

## Relationships in Triangles: math test solutions, Grade 10 – download the PDF

Test solutions with the detailed point scale. Add up your points and spot what to review.

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

### 1 Midsegment

/ 3 pts

- $BC = 2 DE$ :  $6x - 2 = 4x + 14$ , so  $2x = 16$  and  $x = 8$ . (1 pt)
- $DE = 2(8) + 7 = 23$  and  $BC = 6(8) - 2 = 46$ . (1 pt)
- $AD = 15$  and  $AE = 19$ , so the perimeter of  $ADE$  is  $15 + 19 + 23 = 57$  cm. (1 pt)

## 2 Centers of a right triangle

/ 4 pts

- a.  $BC = \sqrt{12^2 + 5^2} = \sqrt{169} = 13$ . (1 pt)
- b. The circumcenter of a right triangle is the midpoint of the hypotenuse:  
 $\left(\frac{12+0}{2}, \frac{0+5}{2}\right) = (6, 2.5)$ , and  $R = 13 \div 2 = 6.5$ . (1 pt)
- c.  $G = \left(\frac{0+12+0}{3}, \frac{0+0+5}{3}\right) = \left(4, \frac{5}{3}\right)$ . (1 pt)
- d. Area = 30, semiperimeter =  $\frac{12+5+13}{2} = 15$ , so  $r = 30 \div 15 = 2$ . The incenter is at distance 2 from both axes:  $I(2, 2)$ . (1 pt)

## 3 Triangle inequality

/ 3 pts

- a.  $8 + 9 = 17$ , which is not greater than 17: **no**. (1 pt)
- b.  $12 + 15 = 27 > 20$ : **yes**. (1 pt)
- c.  $13 - 6 < x < 13 + 6$ , so  $7 < x < 19$  inches. (1 pt)

## 4 Angles and sides

/ 3 pts

- a.  $12x = 180$ , so  $x = 15$ . (1 pt)
- b.  $\angle K = 60^\circ$ ,  $\angle L = 70^\circ$ ,  $\angle M = 50^\circ$ . (1 pt)
- c.  $\overline{KL}$  is opposite  $M$  ( $50^\circ$ ),  $\overline{LM}$  is opposite  $K$  ( $60^\circ$ ),  $\overline{KM}$  is opposite  $L$  ( $70^\circ$ ). So  $KL < LM < KM$ . (1 pt)

## 5 Medians and the centroid

/ 4 pts

- a.  $AG = 2GD$ :  $3x + 3 = 2x + 10$ , so  $x = 7$ . (1 pt) Then  $AG = 24$  and  $GD = 12$  (1 pt), so  $AD = 36$ . (Total for (a): 2 pts)
- b.  $x = \frac{-4 + 8 + 2}{3} = 2$  (1 pt) and  $y = \frac{3 - 1 + 10}{3} = 4$  (1 pt), so  $G(2, 4)$ .

6

**Perpendicular bisector and the right center**

/ 3 pts

- a.  $PA = PB$ :  $7y - 9 = 4y + 12$ , so  $3y = 21$  and  $y = 7$ . (1 pt)
- b.  $PA = 7(7) - 9 = 40$ . Check:  $PB = 4(7) + 12 = 40$ . (1 pt)
- c. The **circumcenter**, where the perpendicular bisectors of the sides meet. (1 pt)

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