Problems of Kinematics: Motion in 1 dimension. Meeting and pursuit

1) A motorist driving at a constant speed of 81 m/s passes a parked motorcycle police officer. The officer starts to accelerate at 4.5 m/s^2 to catch him. Assuming the officer maintains this acceleration, find: **a)** The time it takes the police officer to reach the motorist. **b)** The displacement of the officer as he overtakes the motorist.
Answer: **a)** 36 s, **b)** 2916 m.

2) Two trains leave different cities heading toward each other at different speeds. A train *A*, traveling 126 km/h, leaves city *A* heading toward city *B*, 14850 m away. At the same time a train *B*, traveling 144 km/h, leaves city *B* heading toward city *A*. **a)** When do the two trains meet? **b)** How far from city *A* do they meet?
Answer: **a)** 198 s, **b)** 6930 m.

3) Two trains leave different cities heading toward each other at different speeds. A train *A*, traveling 20 m/s, leaves city *A* heading toward city *B*, 4680 m away. 14 seconds later, a train *B*, traveling 30 m/s, leaves city *B* heading toward city *A*. **a)** In how many seconds will train *A* meet train *B*? **b)** How far from city *A* do they meet?
Answer: **a)** 102 s, **b)** 2040 m.

4) A motorist driving at a constant speed of 82 m/s passes a parked motorcycle police officer. The officer starts to accelerate at 4 m/s^2 to catch him. Assuming the officer maintains this acceleration, find: **a)** The time it takes the police officer to reach the motorist. **b)** The displacement of the officer as he overtakes the motorist.
Answer: **a)** 41 s, **b)** 3362 m.

5) Two trains leave different cities heading toward each other at different speeds. A train *A*, traveling 30 m/s, leaves city *A* heading toward city *B*, 14820 m away. At the same time a train *B*, traveling 35 m/s, leaves city *B* heading toward city *A*. **a)** When do the two trains meet? **b)** How far from city *A* do they meet?
Answer: **a)** 228 s, **b)** 6840 m.

6) Two trains leave different cities heading toward each other at different speeds. A train *A*, traveling 162 km/h, leaves city *A* heading toward city *B*, 5900 m away. 20 seconds later, a train *B*, traveling 198 km/h, leaves city *B* heading toward city *A*. **a)** In how many seconds will train *A* meet train *B*? **b)** How far from city *A* do they meet?
Answer: **a)** 70 s, **b)** 3150 m.