Name: _____

Lesson 1.13. Blue & Green Arrows

Date: _____ Period: _____

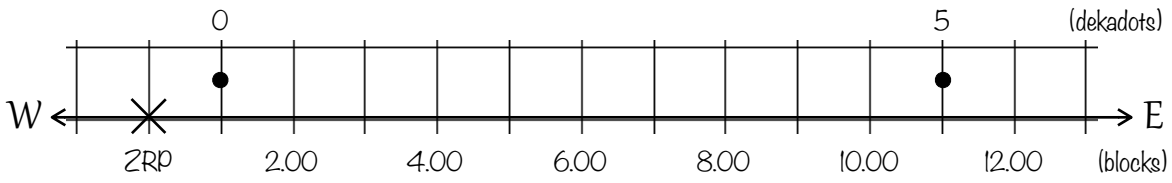
In the previous lesson, you learned to draw **blue arrows** to represent the positions that a moving particle passed at each time point. Congratulations! You are well on your way to mastering the first quantity to be introduced in this class: *position*.

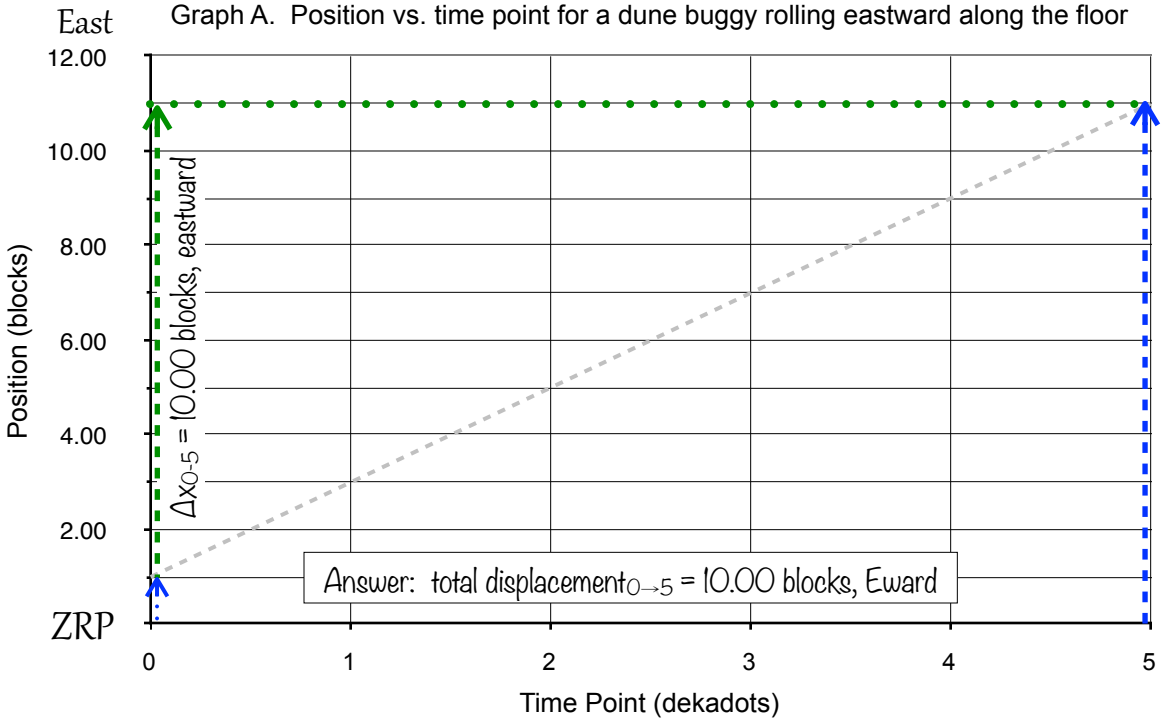
In this lesson, you will learn to draw **green arrows** and their dotted lines to represent the *total displacement* of a moving particle during any specified time interval. Now, there are several ways to determine the total displacement, but in this first lesson about the green arrows, we will limit ourselves to scenarios in which we know the initial and final positions. We will *definitely* consider other ways to arrive at total displacement in due course.

Here are some helpful strategies:

1) Draw what you already know first.
2) **Blue arrows** always start at the time point axis.
3) **Green arrows** always start at the point of an *initial* blue arrow.

Now, sharpen your **green** colored pencil (or whatever) and turn the page.





A buggy was just passing 1.00 block, east of the reference point when the timer made the first dot on the ticker tape. At 5 dekadots, the buggy passed 11.00 blocks, also east of the reference point. Determine the buggy's total displacement during this time interval.

A) Helpful Strategies.

- ☐ We know the initial and final positions, so draw them first.
- ☐ **Blue arrows** always start at the time point axis.
- ☐ **Green arrows** always start at the tip of an *initial* blue arrow.

B) The motion map!

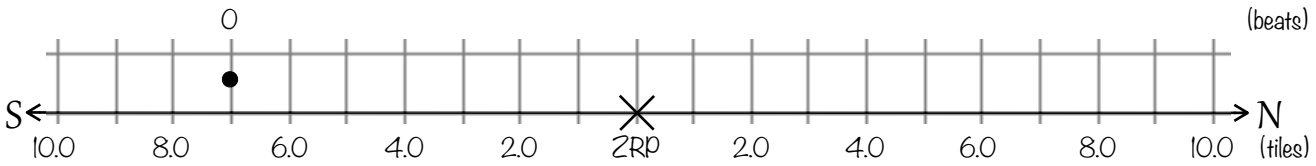
- ☐ With **blue** colored pencil, draw ellipses at the initial and final positions.
- ☐ With **green** colored pencil, shade in the region between the position arrows. *(What does the shaded region represent?)*

C) The position graph!!

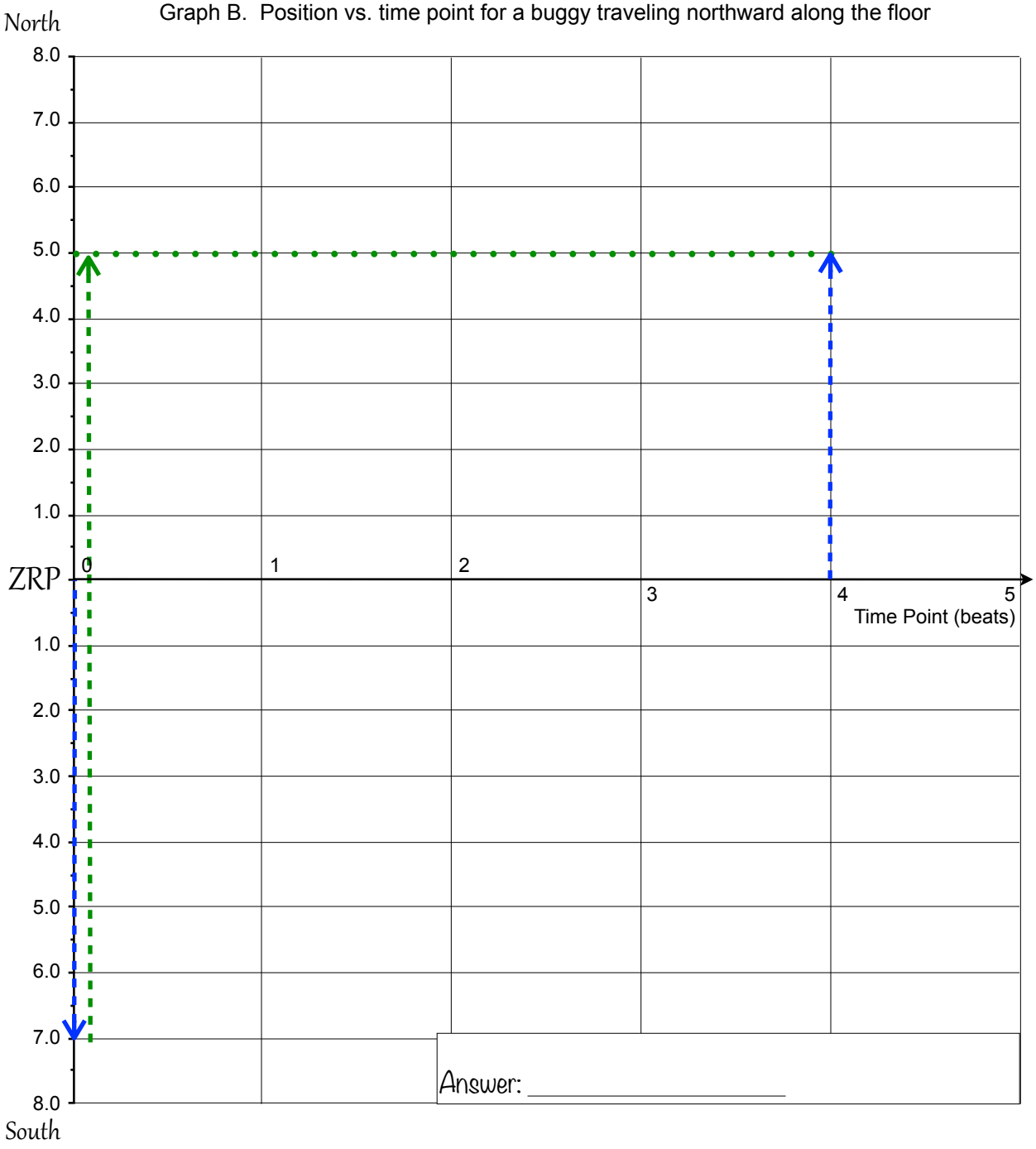
- ☐ With **blue** colored pencil, draw an ellipse around the ZRP.
- ☐ With **blue** colored pencil, draw position arrows (or a dot) at the initial and final positions.
- ☐ Now, pay close attention. The order in which you perform the following is important.
  - ☐ Touch your **green** colored pencil to the paper at the point of the *final position arrow*.
  - ☐ Draw a **green dotted line** straight back *from* the final time point *to* the initial time point.
  - ☐ Touch the **green** colored pencil to the paper at the point of the *initial position arrow*.
  - ☐ Draw a **green arrow** straight to where you ended the green dotted line.
- ☐ With regular writing pencil, label the position arrows and the total displacement arrow, and draw a trend line between the points of the position arrows. Then, write your answer.

Trust me on this one. You will spare yourself multiple "Try Again Alerts" (70% credit) not to mention much un-compensated mental anguish if you get in the habit of drawing these correctly.

A buggy passed 7.0 tiles, south of the reference point when the student placed the first washer. At 4 beats, the buggy was at 5.0 tiles, north of the reference point. Determine its total displacement during this time interval.

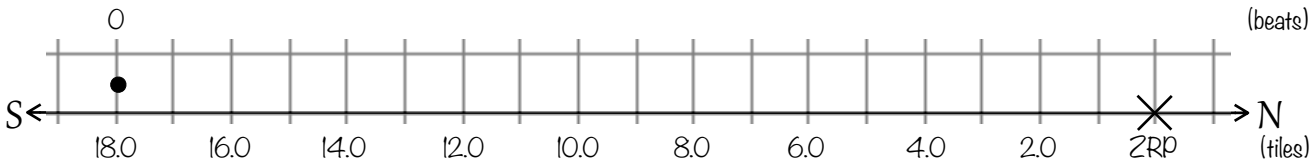


Graph B. Position vs. time point for a buggy traveling northward along the floor

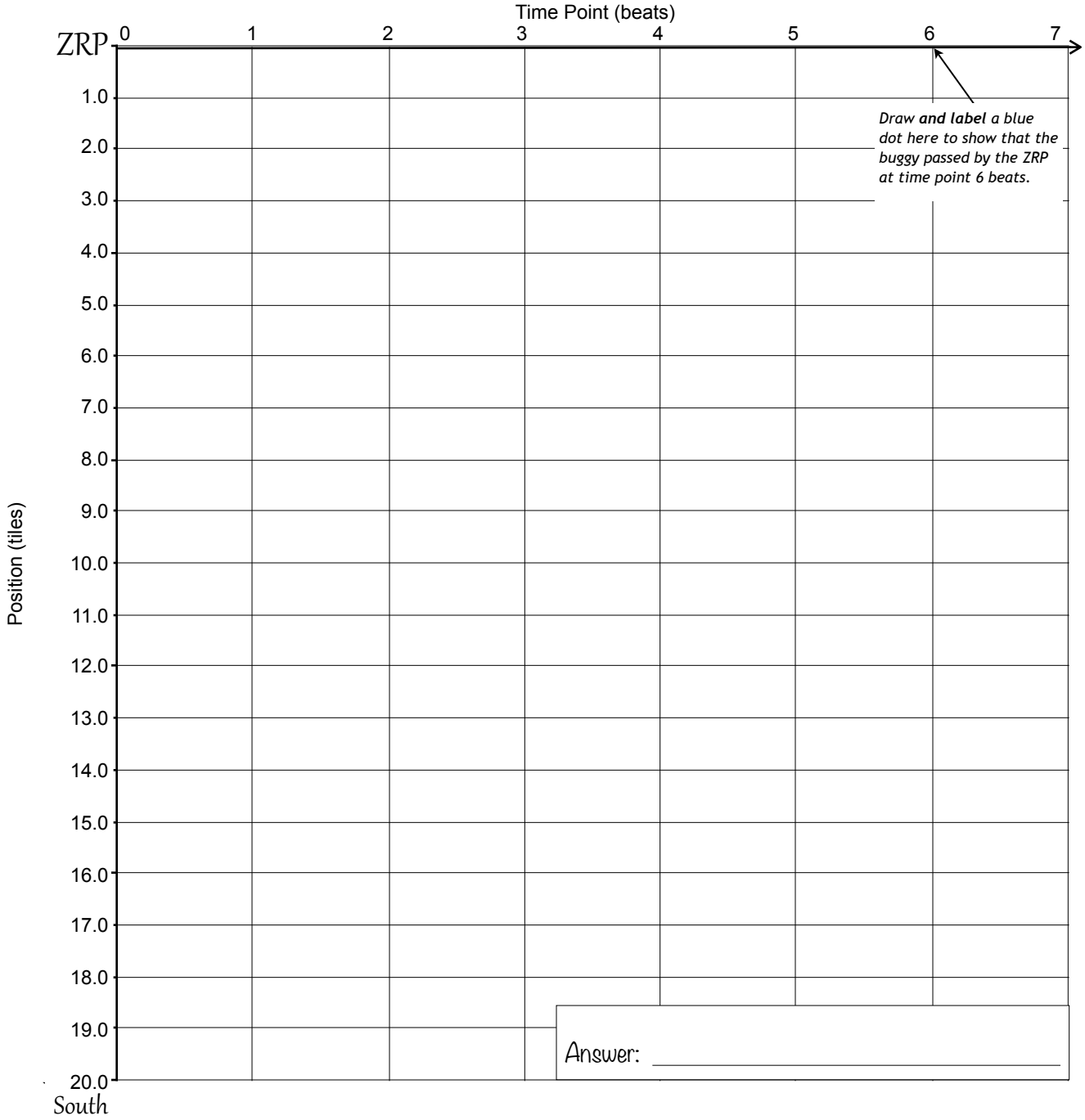


Answer: _____

A buggy passed 18.0 tiles, south of the reference point when the student placed the first washer. At 6 beats, the buggy passed by the reference point. Determine its total displacement during this time interval.



Graph C. Position vs. time point for a groovy dune buggy traveling along the floor



Name: _____

Homework 1.13. Blue & Green Arrows

Date: _____ Period: _____

Please answer all of the parts of Question 1 neatly, in pencil, right on this sheet (you're welcome). Express your ideas as complete thoughts written in clear, declarative English sentences. Make every pronoun refer unmistakably to a definite antecedent.

Please note: "Yes. Graphs A and B." and "In the 4th quadrant." and "They should be equal because they represent the same thing." are neither careful explanations nor complete thoughts; responses such as these do not explain anything nor do they demonstrate that you understand anything at all. Eschew them!!

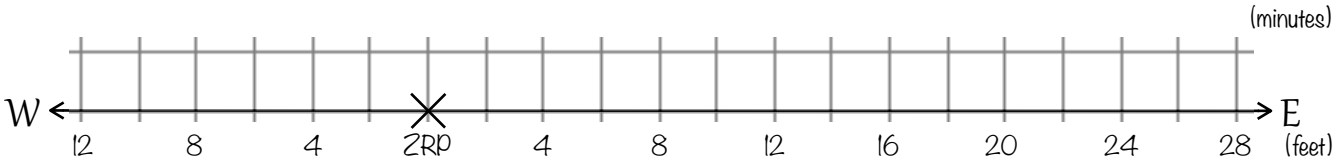
1) Consider Graphs A - C ***in the lesson*** (***NOT*** the homework graphs on the following pages!).
   a) What does the region you shaded on each motion map tell you about the motion of the particle?

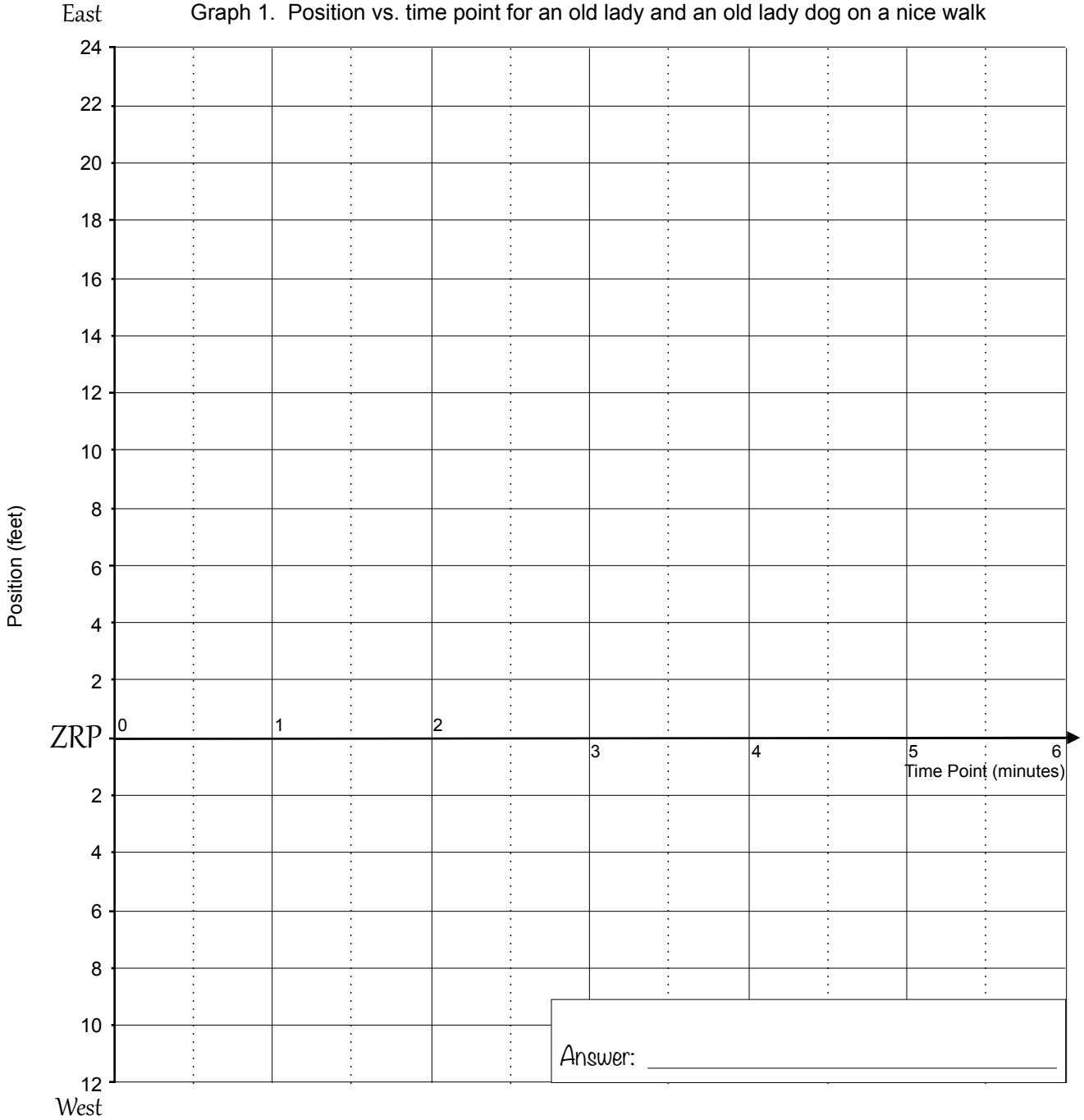
   b) What does the green arrow you drew on each position graph tell you about the motion of the particle?

   c) How should the area you shaded on each motion map compare to the length of the green arrow on the corresponding position graph? Check to see whether your result in each case is as you predict!

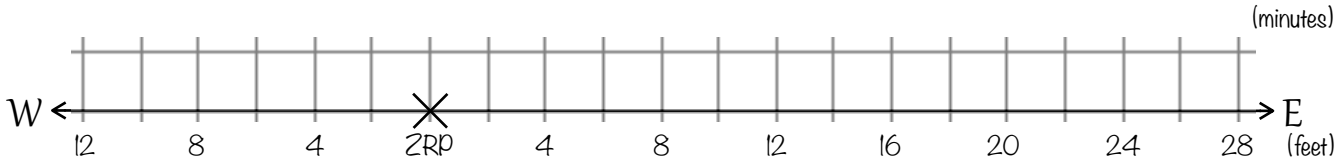
2) Please draw blue and green arrows, dotted lines and shaded regions on the following graphs and motion maps. Labels are written in regular writing pencil. Do your work **right on this sheet!** Your work should look similar to the example demonstrated in class, which is part of your class notes.

On the motion map and position graph below, please represent the motion of an old lady walking her old dog. They began at the end of her driveway, which is 10 feet, west of her favorite mailbox (the reference point). Five minutes later, they reached the house with the yellow front door, 20 feet, east of the reference point. Determine their total displacement during the 5 minutes. Detailed instructions are printed in the lesson.



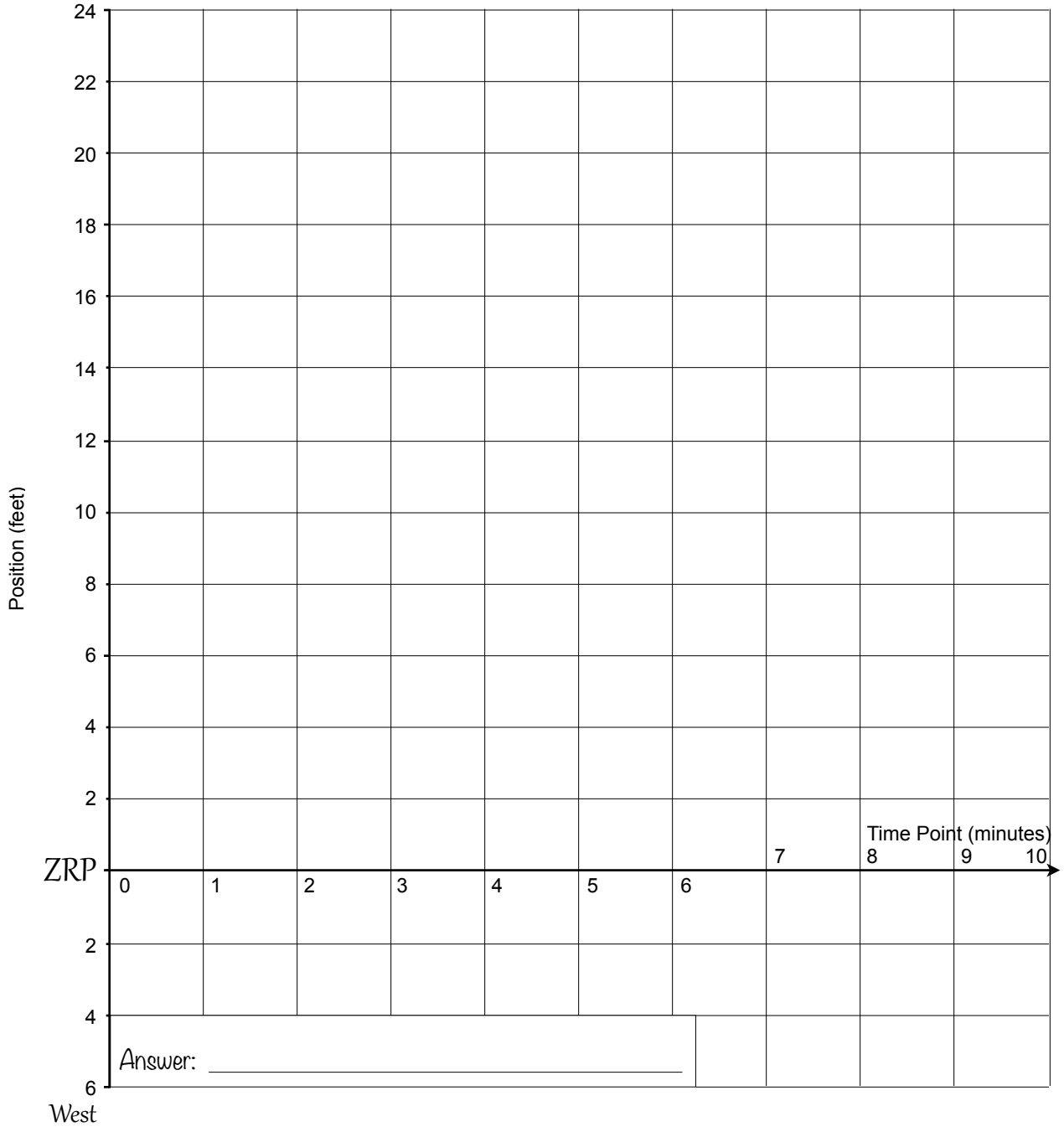


On the motion map and position graph below, please represent the motion of an old lady and her old dog returning from their walk. They began at the house with the yellow front door, which is 20 feet, east of her favorite mailbox (the reference point). When they stopped to rest 8 minutes later, they were 4 feet, west of the mailbox. Please determine their total displacement before stopping to rest. Detailed instructions are printed in the lesson.



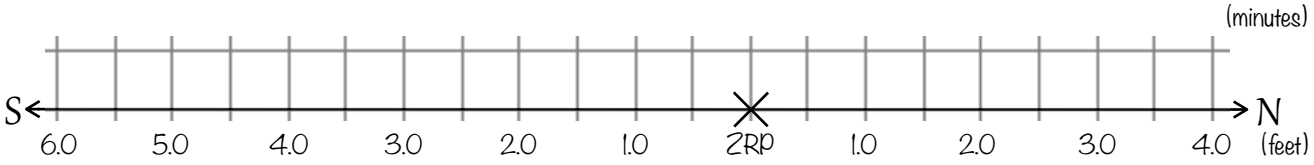
East

Graph 2. Position vs. time point for an old lady and an old lady dog returning from their walk

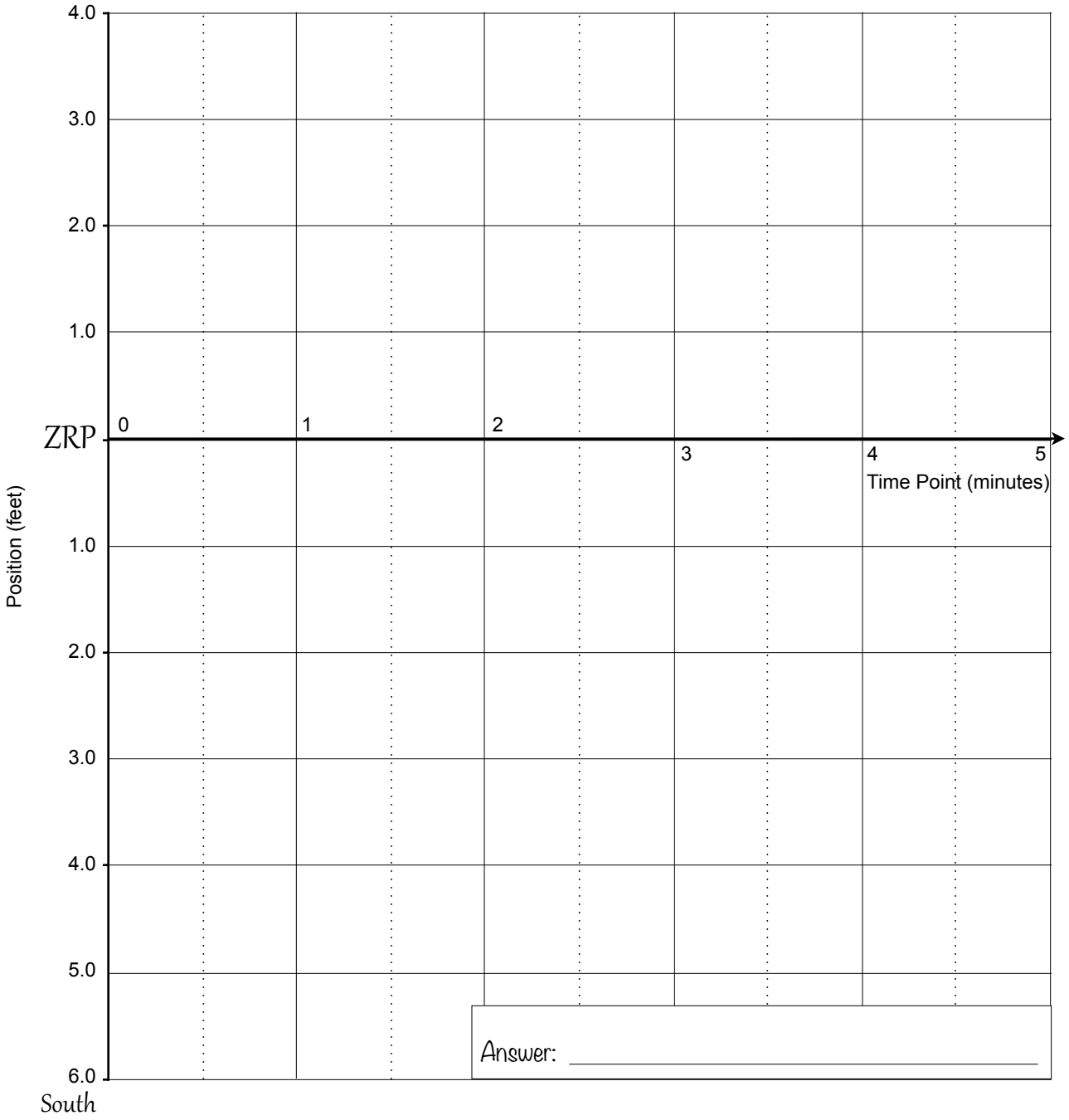


West

Guy Studly has only a short time during each locker break to impress the ladies with his manly good looks. Beginning 5 feet south of the physics classroom door (the ZRP) he sauntered northward slowly, hoping that the cutie who was asking Mrs. Hoots a question would notice. (She didn't. She was busy preparing for a Spanish test.) Alas, he had to abandon his attempt 4 minutes later when he was 3 feet north of the physics classroom door because the the warning bell rang. Please determine his total displacement from his starting position. Detailed instructions are printed in the lesson.



Graph D. Position vs. time point for Guy Studly impressing the ladies



Answer: _____