Name: Date:

1. $\boxed{5 \text{ h}}$

2. $\boxed{3 \text{ mph}}$

3. $\boxed{140 \text{ mi}}$

4. Two boats are travelling in opposite directions. Let's find the speed of each boat: $S_{upstream} = 25 - 5 = 20$, and $S_{downstream} = 25 + 5 = 30$. Now we just have a simple meet problem. The towns are 90 miles apart, and one boat travels at 20 mph and another boat travels at 30 mph. From the meet lecture, we know that $T = D \div R$, and R is the combined rates of the two boats, so $R = 20 + 30 = 50$. So the time it takes them to meet is $90 \div 50 = 1.8\ h = 1\ h + 48\ min$. So if they pass each other 1 hour and 48 minutes after they leave, then the time they pass is $\boxed{\text{1:48p}}$

5. $\boxed{4 \text{ hr}}$

6. $\boxed{10 \text{ hr}}$

7. $\boxed{S_B = 17 \text{ mph } S_C = 3 \text{ mph}}$

8. This problem has no current, so we have a simple meet problem. As stated in the solution to Problem 4, we need the formula $T = D \div R$ where R is the combined rates, so $R = 36+28 = 64$ mph. So $T = 192 \div 64 = 3$ hours, and 3 hours after 9:00 AM is $\boxed{\text{12:00 pm}}$.

9. $\boxed{10 \text{ hr}}$

10. We are given the time it takes Queen Mary to travel upstream and downstream, so we can calculate S_u and S_d by dividing distance by time: $S_u = 360 \div 18 = 20$ mph, and $S_d = 360 \div 10 = 36$ mph. We can use this information to find the speed of the current, S_c, with the formula on the first page of your lecture notes: $S_c = \frac{S_d - S_u}{2} = \frac{36-20}{2} = 8$ mph. Now we turn our attention to Queen Elizabeth. Her upstream speed is $S_u = 360 \div 15 = 24$ mph. We know that $S_u = S_b - S_c$, so we can find the speed of the boat since we know $S_u = 24$ and $S_c = 8$. So $24 = S_b - 8 \Rightarrow= S_b = 32$. Now we can find her downstream speed: $S_d = S_b + S_c = 32 + 8 = 40$. Finally, we can find the time it takes Queen Elizabeth to return using $T = D \div R$: $T = 360 \div 40 = \boxed{9 \text{ hr}}$