2014 – 2015 Study List Solutions

10E-36. The volume of the Grand Canyon is 2500 cubic miles. If this volume were spread uniformly over the entire surface of the earth, how thick would the added layer be? ---------- 36= _____ in

$SA_{earth} = 4\pi(3960)^2 = 1.97 \times 10^8 \text{ mi}^2$

$(2500 \text{ mi}^3 / 1.97 \times 10^8 \text{ mi}^2) \times (5280 \text{ ft/mi}) \times (12 \text{ in/ft}) =$ **.804**

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

$E = F \times d$ {work} $\qquad v^2 = v_0^2 + 2a(x - x_0)$

$$a = \frac{v^2 - v_0^2}{2(x - x_0)} = \frac{1500^2 - 0}{2(2)} = 562{,}500 \text{ m/s}^2$$

$F = ma$

$E = mad$

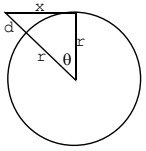
$E = (.050)(562{,}500)(2) = 56{,}250 \text{ J} =$ **56.3 kJ**

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

Height inversely proportional to gravity: $4 \times 1 = h \times .167$ $\quad h = 4/.167 =$ **24.0**

11D-37. On a clear day at the 102 meter tall observation deck of the Atomium in Brussels, Belgium, one can just make out the cathedral of Antwerp on the horizon. How far is it from Brussels to Antwerp? ----- 37= _____ mi

$r = 3960$ mi $\qquad d = 102$ m $= .06337\ldots$ mi

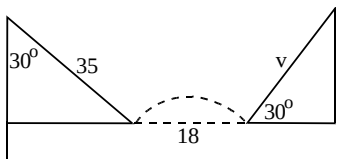


$\cos\theta = r / (r + d) = .32416\ldots° \Rightarrow .0045677\ldots$rad

$s = \theta r =$ **22.4**

11F-38. A trapeze artist swings from one 35-ft long trapeze (or swing) to another trapeze. She releases one trapeze at a 30° angle relative to the vertical. She flies through the air, catching the other trapeze 18 ft away at the same elevation. What was her release velocity? ---------- 38= _____ fps

$$d_{h_{max}} = \frac{v^2 \sin 2\theta}{g}$$



$$18 = \frac{v^2 \sin 60^\circ}{(32.174)} \qquad v = \textbf{25.9}$$

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

$v^2 = v_0^2 + 2a(y - y_0)$

$[(80)(88/60)]^2 = v_0^2 + 2(-32.174)(0 - 60)$

$v_0 = 99.53005 \times 60/88 = \mathbf{67.9}$

12A-36. The mass of the earth is 5.9742 × 10^{24} kg. What is the percent error in calculating the mass based on an average density of 5.613 g/cm^3? ---------- 36= _____ %(SD)

r = 3960 mi × (5280 ft/mi) × (12 in/ft) × (2.54 cm/in) × (1m/100cm) = 6373002.24 m

5.613g/cm^3 = 5,613 kg/m^3 × (4/3)π r^3 = 6.08577462… × 10^{24} kg = calculated mass

(exact, approx.., %chg): [5.9742 × 10^{24} kg, 6.08577… × 10^{24} kg, % chg] = 1.8676 = **1.9 (2SD)**

{For SD calculation}:

[(6.08577462 {4SD} / 5.9742 {5SD}) – 1] × 100%

When you divide above, you get 1.018676077 to 4SD.

When you subtract 1, you get .018676077 to the thousandths place → .019

Times 100% = **1.9 (2SD)**

12C-36. What is the closest approach of the line y = 5.5x + 15 to the origin? ---------- 36= _____

5.5x – y + 15 = 0 → a = 5.5, b = -1, c = 15, x = 0, y = 0

$$d = \frac{|ax + by + c|}{\sqrt{a^2 + b^2}} = \frac{|15|}{\sqrt{(5.5)^2 + (-1)^2}} = \mathbf{2.68}$$

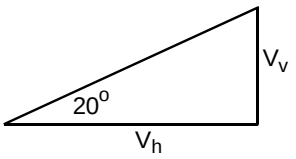
12C-38. A motorcycle dare devil rides his motorcycle up a 20° ramp at 55 mph. The ramp was built using 10 sheets of 8-ft long plywood. What is the horizontal distance from the end of the ramp to the spot on the ground where the dare devil lands? ---------- 38= _____ ft

55 mph (88/60) = 80.666… ft/sec

$y = y_0 + v_0 t + \frac{1}{2} a t^2$

$0 = 80 \sin 20° + (80.66 \sin 20°)t + \frac{1}{2}(-32.174)t^2$

t = 2.4185… sec



$x = x_0 + v_0 t + \frac{1}{2} a t^2$

x = 0 + (80.66 cos 20°)(2.4185…) + 0 x = **183**

12G-37. The US leads the world in generation of municipal waste, generating 760 kg annually per person. How many Olympic-sized swimming pools would be filled by garbage in the US annually? The US population is 307,006,550, the capacity of a pool is 2520 cubic meters and garbage density is 0.85 g/cm$^{3.}$.37= _____ (SD)

$$\frac{(307,006,550)(760kg)}{(2520m^3)(.85g/1cm^3)(1kg/1000g)(100cm/1m)^3} = 108{,}928.56 = \mathbf{110{,}000} \quad \{2SD\}$$

12I-37. The world's gross domestic product (GDP) in 2010 was $62.909274 trillion. The US GDP was $14.6578 trillion. What is the percent error in estimating the world GDP to be four times the US GDP? ---------- 37= _____%(SD)

$$\left[\frac{4(14.6578)}{62.909274\{6SD\}} - 1\right]100\% = \mathbf{-6.8004\ \{5SD\}} \qquad .931996131 - 1 = -.068004$$

13A-36. A 55-gal saltwater fish tank is prepared by adding ½ cup of salt to each gallon of fresh water. Over time, 3 gallons of pure water (no salt) evaporated from the tank. To replenish the tank, an additional 8 gallons of saltwater was removed. How many cups of salt should be mixed with fresh water to make up the 11 gallons needed to restore the salt concentration of the tank to the proper level? ---------- 36= _____ cups

½ cup = 1/32 gal

Let x = % of salt water

(1/32)(55) - (0)(3) = x(55-3) → x = .033053…

52 – 8 = 44

Let w = gallons of salt

x(44) + w(11) = (1/32)(55) → w = .024038…

w (11)(16 c/gal) = **4.23**

13A-37. Brad left San Saba on State Highway 190 driving to Iraan, 204 mi away, at 53 mph. Brandon left Iraan 30 min after Brad left, driving to San Saba on the same highway. If they met in Eldorado which is 79 mi from Iraan, what was Brandon's velocity ?---------- 37=_____ mph

53t = 204 – 79 → t = 2.3585

V(t - .5) = 79

V = **42.5**

13C-38. A spring elongates 1 in for every 5 lbs of load. Four gallons of coconut oil (density equals 0.92 g/cm^3) are hung on the spring which is attached to a frame. However, the container has a leak, losing 10 tablespoons of coconut oil every minute. How long will it take for the container to rise 1.875 in? ---------- 38=_____ hr

.92 g x (1 kg/ 1000g) → .002028253 pounds

cm^3 x (1 ml/1cm^3) x (1 L/1000mL) → .0002641 gal 7.6777… lb/gal

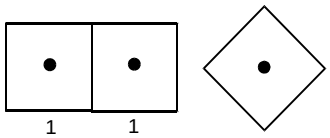
F = (constant)(distance) F = kx 5 = k(1) k = 5

F = (5)(1.875 in) = 9.375 lb

9.375 lb / 7.6777…lb/gal = 1.221057… gal

(1.221057…gal)(128 oz/gal)(2 Tbsp/oz)(1 min/10 Tbsp)(1 hr/60 min) = **.521**

13D-37. A cube of iron weighs 40 lbs and rests on a table. The cube is pushed which causes it to rotate with one edge always in contact with the table, eventually flipping it onto an adjacent face. How much energy must be applied to accomplish this? Energy is the product of the cube weight and the change in the vertical distance of its centroid which is the center of the cube. The density of iron is 7.86 g/cm^3.---------- 37=_____ ft-lbs



40 lb → 18.14369…kg x (1000 g/ kg) = 18,143.69… g {A}

{A} / 7.86 = 2308.358… cm^3 {B}

$\sqrt[3]{B}$ cm x (1 in/ 2.54 cm) x (1 ft / 12 in) = .433596… {C}

h = $\frac{C\sqrt{2}}{2}$ - C/2 = .0898 {D} {E} = D (40) = **3.59**

13E-36. The total length of active track in the New York subway system is 842 mi. Howard starts inspecting track at 2000 ft/hr. After 800 hr inspecting, Howard still works, but Jana starts inspecting different sections at 2500 ft/hr. How many hours will Jana work if they completely finish inspecting all the track?- 36= _____ hr

$r_1t_1 + r_2t_2 = J$

2000(t + 800) + 2500t = 842(5280)

t = **632**

13F-38. A target is dropped from a 1900 ft tall tower. A bullet is fired from the ground straight up towards the falling target but with a time delay of t seconds. If the bullet initial velocity was 1800 mph, what is t if the bullet hits the target at an elevation of 600 ft? ---------- 38=_____ s

$y = y_0 + v_0t + ½ at^2$

$600 = 1900 + 0 + ½(-32.174)t^2$ t = 8.98947… [A]

1800 (88/60) = 2640 ft/s 600 / 2640 = .22727… [B]

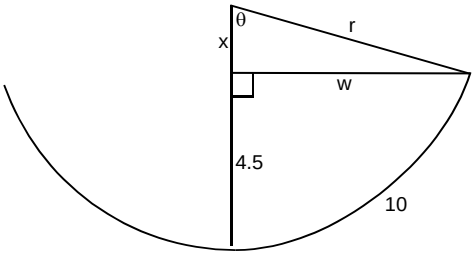
A – B = **8.76**

13G-36. A company can buy a bracket for $5.70. They alternatively consider buying a bracket-making machine. The machine costs $12,000, labor and electricity to operate the machine is $30/hr, and the material cost for one bracket is $0.75. The machine makes 200 brackets/hr. What is the minimum number of brackets produced for which it will be cheaper for the company to buy the machine and make their own brackets rather than purchasing brackets? ------- 36= _____ integer

$12{,}000 + 30(n/200) + .75n = 5.70n$

$n = 2500$ (breaks even) → **2501**

14A-38. Two persons each hold the end of a 20 ft long jumping rope. How far apart should they stand if they hold the rope 4.5 ft off the ground, and the middle of the rope just touches the ground? Assume the arc formed by the jumping rope is circular. ---------- 38= _____ ft



$s = \theta r \quad 10 = \theta r \quad \cos\theta = x / r$

$r = x + 4.5 \quad 10 = \theta(x + 4.5)$

$\theta = 10 / (x + 4.5) \quad \cos\theta = x / (x + 4.5)$

$\cos(10 / (x + 4.5)) = x / (x + 4.5)$

nsolve | $x > 0$ $x = 5.7586\ldots$ $\theta = .97478\ldots$

$\tan\theta = w / x \quad w = 8.48989\ldots \quad 2w =$ **17.0**

14B-37. A projectile is fired from Odessa to Midland, 20.1 mi away, at a release angle of 49°. What is the projectile maximum elevation during flight? ----- 37= _____ mi

$(20.1)(5280) = (v^2 \sin[2(49°)]) / 32.174$

$v = 1{,}856.91117\ldots$

$d_{v\,max} = (v^2 \sin^2 49°) / 2(32.174) \times (1\text{ mi} / 5280\text{ ft}) =$ **5.78**

Alternate solution:

$\tan\theta = [4(d_{v\,max})] / d_{h\,max} \quad \tan(49^o) = [4(d_{v\,max})] / 20.1 \quad (d_{v\,max}) =$ **5.78**

14C-38. Atoms travel a distance x through a solid object according to the Arrhenius equation, $x \approx \sqrt{D_0 t \exp\left(\frac{-Q}{RT}\right)}$, where D_0 is a constant, t is the elapsed time, Q is the activation energy, R is the universal gas constant [1.987 cal/(mol·K)], and T is absolute temperature. Calculate Q if an atom diffuses a distance of 1 mm in 10 s at 800°C or in 500 s at 700°C. ---------- 38= _____ cal/mol

$.001 = \sqrt{D_{(10)} e^{\left(\frac{-Q}{1.987(800+273.13)}\right)}} \qquad .001 = \sqrt{D_{(500)} e^{\left(\frac{-Q}{1.987(700+273.13)}\right)}}$

Solve: $e^{\left(\frac{-x}{1.987(1073.13)}\right)} = 50\, e^{\left(\frac{-x}{1.987(973.13)}\right)}$ $x =$ **81,200**

14D-37.What is the probability of a monkey typing Shakespeare's play, *MacBeth*? The play has 99,110 characters, and there are 48 type-able keys on a keyboard. Assume the monkey presses keys randomly with equal probability, and it has the patience to type the entire play.---------- 37=_____

$(1/48)^{99110}$ 99110 log (1/48) = -166,627.819..

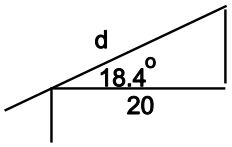
Add: 166,628 + (-166,627.819…) = .180963

$10^{.180963}$ = 1.52 → **1.52×10^{-166628}**

14D-38. A golfer uses a 6 iron to tee off. The golf ball initial velocity is 70 mph, and the 6 iron has a loft angle of 29° (relative to the horizontal). How far does the ball travel before hitting the ground?. ---------- 38=_____ yd

$$d_{h_{max}} = \frac{\left(70 \times \frac{88}{60}\right)^2 \sin(58^o)}{32.174} \text{ ft} \times \frac{1 \text{ yd}}{3 \text{ ft}} = \mathbf{92.6}$$

14F-37. A "square" of roofing shingles cover 100 sq. ft of roof. How many squares are needed to roof a simple, A-frame house that is 40 ft wide by 65 ft long? Assume the roof is sloped at 18.4° relative to the horizontal, the eaves overhang the house by 2 ft all the way round its periphery, and that 5% extra must be purchased to account for trimming loss. ---------- 37=_____ integer



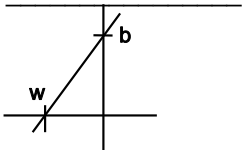
cos 18.4° = 20 / d d = 21.0775…

d + 2 = 23.0775…

A = 2(23.0775…)(65 + 4) = 3184.704…

(1.05)A / 100 = 33.4 → **34**

14F-38. What is positive b if the right triangle formed by the x- and y-axes and the line y= 4x + b has an area of 1200? ---------- 38=_____



A = ½ wb -1200 = ½ wb

b = y – 4x b = 0 – 4w w = b / (-4)

-1200 = ½ (b / -4)b b = **98.0**

14G-37. What is the weight of a car if its mass is 75 slugs? A 1-slug object is accelerated by 1 ft/s^2 when 1 lb (force) is applied. ---------- 37=_____ lbs

F_w = mg = 75 (32.174) = **2410**

14G-38. A top-fuel dragster races on a 0.25 mi straight track. It accelerates from rest to 325 mph in the first 500 ft and then finishes the race at constant velocity. What is the posted time for the race? ----------38=_____ s

325(88/60) = 476.66… ft/s

$v^2 = v_0^2 + 2ax$

$(476.66..)^2 = 2a(500) \quad \rightarrow \quad a = 227.2111\ldots\ ft/s^2$

$v = v_0 + at \quad \rightarrow \quad t = (v - v_0) / a$

(476.66… - 0) / 227.2111… = 2.0979…sec (C)

5280 / 4 = 1320 ft 1320 – 500 = 820 ft 820 ft / 476.66…ft/s = 1.72027… sec (D)

C + D = **3.82**

14H-38. An artillery shell is fired at an angle of 33° relative to horizontal but falls 300 ft short of the target. The angle is adjusted to 41° to hit the target. What is the projectile initial velocity?----------38=_____ mph

$$(x - 300) = \frac{v^2 \sin 66^o}{32.174} \qquad x = \frac{v^2 \sin 82^o}{32.174}$$

$$\frac{v^2 \sin 82^o}{32.174} - 300 = \frac{v^2 \sin 66^o}{32.174}$$

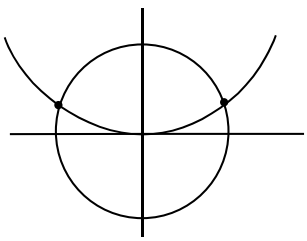
Solve: v = 354.692…ft/s (60/88) = **242**

14I-36. Every Formula 1 racing car can decelerate from 100 mph to zero and then accelerate back to 100 mph, all in less than 5 s. Assuming deceleration and acceleration are equal, what minimum, positive acceleration does this represent? ---------- 36= _____ ft/s^2

$v = v_0 + at$ $a = (v - v_0) / t$ 100 mph (22/15) = 146.666… ft/s

a = (146.66… – 0) / 2.5 s = **58.7**

14I-37. A circular saw has a 6-in diameter blade. It is used to cut a 2-in diameter rod into two pieces. When the blade edge reaches the center of the rod, what rod area remains to be sawn?----------37=_____ in^2



$(x - 0)^2 + (y - 3)^2 = 9$

$y - 3 = \pm\sqrt{9 - x^2}$ $y = 3 \pm\sqrt{9 - x^2}$

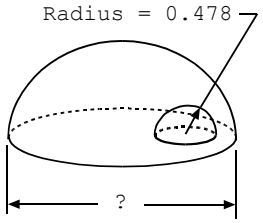
$y_1 = 3 - \sqrt{9 - x^2}$ $x^2 + y^2 = 1$ $y_2 = \sqrt{1 - x^2}$

Solve $y_1 = y_2$ $x = \frac{\sqrt{35}}{6}$ $2\int_0^{\sqrt{35}/6} [y_2 - y_1]dx = A$

$\pi (1)^2 - A$ = **1.68**

10B-50.

HEMISPHERE WITH
HEMISPHERICAL CAVITY



Total Surface Area = 19.7

10B-50 = _____

$SA = 3\pi r_1^2 - \pi r_2^2 + 2\pi r_2^2$

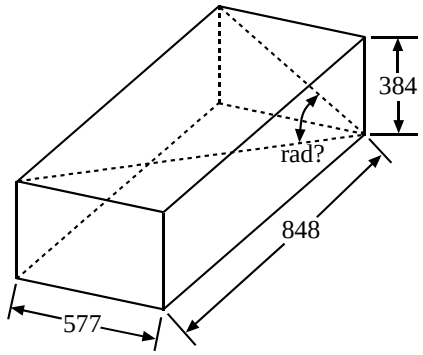
$3\pi R^2 - \pi(.478)^2 + 2\pi(.478)^2 = 19.7$

$3\pi R^2 + \pi(.478)^2 = 19.7$

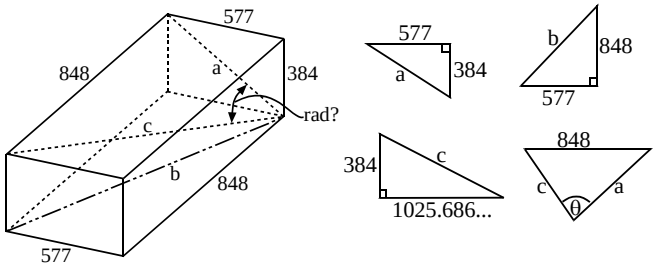
R = 1.419 D = **2.84**

10I-50.

RECTANGULAR SOLID



10I-50 = _____



$a = \sqrt{577^2 + 384^2} = 693.098\ldots$

$b = \sqrt{848^2 + 577^2} = 1025.686\ldots$

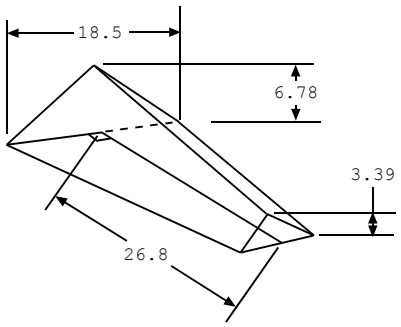
$c = \sqrt{384^2 + 1025.686...^2} = 1095.211\ldots$

$848^2 = 693^2 + 1095^2 - 2(693)(1095)\cos\theta$

θ = **.886**

11A-50.

TRUNCATED ISOSCELES TRIANGULAR
PYRAMID



Volume = ?

11A-50 = _____

$V = 1/3\left[A_1 + A_2 + \sqrt{A_1 A_2}\right]h$

$A_1 = \frac{1}{2}(6.78)(18.5) = 62.715$

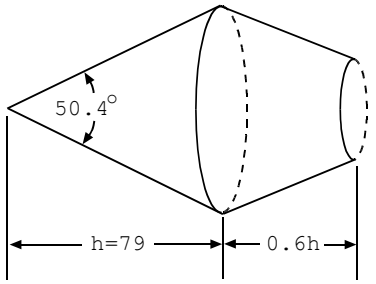
$6.78 / 3.39 = 18.5 / b \quad b = 9.25$

$A_2 = \frac{1}{2}(b)(3.39) = 15.67875$

h = 26.8

V = **980**

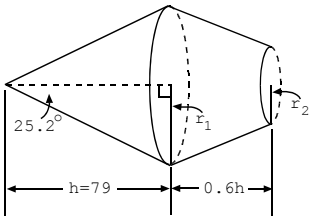
11H-50.
CONGRUENT CONES, ONE OF WHICH IS TRUNCATED



Total Volume = ?

11H-50 = _____

or



$\tan(25.2°) = r_1/79$
$r_1 = 37.174\ldots$

$h_f = (.6)h_c = (.6)(79) = 47.4$

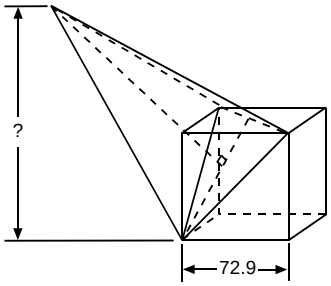
$r_2 = (.4)(r_1) = 14.869\ldots$

$V = (1/3)\pi r^2 h_c + (1/3)\pi(r_1^2 + r_2^2 + r_1 r_2)h_f$

$V =$ **221000**

Find cone, double it, delete missing cone.

12B-50.
CUBE AND PYRAMID WITH TRIANGULAR BASE



Cube Volume = 2[Pyramid Volume]

12B-50 = _____

Base is equilateral Δ

$B = \dfrac{(72.9\sqrt{2})^2\sqrt{3}}{4} = 4602.414\ldots$

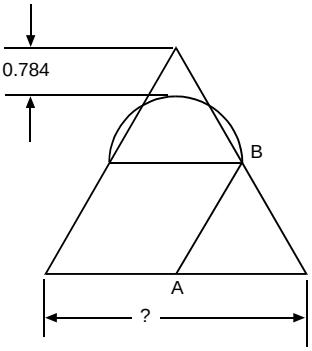
$V_{cube} = 72.9^3 = 387{,}420.489$
$V_{pyramid} = \frac{1}{2} V_{cube} = 193{,}710.2445 = 1/3(B)(H)$
$H = 126.266\ldots.$

$\frac{1}{2}(72.9\sqrt{2})h = B \quad h = 89.2839\ldots$

$\sin\theta = 72.9 / h \quad \theta = 54.7356\ldots$
$\alpha = 90 - \theta = 35.264\ldots$

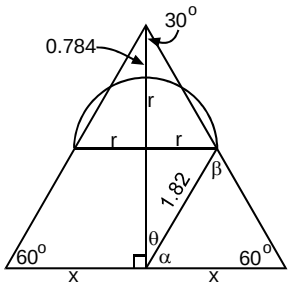
$2/3\ h = 59.5226\ldots$ {D}
$D\sin(\theta) + H\sin(\alpha) =$ **122**

12C-60.
EQUILATERAL TRIANGLE AND SEMICIRCLE



A = midpoint
AB = 1.82

12C-60 = _____



$\tan 30° = r / (r + .784)$
$r = 1.070964$

$\sin\theta = r / 1.82$
$\theta = 36.0465\ldots$

$\alpha = 90 - \theta$
$= 53.95349\ldots$

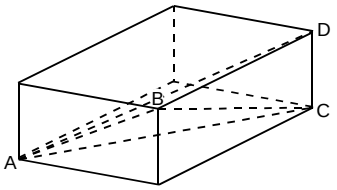
$\beta = 180 - (60 + \alpha) = 66.0465\ldots°$

$\sin\beta / x = \sin 60° / 1.82$

$x = 1.92 \quad 2x =$ **3.84**

12E-50.

RECTANGULAR SOLID



Face Diagonals
AB = 18.3, BC = 26.4, AC = 28

AD = ?

12E-50 = _____

1) $x^2 + y^2 = 18.3^2$

2) $y^2 + z^2 = 26.4^2$

3) $x^2 + z^2 = 28^2$

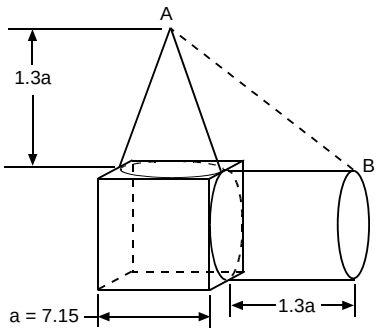
(3) – (1) = $z^2 - y^2 = 449.11$
(2) = $z^2 + y^2 = 26.4^2$

$z^2 = 573.035$
$y^2 = 123.925$
$x^2 = 210.965$

AD = $\sqrt{x^2 + y^2 + z^2}$ = **30.1**

13E-50.

CONE, CUBE AND CYLINDER



AB = ?

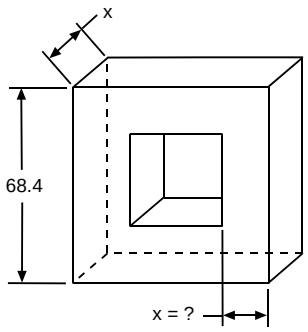
13E-50 = _____

$[(1.3)(7.15)]^2 + [(7.15/2) + 1.3(7.15)]^2 = x^2$

x = **15.9**

13H-50.

RECTANGULAR SOLID WITH SQUARE FACE AND CENTER SQUARE HOLE



Total Surface Area = 15,000

13H-50 = _____

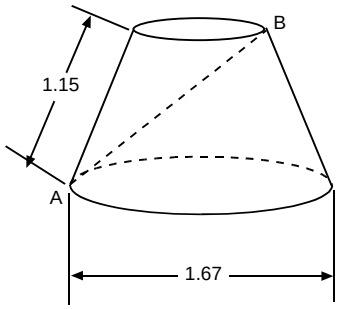
$2(68.4)^2 + 4(68.4x) - 2(68.4 - 2x)^2 + 4[(68.4 - 2x)(x)]$

= 15,000

x = **19.0**

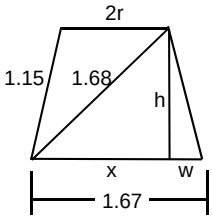
14A-50.

FRUSTUM



AB = 1.68
Volume = ?

14A-50 = _____



$w = (1.67 - 2r)/2$

$x = 1.67 - [(1.67 - 2r)/2] = .835 + r$

$h^2 + (.835 + r)^2 = 1.68^2$

$h^2 + [(1.67-2r)/2]^2 = 1.15^2$

$h = 1.0833\ldots \quad r = .44907\ldots$

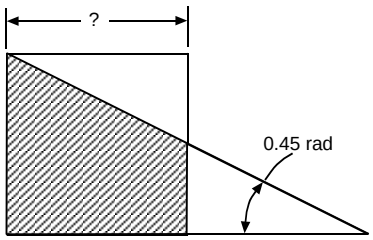
$V = (1/3)\pi h\,(r_1^2 + r_2^2 + r_1 r_2)$

$r_1 = .44907\ldots \quad r_2 = 1.67/2 = .835$

$V =$ **1.45**

14A-60.

SQUARE AND RIGHT TRIANGLES



Hatched Area = 44.5

14A-60 = _____

Top triangle, $\theta = .45$

square – triangle: $x^2 - \frac{1}{2}\,xw = 44.5$

$\tan(.45) = w/x$

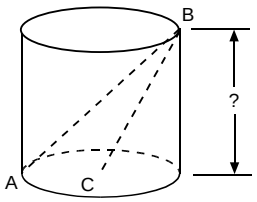
$x^2 - \frac{1}{2}\,(x)(x\tan(.45)) = 44.5$

$x =$ **7.66**

14B-49.

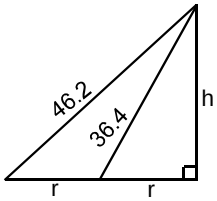
CYLINDER

C = Center



AB = 46.2 BC = 36.4

14B-49 = _____



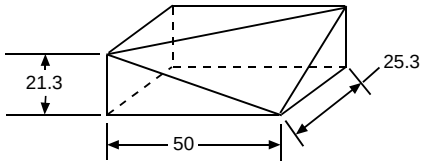
$h^2 + (2r)^2 = 46.2^2$

$h^2 + r^2 = 36.4^2$

solve: $h =$ **32.5**

14C-49.

TRUNCATED RECTANGULAR SOLID



Volume = ?

14C-49 = _____

$d = \sqrt{50^2 + 25.3^2} = 56.0365\ldots$

$s = \frac{50 + 25.3 + d}{2} = 65.6682$

$A = \sqrt{s(s-50)(s-25.3)(s-d)} = 632.499\ldots$

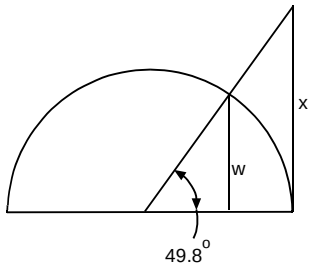
$V_1 = (1/3)A(21.3) = 4{,}490.7499\ldots$

$V_2 = 50(25.3)(21.3) = 26{,}944.5$

$V_2 - V_1 =$ **22,500**

14C-60.

SEMICIRCLE AND RIGHT TRIANGLES



x/w = ?

14C-60 = _____

let r = 1

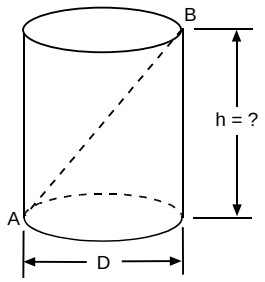
tan 49.8° = x/1, x = tan 49.8°

sin 49.8° = w/1, w = sin 49.8°

x / w = **1.55**

14D-50.

CYLINDER



AB = 568
h>D
Volume = 4.31×10^7

14D-50 = _____

$h^2 + D^2 = 568^2$

and

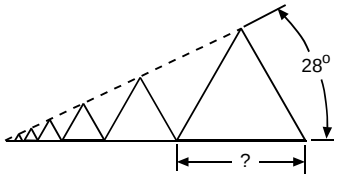
$\pi(D/2)^2 h = 4.31 \times 10^7$

4 solutions:

Choose h = **447** D = 350

14D-60.

INFINITE NUMBER OF EQUILATERAL TRIANGLES



Total Area = 277

14D-60 = _____

$$\text{Area} = \sum \frac{x^2\sqrt{3}}{4} + \left[\frac{x\sin 32^o}{\sin 88^o}\right]^2 \frac{\sqrt{3}}{4}$$

$$+ \left[\frac{x\sin 32^o g \sin 32^o}{\sin 88^o g \sin 88^o}\right]$$

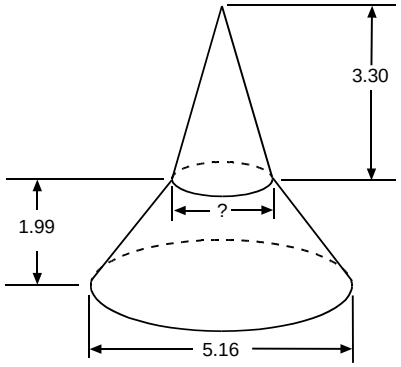
$$277 = \frac{\sqrt{3}}{4}\sum_{n=0}^{\infty} x^2 \left[\frac{\sin 32^o}{\sin 88^o}\right]^{2n}$$

$$\text{Solve:} \quad 277 = \frac{\sqrt{3}}{4} g x^2 g \sum_{n=0}^{\infty}\left[\frac{\sin 32^o}{\sin 88^o}\right]^{2n}$$

x = **21.4**

14G-49.

FRUSTUM AND CONE



Total Volume = 30

14G-49 = _____

$$30 = \frac{1}{3}\pi(1.99)\left[\left(\frac{5.16}{2}\right)^2 + x^2 + \frac{5.16x}{2}\right]$$

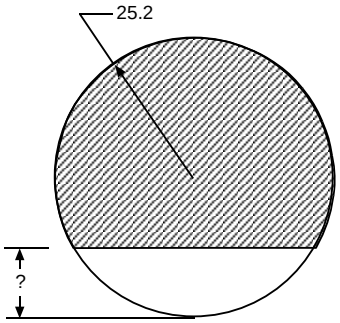
$$+ \frac{1}{3}\pi(x)^2(3.3)$$

x = 1.29

2x = **2.58**

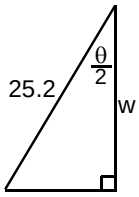
14G-60.

CIRCLE AND SEGMENT



Hatched Area = 1580

14G-60 = _____



$\pi(25.2)^2 - [(25.2)^2 / 2](\theta - \sin\theta) = 1580$

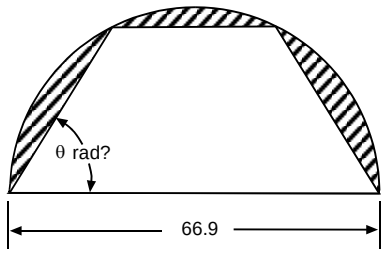
$\theta = 2.146\ldots$

$\cos(\theta/2) = w / 25.2$

$w = 12.0313\ldots$

$25.2 - w =$ **13.2**

14H-60.
SEMICIRCLE AND ISOSCELES TRAPEZOID



Hatched Area = 339
θ< 1 rad

14H-60 = _____

$(2)\frac{r^2}{2}(\alpha_1 - \sin\alpha_1) + \frac{r^2}{2}(\alpha_2 - \sin\alpha_2)$

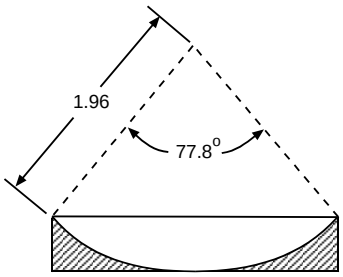
$339 = (33.45)^2(\alpha - \sin\alpha)$

$+ (33.45)^2/2\,[(\pi - 2\alpha) - \sin(\pi - 2\alpha)]$

If θ < 1, then α has to be > 1 and α = 1.205…

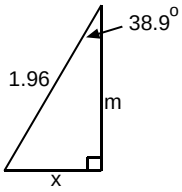
then $(\pi - \alpha)/2$ = **.968**

14I-60.
RECTANGLE AND SEGMENT



Hatched Area = ?

14I-60 = _____



sin 38.9° = x / 1.96
x = 1.2308…

cos 38.9° = m / 1.96
m = 1.52535…

w = 1.96 – m w = .43464…

Radian mode.
Area = $(2x)w - (r^2/2)(\theta - \sin\theta)$

Area = **.339**