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 suvat formulae need constant acceleration.

   ☐ True ☐ False

7. To make d/t as large as possible, use the greatest d and the least 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?

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

   ☐ The smaller force is always used: the acceleration comes from the 3 N

   ☐ Resistance never affects acceleration, so the 18 N should be used

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 largest time

   ☐ Using the largest distance with the smallest 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. **True**

   True. The suvat formulae need constant acceleration; when acceleration varies, use calculus.

7. **True**

   True. To make d/t as large as possible, use the greatest d and the least t; a larger t makes the quotient smaller.

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**

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