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| Year  9 | | *Enlargement & Similarity* | Non Calculator |
| **Skills and Knowledge Assessed:**   * Use the enlargement transformation to explain similarity and develop the conditions for triangles to be similar (ACMMG220) * Solve problems using ratio and scale factors in similar figures (ACMMG221) | | | Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Section 1Short Answer Section | | | |
| Write all working and answers in the spaces provided on this test paper. | | | |
|  | Complete the statement below.  If two polygons are similar, then the corresponding \_\_\_\_\_\_\_\_\_\_ of the first are equal to those of the second. | | |
|  | Square A is enlarged, with a scale factor of 3, to produce Square B.    What is the side length of Square B?  …………………………………………..  …………………………………………..  ………………………………………….. | | |
|  | Shape 1 is a regular pentagon.  It is enlarged to produce shape 2.  What is the enlargement factor?  ……………………………………………………………………..  ……………………………………………………………………..  ……………………………………………………………………..  …………………………………………………………………….. | | |
|  | Two similar rhombuses are shown below.    What is the size of the angle marked  ……………………………………………………………………..  ……………………………………………………………………..  ……………………………………………………………………..  …………………………………………………………………….. | | |
|  | By measurement and calculation, find the scale factor when the lighter triangle is enlarged to give the darker triangle.  ..................................................................  ..................................................................    ..................................................................  .................................................................. | | |
|  | Equilateral Triangle X is enlarged, with a scale factor of 2.5, to produce Triangle Y.    What is the side length of Triangle Y?  …………………………………………..  …………………………………………..  ………………………………………….. | | |
|  | NOT TO  SCALE  What is the enlargement factor?  ……………………………………………………………………..  ……………………………………………………………………..  ……………………………………………………………………..  …………………………………………………………………….. | | |
|  | Two kites are shown below. Are they similar?  Explain your answer.    ………………………………………………………  ……………………………………………………………………..  ……………………………………………………………………..  …………………………………………………… | | |
|  | Justin is drawing an enlargement of the quadrilateral *IJKL* from the point *P*. He has marked the position of the points *I’, J’* and *L’.* By measurement and calculation find the position of *K’* and complete the quadrilateral. | | |
|  | The two triangles are similar.  What is the length of *HI*?  ...............................................................  ...........................................................................................  ...............................................................  .............................................................. | | |
|  | By measurement and calculation, find the scale factor when  is enlarged to ?    ..........................................................................................................................................................    ..................................................................................................................................................... | | |
|  | |||  What is the length of *AC* ?  ...............................................................  ............................................................  ...............................................................  .............................................................. | | |
|  | Which pair of triangles are similar in the diagram below?  Explain why.  .......................................................................    ..................................................................... | | |
|  | A vertical tree casts a 15 m shadow.  At the same time a 1.5 m high vertical fence post casts a shadow which is 0.6 m long.  Use this information to calculate the height of the tree.  ...............................................................  ................................................................  ...............................................................  .............................................................. | | |
|  | Find the value of *x*.  NOT TO  SCALE  ……………………………………………………………………………………………….  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | | |

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| Year  9 | | *Enlargement & Similarity* | Calculator Allowed |
| Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Section 2Multiple 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. | | | |
|  | Which is always true about a pair of similar figures?  A. The corresponding sides are equal in length.  B. Their areas are equal.  C. The corresponding angles are equal.  D. Their perimeters are equal. | | |
|  | What is the enlargement factor from *Triangle* *A* to *Triangle* *B*?    NOT TO  SCALE.  A.  B. 3 C. 6 D. 12 | | |
|  | A square with sides 12 cm is enlarged with scale factor of 4.  What are the side lengths of the new square?  A. 3 cm B. 16 cm C. 24 cm D. 48 cm | | |
|  | Robin takes a photograph which measures 8 cm by 10 cm, to the printers to make a poster.  The poster is 8 times the size of the photograph.  What is the measurement of the poster on its shorter side?  A. 64 cm B. 72 cm C. 80 cm D. 160 cm. | | |
|  | What is the scale factor when  is enlarged to ?  A. 1  B. 2  C. 3  D. 4 | | |
|  | Four rectangles are shown below.  Which two are similar?  A. *I* and *IV* B. *II* and *III* C. *II* and *IV* D. *III* and *IV* | | |
|  | Which is **not** always true?  A. All circles are similar.  B. All equilateral triangles are similar.  C. All rectangles are similar.  D. All squares are similar. | | |
|  | The design on a towel has two similar rectangles.  What is the width of the smaller rectangle?  A. 0.4 m B. 0.6 m  C. 0.8 m D. 0.9 m | | |
|  | The plan of a building is drawn to a scale of 1 : 50. If the width of the building on the plan is 320 mm, what is the width of the actual building?  A. 3.2 m B. 6.4 m C. 8 m D. 16 m | | |
|  | What is the length of *A’C’* ?  A. 2.5 cm  B. 6 cm  C. 10 cm  NOT TO  SCALE  D. 12 cm | | |
|  | Which reason could be used to prove that  ?    A. The three corresponding angles of the triangles are equal.  B. The three corresponding angles of the triangles are in proportion.  C. The three corresponding sides of the triangles are in proportion.  D. Two corresponding sides of the triangles are in proportion and the included angle is equal. | | |
|  | has been enlarged to produce  What is the scale factor of the enlargement?  A.  B.  C. 3 D. 4 | | |
|  | One pair of similar triangles is shown in the diagram.  Which statement names the similar triangles with vertices in corresponding order?  A.  B.  C.  D. | | |
|  | In the diagram, .  What is the length of *PQ*?  NOT TO  SCALE  A. 15 cm  B. 45 cm  C. 54 cm  D. 60 cm | | |
|  | Which two parallelograms are similar?    NOT TO  SCALE    A. I and II. B. I and III.  C. II and IV. D. III and IV. | | |

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| Year  9 | *Enlargement & Similarity* | Calculator Allowed |
| Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Section 3Longer Answer Section | | |
| Answers should be supported by relevant mathematical reasoning and/or calculations.  Write all working and answers in the spaces provided on this test paper. | | |

|  | | **Marks** |
| --- | --- | --- |
|  | Enlarge the kite  with the centre of the enlargement at *O*, and a scale factor of 3.  The position of *B’* has already been drawn. | **2** |
| 2. | a) What is the ratio of the corresponding sides?  …………………………………………………………………………………………………………………………………………………  ………………………………………………………………………………………………………………………………………………… | **1** |
|  | b) Find the length of *ST*  ………………………………………………………………………………………………………………………………………………….  …………………………………………………………………………………………………………………………………………………  …………………………………………………………………………………………………………………………………………………. | **2** |
| 3. | Using the grid provided, or otherwise, draw the image of quadrilateral *KLMN* after an enlargement with scale factor 1.5 and centre *O*. | **2** |
|  | b) The perimeter of the original quadrilateral is 172 mm.  What is the perimeter of the enlarged quadrilateral?  ……………………………………………………………………………………………….  ………………………………………………………………………………………………. | **1** |

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| 4. | NOT TO  SCALE | |  |
|  | a) Prove that  ……………………………………………  …………………………………………….  ……………………………………………  …………………………………………… | b) Find the length of *QR*.  ……………………………………………  …………………………………………….  ……………………………………………  …………………………………………… | **5** |
| 5. | NOT TO  SCALE | |  |
|  | a) Prove that  ……………………………………………  …………………………………………….  ……………………………………………  …………………………………………… | b) Find the length of *FG.*  ……………………………………………  …………………………………………….  ……………………………………………  …………………………………………… | **5** |

# 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

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

*Enlargement & Similarity*

# ANSWERS

|  |  |
| --- | --- |
| Section 1 ( 1 mark each) | |
|  | Working and Answers |
|  | If two polygons are similar, then the corresponding **angles** of the first are equal to those of the second. |
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|  | By Measurement, the corresponding angles are not equal, and the corresponding sides are not in the same ratio.  The kites are **not similar**. |
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|  | Because of the parallel lines, there are two pairs of equal alternate angles (marked on the diagram).  These lie in triangles A and C.  With two angles equal in the triangles, the third angle is also equal.  Triangles A and C are similar because all corresponding angles are equal. |
|  | Because of the parallel rays of the sun, the angles of elevation are equal.  Because the tree and post are vertical, the right angles are equal.  So the triangles are equal and the corresponding sides are in the same ratio.    OR |
|  | Because the triangles are similar, the corresponding sides are in the same ratio. |

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| Section 2 (1 mark each) | | |
|  | Working | Answers |
|  | Only C is true of all pairs of similar figures. | C |
|  |  | B |
|  |  | D |
|  |  | A |
|  |  | B |
|  | If square I is enlarged with scale factor 2, it gives square IV.  I and IV are similar | A |
|  | As circles all have the same shape, they are similar to one another.  As all squares and equailateral trianglles have all angles equal, they are similar, since the corresponding sides are always equal and since they have all sides equal, the corresponding sides are always in the same ratio.  Rectangles have angles equal, but the sides can be different lengths, so they are not always in the same ratio. | C |
|  | The restangles are similar, so sides are in the same ratio. | B |
|  |  | D |
|  |  | C |
|  |  | A |
|  |  | B |
|  | Angle A is common and because of the parallel lines  So in order | A |
|  |  | C |
|  | A. Corresponding angles are not equal.  B. Corresponding sides not in the same ratio.  C. Corresponding sides not in the same ratio.  D. Corresponding sides in the same ratio and corresponding angles equal. | D |

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| Section 3 | |  |
|  | Working and Answers | Marks |
| 1. |  | 2 marks  for correct  image.  1 mark if wrong scale factor.  Or  1 mark if correct ratio but errors in measurement are made. |
| 2. | a) What is the ratio of the corresponding sides? | 1 mark for either form of the ratio. |
|  | b) Find the length of *ST*  OR | 2 mark for the correct result or a result obtained correctly from an incorrect answer to a).  1mark for an answer with a single error in calculation or in reasoning |
| 3. | Using the grid provided, or otherwise, draw the image of quadrilateral *KLMN* after an enlargement with scale factor 1.5 and centre *O*. | 2 marks  for correct  image.  1 mark if wrong scale factor.  Or  1 mark if correct ratio but errors in measurement are made. |
|  | b) The perimeter of the original quadrilateral is 172 mm.  What is the perimeter of the enlargement? | 1 mark for correct  answer |

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| 4. | NOT TO  SCALE | |  |
|  | 1. Prove that | b) Find the length of *QR*. | **a)** 3 marks for full proof.  2 marks if single error is made  1 mark if basic attempt made  **b)** 2 marks for correct answer  1 mark if a single error made |

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| 5. | NOT TO  SCALE | |  |
|  | a) Prove that | b) Find the length of *FG.*  Since corresponding sides are in the same ratio | **a)** 3 marks for full proof.  2 marks if single error  1 mark if basic attempt made  **b)** 2 marks for correct answer  1 mark if a single error made |

*Multiple Choice Answer Sheet*

Name Marking Sheet

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