**Problem a1:** Line B crosses point A(2,3) and B(3,8), what is the slope of line B?

Step-by-Step Instructions:

1. *Recall: What is does the slope mean?*
2. *Understand: The slope of a line is the distance traveled in the y direction divided by the distance traveled in the x direction*
3. *Think: what is the equation for finding the slope of the line?*
4. *Think: can graphing these points on a grid help you?*
5. *Remember: Make sure that you keep the order of the points consistent.*
6. *Scaffolding: You must find the difference in y-coordinates of the points and then the difference in x-coordinates of the points*
7. *Scaffolding: The slope is calculated by rise (8-3) over run (3-2)*
8. *Scaffolding: The rise simplified is 5, while the run is 1*
9. *Scaffolding: Therefore the slope is 5/1*
10. *Scaffolding: m=5*

**Problem a2:** The amount of money that farmers in Massachusetts paid to maintain their 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). How much money does farmers get in the year 2001?

1. *Recognize: What kind of problem is this?*
2. *Scaffolding: This is a linear equation problem.*
3. *Think: What does the 3.53 mean in the equation?*
4. *Scaffolding: The 3.53 is the slope of the equation. This means that with every increase of one year (t) the amount of money the farmers paid (P) increases by 3.53 million dollars*
5. *Think: If 1991 means t=0, what does 2001 mean?*
6. *Scaffolding: 2001-1991 = 10, which means that t =10 for the year 2001*
7. *Scaffolding: To find the amount of money the farmers paid (P), plug 10 into the equation.*
8. *Scaffolding: P = 3.53 (10) +100*
9. *Scaffolding: Simplify the expression to P = 35.3 + 100, so P = 135.3*
10. *Check: What is the problem asking for? What are the units needed.*
11. *Recognize: The problem asks how much money the farmers get in that year, and the unit is in millions of dollars.*
12. *Scaffolding: So the answer is: “In 2001, the farmers got 135.3 million dollars”*

**Problem a3:** 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 does a student spend after buying books and a yearly membership?

1. *Recognize: What kind of problem is this?*
2. *Scaffolding: This is a linear equation problem.*

**Problem b1:** Solve this linear system using your method: 6x - 5y = 8 and -12x + 2y = 0.

1. *Recall: What does a solution to a linear system mean?*
2. *Understand: A solution to the linear system is found when you have values of x and y that make both of the equations true.*
3. *Scaffolding: You need to find the point (values of x and y) that make both of the equations true.*
4. *Think: What methods are there to solve this equation?*
5. *Scaffolding: Since the coefficients of the x’s are both multiples of six, the elimination method works best here.*
6. *Recall: What is the elimination method?*
7. *Understand: The elimination method is when you can add the two equations together to cancel out one of the variables. In this case, we want to cancel out the x value*
8. *Scaffolding: To eliminate the x variable, the coefficients must be inverses.*
9. *Scaffolding: You can multiply the first equation by 2 to make the x coefficient 12, which is the inverse of -12.*
10. *Understand: You cannot just multiply the 6 by 2, you must multiply the entire equation*
11. *Scaffolding: If you multiply the first equation by 2, you get 12x – 10y = 16.*
12. *Scaffolding: Now you should add the two equations together. -12x+12x=0, so you have eliminated the x variable.*
13. *Scaffolding: Add the like terms of the equation. -10y + 2y = -8y. and 16+0=16*
14. *Scaffolding: So we have -8y = 16. Divide each side by -8 to solve the equation.*
15. *Scaffolding: Now we have y = -2. Plug this value back into either equation to solve for x.*
16. *Scaffolding: We get x = -1/3*
17. *Scaffolding: The solution is (-1/3, -2)*

**Problem b2:** 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.

1. *Recognize: What kind of problem is this?*
2. *Scaffolding: This is a linear equation problem.*
3. *Recognize: What does it mean if lines never touch each other?*
4. *Understand: The only time that lines will never intersect is if they are parallel to each other*
5. *Recall: What does being parallel mean in terms of slope?*
6. *Understand: If one line is parallel to another it means that the slopes of the two lines are the same*
7. *Scaffolding: What is the slope of the first line?*
8. *Scaffolding: For the first line, m=2. This means that our equation should also have a slope of 2.*
9. *Scaffolding: Since we have a point on our line and the slope of our line, we can now find the equation of the line.*
10. *Recall: The point (0, 0) is the origin. This means that the y-intercept of our line is 0.­*
11. *Scaffolding: So this means that the equation of our line is y = 2x*
12. *Check: What did the problem ask for? Was it the full equation of the line?*
13. *Scaffolding: Since the problem asked for the values of a and b, we must phrase our answer in this way.*
14. *Scaffolding: So a=2 and b=0*

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**Problem c1:** Find the distance between A(2,0) and B(5,4)?

1. *Scaffolding: Graph these two points to get a better understanding of the distance*
2. *Recall: What is the equation for finding the distance between two points*
3. *Understand: The distance between two points can be found*
4. *Scaffolding: d2 = (x1 –x2 )2 + (y1 – y2)2*
5. *Scaffolding: Now plug in values from the two points to solve.*
6. *Scaffolding: d2 = (5– 2)2 + (4 – 0)2*
7. *Scaffolding: Simplify the equation to get: d2 = 9 + 16 = 25*
8. *Scaffolding: d = 5*

**Problem c2:** 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?

1. *Recognize: What kind of problem is this?*
2. *Scaffolding: This is a distance problem.*
3. *Recognize: The problem gives you the students’ seats as points on a coordinate plane*
4. *Scaffolding: Graph these two points to get a better understanding of the distance*
5. *Recall: What is the equation for finding the distance between two points*
6. *Understand: The distance between two points can be found*
7. *Scaffolding: d2 = (x1 –x2 )2 + (y1 – y2)2*
8. *Scaffolding: Now plug in values from the two points to solve.*
9. *Scaffolding: d2 = (-2– (-4))2 + (5 – 7)2*
10. *Scaffolding: Simplify the equation to get: d2 = 4 + 4 = 8*
11. *Scaffolding: d = sqrt(8), which you can simplify to d = sqrt(4) \* sqrt(2) = 2 \* sqrt(2)*
12. *Check: What did the problem ask for? What are the units given in the problem?*
13. *Scaffolding: It asks for the distance between their seats, but does not give units*
14. *Scaffolding: So the answer is “ Mary’s seat is 2 \* sqrt(2) units from Betty’s seat”*

**Problem c3:** 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?

1. *Recognize: What kind of problem is this?*
2. *Scaffolding: This is a distance problem.*
3. *Recognize: The distances can be converted into coordinates*
4. *Recognize: This is a somewhat backwards problem- it gives us d = 5*
5. *Scaffolding: Let’s make the distance from the end zone x and the distance from the sideline y*
6. *Scaffolding: The coordinate that you are standing at is (3, 4).*
7. *Scaffolding: The coordinate that Othello stands at is (7, Y), where Y is the unknown distance that Othello is from the end zone*
8. *Recall: What is the equation for finding the distance between two points*
9. *Understand: The distance between two points can be found*
10. *Scaffolding: d2 = (x1 –x2 )2 + (y1 – y2)2*
11. *Scaffolding: Now plug in values from the two points to solve.*
12. *Scaffolding: 52 = (7– 3)2 + (Y – 4)2*
13. *Scaffolding: Simplify the equation to get: 25 = 16 + (Y – 4)2*
14. *Scaffolding: Simplify the equation to get: 9 = (Y – 4)2*
15. *Scaffolding: Find the square root of both sides to simplify: 3 = Y – 4*
16. *Scaffolding: Y = 7*
17. *Check: What did the problem ask for? What are the units of the distance?*
18. *Scaffolding: Since the problem asked for the distance that Othello is from the end zone. The units are yards.*
19. *Scaffolding: So the answer is “Othello is 7 yards from the end zone”*