

# High School Mathematics Test 2013

Year  
10

## Enlargement & Similarity

Calculator Allowed

**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.

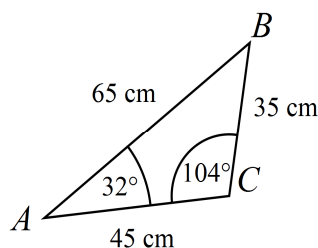
1.  $\triangle MNO$  is drawn to be similar to  $\triangle ABC$ . What scale factor was used in drawing  $\triangle MNO$ ?

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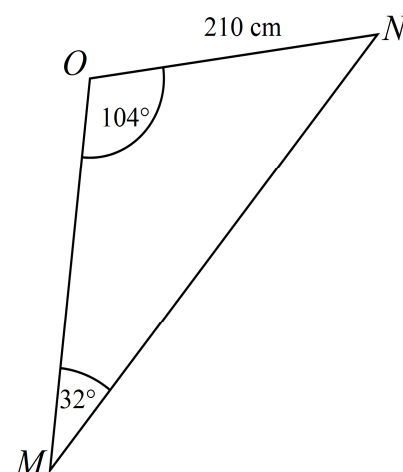
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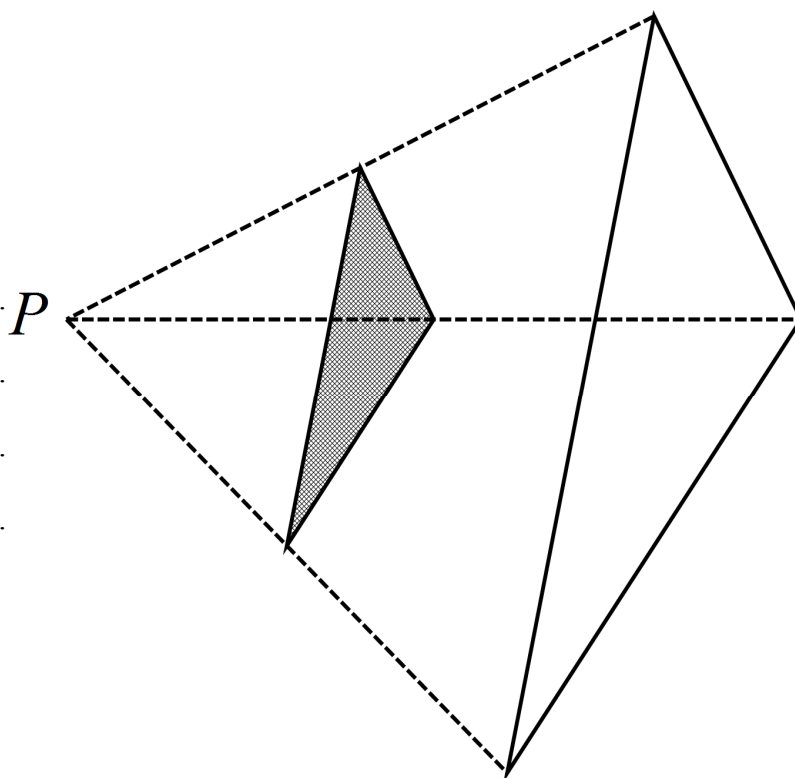
2. By measurement and calculation, find the scale factor when the shaded triangle is enlarged to give the unshaded triangle.

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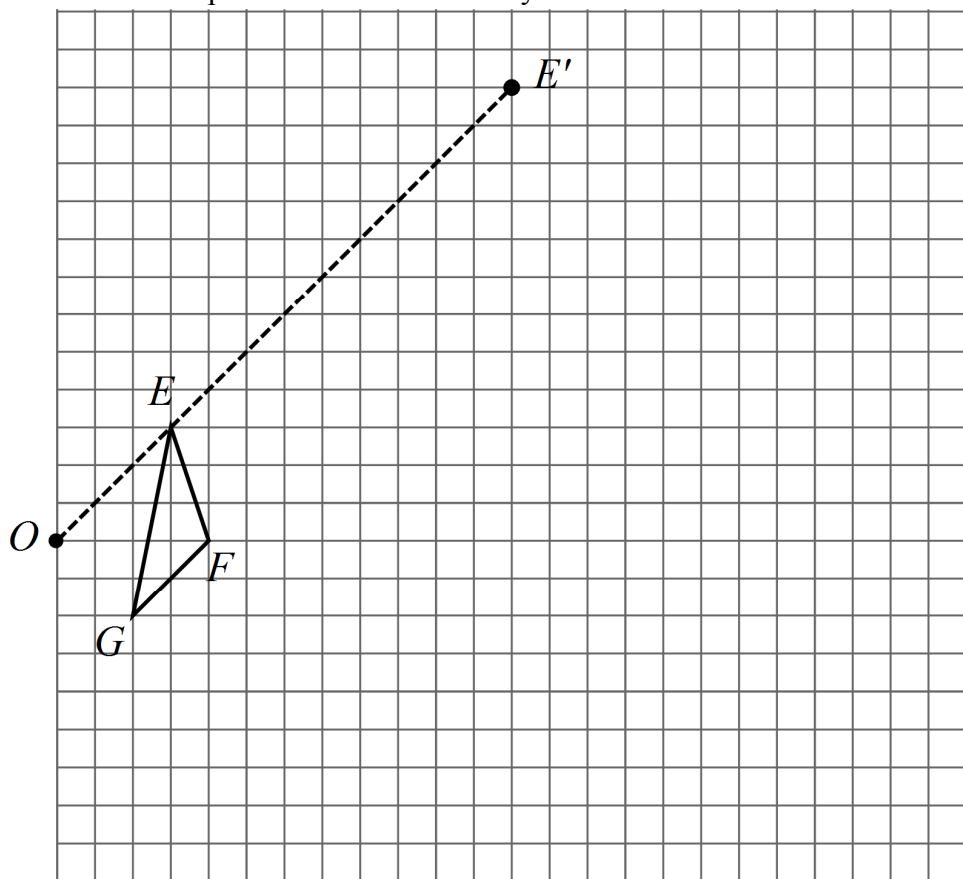
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3. Enlarge  $\triangle EFG$  with the centre of the enlargement at  $O$ , and a scale factor of 4, to produce an image  $\triangle E'F'G'$ . The position of  $E'$  has already been drawn.



4. Name a test that can be used to determine if two triangles are similar.

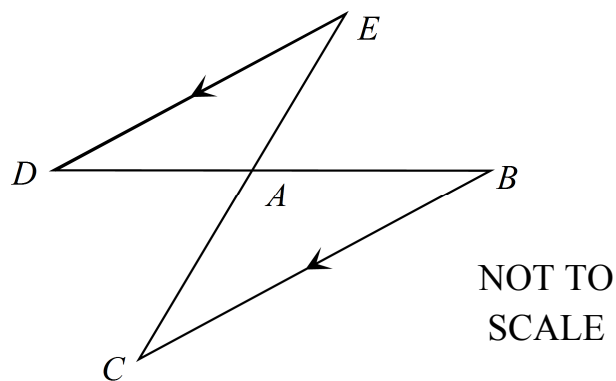
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5. Two rectangles are similar. The smaller rectangle has sides 12 cm and 7 cm. The longer side of the large rectangle is 30 cm. How long is it's the other side?

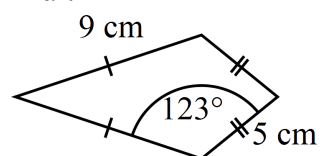
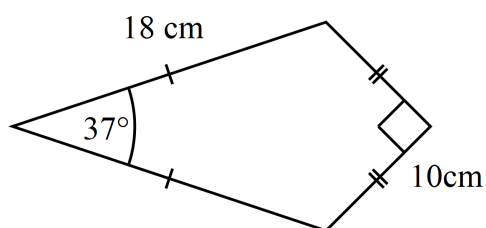
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6. In the diagram,  $CB \parallel DE$ .  
Which test could be used to show that  $\triangle ABC \sim \triangle ADE$ ?  
(A full proof is not required.)

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7. Explain why the two rhombuses below are not similar.



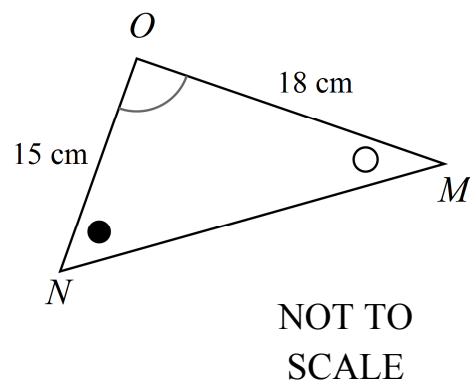
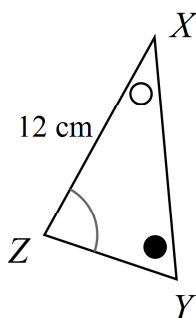
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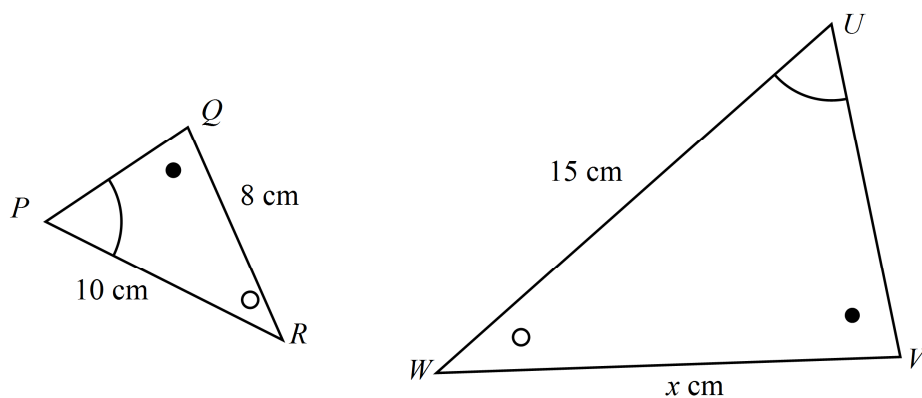
8.  $\triangle MNO$  has been 'enlarged' to produce  $\triangle XYZ$ .

What is the scale factor?

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9.  $\triangle PQR \parallel \triangle UVW$ .  
Find the value of  $x$ .



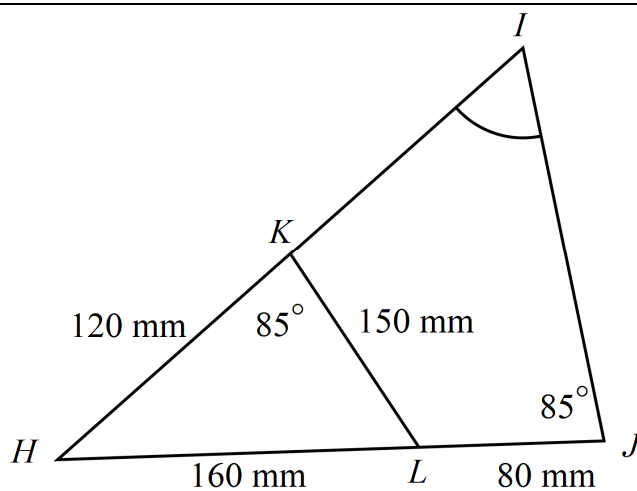
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10.  $\triangle IJH \parallel \triangle LKH$ .  
Find the length of  $IJ$ .



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# High School Mathematics Test 2013

## Enlargement & Similarity

Calculator Allowed

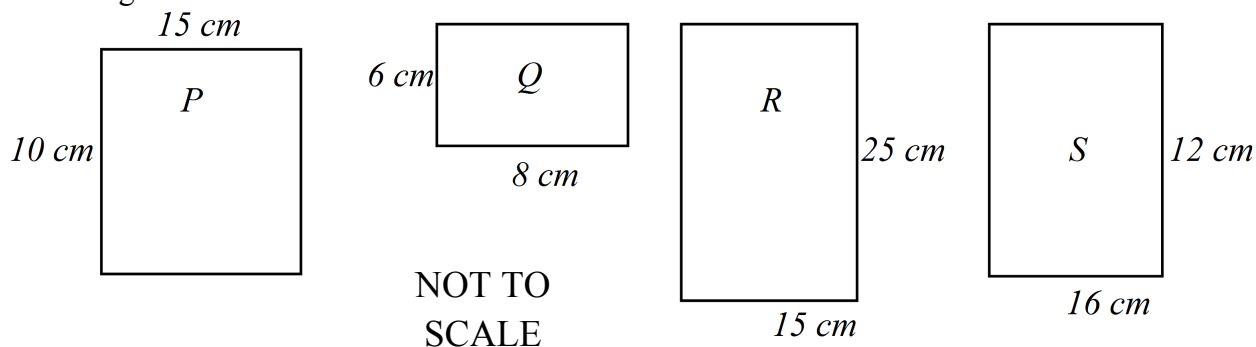
Year  
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Name \_\_\_\_\_

### 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. Four rectangles are shown below.



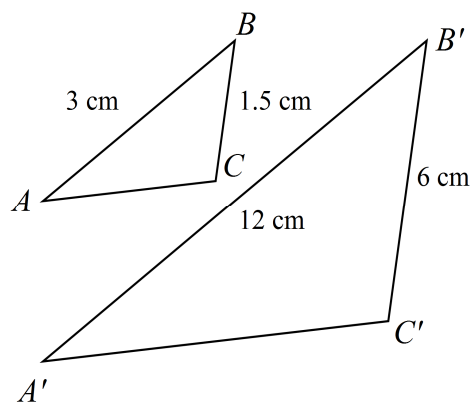
Which two are similar?

- A. P and Q      B. P and S      C. Q and R      D. Q and S

2.  $\triangle ABC$  and its image under an enlargement are shown.  
What is the enlargement factor?

- A. 2  
B. 3  
C. 4  
D. 6

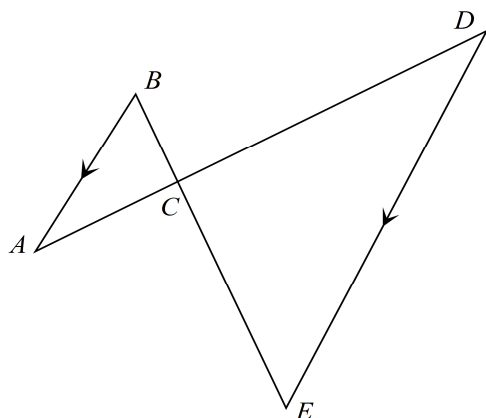
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3. Which of the following is always true?
- A. All irregular hexagons are similar.
  - B. All regular hexagons are similar.
  - C. All rhombuses are similar.
  - D. All triangles are similar.
4. The plan of a building is drawn to a ratio of 1 : 30. If the width of the building on the plan is 105 cm, what is the width of the actual building?

A. 3.5 m                      B. 31.5 m                      C. 350 m                      D. 3 150 m

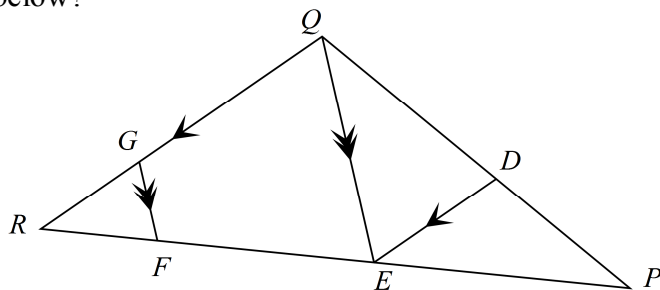
5. Which reason could be used to prove that  $\triangle ABC \parallel \triangle DEC$  ?



- A. The three corresponding sides of the triangles are in the same ratio.
- B. The three corresponding angles of the triangles are in the same ratio
- C. The three corresponding angles of the triangles are equal.
- D. Two corresponding sides of the triangles are in the same ratio and the included angle is equal.

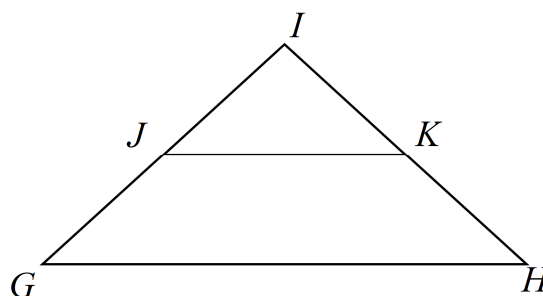
6. Which triangles are similar in the diagram below?

- A.  $\triangle PED \parallel \triangle PRQ$
- B.  $\triangle PED \parallel \triangle FGR$
- C.  $\triangle PED \parallel \triangle RED$
- D.  $\triangle PED \parallel \triangle QER$



7.  $\triangle GHI$  is an isosceles triangle with  $GI = HI$ . Which additional piece of information would be enough to allow you to prove that  $\triangle GHI \parallel \triangle JKI$ ?

- A.  $GJ = KH$   
 B.  $JI = GJ$   
 C.  $KI = KH$   
 D.  $GH = 2 \times JK$

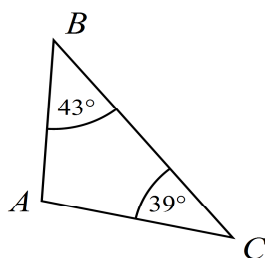


8. Karl prints a square photograph, then decides that he likes it so much he wants to print it again, 4 times larger, to put in a frame. The area of the original photograph was  $100 \text{ cm}^2$ . What is the area of the enlarged photograph?

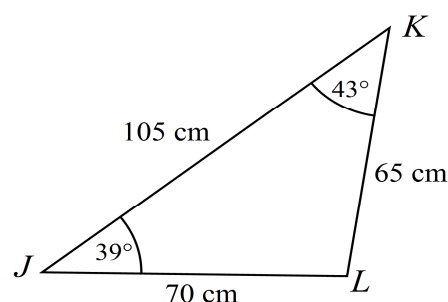
- A.  $25 \text{ cm}^2$       B.  $400 \text{ cm}^2$       C.  $800 \text{ cm}^2$       D.  $1\,600 \text{ cm}^2$

9.  $\triangle ABC \parallel \triangle LKJ$ . Each side of  $\triangle LKJ$  is five times the corresponding side of  $\triangle ABC$ . What is the length of  $BC$ ?

- A. 13 cm  
 B. 14 cm  
 C. 21 cm  
 D. 195 cm



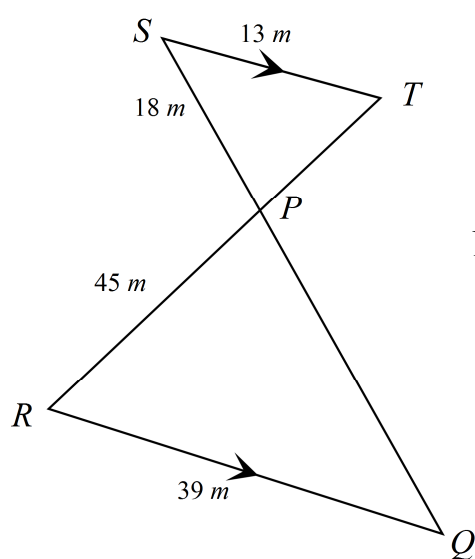
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10. In the diagram,  $ST \parallel RQ$ ,  
 $ST = 13 \text{ m}$ ,  $RP = 45 \text{ m}$ ,  
 $RQ = 39 \text{ m}$  and  $SP = 18 \text{ m}$ .

What is the length of  $PQ$ ?

- A. 15 cm  
 B. 54 cm  
 C. 117 cm  
 D. 135 cm



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# High School Mathematics Test 2013

## Enlargement & Similarity

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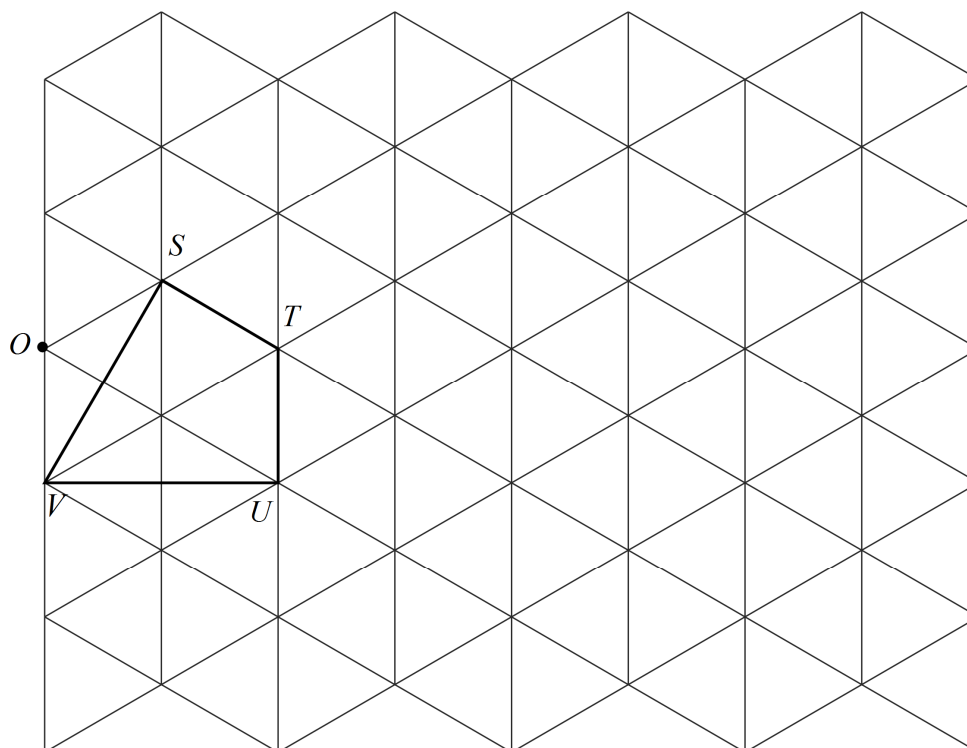
Calculator Allowed

Name \_\_\_\_\_

### Section 3 Longer Answer Section

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

- |  | Marks    |
|--|----------|
| 1. Using the grid provided, or otherwise, draw the image of quadrilateral $STUV$ after an enlargement with scale factor 3 and centre $O$ . | <b>3</b> |



- b) What is the length of the diagonal  $S'U'$ , correct to the nearest mm?

**1**

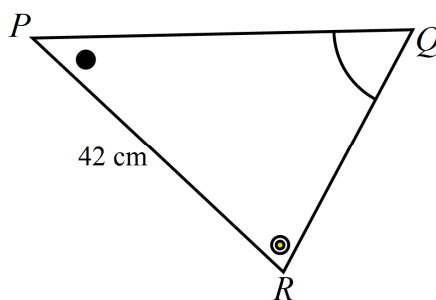
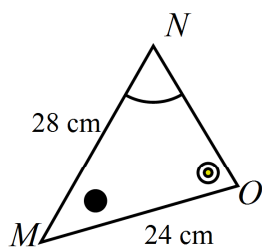
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Marks

2.



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a) Prove that  $\triangle MNO \parallel \triangle PQR$ .

b) Find the length of  $PQ$ .

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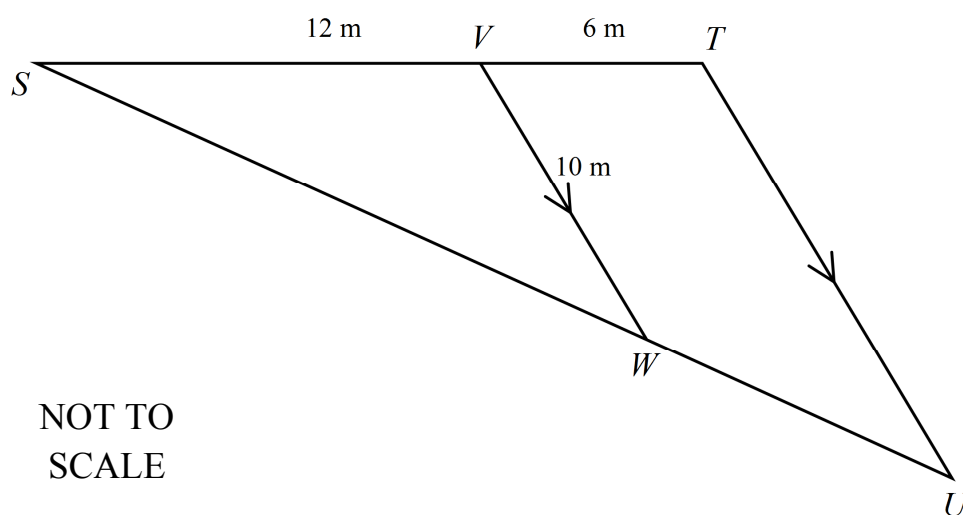
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3.



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a) Prove that  $\triangle STU \parallel \triangle SVW$ .

b) Find the length of  $TU$ .

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# *High School Mathematics Test 2013*

## *Multiple Choice Answer Sheet*

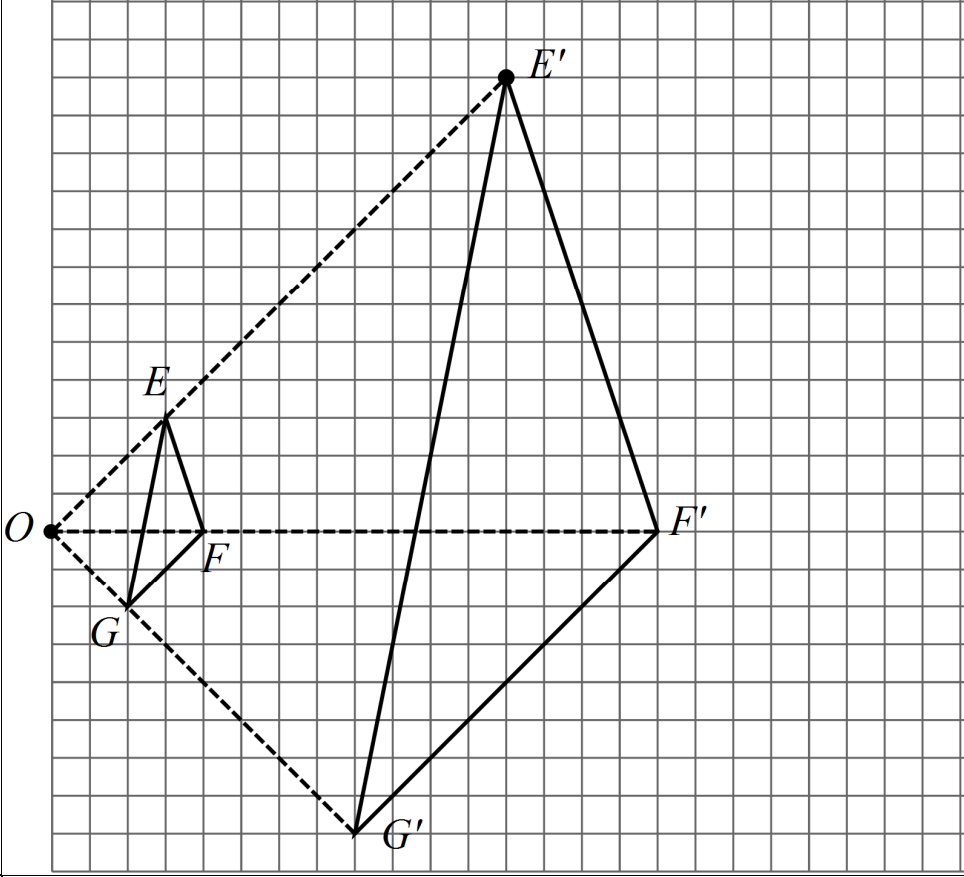
Name \_\_\_\_\_

Completely fill the response oval representing the most correct answer.

- |     |   |                       |   |                       |   |                       |   |                       |
|-----|---|-----------------------|---|-----------------------|---|-----------------------|---|-----------------------|
| 1.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 2.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 3.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 4.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 5.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 6.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 7.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 8.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 9.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 10. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |

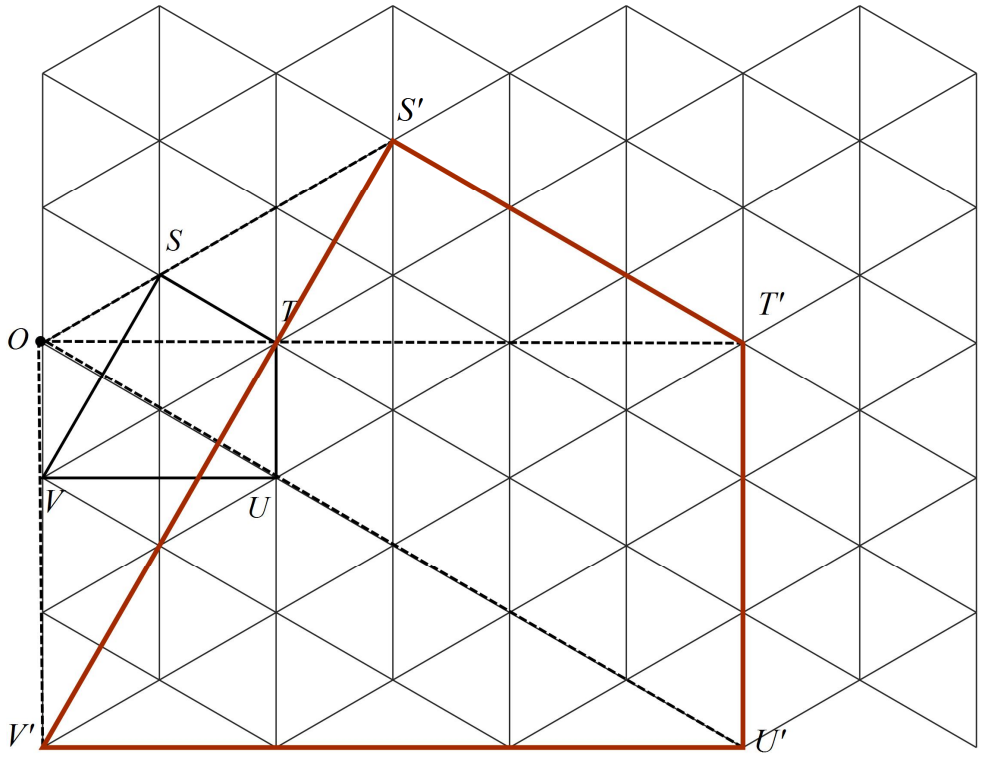
# High School Mathematics Test 2013 Enlargement & Similarity

## ANSWERS

Section 1	
1.	Scale factor $k = \frac{210}{35} = 6$
2.	Each distance in the image is twice that in the original, so $k = 2$ .
3.	
4.	Any one of : The corresponding angles of the two triangles are equal. All the corresponding sides of the two triangles are in the same ratio. Two pairs of corresponding sides of the triangles are in the same ratio, with the included angle equal.
5.	Scale factor $= \frac{30}{12} = 2\frac{1}{2}$ Other side $= 7 \times 2\frac{1}{2} = 17\frac{1}{2}$ cm.
6.	There are two pairs of equal alternate angles on the parallel lines and a pair of equal vertically opposite angles, so corresponding angles being equal could be used to prove similarity.

7.	<p>The corresponding sides are in the same ratio.          Using the angle sum of the larger kite, find the two equal angles, call them <math>x</math>.  <math>2x + 37 + 90 = 360</math>  <math>2x = 360 - 127</math>  <math>2x = 233</math>  <math>x = 116\frac{1}{2}</math></p> <p>This is not the same as the corresponding angle in the other kite (<math>123^\circ</math>) so the kites are not similar.</p>
8.	<p>Corresponding sides are <math>OM</math> and <math>ZX</math>.          Scale factor = <math>\frac{\text{image}}{\text{original}} = \frac{12}{18} = \frac{2}{3}</math></p>
9.	<p><math>\frac{x}{8} = \frac{15}{10}</math>  <math>x = 8 \times \frac{15}{10}</math>  <math>x = 12</math></p>
10.	<p><math>\frac{IJ}{KL} = \frac{JH}{KH}</math>  <math>\frac{IJ}{150} = \frac{160 + 80}{120}</math>  <math>\frac{IJ}{150} = \frac{240}{120}</math>  <math>IJ = \frac{240 \times 150}{120}</math>  <math>IJ = 300 \text{ mm}</math></p>

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

Section 3	
1.	
	b) By Measurement $S'U' = 92$ mm.
2.	<p>a)</p> <p>In <math>\triangle MNO</math> and <math>\triangle PQR</math></p> <p><math>\angle M = \angle P</math> (given)</p> <p><math>\angle N = \angle Q</math> (given)</p> <p><math>\angle O = \angle R</math> (given)</p> <p><math>\therefore \triangle MNO \parallel \triangle PQR</math> (corresponding angles equal)</p>
	<p>b)</p> $\frac{PQ}{28} = \frac{42}{24}$ $PQ = 28 \times \frac{42}{24}$ $PQ = 49 \text{ cm}$
3.	<p>a)</p> <p>In <math>\triangle STU</math> and <math>\triangle SVW</math></p> <p><math>\angle STU = \angle SVW</math> (corresponding angles on <math>\parallel</math> lines)</p> <p><math>\angle SUT = \angle SWV</math> (corresponding angles on <math>\parallel</math> lines)</p> <p><math>\angle TSU = \angle VSW</math> (common)</p> <p><math>\therefore \triangle STU \parallel \triangle SVW</math> (corresponding angles equal)</p>

	<p>b) <math>\frac{TU}{10} = \frac{12 + 6}{12}</math></p> <p><math>TU = 10 \times \frac{18}{12}</math></p> <p><math>TU = 15 \text{ m}</math></p>
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# High School Mathematics Test 2013

## Multiple Choice Answer Sheet

Name \_\_\_\_\_ Marking Sheet

Completely fill the response oval representing the most correct answer.

- |     |   |                                  |   |                                  |   |                                  |   |                                  |
|-----|---|----------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------------------|
| 1.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input checked="" type="radio"/> |
| 2.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input checked="" type="radio"/> | D | <input type="radio"/>            |
| 3.  | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 4.  | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 5.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input checked="" type="radio"/> | D | <input type="radio"/>            |
| 6.  | A | <input checked="" type="radio"/> | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 7.  | A | <input checked="" type="radio"/> | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 8.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input checked="" type="radio"/> |
| 9.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input checked="" type="radio"/> | D | <input type="radio"/>            |
| 10. | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |