**VOCABULARY**

**Polygon –** a closed shape consisting of three or more line segments as sides.

**Quadrilateral –** a polygon with four sides.

**Parallelogram –** a quadrilateral with two pairs of opposite parallel sides.

**Auxiliary Line –** a line drawn in a diagram to help complete a proof by making other figures

such as congruent triangles or angles formed by a transversal.

**Diagonal –** a segment with two nonconsecutive vertices of a polygon as its endpoints.

**Bisect –** a segment divides another segment into two congruent segments.

**Parallelogram Theorems**

|  |  |  |
| --- | --- | --- |
| **Opposite Sides of a Parallelogram**  **are Congruent.** | **Opposite Angles of a Parallelogram**  **are Congruent.** | **The Diagonals of a Parallelogram**  **Bisect Each Other.** |

**For #1-2, complete the statements and justifications for each two-column proof**

**to prove that opposite sides and angles of a parallelogram are congruent.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **1.** | **Given:** ABCD is a parallelogram  **Prove:** AB ≅ CD, BC ≅ DA,  ∠B ≅ ∠D |  | **2.** | **Given:** ABCD is a parallelogram  **Prove:** DA ≅ BC, AB ≅ CD,  ∠A ≅ ∠C |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Step** | **Statement** | **Justification** |  | **Step** | **Statement** | **Justification** |
| **1** | ABCD is a parallelogram | Given | **1** | ABCD is a parallelogram | Given |
| **2** | Draw diagonal \_\_\_ | Definition of auxiliary line | **2** | Draw diagonal \_\_\_ | Definition of auxiliary line |
| **3** | ∠BAC ≅ ∠\_\_\_\_\_\_,  ∠BCA ≅ ∠\_\_\_\_\_\_, | Alternate Interior Angles are Congruent | **3** | ∠BDC ≅ ∠\_\_\_\_\_\_,  ∠DBC ≅ ∠\_\_\_\_\_\_, | Alternate Interior Angles are Congruent |
| **4** | AC ≅ \_\_\_\_ | Reflexive sides are congruent | **4** | BD ≅ \_\_\_\_ | Reflexive sides are congruent |
| **5** | ΔABC ≅ Δ\_\_\_\_\_\_ |  | **5** | ΔABD ≅ Δ\_\_\_\_\_\_ |  |
| **6** | AB ≅ CD, BC ≅ DA, ∠B ≅ ∠D |  | **6** | DA ≅ BC, AB ≅ CD, ∠A ≅ ∠C |  |

**For #3-4, complete the statements and justifications for each two-column proof**

**to prove that diagonals of a parallelogram bisect each other.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **3.** | **Given:** ABCD is a parallelogram  **Prove:** BE ≅ DE, AE ≅ CE |  | **4.** | **Given:** ABCD is a parallelogram  **Prove:** EB ≅ ED, EC ≅ EA |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Step** | **Statement** | **Justification** |  | **Step** | **Statement** | **Justification** |
| **1** | ABCD is a parallelogram | Given | **1** | ABCD is a parallelogram | Given |
| **2** | Draw diagonals BD and AC to form E. | Definition of auxiliary line | **2** | Draw diagonals BD and AC to form E. | Definition of auxiliary line |
| **3** | ∠ABE ≅ ∠\_\_\_\_\_\_,  ∠BAE ≅ ∠\_\_\_\_\_\_, | Alternate Interior Angles are Congruent | **3** | ∠CBE ≅ ∠\_\_\_\_\_\_,  ∠BCE ≅ ∠\_\_\_\_\_\_, | Alternate Interior Angles are Congruent |
| **4** | AB ≅ \_\_\_\_ | Opposite Sides of a Parallelogram are ≅ | **4** | BC ≅ \_\_\_\_ | Opposite Sides of a Parallelogram are ≅ |
| **5** | ΔABE ≅ Δ\_\_\_\_\_\_ |  | **5** | ΔBEC ≅ Δ\_\_\_\_\_\_ |  |
| **6** | BE ≅ DE, AE ≅ CE |  | **6** | EB ≅ ED, EC ≅ EA |  |

**KEY IDEAS ABOUT PARALLELOGRAMS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| **Opposite Sides**  **are Parallel** | **Alternate Interior Angles are Congruent** | **Opposite Sides**  **are Congruent** | **Opposite Angles**  **are Congruent** | **Same-Side Interior**  **Angles are Supplementary** | **Diagonals Bisect**  **Each Other** |

For #1-6, let each quadrilateral be a parallelogram. Complete the relationship based on the given key idea.

|  |  |  |
| --- | --- | --- |
| 1. Opposite Sides are Congruent     PG ≅ \_\_\_\_ , GR ≅ \_\_\_\_ | 1. Opposite Angles are Congruent       ∠G ≅ ∠\_\_\_\_ , ∠P ≅ ∠\_\_\_\_ | 1. Same-Side Interior Angles are Supplementary     *m*∠P + *m*∠\_\_\_\_\_\_ = \_\_\_\_°  *m*∠P + *m*∠\_\_\_\_\_\_ = \_\_\_\_° |
| 1. Alternate Interior Angles are Congruent     ∠GPR ≅ ∠\_\_\_\_ , ∠GRP ≅ ∠\_\_\_\_ | 1. Diagonals Bisect Each Other     PS ≅ \_\_\_\_ , MS ≅ \_\_\_\_ | 1. Opposite Sides are Parallel     PG || \_\_\_\_ , PM || \_\_\_\_ |

For #7-12, let each quadrilateral be a parallelogram. Complete the relationship with ≅, || or = 180° and

circle the key idea.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Diagram | Relationship | Key Idea | | | | | |
| **7.** |  | ∠SRG ∠NGR ,  ∠SGR ∠NRG | Opposite Sides  are Parallel | Alternate Interior Angles are Congruent | Opposite Sides  are Congruent | Opposite Angles  are Congruent | Same-Side Interior  Angles are Supplementary | Diagonals Bisect  Each Other |
| **8.** |  | CO LD ,  CL OD | Opposite Sides  are Parallel | Alternate Interior Angles are Congruent | Opposite Sides  are Congruent | Opposite Angles  are Congruent | Same-Side Interior  Angles are Supplementary | Diagonals Bisect  Each Other |
| **9.** |  | KC YT ,  KY CT | Opposite Sides  are Parallel | Alternate Interior Angles are Congruent | Opposite Sides  are Congruent | Opposite Angles  are Congruent | Same-Side Interior  Angles are Supplementary | Diagonals Bisect  Each Other |
| **10.** |  | ∠A ∠I ,  ∠R ∠Z | Opposite Sides  are Parallel | Alternate Interior Angles are Congruent | Opposite Sides  are Congruent | Opposite Angles  are Congruent | Same-Side Interior  Angles are Supplementary | Diagonals Bisect  Each Other |
| **11.** |  | PG BG ,  HG TG | Opposite Sides  are Parallel | Alternate Interior Angles are Congruent | Opposite Sides  are Congruent | Opposite Angles  are Congruent | Same-Side Interior  Angles are Supplementary | Diagonals Bisect  Each Other |
| **12.** |  | *m*∠C *m*∠I  *m*∠C *m*∠T | Opposite Sides  are Parallel | Alternate Interior Angles are Congruent | Opposite Sides  are Congruent | Opposite Angles  are Congruent | Same-Side Interior  Angles are Supplementary | Diagonals Bisect  Each Other |

**Quadrilateral to Parallelogram Converse Theorems**

|  |  |  |
| --- | --- | --- |
| **If two pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.** | **If two pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram.** | **If diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.** |

**For #13-14, complete the statements and justifications for each two-column proof**

**to prove that opposite congruent SIDES of a quadrilateral form a parallelogram.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **13.** | **Given:** AB ≅ CD, BC ≅ DA  **Prove:** ABCD is a parallelogram |  | **14.** | **Given:** BC ≅ DA, CD ≅ AB  **Prove:** ABCD is a parallelogram |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Step** | **Statement** | **Justification** |  | **Step** | **Statement** | **Justification** |
| **1** | AB ≅ CD, BC ≅ DA | Given | **1** | BC ≅ DA, CD ≅ AB | Given |
| **2** | Draw diagonal \_\_\_ | Definition of auxiliary line | **2** | Draw diagonal \_\_\_ | Definition of auxiliary line |
| **3** | AC ≅ \_\_\_\_ | Reflexive sides are congruent | **3** | BD ≅ \_\_\_\_ | Reflexive sides are congruent |
| **4** | ΔABC ≅ Δ\_\_\_\_\_\_ |  | **4** | ΔBCD ≅ Δ\_\_\_\_\_\_ |  |
| **5** | ∠BAC ≅ ∠\_\_\_\_\_\_,  ∠BCA ≅ ∠\_\_\_\_\_\_ |  | **5** | ∠CBD ≅ ∠\_\_\_\_\_\_,  ∠CDB ≅ ∠\_\_\_\_\_\_ |  |
| **6** | AB || \_\_\_, BC || \_\_\_ | Congruent Alternate Interior Angles form  Parallel Lines | **6** | BC || \_\_\_, CD || \_\_\_ | Congruent Alternate Interior Angles form  Parallel Lines |
| **7** | ABCD is a parallelogram | Definition of Parallelogram | **7** | ABCD is a parallelogram | Definition of Parallelogram |

**VOCABULARY**

**Quadrilateral Angle Sum –** the sum of the angles of a quadrilateral is 360°.

**For #15-16, complete the statements and justifications for each two-column proof**

**to prove that opposite congruent ANGLES of a quadrilateral form a parallelogram.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **15.** | **Given:** ∠A ≅ ∠C, ∠B ≅ ∠D  **Prove:** ABCD is a parallelogram |  | **16.** | **Given:** ∠A ≅ ∠C, ∠B ≅ ∠D  **Prove:** ABCD is a parallelogram |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Step** | **Statement** | | | **Justification** |  | **Step** | **Statement** | | | **Justification** |
| **1** | ∠A ≅ ∠C, ∠B ≅ ∠D | | | Given | **1** | ∠A ≅ ∠C, ∠B ≅ ∠D | | | Given |
| **2** | *m*∠A + *m*∠C + *m*∠B + *m*∠D = \_\_\_\_° | | | Quadrialteral Angle Sum | **2** | *m*∠A + *m*∠C + *m*∠B + *m*∠D = \_\_\_\_° | | | Quadrialteral Angle Sum |
| **3** | *m*∠A + *m*∠A + *m*∠B + *m*∠B = \_\_\_\_°  *m*∠A + *m*∠A + *m*∠D + *m*∠D = \_\_\_\_° | | | Substitution | **3** | *m*∠C + *m*∠C + *m*∠B + *m*∠B = \_\_\_\_°  *m*∠C + *m*∠C + *m*∠D + *m*∠D = \_\_\_\_° | | | Substitution |
| **4** | 2*m*∠A + 2*m*∠B = \_\_\_\_°  2*m*∠A + 2*m*∠D = \_\_\_\_° | | | Simplify | **4** | 2*m*∠C + 2*m*∠B = \_\_\_\_°  2*m*∠C + 2*m*∠D = \_\_\_\_° | | | Simplify |
| **5** | *m*∠A + *m*∠B = \_\_\_\_°  *m*∠A + *m*∠D = \_\_\_\_° | | | Divide by 2 | **5** | *m*∠C + *m*∠B = \_\_\_\_°  *m*∠C + *m*∠D = \_\_\_\_° | | | Divide by 2 |
| **6** | BC || \_\_\_, AB || \_\_\_ | Supplementary Same-Side Interior Angles form  Parallel Lines | | | **6** | CD || \_\_\_, CB || \_\_\_ | Supplementary Same-Side Interior Angles form  Parallel Lines | | |
| **7** | ABCD is a parallelogram | | Definition of Parallelogram | | **7** | ABCD is a parallelogram | | Definition of Parallelogram | |

**For #17-18, complete the statements and justifications for each two-column proof**

**to prove that a quadrilateral with diagonals that bisect each other form a parallelogram.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **17.** | **Given:** AE ≅ CE, BE ≅ DE  **Prove:** ABCD is a parallelogram |  | **18.** | **Given:** AE ≅ CE, BE ≅ DE  **Prove:** ABCD is a parallelogram |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Step** | **Statement** | **Justification** |  | **Step** | **Statement** | **Justification** |
| **1** | AE ≅ CE, BE ≅ DE | Given | **1** | AE ≅ CE, BE ≅ DE | Given |
| **2** | ∠BEA ≅ ∠\_\_\_\_\_, ∠BEC ≅ ∠\_\_\_\_\_ | Vertical Angles are Congruent | **2** | ∠AEB ≅ ∠\_\_\_\_\_,  ∠CEB ≅ ∠\_\_\_\_\_ | Vertical Angles are Congruent |
| **3** | ΔBEA ≅ Δ\_\_\_\_\_, ΔBEC ≅ Δ\_\_\_\_\_ |  | **3** | ΔAEB ≅ Δ\_\_\_\_\_,  ΔCEB ≅ Δ\_\_\_\_\_ |  |
| **4** | ∠ABE ≅ ∠\_\_\_\_\_\_,  ∠CBE ≅ ∠\_\_\_\_\_\_ |  | **4** | ∠EAB ≅ ∠\_\_\_\_\_\_,  ∠ECB ≅ ∠\_\_\_\_\_\_ |  |
| **5** | AB || \_\_\_, CB || \_\_\_ | Congruent Alternate Interior Angles form  Parallel Lines | **5** | AB || \_\_\_, CB || \_\_\_ | Congruent Alternate Interior Angles form  Parallel Lines |
| **6** | ABCD is a parallelogram | Definition of Parallelogram | **6** | ABCD is a parallelogram | Definition of Parallelogram |

For #19-24, complete the relationship with ≅, || or = 180° and

circle the key idea that makes each quadrilateral a parallelogram.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Diagram | Relationship | Key Idea | | | | | |
| **19.** |  | PS AS ,  TS RS | Opposite Sides  are Parallel | Alternate Interior Angles are Congruent | Opposite Sides  are Congruent | Opposite Angles  are Congruent | Same-Side Interior  Angles are Supplementary | Diagonals Bisect  Each Other |
| **20.** |  | ∠D ∠C ,  ∠K ∠B | Opposite Sides  are Parallel | Alternate Interior Angles are Congruent | Opposite Sides  are Congruent | Opposite Angles  are Congruent | Same-Side Interior  Angles are Supplementary | Diagonals Bisect  Each Other |
| **21.** |  | ∠RCS ∠KSC ,  ∠RSC ∠KCS | Opposite Sides  are Parallel | Alternate Interior Angles are Congruent | Opposite Sides  are Congruent | Opposite Angles  are Congruent | Same-Side Interior  Angles are Supplementary | Diagonals Bisect  Each Other |
| **22.** |  | *m*∠R *m*∠Y  *m*∠L *m*∠O | Opposite Sides  are Parallel | Alternate Interior Angles are Congruent | Opposite Sides  are Congruent | Opposite Angles  are Congruent | Same-Side Interior  Angles are Supplementary | Diagonals Bisect  Each Other |
| **23.** |  | RE SD ,  SR DE | Opposite Sides  are Parallel | Alternate Interior Angles are Congruent | Opposite Sides  are Congruent | Opposite Angles  are Congruent | Same-Side Interior  Angles are Supplementary | Diagonals Bisect  Each Other |
| **24.** |  | TX SA ,  ST AX | Opposite Sides  are Parallel | Alternate Interior Angles are Congruent | Opposite Sides  are Congruent | Opposite Angles  are Congruent | Same-Side Interior  Angles are Supplementary | Diagonals Bisect  Each Other |

**KEY IDEAS FOR QUADRILATERALS TO BE PARALLELOGRAMS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| **Opposite Sides**  **are Parallel** | **Alternate Interior Angles are Congruent** | **Opposite Sides**  **are Congruent** | **Opposite Angles**  **are Congruent** | **Same-Side Interior**  **Angles are Supplementary** | **Diagonals Bisect**  **Each Other** |

For #25-30, use the key idea to find the measures to prove that each quadrilateral a parallelogram.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **25.** |  | | **26.** |  | | **27.** |  |
| NT = \_\_\_\_\_ AT = \_\_\_\_\_  *m*∠TAL = \_\_\_\_° *m*∠ALN = \_\_\_\_°  *m*∠NTA = \_\_\_\_° *m*∠NTL= \_\_\_\_°  *m*∠NLT = \_\_\_\_° *m*∠ATL = \_\_\_\_°  BN = \_\_\_\_\_ BL = \_\_\_\_\_ | | | DL = \_\_\_\_\_ FL = \_\_\_\_\_  *m*∠FLD = \_\_\_\_° *m*∠LDA = \_\_\_\_°  *m*∠AFL = \_\_\_\_° *m*∠AFD = \_\_\_\_°  *m*∠ADF = \_\_\_\_° *m*∠LFD = \_\_\_\_°  MA = \_\_\_\_\_ MD = \_\_\_\_\_ | | | LP = \_\_\_\_\_ LI = \_\_\_\_\_  *m*∠LIH = \_\_\_\_° *m*∠PHI = \_\_\_\_°  *m*∠ILP = \_\_\_\_° *m*∠PHL= \_\_\_\_°  *m*∠PLH = \_\_\_\_° *m*∠IHL = \_\_\_\_°  AP = \_\_\_\_\_ AL = \_\_\_\_\_ | |
| **28.** | |  | **29.** | |  | **30.** |  |
| NK = \_\_\_\_\_ KR = \_\_\_\_\_  *m*∠NKR = \_\_\_\_° *m*∠YRK = \_\_\_\_°  *m*∠KNY = \_\_\_\_° *m*∠YRN= \_\_\_\_°  *m*∠YNR = \_\_\_\_° *m*∠KRN = \_\_\_\_°  MY = \_\_\_\_\_ MN = \_\_\_\_\_ | | | LM = \_\_\_\_\_ LQ = \_\_\_\_\_  *m*∠QNM = \_\_\_\_° *m*∠NML = \_\_\_\_°  *m*∠LQN = \_\_\_\_° *m*∠LMQ = \_\_\_\_°  *m*∠LQM = \_\_\_\_° *m*∠NMQ = \_\_\_\_°  PL = \_\_\_\_\_ PQ = \_\_\_\_\_ | | | NG = \_\_\_\_\_ SG = \_\_\_\_\_  *m*∠NTS = \_\_\_\_° *m*∠TNG = \_\_\_\_°  *m*∠GST = \_\_\_\_° *m*∠GNS= \_\_\_\_°  *m*∠GSN = \_\_\_\_° *m*∠TNS = \_\_\_\_°  AS = \_\_\_\_\_ AG = \_\_\_\_\_ | |

**KEY IDEAS FOR QUADRILATERALS TO BE PARALLELOGRAMS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| **Opposite Sides**  **are Parallel** | **Alternate Interior Angles are Congruent** | **Opposite Sides**  **are Congruent** | **Opposite Angles**  **are Congruent** | **Same-Side Interior**  **Angles are Supplementary** | **Diagonals Bisect**  **Each Other** |

|  |  |  |
| --- | --- | --- |
| **31.** | The Dockland office building is used for harboring container ships and passenger liners at the Elbe River in Hamburg, Germany. The base is 282 feet across with a fully glazed front facade height of 62 feet. The slant height is 154 feet at an angle of 24° elevating from the bottom. Label the given dimensions and use the key ideas to find the measures below to prove that this quadrilateral building takes the form of a parallelogram. |  |
| AB = \_\_\_\_, DC = \_\_\_\_ , AD = \_\_\_\_, BC= \_\_\_\_, *m*<A = \_\_\_\_ , *m*<C = \_\_\_ , *m*<ADC = \_\_\_ ,  *m*<CBA = \_\_\_ , *m*<CBD = \_\_\_ , *m*<ADB= \_\_\_ , *m*<ABD = \_\_\_ , *m*<CDB= \_\_\_ , DE= \_\_\_ , and DB= \_\_\_ | |

**For #32-33, complete each paragraph proof using the vocabulary of the key ideas.**

|  |  |  |
| --- | --- | --- |
| **32.** | **Given:** *p* || *q* and *l* || *m* **Prove:** <2 is congruent to <12  <2 is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to <14 because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ angles are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. <14 is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to <12 because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ angles are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. By substitution <14, <2 is congruent to <12. |  |
| **33.** | **Given:** *p* || *q* and *l* || *m* **Prove:** <3 is supplementary to <12  <3 is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to <8 because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ angles are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. <8 is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to <12 because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ angles are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. By substitution of <8, <3 is supplementary to <12. |  |

**VOCABULARY**

**Rectangle –** a quadrilateral with four right angles.

**Rectangle Theorems**

|  |  |
| --- | --- |
| **A rectangle is a parallelogram.** | **The Diagonals of a Rectangle are Congruent.** |

**For #34-35, complete the statements and justifications for each two-column proof**

**to prove that a rectangle is a parallelogram.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **34.** | **Given:** ABCD is a rectangle  **Prove:** ABCD is a parallelogram |  | **35.** | **Given:** RECT is a rectangle  **Prove:** RECT is a parallelogram |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Step** | **Statement** | **Justification** |  | **Step** | **Statement** | **Justification** |
| **1** | ABCD is a rectangle | Given | **1** | RECT is a rectangle | Given |
| **2** | ∠A, ∠B, ∠C,  and ∠D are \_\_\_\_\_\_\_\_\_\_ angles. | Definition of rectangle | **2** | ∠R, ∠E, ∠C,  and ∠T are \_\_\_\_\_\_\_\_\_\_ angles. | Definition of rectangle |
| **3** | ∠A \_\_\_ ∠C,  ∠B \_\_\_ ∠D | All right angles are congruent | **3** | ∠R \_\_\_ ∠C,  ∠E \_\_\_ ∠T | All right angles are congruent |
| **4** | ABCD is a parallelogram | Congruent opposite angles of a quadrilateral form a parallelogram. | **4** | RECT is a parallelogram | Congruent opposite angles of a quadrilateral form a parallelogram. |

**For #36-37, complete the statements and justifications for each two-column proof**

**to prove that a rectangle has CONGRUENT DIAGONALS.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **36.** | **Given:** ABCD is a rectangle  **Prove:** AC ≅ BD |  | **37.** | **Given:** RECT is a rectangle  **Prove:** RC ≅ ET |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Step** | **Statement** | **Justification** |  | **Step** | **Statement** | **Justification** |
| **1** | ABCD is a rectangle | Given | **1** | RECT is a rectangle | Given |
| **2** | ABCD is a parallelogram | A rectangle is a parallelogram | **2** | RECT is a parallelogram | A rectangle is a parallelogram |
| **3** | AD ≅ \_\_\_\_ | Opposite sides of a parallelogram are congruent | **3** | RT ≅ \_\_\_\_ | Opposite sides of a parallelogram are congruent |
| **4** | ∠C and ∠D are \_\_\_\_\_\_\_\_\_\_ angles | Definition of rectangle | **4** | ∠T and ∠C are \_\_\_\_\_\_\_\_\_\_ angles | Definition of rectangle |
| **5** | ∠C \_\_\_ ∠D | All right angles are congruent | **5** | ∠T \_\_\_ ∠C | All right angles are congruent |
| **6** | DC \_\_\_ CD | Reflexive sides are congruent | **6** | TC \_\_\_ CT | Reflexive sides are congruent |
| **7** | ΔADC ≅ Δ\_\_\_\_\_ |  | **7** | ΔRTC ≅ Δ\_\_\_\_\_ |  |
| **8** | AC ≅ BD |  | **8** | RC ≅ ET |  |

**For #38-40, find each measure using the key idea of congruent diagonals in a rectangle.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **38.** | NM = \_\_\_\_, TY = \_\_\_\_,  YS = \_\_\_\_, SM = \_\_\_\_ | **39.** | SH = \_\_\_\_, PL = \_\_\_\_,  IS = \_\_\_\_, IL = \_\_\_\_ | **40.** | HA = \_\_\_\_, WN = \_\_\_\_,  TW = \_\_\_\_, TH = \_\_\_\_ |

|  |  |  |
| --- | --- | --- |
| **41.** | The Dockland office building contains a rectangle in the middle of the structure. Recall the base is 282 feet across, the height of 62 feet, and the slant height is about 154 feet.  Label the given dimensions on the blueprint and use the key ideas of parallelograms and of congruent diagonals in a rectangle to find the measures below. |  |
| FB = \_\_\_\_, DG = \_\_\_\_ , FD = \_\_\_\_, BG= \_\_\_\_, FG = \_\_\_\_, DB = \_\_\_\_ , FE = \_\_\_\_, EG= \_\_\_\_, DE = \_\_\_\_, EB= \_\_\_\_ | |

|  |  |  |
| --- | --- | --- |
| **42.** | It is very rare but some morning glories grow to have only four pedals instead of five. This one here had a height by length ratio of 6 inches by 8 inches. What should be the following measures?  MG = \_\_\_\_, NL = \_\_\_\_ , MY = \_\_\_\_, NY= \_\_\_\_, GY = \_\_\_\_, LY = \_\_\_\_ |  |

|  |  |  |
| --- | --- | --- |
| **43.** | The Parthenon in Greece has dimensions that follow the Fibonacci Sequence of 1, 1, 2, 3, 5, 8, 13, etc. This diagram shows a model of the Parthenon based on these dimensions. What should be the following lengths of the model to the nearest 10th?  RH = \_\_\_, PT = \_\_\_ , NP = \_\_\_,  NR = \_\_\_, NT = \_\_\_, NH = \_\_\_ |  |