Building Algebraic Thinking Algebra Survey (Post)

Directions for the FUNCTIONS Survey

Welcome!

You will be asked to work through a middle school level mathematics item. After you finish working through an item on your own, you will be asked to identify the mathematical learning goals included in that item. You will see a student’s attempt or a number of students’ attempts at the same problem. You will be asked to identify any possible misconceptions the student or students may have. You must then determine an appropriate approach to deconstruct the student’s or students’ misconceptions.

Please do not use the forward or backward button of your browser window. Doing so will cause you to lose your responses. You must hit the submit button after each page. This ensures that your data has been saved. Thank you!
Jane, Graham, Susan, Paul, and Peter all travel to school along the same country road every morning. Peter goes in his dad’s car, Jane bikes and Susan walks. The other two children vary how they travel from day to day. The map above shows where each person lives.

The graph describes each pupil’s journey to school last Monday.

1. Label each point on the graph with the name of the person it represents.
2. How did Paul and Graham travel to school on Monday?
3. Describe how you arrived at your answer in part 2.
4. Peter’s father is able to drive at 30 mph on the straight section of the road, but he has to slow down for the corners. Sketch a graph on the axes below to show how the car’s speed varies along the route.

The format of the original online instrument has been modified to fit this paper version.

www.intasc.org
PROBLEM: FUNCTIONS

The following are the attempts of three different students.

Kelley answers parts 1 & 2.

1) Label each point on the graph with the name of the person it represents.

2) How did Paul and Graham travel to school on Monday?

Jackie answers part 3.

3) Describe how you arrived at your answer in part 2.

If Graham had walked to school, he would have taken as long as Susan and he had gone in the car he would have been faster so he must have cycled. Paul had walked he would have taken longer than Susan if he had gone in the car he would have taken been much quicker than Peter who had further to go.

Joanne answers part 4.

4) Peter’s father is able to drive at 30 mph on the straight section of the road, but he has to slow down for the corners. Sketch a graph on the axes below to show how the car’s speed varies along the route.

4) What do you think Joanne understands about the mathematics of this problem? What is your evidence? (Please remember to comment on what Joanne understands. You will have an opportunity to comment on her misconceptions next.)
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PROBLEM: FUNCTIONS

The following are the attempts of three different students.

Kelley answers parts 1 & 2.
1) Label each point on the graph with the name of the person it represents.
2) How did Paul and Graham travel to school on Monday?

![Graph with points labeled Kelley, Peter, Jan, Paul, Susan, Graham]

Jackie answers part 3.
3) Describe how you arrived at your answer in part 2.

![Text: If Graham had walked to school he would have taken as long as Susan. If he had gone in the car he would have been faster so he must have cycled. Paul had walked he would have taken longer than Susan. If he had gone in the car he would have taken been much quicker than Peter who had further to go.]

Joanne answers part 4.
4) Peter's father is able to drive at 30 mph on the straight section of the road, but he has to slow down for the corners. Sketch a graph on the axes below to show how the car's speed varies along the route.

![Graph of Peter's Journey to School]

FUNCTIONS ASSESSMENT

Please answer all of the following questions regarding the students' work to the left. You may need to scroll down in order to see the students' work.

5) What, if any, misconceptions does Kelley show?

![Blank space for answer]

6) What, if any, misconceptions does Jackie show?

![Blank space for answer]

7) What, if any, misconceptions does Joanne show?

![Blank space for answer]
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PROBLEM: FUNCTIONS

The following are the attempts of three different students.

1) Kelley answers parts 1 & 2.

   a) Label each point on the graph with the name of the person it represents.

   b) How did Paul and Graham travel to school on Monday?

   [Graph of Kelley, Peter, Jan, Paul, and Susan with axes labeled: Time taken to travel to school (minutes), Length of journey to school (miles).]

2) Jackie answers part 3.

3) Describe how you arrived at your answer in part 2.

   [Text: If Graham had walked to school, it would have taken as long as when he had gone in the car. He would have been faster to reach home quickly. Paul had walked, so he would have taken longer than Susan. If he had gone in the car, he would have taken been much quicker than ever one had further to go.]

4) Joanne answers part 4.

5) Peter’s father is able to drive at 30 mph on the straight section of the road, but he has to slow down for the corners. Sketch a graph on the axes below to show how the car’s speed varies along the route.

   [Graph of Peter’s Journey to School with axes labeled: Distance From Peter’s home (miles), Car’s Speed (mph).]

FUNCTIONS ASSESSMENT

Please answer all of the following questions regarding the students’ work to the left. You may need to scroll down in order to see the students’ work.

8) What questions would you ask Kelley in order to address her misconceptions?

9) What questions would you ask Jackie in order to address her misconceptions?

10) What questions would you ask Joanne in order to address her misconceptions?

[Submit & Proceed]
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PROBLEM: FUNCTIONS

The following are the attempts of three different students.

Kelley answers parts 1 & 2.

1) Label each point on the graph with the name of the person it represents.

2) How did Paul and Graham travel to school on Monday?

Jackie answers part 3.

3) Describe how you arrived at your answer in part 2.

If Graham had walked to school, he would have taken as long as Susan. If he had gone in the car, he would have been faster.

Joanne answers part 4.

4) Peter’s father is able to drive at 30 mph on the straight section of the road, but he has to slow down for the corners. Sketch a graph on the axes below to show how the car’s speed varies along the route.

FUNCTIONS ASSESSMENT

Please answer all of the following questions regarding the students’ work to the left. You may need to scroll down in order to see the students’ work.

11) What strategies would you employ to deconstruct Kelley’s misconceptions for this specific problem?

12) What strategies would you employ to deconstruct Jackie’s misconceptions for this specific problem?

13) What strategies would you employ to deconstruct Joanne’s misconceptions for this specific problem?