Name _____ Date _____

LESSON 5.4

LESSON 5.4

Practice B

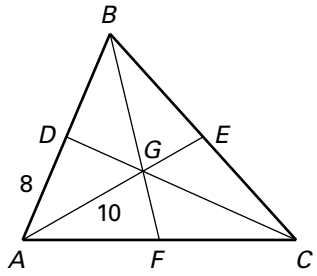
For use with pages 332–341

G is the centroid of $\triangle ABC$, $AD = 8$, $AG = 10$, and $CD = 18$. Find the length of the segment.

1. $\overline{BD}$ **2.** $\overline{AB}$

3. $\overline{EG}$ **4.** $\overline{AE}$

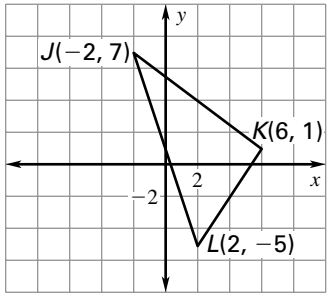
5. $\overline{CG}$ **6.** $\overline{DG}$



7. Use the graph shown.

a. Find the coordinates of M, the midpoint of $\overline{JK}$. Use the median $\overline{LM}$ to find the coordinates of the centroid P.

b. Find the coordinates of N, the midpoint of $\overline{JL}$. Verify that $KP = \frac{2}{3}KN$.



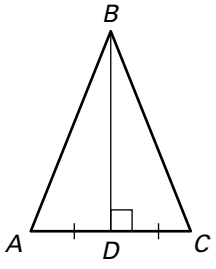
Find the coordinates of the centroid P of $\triangle ABC$.

8. $A(-7, -4)$, $B(-3, 5)$, $C(1, -4)$

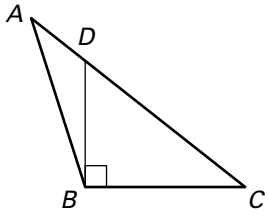
9. $A(0, -2)$, $B(6, 1)$, $C(9, -5)$

Is $\overline{BD}$ a *perpendicular bisector* of $\triangle ABC$? Is $\overline{BD}$ a *median*? an *altitude*?

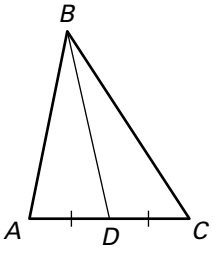
10.



11.



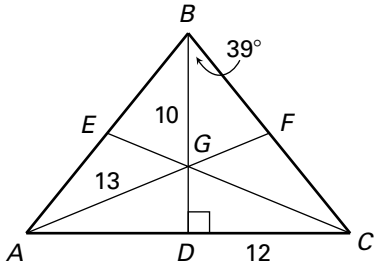
12.



Find the measurements.

13. Given that $AB = BC$, find AD and $m\angle ABC$.

14. Given that G is the centroid of $\triangle ABC$, find FG and BD.



Name _____ Date _____

LESSON 5.4

Practice B *continued*

For use with pages 332–341

Copy and complete the statement for △ *HJK* with medians $\overline{HN}$, $\overline{JL}$, and $\overline{KM}$, and centroid *P*.

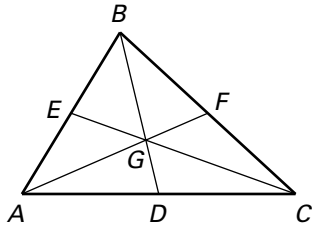
15. $PN = \_?\_\ HN$ **16.** $PL = \_?\_\ JP$ **17.** $KP = \_?\_\ KM$

Point *G* is the centroid of △ *ABC*. Use the given information to find the value of *x*.

18. $CG = 3x + 7$ and $CE = 6x$

19. $FG = x + 8$ and $AF = 9x - 6$

20. $BG = 5x - 1$ and $DG = 4x - 5$



Complete the sentence with *always*, *sometimes*, or *never*.

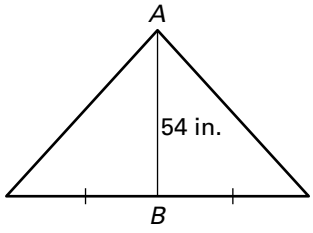
21. The median of a triangle is _?_ the perpendicular bisector.

22. The altitude of a triangle is _?_ the perpendicular bisector.

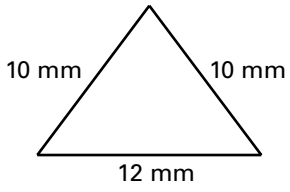
23. The medians of a triangle _?_ intersect inside the triangle.

24. The altitudes of a triangle _?_ intersect inside the triangle.

25. **House Decoration** You are going to put a decoration on your house in the triangular area above the front door. You want to place the decoration on the centroid of the triangle. You measure the distance from point *A* to point *B* (see figure). How far down from point *A* should you place the decoration? *Explain*.

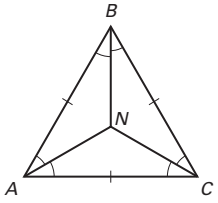


26. **Art Project** You are making an art piece which consists of different items of all shapes and sizes. You want to insert an isosceles triangle with the dimensions shown. In order for the triangle to fit, the height (altitude) must be less than 8.5 millimeters. Find the altitude. Will the triangle fit in your art piece?



Lesson 5.3, continued

6. First draw equilateral $\triangle ABC$, with incenter N.



Because the triangle is equilateral, it is also equiangular. So, the angle bisectors of the triangle form six congruent angles. From the figure you can see that $\triangle ABN \cong \triangle CBN \cong \triangle ACN$ by the ASA Congruence Postulate. Then you can conclude that $\overline{AN} \cong \overline{BN} \cong \overline{CN}$ because corresponding parts of congruent triangles are congruent. Therefore, the incenter N is equidistant from the vertices of the triangle.

7. $N\left(\frac{5}{2}, \frac{5}{2}\right)$ **8.** $N\left(\frac{7\sqrt{2} - \sqrt{5}}{\sqrt{2} + 2\sqrt{5}}, \frac{7\sqrt{2} - \sqrt{5}}{\sqrt{2} + 2\sqrt{5}}\right)$

Lesson 5.4

Practice Level A

1. 6 **2.** 17 **3.** (6, 3) **4.** $2\sqrt{13}$ **5.** (5, −1)

6. $\sqrt{37}$ **7.** $\frac{1}{3}$ **8.** $\frac{2}{3}$ **9.** 6 **10.** 2 **11.** 6

12. 12 **13.** 6 **14.** 3 **15.** yes; yes; yes

16. no; no; no **17.** The equation should be $BD = \frac{2}{3}BE$, so $BD = \frac{2}{3}(24) = 16$ and $DE = 24 - 16 = 8$. **18.** 12 **19.** 8

Practice Level B

1. 8 **2.** 16 **3.** 5 **4.** 15 **5.** 12 **6.** 6

7. a. $M(2, 4)$; $P(2, 1)$ **b.** $N(0, 1)$; $KP = 4$ and $KN = 6$ therefore $KP = \frac{2}{3}KN$. **8.** (−3, −1)

9. (5, −2) **10.** yes; yes; yes **11.** no; no; no

12. no; yes; no **13.** 12; 78° **14.** 6.5; 15

15. $\frac{1}{3}$ **16.** $\frac{1}{2}$ **17.** $\frac{2}{3}$ **18.** 7 **19.** 5 **20.** 3

21. sometimes **22.** sometimes **23.** always

24. sometimes **25.** 36 in.; By Theorem 5.8, the distance from the vertex to the centroid is $\frac{2}{3}$ times the length of the median $(\overline{AB})$. **26.** 8 mm; yes

Practice Level C

1. 10 **2.** 5 **3.** 12 **4.** 6.5 **5.** 13 **6.** $\frac{2}{3}$ **7.** $\frac{1}{3}$

8. a. (6, 6) **b.** (6, 3) **c.** (4, 0); $BG = 2\sqrt{13}$ and $BE = 3\sqrt{13}$ therefore $BG = \frac{2}{3}BE$. **9.** 2 **10.** 2

11. 8 **12.** (5, 2) **13.** (−5, 6) **14.** always

15. always **16.** 3 in.^{2}; altitude **17. 1.** $\triangle ABC$ is isosceles, $\overline{BD}$ is a median to base $\overline{AC}$; (Given)

2. D is the midpoint of $\overline{AC}$.; (Definition of median) 3. $\overline{AD} \cong \overline{CD}$; (Definition of midpoint)

4. $\overline{AB} \cong \overline{CB}$; (Definition of isosceles triangle)

5. $\overline{BD} \cong \overline{BD}$; (Reflexive Property of Congruence)

6. $\triangle BDC \cong \triangle BDA$; (SSS Congruence Postulate) **7.** $\angle BDC \cong \angle BDA$; (Corresponding parts of congruent triangles are congruent.)

8. $\angle BDC$ and $\angle BDA$ are a linear pair.; (Definition of linear pair) **9.** $\overline{BD} \perp \overline{AC}$; (If two lines intersect to form a linear pair of congruent angles, then the lines are perpendicular.) **10.** $\overline{BD}$ is also an altitude.; (Definition of altitude)

Review for Mastery

1. $RU = 6$, $RS = 4$ **2.** 26 **3.** (5, 2) **4.** (−5, 6)

5. (2, 6) **6.** (3, 2)

Problem Solving Workshop: Using Alternative Methods

1. (7, 5) **2.** (5, 6) **3.** $PD = 600$ ft, $PN = 300$ ft, $MD = 480$ ft, $ED = 960$ ft, $PM = 380$ ft, $FM = 1140$ ft

Challenge Practice

1. $x = 3.5$ or $x = -2$ **2.** $x = 5.5$ or $x = -1$

3. $x = 2$ **4.** $x = 7$ or $x = 1$ **5.** $\frac{16\sqrt{5}}{3}$

6. $\frac{8\sqrt{1794}}{3}$ **7.** $\frac{4\sqrt{2.816}}{3}$ **8.** $\frac{4\sqrt{317.2136}}{3}$

9. Midpoint of $\overline{AB}$: $\left(\frac{a}{2}, 0\right)$;

midpoint of $\overline{BC}$: $\left(\frac{b}{2}, \frac{c}{2}\right)$;

midpoint of $\overline{CA}$: $\left(\frac{a + b}{2}, \frac{c}{2}\right)$