Activity Sheet for the September, 2013, MATHCOUNTS Mini

Warm-Up!

Try these problems before watching the lesson.

1. Armond the Ant crawls one foot every 10 seconds when not carrying anything, and he crawls one foot every 15 seconds when he's carrying a crumb. He carries nothing as he walks 10 feet from a wall to the place on the floor where you dropped a cookie. He picks up a crumb and then walks back to the wall along the same path. How many minutes does this entire trip take? Express your answer as a mixed number.

2. If I drive 30 miles an hour from work to home, then my trip will take 24 minutes. How fast do I have to drive to make the trip in 12 minutes?

3. Wally the wandering walrus swims 6 miles north, then 3 miles east, then 3 miles north, then 15 miles west. How many miles is he from where he started?

4. A frog is at the bottom of a 12-meter well. Each morning he climbs up 5 meters. Each night he slides down 3 meters. If he starts climbing on a Sunday, on which day will he reach the top of the well and escape?

The Problems

First Problem: Mary and Ann live at opposite ends of the same road. They plan to leave home at the same time and ride their bikes to meet somewhere between the two houses. At 11:00 a.m. Mary has traveled half of the distance between their houses. Ann is riding more slowly and has covered only $\frac{3}{8}$ of the distance between the houses. They are still one mile apart. How many miles apart are their houses?

Second Problem: Joy is riding her bicycle up a hill. After traveling 3 km, Joy passes Greg, who is walking down the hill at a rate of 1 m/s. Joy continues up the hill for another 7 km before riding down at double the average speed she rode up. Joy and Greg arrive at Joy's starting point at the same moment. In meters per second, what was Joy's average speed going down the hill?

Third Problem: Every day, Zuleica's mother Wilma drives from home to the train station, arriving right when Zuleica's train from school gets to the station. Then Wilma drives Zuleica home. They always return home at 5:00 p.m. One day Zuleica left school early and got to the train station an hour early. She then started walking home. Wilma left home at her usual time to pick Zuleica up, and they met along the route between the train station and their house. Wilma picked Zuleica up and then drove home, arriving at 4:46 p.m. For how many minutes had Zuleica been walking before Wilma picked her up?

Follow-up Problems

5. Cindy walks at a constant rate of 2 miles per hour. She leaves home to walk to her friend Jenny's house at 9 a.m. When she is halfway there, she thinks that she left her phone at home. She turns around and begins to walk back home, but when she is halfway home (from where she turned around), she finds her phone. She turns back around to walk to Jenny's and arrives there at 10 a.m. How many miles apart are Cindy's house and Jenny's house? Express your answer as a mixed number.

6. A man is running through a train tunnel. When he is $\frac{2}{5}$ of the way through, he hears a train behind him that is approaching, but has not yet reached the tunnel's entrance. The train is traveling at a speed of 60 mi/h. Whether he runs ahead or runs back, he will reach an end of the tunnel at the same time the train reaches that end. At what rate, in mph, is he running?

7. Tirunesh and Sally start at the same point on a 400-meter circular track. They start running at the same time, but in *opposite* directions around the track. Tirunesh runs at a rate of 8 meters per second, while Sally runs 7 meters per second. After they start, they give each other a high-five each time they meet on the track. How many high-fives will they give each other in the first 5 minutes they run?

8. Marco starts hiking on a path at noon, and stops at 8 p.m. He rests until noon the following day, and then starts hiking back towards his original starting point along the same path. He gets back to the starting point 8 hours after he starts walking. He doesn't necessarily walk at a constant rate either day. Explain why there must be a point on the path that Marco visits at the exact same time on both days.

9. Suppose Marco begins hiking back towards his original starting point at noon the following day, but his return trip only takes 4 hours. Must there still be a point on the path that Marco visits at exactly the same time on both days?

Wow! Share Your Thoughts

Have some thoughts about the video? Want to discuss the problems on the Activity Sheet? Visit the MATHCOUNTS Facebook page or the Art of Problem Solving Online Community (www.artofproblemsolving.com).