High School
Mathematics Test 2013
Congruence

Year
10

Skills and Knowledge Assessed:
- Define congruence of plane shapes using transformations (ACMMG200)
- Develop the conditions for congruence of triangles (ACMMG201)
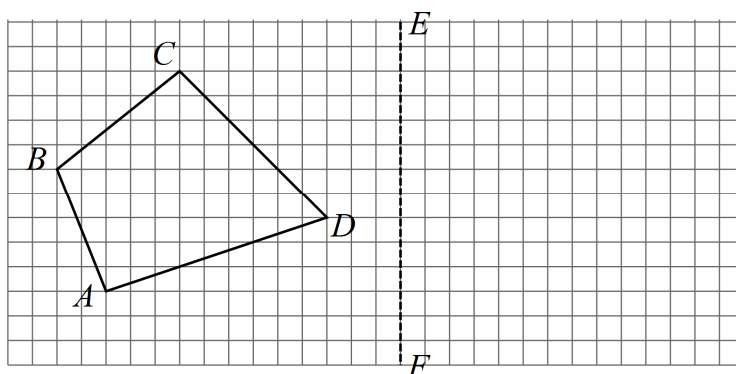- Formulate proofs involving congruent triangles and angle properties (ACMMG243)

Name_____

Section 1   Short Answer Section

Write all working and answers in the spaces provided on this test paper.
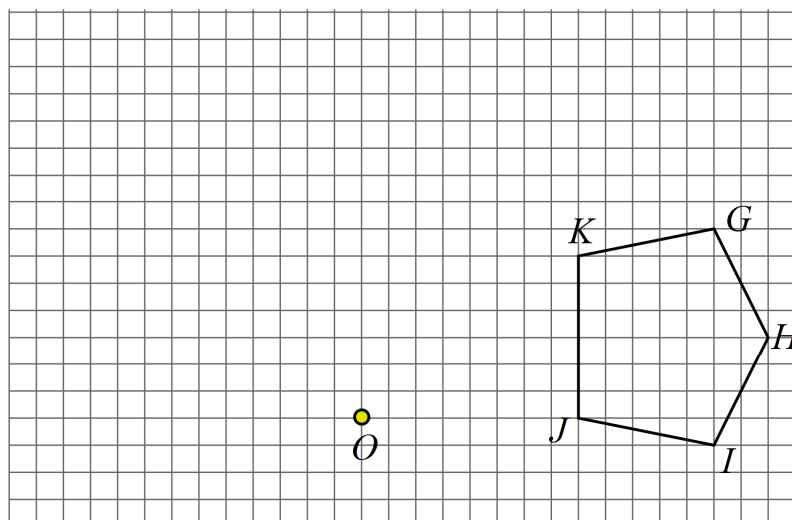**DIAGRAMS ARE NOT TO SCALE**

1.   A quadrilateral *ABCD* is shown.

Draw a congruent quadrilateral by reflecting the vertices of the quadrilateral in the line *EF*.
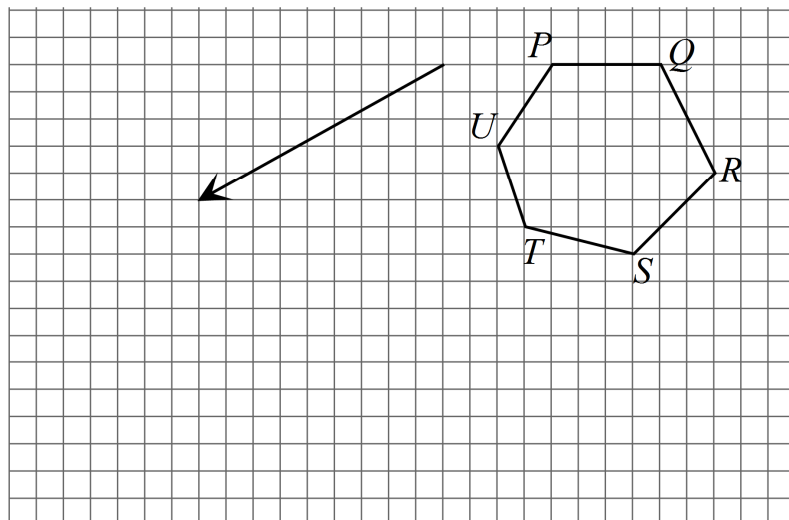

2.   A pentagon *GHIJK* is shown.

Draw a congruent pentagon by rotating the vertices through 90° in an anticlockwise direction about the point *O*.
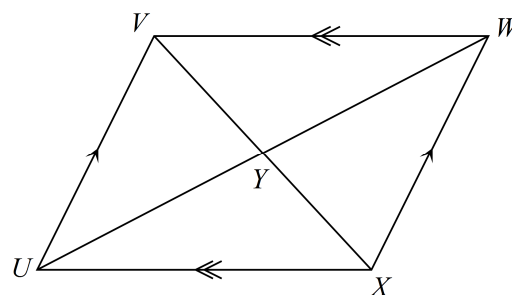
3.   A hexagon *PQRSTU* is shown.

Draw a congruent hexagon by
translating the vertices of the
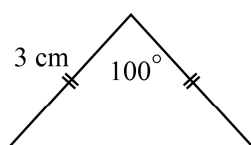hexagon in the direction and distance
of the arrow.

4.   *UVWX* is a parallelogram.
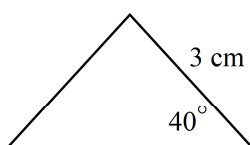Name a pair of congruent triangles in the diagram.

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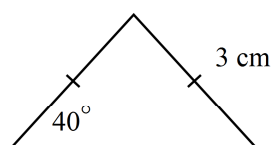
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5.   Which two triangles below have enough information provided to show they are congruent to one
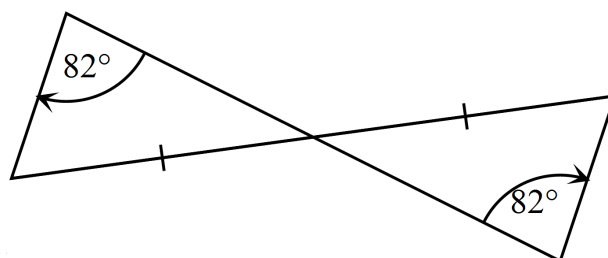another.
Explain your answer.

Triangle 1   Triangle 2   Triangle 3

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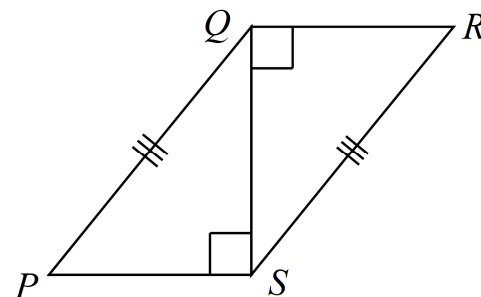
6.   Which of the conditions AAS, RHS, SAS or SSS
could be used to show congruence of the triangles
shown? Explain your answer.

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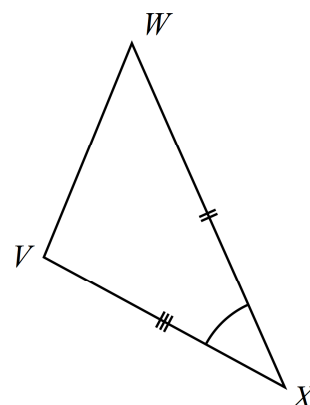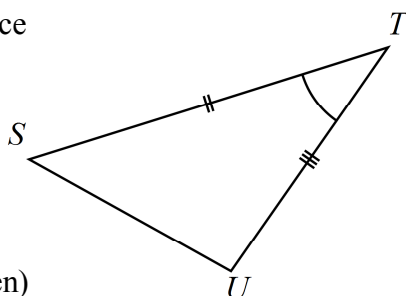
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7. Which of the conditions AAS, RHS, SAS or SSS could be used to show congruence of the triangles shown? Explain your answer.
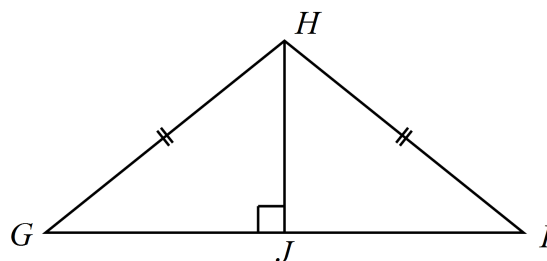
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8. Complete the proof below (including the congruence test used) to show that
$\triangle STU \equiv \triangle WXV$

In $\triangle STU$ and $\triangle WXV$
    $ST =$ (Given)
    $TU =$ (Given)
    $\angle STU =$ (Given)
    $\therefore \triangle STU \equiv \triangle WXV$ (   )

9. Complete the proof below (including the congruence test used) to show that
$\triangle GHJ \equiv \triangle IHJ$

In $\triangle GHJ$ and $\triangle IHJ$
$\angle GJH =$ (right angles on straight line)
    $GH =$ (given)
HJ is
    $\therefore \triangle GHJ \equiv \triangle IHJ$ (   )

10. Complete the reasons in this congruence proof.

Data : $\triangle KLM$ is isosceles, with $KM = LM$.
          NM bisects $\angle KML$.

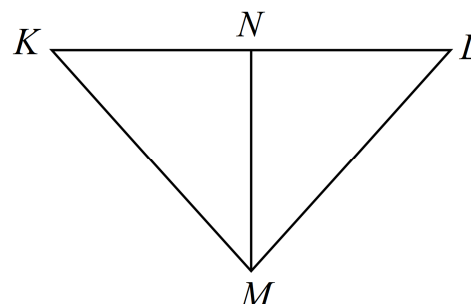Aim :   Prove that $\triangle KNM \equiv \triangle LNM$.

Proof : In $\triangle KNM$ and $\triangle LNM$
        $KM = LM$ (   )

    $\angle KMN = \angle LMN$ (   )

                NM is

$\therefore \triangle KNM \equiv \triangle LNM$ (   )

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<table>
<tr><td>Year
10</td><td>Calculator Allowed

Name_____</td></tr>
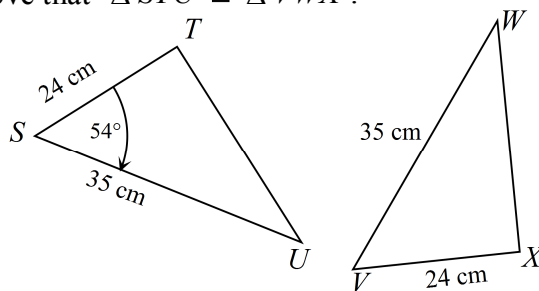</table>

Section 2   Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.
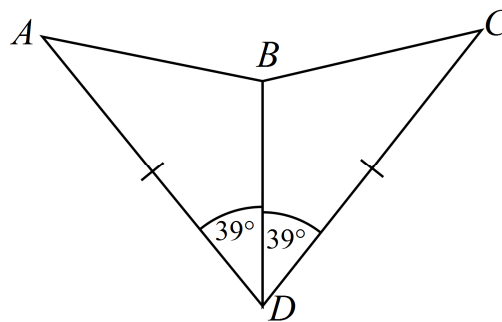
DIAGRAMS ARE NOT TO SCALE

1.   What additional information is needed to prove that $\triangle STU \equiv \triangle VWX$?

   A. $\angle VWX = 54°$

   B. $\angle VXW = 54°$

   C. $\angle WVX = 54°$

   D. $WX = 35$ cm
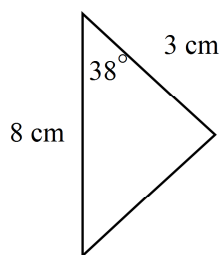
2.   Which congruence test could be used to prove that

   A.   AAS

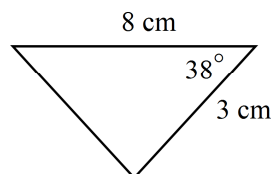   B.   RHS

   C.   SAS

   D.   SSS

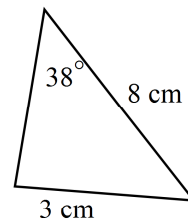3.   Which triangles are congruent?

   A.   All three triangles.

   B.   Triangles P and Q.
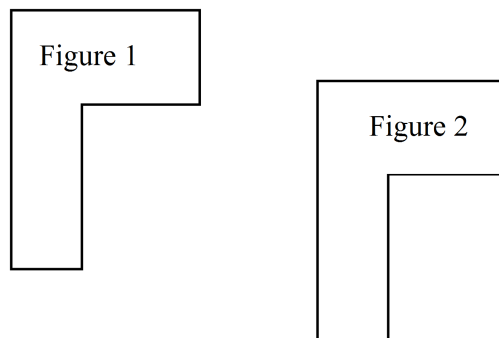
   C.   Triangles P and R.

   D.   Triangles Q and R.
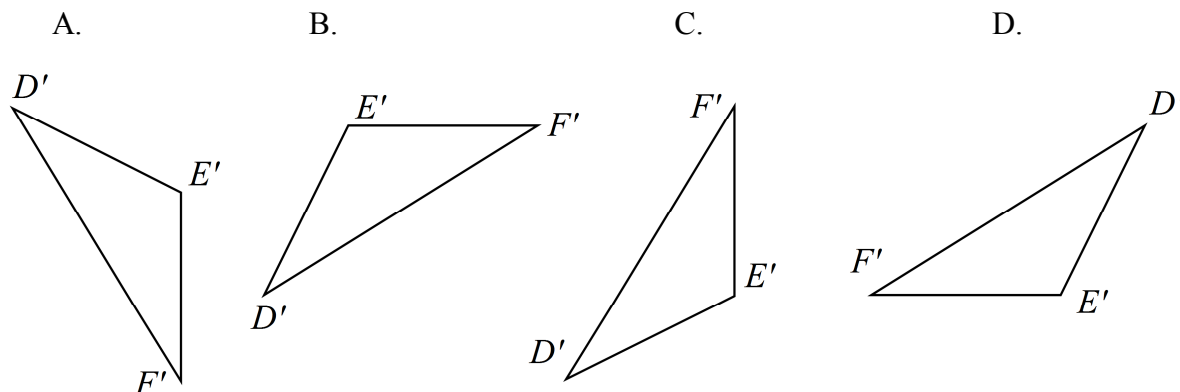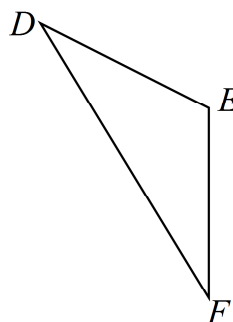
4.   Figure 1 and Figure 2 are congruent.
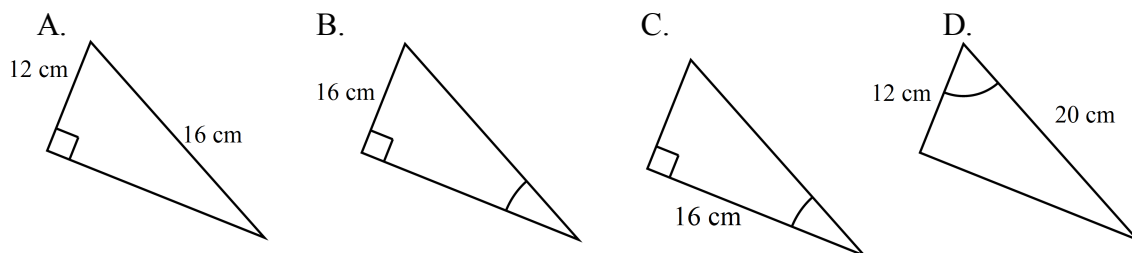   What could transform Figure 1 to Figure 2?

     A.   A clockwise rotation of 180°.

     B.   An anticlockwise rotation of 90°.

     C.   A reflection.

     D.   A translation.

5.   Triangle *DEF* is rotated in a clockwise
   direction through 90°.
     Which figure could be the result?

     A.   B.   C.   D.

6.   Which of the triangles is congruent to △*EFG* ?

     A.   B.   C.   D.
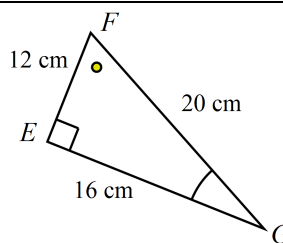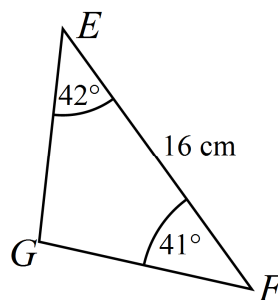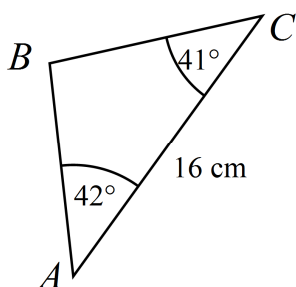
7.   Which statement is true?

A.   Triangle *I* is congruent to triangle *IV*.

B.   Triangle *II* is congruent to triangle *III*.

C.   Triangle *I* is congruent to triangle *II* and
     triangle *III* is congruent to triangle *IV*.

D.   Triangle *I* is congruent to triangle *III* and
     triangle *II* is congruent to triangle *IV*.
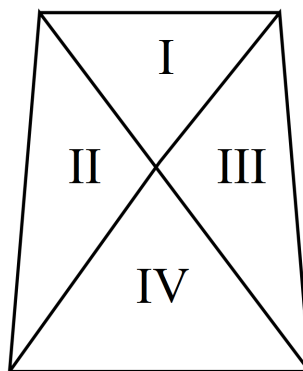
8.   Which of the congruence tests is sufficient to prove that $\triangle ABC \equiv \triangle EFG.$?

   A. AAS   B. RHS   C.   SAS   D.   SSS

9.   Which triangles are congruent?
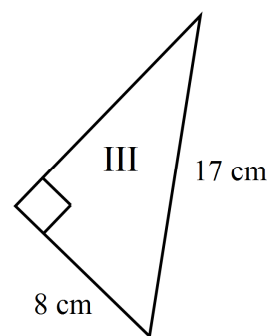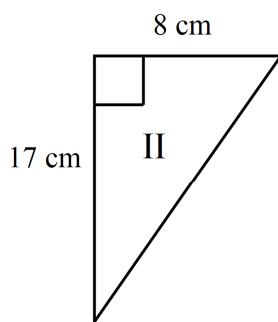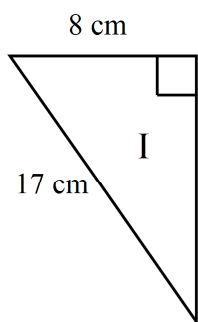
   A.   *I* and *II* only.   B.   *I* and *III* only.
   C.   *II* and *III* only.   D.   *I, II* and *III*.

10.   Which is not a pair of congruent triangles?

   A.   Triangles E and F.

   B.   Triangles E and I.

   C.   Triangles F and H.

   D.   Triangles H and J.

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Section 3   Longer Answer Section

Write all working and answers in the spaces provided on this test paper.
DIAGRAMS ARE NOT TO SCALE

Marks

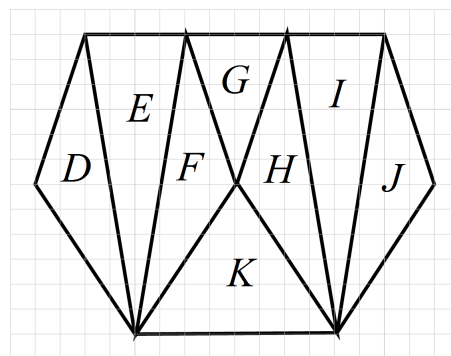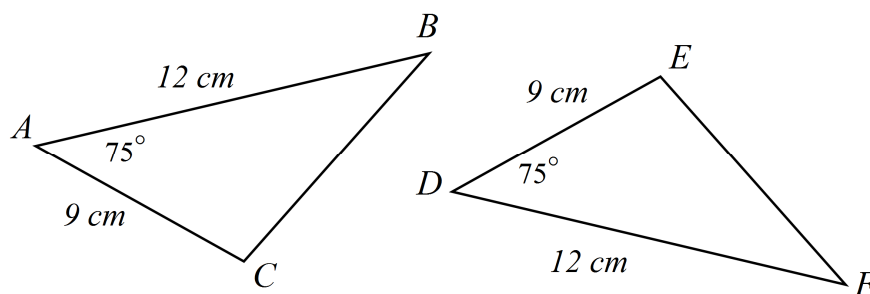1.   a)   Prove that $\triangle ABC \equiv \triangle DFE$ **3**

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Marks

b)   Prove that △ *GHI* ≡ △ *JKI*.   **3**

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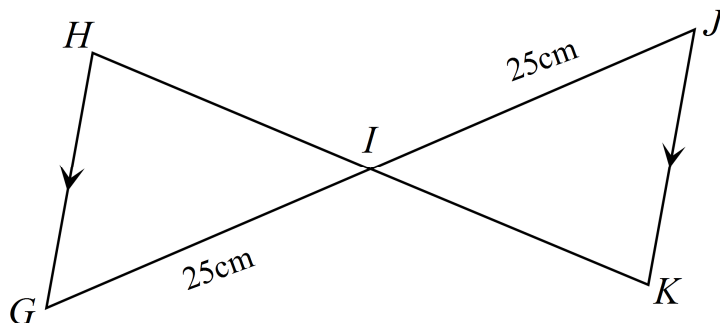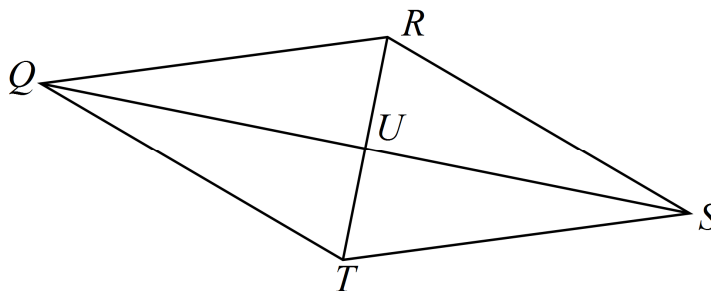
c)   *QRST* is a rhombus.   **4**
Given that the diagonals bisect one another, use congruent triangles to prove that the
diagonals meet at right angles.

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Multiple Choice Answer Sheet

Name _____

Completely fill the response oval representing the most correct answer.

1. A ◯ B ◯ C ◯ D ◯
2. A ◯ B ◯ C ◯ D ◯
3. A ◯ B ◯ C ◯ D ◯
4. A ◯ B ◯ C ◯ D ◯
5. A ◯ B ◯ C ◯ D ◯
6. A ◯ B ◯ C ◯ D ◯
7. A ◯ B ◯ C ◯ D ◯
8. A ◯ B ◯ C ◯ D ◯
9. A ◯ B ◯ C ◯ D ◯
10. A ◯ B ◯ C ◯ D ◯

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ANSWERS

Section 1
1.

| 2. |

| 3. |

4.	$\Delta\ VWY \equiv \Delta UXY$ OR $\Delta\ VYU \equiv \Delta XYW$
5.	Triangle 1 and Triangle 3 have enough to show congruence. Using the angle sum of Triangle 3 gives the angle of 100º between the two equal sides, so can use SAS to show congruence. Triangle 2 is not shown as isosceles.
6.	AAS, since there are a pair of vertically opposite angles (which are equal) to go with the pairs of equal angles and sides given.
7.	RHS, since there is a common side QS to go with the pairs of equal right angles and other sides given.
8.	In $\Delta\ STU$ and $\Delta\ WXV$ $\quad ST =\ WX$ (Given) $\quad TU =\ VX$ (Given) $\angle STU =\ \angle WXV$ (Given) $\quad \therefore \Delta\ STU \equiv \Delta\ WXV$ (SAS)
9.	In $\Delta\ GHJ$ and $\Delta\ IHJ$ $\angle GJH =\ \angle\ IJH$ (right angles on straight line) $\quad GH =\ IH$ (Equal sides of isosceles Δ) HJ is common $\quad \therefore \Delta\ GHJ \equiv \Delta\ IHJ$ (RHS)
10.	$\quad KM\ =\ LM$ (given) $\quad \angle\ KMN =\ \angle\ LMN$ (equal parts of bisected angle) $\qquad NM$ is common $\therefore \Delta\ KNM\ \equiv\ \Delta\ LNM$ (SAS)

Section 2	
1.	C
2.	C
3.	B
4.	D
5.	D
6.	C
7.	B
8.	A
9.	B
10.	A

Section 3		
1.	a)	In $\triangle ABC$ and $\triangle DFE$ $AB = DF$ (given) $\angle BAC = \angle EDF$ (given) $AC = ED$ (given) $\triangle ABC \equiv \triangle DFE$ (SAS)
	b)	In $\triangle GHI$ and $\triangle JKI$ $\angle HGI = \angle IJK$ (alternate angles on ∥ lines) $\angle HIG = \angle KIJ$ (vertically opposite angles) $GI = IJ$ (given) $\triangle GHI \equiv \triangle IKJ$ (AAS)
	c)	In $\triangle QUR$ and $\triangle SUR$ $QU = US$ (diagonals bisect) RU is common $QR = RS$ (sides of rhombus are equal) $\triangle QUR \equiv \triangle SUR$ (SSS) $\therefore \angle QUR = \angle SUR$ (corresponding sides of congruent triangles) But $\angle QUR$ and $\angle SUR$ are supplementary $\therefore \angle QUR = \angle SUR = 90^\circ$ (equal supplementary angles) $\therefore$ The diagonals meet at right angles.

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Multiple Choice Answer Sheet

Name_____ <u>Marking Sheet</u>

Completely fill the response oval representing the most correct answer.

1.   A ◯   B ◯   C ●   D ◯
2.   A ◯   B ◯   C ●   D ◯
3.   A ◯   B ●   C ◯   D ◯
4.   A ◯   B ◯   C ◯   D ●
5.   A ◯   B ◯   C ◯   D ●
6.   A ◯   B ◯   C ●   D ◯
7.   A ◯   B ●   C ◯   D ◯
8.   A ●   B ◯   C ◯   D ◯
9.   A ◯   B ●   C ◯   D ◯
10. A ●   B ◯   C ◯   D ◯