

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. Area below the axis counts as negative, so a definite integral can be smaller than the total area, or even zero.
☐ True ☐ False
7. The suvat formulae need constant acceleration.
☐ True ☐ False
8. For $v(t)=3t^2-3$ on $0 \leq t \leq 2$, why are displacement and total distance different?
☐ Displacement ignores time, so it cannot be found by integrating $v(t)$
☐ The velocity changes sign at $t=1$, so the signed integral cancels part of the travel
☐ Distance equals displacement whenever the velocity is a polynomial
9. 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: $18-3=15 \text{ N}$
☐ The smaller force is always used: the acceleration comes from the 3 N
☐ Resistance never affects acceleration, so the 18 N should be used
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**

$$v=u+at=0+3\times4=12.$$

4. **2.0**

$$\text{Displacement}=[t^3-3t] \text{ from } 0 \text{ to } 2=8-6=2.$$

5. **24.0**

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

6. **True**

True. Area below the axis counts as negative, so a definite integral can be smaller than the total area, or even zero.

7. **True**

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

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: $18-3=15$ 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/s².

10. **6.0**

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