

Minnesota State High School Mathematics League

2013-14 Meet 2, Individual Event A

Question #1 is intended to be a quickie and is worth 1 point. Each of the next three questions is worth 2 points. Place your answer to each question on the line provided. You have 12 minutes for this event.

$$x = \frac{1-5y}{2}$$

1. Solve $2x+5y=1$ for x .

$$2x = 1-5y$$

$$x = \frac{1-5y}{2}$$

$$y > \frac{5}{11}x - \frac{2}{11}$$

2. Write the linear inequality that corresponds to the graph shown in Figure 2.

$$m = \frac{3 - (-2)}{7 - (-4)} = \frac{5}{11}$$

$$y = \frac{5}{11}x + b$$

$$(3) = \frac{5}{11}(7) + b$$

$$b = 3 - \frac{35}{11} = -\frac{2}{11}$$

$$\text{or } y - y_0 = m(x - x_0)$$

$$y - 3 = \frac{5}{11}(x - 7)$$

$$y = \frac{5}{11}x - \frac{35}{11} + \frac{33}{11}$$

$$\Rightarrow y = \frac{5}{11}x - \frac{2}{11} \Rightarrow y > \frac{5}{11}x - \frac{2}{11} \quad \text{Assume shaded indicates solution region.}$$

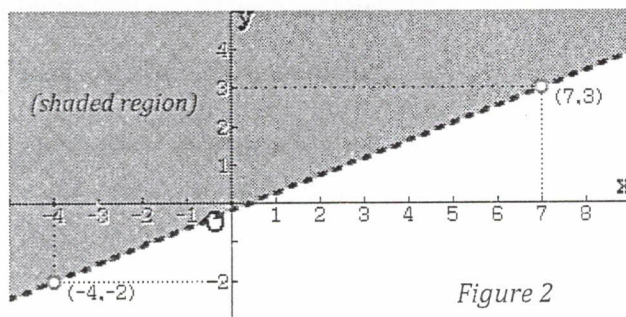


Figure 2

10

3. Brad's father is three times as old as Brad. In ten years, Brad's father will only be twice as old as Brad. How old is Brad currently?

$$F = 3B$$

$$F + 10 = 2(B + 10)$$

$$3B + 10 = 2B + 20$$

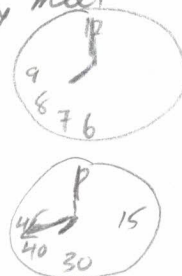
$$B = \boxed{10}$$

$$\frac{480}{11} = 43\frac{7}{11} \text{ min}$$

4. If a clock shows 8:00 pm now, determine exactly how many minutes must pass before the clock's hour and minute hand will be pointing in the same direction for the first time.

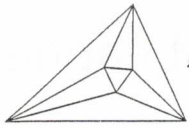
Between 8 pm & 9 pm. Find $m = \#$ minutes after 8 pm when they meet
 distance = rate · time. ^{end} position = start posn + distance

$$40 + \frac{m}{12} = 0 + m \Rightarrow \frac{11}{12}m = 40 \Rightarrow m = \frac{480}{11} = 43\frac{7}{11} \text{ minutes}$$



Name: _____

Team: _____



Minnesota State High School Mathematics League

2013-14 Meet 2, Individual Event B

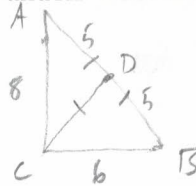
Question #1 is intended to be a quickie and is worth 1 point. Each of the next three questions is worth 2 points.
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Perimeter $[\triangle ACD] =$
18

1. In right triangle ABC , $BC = 6$, $AC = 8$, and $AB = 10$. If \overline{CD} is a median of the triangle, calculate the perimeter of $\triangle ACD$.

$Perim = 5 + 5 + 8 = 18$

3-4-5!

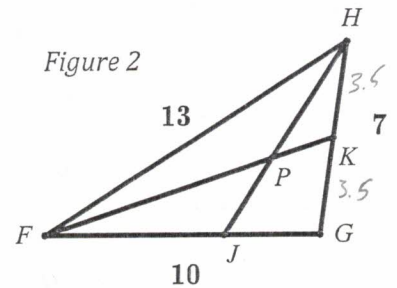


$HP : PJ =$

2. $\triangle FGH$ has side lengths $f = 7$, $g = 13$, and $h = 10$, as shown in Figure 2. Angle bisector \overline{HJ} and median \overline{FK} are drawn, intersecting at point P . Determine exactly the ratio $HP : PJ$.

Solution uses "mass point geometry."

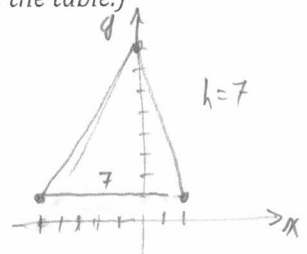
This knowledge was required in 2013-14;
it is not required now.



Volume = 49

3. Calculate the volume of pyramid $GIZA$, where $G = (2, 1)$, $I = (0, 8)$, $A = (-5, 1)$, and Z is any point located exactly 6 units above the xy -plane. (Hint: imagine the coordinate plane being laid flat on a table; point Z would be floating somewhere 6 units above the table.)

$V = \frac{1}{3}BH = \frac{1}{3}(\frac{1}{2}bh)H = \frac{1}{6}7 \cdot 7 \cdot 6 = 49$



$VY : RS =$

4. In $\triangle PQR$ (Figure 4), S and T are the trisection points (nearest to P) of \overline{PQ} and \overline{PR} respectively, V is the intersection of \overline{QT} and \overline{RS} , and \overline{PV} intersects \overline{QR} at W . X is the other trisection point of \overline{PR} , and \overline{RS} and \overline{WX} intersect at Y . Determine exactly the ratio $VY : RS$.

Solution also uses "mass point geometry."

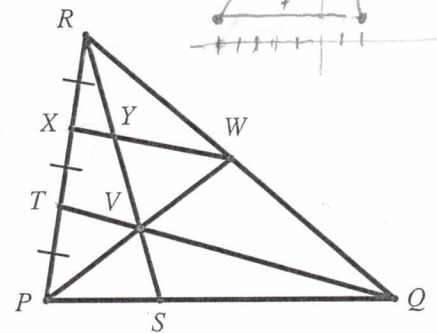


Figure 4

Name: _____

Team: _____