12 Test Problems (4 sections, 3 questions per section)

**Line Slope:**

**All Math Problem:** Line B crosses point A(2,3) and B(2,8), what is the slope of line B?

*Problem Analysis: This problem comes from normal textbook, its topic is Line Slope, its difficulty level is basic, its word verbalized level can be categorized as a medium verbalized algebra-and-geometry math problem. It is the student-produced response problem.*

*Problem Analysis (2): This problem is more verbalized then Problems 1.1 and 1.2. It asks for more language to math translation than the first problems did. Therefore, it is categorized as a medium verbalized algebra-and-geometry math problem. It allows students to either use their geometric skills to graph the points and find the equation from there, or use their algebraic skills to solve for the slope of the line using the formula. The difficulty level is basic, and it is a student-produced response problem.*

*Question: Are both the x coordinates supposed to be 2? Because this would mean that the line is vertical and therefore the slope is undefined. If it is meant to be this way, it’s a bit trickier than the basic level*

**Hybrid Problem**: The amount of money that farmers in Massachusetts paid to maintain their crops

between 1991 and 2008 is modeled by the equation P=3.53t+100, where P is the amount of

money the farmers paid, in millions of dollars, and t is the year(assuming 1991 is  t=0). What does the 3.53 mean in the equation?

A.The cost for maintaining crops was $3.53 million in 1991.

B.The cost for maintaining crops was $3.53 million in 2008.

C.The costs for maintaining crops increased a total of $3.53 million between 1991 and 2008.

D.The costs for maintaining crops increased by $3.53 million each year between 1991 and 2008.

*Problem Analysis: This problem comes from* [*KahnAcademy*](https://www.khanacademy.org/test-prep/new-sat/new-sat-math/new-sat-heart-of-algebra/v/sat-math-h8-easier)*, its topic is Line Slope, its difficulty level is basic, its word verbalized level can be categorized as a deep word problem. However, in comparison to Problem 4.1, this problems directly gives the math model in a forward manner, but asks students to explain its variable’s meaning in a backward manner.  It is a multiple-choice problem.*

**Wordy Problem:** A college bookstore charges $60 for a yearly membership. The first book is free with the membership,and any book after that costs $7.60 including tax. How many money, **m**, does a student spend after buying, **b,** books and ayearly membership?

1. m = 7.60b
2. m = 7.60(b-1)
3. m = 7.60b+60
4. m = 7.60(b-1)+60

*Problem Analysis: This problem comes from* [*Kahn Academy*](https://www.khanacademy.org/test-prep/new-sat/new-sat-math/new-sat-heart-of-algebra/v/sat-math-h3-easier)*, its topic is Line Slope, its difficulty level is basic, its word verbalized level can be categorized as a deep word problem. However, in comparison to Problem 3.1, this problems give a hint to translate verbalized natural language toward the math model. It is a multiple-choice problem.*

**Systems of Linear Equations:**

**All Math Problem:** Solve this linear system using your method: 6x - 5y = 8 and -12x + 2y = 0.

*Problem Analysis: this problem investigates students’ strategy selection toward system of linear equation problem. We expect students know three different methods: graphing, method of substitution and method of elimination. This problem follows a forward reasoning manner to solve it.It is the student-produced response problem.*

**Hybrid Problem:** As a construction manager, you are asked to build a new straight road, which crosses the point (0,0). There is another straight road already built, which can be expressed as y=2x-1. You are asked to build your road such that it will never cross this other road. Find the correct value for a and b in the following equation of your road(y = ax+b). Round any decimals to the nearest hundredth.

*Problem Analysis: This problem comes from* [*online*](http://www.shmoop.com/math-shack/geometry/parallel-and-perpendicular-lines-word-problem/), *it is labeled as a systems of linear equation word problem. It investigates students’ ability to translate this word problem as a* *mathematical model and further solve it using the concept of systems of linear equation. It is an geometrical thinking to derive the concept understanding.*

**Word Problem:** Tickets for a play were $2 for each child and $4 for each adult. At one showing of the play, one adult brought 4 children and the remaining adults brought 2 children each. The total ticket sales from the children and  adults was $60. How many children and adults attended the play?

A.12 children and 9 adults

B.14 children and 8 adults

C.16 children and 7 adults

D.18 children and 6 adults

*Problem Analysis: this problem comes from* [*KahnAcademy*](https://www.khanacademy.org/test-prep/new-sat/new-sat-math/new-sat-heart-of-algebra/v/sat-math-h5-harder)*, it is labeled as a systems of linear equation word problem.  It investigates students’ ability to translate this word problem as a mathematical model and further solve it using the concept of systems of linear equation. It is an algebraic thinking to derive the concept understanding.*

**Distance:**

**All Math Problem**: Find the distance between A(2,0) and B(5,4)?

*Problem Analysis: This is the shallow verbalized algebra-and-geometry problem. Students need to understand the concept behind problem narrative. It is a forward reasoning problem.*

**Hybrid Problem:** The class of math is mapped on a coordinate grid with the origin being at the center point of the hall. Mary’s seat is located at the point (-4, 7) and Betty’s seat is located at (-2, 5). How far is it from Mary’s seat to Betty’s seat?

(A) https://lh6.googleusercontent.com/SeHe9QbCbAdU_drojC4A6Ww_IUw5U4eNMrXhYJ0PgPBWgsKPLd-QSC8N1OJzzCof16G7VxeUjgfsuFNmSignEgQHT2HBRWglKzvv-8LSl_THQqPV3aMvgnFNl-azsPZblHxmaB0vunits

(B)https://lh5.googleusercontent.com/Uh6YSg7-mIXf29AC83xEOiFyaiQ_Y8C0NPEFF63Tq6a8IcR68vSObjc6B3QLfCPoRqKH5zAs3WLyJBo6Qc7VuL5FD0yAmbgagKxxYv-xYsEIGXnXdknOTe24u6u7OKRViYNICsCl units

(C) 5 units

(D) 7 units

*Problem Analysis: This problem comes from online. This is deep verbalized algebra-and-geometry problem. It requires students to translate this problem as the math distance model and further solve it. It is a multiple-choice problem.*

**Wordy Problem:** You're leading the Shmoopville Beefalos in the championship football game against your bitter rivals, the Yooda City Wildcats. You're 3 yards from the end zone and 4 yards from the sideline, and you throwed the ball 5 yards to Othello to complete the big play. Othello is 7 yards from the end zone. How far does Othello stand from the sideline?

*Problem Analysis: This problem comes from* [*online*](http://www.shmoop.com/math-shack/geometry/word-problems-distance-/)*. It is a deep verbalized algebra-and-geometry problem. It requires students to translate this problem as a math distance model and further solve it. It is a student-produced response problem.*

**Midpoint:**

**All Math Problem:** Find the midpoint of the segment connecting the points (6,4) and (3,-4).

**Hybrid Problem:** Mark planted two trees on a planning grid at coordinates (0,8) and (12,4). He wants to plant a row of hedges such that any hedge is the same distance from each of the two trees. Determine the midpoint of the line segment connecting the two trees.

**Wordy Problem:** You and your friend Anna both work in downtown Axis Town, where the streets run north-south, the avenues run east-west, and the street blocks are all 100 meters by 100 meters.Your office is at 12th Street and 9th Avenue, and Anna's office is at 2nd Street and 7th Avenue. You're meeting for lunch at a restaurant exactly halfway between your offices. Find the intersection where the restaurant is located.