High School Mathematics Test 2015

Year 10

Congruence

Non Calculator

Skills and Knowledge Assessed:

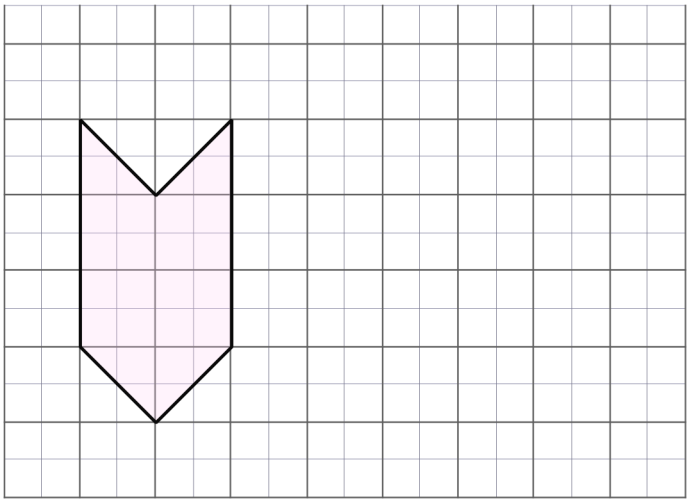
- Define congruence of plane shapes using transformations (ACMMG200)
- Develop the conditions for congruence of triangles (ACMMG201)
- Formulate proofs involving congruent triangles and angle properties (ACMMG243)

Name_____

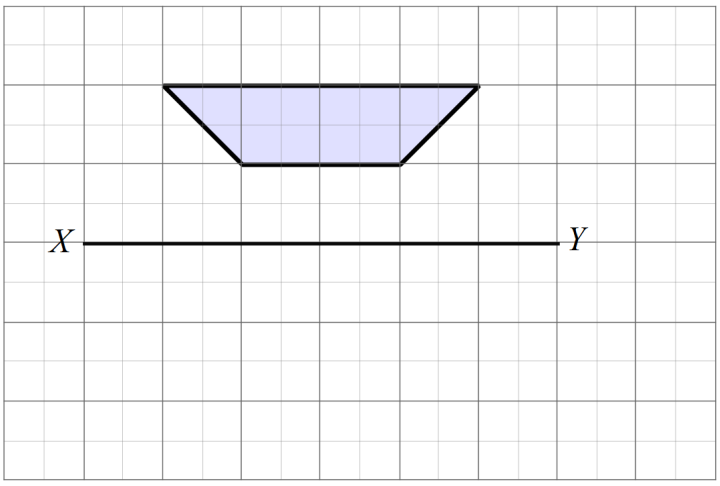
Section 1 Short Answer Section

Write all working and answers in the spaces provided on this test paper.
YOU WILL NEED A RULER, COMPASSES AND PROTRACTOR.

1. Use the grid to draw a shape which is congruent to the one shown.



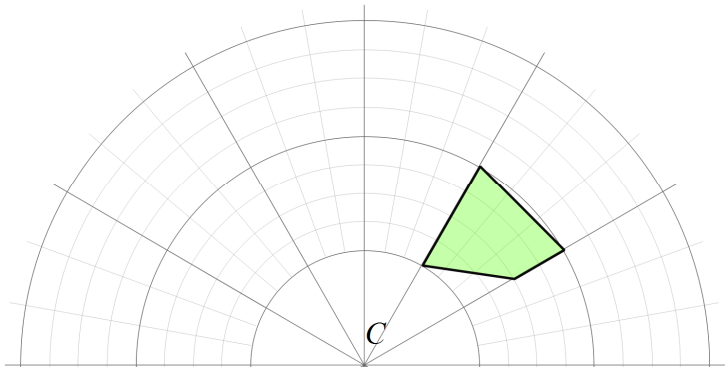
2. Reflect the trapezium in the line *XY*.



Draw the trapezium in its new position.

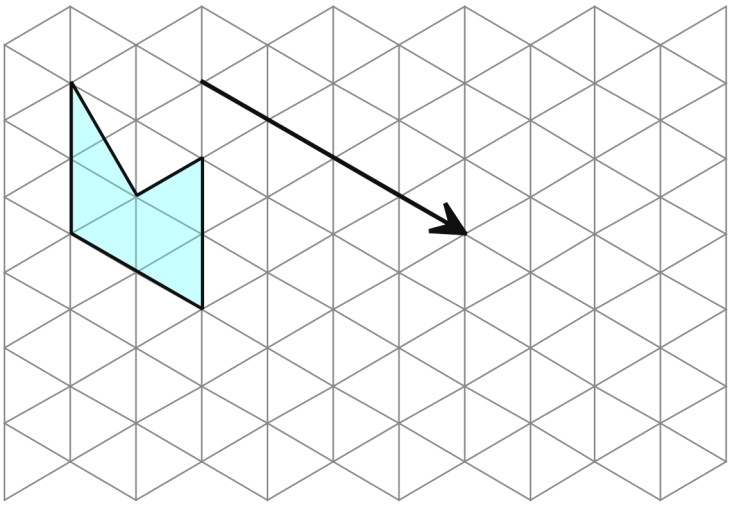
3. Rotate the quadrilateral through 60° about C in an anticlockwise direction.

Draw the quadrilateral in its new position.

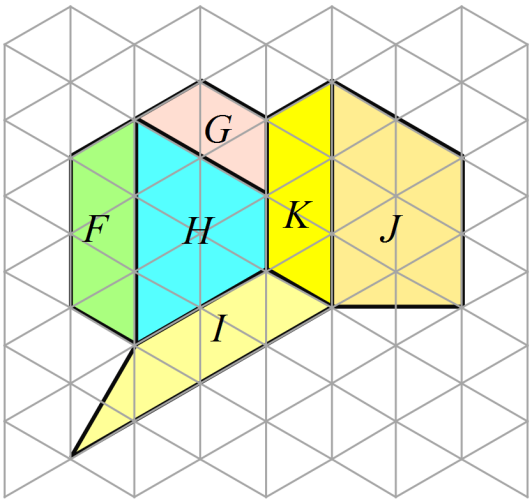


4. Translate the shape in the distance and direction of the arrow.

Draw the shape in its new position.



5. Which two trapeziums are congruent? (Write their letters in the space below.)



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6. **AAS** is an abbreviation for one of the tests for congruent triangles. It says:

Two triangles are congruent if two angles and a side of one triangle are equal to two angles and a corresponding side of the other.

What does the test which is abbreviated as **SAS** say?

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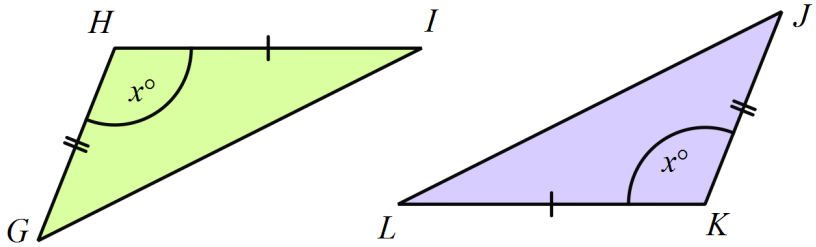
7. Which of the congruence test (AAS, RHS, SAS or SSS) could be used to show congruence of triangles *GHI* and *JKL*?



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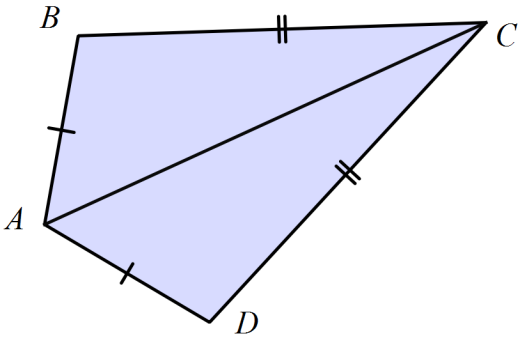
8. A kite *ABCD* has a diagonal drawn.
Which of the congruence test (AAS, RHS, SAS or SSS) could be used to show that :
$\Delta ABC \equiv \Delta ADC$.



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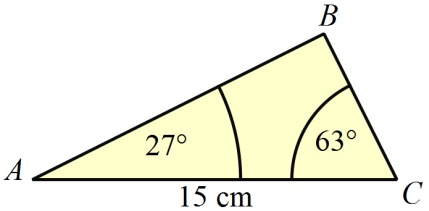
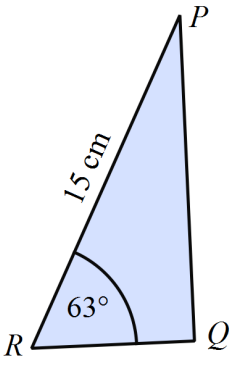
9. What additional piece of information would need to be given about ΔPQR in order to prove that $\Delta ABC \equiv \Delta PQR$?





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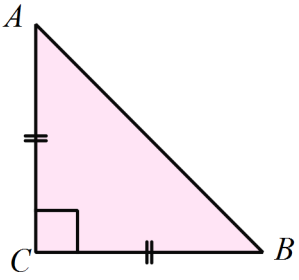
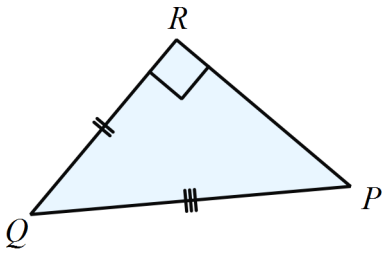
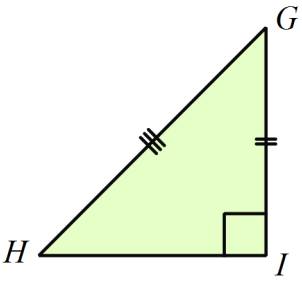
10. Which two triangles below have enough information provided to show they are congruent to one another.







Explain your answer.

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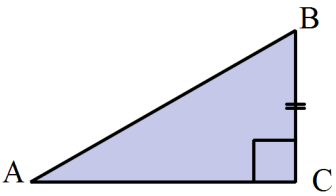
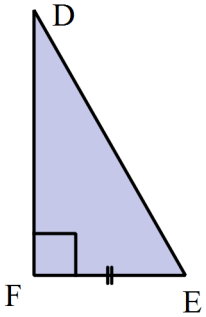
11. In the figure below, $BC = EF$.

$\angle ACB = \angle DFE = 90°$.

Give one additional piece of information would allow you to show that $\Delta ACB \equiv \Delta DFE$ and which congruence test would be used?





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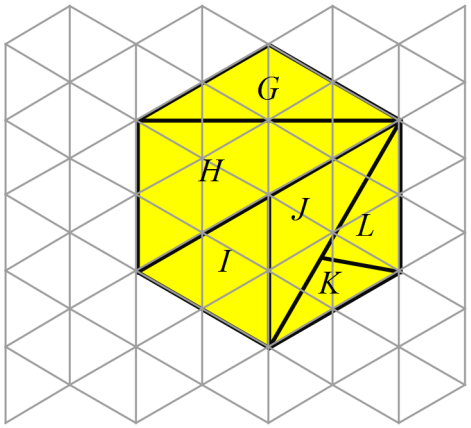
12. The diagram at right is drawn on isometric grid paper.

It shows a regular hexagon which has been divided into a number of triangles.

Which pair of triangles are congruent and which test could be used to prove this?



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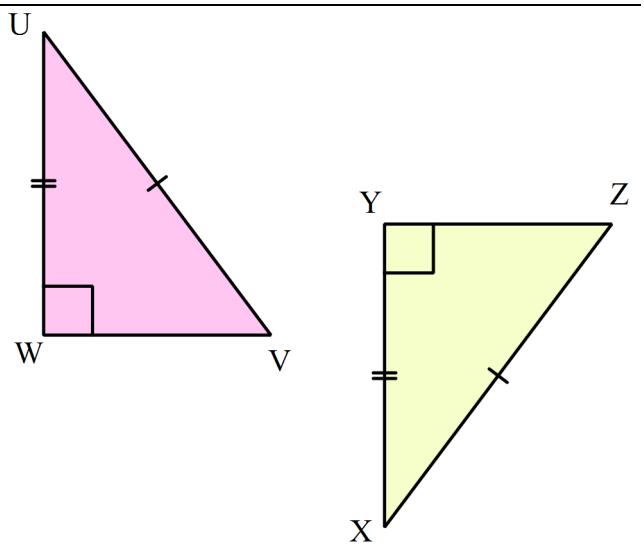
13. UW = XY, UV = XZ and $\angle W = \angle Y = 90°$. .



A proof that $\Delta UWV \equiv \Delta XYZ$ has been started.

In ΔUWV and ΔXYZ
$UW = XY$ (given)
$UV = XZ$ (given)

Complete the last two lines of the proof.

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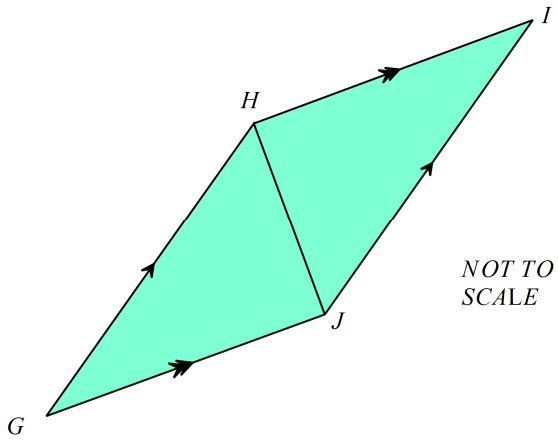
14. Complete the proof below, by writing in the reasons for each step.



Show that $\Delta GHJ \equiv \Delta IHJ$

In ΔGHJ and ΔIHJ

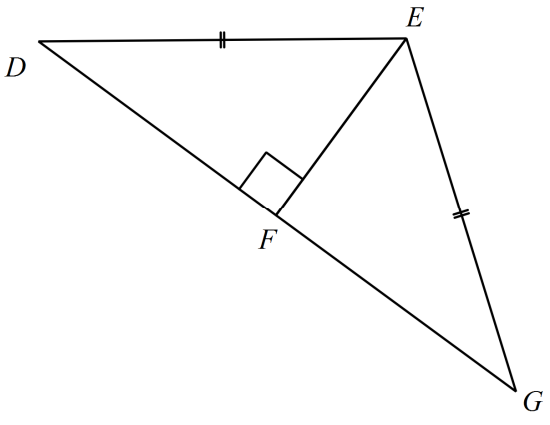
$\angle GHJ = \angle IJH$ (.....)

$\angle GJH = IHJ$ (.....)

HJ is .....

$\therefore \Delta GHJ \equiv \Delta IHJ$ (.....)

15. In the diagram below, $DE = GE$, DF is a straight line segment and $\angle DFE = 90°$.
Complete the proof below, by filling in the missing information.



Prove that $\Delta FED \equiv \Delta FEG$.

In ΔFED and ΔFEG

..... = ... (given)

$\angle DFE = \angle GFE$ (.....)

FE is .....

$\Delta FED \equiv \Delta FEG$ (.....)

High School
Mathematics Test 2015

Year 10

Congruence

Calculator Allowed

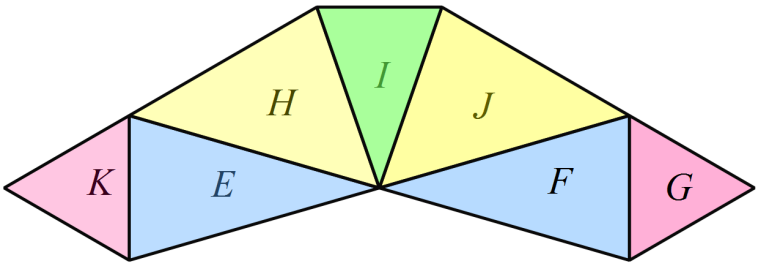
Name_____

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.

YOU WILL NEED A RULER, COMPASSES AND PROTRACTOR.

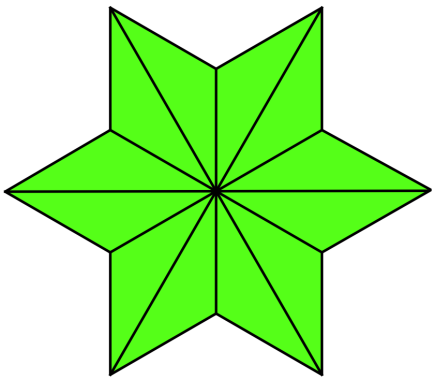
1. Which of the pairs of triangles listed below are congruent?



TO SCALE

A. *K* and *F* B. *K* and *J* C. *K* and *I* D. *K* and *G*

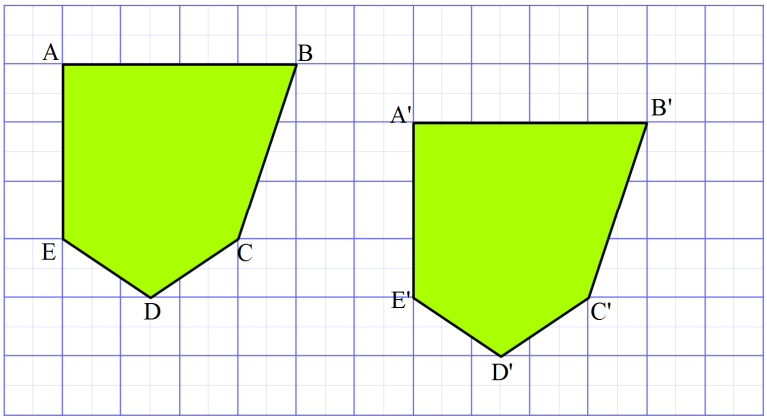
2. How many congruent triangles are there in the shape below?



A. 4
B. 6
C. 12
D. 18

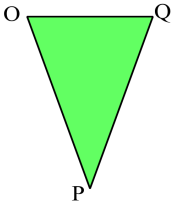
3. What transformation could have been used to produce the congruent image $A'B'C'D'E'$.

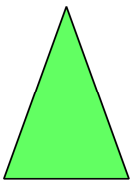
A. Reflection.
B. Rotation through 90°.
C. Rotation through 180°.
D. Translation.

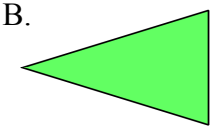


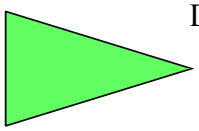
4. The triangle OPQ is reflected in the interval OQ.

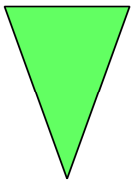
Which triangle could be the image?



A. 

B. 

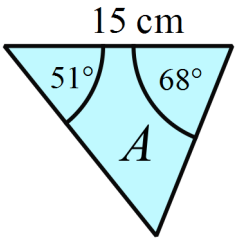
C. 

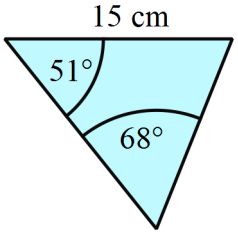
D. 

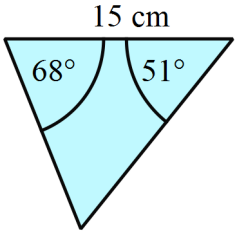
5. Triangle A has the measurements shown at right.

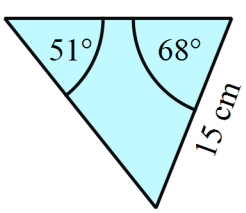
Which of the triangles below is congruent to Triangle A?

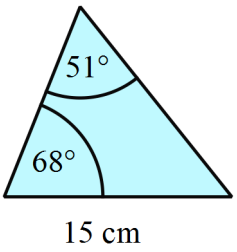
The diagrams are not to scale.



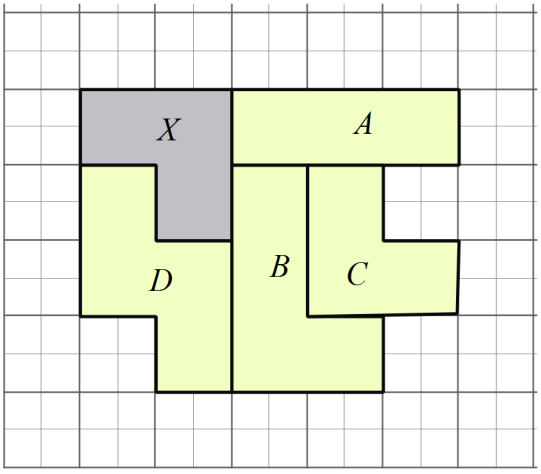
A. 

B. 

C. 

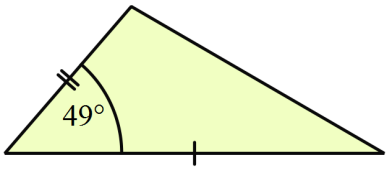
D. 

6. Which shape is congruent to shape X?

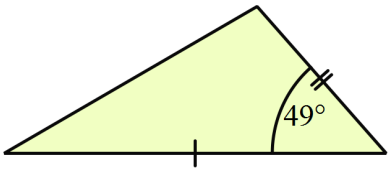


A. Shape A
B. Shape B
C. Shape C
D. Shape D

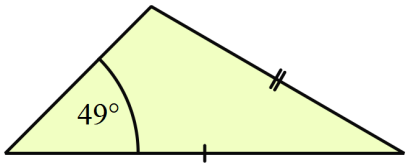
7. Which triangles are congruent?



Triangle 1



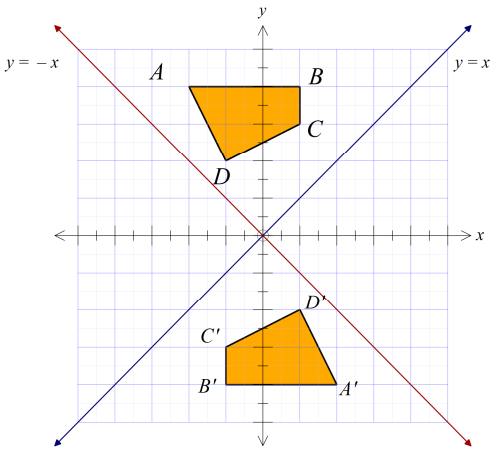
Triangle 2



Triangle 3

A. All three triangles.
B. Triangles 1 and 2.
C. Triangles 1 and 3.
D. Triangles 2 and 3.

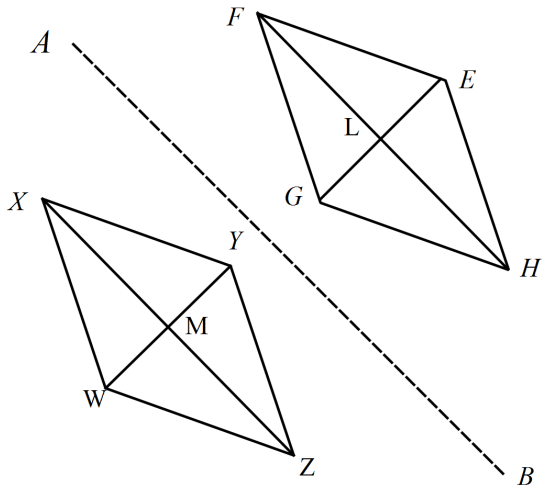
8. Figure *ABCD* is moved to an image *A'B'C'D'* by a single transformation. What was the transformation?



A. A clockwise rotation of 180° about the origin.
B. A clockwise rotation of 90° about the origin.
C. A reflection in the line $y = x$.
D. A reflection in the line $y = -x$

9. The rhombus $WXYZ$ is reflected in the line segment AB, to give the rhombus $EFGH$.

Which is **not** a pair of congruent triangles?



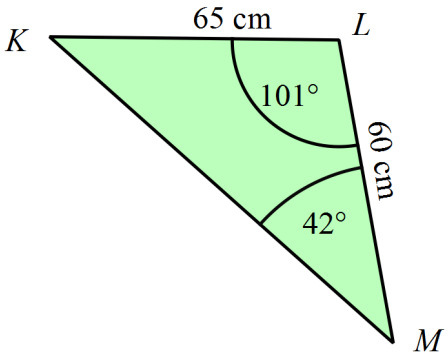
A. $\Delta\, EFH$ and $\Delta\, WXZ$

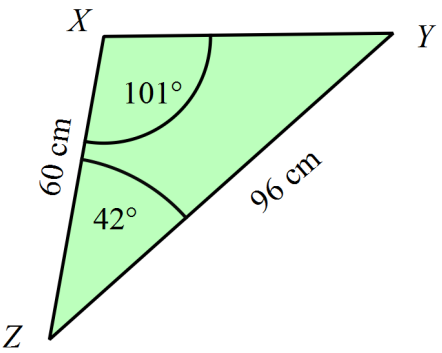
B. $\Delta\, FGH$ and $\Delta\, XYZ$

C. $\Delta\, LEF$ and $\Delta\, MWX$

D. $\Delta\, WXZ$ and $\Delta\, GEH$

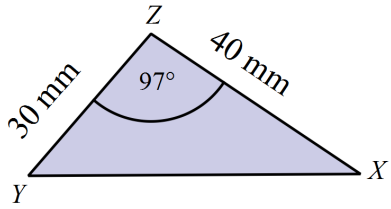
10. Which of the congruence tests is sufficient to prove that $\Delta\, KLM \equiv \Delta\, YXZ$?





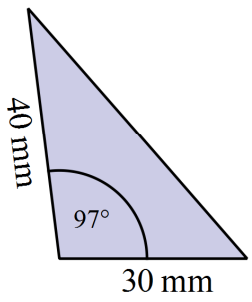
A. AAS B. RHS C. SAS D. SSS

11. Which triangle is congruent to $\Delta\, XYZ$? ?

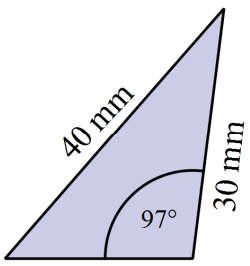


NOT TO SCALE

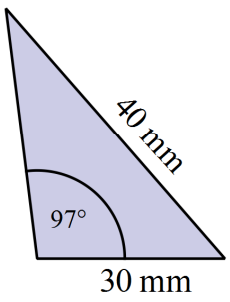
A.



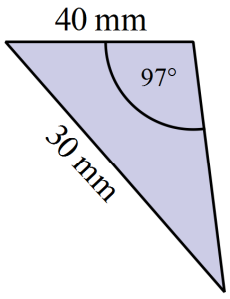
B.



C.



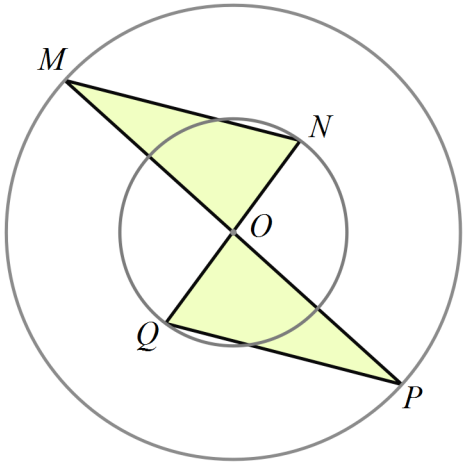
D.



12. The circles shown are concentric with centre O.

MP and NQ are diameters of the larger and smaller circles respectively.

Which of the congruence tests is sufficient to prove that $\Delta MNO \equiv \Delta PQO$?



A. AAS B. RHS

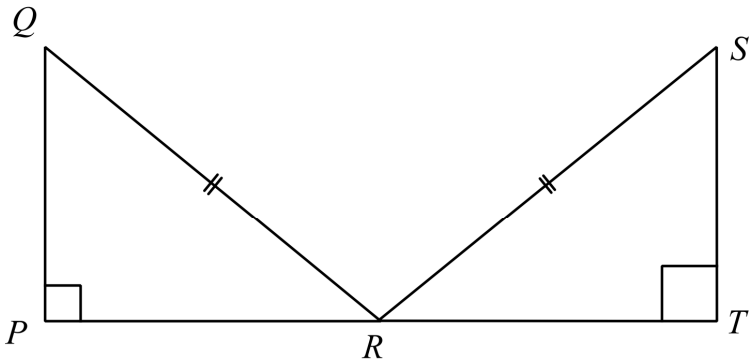
C. SAS D. SSS

13. $\angle QPR = \angle STR = 90°$.

$QR = SR$ and R bisects PT.

Which of the congruence tests could be used to show that

$\Delta QRP \equiv \Delta SRT$?



NOT TO SCALE

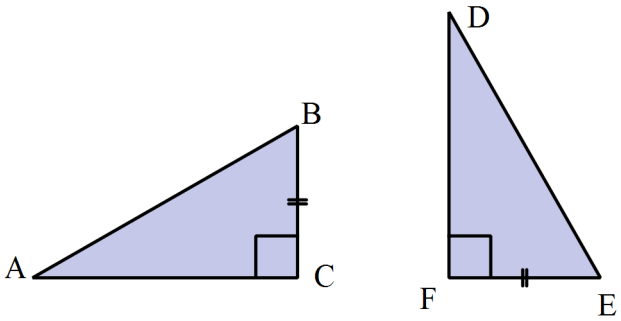
A. AAS

B. RHS

C. SAS

D. SSS

14. In the figure below, $BC = EF$.
$\angle ACB = \angle DFE = 90°$.
Which single additional piece of information would allow you to show that $\Delta ACB \equiv \Delta DFE$ using AAS.

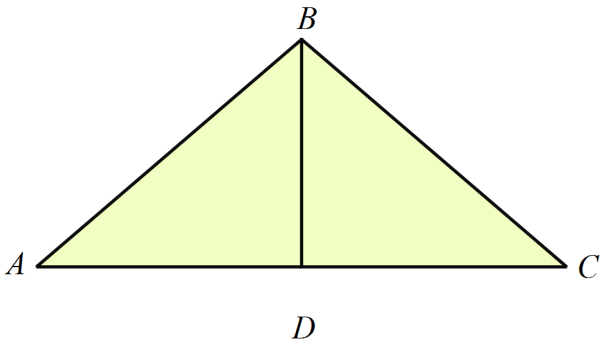


A. $\angle A = \angle E$ B. $\angle B = \angle E$ C. $BA = ED$ D. CA = FD

15. In ΔABC, D bisects AC.

$BD \perp AC$.

In the proof that $\Delta ABD \equiv \Delta CBD$, a reason has been left out indicated by *******



In ΔABD and ΔCBD

$AD = CD$ (D bisects AC)

$\angle ADB = \angle CDB$ (*******)

BD is common.

$\Delta ABD \equiv \Delta CBD$ (SAS)

Which reason should go in the spot?

A. Alternate angles on parallel lines.

B. Base angles of isosceles triangle.

C. Right angles on a straight line.

D. Vertically opposite angles.

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Calculator Allowed

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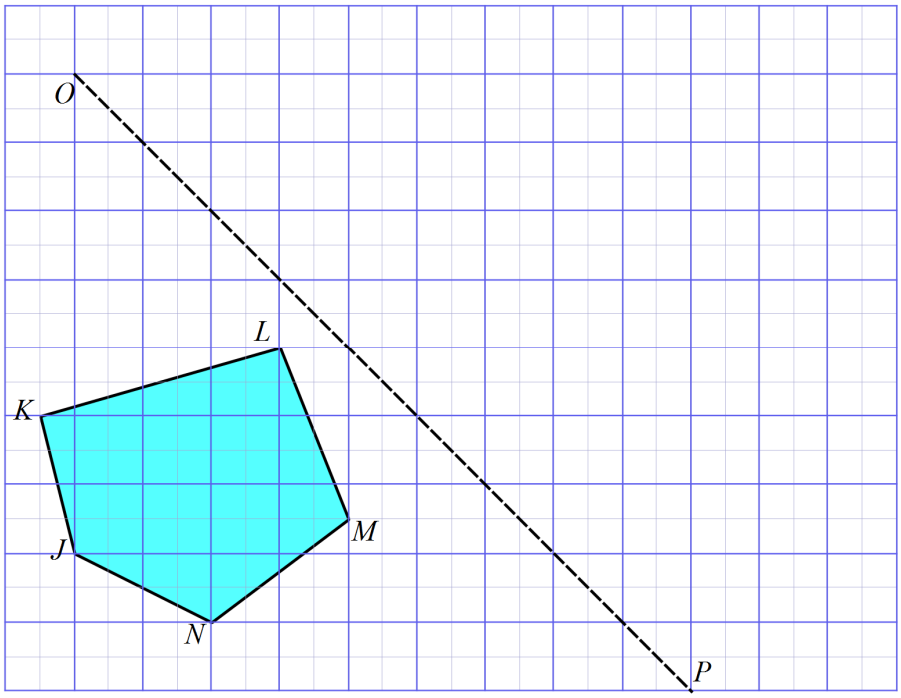
Section 3 Longer Answer Section

Write all working and answers in the spaces provided on this test paper.
YOU WILL NEED A RULER, COMPASSES AND PROTRACTOR.

Marks

1. (a) Reflect the polygon *JKLMN* in the line *OP*. **2**



(b) Label the image after reflections as *J'K'L'M'N'*. **1**

(c) What could you say about $\angle JNM$ and $\angle J'N'M'$? **1**

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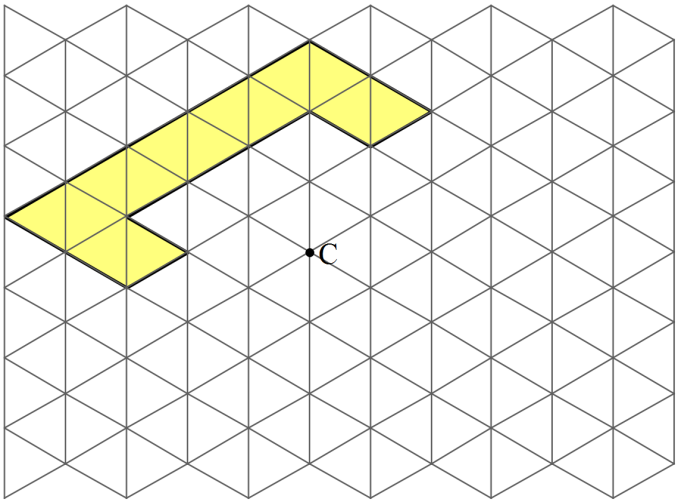
Marks

2. Draw the image of the shape below when it is rotated through 180° about the point C. **2**

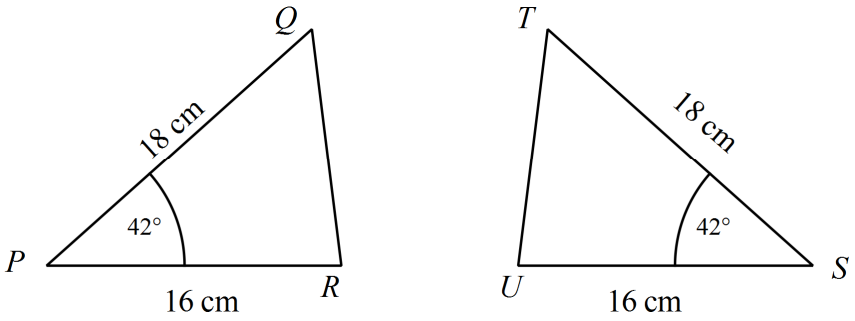


3. (a) A triangle has two sides whose lengths are given below and has an angle of 40° between these two sides. Use instruments to accurately draw the triangle. **2**

Marks

(b) A triangle has a base which measures 8 cm, with an angles of 30° and 50° at the ends of the base. Use instruments to accurately draw the triangle. **2**

4. (a) Prove that $\Delta PQR \equiv \Delta STU$. **2**



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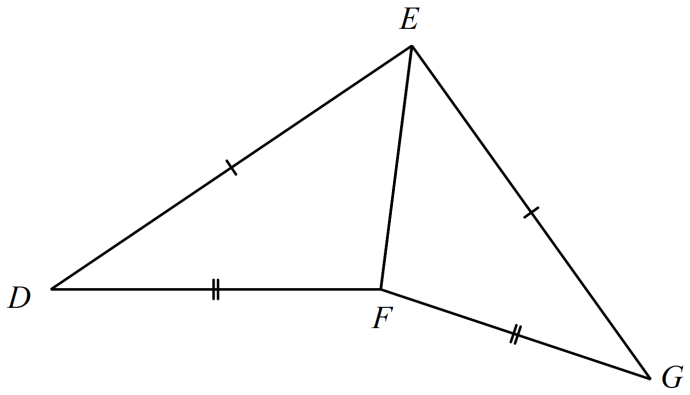
Marks

(b) Prove that $\Delta FED \equiv \Delta FEG$. **2**



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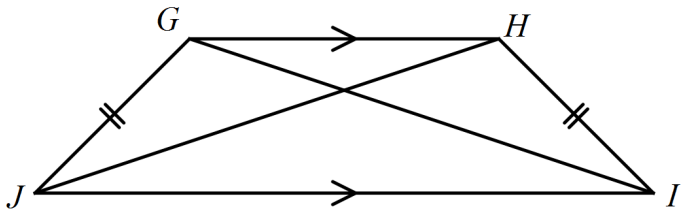
(c) In the quadrilateral *GHIJ,* the diagonals are equal in length and $GJ = HI$. **2**
Prove that $\Delta GHI \equiv \Delta GHJ$.



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Multiple Choice Answer Sheet

Congruence

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 ⬭
11.	A ⬭	B ⬭	C ⬭	D ⬭
12.	A ⬭	B ⬭	C ⬭	D ⬭
13.	A ⬭	B ⬭	C ⬭	D ⬭
14.	A ⬭	B ⬭	C ⬭	D ⬭
15.	A ⬭	B ⬭	C ⬭	D ⬭

High School Mathematics Test 2015

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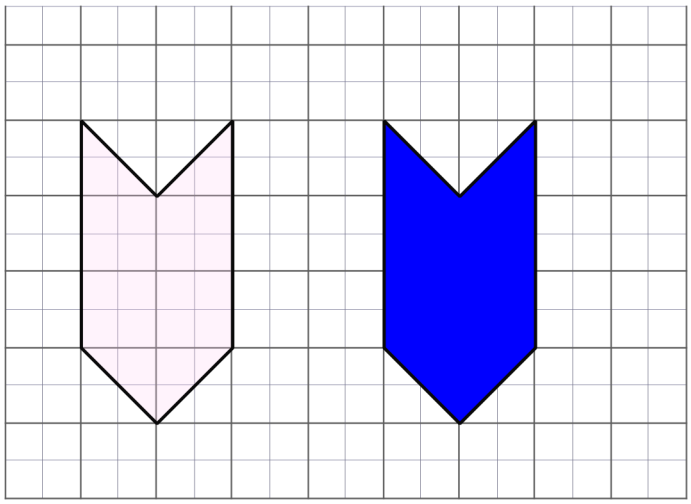
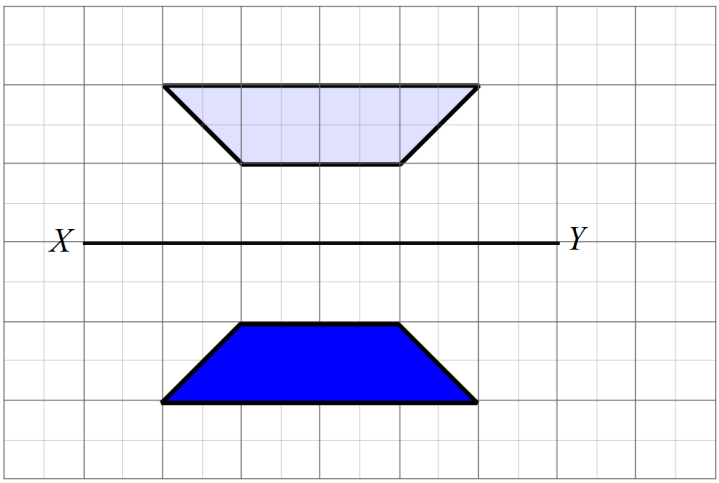
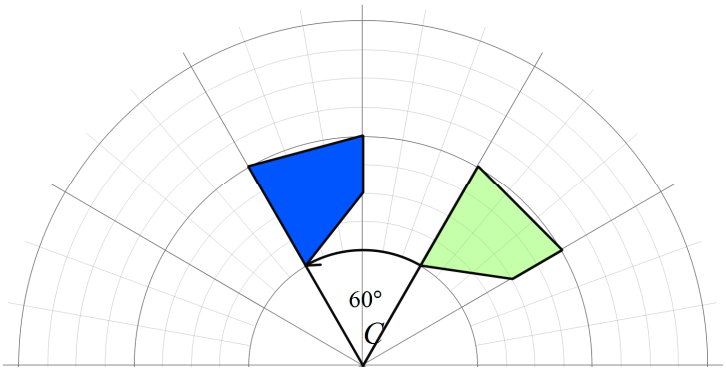
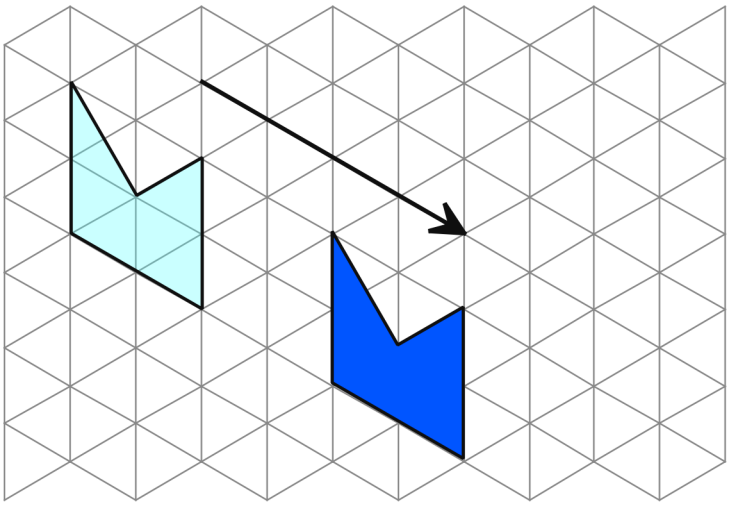
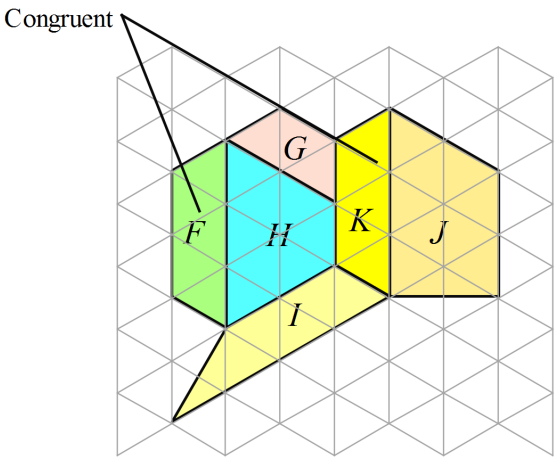
Congruence

Non Calculator

Section 1 Short Answer Section

ANSWERS

No.	WORKING	ANSWER
1.	Any position or orientation is okay. 	Solution is the darker shaded shape on the diagram; can be in any position.
2.		Solution is the darker shaded shape on the diagram; must be in the position shown.

3.		Solution is the darker shaded shape on the diagram; must be in the position shown.
4.		Solution is the darker shaded shape on the diagram; must be in the position shown.
5.		F and K
6.	SAS says that two triangles are congruent if two sides and an included angle of one triangle are equal to two sides and an included angle of the other.	Statement shown
7.	There are two sides and an included angle equal. (SAS)	SAS
8.	As AC is common and 2 sides are given, SSS could be used.	SSS
9.	To use AAS, you would need that $\angle P = 27°$.	$\angle P = 27°$.

10.	ΔPQR and ΔGHI are congruent using RHS.	See explanation
11.	AC = FD would allow use of SAS. AB = DE would allow use of RHS. $\angle A = \angle D$ would allow use of AAS. $\angle B = \angle E$ would allow use of AAS.	Any one of the 4 choices given at left is correct.
12.	Triangles G and J are congruent and since there is grid behind, we can use SSS, AAS or SAS to prove congruence.	Triangles G and J are congruent using SSS, AAS or SAS.
13.	$\angle UWV = \angle XYZ = 90°$ (given) $\therefore \Delta UWV \equiv \Delta XYZ$ (RHS)	provide the two lines
14.	In ΔGHJ and ΔIHJ $\angle GHJ = \angle IJH$ (**alternate angles on $\parallel$ lines**) $\angle GJH = IHJ$ (**alternate angles on $\parallel$ lines**) HJ is **common** $\therefore \Delta GHJ \equiv \Delta IHJ$ ($\boldsymbol{AAS}$)	Bold reasons are needed.
15.	In ΔFED and ΔFEG $\boldsymbol{ED} = \boldsymbol{EG}$ (given) $\angle DFE = \angle GFE$ (**right angles on str line**) FE is **common** $\Delta FED \equiv \Delta FEG$ ($\boldsymbol{RHS}$)	Bold lines are needed

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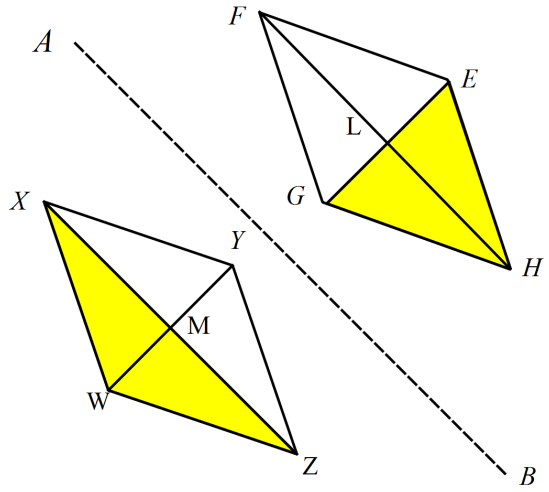
Congruence

Calculator Allowed

Section 2 Multiple Choice Section

ANSWERS

No.	WORKING	ANSWER
1.	The only triangle congruent to K is G.	D
2.	There are 12	C
3.	Translation	D
4.	A is a reflection in the line OQ	A
5.	B is congruent through AAS.	B
6.	C is congruent to X	C
7.	Triangles 1 and 2 are congruent SAS.	B
8.	A clockwise rotation of 180° about the origin.	A
9.	ΔWXZ and ΔGEH are not congruent 	D
10.	AAS using the 60 cm side and the angles 101° and 42°.	A
11.	A is congruent to the given triangle using SAS.	A
12.	Using the equal radii of the larger and smaller circels and the vertically opposite angles we can show congruence using SAS.	C
13.	Can use RHS with angles P and T as the right angles, PR = RT as equal sides, and QR = SR as equal hypotenuses.	B

14.	$\angle B = \angle E$ together with the right angles and equal sides allows AAS.	B
15.	$BD \perp AC$, so $\angle BDA = 90°$ and $\angle BDC = 90°$, because right angles on a straight line are equal.	C

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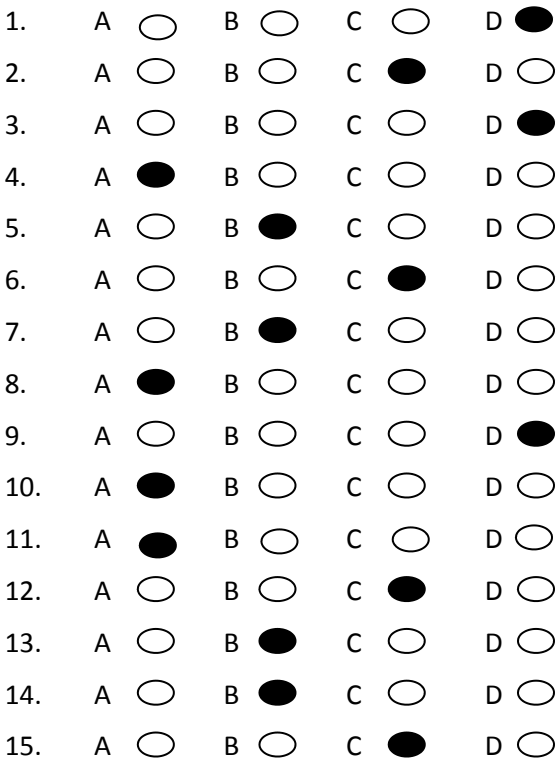
Multiple Choice Answer Sheet

Congruence

Name _____ANSWERS_____

Completely fill the response oval representing the most correct answer.



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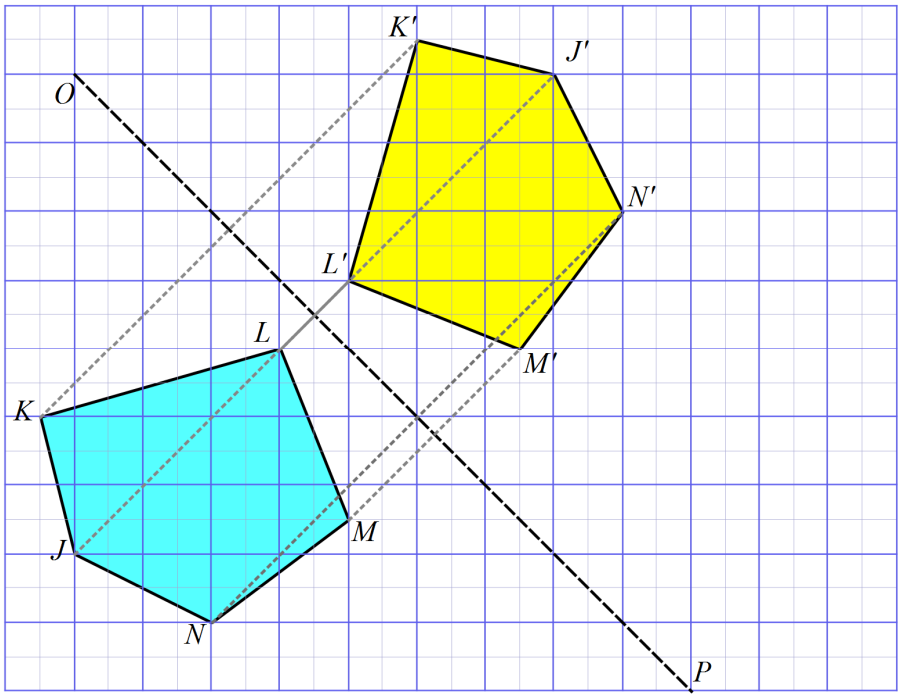
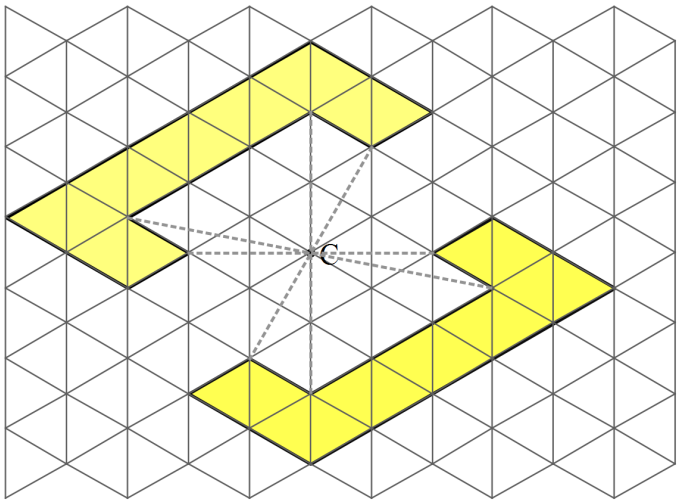
Section 3 Longer Answer Section

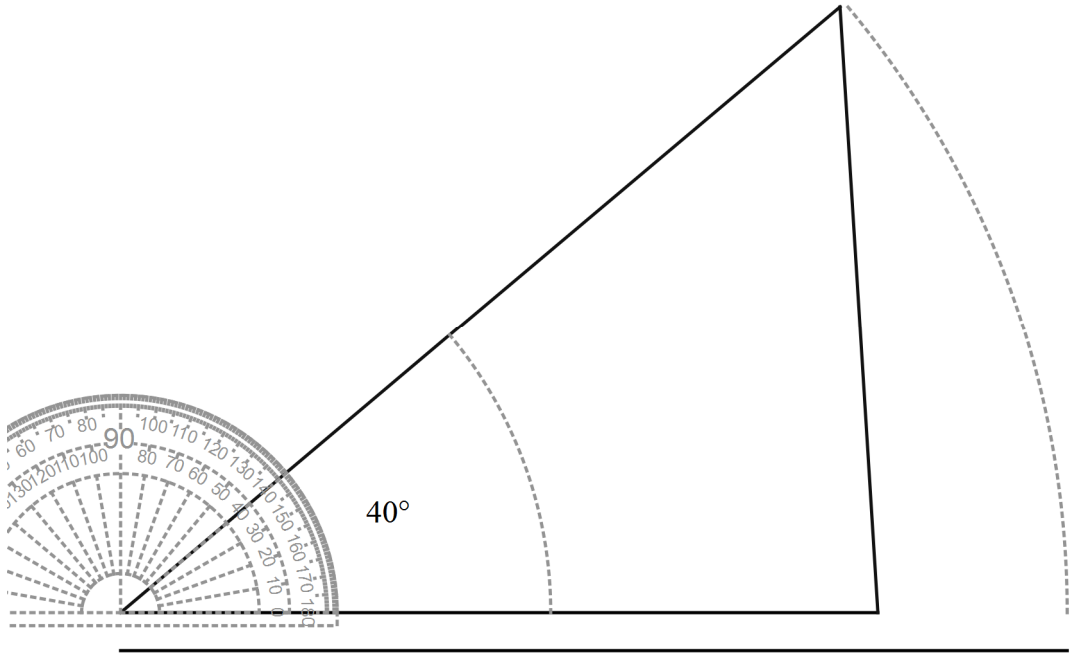
ANSWERS

		Marks
1.	(a) 	**2**
	(b) Labels on the image above.	**1**
	(c) $\angle JNM = \angle J'N'M'$	**1**

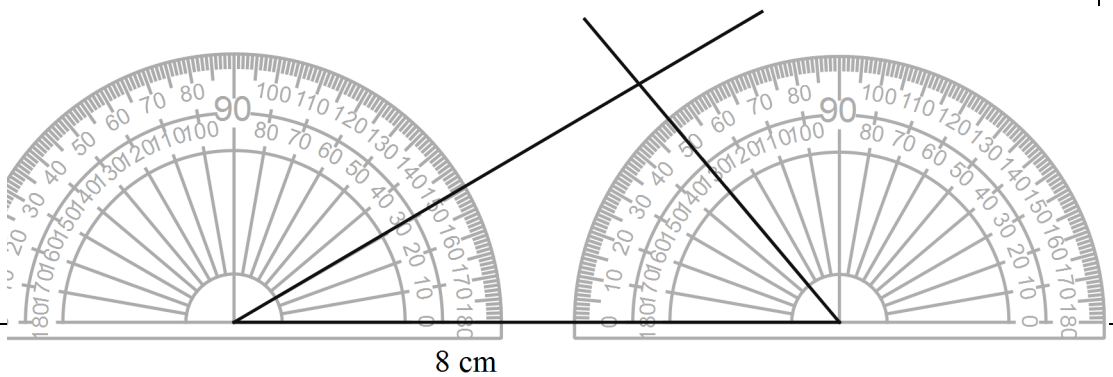
2. (a)



3. (a) **2**



(b) **2**



4.	(a) In ΔPQR and ΔSTU $PR = SU$ (given) $\angle QPR = \angle TSU$ (given) $PQ = ST$ (given) $\therefore \Delta PQR \equiv \Delta STU$ (SAS)	**2**
	(b) In ΔFED and ΔFEG $ED = EG$ (given) $DF = GF$ (given) EF is common $\Delta FED \equiv \Delta FEG$ (SSS)	**2**
	(c) In ΔGHI and ΔGHJ. $HI = GJ$ (given) $GI = HJ$ (equal diagonals) GH is common $\Delta GHI \equiv \Delta GHJ.$ (SSS)	**2**