School Name
Mathematics Test 2017

Year 9

Enlargement and Similarity

Non Calculator

Skills and Knowledge Assessed:

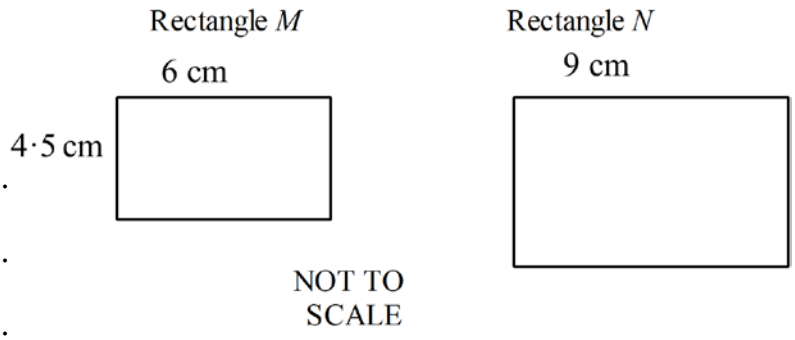
- Use the enlargement transformation to explain similarity and develop the conditions for triangles to be similar (ACMMG220)
- Solve problems using ratio and scale factors in similar figures (ACMMG221)

Name_____

Section 1 Short Answer Section

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

1. Rectangle *M* is enlarged to produce Rectangle *N*.



What is the enlargement factor?

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2. A triangle has sides 6 cm, 8 cm and 10 cm and a right angle between the two shorter sides.
An enlargement of this triangle is drawn, with an enlargement factor of 3.
Describe the sides and angles of the new shape.

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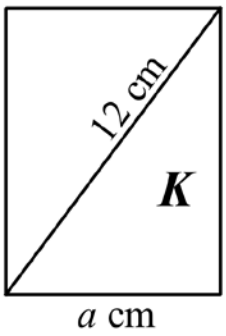
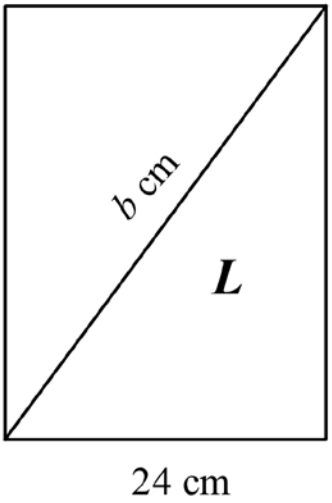
3. A rectangle K is enlarged with scale factor 3, to produce rectangle L.

What are the measurements marked a and b?





NOT TO SCALE

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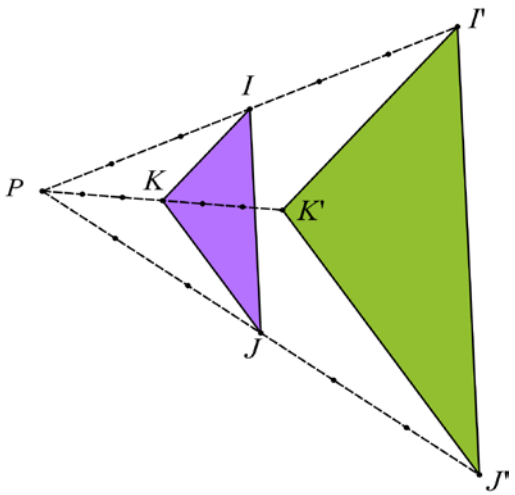
4. ΔIJK is enlarged to give Δ I'J'K'

There are equal divisions along the construction lines which were used to draw the enlargement.

Find the scale factor for the enlargement.



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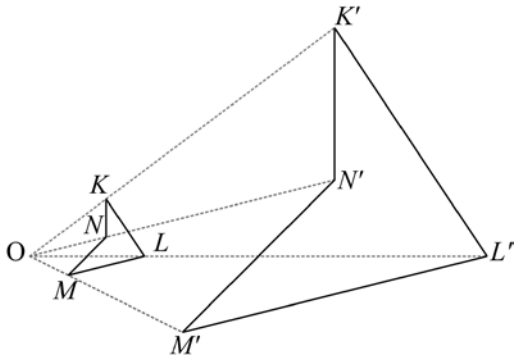
5. The quadrilateral *KLMN* is enlarged to an image *K'L'M'N'*.

By measuring and calculation find the scale factor of the enlargement.



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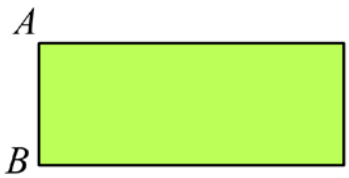
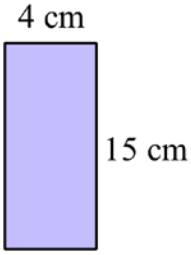
6. The two rectangles shown are similar. The scale factor is $1\frac{1}{2}$.
What is the length of *AB*?



NOT TO SCALE



NOT TO SCALE

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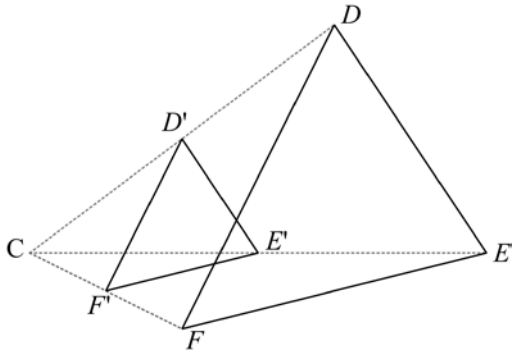
7. The triangle *DEF* is reduced to an image *D'E'F*.

By measuring and calculation find the scale factor of the reduction.



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8. An isosceles triangle *PQR* has two sides of 5 cm and one of 7 cm.

Give the dimensions of another triangle which would be similar to $\Delta\ PQR$. .

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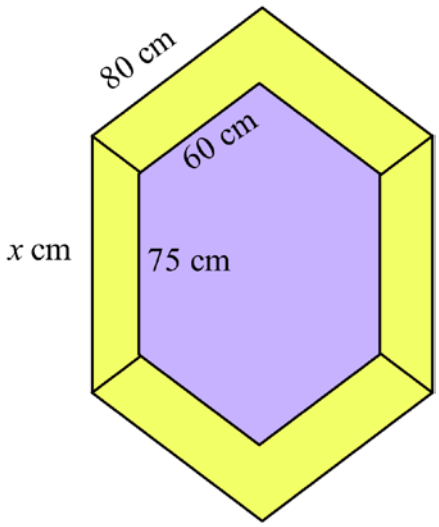
9. A decorative shield is in the shape of two similar irregular hexagons, as shown.



Given the dimensions shown, determine the value of *x*.

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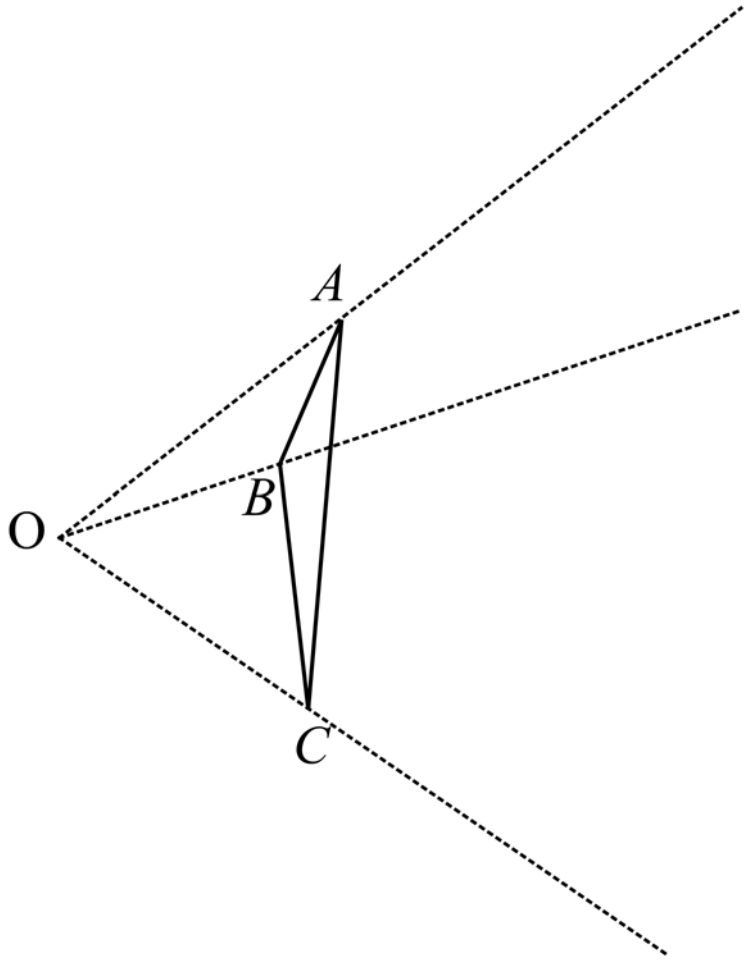
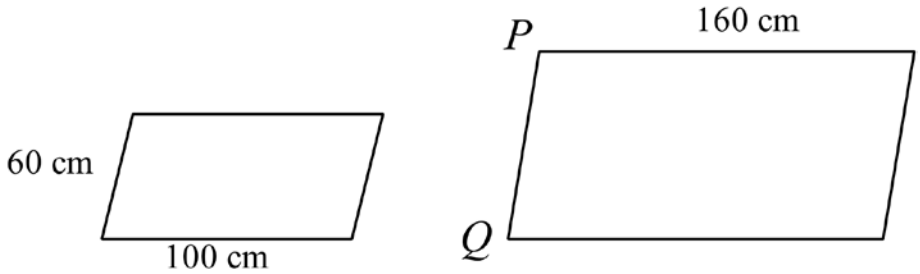
10. By measurement and calculation complete the enlargement of ΔABC, with centre O and scale factor = 2.



11. These two parallelograms are similar.
Calculate the length of *PQ*.

NOT TO SCALE



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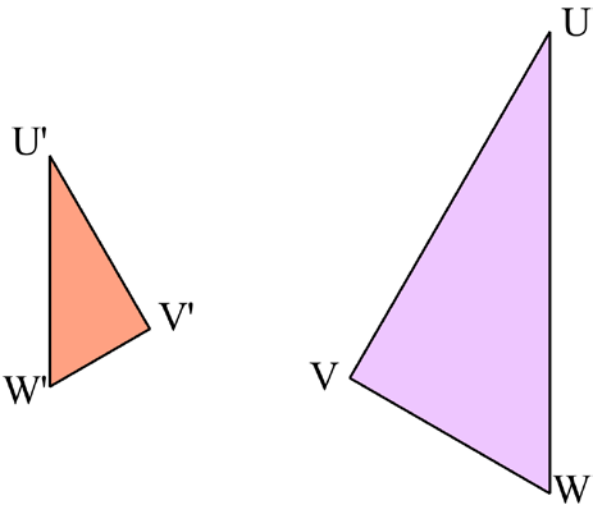
12. $\Delta\ U'V'W$ is the image after a reduction and a reflection of $\Delta\ UVW$.

By measurement and calculation find the scale factor of the enlargement.



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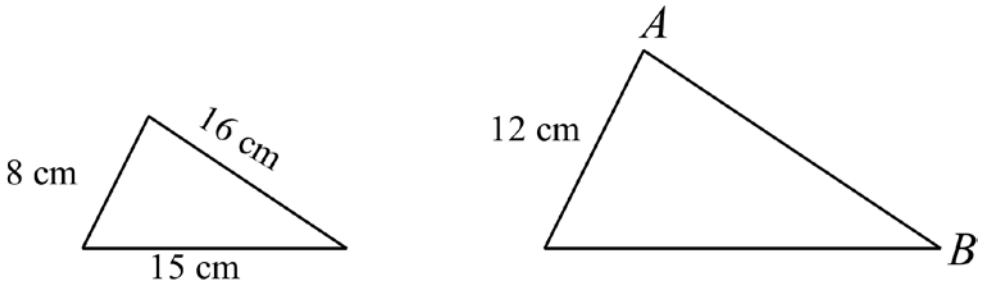
13. Two similar right triangles are shown.
What is the length of *AB*?



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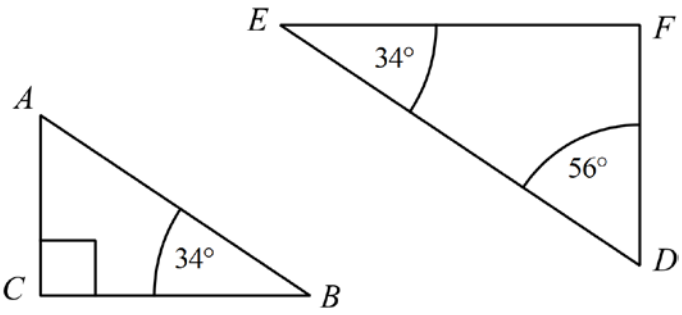
14. Explain why $\Delta ABC \,|||\, \Delta DEF$.



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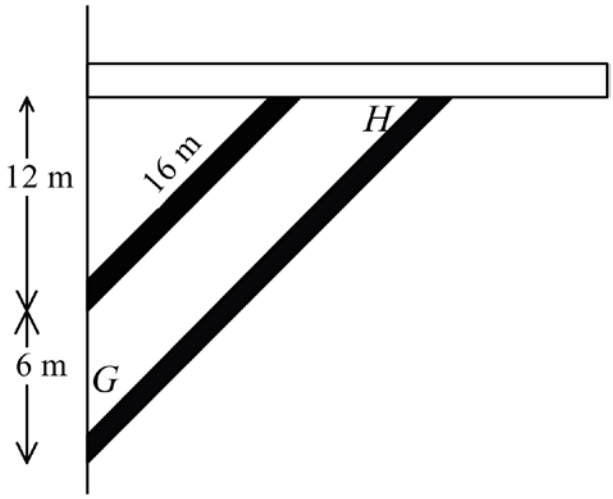
15. A balcony is supported by two parallel brackets, as shown
The shorter bracket is attached to the wall 12 m below the balcony and the longer one is 6m below this.
Use this information to calculate the length of the longer bracket (*GH*).



NOT TO SCALE

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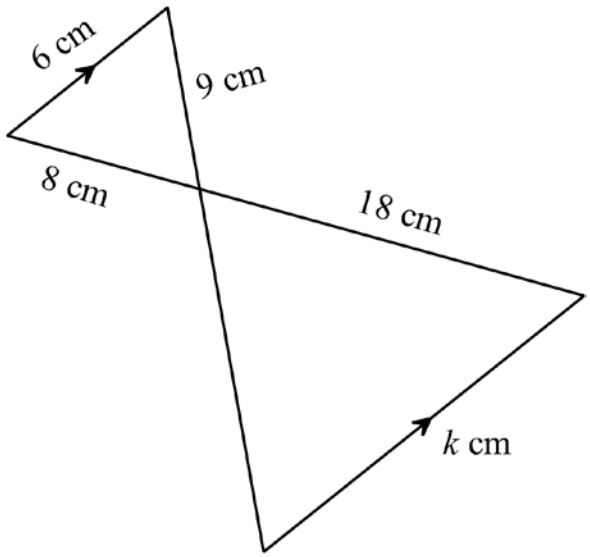
16. A pair of similar triangles are drawn between a pair of parallel line segments, as shown. Calculate the value of *k*.



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School Name
Mathematics 2017

Year 9

Enlargement and Similarity

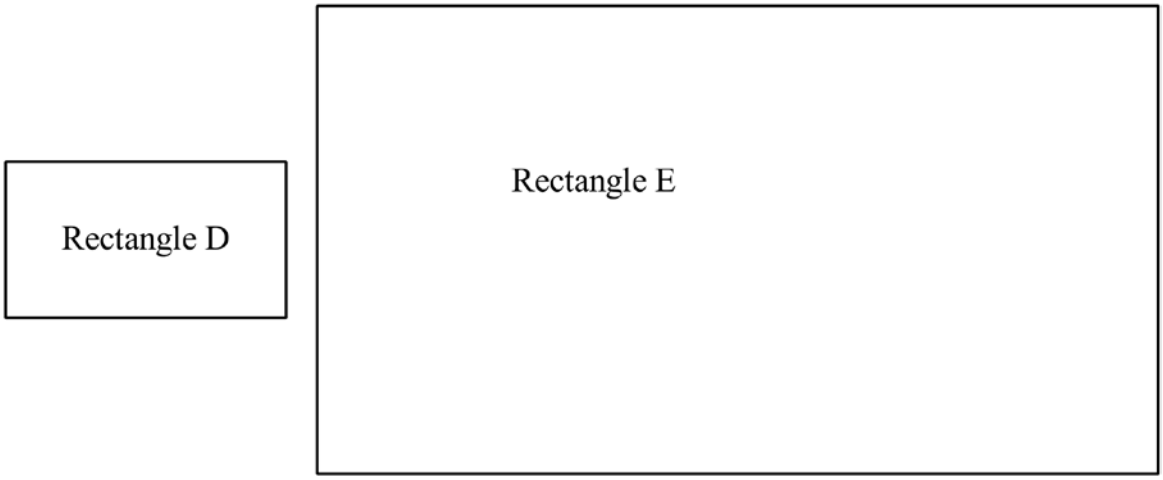
Calculator Allowed

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.

1. By measurement and calculation, determine what scale factor would enlarge Rectangle D to Rectangle E?

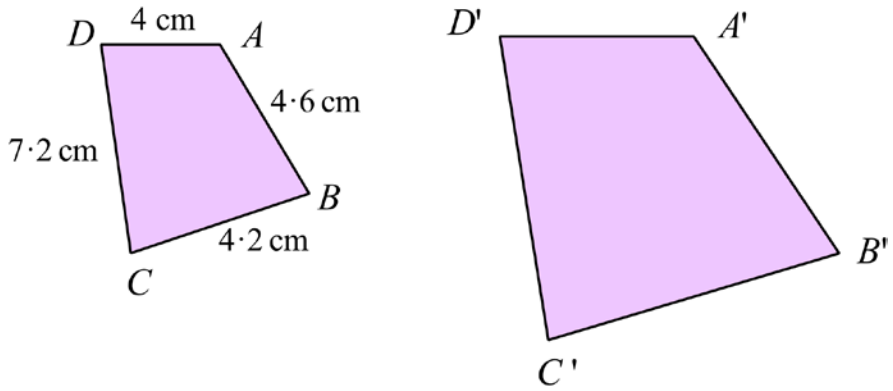


A. $1\frac{1}{2}$ B. 2 C. $2\frac{1}{2}$ D. 3

2. A regular hexagon with sides 16 cm is enlarged with a scale factor of 2.5.
What are the side lengths of the image?

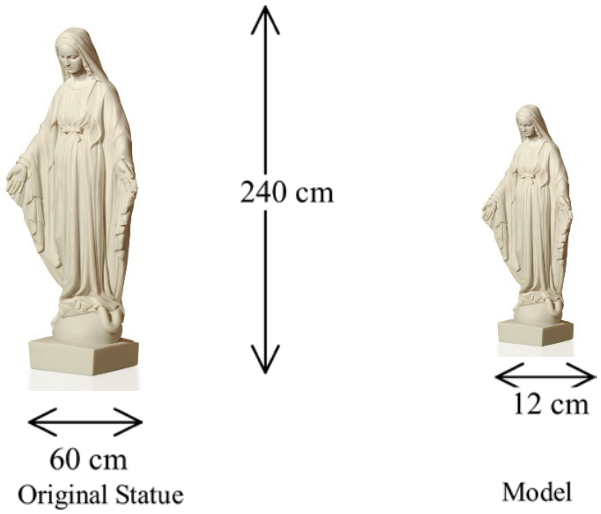
A. 6.4 cm
B. 18.5 cm
C. 24 cm
D. 40 cm

3. Quadrilateral *ABCD* is enlarged with a scale factor of 3.
Which side in the image would be 12.6 cm in length?



A. *A'B'* B. *B'C'* C. *C'D'* D. *D'A'*

4. A statue in a park measures 60 cm across its base and stands 240 cm high.
A model is made of the statue which is similar to the original, but measures 12 cm across its base.



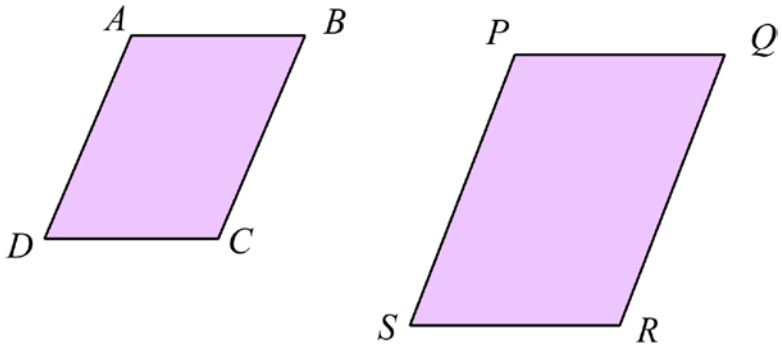
NOT TO SCALE

What is the height of the model?

A. 48 cm B. 54 cm C. 80 cm D. 720 cm

5. The two parallelograms below are similar.
Which is **not** true?

NOT TO SCALE



A. $\frac{AB}{PQ} = \frac{DC}{SR}$

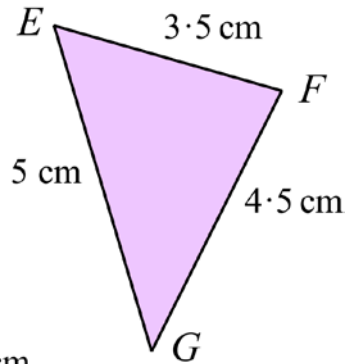
B. $\frac{DA}{SP} = \frac{CB}{RQ}$

C. $\angle ABC = \angle QRS$

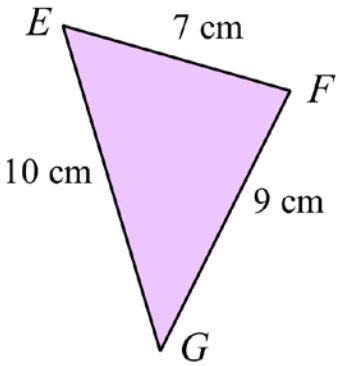
D. $\angle DAB = \angle SPQ$

6. Which of the triangles shown below is similar to triangle *EFG*?

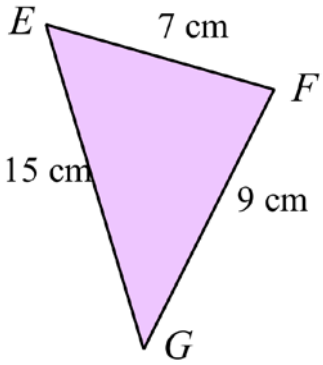
NOT TO SCALE



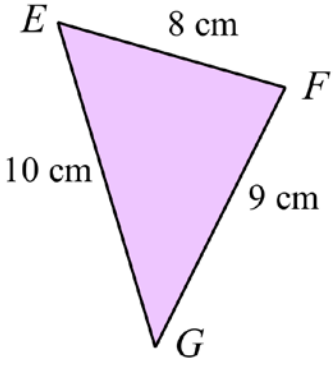
A.



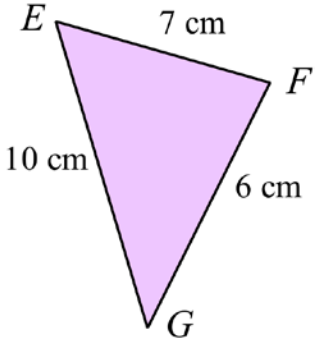
B.



C.

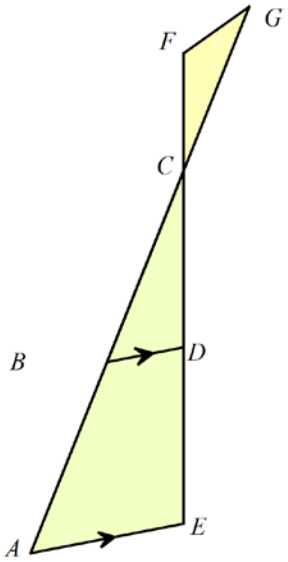


D.



7. Which two triangles are similar in this diagram?

NOT TO SCALE



A. $\Delta\, ACE \,|||\, \Delta\, GCF.$

B. $\Delta\, ACE \,|||\, \Delta\, BCD.$

C. $\Delta\, BCD \,|||\, \Delta\, GCF.$

D. $\Delta\, BCD \,|||\, \Delta\, EFG.$

8. Which statement is **not** true?

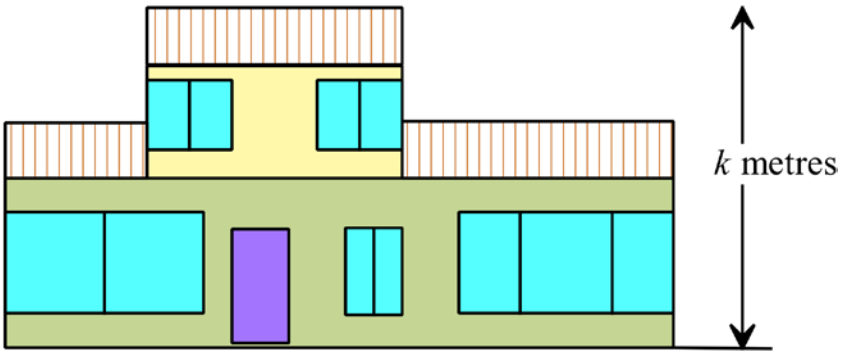
A. Any two squares are similar.

B. Any two equilateral triangles are similar.

C. Any two isosceles triangles are similar.

D. Any two regular octagons are similar.

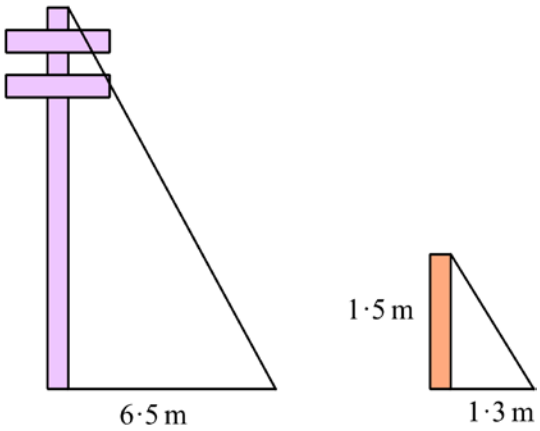
9. This elevation of a building is drawn to a scale of 1 : 150.



What is the value of k (the height of the actual building)?

A. 6.0 m B. 6.75 m C. 7.5 m D. 9.0 m

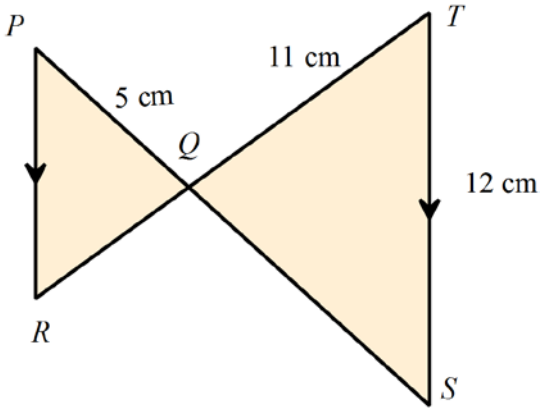
10. A power pole casts a 6.5 m shadow while a nearby post which is 1.5 m tall, casts a 1.2 m shadow.



What is the height of the power pole?

A. 5.6 m B. 7.2 m C. 7.5 m D. 8.1 m

11. Which reason could be used to prove that $\Delta PQR \;|||\; \Delta SQT$?



NOT TO SCALE

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.

12. ΔABC and ΔUVW are similar.

What is the length of *UW*'?

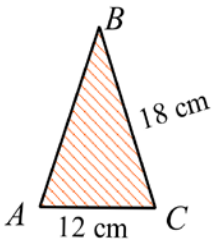
A. 7.5 cm

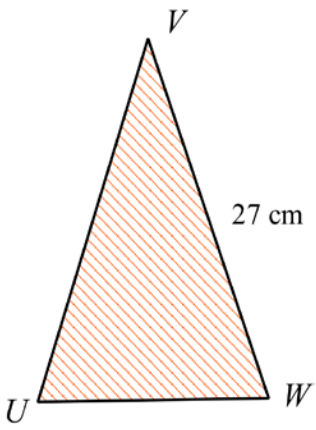
B. 18.0 cm

C. 19.2 cm

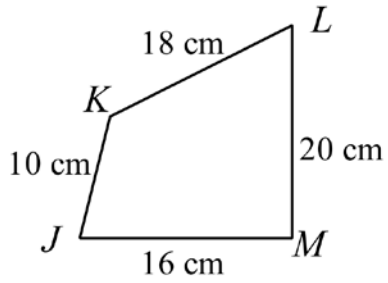
D. 40.5 cm

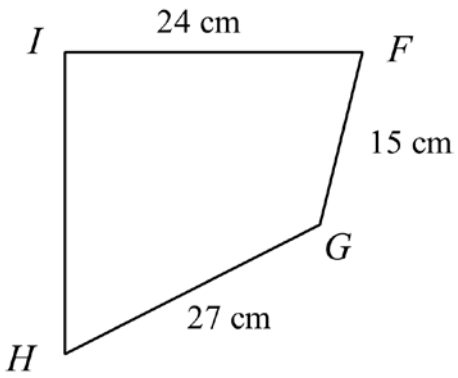
NOT TO SCALE





13. Quadrilateral $JKLM$ is an enlargement of $FGHI$.





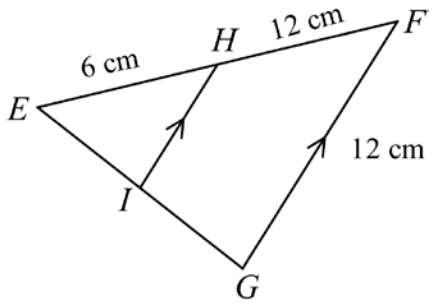
What is the length of *HI*?

A. 18 cm B. 24 cm C. 27 cm D. 30 cm

14. In the diagram $FG \parallel HI$.

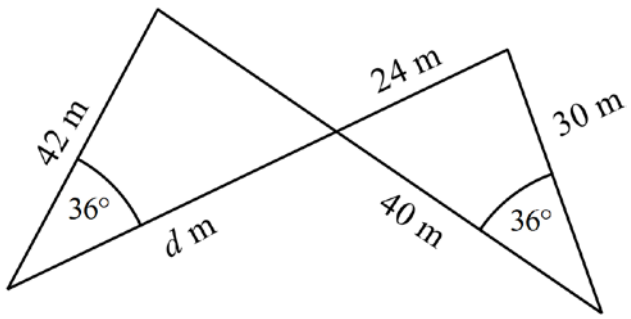
EH = 6 cm, *HF* = 12 cm and *FG* = 12 cm.

What is the length of *HI*?



A. 4.0 cm
B. 4.5 cm
C. 6.0 cm
D. 7.5 cm

15. What is the value of *d*?



A. 28.6 cm B. 31.5 cm C. 56.0 cm D. 70.0 cm

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Enlargement and Similarity

Calculator Allowed

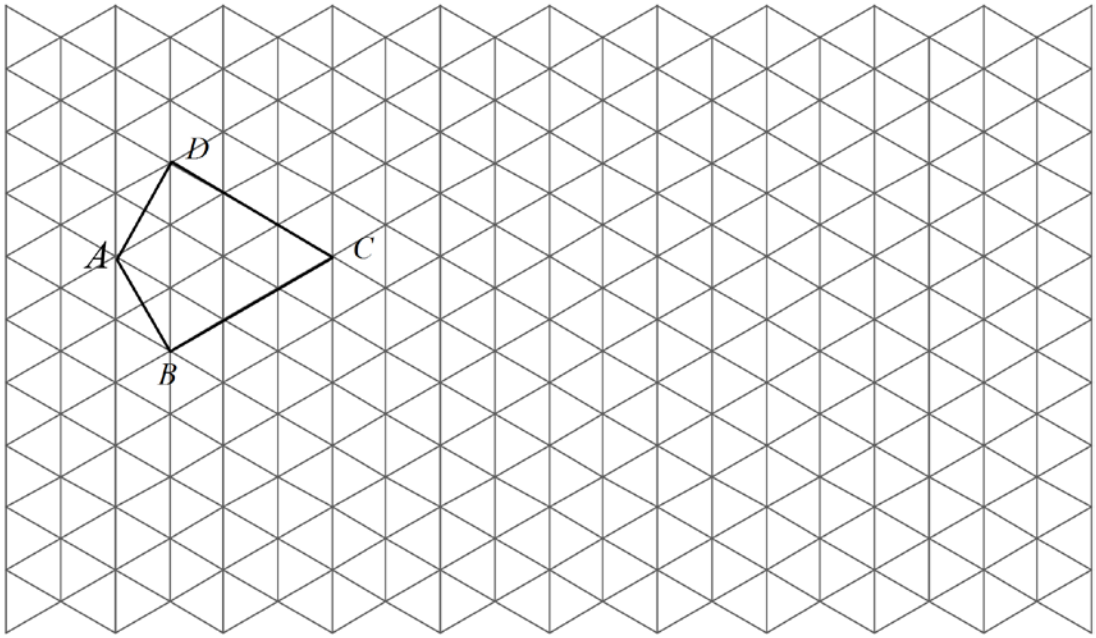
Name_____

Section 3 Longer Answer Section

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

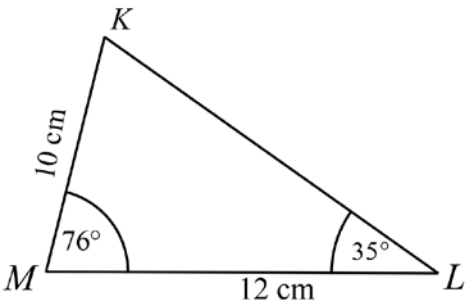
Marks

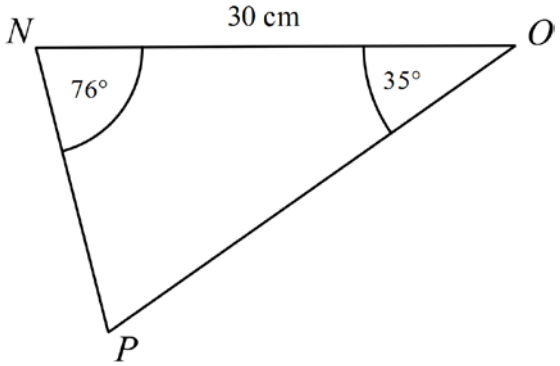
1. Use the grid provided to draw an enlargement of quadrilateral ABCD, with a scale factor 2. **3**



Marks

2.





SCALE

a) Explain why $\Delta KLM \,|||\, \Delta PON$. **2**

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b) What is the ratio of the corresponding sides? **1**

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c) Find the length of *NP*. **2**

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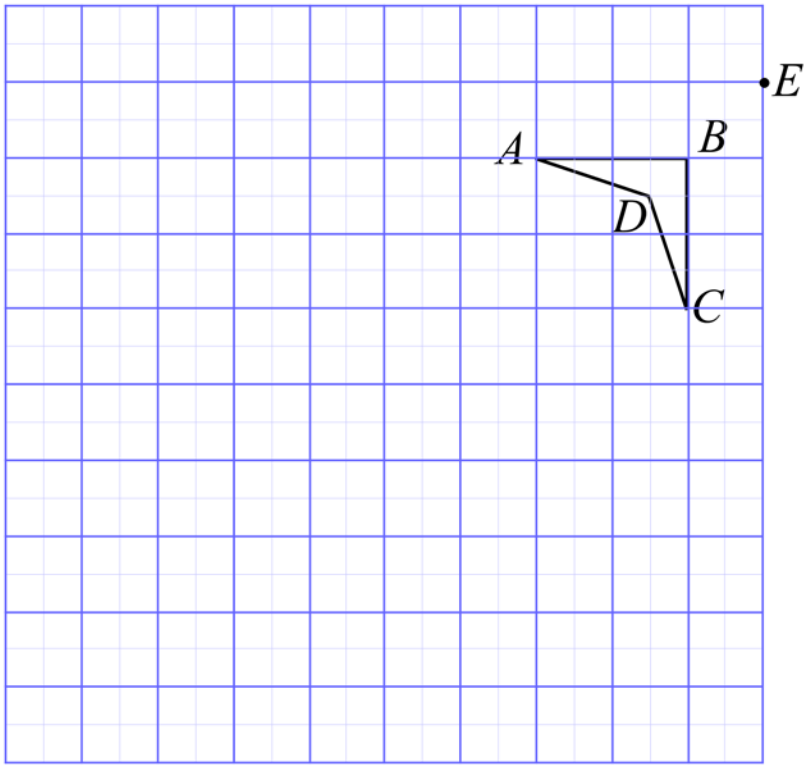
Marks

3. (a) Use the grid below to assist with drawing an enlargement of *ABCD* form centre *E* with scale factor 3. (Show all construction lines and label the image appropriately.) **3**



b) The perimeter of the original quadrilateral is 72 mm. **1**

What is the perimeter of the enlarged quadrilateral?

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c) The area of the original quadrilateral is 1 cm^2. **1**

What is the area of the enlarged quadrilateral?

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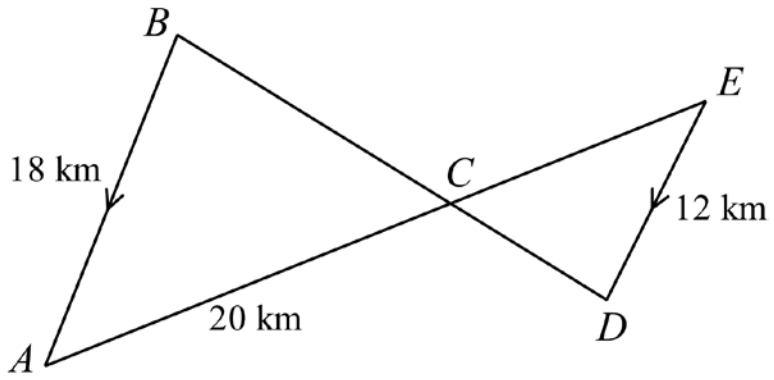
Marks

4. (a) Given that $AB \parallel DE$, prove that $\Delta ABC \sim \Delta EDC$. **2**



NOT TO SCALE

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(b) Find the length of CE. **2**

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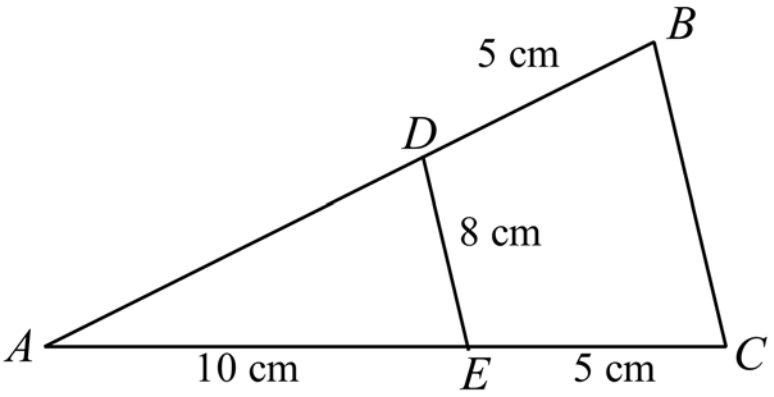
Marks

5. (a) ΔABC is isosceles with $AB = AC = 15$ cm. **2**

DE is drawn so that *DB* = *EC* = 5 cm.

Prove that $\Delta ABC \,|||\, \Delta ADE$.



NOT TO SCALE

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(b) Find the length of *BC*. **2**

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School Name

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Multiple Choice Answer Sheet

Enlargement and Similarity

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 ⬭

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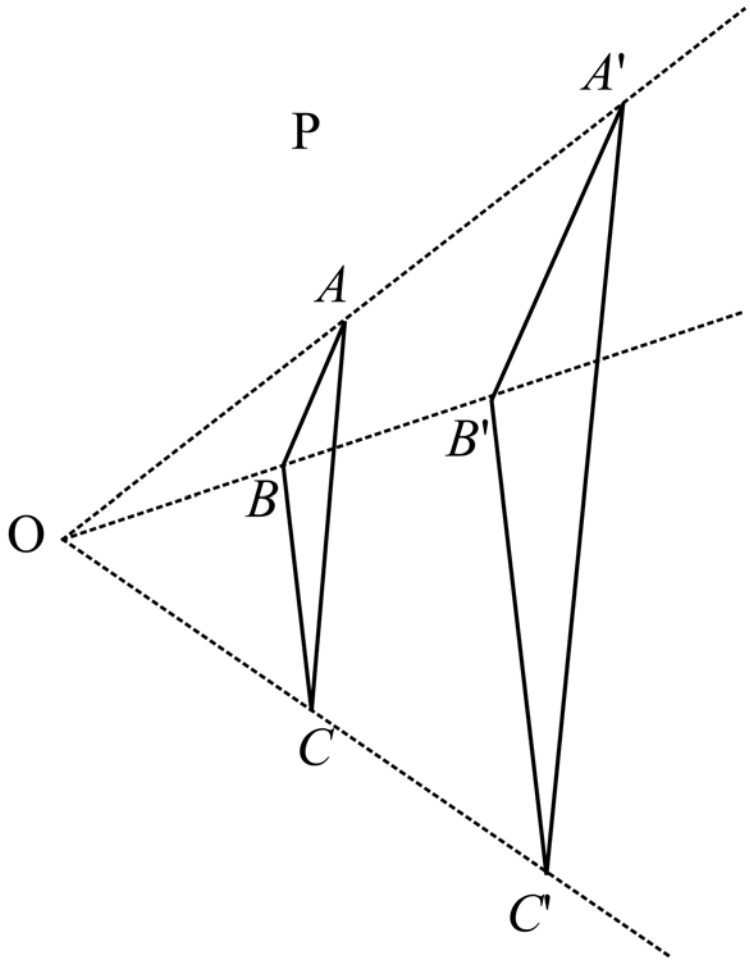
Year 9

Enlargement and Similarity

Non Calculator Section

ANSWERS

Question	
1.	Comparing corresponding sides Enlargement factor $= \frac{9}{6} = 1.5$
2.	The image will have sides $6 \times 3 =$ **18 cm**, $8 \times 3 =$ **24 cm** and $10 \times 3 =$ **30 cm**. There will still be a right angle between the two shorter sides.
3.	$a = \frac{24}{3} = 8$ $b = 12 \times 3 = 36$
4.	Each construction line has 6 divisions, the original triangle is at the 3rd division and the image is at the 6th, so the enlargement scale factor $= \frac{6}{3} = 2$
5.	Measuring OL and OL' gives 1.5 cm and 6 cm respectively. scale factor $= \frac{6}{1.5} = 4$ Can be done by comparing other distances,
6.	*AB* corresponds to the shorter side. $AB = 4 \times 1\frac{1}{2} = 6$ cm
7.	Measuring *CE* and *CE'* gives 6 cm and 3 cm respectively. scale factor $= \frac{3}{6} = \frac{1}{2}$
8.	Any lengths which are multiples of 5 cm and 7 cm. e.g Two sides of 7.5 cm and one of 10.5 cm. Two sides of 10 cm and one of 14 cm. Two sides of 15 cm and one of 21 cm. Two sides of 2.5 cm and one of 3.5 cm.
9.	Scale factor $= \frac{80}{60} = \frac{4}{3}$ $x = 75 \times \frac{4}{3} = 100$ cm

10.	 A'B' = 4cm and B'C' = 6cm
11.	Scale factor = $\frac{160}{100} = 1.6$ $PQ = 60 \times 1.6 = 96$ cm OR $\frac{PQ}{60} = \frac{160}{100}$ $PQ = \frac{60 \times 160}{100}$ $= \frac{9600}{100} = 96$ cm
12.	By measurement UW = 6 cm and U'W' = 3 cm. Scale factor = $\frac{3}{6} = \frac{1}{2}$

13.

$$\text{Scale factor} = \frac{12}{8} = 1\tfrac{1}{2}$$

$$AB = 16 \times 1\tfrac{1}{2}$$

$$= 16 \times \frac{3}{2} = 24 \text{ cm}$$

OR

$$\frac{AB}{16} = \frac{12}{8}$$

$$AB = \frac{16 \times 12}{8} = 24 \text{ cm}$$

14.

In ΔDEF $\angle F = 180 - (34 + 56) = 90°$

In ΔABC $\angle A = 180 - (34 + 90) = 56°$

$\therefore$ the two triangles are similar

(they have corresponding angles equal.)

OR Equiangular due to angle sum of triangle.

15.

$$\frac{GH}{16} = \frac{18}{12}$$

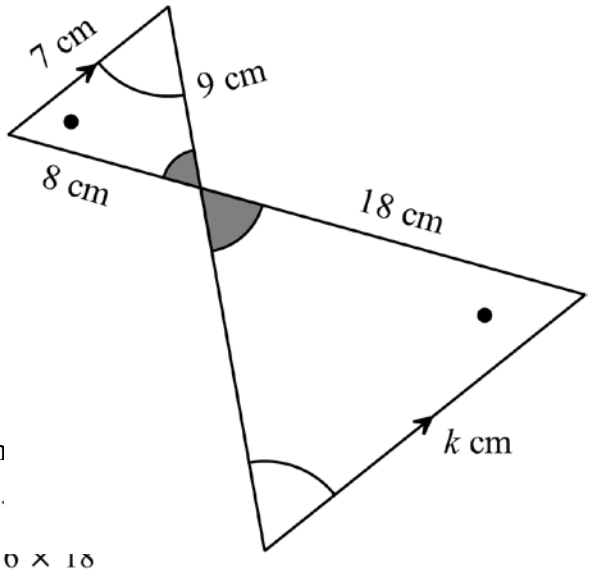
$$GH = \frac{16 \times 18}{12}$$

$$= \frac{4\,\cancel{16} \times \cancel{18}\,6}{\cancel{12}\,1}$$

$$= 24 \text{ m}$$

16.

From the parallel lines and transversals, the equal angles are shown.



Matchin

$$\frac{k}{6} =$$

$$k = \frac{6 \times 18}{8}$$

$$= \frac{3\,\cancel{6} \times \cancel{18}\,9}{\cancel{8}\,2}$$

$$= \frac{27}{2}$$

$$= 13.5 \text{ cm}$$

School Name
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Year 9

Enlargement and Similarity

Calculator Allowed
Multiple Choice
Section

ANSWERS

	Working	**Answer**
1.	By measuring Rectangle D is 2.0 cm by 3.7 cm and Rectangle E is 6.0 cm by 11.1 cm. Scale factor $= \frac{6.0}{2.0} = \frac{11.1}{3.7} = 3$ Different measurements may be possible depending on printing, but answer is the same	**D**
2.	Image length $= 2.5 \times 16$ $= 40$ cm	**D**
3.	Original length $= 12.6 \div 3 = 4.2$ cm BC is 4.2 cm so $B'C'$ would be 12.6 cm.	**B**
4.	Scale factor $= \frac{12}{60} = \frac{1}{5} = 0.2$ Height of model $= \frac{1}{5} \times 240 = 0.2 \times 240 = 48$ cm	**A**
5.	The first two are correct as they give the ratio of corresponding sides (which are in the same ratio). The last is correct as it equates two corresponding angles (which are equal). Option C pairs two angles which are not corresponding, so are not equal.	**C**
6.	All of the options have a measurement which is twice that in ΔEFG. If ΔEFG was enlarged with factor 2, the measurements would be 7 cm. 9 cm and 10 cm. So option A is similar to ΔEFG.	**A**

	Working	**Answer**
7.	$\angle CAE = \angle CBD$ (Corr $\angle$ on $\parallel$ lines) $\angle CEA = \angle CDB$ (Corr $\angle$ on $\parallel$ lines) $\angle ACE = \angle BDD$ (Vert Opp $\angle$) So $\Delta\, ACE \,\|\|\|\, \Delta\, BCD$	**B**
8.	For all of the regular figures, because all angles are equal and all sides are equal, any two figure will have corresponding angles equal and corresponding sides in the same ratio. This does not apply for an isosceles triangle as all sides are not equal and two isosceles triangles can have angles which are different.	**C**
9.	Height of elevation = 4.5 cm $y = 4.5 \times 150 = 675$ cm $= 6.75\ m$	**B**
10.	Height = h $\frac{h}{1.5} = \frac{6.5}{1.3}$ $h = \frac{1.5 \times 6.5}{1.3}$ $= 7.5$ m	**C**
11.	$\angle RPQ = \angle TSQ$ (Alt $\angle$ on $\parallel$ lines) $\angle PRQ = \angle STQ$ (Alt $\angle$ on $\parallel$ lines) $\angle PQR = \angle SQT$ (Vert Opp $\angle$) So $\Delta\, ACE \,\|\|\|\, \Delta\, BCD$ (corresponding angles are equal)	**A**
12.	$\frac{UW}{12} = \frac{27}{18}$ $UW = \frac{12 \times 27}{18}$ $= 18$ cm	**B**
13.	Matching corresponding sides: $\frac{IH}{20} = \frac{24}{16} \left(= \frac{27}{18} = \frac{15}{10} \right)$ $IH = \frac{20 \times 24}{16}$ $= 30$ cm	**D**

	Working	**Answer**
14.	$\Delta EFG \,\|\|\| \Delta EHI$ (equiangular due to $\|\|$ lines and common angle) $\frac{HI}{FG} = \frac{EH}{EF}$ $\frac{HI}{12} = \frac{6}{6+12}$ $\frac{HI}{12} = \frac{6}{18}$ $HI = \frac{12 \times 6}{18}$ $= 4$ cm	**A**
15.	$\frac{d}{40} = \frac{42}{30}$ $d = \frac{40 \times 42}{30}$ $= 56$ cm	**C**

School Name

Mathematics 2017

Multiple Choice Answer Sheet

Enlargement and Similarity

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 ○

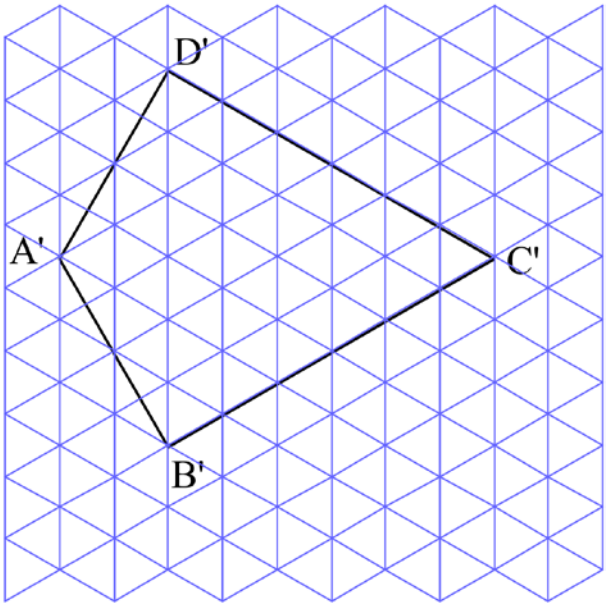
School Name
Mathematics Test 2017

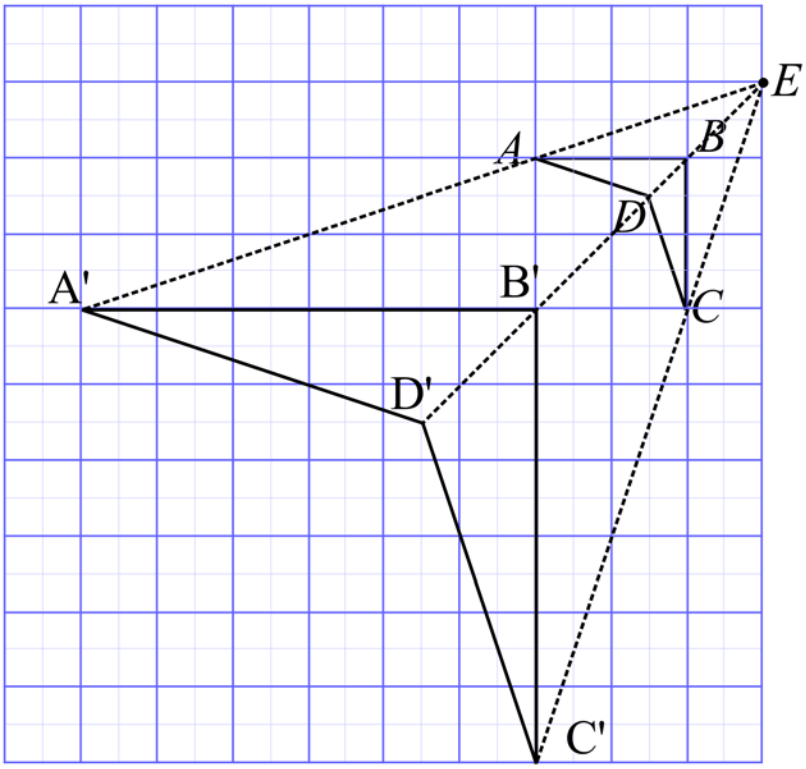
Year 9

Enlargement and Similarity

Calculator Allowed
Longer Answer Section

ANSWERS

Question	Answer	Marks
1.		As no centre is specified, position can be anywhere on the grid. 2 marks for correct shape and size. 1 mark if the size is generally correct, with a single vertex misplaced or overall size is incorrect but shape is correct.
2.	(a) $\angle M = \angle N$ (given) $\angle L = \angle O$ (given) $\therefore \quad \angle K = \angle P$ (angle sum Δ) $\therefore \Delta KLM \,\|\|\| \Delta PON$ (corresp angles equal)	2 marks for explanation that lists at least two equal pairs of angles and includes mention of corresponding angles being equal as a reason for similarity. 1 mark for answer which mentions or lists some equal angles
	(b) Ratio $= \frac{30}{12} = 2.5$ (corresponding sides between marked angles)	1 for correct answer

Question	Answer	Marks
	(c) $\frac{NP}{10} = \frac{30}{12}$ **or** $NP = 2.5 \times 10$ $NP = \frac{10 \times 30}{12}$ $= 25$ cm $= 25$ cm	2 marks for correct answer. 1 mark for working with an error in calculation or algebra.
3.	(a)  	3 marks for all points located correctly and labelled correctly with clear construction lines. 2 marks for or most points located correctly or if not labelled correctly with clear construction lines. 1 mark for an attempt which shows some knowledge of enlargement.
	(b) New perimeter = $72 \times 3 = 216$ mm	1 mark for correct answer
	(c) New area = $1 \times 3^2 = 9$ cm^2	1 mark for correct answer

Question	Answer	Marks
4.	(a) $\angle A = \angle E$ (alt $\angle$ on $\parallel$ lines) $\angle B = \angle D$ (alt $\angle$ on $\parallel$ lines) $\angle ACB = \angle ECD$ (vert opp $\angle$) $\therefore \Delta ABC \,|||\, \Delta EDC$ (correponding angles equal)	2 marks for explanation that lists at least two equal pairs of angles and includes mention of corresponding angles being equal as a reason for similarity. 1 mark for answer which mentions or lists some equal angles
	(b) $\frac{CE}{20} = \frac{12}{18}$ $CE = \frac{20 \times 12}{18}$ $= 13\frac{1}{3}$ km	2 marks for correct answer. 1 mark for working with an error in calculation or algebra.
5.	(a) $AB = AC = 15$ (given) $DB = EC = 5$ cm (given) $\therefore AD = AE = 15 - 5 = 10$ cm $\frac{AB}{AD} = \frac{15}{10} = 1.5$ $\frac{AC}{AE} = \frac{15}{10} = 1.5$ $\angle A$ is common $\therefore \angle ABC \,|||\, \angle ADE$ (corresponding sides in same ratio and included angle equal)	2 marks for explanation that lists at least two equal pairs of angles and includes mention of corresponding angles being equal as a reason for similarity. 1 mark for answer which mentions or lists some equal angles
	(b) $\frac{BC}{8} = \frac{15}{10}$ $BC = \frac{8 \times 15}{10}$ $= 12$ cm	2 marks for correct answer. 1 mark for working with an error in calculation or algebra.