

## 2011-12 UIL Calculator Applications Contest Stated Problem Study List

- 05C-38. On an analog watch, the minimum and maximum distances between the tips of the hour and minute hands are 0.1 and 0.96 inches, respectively. What is the distance between the tips at 1:15 PM? ----- 38=\_\_\_\_\_ in
- 05E-36. A 4-ft high picket fence is being built. The builder adds 5 ft<sup>2</sup> in 20 minutes. When the fence is 20 ft long, a painter starts painting the fence at a rate of 8 linear feet of fence per hour. How long does it take for the painter to catch up with the builder? ----- 36=\_\_\_\_\_ hr
- 06A-26. A ten acre square plot was fenced using 4 rows of barbed wire. The owner calculated the length of barbed wire needed, but he forgot to include that the barbed wire was looped once around the fence posts that were 12 ft apart. Each looping turns a diameter of 2 inches. How much extra fencing is needed? ----- 26=\_\_\_\_\_ ft
- 06B-37. A 2 meter long piece of dental floss is pulled tight 1 meter above the ground. It is then relaxed by moving one end 175 mm towards the other end. Assuming the sagged floss forms a circular arc, how far above the ground is the midpoint of the floss? ----- 37=\_\_\_\_\_ cm
- 07A-36. A landowner 'steps off' a boundary and estimates a distance of 1152 ft. A surveyor measures the distance to be 1176.37 ft. What is the percent error in the landowner's estimate? ----- 36=\_\_\_\_\_ % (SD)
- 07C-38. A gun fires a bullet at 500 mph. What is the bullet's maximum range, the farthest horizontal distance it can travel? ----- 38=\_\_\_\_\_ mi
- 07E-37. Two ships travel east at 25 mph, one exactly 15 mi behind the other. They simultaneously change course, one heading 20° northward, and the other heading southward at the same angle. How far apart are the ships after 2 hr? ----- 37=\_\_\_\_\_ mi
- 07G-38. A screen transmits 35% of incident light and reflects the rest. What fraction of incident light passes through two screens stacked together?----- 38=\_\_\_\_\_ %
- 08A-38. A car accelerates from rest, drives a certain distance at 60 mph, and then decelerates to rest. Acceleration and deceleration have equal magnitude but opposite sign. If the total distance traveled was 18 mi and the total elapsed time was 20 min, what was the (positive) acceleration? ----- 38=\_\_\_\_\_ ft/s<sup>2</sup>
- 08B-37. Five oz of dye is needed to make one gallon of dye stock. How much dye is needed to convert 15 gallons of water to dye stock? ----- 37=\_\_\_\_\_ cups
- 08D-37. The 2007 Ford Mustang accelerates from 0 to 60 mph in 7.6 s. Assuming constant acceleration, how long would it take to accelerate from 0 to 30 mph? ----- 37=\_\_\_\_\_ s
- 08E-37. A hiker and a jogger start out together on a 5 mi long trail. The jogger runs a mi in 8 min 10 s, and the hiker travels at 2.5 mph. When the jogger got to the end of the trip, she turned around and ran back to the hiker. She then reversed direction again, heading back towards the end of the trail. This continued until the hiker finished the trail. How far did the jogger run? ----- 37=\_\_\_\_\_ mi
- 09B-36. What is the length of the line segment on  $y = 4x+3$  intersecting the inside of the circle  $x^2 + y^2 = 20$ ? ----- 36=\_\_\_\_\_

- 09F-37. A pipe has an outside diameter of 1.25 in and an inside diameter of 0.75 in. If Kelly hacksaws the pipe in two, what fraction of the pipe cross sectional area is sawn when the blade breaks through to the inside? ----- 37= \_\_\_\_\_ %
- 09G-38. During a footrace, a fast runner runs at a 6 min/mi pace, and a slow runner runs at a 7 min/mi pace. The fast runner passes the slow runner. After a 2 sec delay, the slow runner initiates an acceleration, catching up with the fast runner 968 ft after he was passed. What is this acceleration? ----- 38= \_\_\_\_\_ ft/s<sup>2</sup>
- 09H-36. A 36-in piece of string is used to form a triangle with sides in the ratio 4:5:8. What is the triangle area? ----- 36= \_\_\_\_\_ in<sup>2</sup>
- 10A-38. One point (a,b) on the line  $y = 5x+3$  is equidistant from the points (4,8) and (-3, -5). What is a? ----- 38= \_\_\_\_\_
- 10F-36. How far is it from Austin TX to Istanbul if a plane averaging 560 mph leaves Austin at 3:30 AM local time and arrives in Istanbul, 8 time zones later, at 11 PM local time the same day? ----- 36= \_\_\_\_\_ mi
- 10G-38. Walking along the outer circular edge of a rotating merry-go-round, Samantha completes one revolution in 11 sec walking one direction and 21 sec walking the other direction. What is the rotational speed of the merry-go-round?----- 38= \_\_\_\_\_ RPM
- 11A-36. Electric rail guns accelerate objects at incredible rates. A 50-g armature is accelerated horizontally from rest to 1.5 km/s over a 2-meter distance. How much energy is necessary to accomplish this? Energy is the product of the applied force and the distance traveled. - 36= \_\_\_\_\_ kJ
- 11A-37. At what angle relative to the horizontal must an object be launched if its minimum velocity in flight is 28% of its launch velocity? ----- 37= \_\_\_\_\_ deg
- 11A-38. How many minutes after 8:10 do the minute and hour hands of a clock line up? ----- 38= \_\_\_\_\_ min
- 11B-36. A person can jump 4 ft vertically on earth. For the same effort, defined as identical initial velocity, how far could they jump on the moon, if the gravitational acceleration is 16.7% that of earth? 36= \_\_\_\_\_ ft
- 11D-28. Two planes fly at 160 mph with one 200 ft behind the other. The lead plane initiates a horizontal loop, coming full circle and eventually 300 ft behind the other plane. If the average velocity was constant, what was the diameter of the loop? ----- 28= \_\_\_\_\_ ft
- 11D-36. A parachute is designed to automatically deploy when the freefall velocity reaches 65 mph. At what elevation should a plane fly if the parachute opens at 8,000 ft? ----- 36= \_\_\_\_\_ ft
- 11D-38. Mike and Mary stand unmoving 24 ft apart. Ned stands 18 ft from Mike and 8 ft from Mary, forming a scalene triangle. What is the shortest distance Ned can move to create a right triangle? ----- 38= \_\_\_\_\_ ft
- 11E-36. A ball is dropped vertically from a height of 1 yard. It recovers 80% of its height on the first bounce. What is the total distance traveled by the ball from the time it was released until it came to rest on the floor? ----- 36= \_\_\_\_\_ ft

11G-37. The lines  $y = 12x$ ,  $y = 4x+8$  and  $y = b$  intersect to form a triangle. Solve for  $b$  if the length of the line segment associated with  $y = b$  equals 15 and  $b$  is negative. ----- 37= \_\_\_\_\_

11I-36. A carton crushes if its impact velocity exceeds 80 mph. If the carton is thrown vertically upward from a 60-ft tall building, and it just crushes when it hits the ground, what was the initial velocity (up is positive)? ----- 36= \_\_\_\_\_ mph

11I-38. Marin runs a mile in 5 min 30 sec. She and Mary, who runs a mile in 7 min 26 sec, start at the south end of a  $\frac{1}{4}$  mi circular track. Marin takes off running on the track, and at the same time, Mary takes off in a straight line off the track, meeting up with Marin before she finishes one lap. Considering due east to be  $0^\circ$ , at what positive angle does Mary need to run? ----- 38= \_\_\_\_\_ rad