

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

2. Find the integral of $3x^2$ from 0 to 2.

3. Starting from rest at $a=3\text{ m/s}^2$, find speed after 4 s.

4. For $v=3t^2-3$, find displacement from $t=0$ to 2.

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

6. A definite integral always equals the total positive area, even when the graph crosses the axis.

☐ True ☐ False
7. The constant-acceleration formulae apply unchanged when acceleration varies with time.

☐ True ☐ False
8. For $v(t)=3t^2-3$ on $0\leq t\leq 2$, why are displacement and total distance different?

☐ The velocity changes sign at $t=1$, so the signed integral cancels part of the travel

☐ Distance is always zero

☐ Displacement ignores time
9. 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: $18-3=15\text{ N}$
10. For that motion, find total distance from $t=0$ to 2.

1. **3.0**

Use the resultant: $a=F/m=15/5=3$.
2. **8.0**

An antiderivative is x^3 . Subtract its values: $2^3-0^3=8$.
3. **12.0**

 $v=u+at=0+3\times 4=12$.
4. **2.0**

Displacement= $[t^3-3t]$ from 0 to 2= $8-6=2$.
5. **24.0**

 $s=ut+at^2/2=0+3\times 16/2=24$.
6. **False**

The integral of $1/x$ is $\ln|x|+C$, not the power rule with $n=-1$. Signed area can be zero even when the total enclosed area is positive.
7. **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.
8. **The velocity changes sign at t=1, so the signed integral cancels part of the travel**

The signed integral over the whole interval gives displacement 2. The motion reverses at $t=1$, so total distance needs the split: 2 backwards then 4 forwards, totalling 6.
9. **Newton's second law uses the RESULTANT force: $18-3=15\text{ N}$**

 $F=ma$ relates the resultant of all forces to the acceleration. Opposing forces subtract, so the resultant is 15 N and $a=15/5=3\text{ m/s}^2$.
10. **6.0**

Velocity changes sign at $t=1$. The two positive distances are 2 and 4, giving 6.