1. 38, 38, 38, 38

2. 26, 128, 128

3. 118, 31, 31

4. 33.5, 33.5, 113, 33.5

5. 32, 90, 58, 32

6. 90, 60, 60, 30

7. 55, 35, 55, 90

8. 60, 90, 30

9. 90, 55, 90

10. 4; $LN = MP = 4$

11. 3; $LN = MP = 7$

12. 1; $LN = MP = 4$

13. 9; $LN = MP = 67$

14. $\frac{5}{3}$; $LN = MP = \frac{29}{3} = 9\frac{2}{3}$

15. $\frac{5}{2}$; $LN = MP = 12\frac{1}{2}$

16. rhombus; one diag. bis. 2 $\angle$s of the $\square$ (Thm. 6-12).

17. rhombus; the diags. are $\perp$.

18. neither; the figure could be a $\square$ that is neither a rhombus nor a rect.

19. The pairs of opp. sides of the frame remain $\cong$, so the frame remains a $\square$.

20. After measuring the sides, she can measure the diagonals. If the diags. are $\cong$, then the figure is a rectangle by Thm. 6-14.

21. Square; a square is both a rectangle and a rhombus, so its diag. have the properties of both.

22. **a.** Def. of a rhombus

b. Diagonals of a ▱ bisect each other.

c. $\overline{AE} \cong \overline{AE}$

d. Reflexive Prop. of $\cong$

e. $\triangle ABE \cong \triangle ADE$

f. CPCTC

g. $\angle$ Add. Post.

h. $\angle AEB$ and $\angle AED$ are rt. $\angle$s.

i. $\cong$ suppl. $\angle$s are rt. $\angle$s Thm.

j. Def. of $\perp$

23. Answers may vary. Sample: The diagonals of a ▱ bisect each other so $\overline{AE} \cong \overline{CE}$. Both $\angle AED$ and $\angle CED$ are right $\angle$s because $\overline{AC} \perp \overline{BD}$, and since $\overline{DE} \cong \overline{DE}$ by the Reflexive Prop., $\triangle AED \cong \triangle CED$ by SAS. By CPCTC $\overline{AD} \cong \overline{CD}$, and since opp. sides of a ▱ are $\cong$, $\overline{AB} \cong \overline{BC} \cong \overline{CD} \cong \overline{AD}$. So $ABCD$ is a rhombus because it has 4 $\cong$ sides.

24. A

25–34. **Symbols may vary. Samples are given:**
parallelogram: ▱
rhombus: ▱R
rectangle: ▭
square: $\boxed{\text{S}}$

25. ▱R, $\boxed{\text{S}}$

26. ▱, ▱R, ▭, $\boxed{\text{S}}$

27. ▱, ▱R, ▭, $\boxed{\text{S}}$

28. ▱, ▱R, ▭, $\boxed{\text{S}}$

29. ▭, $\boxed{\text{S}}$

30. ▱, ▱R, ▭, $\boxed{\text{S}}$

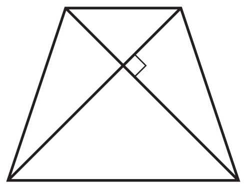
31. ▱, ▱R, ▭, $\boxed{\text{S}}$

32. ▭, $\boxed{\text{S}}$

33. ▱R, $\boxed{\text{S}}$

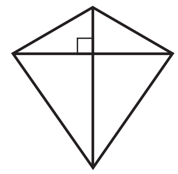
34. ▱R, $\boxed{\text{S}}$

35.



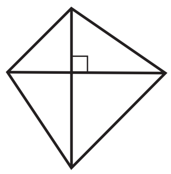
Diag. are $\cong$, diag. are $\perp$.

36.



Diag. are $\perp$ and $\cong$.

37.



Diag. are $\cong$, diag. are $\perp$.

38. **a.** Opp. sides are $\cong$ and $\parallel$; diag. bis. each other; opp. $\angle$s are $\cong$; consec. $\angle$s are suppl.

b. All sides are $\cong$; diag. are $\cong$.

c. All $\angle$s are rt. $\angle$s; diag. are $\perp$ bis. of each other; each diag. bis. two $\angle$s.

39. **1.** $ABCD$ is a parallelogram. (Given) $\overline{AC}$ bisects $\angle BAD$ and $\angle BCD$. (Given)

2. $\angle 1 \cong \angle 2, \angle 3 \cong \angle 4$ (Def. of bisect)

3. $\overline{AC} \cong \overline{AC}$ (Refl. Prop. of $\cong$)

4. $\triangle ABC \cong \triangle ADC$ (ASA)

5. $\overline{AB} \cong \overline{AD}$ (CPCTC)

6. $\overline{AB} \cong \overline{DC}, \overline{AD} \cong \overline{BC}$ (Opp. sides of a ▱ are $\cong$.)

7. $\overline{AB} \cong \overline{BC} \cong \overline{CD} \cong \overline{AD}$ (Trans. Prop. of $\cong$)

8. $ABCD$ is a rhombus. (Def. of rhomb.)

40.

$\square ABCD$ — Given

$\overline{AC} \cong \overline{BD}$ — Given

$\overline{AD} \cong \overline{AD}$ — Ref. Prop.

$\overline{AB} \cong \overline{CD}$ — Opp. sides of a ▱ are ≅.

$\triangle ABD \cong \triangle DCA$ — SSS

$m\angle A + m\angle D = 180$ — Consecutive ∠s of a ▱ are suppl.

$\angle A \cong \angle D$ — CPCTC

$m\angle D + m\angle D = 180$; $m\angle A + m\angle A = 180$ — Substitution

$m\angle D = 90$; $m\angle A = 90$ — Div. Prop. of Eq.

$\angle D \cong \angle B$; $\angle A \cong \angle C$ — Opp. ∠s of a ▱ are ≅.

ABCD is a rectangle — Def. of a rectangle

41. Yes; since all right ∠s are ≅, the opp. ∠s are ≅ and it is a ▱. Since it has all right ∠s, it is a rectangle.

42. Yes; 4 sides are ≅, so the opp. sides are ≅ making it a ▱. Since it has 4 ≅ sides it is also a rhombus.

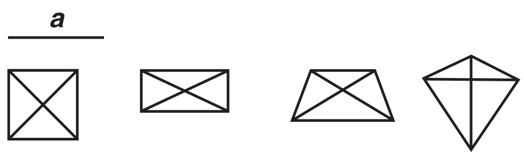
43. Yes; a quad. with 4 ≅ sides is a ▱ and a ▱ with 4 ≅ sides and 4 right ∠s is a square.

44. 30

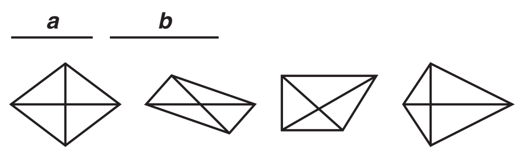
45. $x = 5, y = 32, z = 7.5$ **46.** $x = 7.5, y = 3$

47–49. Drawings may vary. Samples are given.

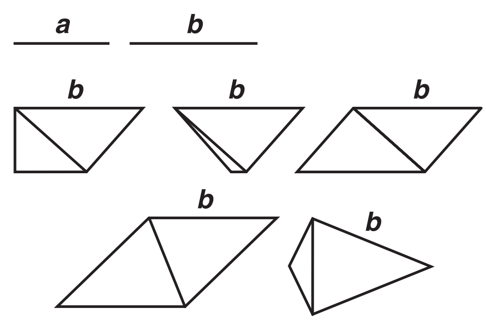
47. Square, rectangle, isosceles trapezoid, kite



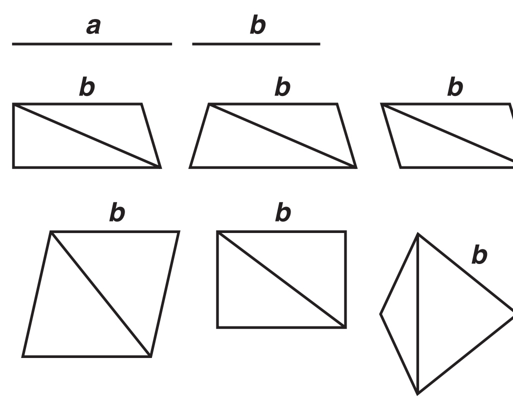
48. Rhombus, ▱, trapezoid, kite



49. For $a < b$: trapezoid, isosc. trapezoid $\left(a > \frac{1}{2}b\right)$, ▱, rhombus, kite



For $a > b$: trapezoid, isosc. trapezoid, ▱, rhombus $(a < 2b)$, kite, rectangle, square $\left(\text{if } a = \sqrt{2}b\right)$



50. 16, 16 **51.** 2, 2 **52.** 1, 1 **53.** 1, 1

54–59. Answers may vary. Samples are given.

54. Draw diag. 1, and construct its midpt. Draw a line through the mdpt. Construct segments of length diag. 2 in opp. directions from mdpt. Then, bisect these segments. Connect these mdpts. with the endpts. of diag. 1.

55. Construct a rt. ∠, and draw diag. 1 from its vertex. Construct the ⊥ from the opp. end of diag. 1 to a side of the rt. ∠. Repeat to other side.

56. Same as 54, but construct a ⊥ line at the midpt. of diag. 1.

57. Same as 56, except make the diag. ≅.

58. Draw diag. 1. Construct a ⊥ at a pt. different than the mdpt. Construct segments on the ⊥ line of length diag. 2 in opp. directions from the pt. Then, bisect these segments. Connect these midpts. to the endpts. of diag. 1.

59. Draw an acute ∠. Use the compass to mark the length of diag. 1 on one side of the angle. The other side will be a base for the trap. Construct a line ∥ to the base through the non-vertex endpt. of diag. 1. Set the compass to the length of diag. 2 and place the point on the non-vertex endpt. of the base. Draw an arc that intersects the line ∥ to the base. Draw diag. 2 through these two points. Finish by drawing the non-∥ sides of the trap.

60. Impossible; if the diag. of a ▱ are ≅, then it would have to be a rectangle and have right ∠s.

61. Yes; ≅ diag. in a ▱ mean it can be a rectangle with 2 opp. sides 2 cm long.

62. Impossible; in a ▱, consecutive ∠s must be supp., so all ∠s must be right ∠s. This would make it a rectangle.

63. Given ▱$ABCD$ with diag. $\overline{AC}$. Let $\overline{AC}$ bisect $\angle BAD$. Because $\triangle ABC \cong \triangle DAC$, $AB = DA$ by CPCTC. But since opp. sides of a ▱ are ≅, $AB = CD$ and $BC = DA$. So $AB = BC = CD = DA$, and ▱$ABCD$ is a rhombus. The new statement is true.