School Name
Mathematics Test 2017

Year 9

Basic Geometry

Non Calculator

Skills and Knowledge Assessed:

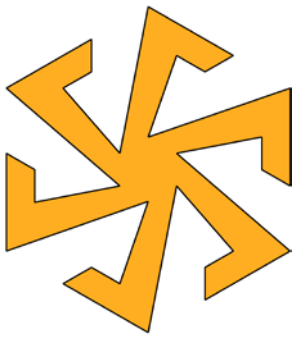
- Use the language, notation and conventions of geometry
- Identify line and rotational symmetries (ACMMG181)
- Recognise the geometrical properties of angles at a point.
- Identify corresponding, alternate and co-interior angles when two straight lines are crossed by a transversal (ACMMG163)
- Investigate conditions for two lines to be parallel and solve simple numerical problems using reasoning (ACMMG164)
- Demonstrate that the angle sum of a triangle is 180° and use this to find the angle sum of a quadrilateral (ACMMG166)
- Classify triangles according to their side and angle properties and describe quadrilaterals (ACMMG165)
- Establish properties of quadrilaterals using congruent triangles and angle properties, and solve related numerical problems using reasoning (ACMMG202)

Name_____

Section 1 Short Answer Section

JUSTIFY YOUR ANSWER WITH REASONS/ CALCULATIONS WHERE NECESSARY.
YOU WILL NEED A RULER AND PROTRACTOR FOR THIS TEST.
Write all working and answers in the spaces provided on this test paper.
DIAGRAMS ARE NOT TO SCALE. (Unless otherwise stated).

1. Describe any line and rotational symmetry properties of the shape below.



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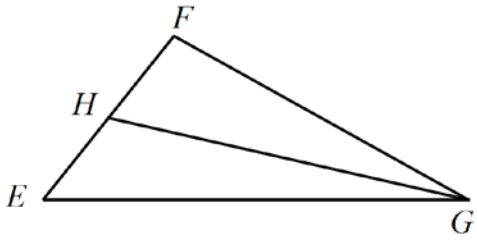
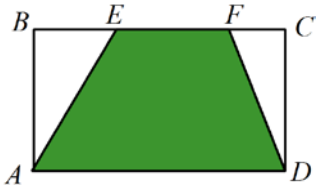
2. Shade in the angles which would be named $\angle EFG$ and $\angle EGH$ in the diagram below.



3. A rectangle *ABCD* is shown below. *E* and *F* are points on the side *BC*.

Describe and name the shape which has been shaded, by listing its vertices.



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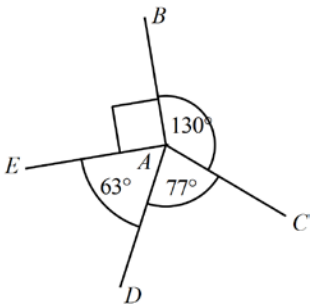
4. Name an obtuse angle in the diagram below.



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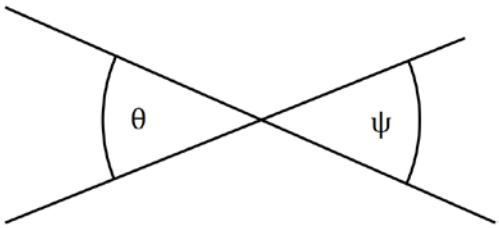
5. The angles marked θ and ψ are equal in size.

What name is given to this type of angle pair?



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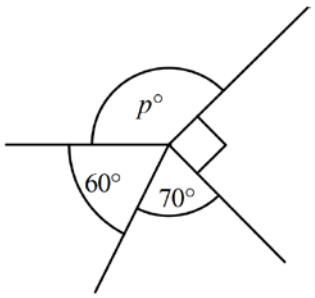
6. Find the value of p in the diagram below.



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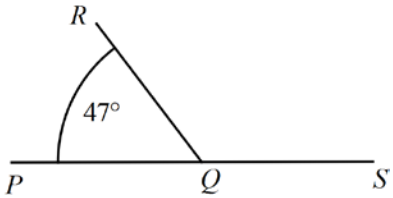
7. What is the size of $\angle RQS$?



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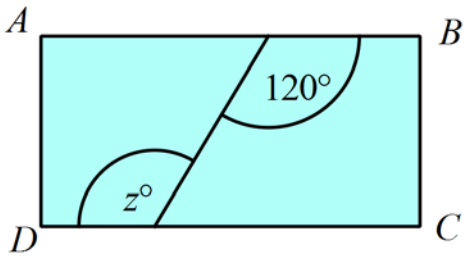
8. $ABCD$ is a rectangle.

What is the value of z?



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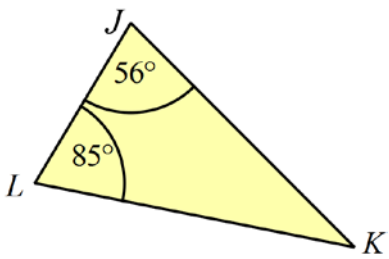
9. What is the size of $\angle K$?



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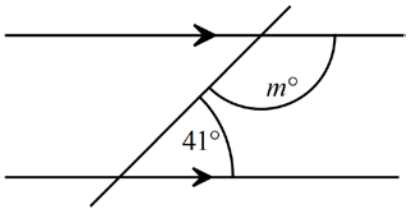
10. What is the value of m?



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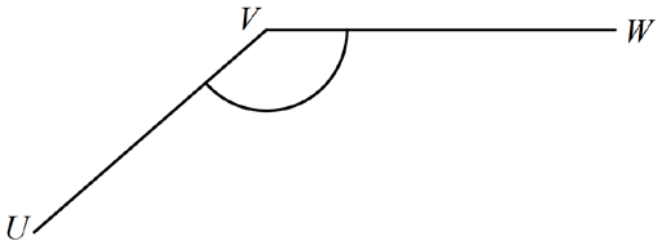
11. Measure the size of $\angle UVW$ correct to the nearest degree.



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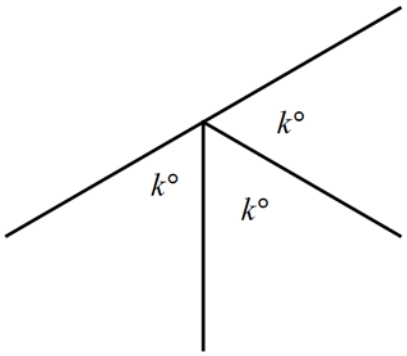
12. Find the value of k.



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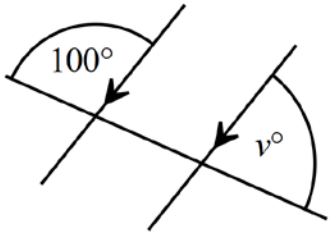
13. Find the value of v.



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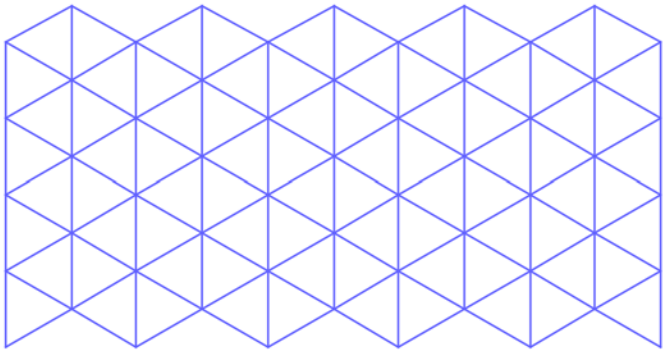
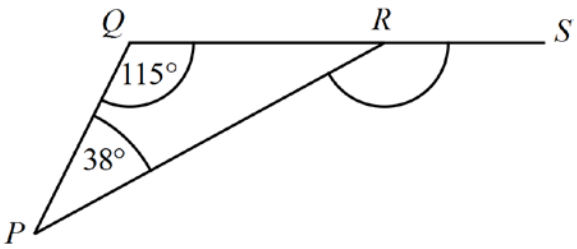
14. A 1 cm isometric grid is shown below.

Use the grid to sketch an obtuse isosceles triangle.



15. Find the size of $\angle PRS$.



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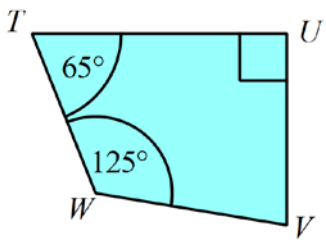
16. Find the size of $\angle UVW$.



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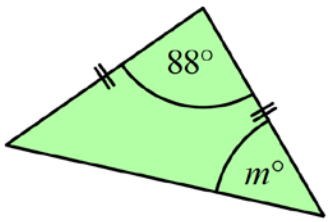
17. Find the value of m.



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18. A quadrilateral has diagonals which are unequal in length, but which bisect one another.
Sketch and name the quadrilateral.

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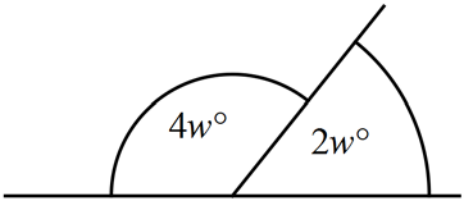
19. Find the value of w.



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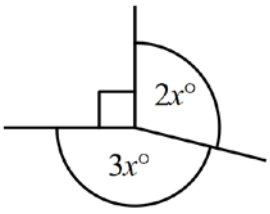
20. Find the value of x.



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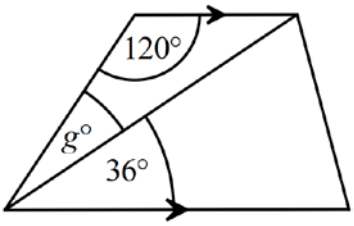
21. Find the value of g.



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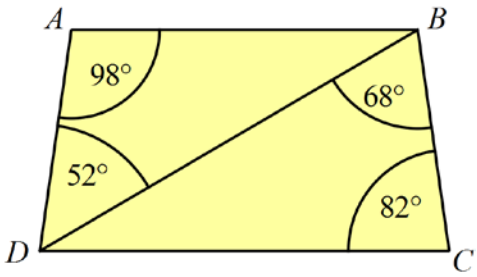
22. Using the angles given in the quadrilateral below, explain why $AB \parallel DC$.



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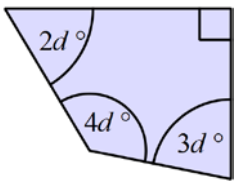
23. Find the value of d.



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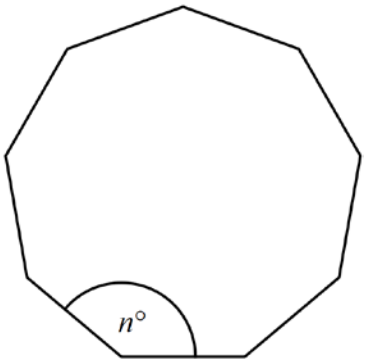
24. A regular nonagon (nine-sided polygon) is shown.

What is the value of n?



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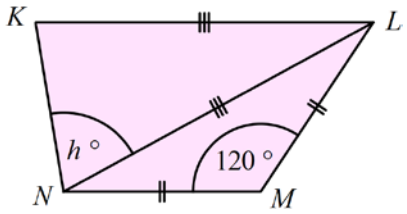
25. In the diagram $KL \parallel NM$, $KL = NL$ and $NM = ML$.

Find the value of h.



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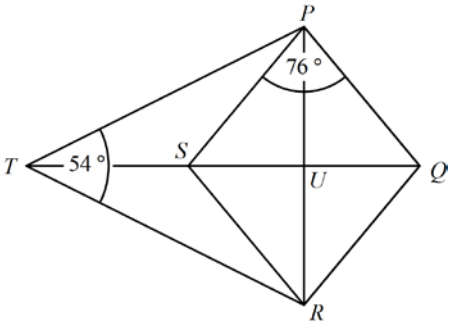
26. $PQRS$ is a rhombus and $PQRT$ is a kite.

What is the size of $\angle SPT$?



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School Name
Mathematics 2017

Calculator Allowed

Year 9

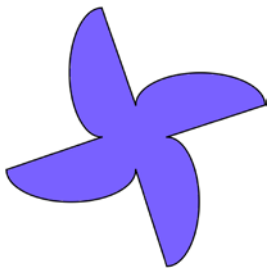
Basic Geometry

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.

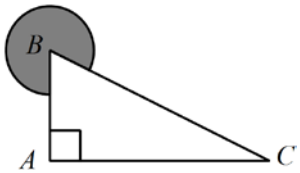
1. Which statement is true about the shape below?



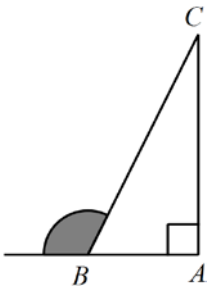
A. The shape has both line symmetry and rotational symmetry.
B. The shape has line symmetry only.
C. The shape has neither line symmetry nor rotational symmetry.
D. The shape has rotational symmetry only.

2. Which diagram shows $\angle ABC$ which is a reflex angle?

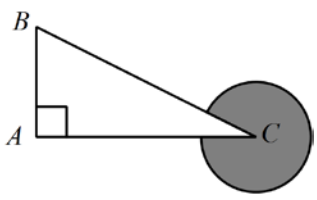
A.



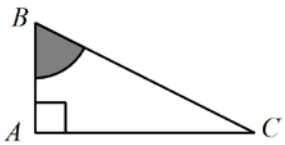
B.



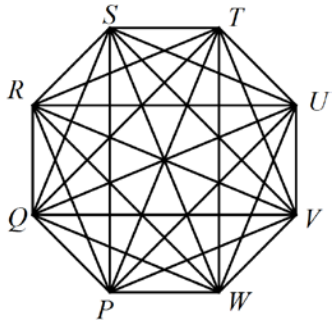
C.



D.



Questions 3 and 4 refer to the regular octagon shown below.



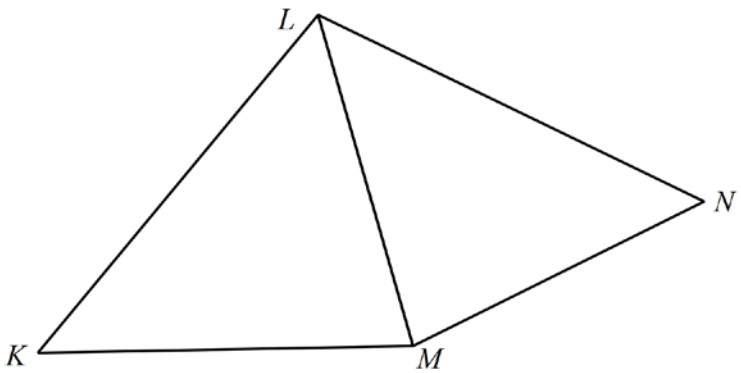
3. What name best describes the shape *PQRS*?

A. Parallelogram B. Rectangle C. Rhombus D. Trapezium

4. How many diagonals does the octagon have?

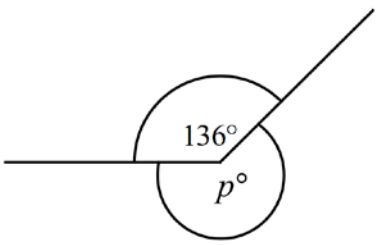
A. 16 B. 20 C. 32 D. 40

5. Use a protractor to determine the size of $\angle KMN$ in the quadrilateral below, correct to the nearest degree.



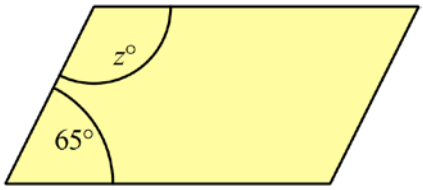
A. 80° B. 104° C. 155° D. 205°

6. What is the value of p in the diagram below?



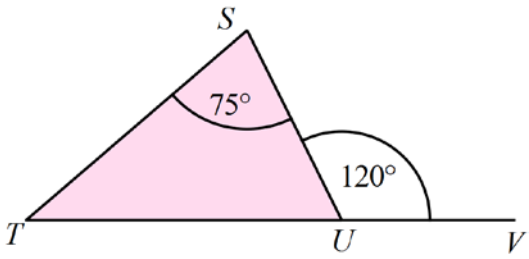
A. $p = 124$ B. $p = 136$ C. $p = 224$ D. $p = 236$

7. The shape below is a parallelogram.
What is the value of z?



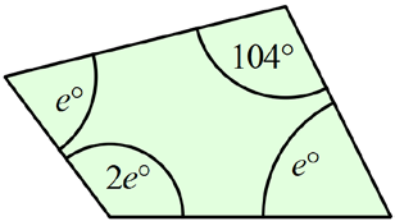
A. $z = 25$ B. $z = 65$ C. $z = 115$ D. $z = 155$

8. What is the size of $\angle STU$ in the diagram below?



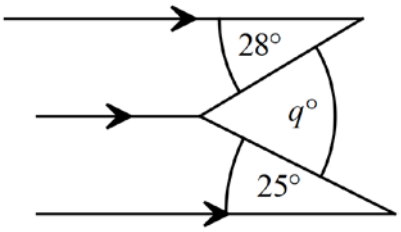
A. 30° B. 45° C. 60° D. 75°

9. What is the value of e in the diagram below?



A. $e = 64$ B. $e = 72$ C. $e = 85.3$ D. $e = 128$

10. What is the value of q?



A. $q = 25$ B. $q = 28$ C. $q = 53$ D. $q = 127$

11. A quadrilateral has the properties below:

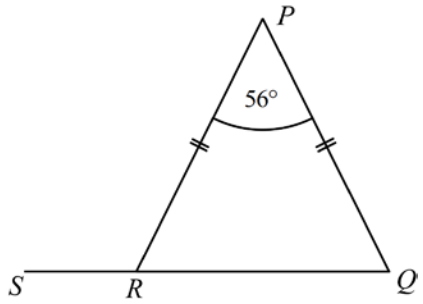
- Its diagonals are unequal.
- Its diagonals bisect one another.
- The angle between its diagonals is 40^o.

What name would best describe the quadrilateral?

A. Parallelogram B. Rectangle C. Rhombus D. Trapezium

12. An isosceles triangle is shown below.

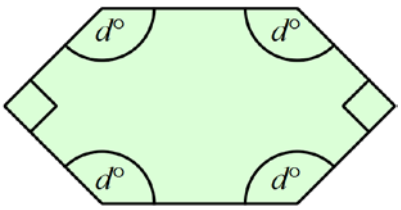
Find the size of $\angle PRS$



A. 56^o B. 62^o C. 118^o D. 124^o

13. There are two right angles and four other equal angles in the hexagon shown below.

What is the value of d ?



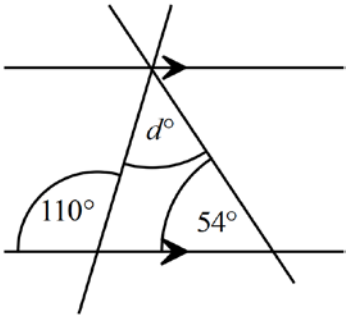
A. $d = 90$ B. $d = 108$ C. $d = 120$ D. $d = 135$

14. A rhombus, which has one of its internal angles equal to 66^o, has it two diagonals drawn.

Which type of triangle is not formed in the resulting figure?

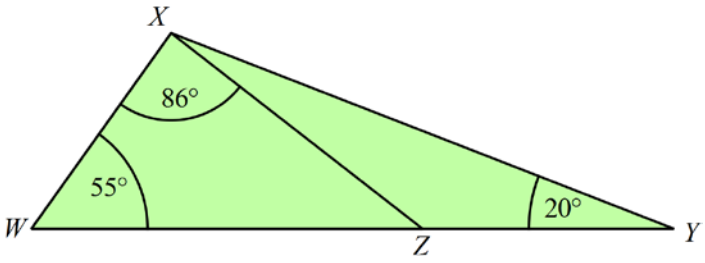
A. An acute isosceles triangle.
B. An acute equilateral triangle
C. An obtuse isosceles triangle
D. A right scalene triangle.

15. What is the value of d in the diagram below?



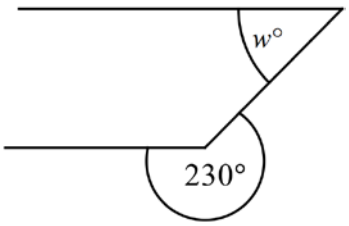
A. $d = 46$ B. $d = 54$ C. $d = 56$ D. $d = 64$

16. What is the size of $\angle YXZ$ in the diagram below?



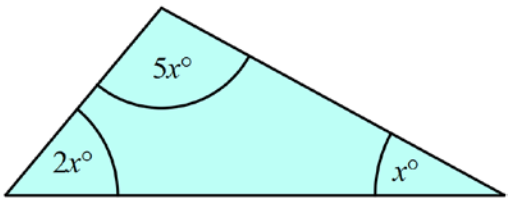
A. 19° B. 20° C. 21° D. 55°

17. What is the value of w in the diagram below?



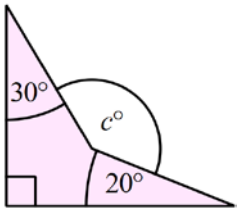
A. $w = 40$ B. $w = 50$ C. $w = 60$ D. $w = 70$

18. What is the value of x?



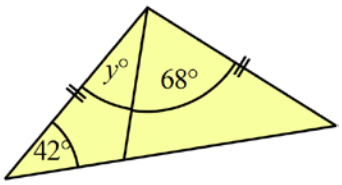
A. $x = 20$ B. $x = 21.5$ C. $x = 22$ D. $x = 22.5$

19. What is the value of c in the diagram below?



A. $c = 140$ B. $c = 150$ C. $c = 160$ D. $c = 220$

20. What is the value of y in the diagram below?



A. $y = 26$ B. $y = 28$ C. $y = 32$ D. $y = 42$

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Section 3 Longer Answer Section

Write all working and answers in the spaces provided on this test paper.

Marks

1. Complete the following using geometric instruments.

   Do not erase any of your construction lines.

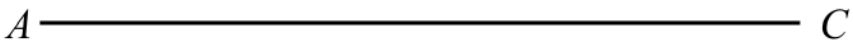
   (a) Draw an isosceles triangle that has an angle of 80^o between its equal sides which each measure 7 cm. **2**

Marks

(b) A diagonal *AC* of a rhombus is shown below. **2**

The diagonal *BD* of the rhombus measures 6 cm in length.

Construct the diagonal *BD* and draw the rhombus.



School Name

Mathematics 2017

Multiple Choice Answer Sheet

Basic Geometry

Name _____

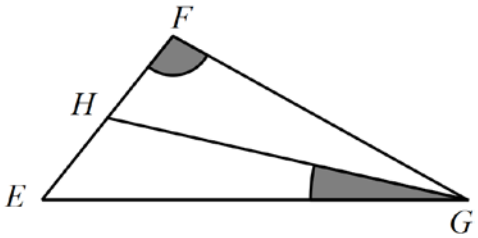
Completely fill the response oval representing the most correct answer.

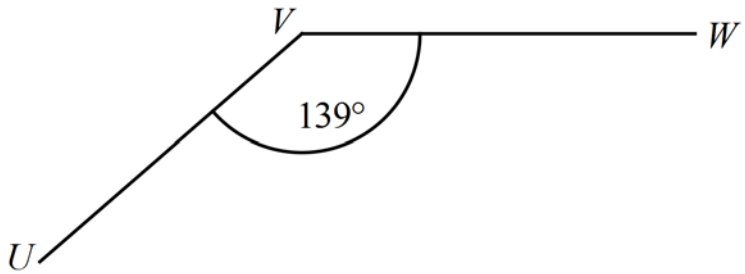
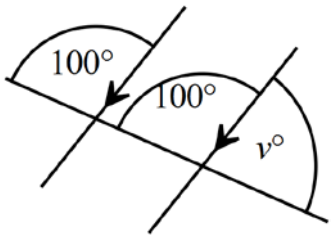
1.	A ⬭	B ⬭	C ⬭	D ⬭
2.	A ⬭	B ⬭	C ⬭	D ⬭
3.	A ⬭	B ⬭	C ⬭	D ⬭
4.	A ⬭	B ⬭	C ⬭	D ⬭
5.	A ⬭	B ⬭	C ⬭	D ⬭
6.	A ⬭	B ⬭	C ⬭	D ⬭
7.	A ⬭	B ⬭	C ⬭	D ⬭
8.	A ⬭	B ⬭	C ⬭	D ⬭
9.	A ⬭	B ⬭	C ⬭	D ⬭
10.	A ⬭	B ⬭	C ⬭	D ⬭
11.	A ⬭	B ⬭	C ⬭	D ⬭
12.	A ⬭	B ⬭	C ⬭	D ⬭
13.	A ⬭	B ⬭	C ⬭	D ⬭
14.	A ⬭	B ⬭	C ⬭	D ⬭
15.	A ⬭	B ⬭	C ⬭	D ⬭
16.	A ⬭	B ⬭	C ⬭	D ⬭
17.	A ⬭	B ⬭	C ⬭	D ⬭
18.	A ⬭	B ⬭	C ⬭	D ⬭
19.	A ⬭	B ⬭	C ⬭	D ⬭
20.	A ⬭	B ⬭	C ⬭	D ⬭

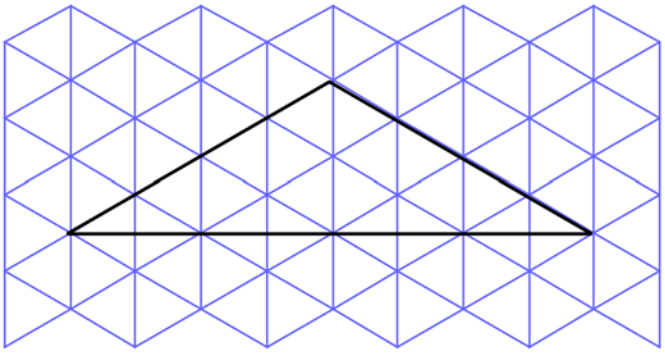
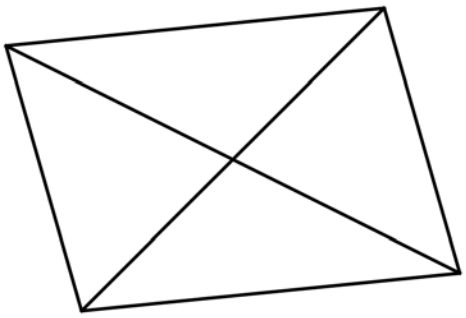
School Name
Mathematics Test 2017

Year 9 **Basic Geometry** Non Calculator Section

ANSWERS

Question	Working and Answer
1.	The shape has no line symmetry and has rotational symmetry of order 6.
2.	
3.	It is the trapezium *AEFD*.
4.	$\angle BAC$ (or $\angle BAD$ or $\angle CAE$)
5.	Vertically opposite angles.
6.	$p + 60 + 70 + 90 = 360$ (angles at a point) $p + 220 = 360$ $p = 360 - 220$ $\boldsymbol{p = 140}$
7.	$\angle RQS + 47° = 180°$ (angles on straight line) $\angle RQS = 180° - 47°$ $\angle RQS = \mathbf{133°}$

Question	Working and Answer
8.	$AB \parallel DC$ (opposite sides of rectangle) $z = \mathbf{120}$ (alternate angles on $\parallel$ lines)
9.	$\angle K + 56° + 85° = 180°$ (angle sum Δ) $\angle K + 141° = 180°$ $\angle K = 180° - 141°$ $\boldsymbol{\angle K = 39°}$
10.	$m + 41 = 180$ (cointerior angles) $m = 180 - 41$ $\boldsymbol{m = 139}$
11.	 Allow answers from 138^o to 140^o.
12.	$k + k + k = 180$ (angles on a straight line) $3k = 180$ $k = \frac{180}{3}$ $\boldsymbol{k = 60}$
13.	Corresponding angles of 100° are shown $v + 100 = 180$ (angles on a line) $v = 180 - 100$ $\boldsymbol{v = 80}$ 

Question	Working and Answer
14.	One possible example of an obtuse isosceles triangle is shown. 
15.	$\angle PRS = 38° + 115°$ (exterior angle of Δ) $\boldsymbol{\angle PRS = 153°}$
16.	$\angle UVW + 125 + 65 + 90 = 360$ (angle sum quadrilateral) $\angle UVW + 280 = 360$ $\angle UVW = 360 - 280$ $\boldsymbol{\angle UVW = 80}$
17.	$2m + 88 = 180$ (angle sum isos Δ) $2m = 92$ $m = 92 \div 2$ $\boldsymbol{m = 46}$
18.	It is a parallelogram. 
19.	$2w + 4w = 180$ (anles on a straight line) $6w = 180$ $w = 180 \div 6$ $\boldsymbol{w = 30}$
20.	$2x + 3x + 90 = 360$ (angles at a point) $5x + 90 = 360$ $5x = 270$ $x = 270 \div 5$ $\boldsymbol{x = 54}$

Question	Working and Answer
21.	$(g + 36) + 120 = 180$ (cointerior angles on $\parallel$ lines) $g + 156 = 180$ $g = 180 - 156$ $\boldsymbol{g = 24}$
22.	$\angle ABD = 180 - (98 + 52) = 30°$ $\angle ABC = 30 + 68 = 98°$ $\angle ABC + \angle BCD = 98 + 82 = 180°$ $\therefore AB \parallel DC$ (cointerior angles are supplementary) Also possible by finding equal alternate angles.
23.	$2d + 3d + 4d + 90 = 360$ (angles sum of quadrilateral) $9d + 90 = 360$ $9d = 270$ $d = 270 \div 9$ $\boldsymbol{d = 30}$
24.	The angle sum of a nonagon $= (9 - 2) \times 180$ $= 1260$ $n = 1260 \div 9$ $\boldsymbol{n = 140}$
25.	$\angle MLN = \angle MNL$ (base angles of isosceles Δ) $2 \times \angle MNL + 120 = 180$ (angle sum of isosceles Δ) $2 \times \angle MNL = 60$ $\angle MNL = 30$ $\angle KNL = 30$ (alternate angles on $\parallel$ lines) $2h + 30 = 180$ (angle sum of isosceles Δ) $2h = 150$ $\boldsymbol{h = 75}$
26.	$\angle PSR = 180 - 76 = 104°$ (angles in rhombus are supplementary) $\angle PSU = 104 \div 2 = 52°$ (diagonals bisect the angles in rhombus) $\angle PTU = 54 \div 2 = 27°$ (diagonals bisect the unequal angles in kite) $\angle TSP = 180 - 52 = 128°$ (angles on a straight line) $\angle SPT = 180 - 128 - 27$ (angle sum of triangle) $\boldsymbol{\angle SPT = 25°}$

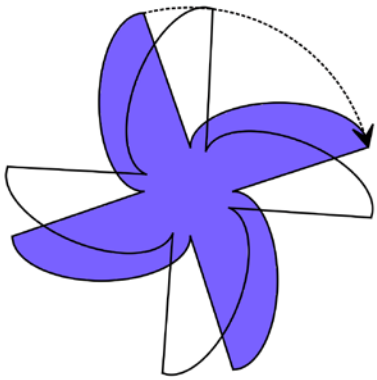
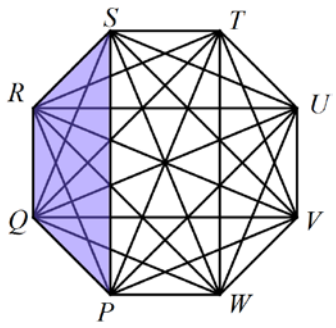
School Name
Mathematics Test 2017

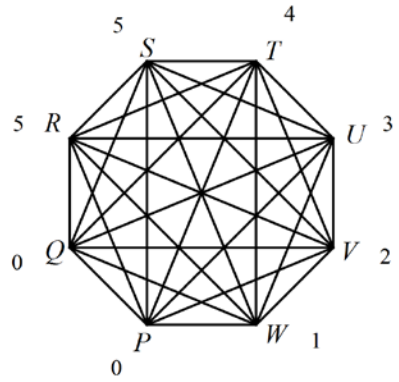
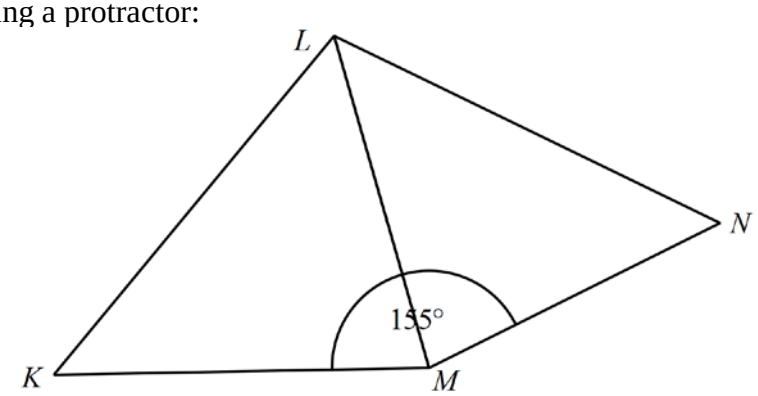
Basic Geometry

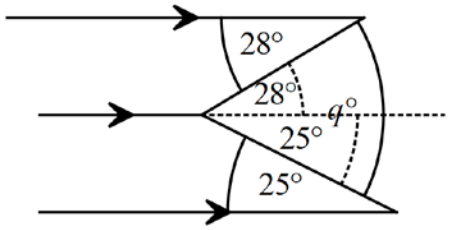
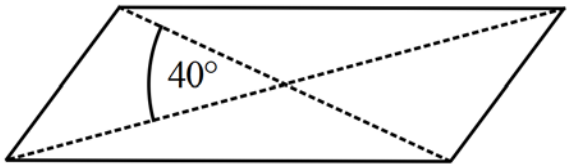
Year 9

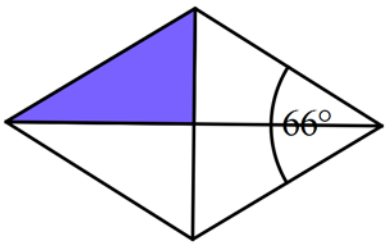
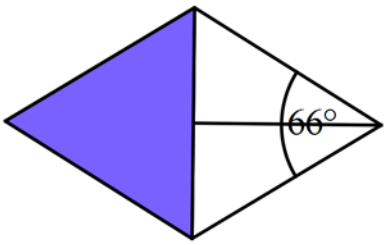
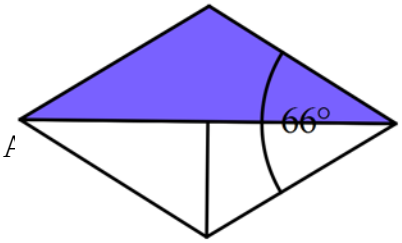
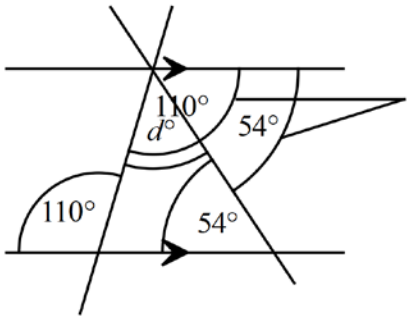
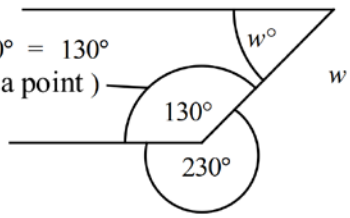
Calculator Allowed
Short Answer
Section

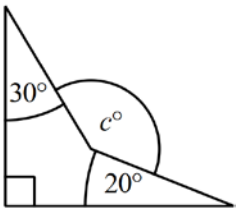
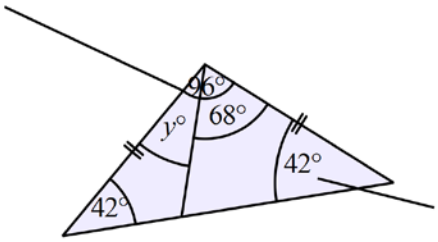
ANSWERS

Question	Working	Answer
1.	 There are four positions that the shape can be rotated to, which appear the same, so it **has rotational symmetry** of order four. There are **no lines of symmetry**. **The shape has rotational symmetry only,**	**D**
2.	A reflex angle is greater than 180° so it makes more than half a full revolution, so this is only A and C. Of these, in Option A, the reflex angle is marked $\angle ABC$ while in Option C it is marked as $\angle BCA$.	**A**
3.	 $PQRS$ is a trapezium.	**D**

4.	 There are 5 diagonals at each vertex. Start at R and work clockwise, counting the number at each vertex, remembering the ones which have already been counted. So at vertex T, the diagonal RT is already counted, so only 4. So at vertex U, the diagonals RU and SU are already counted, so only 3. Total = 5 + 5 + 4 + 3 + 2 + 1 = 20 **OR** 8 vertices × 5 diagonals at each vertex = 40. Each diagonal is counted twice, so there are 20 diagonals.	**B**
5.	Using a protractor: 	**C**
6.	$p + 136 = 360$ (angles at a point) $p = 360 - 136$ $p = 224$	**C**
7.	$z + 65 = 180$ (cointerior angles) $z = 180 - 65$ $z = 115$	**C**
8.	$\angle STU + 75 = 120$ (exterior angle of Δ) $\angle STU = 120 - 75$ $\boldsymbol{\angle STU = 45°}$ (*Or* by finding $\angle SUT = 60°$ and using angle sum Δ)	**B**

9.	$2e + e + e + 104 = 360$ (angle sum quadrilateral) $4e + 104 = 360$ $4e = 256$ $e = \frac{256}{4} = 64$	**A**
10.	 Use alternate angles to get the angles of 28° and 25° Now $q = 25 + 28$ (adjacent angles) $q = 53$	**C**
11.	It is a parallelogram 	**A**
12.	$2 \times \angle PRQ + 56° = 180°$ (angle sum isosceles Δ) $\angle PRQ = \frac{180 - 56}{2} = \frac{124}{2} = 62°$ $\angle PRS = 180 - 62$ (angles on straight line) $\angle PRS = 118°$	**C**
13.	Angle sum Hexagon $= (6 - 2) \times 180 = 720°$ $4d + 180 = 720$ $4d = 540$ $d = \frac{540}{4} = 135$	**D**

14.	 right triangle  acute isosceles triangle  obtuse isosceles triangle	**B**
15.	 Using Alternate angles Then $d = 110 - 54 = 56$	**C**
16.	$\angle XZY = 86 + 55 = 141°$ (exterior angle Δ) $\angle YXZ = 180 - (141 + 20)$ (angle sum Δ) $\angle YXZ = 180 - 161 = 19°$	**A**
17.	$360° - 230° = 130°$ (angles at a point)  $w + 130 = 180$ (cointerior angles) $w = 50$	**B**
18.	$5x + 2x + x = 180$ (angle sum Δ) $8x = 180$ $x = 22.5$	**D**

19.	Find the last interior angle of the quadrilateral Angle = 360 – (90 + 30 + 20) = 360 – 140 = 220° c = 360 – 220 = 140  	**A**
20.	angle sum isosceles Δ  Base angles of isosceles Δ y = 96 – 68 (adjacent angles) = 28	**B**

School Name

Mathematics 2017

Multiple Choice Answer Sheet

Basic Geometry

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 ○
16.	A	●	B	○	C	○	D ○
17.	A	○	B	●	C	○	D ○
18.	A	○	B	○	C	○	D ●
19.	A	●	B	○	C	○	D ○
20.	A	○	B	●	C	○	D ○

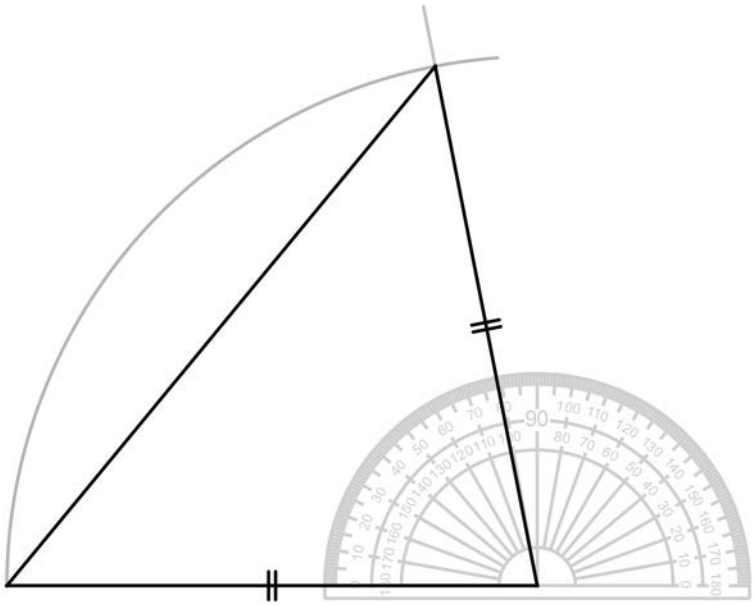
School Name
Mathematics Test 2017

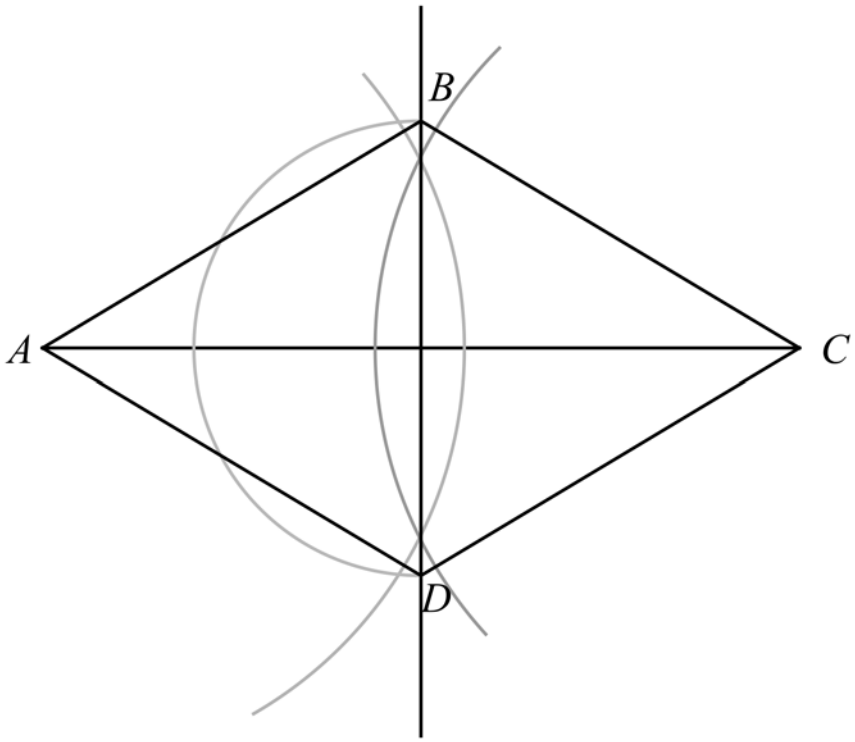
Year 9

Basic Geometry

Calculator Allowed
Longer Answer Section

ANSWERS

Question	Answer	Marks
1.	(a) 	2 marks for an accurate and correct drawing with construction lines. 1 mark for a diagram which is inaccurate, slightly incorrectly done or missing construction lines.

Question	Answer	Marks
	(b)  	2 marks for an accurate and correct drawing with construction lines. 1 mark for a diagram which is inaccurate, slightly incorrectly done or missing construction lines.