What is Braking Distance on Wet Roads?

Worksheet

Braking distance on wet roads is calculated as d = v²/(2μg), where friction coefficient μ drops from ~0.7 (dry) to ~0.4 (wet). At 20 m/s on a wet road, stopping distance nearly doubles compared to dry conditions.

$$d = v^2/2\mu\, g$$

d = Braking distance (m)
v = Initial velocity (m/s)
μ = Friction coefficient ((unitless, ~0.7 dry, ~0.4 wet))
g = Gravity (9.8 m/s²)

Questions

1. On a wet road (μ=0.4), braking distance at 15 m/s = ?
A) ~15 m
B) ~29 m
C) ~50 m
D) ~100 m

2. Why is wet road friction coefficient lower?
A) Tires are colder
B) Water layer separates tire from pavement
C) Road is newer
D) Gravity weakens

3. Stopping distance is proportional to...
A) Speed only
B) Speed²
C) Friction only
D) Time only

4. At 20 m/s on a wet road (μ=0.4), stop distance = ?
A) ~20 m
B) ~40 m
C) ~51 m
D) ~100 m

5. A car brakes suddenly on a wet road at 20 m/s. How far does it slide before stopping? (μ=0.4)

6. Same car, same speed, but on a dry road (μ=0.7). Compare stopping distance.

7. A truck at 10 m/s brakes on a wet road. Stopping distance?

8. Define: Why does braking distance increase on wet roads?

9. Define: What is the braking distance formula?

10. Define: At 20 m/s, how much longer is stopping on wet vs. dry road?

Answer Key

1. C) ~50 m — d = 225/(2×0.4×9.8) ≈ 28.7 meters.

2. B) Water layer separates tire from pavement — Water creates a slippery layer between tire and road surface.

3. B) Speed² — The formula shows d ∝ v² — doubled speed quadruples stopping distance.

4. C) ~51 m — d = 400/(2×0.4×9.8) ≈ 51 meters.

5. Use d = v² / (2μg) d = (20)² / (2 × 0.4 × 9.8) d = 400 / 7.84 d ≈ 51 meters Answer: Approximately 51 meters (very long!).

6. d = (20)² / (2 × 0.7 × 9.8) d = 400 / 13.72 d ≈ 29 meters Answer: Only 29 meters on dry road — wet road requires ~1.75× more distance.

7. d = (10)² / (2 × 0.4 × 9.8) d = 100 / 7.84 d ≈ 12.8 meters Answer: About 13 meters.

8. Water reduces tire-road friction (μ drops from 0.7 to 0.4), requiring longer distance to stop.

9. d = v² / (2μg), where v=speed, μ=friction, g=gravity (9.8 m/s²).

10. Wet ≈ 51 m; dry ≈ 29 m. Wet requires about 1.75 times longer distance.