Estimating, Graphing and Other Thinking Problems

1. A ball is thrown straight up at 30m/s. Estimate the time to its highest point.

A. 1s B. 2s C. 3s D. 4s E. 5s F. 6s G. 7s

2. A ball is thrown straight up at 30m/s. Estimate the time to return to its initial position.

A. 1s B. 2s C. 3s D. 4s E. 5s F. 6s G. 7s

3. A ball is thrown straight up at 30m/s. Estimate the maximum height reached by the ball.

A. 10m B. 20m C. 30m D. 40m E. 45m F. 65m G. 90m

4. A ball is thrown straight up at 50m/s. Estimate the time to its highest point.

A. 4s B. 5s C. 6s D. 8s E. 10s F. 12s G. 15s

5. A ball is thrown straight up at 50m/s. Estimate the time to return to its initial position.

A. 4s B. 5s C. 6s D. 8s E. 10s F. 12s G. 15s

6. A ball is thrown straight up at 50m/s. Estimate the maximum height reached by the ball.

A. 25m B. 50m C. 75m D. 100m E. 125m F. 150m G. 200m

7. A ball is thrown straight up at 10m/s. Estimate the time to its highest point.

A. 1s B. 2s C. 3s D. 4s E. 5s F. 6s G. 7s

8. A ball is thrown straight up at 10m/s. Estimate the time to return to its initial position.

A. 1s B. 2s C. 3s D. 4s E. 5s F. 6s G. 7s

9. A ball is thrown straight up at 10m/s. Estimate the maximum height reached by the ball.

A. 1m B. 2m C. 3m D. 4m E. 5m F. 10m G. 20m

10. A ball is dropped from a very tall building. What is the best ESTIMATE of its speed 1.0s later?

A. 1m/s B. 5m/s C. 10m/s D. 12m/s E. 15m/s F. 20m/s G. 25m/s
H. 30m/s I. 35m/s J. 40m/s K. 45m/s L. 50m/s M. 55m/s N. 60m/s

11. A ball is dropped from a very tall building. What is the best ESTIMATE of its average speed for the first 1.0s of its fall?

A. 1m/s B. 5m/s C. 10m/s D. 12m/s E. 15m/s F. 20m/s G. 25m/s
H. 30m/s I. 35m/s J. 40m/s K. 45m/s L. 50m/s M. 55m/s N. 60m/s

12. A ball is dropped from a very tall building. What is the best ESTIMATE of how far it falls during the first 1 second?

A. 1m B. 2m C. 5m D. 10m E. 15m F. 20m G. 25m
H. 30m I. 35m J. 40m K. 45m L. 50m M. 55m N. 60m

13. A ball is dropped from a very tall building. What is the best ESTIMATE of its speed 2.0s later?

A. 1m/s B. 5m/s C. 10m/s D. 12m/s E. 15m/s F. 20m/s G. 25m/s
H. 30m/s I. 35m/s J. 40m/s K. 45m/s L. 50m/s M. 55m/s N. 60m/s

14. A ball is dropped from a very tall building. What is the best ESTIMATE of its average speed for the first 2.0s of its fall?

A. 1m/s	B. 5m/s	C. 10m/s	D. 12m/s	E. 15m/s	F. 20m/s	G. 25m/s
H. 30m/s	I. 35m/s	J. 40m/s	K. 45m/s	L. 50m/s	M. 55m/s	N. 60m/s

15. A ball is dropped from a very tall building. What is the best ESTIMATE of how far it falls during the first 2 seconds?

A. 1m	B. 2m	C. 5m	D. 10m	E. 15m	F. 20m	G. 25m
H. 30m	I. 35m	J. 40m	K. 45m	L. 50m	M. 55m	N. 60m

16. A ball is dropped from a very tall building. What is the best ESTIMATE of its speed 5.0s later?

A. 1m/s	B. 5m/s	C. 10m/s	D. 12m/s	E. 15m/s	F. 20m/s	G. 25m/s
H. 30m/s	I. 35m/s	J. 40m/s	K. 45m/s	L. 50m/s	M. 55m/s	N. 60m/s

17. A ball is dropped from a very tall building. What is the best ESTIMATE of its average speed for the first 5.0s of its fall?

A. 1m/s	B. 5m/s	C. 10m/s	D. 12m/s	E. 15m/s	F. 20m/s	G. 25m/s
H. 30m/s	I. 35m/s	J. 40m/s	K. 45m/s	L. 50m/s	M. 55m/s	N. 60m/s

18. A ball is dropped from a very tall building. What is the best ESTIMATE of how far it falls during the first 5 seconds?

A. 20m	B. 25m	C. 50m	D. 75m	E. 90m	F. 100m	G. 125m
H. 150m	I. 200m	J. 225m	K. 250m	L. 400m	M. 450m	N. 500m

19. A ball is dropped from a very tall building. What is the best ESTIMATE of its speed 4.0s later?

A. 1m/s	B. 5m/s	C. 10m/s	D. 12m/s	E. 15m/s	F. 20m/s	G. 25m/s
H. 30m/s	I. 35m/s	J. 40m/s	K. 45m/s	L. 50m/s	M. 55m/s	N. 60m/s

20. A ball is dropped from a very tall building. What is the best ESTIMATE of its average speed in the interval from 2s to 4s?

A. 1m/s	B. 5m/s	C. 10m/s	D. 12m/s	E. 15m/s	F. 20m/s	G. 25m/s
H. 30m/s	I. 35m/s	J. 40m/s	K. 45m/s	L. 50m/s	M. 55m/s	N. 60m/s

21. A ball is dropped from a very tall building. What is the best ESTIMATE of how far it falls between 2s and 4s?

A. 1m	B. 2m	C. 5m	D. 10m	E. 15m	F. 20m	G. 25m
H. 30m	I. 35m	J. 40m	K. 45m	L. 50m	M. 55m	N. 60m

22. A car drives horizontally off of a wall at 14.0m/s. The car lands 7.0m from the base of the wall. What is the best estimate of the time of flight?

A. 2.0s	B. 12s	C. 0.3s	D. 8.0s	E. 4.0s	F. 0.50s	G. 1.0s

23. A car drives horizontally off of a wall at 14.0m/s. The car lands 7.0m from the base of the wall. What is the best estimate of the height of the wall?

A. 4m	B. 6m	C. 1.25m	D. 2.5m	F. 5m	G. 0.50m	H. 0.75m

24. A van drives horizontally off of a cliff at 8.0m/s. The van lands 40.0m from the edge of the cliff. What is the best estimate for the time of flight?

A. 2.0s	B. 2.5s	C. 4.0s	D. 5.0s	E. 8.0s	F. 10.0s	G. 12s

25. A van drives horizontally off of a cliff at 8.0m/s. The van lands 40.0m from the edge of the cliff. What is the best estimate for the height of the cliff?

A. 50m B. 100m C. 125m D. 150m E. 25m F. 500m G. 75m

26. A bus is travelling left and speeding up. What direction is the acceleration? Left
27. A bus is travelling left and speeding up. Is the acceleration positive or negative? Negative
28. A bus is travelling left and slowing down. What direction is the acceleration? Right
29. A bus is travelling left and slowing down. Is the acceleration positive or negative? Positive
30. A bus is travelling right and speeding up. What direction is the acceleration? Right
31. A bus is travelling right and speeding up. Is the acceleration positive or negative? Positive
32. A bus is travelling right and slowing down. What direction is the acceleration? Left
33. A bus is travelling right and slowing down. Is the acceleration positive or negative? Negative

Sketch $\vec{d}$ vs t, $\vec{v}$ vs t and $\vec{a}$ vs t graphs for the following motions

34. A bus is at rest and then, at t=0s, speeds up to the left.
35. A pigeon is travelling right and then, at t=0s, slows to a stop.
36. A tardigrade is moving to the left at some non-zero speed and then, at t=0s, speeds up.
37. A bratwurst is travelling left and then, at t=0s, slows down but does not come to rest.
38. A bowl of congee is at rest, and then, at t=0s, it speeds up to the right.
39. A walrus is travelling to the right at some nonzero speed. At t=0s it speeds up to the right until t=3.0s. The walrus the abruptly slows to a stop from t=3.0s to t=4.0s.

40. A car is driving east at 20m/s. A truck is 1.0km behind the car, travelling east at 30m/s. How long will it take for the truck to catch the car?
41. A car is traveling west at a constant 12.0m/s. At t=0s, A truck is 40.0m behind the car travelling west at 16.0m/s. The truck truck accelerates west at 5.0m/s^2. Find the time it takes for the truck to catch up to the car.
42. A car is traveling west at a constant 12.0m/s. At t=0s, A truck is 40.0m behind the car travelling west at 16.0m/s. The truck truck accelerates west at 5.0m/s^2. Find the velocity of the truck as it catches the car.

43. A projectile is launched over level ground at 30.0m/s [37° above horizontal]

ESTIMATE
A. Time of flight
B. Range of flight
C. Maximum height.

44. A projectile is launched over level ground at 30.0m/s [53° above horizontal]

ESTIMATE
A. Time of flight
B. Range of flight
C. Maximum height.

Estimating, Graphing and Other Thinking Problems #34-39

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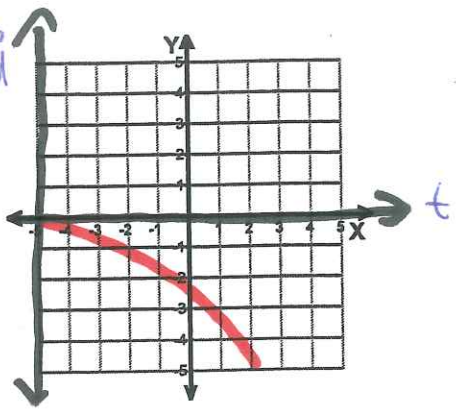

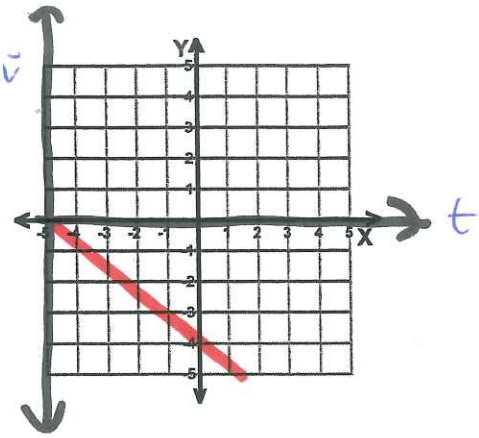

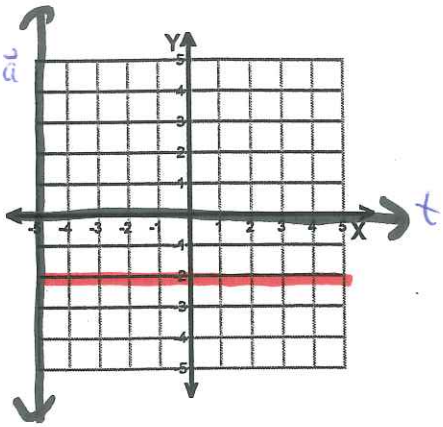

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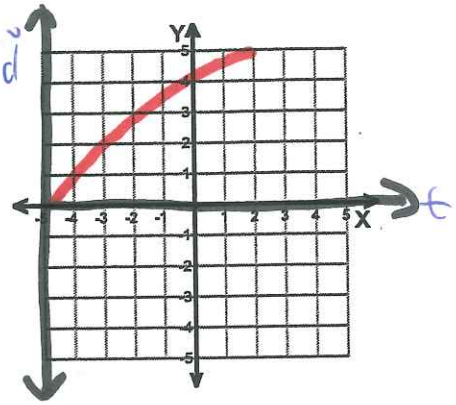

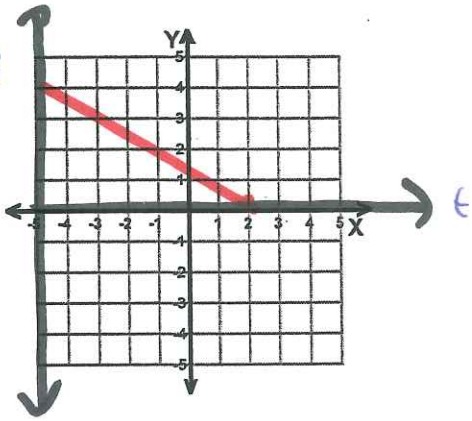

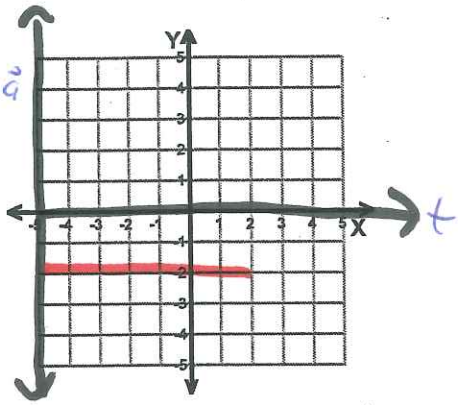

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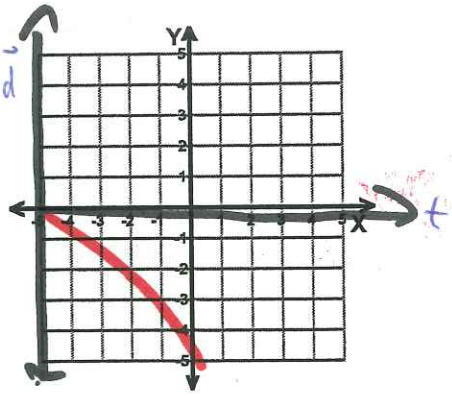

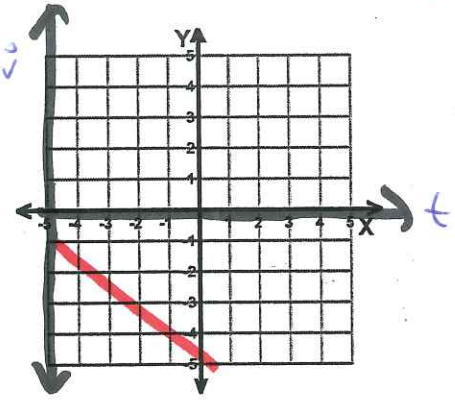

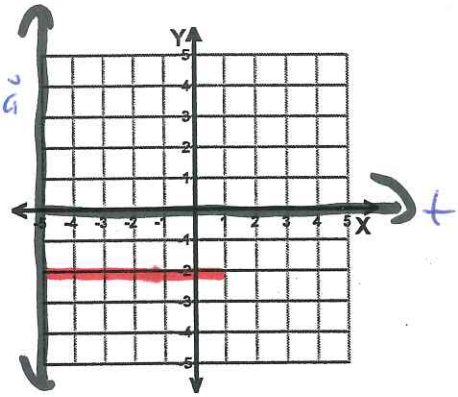

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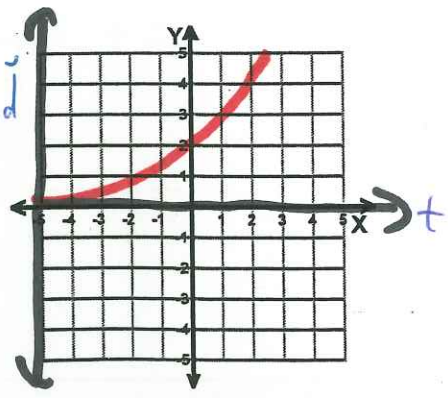

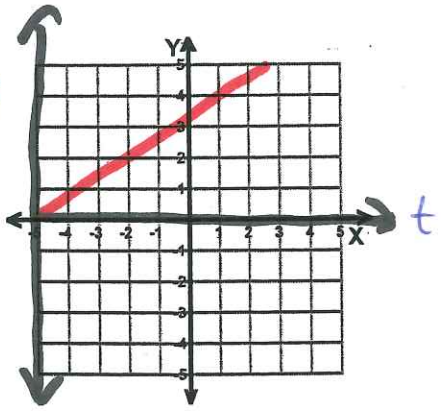

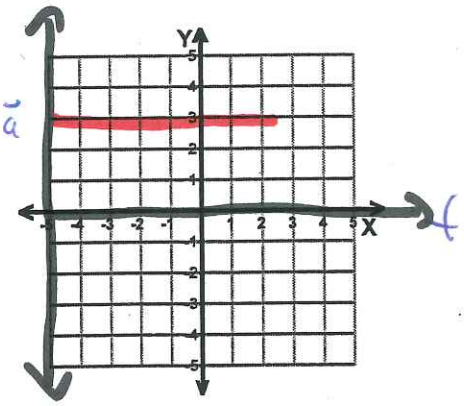

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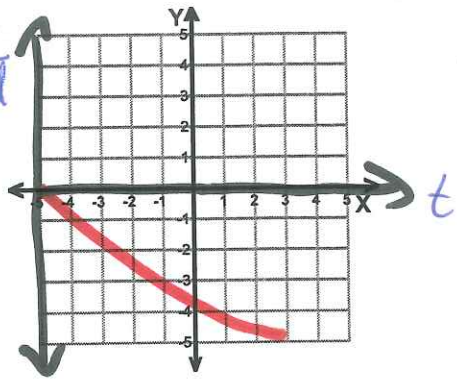

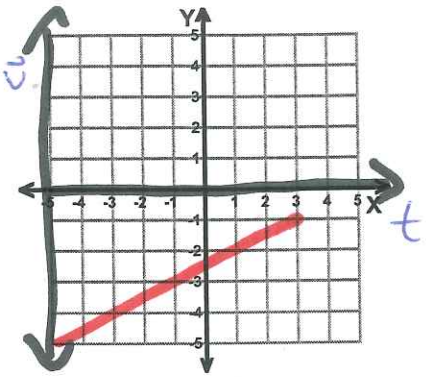

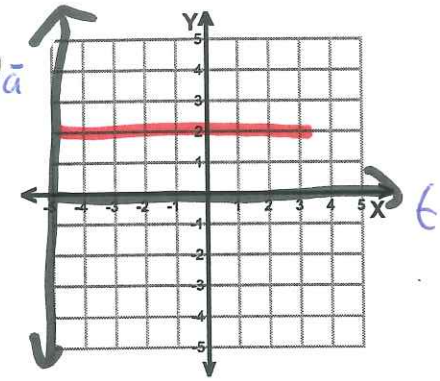

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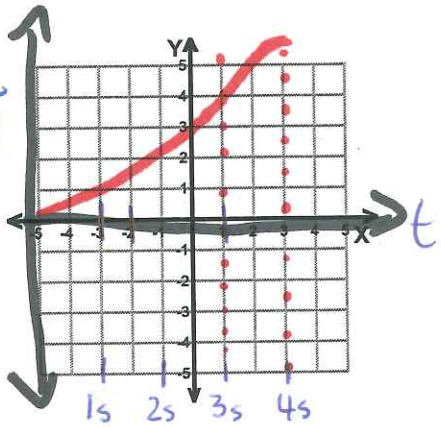
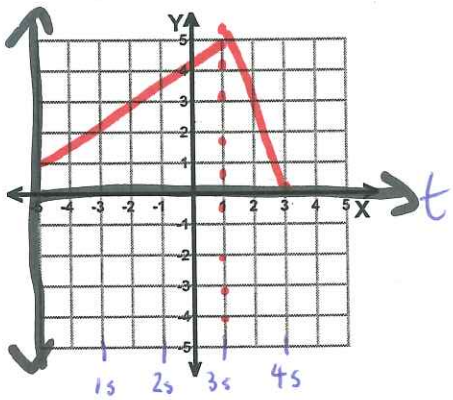
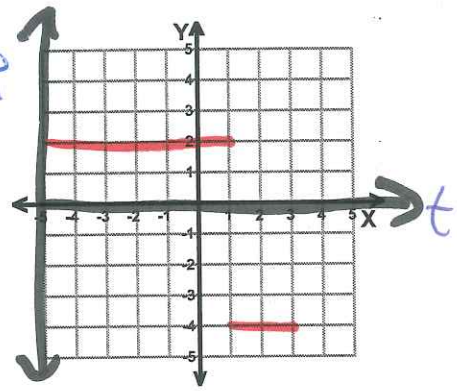
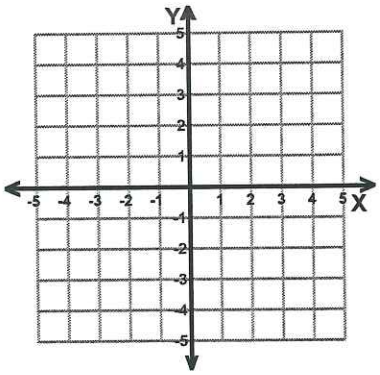
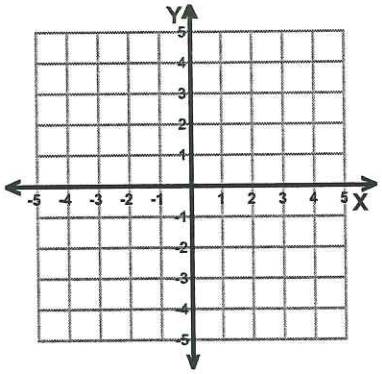
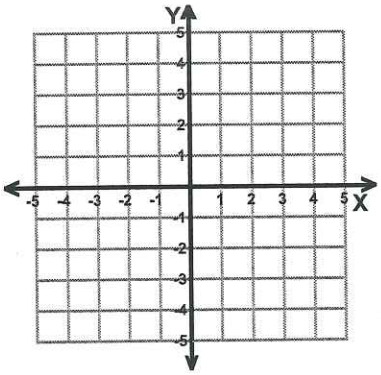


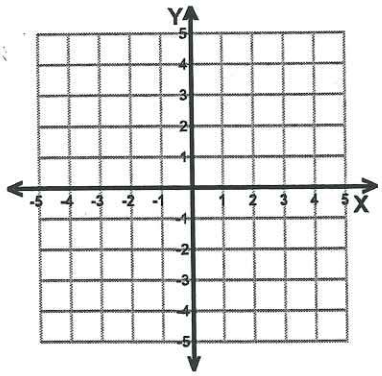


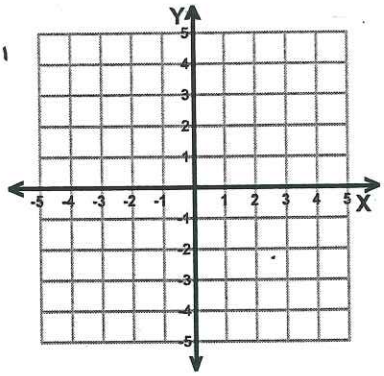


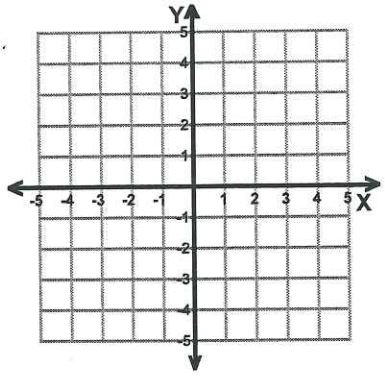












Estimating, Graphing and Other Thinking Problems

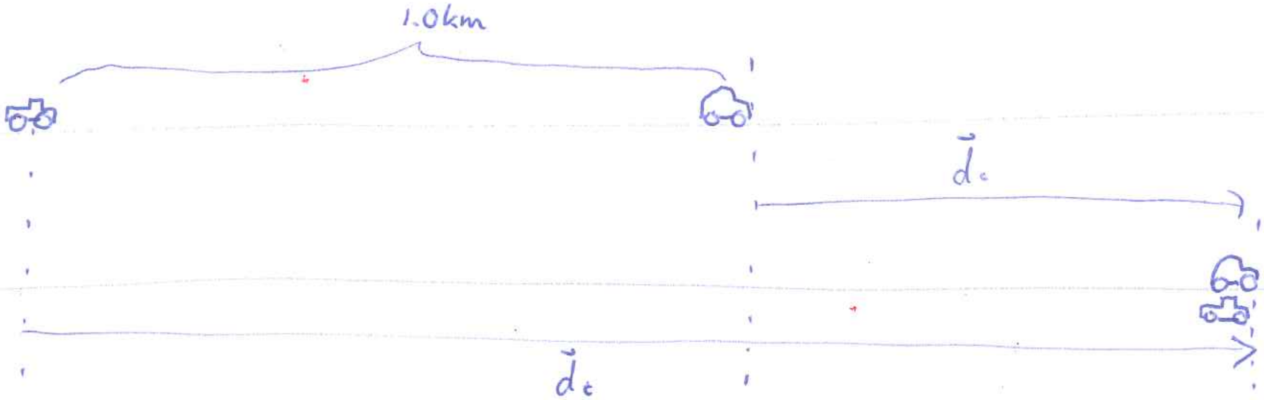
40. I'll solve a couple of ways.

$\vec{v}_{cg} = 20\,m/s$ E $\vec{v}_{tg} = 30\,m/s$ E $\vec{v}_{tc} = \vec{v}_{tg} + \vec{v}_{gc} = 10\,m/s$ E

$\vec{d}_{tc} = 1000\,m$

$$t = \frac{\vec{d}}{\vec{v}} = \frac{1000\,m}{10\,m/s} = 100\,s$$

OR   Car: $v_c = 20\,m/s$ truck: $v_T = 30\,m/s$



$\vec{d}_t = \vec{d}_c + 1000\,m$ $t_c = t_T = t$

$d_c = 20t$ $d_T = 30t$

$30t = 20t + 1000\,m$

$10t = 1000\,m$

$t = 100\,s$

41. Again, 2 ways

$\vec{v}_{TC_0} = 4.0\ m/s\ W$

$\vec{a}_{TC} = 5.0\ m/s^2\ W$

$\vec{d}_{TC} = 40.0\ m$

$t = ?$

$$d = v_0 t + \frac{1}{2} a t^2$$

$$40 = 4t + 2.5t^2$$

$$2.5t^2 + 4t - 40 = 0$$

$$t = \frac{-4 \pm \sqrt{4^2 - 4(2.5)(-40)}}{2(2.5)}$$

$t_1 = 3.279215611\ s$ $\quad t_2 = -4.879215611\ s$

OR:

car:

$d_c = d$

$v_c = 12\ m/s$

$t_c = t$

$d_c = 12t = d$

SAMESIES!

truck:

$d_t = d + 40\ m$

$v_{0t} = 16\ m/s$

$\vec{a}_t = 5.0\ m/s^2$

$t_t = t$

$$d_t = v_{0t} t + \frac{1}{2} a_t t^2$$

$$12t + 40 = 16t + 2.5t^2$$

$$2.5t^2 + 4t - 40 = 0$$

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42. Use the results from #41

TRUCK:

$\vec{v} = \vec{v}_0 + \vec{a} t = 16\ m/s + 5.0\ m/s^2 (3.279215611\ s) = 32.39607806\ m/s$

$\vec{v} = 32\ m/s$ West