16. P · Quantities and units in mechanics

Starter Quiz ·

AQA · A-Level · Mathematics

Name: _____ Score: _____

1. Find the lower bound of 3.4 rounded to the nearest 0.1.

   _____

2. Find acceleration for mass 5 kg and resultant force 15 N.

   _____

3. Find the upper bound of 250 rounded to the nearest 10.

   _____

4. Starting from rest at a=3 m/s^2, find speed after 4 s.

   _____

5. A distance is at most 105 m and time at least 20 s. Find the upper speed bound.

   _____

6. The constant-acceleration formulae apply unchanged when acceleration varies with time.

   ☐ True ☐ False

7. The greatest value of positive d/t uses the greatest d and greatest t.

   ☐ True ☐ False

8. A trolley has driving force 18 N and resistance 3 N. Why is the acceleration found from 15 N, not 18 N?

   ☐ Resistance never affects acceleration

   ☐ The smaller force is always used

   ☐ Newton's second law uses the RESULTANT force: 18-3=15 N

9. For positive quantities, when is the upper bound of speed d/t achieved?

   ☐ Using the means of both quantities

   ☐ Using the largest distance with the smallest time

   ☐ Using the largest distance with the largest time

10. For that motion, find displacement after 4 s.

    _____

AQA · A-Level · Mathematics

1. **3.35**

   Half the rounding unit is 0.05. Lower bound=3.4-0.05=3.35.

2. **3.0**

   Use the resultant: a=F/m=15/5=3.

3. **255.0**

   Half of 10 is 5. Upper bound=250+5=255; the upper endpoint is excluded.

4. **12.0**

   v=u+at=0+3×4=12.

5. **5.25**

   For positive d and t, the largest quotient uses the greatest d and least t: 105/20=5.25.

6. **False**

   The normal reaction need not equal weight on a slope. Connected-particle models need one equation per particle and a consistent acceleration relation. The constant-acceleration formulae cannot be used for arbitrary variable acceleration.

7. **False**

   An upper bound is not automatically achieved. Dividing upper distance by upper time does not give the largest speed. Keep enough digits in intermediate calculations.

8. **Newton's second law uses the RESULTANT force: 18-3=15 N**

   F=ma relates the resultant of all forces to the acceleration. Opposing forces subtract, so the resultant is 15 N and a=15/5=3 m/s^2.

9. **Using the largest distance with the smallest time**

   A quotient grows when the numerator rises and the denominator falls, so the largest speed pairs the upper distance bound with the lower time bound. Using the largest time underestimates it.

10. **24.0**

    $s=ut+at^2/2=0+3\times16/2=24$.