

Ch 7 Review Problems pp. 292-295 - due ?? *Monday 01/23 #1-53 all*

- Theorem 17: Equal corresponding angles mean that lines are parallel.
- Corollary 1: Equal alternate interior angles mean that lines are parallel.
- Corollary 2: Supplementary interior angles on the same side of a transversal mean that lines are parallel.
- Corollary 3: In a plane, two lines perpendicular to a third line are parallel.
- The Parallel Postulate – Through a point not on a line, there is exactly one line parallel to the given line.
- Theorem 18: In a plane, two lines parallel to a third line are parallel to each other.
- Theorem 19: Parallel lines form equal corresponding angles.
- Corollary 1: Parallel lines form equal alternate interior angles.
- Corollary 2: Parallel lines form supplementary interior angles on the same side of a transversal.
- Corollary 3: In a plane, a line perpendicular to one of two parallel lines is also perpendicular to the other.
- Theorem 20: The Triangle Sum Theorem – The sum of the angles of a triangle is 180° .
- Corollary 1: If two angles of one triangle are equal to two angles of another triangle, the third angles are equal.
- Corollary 2: The acute angles of a right triangle are complementary.
- Corollary 3: Each angle of an equilateral triangle is 60° .
- Theorem 21: An exterior angle of a triangle is equal to the sum of the remote interior angles.
- Theorem 22: The AAS Theorem – If two angles and the side opposite one of them in one triangle are equal to the corresponding parts of another triangle, the triangles are congruent.
- Theorem 23: The HL Theorem – If the hypotenuse and a leg of one right triangle are equal to the corresponding parts of another right triangle, the triangles are congruent.

7.1 – Quadrilaterals

Def: A diagonal of a polygon is a line segment that connects any two nonconsecutive vertices.

Theorem 24: The sum of the angles of a quadrilateral is 360° .

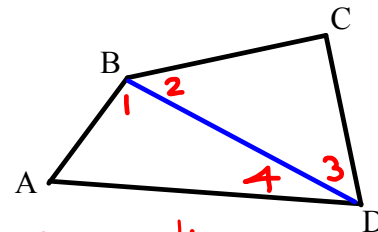
Given: ABCD is a quadrilateral.

Prove: $\angle A + \angle B + \angle C + \angle D = 360^\circ$

Proof:

Statements

1. Draw BD
2. $\angle A + \angle 1 + \angle 4 = 180^\circ$ and $\angle 2 + \angle 3 + \angle C = 180^\circ$
3. $\angle A + \angle 1 + \angle 4 + \angle 2 + \angle 3 + \angle C = 360^\circ$
4. $\angle 1 + \angle 2 = \angle ABC$ and $\angle 3 + \angle 4 = \angle CDA$
5. $\angle A + \angle ABC + \angle C + \angle CDA = 360^\circ$



Reasons

2 points define a line
The sum of the angles in a triangle is 180°
(Δ sum Theorem)
Addition & Simplification
Betweenness of Rays Theorem
Substitution (#4 into #3)

Def. A rectangle is a quadrilateral each of whose angles is a right angle.

Corollary to Theorem 24: A quadrilateral is equiangular iff it is a rectangle.

Given: ABCD with $\angle A = \angle B = \angle C = \angle D$.

Prove: ABCD is a rectangle.

Given: ABCD is a rectangle.

Prove: $\angle A = \angle B = \angle C = \angle D$.

To Prove ABCD is a rectangle:

1. $\angle A = \angle B = \angle C = \angle D$;
ABCD is a quadrilateral

2. $\angle A + \angle B + \angle C + \angle D = 360^\circ$

3. $\angle A + \angle A + \angle A + \angle A = 360^\circ$

4. $4\angle A = 360^\circ$

5. $\angle A = 90^\circ$

6. $\angle B = \angle C = \angle D = 90^\circ$

7. $\angle A, \angle B, \angle C, \angle D$ are all right angles

8. ABCD is a rectangle

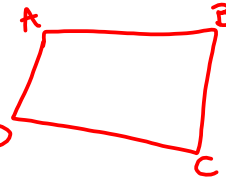
Given

sum of \angle 's
in a quadrilateral
is 360°

substitution
simplification
division

substitution

90° angles are right
A quadrilateral with all right \angle 's is
a rectangle



To prove $\angle A = \angle B = \angle C = \angle D$:

1. ABCD is a rectangle

2. $\angle A, \angle B, \angle C, \angle D$ are all right angles

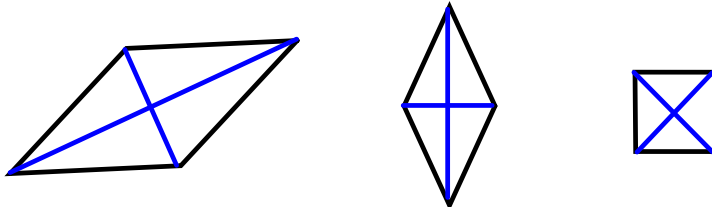
3. $\angle A = \angle B = \angle C = \angle D$

Given

All angles of a rectangle
are right angles

All right angles are equal

Each of the figures below is a rhombus.



What seems to be true about

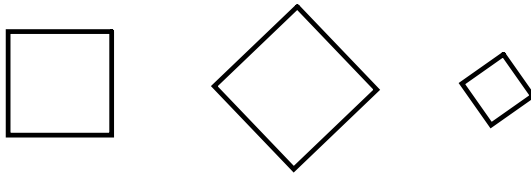
19. the sides of a rhombus?

- all equal length
- opposite sides parallel

20. the diagonals of a rhombus?

- perpendicular to each other
- bisect each other

Each of the figures below is a square.



What property do you think squares have in common with

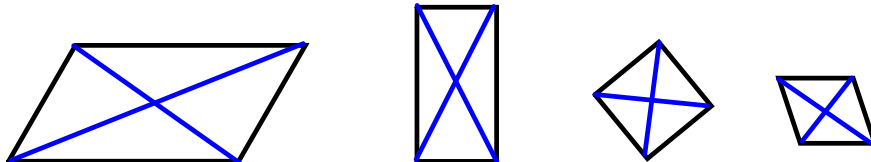
21. rectangles

all angles are right angles

22. rhombuses?

all sides equal length

Each of the figures below is a parallelogram.



What seems to be true about

23. The opposite sides of a parallelogram?

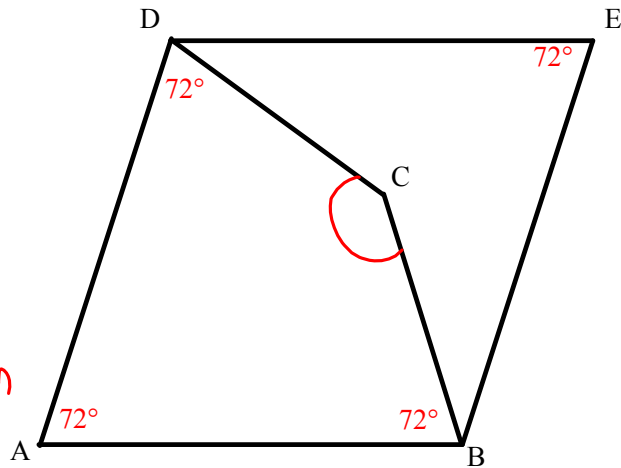
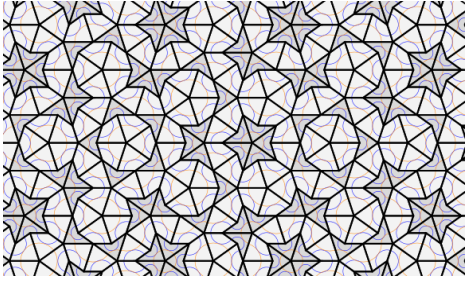
- equal length
- parallel to each other

24. The opposite angles of a parallelogram?

- equal measure

25. The diagonals of a parallelogram?

- bisect each other



28. Which Penrose tile is convex?

ABCD is convex
(any line segment drawn between 2 points will stay inside the shape)

29. Find the measure of $\angle BCD$.

$\angle BCD + 72^\circ + 72^\circ + 72^\circ = 360^\circ$ by Quadrilateral Sum Theorem
 $\angle BCD + 216^\circ = 360^\circ$ (simplification)
 $\angle BCD = 144^\circ$ (subtraction)

30. Draw AC and CE.

The figure is drawn so that $AB=BE=ED=DA$ and $CB=CE=CD$.

31. How do you know that $\triangle ADC \cong \triangle ABC$ and $\triangle EDC \cong \triangle EBC$?

SAS SSS

Find the measures of the rest of the angles.

32. What do all four triangles in the figure have in common?

all are isosceles

33. What seems to be true about points A, C, and E? collinear

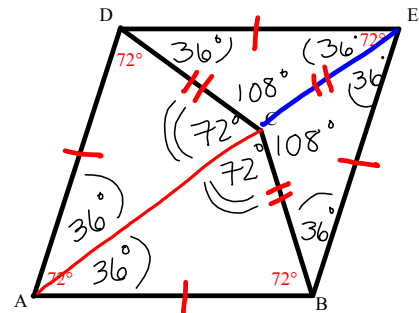
34. Why? $72^\circ + 108^\circ = 180^\circ$, so ACE is a straight angle

35. Does the figure appear to have line symmetry? Why or why not?

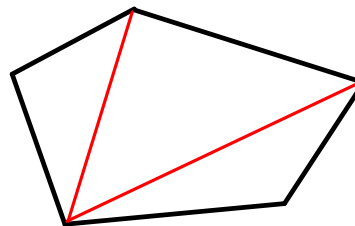
Yes, about the line AE

36. If a quadrilateral is equilateral, does it follow that it is also equiangular? Why or why not?

No. An equilateral quadrilateral, or rhombus, may have non-right angles, as in this example, where 2 opposite angles measure 72° and 2 measure 108° .



In the figure below, a pentagon has been divided into triangles by the diagonals from one vertex.

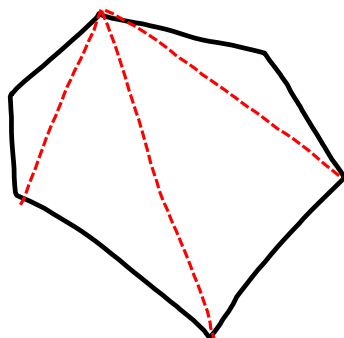


38. How many sides does a pentagon have, **5**

how many diagonals were drawn, **2**

and how many triangles were formed? **3**

39. Draw a hexagon and the diagonals from one vertex.

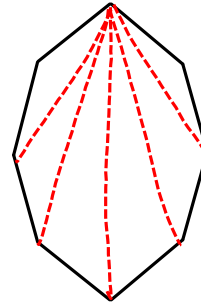


40. How many sides does a hexagon have, **6**

how many diagonals did you draw, **3**

and how many triangles were formed? **4**

41. Draw the diagonals from one vertex for the given figure.



42. How many sides does the polygon have, **8**
 how many diagonals did you draw, **5**
 and how many triangles were formed? **6**

In general, if a polygon has n sides, in terms of n ,

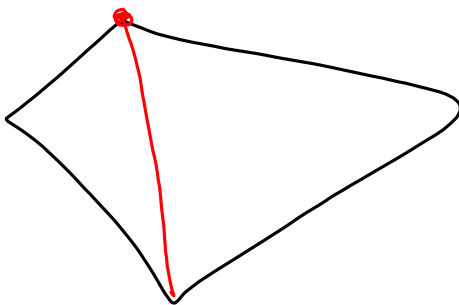
43. how many diagonals can be drawn from one vertex?

$$n - 3$$

44. how many triangles do these diagonals form?

$$n - 2$$

45. Show that your answers are correct for a quadrilateral.



$$n = 4$$

$$d = 4 - 3 = 1 \checkmark$$

$$\Delta = 4 - 2 = 2 \checkmark$$