

1. $n = 15$

2. $m = 14$

3. Recall the Pythagorean Theorem. If you have a right triangle, the two legs (the sides of the triangle that connect to the right angle) are called x and y , and the hypotenuse (the side of the triangle opposite the right angle) is called z . Then we have $x^2 + y^2 = z^2$.

For the first image, we have legs with lengths 7 and 25. So we can find a by filling in the formula: $7^2 + 25^2 = a^2 = 49 + 625 = 674$. So we know $a^2 = 674$. This must mean that $a = \sqrt{674}$.

For the second image, we have a leg with lengths 8 and b and the hypotenuse is 18. We set up the equation $8^2 + b^2 = 18^2 \Rightarrow 64 + b^2 = 324 \Rightarrow b^2 = 260$. Thus, we know $b = \sqrt{260}$. However, this answer is not quite correct. We can factor $260 = 4 \cdot 65$. Then we have $\sqrt{260} = \sqrt{4 \cdot 65} = \sqrt{4} \cdot \sqrt{65} = 2\sqrt{65}$. This is the more correct answer.

In the third image, we have legs 5 and c and hypotenuse 13. We set up the equation $5^2 + c^2 = 13^2 \Rightarrow 25 + c^2 = 169 \Rightarrow c^2 = 144 \Rightarrow c = 12$.

4. For the first triangle, we have $12^2 + d^2 = 16^2 \Rightarrow 144 + d^2 = 256 \Rightarrow d^2 = 112 \Rightarrow d = \sqrt{112} = 10.6$.

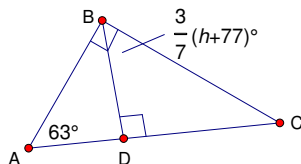
For the second triangle, we have $5^2 + 10^2 = e^2 = 25 + 100 = 125$, so $e = \sqrt{125} = 11.2$.

For the third triangle, we have $5^2 + 3^2 = f^2 = 25 + 9 = 34$, so $f = \sqrt{34} = 5.8$.

5. The angles in a triangle add up to 180° . If you have a right triangle, the two not-right angles must add up to 90° .

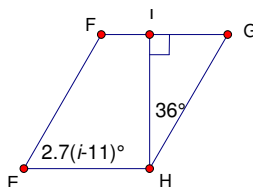
In the first image, we see that one angle is a right angle, so the other two angles must add up to 90. We have $90 = 48 + 3.5g$. Now we solve for g : $42 = 3.5g \Rightarrow g = 12$.

Now the second image. We see that we have three right triangles in one. Label the diagram as shown.



We can see that $\angle ABD = 90 - 63 = 27$. Then we know that $\angle ABC = 90$, so $\angle CBD = 90 - \angle ABD = 90 - 27 = 63$. So we see that $\frac{3}{7}(h + 77) = 63$. Now we solve for h : $h + 77 = 63 \cdot \frac{7}{3} = 147 \Rightarrow h = 147 - 77 = 70$.

Now the third image. We are given this image is a parallelogram. That means that opposite angles are the same.





Math Olympiad and Problem Solving Programs
E210 - Introductory Math Competitions
Problem Set 28.2 - Geometry

Name:

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Since $\triangle IHG$ is a right triangle, $\angle IGH = 90 - 36 = 54$. Then we know $\angle IGH = \angle FEH$, so we have $54 = 2.7(i - 11)$. Now we solve for i : $i - 11 = 54 \div 2.7 = 20 \Rightarrow i = 20 + 11 = \boxed{31}$.

6. $10^2 = 6^2 + h^2 \Rightarrow h = \boxed{8 \text{ ft}}$

7. $\boxed{150 \text{ ft}}$

8. Two sides of the building (I'll call them side A) are 30 yards long and 100 yards tall, and the other two sides of the building (I'll call them side B) are 40 yards long and 100 yards tall. We need to convert these measures to feet. Side A is 90 ft by 300 ft, and Side B is 120 ft by 300 ft.

How many windows fit on Side A? Since the windows are 10 ft long, and the side of the building is 90 ft long, there are $90 \div 10 = 9$ windows across the building. Since the windows are 12 ft tall and the building is 300 ft tall, there are $300 \div 12 = 25$ windows that fit along the height of the building. So on Side A, there are $9 \times 25 = 225$ windows. Since there are 2 Side A's, there are $225 \times 2 = 450$ windows.

How many windows fit on Side B? Since the windows are 10 ft long, and the side of the building is 120 ft long, there are $120 \div 10 = 12$ windows across the side of the building. Since the windows are 12 ft tall and the building is 300 ft tall, there are $300 \div 12 = 25$ windows that fit along the height of the building. So on Side B, there are $12 \times 25 = 300$ windows. Since there are 2 Side B's, there are $300 \times 2 = 600$ windows.

There are $450 + 600 = 1050$ windows. Each window requires a half gallon of cleaner. So the window washer needs $1050 \times \frac{1}{2} = \boxed{525 \text{ gal}}$.