Exam Enhancements

Group Tests and IFAT (Immediate Feedback Assessment Technique)

Part 1: Group tests

* Can be used for any exam
* Counts for 20-30% of grade
* Given after individual portion
* Derivative of one or two of the problems on the individual exam
* Requires more conceptual thinking
* Has an element of synthesis or continuing to a deeper level

My method

* I use a question I wish I could ask, but know from experience it will be too difficult for an exam
* Put a simpler version on the individual portion of the exam
* Put the deeper question on the group portion
* Graphs are great on a group exam

Implementation

* One way: a given amount of time for individual portion and group portion
* For high school, this might be over two days
* For a large class, students can form groups of four as they finish an exam.

Example

* Individual:
  * You run with a speed of 4.5 miles/hour. How long will it take you to run 100 yards?
  * Your schnauzer runs with a speed of 2.2 miles per hour. How long will it take your dog to run 100 yards?
* Group: You and your Schnauzer are at the park, and another dog is 50 yards away. How much head start can you give the dog so that you know that you will be able to catch him before he reaches the other dog? Graph the situation.

Grading

* Give each person one copy. This ensures everyone participates
* Grade only one test – I ask them to staple the group of exams together with the one they want graded on top.

Advantages

* We always hope our exams will be learning experiences – this really is one.
* The whole is more than the sum of the parts.
* Students are gently apprised of what they did wrong on the individual portion by classmates, so they are not surprised when they get their exams back. You are somewhat absolved of your critical function.
* Grading is a snap!

Disadvantages

* Works best if you have already established that your class is a learning community, and people work together.
* Group dynamics can be tricky

Part 2: Scratch Off

* All the excitement of the Lottery!
* And a learning experience.
* http://www.epsteineducation.com/home/about/default.aspx

ConcepTest 2.6b

Cruising Along II

You drive 4 miles at 30 mi/hr and then another 4 miles at 50 mi/hr. What is your average speed for the whole 8-mile trip?

1) more than 40 mi/hr
2) equal to 40 mi/hr
3) less than 40 mi/hr

ConcepTest 2.6b

Cruising Along II

You drive 4 miles at 30 mi/hr and then another 4 miles at 50 mi/hr. What is your average speed for the whole 8-mile trip?

1) more than 40 mi/hr
2) equal to 40 mi/hr
3) less than 40 mi/hr

It is not 40 mi/hr! Remember that the average speed is distance/time. Since it takes longer to cover 4 miles at the slower speed, you are actually moving at 30 mi/hr for a longer period of time! Therefore, your average speed is closer to 30 mi/hr than it is to 50 mi/hr.

Follow-up: How much further would you have to drive at 50 mi/hr in order to get back your average speed of 40 mi/hr?

ConcepTest 2.6a

Cruising Along I

You drive for 30 minutes at 30 mi/hr and then for another 30 minutes at 50 mi/hr. What is your average speed for the whole trip?

1) more than 40 mi/hr
2) equal to 40 mi/hr
3) less than 40 mi/hr

ConcepTest 2.6a

Cruising Along I

You drive for 30 minutes at 30 mi/hr and then for another 30 minutes at 50 mi/hr. What is your average speed for the whole trip?

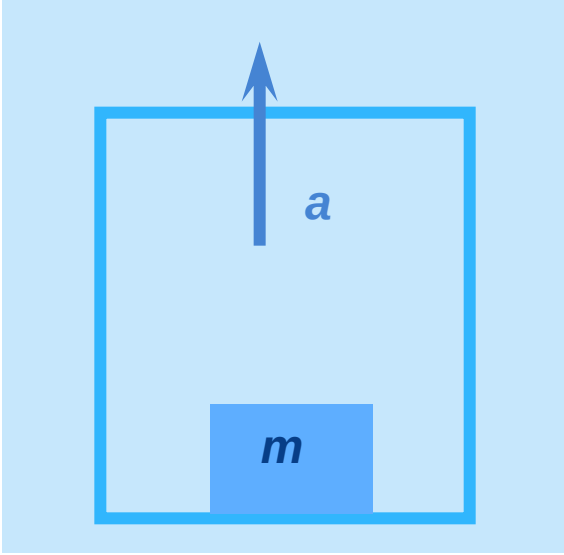
1) more than 40 mi/hr
2) equal to 40 mi/hr
3) less than 40 mi/hr

It is 40 mi/hr in this case. Since the average speed is distance/time and you spend the same amount of time at each speed, then your average speed would indeed be 40 mi/hr.

ConcepTest 4.9b Going Up II

A block of mass *m* rests on the floor of an elevator that is accelerating upward. What is the relationship between the force due to gravity and the normal force on the block?

1) $N > mg$
2) $N = mg$
3) $N < mg$ (but not zero)
4) $N = 0$
5) depends on the size of the elevator



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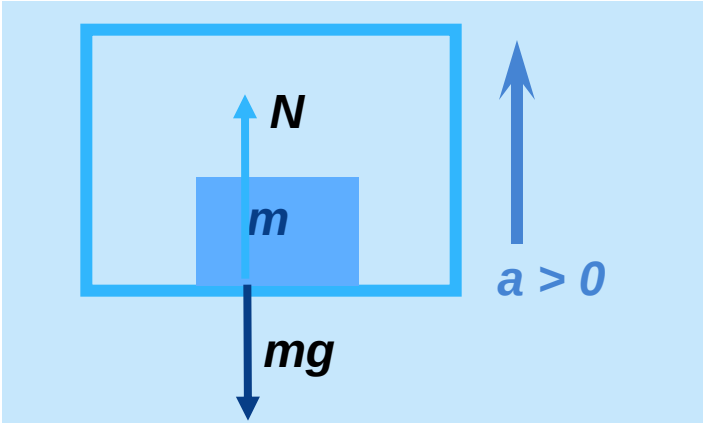
The block is accelerating upward, so it *must* have a net upward force. The forces on it are N (up) and mg (down), so N must be greater than mg in order to give the net upward force!



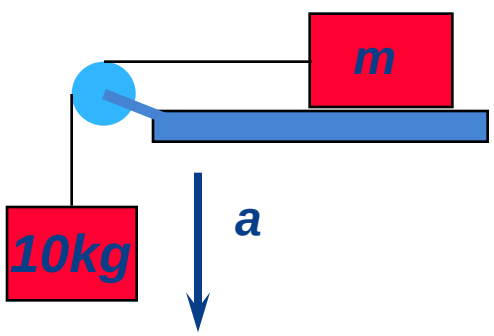
$$\Sigma F = N - mg = ma > 0$$
$$\therefore \; N > mg$$

Follow-up: What is the normal force if the elevator is in free fall downward?

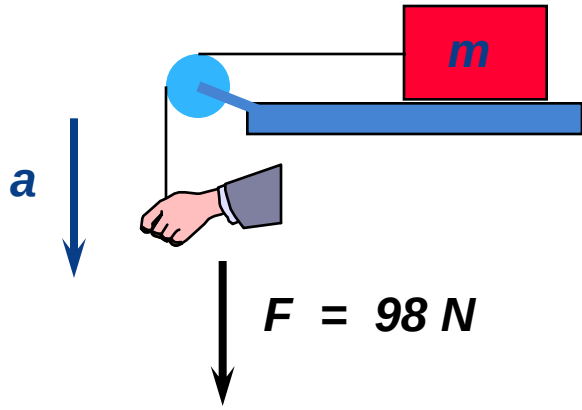
ConcepTest 4.18 Over the Edge

In which case does block *m* experience a larger acceleration? In (1) there is a *10 kg* mass hanging from a rope and falling. In (2) a hand is providing a constant downward force of *98 N*. Assume massless ropes.

1) *case 1*
2) *acceleration is zero*
3) *both cases are the same*
4) *depends on value of m*
5) *case 2*



Case (1)



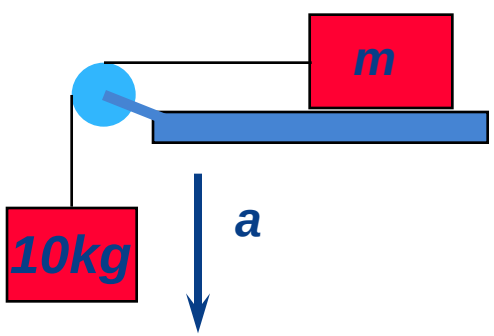
Case (2)

ConcepTest 4.18 Over the Edge

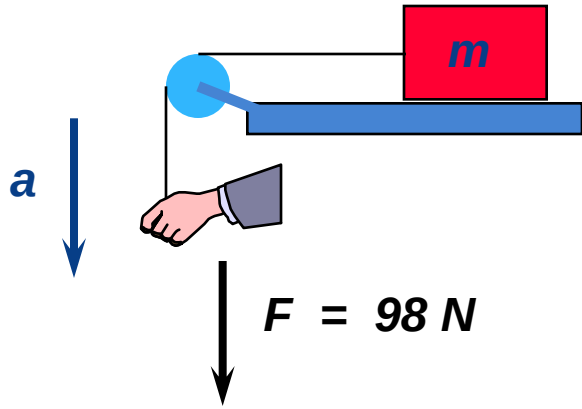
In which case does block *m* experience a larger acceleration? In (1) there is a *10 kg* mass hanging from a rope and falling. In (2) a hand is providing a constant downward force of *98 N*. Assume massless ropes.

1) *case 1*
2) *acceleration is zero*
3) *both cases are the same*
4) *depends on value of m*
5) *case 2*

In (2) the tension is *98 N* due to the hand. In (1) the tension is **less** than *98 N* because the block is **accelerating down**. Only if the block were at rest would the tension be equal to *98 N*.



Case (1)

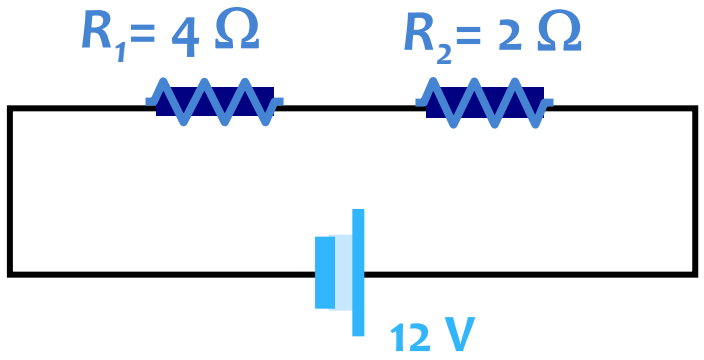


Case (2)

ConcepTest 18.1b Series Resistors II

In the circuit below, what is the voltage across R_1?

1) 12 V
2) zero
3) 6 V
4) 8 V
5) 4 V

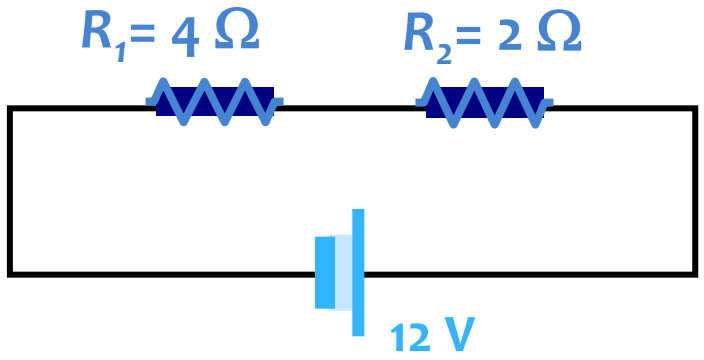


ConcepTest 18.1b Series Resistors II

In the circuit below, what is the voltage across R_1?

1) 12 V
2) zero
3) 6 V
4) 8 V
5) 4 V

The voltage drop across R_1 has to be twice as big as the drop across R_2. This means that $V_1 = 8$ V and $V_2 = 4$ V. Or else you could find the current $I = V/R = (12\text{ V})/(6\ \Omega) = 2$ A, then use Ohm's Law to get voltages.

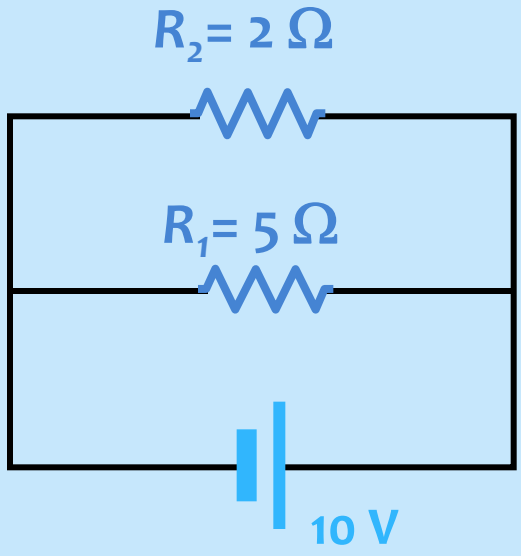


Follow-up: What happens if the voltage is doubled?

ConcepTest 18.2a Parallel Resistors I

In the circuit below, what is the current through R_1?

1) 10 A
2) zero
3) 5 A
4) 2 A
5) 7 A

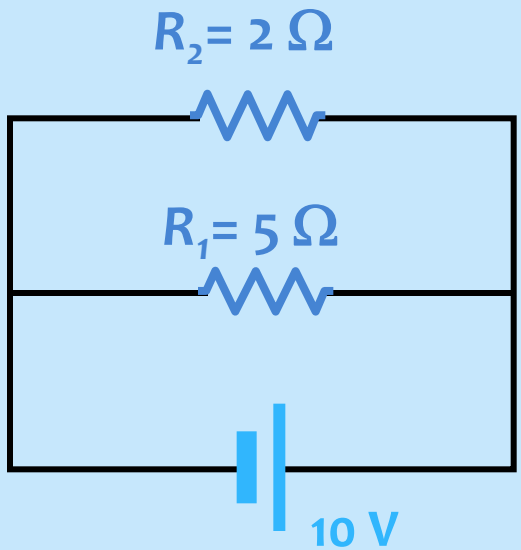


ConcepTest 18.2a Parallel Resistors I

In the circuit below, what is the current through R_1?

1) 10 A
2) zero
3) 5 A
4) 2 A
5) 7 A

The *voltage* is the *same* (10 V) across each resistor because they are in parallel. Thus, we can use Ohm's Law, $V_1 = I_1 R_1$ to find the current $I_1 = 2$ A.



Follow-up: What is the total current through the battery?