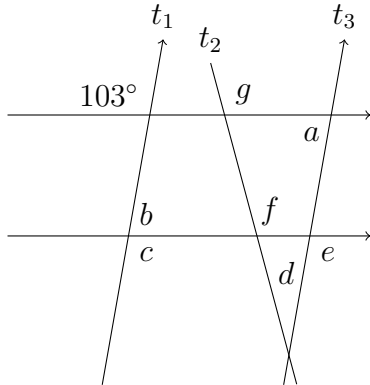


# Quiz Three

Show all your work

Name: \_\_\_\_\_  
 Number: \_\_\_\_\_  
 Signature: \_\_\_\_\_  
 Score: \_\_\_\_/20

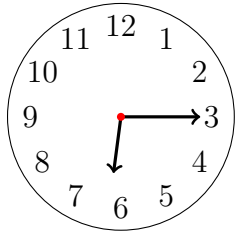
**Problem 1:** Euclid drew two pairs of parallel lines, the horizontal pair, and the pair,  $t_1$  and  $t_3$ . Suppose  $\angle g \cong 112^\circ$ , find angles:  $\angle e$  and  $\angle f$ .



- $\angle a \cong 77^\circ,$
- $\angle b \cong 77^\circ,$
- $\angle c \cong 103^\circ,$
- $\angle d \cong 35^\circ,$
- $\angle e \cong 103^\circ,$
- $\angle f \cong 112^\circ.$

Score: /3

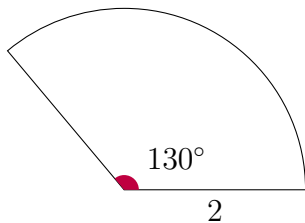
**Problem 2:** Find the smaller angle formed by the hour hand and the minute hand at six fifteen on a twelve-hour analogue clock. Show your work.



The minute hand moves  $6^\circ$  per minute, so at 6:15 it is  $15 \times 6^\circ = 90^\circ$  from vertical. The hour hand moves  $0.5^\circ$  per minute, so at 6:15 it is  $(6 \times 60 + 15) \times 0.5^\circ = 375 \times 0.5^\circ = 187.5^\circ$  from vertical. Therefore the angle between the hands is  $187.5^\circ - 90^\circ = 97.5^\circ$ .

Score: /3

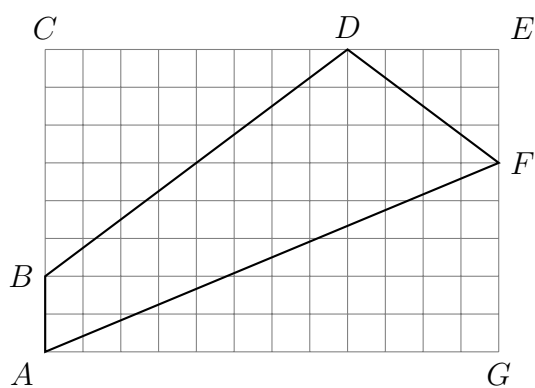
**Problem 3:** Find the area and perimeter of the given sector given that the sector angle is  $130^\circ$  with a radius of 2.



The area is  $\frac{130}{360}$  of the full circle, so  $\frac{13}{36} \cdot \pi 2^2 = \frac{13}{9} \pi$ .  
 Similarly, the length of the arc is  $\frac{130}{360} \cdot 2\pi 2 = \frac{13}{9} \pi$ . Therefore the perimeter is  $2 + 2 + \frac{13}{9} \pi = 3 + \frac{13}{9} \pi$ .

Score: /4

**Problem 4:** Find the area and perimeter of quadrilateral  $ABDF$  enclosed in the given rectangle  $ACEG$ .

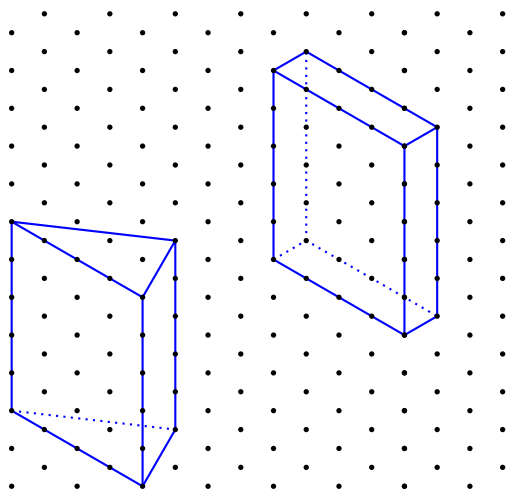


- The the rectangle  $ACEG$  has area  $12 \times 8 = 96$ ,
- the area of  $\triangle AFG$  is  $\frac{5 \times 12}{2} = 30$ ,
- the area of  $\triangle BCD$  is  $\frac{6 \times 8}{2} = 24$ , and
- the area of  $\triangle DEF$  is  $\frac{3 \times 4}{2} = 6$ .

Therefore the area of  $ABDF$  is  $96 - (30 + 24 + 6) = 36$ .

Score: /4

**Problem 5:** Draw a triangular prism and a rectangular prism both of base area 4 square units, and height of 5 units. Which one has a bigger volume? Which one has a bigger surface area?



The volume of each prism is base area  $\times$  height  $= 4 \times 5 = 20$ .

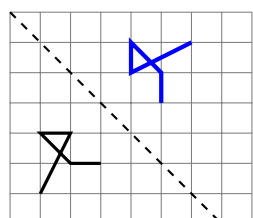
The surface area of each prism depends on the perimeter of the base. Say the perimeter is  $p$ , then the surface area of each prism is  $5p + 2 \times$  base area  $= 5p + 8$ .

For the triangular prism, the drawn solid has area  $5(4 + \sqrt{5} + \sqrt{13}) + 8 = 28 + 5\sqrt{5} + 5\sqrt{13} \approx 57.2$ . The smallest area happens when the triangle is equilateral (with side  $\frac{4}{3}\sqrt{27}$ ). In that case the area is  $20\sqrt[4]{27} + 8 \approx 53.6$ .

For the rectangular prism, the drawn solid has area  $2(4 + 1 \times 5 + 4 \times 5) = 58$ . The smallest area happens when the base is a square (with side 2). In that case the area is  $5 \times 4 \times 2 + 8 = 48$ .

Score: /4

**Problem 6:** Reflect the figure along the dashed diagonal.



Score: /2