Math 123
Fall 2022
Dr. Lily Yen

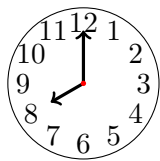# Quiz 2
Show all your work

Problem 1: Lines L and M are parallel with transversals t_1 and t_2. Given two angles $65°$ and $142°$ as shown in the diagram, find the interior angles $\angle a$, $\angle b$, and $\angle c$ in the small triangle.

$a = 77°$, $b = 65°$, and $c = 38°$
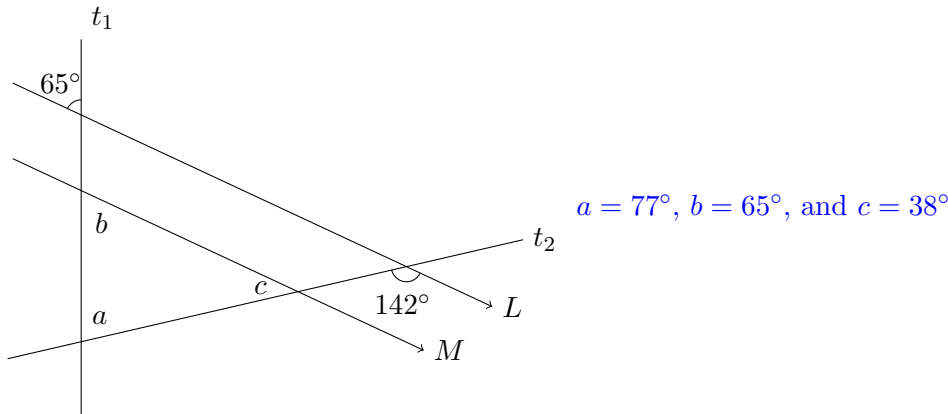
Score: /3

Problem 2: Find the smaller angle formed by the hour hand and the minute hand at eight o'clock on a twelve-hour analogue clock. Show your work.

Since $360°$ is one full round of the circle, each hour covers $360°/12 = 30°$. So the smaller angle is $4 \times 30° = 120°$.

Score: /2

Problem 3: Given two similar quadrilaterals: quadrilateral $ABCD$ is similar to quadrilateral $EFGH$, find x and y given that $\overline{FE} = 1/2$, and $\overline{HE} = 3/5$.
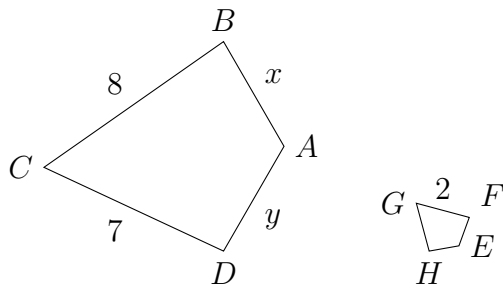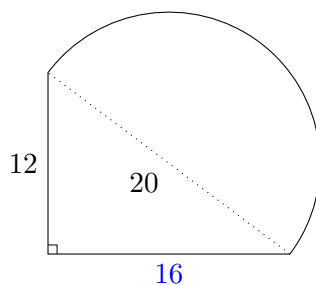

Since quadrilateral $ABCD$ is similar to quadrilateral $EFGH$, $\overline{AB}/8 = \overline{EF}/2$, or the smaller quadrilateral is one quarter in side lengths than the larger one. Since $\overline{FE} = 1/2$, $\overline{AB} = 4 = x \times 1/2 = 2$. Similarly $y = 3/5 \times 4 = 12/5 = 2.4$.

Score: /3

Problem 4: Find the combined perimeter of a right triangle with a semicircle drawn on its hypotenuse. If necessary, round to nearest thousandths.

$$\boxed{59.416 \, \text{u}}$$

If the last side of the triangle has length x, the Pythagorean Theorem gives that $x^2 + 12^2 = 20^2$, so $x^2 = 20^2 - 12^2 = 256 = 16^2$, so $x = 16$.
The semicircle has radius 10, so length $\frac{1}{2} \times 2\pi r = 10\pi$.
The perimeter is thus $12 + 16 + 10\pi = 28 + 10\pi \approx 59.416$.

Score: /3

Problem 5: Shown is Quadrilateral A on the grid.

    a. Find the perimeter of the quadrilateral.

    b. Draw a circle of your choice completely inside Quadrilateral A and find the area of the quadrilateral minus your circle.
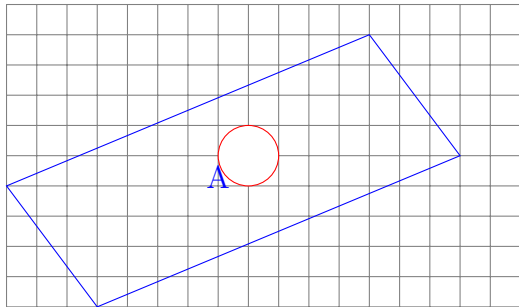
Since quadrilateral A's shorter side is the hypotenuse of a 3-4-5 triangle, the short side has length 5. The long side is part of a 5-12-13 triangle, so has length 13. In summary, the perimeter is $2 \times (5 + 13) = 36$.
Using the enclosing rectangle around quadrilateral A, we find
$9 \times 15 - 3 \times 4 - 5 \times 12 = 135 - 12 - 60 = 63$ square units.
Depending on the size of the circle, one gets $63 - \pi r^2$ as the area without the circle. At least a radius 1 circle can be contained in the quadrilateral.

Score: /3

Problem 6: In the three dimensional guide below, draw a tall square prism with base area 9 square units.

    a. Indicate the height of the square prism on the 3-D grid.

    b. Drill a cylindrical hole of radius 1 in its base circle from the top to the bottom of the tall square prism. Find the volume of the resulting solid.
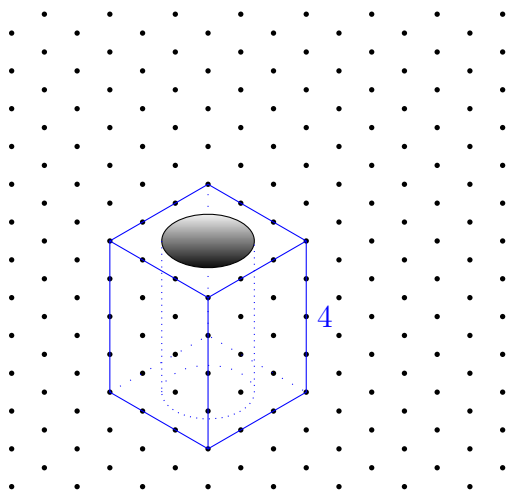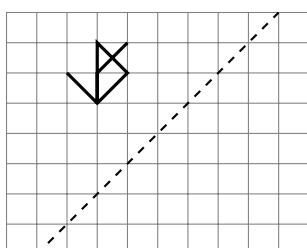

If the height is h, the volume is

$$3^2 h - \pi 1^2 h = (9 - \pi)h.$$

If $h = 4$ as in the figure, the volume is $36 - 4\pi$.

Score: /4

Problem 7: Reflect the given figure along the dashed line.

Score: /2