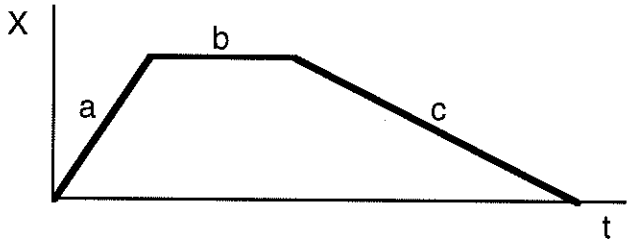
ABRHS PHYSICS (CP) NAME: KEY

Linear Motion I Review

1. The slope of a position-time graph is Velocity.
2. The slope of a velocity-time graph is Acceleration.
3. What are the units of velocity? m/s What are the units of acceleration? m/s^2
4. What does it mean to have a constant speed?
   Your speed never changes → you move the same distance every second.
5. What does it mean to have a constant velocity?
   Same as #4, but you also have to go straight. (Can't turn left or right)
6. Is it possible to have a constant speed, yet your velocity be changing? Explain.
   Yes - going around in a circle with a constant speed. See # 5.
7. What does it mean to have a constant acceleration?
   Your velocity changes the same amount every second.
8. If you have a constant acceleration of 15 km/h/s, what is happening?
   Every second, you speed up 15 km/h
9. What is the difference between speed and velocity?
   velocity includes the direction you are traveling
10. Is it possible to have a constant speed and still be accelerating? How about a constant velocity? Explain.
    Yes, if you are changing direction. (#6 above.) No!
11. Which of the following should be considered an "accelerator" in an automobile?
    a. Brake pedal. b. Gas pedal. c. Steering wheel. d. All of these.

Questions 12 to 14 refer to the following graph:



12. Over which interval(s) is the object moving in the positive direction? How about the negative direction?
    ~~only a~~ a b c
13. Over which interval(s) is the object slowing down? How about speeding up?
    a, b, c are all constant speeds.
14. Over which interval(s) does the object have a constant velocity?
    All of them. But b is a constant velocity of 0 m/s, so usually we don't include that.

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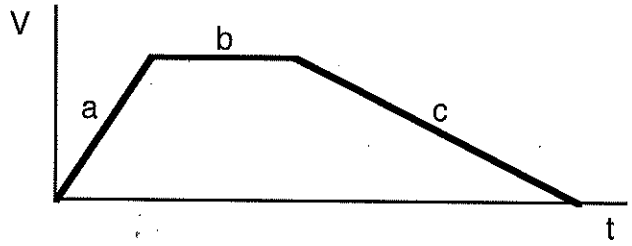
Questions 15 to 18 refer to the following graph:



15. Over which interval(s) is the object moving in the positive direction? How about the negative direction? → None!

All of them! (velocity is always positive)

16. Over which interval(s) is the object slowing down? How about speeding up?

slowing down = c speeding up = a

17. Over which interval(s) does the object have a constant velocity?

b

18. Does the object have a velocity of zero over any interval?

No. (well, at the very begining & veryend v=0)

19. How long will it take a child running with a constant velocity of 3 m/s to cover a distance of 40 meters? What is the child's acceleration over this distance?

$v = \frac{d}{t}$ $3 = \frac{40}{t}$ $t = \frac{40}{3}$ $t = 13.3$ sec.

20. If you travel 100 meters in 12 seconds, what is your average speed? Can you say anything about your instantaneous speed at exactly 4 seconds or at exactly the 75 m position? → No. could be faster or slower

$v = \frac{d}{t}$ $v = \frac{100}{12}$ $v = 8.3$ m/s

21. Sound travels at 340 m/s through the air. How long would it take you to hear a thunder clap that occurred 2 km away?

2 km = 2000 m

$v = \frac{d}{t}$ $340 = \frac{2000}{t}$ $t = \frac{2000}{340}$ $t = 5.88$ sec

22. A car constantly accelerates from rest to 30 m/s in 6 seconds.
    a. What was its acceleration?

$a = \frac{v_f - v_i}{t}$ $a = \frac{30-0}{6}$ $a = 5\ m/s^2$

    b. How many <u>more</u> seconds would it take to reach a speed of 50 m/s?

$a = \frac{v_f - v_i}{t}$ $5 = \frac{50-30}{t}$ $5 = \frac{20}{t}$ $t = 4$ sec

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23. If a skateboarder is moving with a speed of 10 m/s and slows down at a rate of 1.6 m/s^2.
    a. How fast is the skateboarder moving 2 seconds later?

$a = \frac{v_f - v_i}{t}$ $\quad -1.6 = \frac{v_f - 10}{2}$ $\quad -3.2 = v_f - 10$ $\quad \boxed{v_f = 6.8\ m/s}$

    b. How many <u>total</u> seconds will it take the skateboarder to come to rest?

$a = \frac{v_f - v_i}{t}$ $\quad -1.6 = \frac{0 - 10}{t}$ $\quad (-1.6)t = -10$ $\quad \boxed{t = 6.25\ sec}$

24. A friend walks straight down a hallway. She first walks 100 meters at a constant speed of 1.5 m/s. Then she runs at 3 m/s for 30 seconds. What was her average speed for the entire motion?

1st) $v = \frac{d}{t}$ $\quad 1.5 = \frac{100}{t}$ $\quad t = \frac{100}{1.5} = 66.7\ sec$

2nd) $v = \frac{d}{t}$ $\quad 3 = \frac{d}{30}$ $\quad d = 90\ m$

3rd) $v = \frac{d}{t}$ $\quad v = \frac{100 + 90}{66.7 + 30} = \frac{190}{96.7}$

$\boxed{v = 1.97\ m/s}$

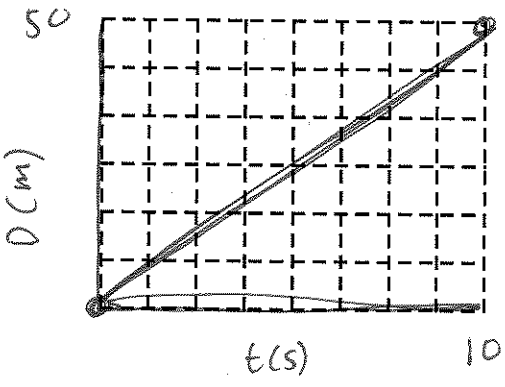
25. Starting from rest, a bike speeds up at a constant rate of 3 m/s every second for 4 seconds.
    a. What is the acceleration of the bike?

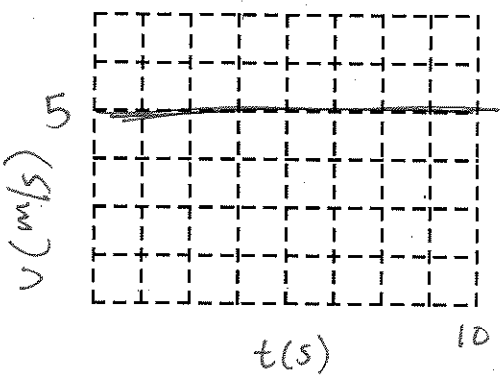
$a = 3\ m/s^2$ $\quad$ (I gave it to you!)

    b. How fast is the bike going at the end of the 4 seconds?

$a = \frac{v_f - v_i}{t}$ $\quad 3 = \frac{v_f - 0}{4}$ $\quad \boxed{v_f = 12\ m/s}$

26. Make the position and velocity graphs for each of the following situations:
    a. A bike moves 50 meters in 10 seconds with a constant velocity.





$v = \frac{d}{t} = \frac{50}{10} = 5\ m/s$

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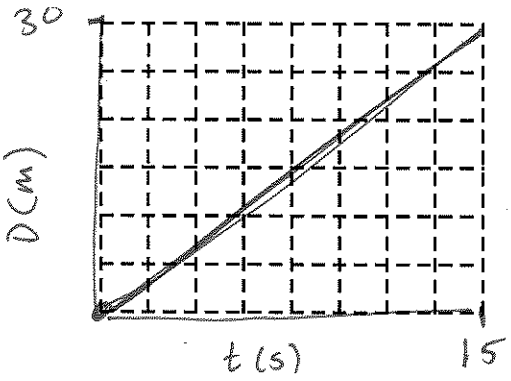
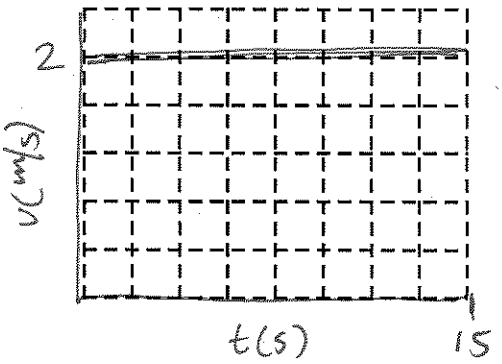
b. A person jogs 2 meters every second for 15 seconds.

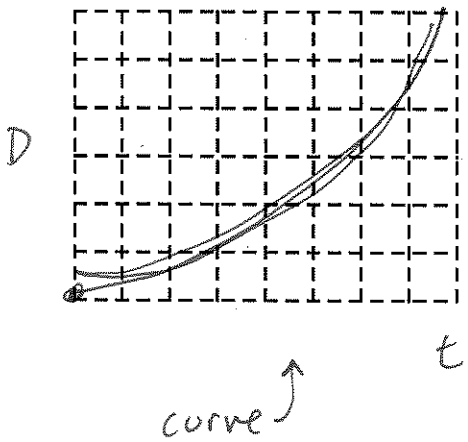


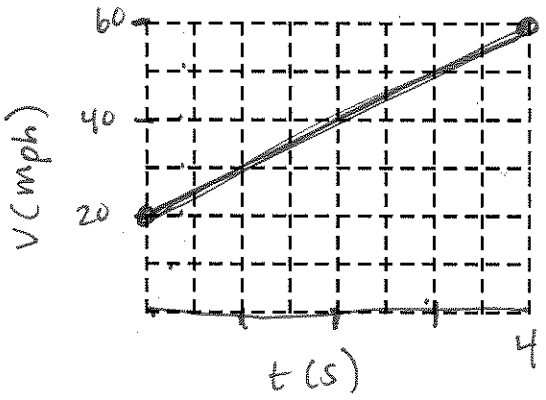


$V = \frac{d}{t}$ $\quad 2 = \frac{d}{15}$

$d = 30\ m$

c. Starting from 20 mph, a car speeds up at a constant rate of 10 mph/s for 4 seconds. (On this one, you do not need any numbers on the distance graph - just show the shape.)





$a = \frac{v_f - v_i}{t}$

$10 = \frac{v_f - 20}{4}$

$v_f = 60$