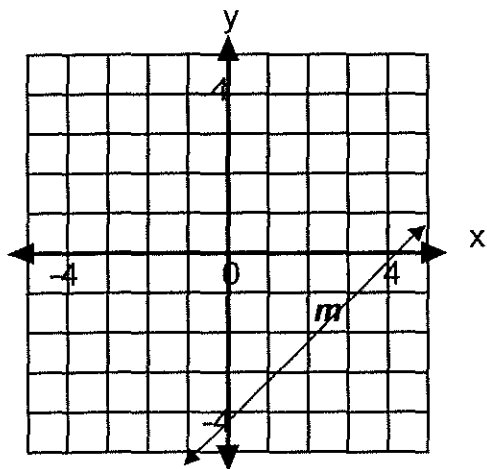
5. Kim and Ken are trying to earn \$400 to buy a mountain bike. Kim earns \$7 per hour as a youth counselor at a day camp. Ken earns \$5 per hour mowing lawns. Let x = Kim's hours and y = Ken's hours. If Kim works 40 hours, what is the least number of hours that Ken will need to work to meet their goal? Write and solve a linear inequality to find the answer.

6. The perimeter of a rectangle is greater than 8 inches. Let x = length and y = width. The linear inequality $2x + 2y > 8$ represents the situation. Graph the possible solutions to the inequality on the grid below.



Extended Response

7. In the grid below, shade above the line m . Do you agree with the statement "On the graph of your inequality below, x can never be positive while y is negative"? Explain in detail your thinking using words, numbers, and/or diagrams.



Give linear inequality which is the solution set to the graph above and why.

- A. $y \geq 4 - x$ B. $x - y \leq 4$ C. $y \geq x + 4$ D. $x - y \geq 4$

The answer is _____ because _____

Short Answer

4. In Janice's English class, each essay is worth 100 points. Janice's scores on her first four essays were 46, 85, 82, and 90. Find the median and the mean. Which would best represent Janice's ability to write an essay? Explain your reasoning.

5. A school club is planning a pizza party. Sandra is calling restaurants to find the cost of buying a large (12-inch) pizza with two toppings. She gets the following prices from the first four restaurants that she calls: \$11, \$13, \$10, and \$9. She calls one more restaurant and reports that the median price of a pizza is \$11. What can you know for certain about the price at the fifth restaurant? Why?

6. Find the mean and median of the following set of data: 8, 15, 4, 7, 14, and 6.

Mean _____

Median _____

Extended Response

7. Five players from last year's varsity basketball team are returning this year. Their heights, in inches, are shown in the table below,

Player	J. Chess	D. Laws	M. Young	B. Allen	A. Lewis
Height	82	65	74	80	69

What is the MEAN height of the returning varsity players?

Three players will move from the junior varsity to the varsity team. The mean height of these players is 68 inches. What effect will this have on the mean height of the team? Explain your thinking.

Name _____
Per. _____ Date _____

Chapter 11W – Functions and Relations

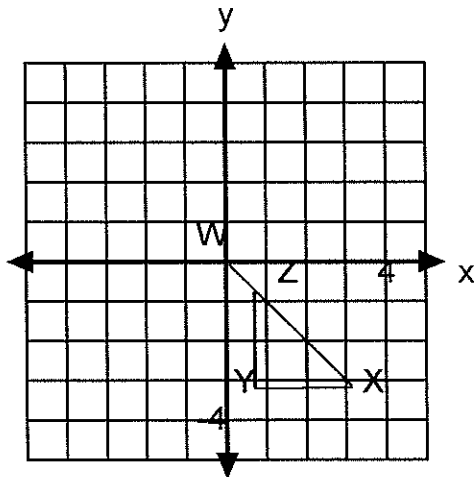
Multiple Choice

1. Which function defines the relation below?

x	-1	0	1
$f(x)$	0	-1	0

- A. $f(x) = x^2 - 1$ B. $f(x) = x - 1$ C. $f(x) = x + 1$ D. Not a function

2. The flag shown on the coordinate plane below is rotated 45° counterclockwise about point w . After the rotation, segment $\overline{WX'}$ passes through which of these points?



- A. (2, 2) B. (2, 0) C. (-2, -2) D. (-2, 0)
3. On a clock, the hour hand points directly at the number 4. Seven hours later, the hour hand points directly at the 11. The change represents a clockwise rotation of how many degrees?

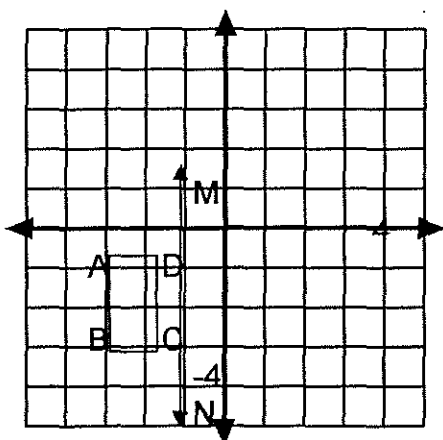
- A. 180° B. 5° C. 150° D. 210°



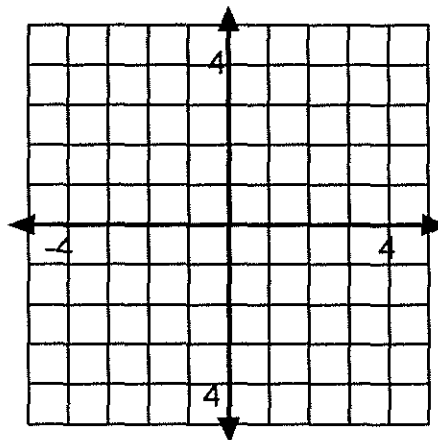
Short Answer

4. The vertices of a triangle are located at $(-4, 2)$, $(-2, 5)$, and $(2, 4)$. The triangle is translated 8 units down and 4 units to the right. Explain in detail how to find the coordinates of the translated image.

5. Rectangle ABCD is reflected over \overline{MN} and translated 3 units up. What are the coordinates of B'' ? Explain in detail using words, what you need to do; then show your work on the coordinate plane.

**Extended Response**

6. What degree rotations would not require a problem to specify whether the rotation was clockwise or counterclockwise? Explain in detail using the blank coordinate plane in your reasoning.



Name _____
Per. _____ Date _____**Chapter 12P – Probability****Multiple Choice**

1. A 6-sided number cube has the numbers from 1 through 6 on it. The cube is rolled once. Which of the following ratios represents the probability of rolling a 3 or higher?
A. $\frac{5}{6}$ B. $\frac{2}{3}$ C. $\frac{1}{2}$ D. $\frac{1}{3}$

2. Brent entered a raffle at the Clark County Fair to win a game system. The fair plans to sell 800 tickets. One ticket will be drawn, and the winner will receive the grand prize. If Brent bought 20 tickets, what is the probability that one of his tickets will be drawn?
A. 0.2% B. 2.5% C. 20% D. 25%

3. Six friends are trying out for a basketball team. The coach chooses two to play a quick game of one-on-one. Which expression could be used to figure out how many combinations of two players there are to choose from?
A. $6!$ B. $\frac{6!}{2!}$ C. $\frac{6!}{(6-2)2!}$ D. $\frac{6!}{(6-2)!}$

4. Ten skiers enter a cross-country race. How many different arrangements of 1st and 2nd place winners are possible?
A. 2 B. 45 C. 90 D. 40,320

Short Answer

5. How many different 4-digit numbers can you make from the digits 3, 5, 2, and 8? Show all work.
6. A small diner offers the specials shown on the menu at the right. Suppose someone ate breakfast, lunch, and dinner at the diner. Explain in detail how you could find the number of possible meal combinations.

*Cliff's Diner***Breakfast Specials**

Strawberry Waffles
Eggs & Bacon
Pancake Stack

Lunch Specials

Club Sandwich
Soup & Salad Bar
Chili & Cornbread

Dinner Specials

Chicken Pot Pie
Turkey Dinner
Macaroni & Cheese
Halibut
Fruit Plate

7. A box has six white marbles and three black marbles. One marble is drawn and not replaced. Then a second marble is drawn. What is the probability that both marbles drawn will be white? Express your answer as a ratio.

Extended Response

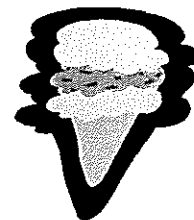
8. A school club is selling banana splits for a fundraiser. A banana split has three scoops of ice cream. The sign shows the flavors of ice cream the club has for sale.

Suppose students must choose three different flavors of ice cream. Explain in detail how you find out how many combinations are possible and determine this number.

Suppose the server is blindfolded (but he still manages to get three different flavors). What is the probability that flavors he chooses are Vanilla, Chocolate, and Strawberry?

Ice Cream Flavors

Vanilla
Chocolate
Strawberry
Mint Chip
Butter Pecan



Name _____

Per. _____ Date _____

Solutions

Chapter 1W – Guess and Check / Graphing

Use Guess and Check with a table to solve each of these problems.

1. The product of two numbers is 450 and the difference is seven. What are the numbers? **18 & 25**

1 st number	2 nd number	product
10**	17	170
20	27	540
15	18	330
18	25	450

**1st or 2nd number must end in 0 or 5 if the product is 450.

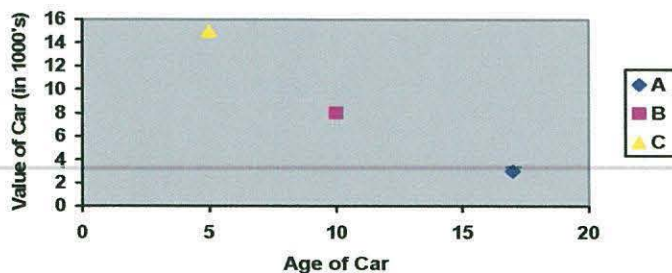
2. The perimeter of a triangle is 53 inches. The second side is 3 inches longer than the first side. The third side is 1.5 times the length of the second side. What is the length the third side?

1 st side	2 nd side	3 rd side	perimeter
10**	13	19.5	42.5
11	14	21	46
13	16	24	53

**1st side must be odd so the 2nd side is even. Otherwise the perimeter is a decimal.

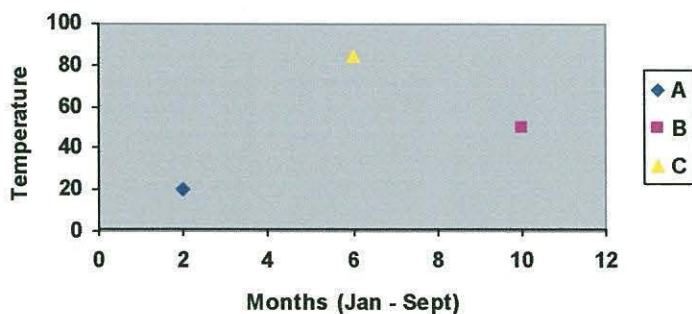
Explain what points A, B, and C represent on each of these graphs, how they relate, and list their coordinates.

3.



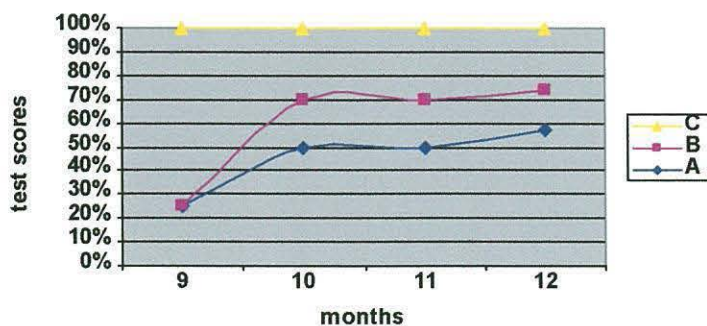
A is the cheapest and oldest car (17,3). B is in the middle of A and C (10,8)
C is the most expensive and newest car (5,15)

4.



February is the coldest month (2,20). October is moderate (10,50).
June is the hottest month (6,82).

5. Compare the following lines below. How do they relate?



A and B start in September at 25%. A increases to 50% in October and reaches 58% in December. B increases to 70% in October and then to 72% in December. C remains a constant 100% from September to December.

Name _____

Per. _____ Date _____

Chapter 2W – Equations and Proportions

Multiple Choice

1. Which of the following choices shows an equation equivalent to $\frac{1}{3}n = -2 + \frac{1}{2}n$?

- A. $2n = -2 + 3n$ **B.** $2n = -12 + 3n$ C. $3n = -6 + 2n$ D. $5n = -12$

Rewrite $\frac{1}{3}n = -2 + \frac{1}{2}n$ as $6(\frac{1}{3}n = -2 + \frac{1}{2}n) \rightarrow 2n = -12 + 3n$

2. The perimeter of a rectangle is 50 inches. The width is given by w and the length is given by $2w+1$. What is the length of the rectangle in inches?

- A. 8 B. 15 **C.** 17 D. 25

$$P = w + w + 2w + 1 + 2w + 1 = 50 \quad \text{length} = 2w + 1 = 2(8) + 1 = 17, C$$

$$6w + 2 = 50$$

$$6w = 48$$

$$w = 8$$

3. Tim spends 2 hours each school day doing his homework. Of this time, he estimates 45 minutes is spent reading. In lowest terms, what is the ratio of time spent reading to time spent on homework?

- A. 2 : 45 B. 3 : 4 C. 3 : 5 **D.** 3 : 8

2 hours = 120 minutes

$$\text{reading} : \text{hw} \sim 45 : 120 \sim \frac{45}{15} : \frac{120}{15} \sim 3 : 8, D$$

4. A cyclist has to travel the distance shown below. If the cyclist travels at a rate of 15 mph, she will travel the distance in 3 hours. If the cyclist increases her speed to 20 mph, how long will it take her to complete the same route?

- A. 1 hr. 30 min. **B.** 2 hr. 15 min C. 3 hr. 45 min D. 4 hr.

$$D = R \cdot T \quad 45 = 20 \cdot T$$

$$D = 15 \cdot 3 = 45 \text{ miles} \quad T = 45/20 = 2.25 = 2 \text{ hr } 15 \text{ min}$$

Short Answer

5. Amy, Ben, and Cynthia ran for junior class president. Amy received 100 more votes than half the number that Cynthia received. Fifty more students voted for Ben than voted for Cynthia. There were 265 votes cast in all. How many votes did Cynthia get? **46 votes**

Amy	Ben	Cynthia	Total
120	90	40	250
125	100	50	275
123	96	46	265

6. Tickets to a concert are three different prices. The seats in Section A are three times the price of the seats in the balcony. The seats in Section B are \$12 less than the seats in Section A. Three seats, one from each section, cost a total of \$100. What is the ticket price for a seat in Section B? **\$36**

A	B	Balcony	Total
60	48	20	128
45	33	15	83
51	39	17	107
48	36	16	100

7. Zaida is making a scale drawing of a room using the scale 1 inch = 12 feet. The length of the room is 33 feet. How many inches long will the wall be on the scale drawing?

Solution: $\frac{\text{inches}}{\text{feet}} \rightarrow \frac{1}{12} = \frac{x}{33} \rightarrow 33 \cdot 1 = 12x \sim x = 2\frac{7}{12} \text{ inches}$

8. The table shows the total cost (C) of a number of items (n).

N	1	2	3	4	5
C	\$2.25	\$4.50	\$6.75	\$9.00	\$11.25

Is the relationship between number of items and total cost an example of **direct** or indirect variation? Explain in detail using words.

$2.25 \cdot n = C$; multiply 2.25 by n for C

What is the cost of 8 items? $C = 2.25 \cdot 8 = \$18$

Extended Response

9. Using a digital camera, Samantha took a picture of a friend. She printed it out on paper that is 4 inches by 6 inches. Samantha would like to enlarge it to make an 8- by 10-inch portrait. Can she enlarge the picture as it is without cropping, or trimming, any part of the picture?

NO. $4 \times 6 \sim 8 \times 12$ 8 is right but 12 is not.

Write a proportion to model this situation. **Solution:** $\frac{4}{6} \neq \frac{8}{10}$

Are the ratios in the proportion equal? **NO**

Explain in detail how this helps you answer the question stated in the problem.

Since the ratios are different she cannot enlarge the picture as described.

What is the largest enlarged picture she could end up with assuming it was on 8- by 10-inch paper and may have to be trimmed?

$4 \times 6 \sim 8 \times 10$ (since the portrait cannot be 8 by 12, it must be x by 10)

Solution: $\frac{4}{6} = \frac{x}{10} \rightarrow 40 = 6x \sim x = 6\frac{2}{3}$

Name _____
Per. _____ Date _____

Chapter 3W – Graphs and Equations

Multiple Choice

1. Which point makes the following linear equation true? $y = \frac{1}{2}x + 2$
 A. (2, 1) B. (2, 0) **C.** (-2, 1) D. (-6, -5)

$$1 \neq \frac{1}{2} \bullet 2 + 2$$

$$0 \neq \frac{1}{2} \bullet 2 + 2$$

$$1 = \frac{1}{2} \bullet (-2) + 2$$

$$-5 \neq \frac{1}{2} \bullet (-6) + 2$$

2. If the equation $y - 4 = \frac{1}{2}x$ were graphed on the coordinate plane, at what point would the line cross the y-axis?
 A. (-4, 0) B. (0, -4) **C.** (0, 4) D. (4, 0)

An equation crosses the y-axis when $x = 0$. $y - 4 = \frac{1}{2} \bullet 0 \rightarrow y = 4$

3. A line passes through points E and F. Point E is located at (0, -4) and point F is located at (3, -4). What point does EF pass through?
 A. (3,2) **B.** (5,-4) C. (1.5,0) D. (3,-8)

Because (3, -4) and (0, -4) both have a y-coordinate -4, EF's y-coordinate must also be -4, (5, -4), B

4. An equation of a line is defined as $y = -x + b$. The point (2, 3) lies on this line. Which other point below is also on this line?
 A. (2, -1) B. (0, 1) C. (-1, 4) **D.** (0, 5)

$$y = -x + b$$

$$3 = -2 + b$$

$$5 = b$$

$$y = -x + 5$$

$$A. -1 \neq -2 + 5$$

$$B. 1 \neq 0 + 5$$

$$C. 4 \neq -(-1) + 5$$

$$D. 5 = -0 + 5$$

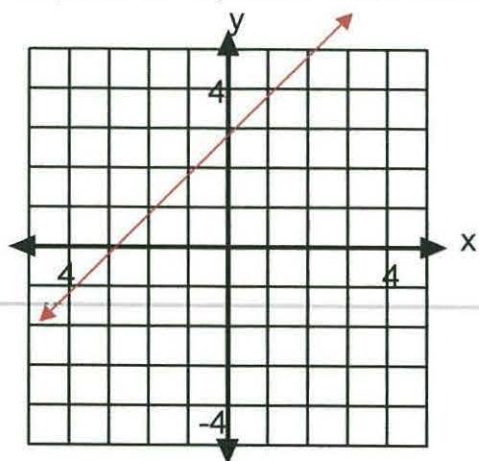
Short Answer

5. Harold is graphing the solution to the equation $x + 4y = 2$. He begins by making the table below. What is the missing number?

x	y
-4	$\frac{3}{2}$
-2	1
0	$\frac{1}{2}$

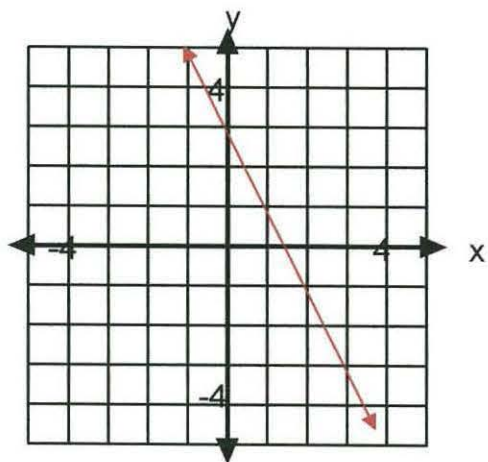
$$x + 4y = 2 \rightarrow 0 + 4y = 2 \rightarrow y = \frac{1}{2}$$

6. Graph of the equation of the line $x - y = -3$.



x	y
0	3
-3	0

7. Graph the equation of the line $y = -2x + 3$.



slope = $-\frac{2}{1}$
y-intercept = 3

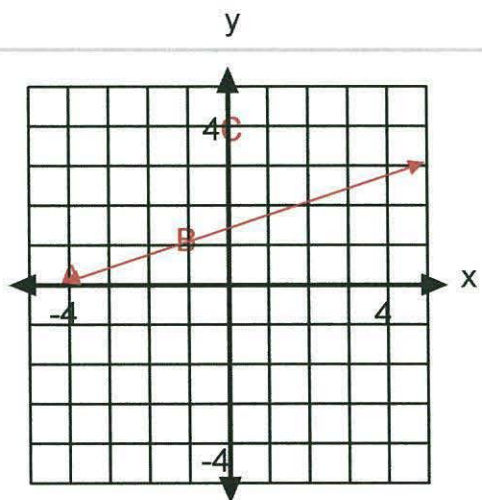
Extended Response

8. Mark is graphing the equation $3y - x = 4$. He found three points: **A**(-4, 0), **B**(-1, 1), and **C**(0, 4). Graph those points on the coordinate plane below. Give two reasons why you know he made a mistake.

1) The three points do not line up

2) The line $3y - x = 4$ does not cross through all three points.

Which of the points is not a solution of the equation?



x	y
-1	1
2	2

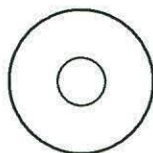
Name _____
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Chapter 4W – Multiple Representations

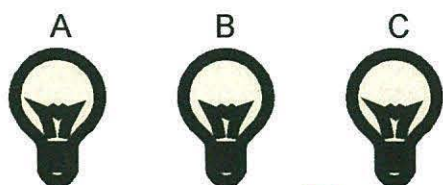
Multiple Choice

1. Bob and John are playing a dart game using the target below. Bob threw 3 darts in the inner circle and one dart in the outer ring for a total of 44 points. John threw 2 darts in each section for a total of 40 points. How many points is the inner circle worth? (since the scores are close, inner & outer scores must be close)

Inner	Outer	Bob's score	John's score	
11	9	42	40	inner must be worth more
12	8	44	40	



- A. 4 B. 8 **C. 12** D. 16
2. On a digital display, light A flashes every 6 minutes, light B flashes every 4 minutes, and light G flashes every 5 minutes. All three lights flash together at 8:45 am. When is the next time they will all flash at the same time?



They will flash at the same time in
LCM (6, 4, 5) = 60 minutes = 1 hour

$$8:45\text{am} + 1:00 = 9:45\text{am}$$

- A. 9:00 am **B. 9:45 am** C. 10:15 am D. 10:45 am
3. If you draw three circles on a piece of paper, what is the greatest number of points of intersection that can occur? All circles' radii must be different.

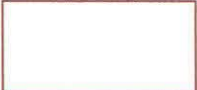


Circle A, B, & C all intersect at 3 points
A & B, B & C, and C & A each intersect at 1 more points
each (3 more points).

4. In a group of 40 high school students, 25 took Spanish and 30 took French. How many students must have taken both languages?
- A. 10 **B. 15** C. 20 D. 25
- $$25 + 30 = 55 \sim> 55 - 40 = 15$$

Short Answer

5. The length and width of a rectangle are consecutive odd numbers. The perimeter of the rectangle is 48 inches. What is the area, in square inches, of the rectangle? Explain your answer using words, numbers, and/ or diagrams.



$$\begin{aligned}
 P &= 4n + 4 = 48 \\
 4n &= 44 \\
 n &= 11 \quad A = 11 \bullet 13 = 143 \text{ sq inches}
 \end{aligned}$$

6. Lance has taken five tests in his Algebra class, each worth 100 points. His average score for the five tests was 85 points. The teacher dropped his lowest test grade and his new average is 88. What is his lowest test grade?

with 5 tests: $\frac{x+m}{5} = 85$ (x = lowest test grade, m = sum of other tests)

with 4 tests: $\frac{m}{4} = 88 \rightarrow m = 88 \bullet 4 = 352$. Sub into 1st eq. $\frac{x+352}{5} = 85$

$x + 352 = 5 \bullet 85 = 425$ $x = 425 - 352 = 67$. Lowest Test = 67

Extended Response

7. A *triangular number* is a number that can be arranged into an equilateral triangle. The first 3 triangular numbers are 1, 3 and 6. Make a chart that shows the first 6 triangular numbers, find a rule for the pattern, and give the tenth triangular number.

n	1	2	3	4	5	6
Triangular number	1	3	6	10	15	21

Rule: tri # has n more than previous Tenth Tri. Number $21+7+8+9+10=55$

8. Suppose the numbers from 1 to 900 are arranged in column eight as shown below. In what column would the number 900 appear?

A	B	C	D	E	F	G	H
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19					

Explain in detail using words, numbers, and/or diagrams. If you divide the number by 8, the remainder will match the first row. $900 \div 8 = 112 \text{ R}4$

In what column would the number 900 appear? **D**

Name _____
Per. _____ Date _____

Chapter 5W – Multiple Representations

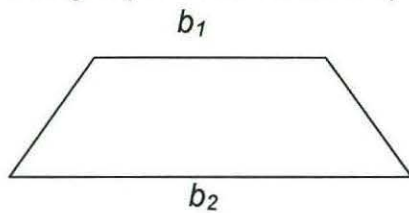
Multiple Choice

1. A soccer field has the length of 120 yards and a width of 80 yards. What is the ratio of its length to width?

$$12 : 80 \rightsquigarrow 12 : 8 \rightsquigarrow 3 : 2$$

- A. 2 : 1 B. 2 : 3 C. 3 : 1 **D. 3 : 2**

2. The length of b_2 of a trapezoid is two times the length of b_1 . Which of the following expressions could represent the height of the trapezoid? (A =area)



$$A = \frac{1}{2}h(b_1 + b_2)$$

$$A = \frac{1}{2}h(b_1 + 2b_1)$$

$$A = \frac{1}{2}h(3b_1)$$

$$2A = 3b_1h$$

$$\frac{2A}{3b_1} = h$$

- A. $\frac{A}{6b_1}$ **B. $\frac{2A}{3b_1}$** C. $\frac{3A}{2b_1}$ D. $\frac{A}{3b_1}$

3. The ratio of perimeters of two square picture frames is 6 : 1. What is the ratio of the areas?

$$6 : 1 \rightsquigarrow 24 : 4. \text{ The 1}^{\text{st}} \text{ frame is } 6 \times 6 \text{ the 2}^{\text{nd}} \text{ is } 1 \times 1. \text{ Ratio of areas: } 36 : 1$$

- A. 3 B. 24 : 1 **C. 36 : 1** D. 48 : 1

4. In his spare time, Jeffrey can read a 200-page book in three days. At this rate, how many days will it take him to read a 300-page book?

$$\text{Solution: } \frac{200}{3} = \frac{300}{x} \rightsquigarrow 200x = 900 \rightsquigarrow x = 9/2 = 4 \frac{1}{2}$$

- A. 4 **B. $4 \frac{1}{2}$** C. $5 \frac{1}{2}$ D. 5

Short Answer

5. On a certain highway, the speed limit for semi-trailer trucks is 50 mph and the speed limit for cars is 60 mph. How much longer will it take a truck driver to travel the same 120 miles as a person driving a car? Explain your answer using words, numbers, and/ or diagrams. **24 minutes**

$$D = RT \quad 120 = 50T \sim 2.4 \text{ hours} \quad 2.4 - 2 = 0.4 \text{ hours}$$

$$120 = 60T \sim 2 \text{ hours} \quad \text{time in minutes} = 0.4(60) = 24 \text{ minutes}$$

6. Donna noticed that she burns 50 calories for every $\frac{1}{2}$ mile she walks. If she walks at a rate of 20 minutes per mile, how many calories will she burn in 30 minutes? How fast is she traveling in miles per hour? Explain your answer using words, numbers, and/ or diagrams. **150 calories, 3 mph**

To figure # of miles: $\frac{20}{1} = \frac{30}{x} \sim 20x = 30 \sim x = 1.5$ miles in 30 min, 3 mi / hr

To figure # of calories: $\frac{50}{\frac{1}{2}} = \frac{y}{1.5} \sim 75 = \frac{1}{2}y \sim y = 150$ calories

7. Two out of 50 people in Washington live in Tacoma. If the population of Washington is about 5,000,000 people, what is the population of Tacoma? Explain your answer using words, numbers, and/ or diagrams.

Solution: $\frac{\text{Tacoma}}{\text{Washington}} \rightarrow \frac{2}{50} = \frac{x}{5,000,000} \rightarrow 20x = 10,000,000 \sim x = 200,000$

Population of Tacoma is 200,000 people.

Extended Response

8. The height of a projectile is given by the formula $h = vt - 16t^2$, where t is the elapsed time in seconds, and v is the initial velocity in feet per second. What is the elapsed time it will take for the ball to reach the ground if $v = 64$?

$$h = 64t - 16t^2 \sim 0 = 64t - 16t^2 \sim 0 = 16t(4 - t) \sim t = 4 \text{ seconds}$$

(The ball hits the ground when $h = 0$)

What is the highest point it reaches in feet?

The highest point will be between $t=0$ and $t=4 \sim t = 2$

The height when $t = 2$ is $h = 64(2) - 16(2)^2 = 128 - 64 = 64$ feet

Explain in detail using words, numbers, and/or diagrams.

Name _____
Per. _____ Date _____

Chapter 6W – Systems of Equations

Multiple Choice

1. Which point below makes this system of equations true? $\begin{cases} 2x = 7 - y \\ -x + 3y = 14 \end{cases}$

Solution:

$$\begin{cases} 2(-2) \neq 7 - 4 \\ -x + 3y = 14 \end{cases}$$

A. (-2, 4)

$$\begin{cases} 2(0) = 7 - 7 \\ 0 + 3(7) \neq 14 \end{cases}$$

B. (0, 7)

$$\begin{cases} 2(1) = 7 - 5 \\ -1 + 3(5) = 14 \end{cases}$$

C. (1, 5)

D. (2, 1)

2. The sum of two years is 88. The second number is three times the first. Which of these systems could be used to find the two numbers if x is the first and y is the second?

The sum of two years is 88

$$x + y = 88$$

The second number is three times the first.

$$y = 3 \cdot x \rightarrow 3x = y$$

A. $\begin{cases} x + y = 88 \\ x = 3y \end{cases}$

B. $\begin{cases} x + y = 88 \\ 3x = y \end{cases}$

C. $\begin{cases} x = 88 - y \\ 3y = 3x \end{cases}$

D. $\begin{cases} 3x + y = 88 \\ 3x = y \end{cases}$

3. The sum of two consecutive odd integers is 76. If m is the first number, what equation would be used to solve for m ?

1st number = m , 2nd number = $m + 2$. The sum = 76 $\rightarrow m + (m + 2) = 76$

A. $m + (m + 1) = 76$

B. $m + 1 = 76$

C. $m + (m + 2) = 76$

D. $m + 2 = 76$

4. Holmes Junior High School has x students. Harper Middle School has y students, 125 fewer students than Holmes. When the two schools are merged there will be 809 students. Which system of equations will help to solve for the number of students in each school?

$x + y = 809$

There are more students at Harper, so $x - y = 125$

A. $\begin{cases} x + y = 809 \\ y = x - 125 \end{cases}$

B. $\begin{cases} x + y = 809 \\ x = y - 125 \end{cases}$

C. $\begin{cases} x + y = 809 \\ x - y = 125 \end{cases}$

D. $\begin{cases} x + y = 809 \\ y - x = 125 \end{cases}$

Short Answer

5. A theater charges \$6 for students and \$9 for adults. For one showing, 200 tickets were sold for a total of \$1,380. How many tickets were sold to adults? Write a system of equations to solve the problem and define the variables.

x : # of student tickets y : # of adult tickets 60 adult tickets

$$\begin{cases} x + y = 200 \\ 6x + 9y = 1380 \end{cases} \rightarrow \begin{cases} -6(x + y) = -6(200) \\ 6x + 9y = 1380 \end{cases} \rightarrow \begin{cases} -6x - 6y = -1200 \\ 6x + 9y = 1380 \end{cases} \xrightarrow{\text{(add equations)}} \begin{cases} -6x - 6y = -1200 \\ 6x + 9y = 1380 \end{cases}$$

$$3y = 180 \sim y = 60$$

6. Chandra thinks that the system of equations below has an infinite number of solutions. Do you agree with her thinking? Yes. Why or why not?

Solution:

$$\begin{cases} 2y = x - 4 \\ -2x = -4y - 8 \end{cases} \sim \begin{cases} -2(2y = x - 4) \\ -2x = -4y - 8 \end{cases} \rightarrow \begin{cases} -4y = -2x + 4 \\ -2x = -4y - 8 \end{cases} \xrightarrow{\text{(add equations)}} \begin{cases} -4y = -2x + 4 \\ -2x = -4y - 8 \end{cases}$$

$$0 = 0$$

0 is always equal to 0 , So there must be an infinite number of solutions

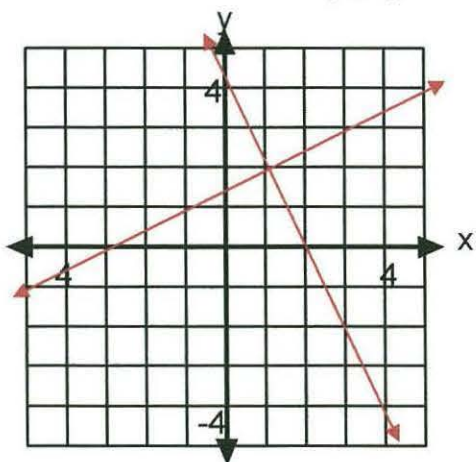
Extended Response

7. Graph this system of equations on the coordinate plane below.

$$\begin{cases} 2x + y = 4 \\ x - 2y = -3 \end{cases}$$

Write the solution below and explain how you can check your work.

$(1, 2)$



Check it in each equation:

$$2(1) + 2 = 4 \sim 4 = 4$$

$$1 - 2(2) = -3 \sim -3 = -3$$

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Chapter 7W – Linear Relationships

Multiple Choice

1. The slope of a line is $\frac{1}{3}$. If the line passes through point A at (0,-4), what is the equation of the line?
- A. $y = -\frac{1}{3}x + 4$ B. $y = \frac{1}{3}x + 4$ **C. $y = \frac{1}{3}x - 4$** D. $y = \frac{1}{3}x$

$$m = \frac{1}{3}, b = -4 \sim y = mx + b \sim y = \frac{1}{3}x - 4$$

2. A line with the slope of 4 passes through point B at (1,-3). Which of the following is the equation of the line?
- A. $y = 4x + 13$ **B. $y = 4x - 7$** C. $y = -4x + 7$ D. $y = -4x - 13$

$$y = mx + b \sim -3 = 4(1) + b \sim -7 = b. \text{ Therefore } y = 4x - 7.$$

3. A line passes through points E and F. Point E is located at (0, -4) and point F is located at (3, -4). What is the slope of the line?
- A. -1 B. 0 C. 1 D. undefined

$$\text{Slope: } \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4 - (-4)}{3 - 0} = 0$$

4. The slope of a line is -1. The point (2, 3) lies on this line. Which other point below is also on this line?

$$y = mx + b \sim 3 = -1(2) + b \sim 5 = b. \text{ Therefore } y = -1x + 5$$

- A. (2, -1) B. (0, 1) C. (-1, 4) D. (0, 5)

$$-1 \neq -1(2) + 5 \quad 1 \neq -1(0) + 5 \quad 4 \neq -1(-4) + 5 \quad 5 = -1(0) + 5$$

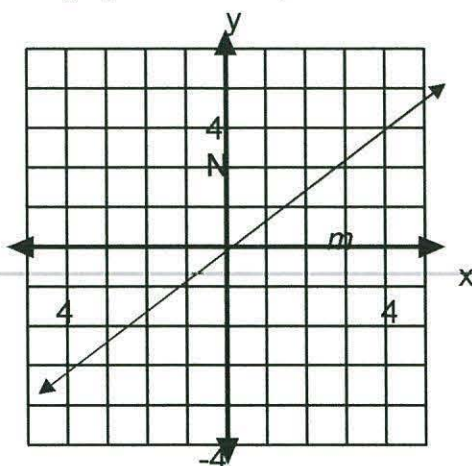
Short Answer

5. Two points on a line are located at (-3,2) and (3,4). What is the equation of the line that crosses through these two points?

$$\text{Slope: } \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 2}{3 - (-3)} = \frac{1}{3} \quad \sim y = mx + b \sim 2 = \frac{1}{3}(-3) + b \sim b = 3$$

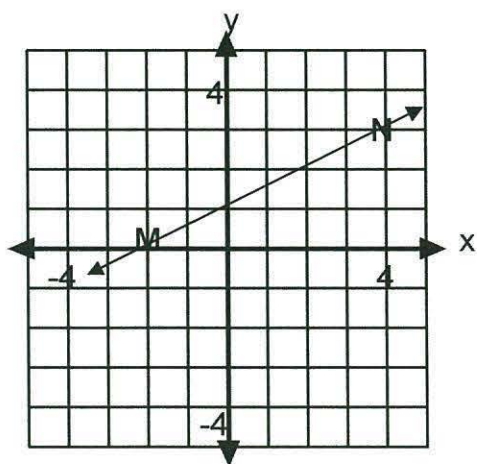
$$\text{Therefore, } y = \frac{1}{3}x + 3$$

6. Explain in detail using words how to write the equation of the line that passes through point N and parallel to line m . $y = \frac{3}{4}x + 3$



The slope (m) of line m is $\frac{3}{4}$.
 $N = 3$ is the y -intercept (b).
 Since $y = mx + b$,
 The equation of the line is $y = \frac{3}{4}x + 3$.
 (The slopes of the lines are the same)

7. Find the equation of the line for MN. $y = \frac{1}{2}x + 1$



slope = $m = \frac{1}{2}$ y -intercept = $b = 1$

Since $y = mx + b$,
 The equation of the line is $y = \frac{1}{2}x + 1$.

Extended Response

8. Lines a and b lie in the same plane. The equation for line a is $y = -5x + 3$. Line b is parallel to line a . On the coordinate plane, line b passes through -3 on the y -axis. Explain in detail using words and numbers how you use the equation for line a to write the equation for line b .

Line b is parallel to line a , $y = -5x + 3$. The slope of both lines is -5 ($m = -5$).
 Since line b crosses the y -axis at -3 , that is the y -intercept ($b = -3$)
 Since $y = mx + b$, the equation of the line is $y = -5x - 3$.

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Chapter 8W – Quadratics

Multiple Choice

1. If the area of a rectangle is $x^2 - 5x - 6$, what is a possible length and width?

- A. $(x-2)(x+3)$ B. $(x+2)(x-3)$ C. $(x-1)(x+6)$ **D. $(x+1)(x-6)$**

Two numbers whose sum is -5 and whose product is -6 : 1 & -6 $\rightarrow (x+1)(x-6)$

2. Write $\frac{2x^2 + 15x - 8}{x+8}$ in the simplest form.

- A. $2x-1$** B. $2x^2 + 15$ C. $2x+1$ D. $\frac{2x+15-8}{8}$

Solution: $\frac{2x^2 + 15x - 8}{x+8} = \frac{(2x-1)(x+8)}{(x+8)} = 2x-1$

3. The equation $4x^2 - 12x = -9$ has these types of solutions:

- A. No Integers** B. 1 Integer C. 2 Integers D. No Reals

$$4x^2 - 12x = -9 \rightarrow 4x^2 - 12x + 9 = 0 \rightarrow (2x-3)(2x-3) = 0 \quad x = 3/2$$

$3/2$ is not an integer, so there are no integer solutions.

4. What value of k would give the equation $x^2 + kx + 4 = 0$ two integer solutions?

- A. $k = -5$** B. $k = 5$ C. $k = 0$ D. $k = 4$

$$\begin{aligned} x^2 + -5x + 4 &= 0 \\ (x-4)(x-1) &= 0 \\ x &= 4, 1 \text{ (both integers)} \end{aligned}$$

Short Answer

5. In the equation $x^2 - 3x = 10$, what is the only positive solution?

$$x^2 - 3x - 10 = 0$$

$$(x - 5)(x + 2) = 0$$

$$x = 5, -2$$

The only positive solution is $x = 5$

6. The product of two consecutive odd integers is 63. Give two possible pairs of integers that satisfy this condition. Explain your answer using words, numbers, and/or diagrams. $(-9, -7), (7, 9)$

$$1^{\text{st}} \# = n, 2^{\text{nd}} \# = n + 2$$

$$n(n + 2) = 63 \sim> n^2 + 2n = 63 \sim> n^2 + 2n - 63 = 0 \sim> (n + 9)(n - 7) = 0$$

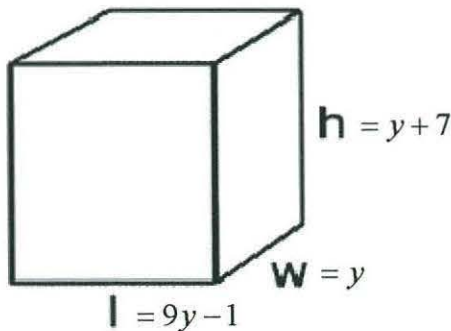
$$\text{when } n = -9, n+2 = -7$$

$$\text{when } n = 7, n+2 = 9$$

Extended Response

7. Write an expression that represents the surface area in the figure below. Explain your answer using words, numbers, and/or diagrams.

$$38y^2 + 28y - 14$$



$$SA = 2y(9y - 1) = 18y^2 - 2y$$

$$2y(y + 7) = 2y^2 + 14y$$

$$2(9y - 1)(y + 7) =$$

$$2(9y^2 + 8y - 7) = \frac{18y^2 + 16y - 14}{38y^2 + 28y - 14}$$

Find the surface area of the figure when $y = 2$ cm and when $y = 3$ cm.

Show all work.

$$38y^2 + 28y - 14 \quad (y = 2)$$

$$38(2)^2 + 28(2) - 14 = 194 \text{ cm}^2$$

$$38y^2 + 28y - 14 \quad (y = 3)$$

$$38(3)^2 + 28(3) - 14 = 412 \text{ cm}^2$$

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Chapter 9W – Inequalities**Multiple Choice**

1. Which of the following represents the solution to the inequality
- $5(x - 8) \leq -3x$
- ?

A. $x \geq 5$ **B.** $x \leq 5$ C. $x \geq -5$ D. $x \leq -5$

$$5(x - 8) \leq -3x \sim 5x - 40 \leq -3x \sim 8x \leq 40 \sim x \leq 5$$

2. Which inequality represents a dashed line passing through (0, -1) and (3,0) and shaded above that line?

A. $y > \frac{1}{3}x - 1$ B. $y < \frac{1}{3}x - 1$ C. $y > 3x - 1$ D. $y < 3x - 1$

$$\text{Slope} = m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - (-1)}{3 - (0)} = \frac{1}{3} \sim y = mx + b \sim m = \frac{1}{3}, b = -1$$

The is shaded above the line (>). Therefore, $y > \frac{1}{3}x - 1$.

3. In the linear inequality
- $-5y \leq 10 - 2x$
- , the values of x and y must be whole numbers that are greater than or equal to 1. What is the least possible value of x that fulfills these conditions?

A. $7\frac{1}{2}$ **B.** 1 C. 7 D. Not possibleDivide by -5 and rewrite $-5y \leq 10 - 2x$ as $y \geq \frac{2}{5}x - 2$.To minimize x let y be the least possible (1) $1 \geq \frac{2}{5}x - 2$ and solve for x

$$1 \geq \frac{2}{5}x - 2 \sim 3 \geq \frac{2}{5}x \sim 7\frac{1}{2} \geq x. \text{ Therefore } 1 \leq x \leq 7\frac{1}{2} \text{ so min value is 1.}$$

4. Name a point that is a solution for the linear inequality
- $x + 4y > 8$
- .

A. (0,0) B. (4,1) C. (0,2) **D.** (1,2)

$0 + 0 > 8$ F

$4 + 4(1) > 8$ F

$0 + 4(2) > 8$ F

$1 + 4(2) > 8$ T

Short Answer

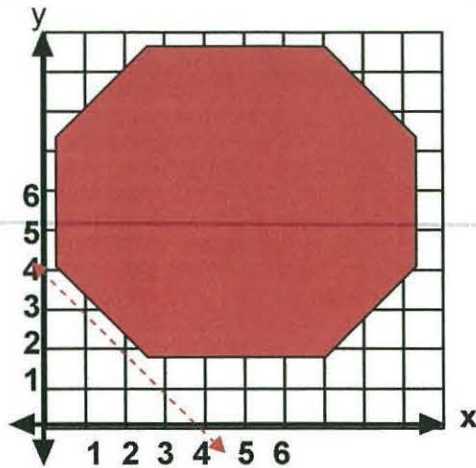
5. Kim and Ken are trying to earn \$400 to buy a mountain bike. Kim earns \$7 per hour as a youth counselor at a day camp. Ken earns \$5 per hour mowing lawns. Let x = Kim's hours and y = Ken's hours. If Kim works 40 hours, what is the least number of hours that Ken will need to work to meet their goal?

Write and solve a linear inequality to find the answer.

$$7x + 5y \geq 400 \sim 7(40) + 5y \geq 400 \sim 280 + 5y \geq 400 \sim 5y \geq 120 \sim y \geq 24$$

The least Ken needs to work is 24 hours.

6. The perimeter of a rectangle is greater than 8 inches. Let x = length and y = width. The linear inequality $2x + 2y > 8$ represents the situation. Graph the possible solutions to the inequality on the grid below.

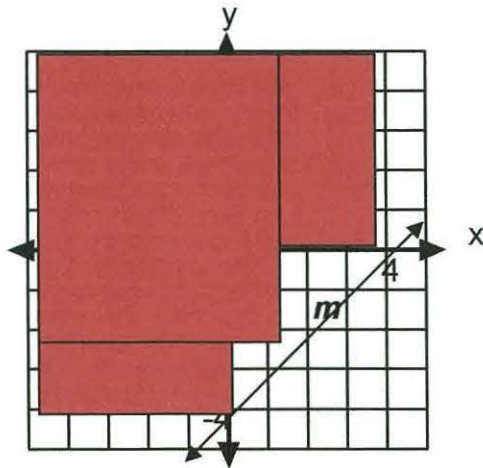


$$\begin{array}{r|l} x & y \\ \hline 0 & 4 \\ 4 & 0 \end{array}$$

Everything above the dashed line

Extended Response

7. In the grid below, shade above the line m . Do you agree with the statement "On the graph of your inequality below, x can never be positive while y is negative"? Explain in detail your thinking using words, numbers, and/or diagrams.



No. $(2, -1)$ is in the shaded region
 -1 is negative yet 2 is positive.

Give linear inequality which is the solution set to the graph above and why.

- A. $y \geq 4 - x$ **B.** $x - y \leq 4$ C. $y \geq x + 4$ D. $x - y \leq 4$

The answer is B because $(0, -4)$ and $(4, 0)$ are solutions to $x - y = 4$. $(0, 0)$ is a solution to $x - y \leq 4$ so its shaded above.

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Chapter 10S – Statistics**Multiple Choice**

1. There were five performances of a Bellingham school play. The numbers of tickets sold for each performance were 148, 154, 141, 172, and 185. What is the average number of tickets sold per performance?

A. 154 **B.** 160 C. 141 D. 800

$$(148+154+141+172+185) / 5 = 800 / 5 = 160$$

2. Tom tracked how much he spent on gasoline for 7 months. The results, rounded to the nearest dollar, are shown below.

Month	May	June	July	August	September	October	November
Amount	\$21	\$36	\$35	\$54	\$24	\$23	\$21

How could you find the **MEDIAN** amount Tom spent on gasoline during these 7 months?

- A. Add the amounts; divide by 7. (*mean*)
B. Put the amounts in order; find the middle value.
 C. Find the middle month; choose that amount.
 D. Find the amount that occurs the most often. (*mode*)
3. The outdoor temperature, in degrees Fahrenheit, is recorded at noon at Orem High School for ten consecutive days in February. The measurements are shown below. In degrees Fahrenheit, what is the **MODE** of the recorded temperatures?

Date	3	4	5	6	7	10	11	12	13	14
°F	26°	32°	35°	34°	37°	32°	26°	24°	26°	25°

- A.** 26° (*occurs most often*) B. 29.7° C. 29° D. 34.5°

Short Answer

4. In Janice's English class, each essay is worth 100 points. Janice's scores on her first four essays were 46, 85, 82, and 90. Find the median and the mean. Which would best represent Janice's ability to write an essay? Explain your reasoning.

Median: 46 82 85 90 \sim $(82 + 85) / 2 = 83.5$

Mean: $(46 + 82 + 85 + 90) / 4 = 303/4 = 75.75$

The median is a better measurement since we see a dramatic improvement between the first and the last three.

5. A school club is planning a pizza party. Sandra is calling restaurants to find the cost of buying a large (12-inch) pizza with two toppings. She gets the following prices from the first four restaurants that she calls: \$11, \$13, \$10, and \$9. She calls one more restaurant and reports that the median price of a pizza is \$11. What can you know for certain about the price at the fifth restaurant? Why? **It's \$11 or more.**

Prices in order: 9 10 11 13 In order for 11 to be the median it needs to be in the middle. The fifth pizza must be \$11 or more to keep 11 in the middle.

6. Find the mean and median of the following set of data: 8, 15, 4, 7, 14, and 6.

Mean 9

Median 7.5

$(8+15+4+7+14+6) / 6 = 54/6 = 9$ 4 6 7 8 14 15 \sim $(7+8)/2 = 7.5$

Extended Response

7. Five players from last year's varsity basketball team are returning this year. Their heights, in inches, are shown in the table below,

Player	J. Chess	D. Laws	M. Young	B. Allen	A. Lewis
Height	82	65	74	80	69

What is the MEAN height of the returning varsity players?

$(82 + 65 + 74 + 80 + 69) = 370/5 = 74$ inches

Three players will move from the junior varsity to the varsity team. The mean height of these players is 68 inches. What effect will this have on the mean height of the team? Explain your thinking.

It will drop since the mean of the new players is 68" and mean of the returning varsity players is 74"

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Chapter 11W – Functions and Relations

Multiple Choice

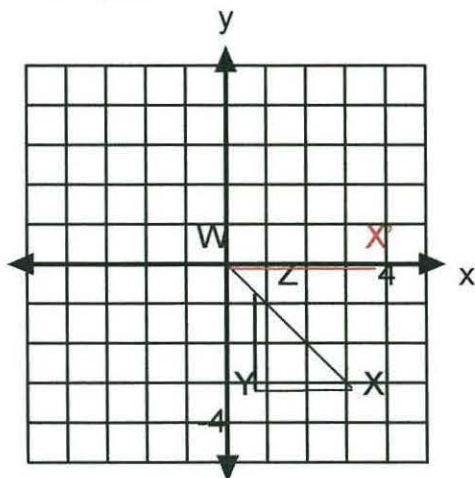
1. Which function defines the relation below?

x	-1	0	1
$f(x)$	0	-1	0

- A.** $f(x) = x^2 - 1$ B. $f(x) = x - 1$ C. $f(x) = x + 1$ D. Not a function

Solution: $f(-1) = (-1)^2 - 1 = 0$, $f(0) = (0)^2 - 1 = -1$, $f(1)^2 - 1 = 0$

2. The flag shown on the coordinate plane below is rotated 45° counterclockwise about point w . After the rotation, segment $\overline{WX'}$ passes through which of these points?



- A. (2, 2) **B.** (2, 0) C. (-2, -2) D. (-2, 0)
3. On a clock, the hour hand points directly at the number 4. Seven hours later, the hour hand points directly at the 11. The change represents a clockwise rotation of how many degrees?

- A.** 180° B. 5° C. 150° D. 210°

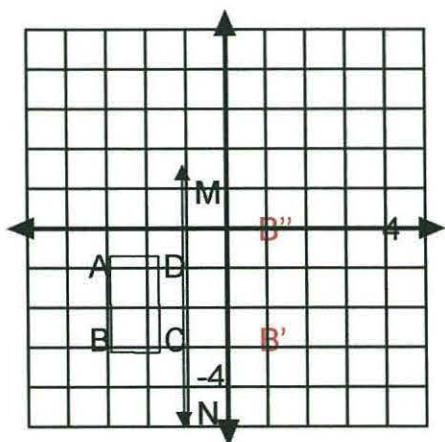


Short Answer

4. The vertices of a triangle are located at $(-4, 2)$, $(-2, 5)$, and $(2, 4)$. The triangle is translated 8 units down and 4 units to the right. Explain in detail how to find the coordinates of the translated image.

$(x, y) \sim (x - 8, y + 4)$ New coordinates: $(-12, 6)$, $(-10, 9)$, $(-6, 8)$

5. Rectangle ABCD is reflected over \overline{MN} and translated 3 units up. What are the coordinates of B'' ? Explain in detail using words, what you need to do; then show your work on the coordinate plane. $(1, 0)$



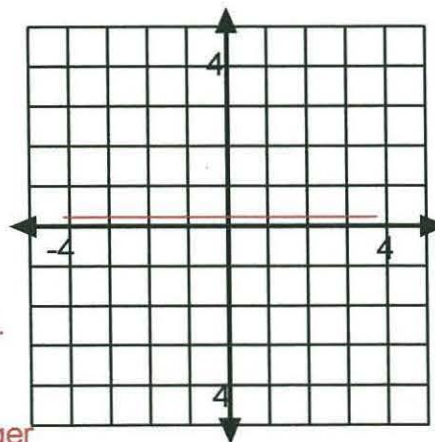
Flip B over MN to B' then move that up 3 units
 $B' = (1, -3) \sim B'' = (1, 0)$

Extended Response

6. What degree rotations would not require a problem to specify whether the rotation was clockwise or counterclockwise? Explain in detail using the blank coordinate plane in your reasoning.

A 180° clockwise rotation would move $(4, 0)$ to $(-4, 0)$ and same with counterclockwise. 360° would also work.

In general, $180n$ degrees where n is an Integer



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Chapter 12P – Probability

Multiple Choice

1. A 6-sided number cube has the numbers from 1 through 6 on it. The cube is rolled once. Which of the following ratios represents the probability of rolling a 3 or higher?

A. $\frac{5}{6}$ B. $\frac{2}{3}$ C. $\frac{1}{2}$ D. $\frac{1}{3}$

$$\text{\#s in success } 3,4,5,6 \quad \frac{\text{\# of successes}}{\text{total}} = \frac{4}{6} = \frac{2}{3}$$

2. Brent entered a raffle at the Clark County Fair to win a game system. The fair plans to sell 800 tickets. One ticket will be drawn, and the winner will receive the grand prize. If Brent bought 20 tickets, what is the probability that one of his tickets will be drawn?

A. 0.2% **B.** 2.5% C. 20% D. 25%

$$\text{Solution: } \frac{20}{800} = 0.025 = 2.5\%$$

3. Six friends are trying out for a basketball team. The coach chooses two to play a quick game of one-on-one. Which expression could be used to figure out how many combinations of two players there are to choose from?

A. $6!$ B. $\frac{6!}{2!}$ C. $\frac{6!}{(6-2)2!}$ **D.** $\frac{6!}{(6-2)!}$

$$6 \text{ could be \#1, } 5 \text{ could be \#2. } 6 \bullet 5 = 30 \quad \frac{6!}{4!} = 30$$

4. Ten skiers enter a cross-country race. How many different arrangements of 1st and 2nd place winners are possible?

A. 2 B. 45 **C.** 90 D. 40,320

$$10 \text{ }_{1^{\text{st}}} \bullet 9 \text{ }_{2^{\text{nd}}} = 90$$

Short Answer

5. How many different 4-digit numbers can you make from the digits 3, 5, 2, and 8? Show all work.

$$4! = \begin{matrix} 4 & \bullet & 3 & \bullet & 2 & \bullet & 1 \\ \text{\# of Choices} & 1^{\text{st}} & 2^{\text{nd}} & 3^{\text{rd}} & 4^{\text{th}} \end{matrix} = 24$$

6. A small diner offers the specials shown on the menu at the right. Suppose someone ate breakfast, lunch, and dinner at the diner. Explain in detail how you could find the number of possible meal combinations.

$$3 \bullet 3 \bullet 5 = 45$$

7. A box has six white marbles and three black marbles. One marble is drawn and not replaced. Then a second marble is drawn. What is the probability that both marbles drawn will be white? Express your answer as a ratio.

$$\text{Solution: } \frac{6}{9} \bullet \frac{5}{8} = \frac{5}{12} = 5 : 12$$

Extended Response

8. A school club is selling banana splits for a fundraiser. A banana split has three scoops of ice cream. The sign shows the flavors of ice cream the club has for sale.

Suppose students must choose three different flavors of ice cream. Explain in detail how you find out how many combinations are possible and determine this number.

$$\text{Solution: } \binom{5}{3} = \frac{5!}{(5-3)!3!} = \frac{5 \bullet 4 \bullet 3 \bullet 2}{2 \bullet 3 \bullet 2} = 10$$

Suppose the server is blindfolded (but he still manages to get three different flavors). What is the probability that flavors he chooses are Vanilla, Chocolate, and Strawberry? $\frac{1}{10}$

*Cliff's Diner***Breakfast Specials**

Strawberry Waffles
Eggs & Bacon
Pancake Stack

Lunch Specials

Club Sandwich
Soup & Salad Bar
Chili & Cornbread

Dinner Specials

Chicken Pot Pie
Turkey Dinner
Macaroni & Cheese
Halibut
Fruit Plate

Ice Cream Flavors

Vanilla
Chocolate
Strawberry
Mint Chip
Butter Pecan

