# 1-D Kinematics Practice

Name:_____

**Reflection and Self-Assessment**

**Part 1:** Circle the statement that best describes how you completed the practice:

- I answered all questions without using the online solutions. I checked my answers against the key at the back of the practice and was able to determine my mistakes and correct them without referring to the online solutions.

- I answered most questions correctly without using the online solutions. I used the online solutions to help me with some questions and was able, with help from the online solutions, to understand every question and answer them correctly.

- I used the online solutions to help me with most of the questions. I was able, with help from the online solutions, to understand each question and answer them correctly.

- Even using the online solutions, I was not able to fully understand the solution to some problems. The questions I had trouble with were:

  _____

- I did not attempt all the questions on the practice.

**Part 2:** Circle the statement that best describes your confidence in answering questions of this type in the future.

- I am confident I can answer nearly any question of this type correctly without using notes or other assistance.

- I am confident I can answer **MOST** questions of this type correctly without using notes or other assistance.

- I am **NOT** confident I can answer most questions of this type correctly without using notes or other assistance.

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1. Match each of the variables to their description

| | |
|---|---|
| A. $v$ | _____ Acceleration |
| B: $\Delta$ | _____ Average velocity |
| C: $\bar{v}$ | _____ Change in |
| D: $v_0$ | _____ Displacement |
| E: $v_f$ | _____ Final Velocity |
| F: $d$ | _____ Initial Velocity |
| G: $a$ | _____ Time |
| H: $t$ | _____ Velocity |

2. Match each of the variables to their description

| | |
|---|---|
| A. Distance | _____ Change in displacement divided by change in time. |
| B: Displacement | _____ Change in distance divided by change in time. |
| C: Speed | _____ Change in velocity divided by change in time. |
| D: Velocity | _____ How far from where it started something has ended up. |
| E: Acceleration | _____ How far something has travelled. |

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| | |
|---|---|
| 3. The average velocity of a train is 45 m/s. How far does it go in 32 seconds?<br><br>*Use formula $d = \bar{v}t$ | 4. The final velocity of a ball rolling down a ramp is 16 m/s, the initial velocity was 0 and it accelerated at 0.67 m/s$^2$. How long did it roll for?<br><br>*Use formula $v_f = v_0 + at$ |
| 5. A car initially at rest accelerates at 2.52 m/s$^2$. How long will it take the car to travel 560 m?<br><br>*Use formula $d = v_0 t + \frac{1}{2}at^2$ | 6. What is the acceleration of an object which was initially moving at 26 m/s and travels 250 m in 25 seconds?<br><br>*Use formula $d = v_0 t + \frac{1}{2}at^2$ |
| 7. What is the average velocity of a car that starts at 5.8 m/s and accelerates at a constant rate to 23.5 m/s?<br><br>*Use formula $\bar{v} = \frac{v_0 + v_f}{2}$ | 8. What is the acceleration of car if it travels 250 m while it slows from 25m/s to 15 m/s?<br><br>*Use formula $v_f^2 = v_0^2 + 2ad$ |

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9. Match each formula to its description

| | |
|---|---|
| A. $\bar{v} = \frac{\Delta d}{\Delta t}$ | _____ Acceleration is change in velocity divided by change in time |
| B: $d = \bar{v}t$ | _____ Average velocity is the average of final and initial velocity |
| C: $v_f = v_0 + at$ | _____ Displacement is average velocity multiplied by time. |
| D: $d = v_0 t + \frac{1}{2}at^2$ | _____ Final velocity is the starting velocity plus the acceleration times how long it has been accelerating. |
| E: $a = \frac{\Delta v}{\Delta t}$ | _____ If acceleration is constant then the displacement of the object will be its starting velocity multiplied by time plus half of the acceleration multiplied by the time it has been accelerating squared |
| F: $\bar{v} = \frac{v_f + v_0}{2}$ | _____ The square of final velocity is equal to the square of initial velocity plus twice the acceleration multiplied by the displacement. |
| G: $v_f^2 = v_0^2 + 2ad$ | _____ Average velocity is change in displacement divided by change in time. |

10. Choose the formula you would use to solve.

| | |
|---|---|
| A: $v_f = v_0 + at$ | _____ You know **change in velocity**, and **change in time.** You want to find **acceleration**. |
| B: $d = v_0 t + \frac{1}{2}at^2$ | _____ You know **initial velocity**, **acceleration**, and **displacement**. You want to find **final velocity**. |
| C: $a = \frac{\Delta v}{\Delta t}$ | _____ You know **initial velocity**, **acceleration**, and **time**. You want to find **final velocity**. |
| D: $\bar{v} = \frac{v_f + v_0}{2}$ | _____ You know **initial velocity**, and **final velocity**. You want to find **average velocity**. |
| E: $v_f^2 = v_0^2 + 2ad$ | _____ You know **initial velocity**, **time**, and **acceleration**. You want to find **displacement**. |

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11. Choose the formula you would use a rearranged version of to solve

| | |
|---|---|
| A. $\bar{v} = \frac{\Delta d}{\Delta t}$ | _____ You know **acceleration**, **initial velocity**, and **final velocity.** You want to find **time**. |
| B: $d = \bar{v}t$ | _____ You know **average velocity** and **initial velocity**. You want to find **final velocity**. |
| C: $v_f = v_0 + at$ | _____ You know **change in velocity**, and **acceleration.** You want to find **change in time**. |
| D: $d = v_0 t + \frac{1}{2}at^2$ | _____ You know **displacement** and **time**. You want to find **average velocity**. |
| E: $a = \frac{\Delta v}{\Delta t}$ | _____ You know **displacement**, **initial velocity**, and **time.** You want to find **acceleration**. |
| F: $\bar{v} = \frac{v_f + v_0}{2}$ | _____ You know **final velocity**, **initial velocity,** and **displacement.** You want to find **acceleration**. |
| G: $v_f^2 = v_0^2 + 2ad$ | _____ You know **average velocity**, and **change in displacement.** You want to find **change in time**. |

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12. A car travelling at 45 m/s hits the breaks causing it to accelerate at -9.2 $m/s^2$, how far will it travel in the next 2.0 seconds?

What we have:

What we want:

Formula:

Answer:

13. A car drives at a constant velocity of 24 m/s for 650 metres. How long does it take?

What we have:

What we want:

Formula:

Answer:

14. An car travelling at 45 m/s hits the breaks causing it to accelerate at -9.2 $m/s^2$, how far will it travel before it stops?

What we have:

What we want:

Formula:

Answer:

15. A car slows to a stop from 29 m/s in 2.5 seconds. What was the acceleration of the car?

What we have:

What we want:

Formula:

Answer:

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16. What is the final velocity of a car which starts at 34 m/s and accelerates at $-3.4\ \mathrm{m/s^2}$ over a distance of 65m?

What we have:

What we want:

Formula:

Answer:

17. What is the acceleration of a car if it goes from rest to 43 m/s over a distance of 95 m?

What we have:

What we want:

Formula:

Answer:

18. What is the final velocity of a rocket which starts at 23 m/s and accelerates at 5.1 $\mathrm{m/s^2}$ for 5.9 seconds?

What we have:

What we want:

Formula:

Answer:

19. What average velocity must a runner maintain if they want to run 10.0 **kilometers** in 45 **minutes?**

What we have:

What we want:

Formula:

Answer:

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20. Determine the two possible values for t by using the quadratic formula if:
    $v_0 = -41$ m/s $d = -10.0$ m $a = 3.9$ m/s$^2$

21. Determine the two possible values for t by using the quadratic formula if:
    $v_0 = 23$ m/s $d = 6.3$ m $a = -6.8$ m/s$^2$

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22. You want to find displacement of an object, list three different formulas you could use and the other pieces of information you would need to find displacement using that formula.

| **Formula** | | | |
|---|---|---|---|
| **Extra info needed** | | | |

23. You want to find initial velocity of an object, list four different formulas you could use and the other pieces of information you would need to find initial velocity using that formula.

| **Formula** | | | | |
|---|---|---|---|---|
| **Extra info needed** | | | | |

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24. You want to find acceleration of an object, list three different formulas you could use and the other pieces of information you would need to find acceleration using that formula.

| **Formula** | | | |
|---|---|---|---|
| **Extra info needed** | | | |

25. You want to find time in a problem, list three different formulas you could use and the other pieces of information you would need to find time using that formula.

| **Formula** | | | |
|---|---|---|---|
| **Extra info needed** | | | |

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26. A car is driving at 35 m/s when the driver sees an object 86.0 m ahead of the car. The driver breaks immediately with acceleration of -4.6 $m/s^2$.

    a. The driver will NOT be able to stop in time. How fast will the car be moving when it hits the object. Note what formula you used.

    b. All else remaining the same, what is the maximum initial velocity the car could be travelling at and stop in time.

    c. All else remaining as it was in the original problem, what is the minimum acceleration that would be required to stop the car in time?

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27. A car is driving at 125 km/hr when the driver sees an object 65 metres ahead of the car. It takes the driver 0.35 seconds to react and then the car slows at 4.5 $m/s^2$. How fast will the car be moving when it hits the object?

Convert 125 km/hr into m/s

Break the problem into two parts

| First part: Car moves with constant velocity until driver reacts | Second part: Car slows |
|---|---|
| What we have: | What we have:<br><br>*Displacement* = **65m – displacement from first part =**<br><br>*Acceleration =*<br><br>*Initial Velocity =* |
| What we want: **Displacement** | What we want: |
| Formula: | Formula: |
| Answer: | Answer: |

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28. A car accelerates to 56 km/hr from rest in 8.5 seconds, then drives at that speed for 19 seconds. What is the total distance they travel?

Convert 56 km/hr into m/s

Break the problem into two parts

| First part: Car accelerates. | Second part: Car drives with constant velocity |
|---|---|
| We will need the acceleration of the car:<br><br>$a = \frac{\Delta v}{\Delta t} =$ | What we have: |
| What we have: | |
| What we want: | What we want: |
| Formula: | Formula: |
| Answer: | Answer: |

Final answer:

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29. Two trains are driving towards each other on the same track! They are both travelling at 65 m/s and break at -1.4 $m/s^2$. What is the minimum distance the trains could be apart when they start breaking so that they do not crash?

30. What is the average velocity of a car which starts at 56 km/hr and accelerates at a constant rate to 106 km/hr?

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31. A car drives with an average velocity of 26 m/s for 250 m. How long did it take?

32. A car, initially driving at 5.0 m/s, accelerates at a constant rate of $2.5\ m/s^2$ for 6.0 seconds. How far do they travel in those 6.0 seconds?

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33. A car, initially driving at 15 m/s accelerates at a constant rate of $0.56\ m/s^2$ over a distance of 450m. What is the final velocity of the car?

34. A car is driving at a velocity of $20.0$ m/s. If they slow at a rate of $4.00\ m/s^2$, how far will they travel before they stop?

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**Questions 35-39 are based on questions from Mr. Trask's Physics**

35. A car is traveling at 108 km/h, stuck behind a slower car. Finally, the road is clear, and the car pulls over to make a pass. The driver stomps on the gas pedal and accelerates up to a speed of 135 km/h. If it took 3.50 s to reach this speed, what is the average acceleration of the car in $m/s^2$?

36. A driver has a reaction time of 0.50 s, and the maximum deceleration of her car is 6.0 $m/s^2$. She is driving at 100.0 km/hr when suddenly she sees an obstacle in the road 70.0 m in front of her. Can she stop the car to avoid the collision?

37. When a jet lands on an aircraft carrier, a hook on the tail of the plane grabs a wire that quickly brings the plane to a halt before it overshoots the deck. In a typical landing, a jet touching down at 240 km/h is stopped in a distance of 95 m. What is the jet's acceleration as it is brought to rest in $m/s^2$?

38. A simple model for a person running the 100.0 m dash is to assume the sprinter runs with constant acceleration until reaching top speed, then maintains that speed through the finish line. If the sprinter reaches her top speed of 11.2 m/s in 2.14 s, what will be her total time?

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39. An airplane travelling at an initial velocity of 120.0 m/s accelerates at 6.24 $m/s^2$ for 1000.0 m. How long does it take for them to travel the distance?

40. Two friends see each other across an airport. They were both at rest, 75 m apart and immediately start running towards each other. One of the friends accelerates at 1.3 $m/s^2$ while the other accelerates at 2.1 $m/s^2$. How long will it take until they meet?

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| **Answer Key** | | | | |
|---|---|---|---|---|
| 1) GCBFEDHA | 2) DCEBA | 3) 1400 m | 4) 24 sec | 5) 21 sec |
| 6) -1.3 m/s$^2$ | 7) 15 m/s | 8) -0.80 m/s$^2$ | 9) EFBCDGA | 10) CEADB |
| 11) CFEBDGA | 12)72 m | 13) 27 sec | 14) 110 m | 15) -12 m/s$^2$ |
| 16) 27 m/s | 17) 9.7 m/s$^2$ | 18) 53 m/s | 19) 0.22 km/min OR 3.7 m/s | 20) 21 sec and 0.25 sec |
| 21) 0.29 sec and 6.5 sec | 22) Formulas are $d = \bar{v}t$ Need $\bar{v}$ and t<br><br>$d = v_0 t + \frac{1}{2}at^2$ Need $v_0, t, a$<br><br>$v_f^2 = v_0^2 + 2ad$ Need $v_0, v_f, a$ | 23) Formulas are $v_f = v_o + at$ Need $v_f, a, t$<br><br>$d = v_0 t + \frac{1}{2}at^2$ Need $d, t, a$<br><br>$\bar{v} = \frac{v_0 + v_f}{2}$ Need $\bar{v}, v_f$<br><br>$v_f^2 = v_0^2 + 2ad$ Need $v_f, a, d$ | 24) Formulas are $v_f = v_o + at$ Need $v_f, v_0, t$<br><br>$d = v_0 t + \frac{1}{2}at^2$ Need $d, v_0\ t$<br><br>$v_f^2 = v_0^2 + 2ad$ Need $v_f, v_0, d$<br><br>Could also use $a = \frac{\Delta v}{\Delta t}$. | 25) Formulas are $d = \bar{v}t$ Need $d, \bar{v}$<br><br>$v_f = v_o + at$ Need $v_f, v_0, a$<br><br>$d = v_0 t + \frac{1}{2}at^2$ Need $d, v_0, a$ |
| 26a) 21 m/s | 26b) 28 m/s | 26c) -7.1 m/s$^2$ | 27) 27 m/s | 28) 360 m |
| 29) $3.0 \times 10^3$ m | 30) 81 km/hr OR 23 m/s | 31) 9.6 sec | 32) 75 m | 33) 27 m/s |
| 34) 50.0 m | 35) 2.14 m/s$^2$ | 36) No, car would travel 8.2m past | 37) -23 m/s$^2$ | 38) 10.0 sec |
| 39) 7.04 sec | 40) 6.6 sec | | | |