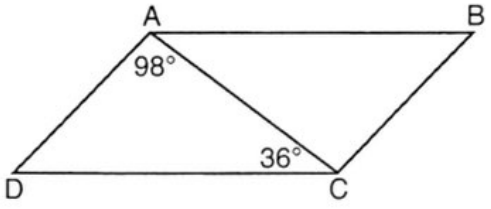
Part II

Answer all 7 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [14]

25 In parallelogram $ABCD$ shown below, $m\angle DAC = 98°$ and $m\angle ACD = 36°$.



What is the measure of angle B? Explain why.

$m\angle D + 98 + 36 = 180$ (triangle sum thm)

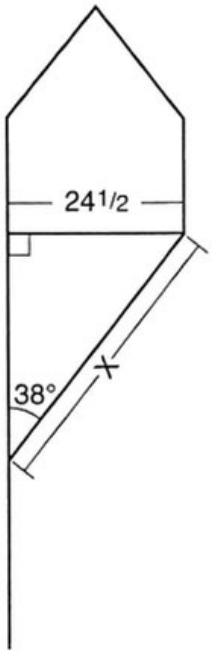
$m\angle D = 46$

$\angle D \cong \angle B$ opposite angles of a parallelogram

$m\angle B = 46°$ transitive prop.

$\angle D$ measures 46° because it sums with the other angles of the $\triangle ACD$. $\angle B$ and $\angle D$ have equal measures because they are opposite angles of a parallelogram (same-side interior angles twice).

26 Diego needs to install a support beam to hold up his new birdhouse, as modeled below. The base of the birdhouse is $24\frac{1}{2}$ inches long. The support beam will form an angle of 38° with the vertical post. Determine and state the approximate length of the support beam, x, to the *nearest inch*.



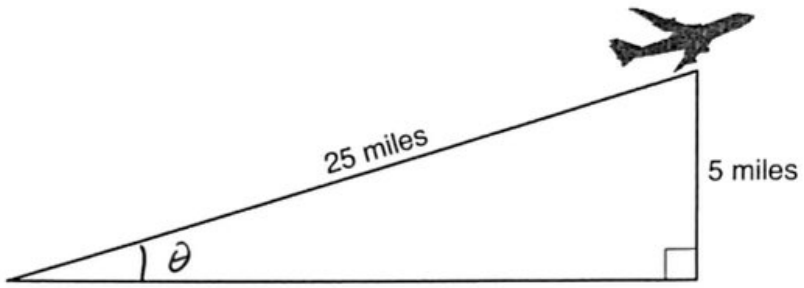
~~Cos~~ $\sin 38 = \frac{24\frac{1}{2}}{x}$

$x = \frac{24\frac{1}{2}}{\sin 38}$

$= 41.68788...$ $39.79455...$

≈ 40 inches

26 An airplane took off at a constant angle of elevation. After the plane traveled for 25 miles, it reached an altitude of 5 miles, as modeled below.



To the *nearest tenth of a degree*, what was the angle of elevation?

[1]

$\sin\theta = \frac{5}{25}$

$\theta = \sin^{-1}\left(\frac{5}{25}\right)$

$= 11.536955\ldots$

$\approx 11.5°$

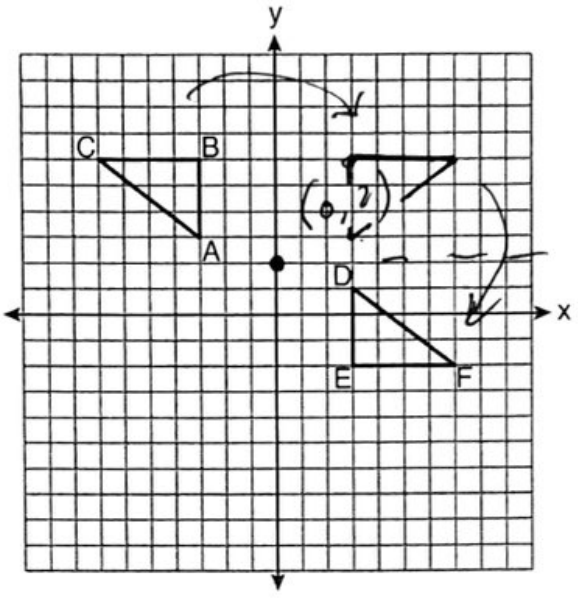
27 A rectangular tabletop will be made of maple wood that weighs 43 pounds per cubic foot. The tabletop will have a length of eight feet, a width of three feet, and a thickness of one inch. Determine and state the weight of the tabletop, in pounds.

$V = 8 \times 3 \times \frac{1}{12}$

$= 2 \text{ ft}^3$

$W = 2 \cdot 43 = 86 \text{ lbs}$

27 On the set of axes below, $\triangle ABC \cong \triangle DEF$.



Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

[180° counterclockwise rotation around (0, 2)]

or

reflect $\triangle ABC$ over the y-axis

reflect $\triangle A'B'C'$ over $y = 2$

"partial"
[1]

31 Determine and state an equation of the line perpendicular to the line $5x - 4y = 10$ and passing through the point (5,12).

$-4y = -5x + 10$

$y = \frac{5}{4}x - \frac{10}{4}$

$m = \frac{5}{4}$

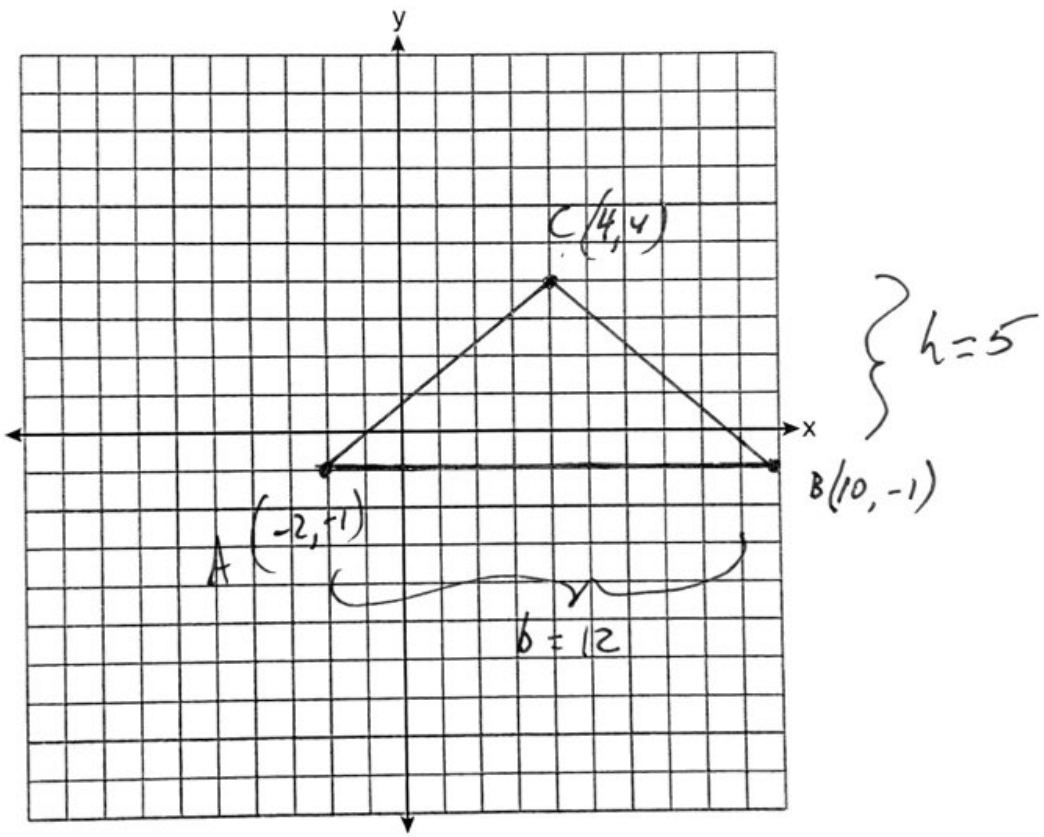
$m_{\perp} = -\frac{4}{5}$

$y - 12 = -\frac{4}{5}(x - 5)$

28 The vertices of $\triangle ABC$ have coordinates $A(-2,-1)$, $B(10,-1)$, and $C(4,4)$. Determine and state the area of $\triangle ABC$. [The use of the set of axes below is optional.]

$A = \frac{1}{2}bh$

$= \frac{1}{2}(12)(5) = 30$

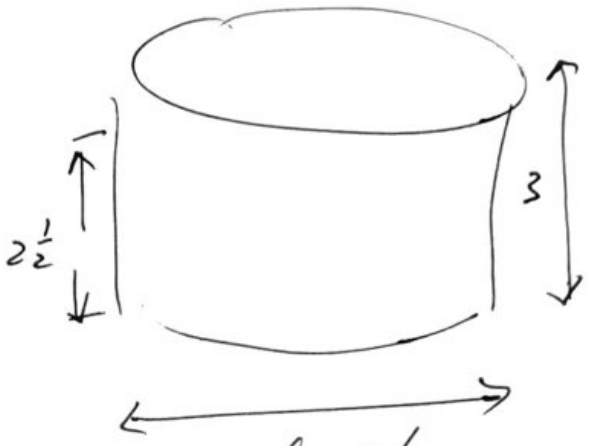


31 A large water basin is in the shape of a right cylinder. The inside of the basin has a diameter of $8\frac{1}{4}$ feet and a height of 3 feet. Determine and state, to the *nearest cubic foot*, the number of cubic feet of water that it will take to fill the basin to a level of $\frac{1}{2}$ foot from the top.

$V = \pi\left(4\frac{1}{8}\right)^2\left(2\frac{1}{2}\right)$

$= 133.6404\ldots$

$\approx 134 \text{ ft}^3$

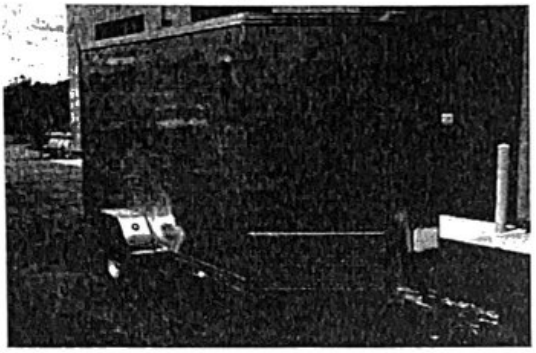


$d = 8\frac{1}{4}$

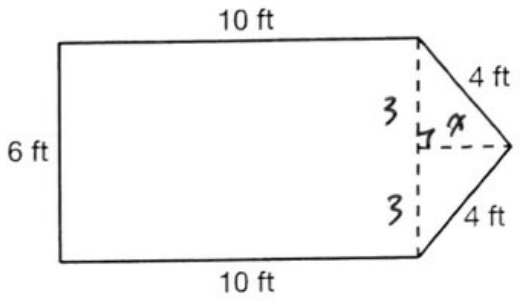
$r = 4\frac{1}{8}$ ft.

34 A cargo trailer, pictured below, can be modeled by a rectangular prism and a triangular prism. Inside the trailer, the rectangular prism measures 6 feet wide and 10 feet long. The walls that form the triangular prism each measure 4 feet wide inside the trailer. The diagram below is of the floor, showing the inside measurements of the trailer.

Cargo Trailer



Cargo Trailer Floor



If the inside height of the trailer is 6.5 feet, what is the total volume of the inside of the trailer, to the *nearest cubic foot*?

$x^2 + 3^2 = 4^2$

$x = \sqrt{16-9} = \sqrt{7}$ [1]

$V_A = \frac{1}{2}(6)\sqrt{7}(6.5)$

$= 51.5921\ldots$

$V_R = 6(10)(6.5)$ [1]

$= 390$

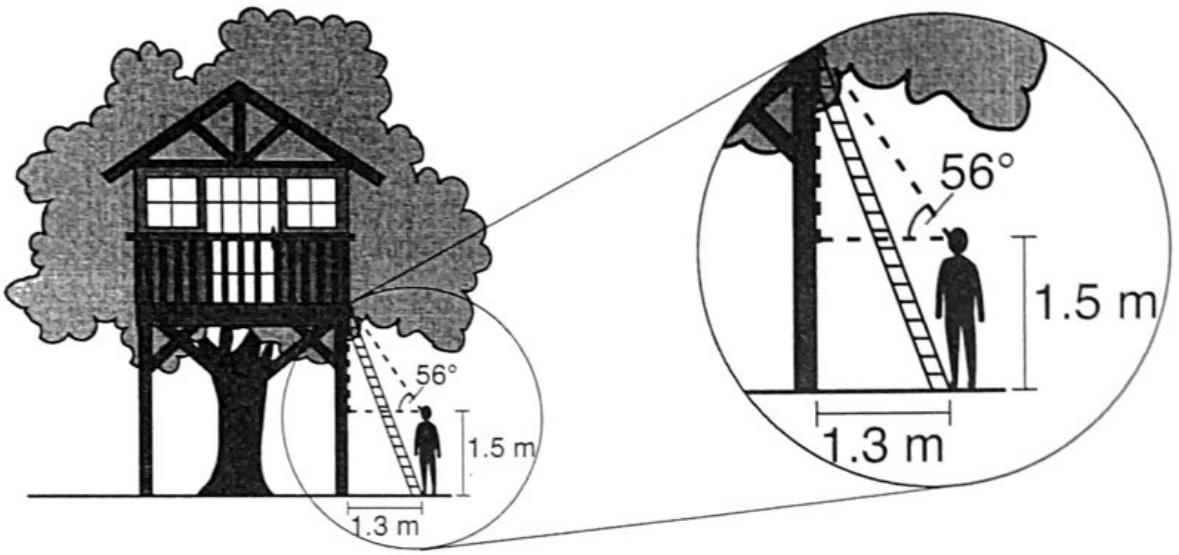
$V_T = 51.5921\ldots + 390$

$= 441.592\ldots$

$\approx 442 \text{ ft}^3$

(4)

33 David has just finished building his treehouse and still needs to buy a ladder to be attached to the ledge of the treehouse and anchored at a point on the ground, as modeled below. David is standing 1.3 meters from the stilt supporting the treehouse. This is the point on the ground where he has decided to anchor the ladder. The angle of elevation from his eye level to the bottom of the treehouse is 56 degrees. David's eye level is 1.5 meters above the ground.

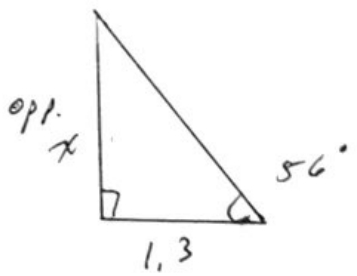


Determine and state the minimum length of a ladder, to the *nearest tenth of a meter*, that David will need to buy for his treehouse.

$\tan 56 = \frac{x}{1.3}$

$x = 1.3 \tan 56$

$= 1.927\,32\ldots$ m [2]



(3 pts)

$h = 1.5 + 1.92\ldots$

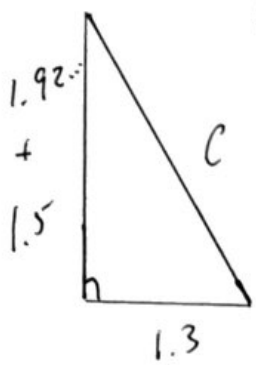
$= 3.427\ldots$

$C^2 = 1.3^2 + (1.5 + 1.92\ldots)^2$

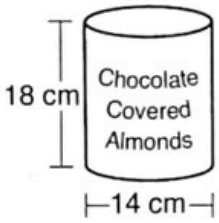
$C = \sqrt{1.69 + 11.74\ldots}$

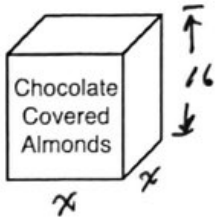
$= \sqrt{13.436\ldots} = 3.665\,59\ldots$

≈ 3.7 m



34 A manufacturer is designing a new container for their chocolate-covered almonds. Their original container was a cylinder with a height of 18 cm and a diameter of 14 cm. The new container can be modeled by a rectangular prism with a square base and will contain the same amount of chocolate-covered almonds.





If the new container's height is 16 cm, determine and state, to the *nearest tenth of a centimeter*, the side length of the new container if both containers contain the same amount of almonds.

[0]

$V = \pi\left(\frac{14}{2}\right)^2 18 = x^2(16) = 2770.884\ldots$

$x = \sqrt{\frac{7^2\pi\,18}{16}}$

$= 13.159798\ldots$

≈ 13.2 cm [3]

A store owner who sells the chocolate-covered almonds displays them on a shelf whose dimensions are 80 cm long and 60 cm wide. The shelf can only hold one layer of new containers when each new container sits on its square base. Determine and state the maximum number of new containers the store owner can fit on the shelf.

$n \leq \frac{80}{13.2} = 6.075\ldots$

$m \leq \frac{60}{13.2} = 4.54$

$m \times n = 6 \times 4 = 24$