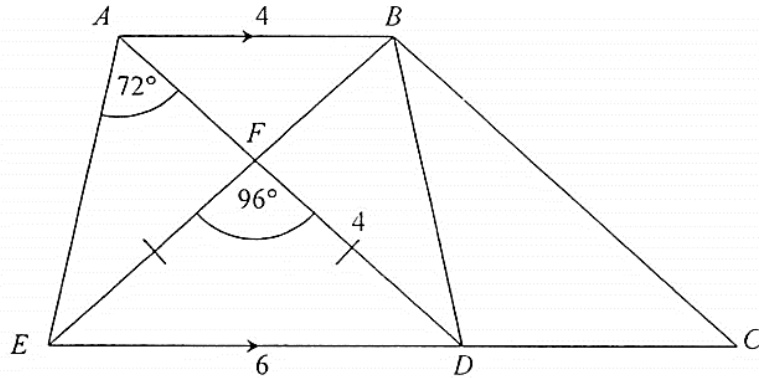


# 7 MUST KNOW QUESTIONS TO CONQUER

## CONGRUENCE & SIMILARITY

1 In the diagram,  $AB$  is parallel to  $EC$ ,  $AD$  and  $EB$  meets at  $F$ ,  $AB = 4$  cm,  $ED = 6$  cm,  $EF = DF = 4$  cm, angle  $EAD = 72^\circ$  and angle  $EFD = 96^\circ$ .



Given that triangles  $AFE$  and  $BFD$  are congruent, and triangles  $ABF$  and  $DEF$  are similar.

(a) Find

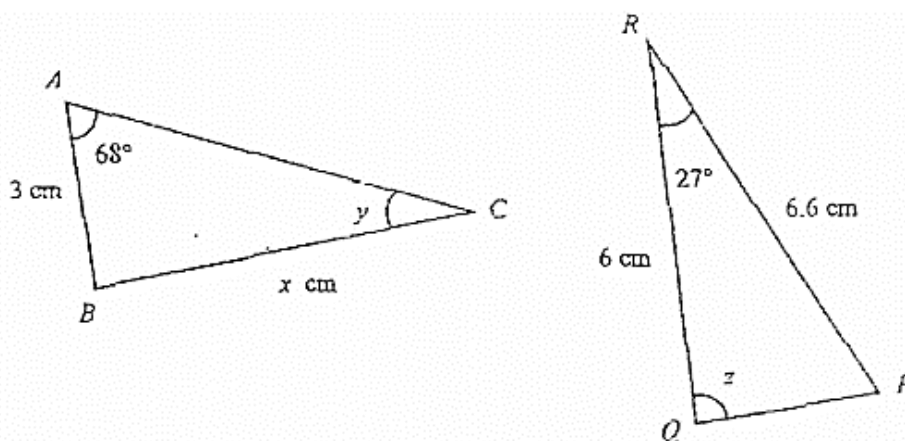
- (i) angle  $BDF$ ,
- (ii) angle  $BAF$ ,
- (iii)  $BE$ .

[1]  
[1]  
[1]

(b) Given that  $ABCD$  is a parallelogram, explain why triangle  $ABD$  is congruent to triangle  $CDB$ .

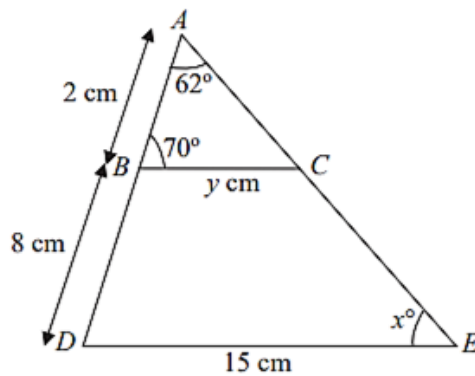
[2]

2  $\triangle ABC$  is congruent to  $\triangle PQR$ . Find the value of  $x$ ,  $y$ , and  $z$ .

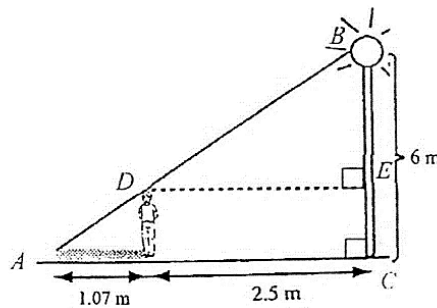


[3]

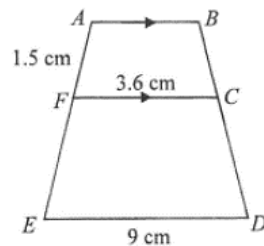
3  $\triangle ABC$  is similar to  $\triangle ADE$ . Find the values of  $x$  and  $y$ . [2]



4 A man is standing at a distance of 2.5m away from a lamp post with a height of 6m. The length of the man's shadow is 1.07m. Using the concept of similar triangles, find the man's height, correct to 1 decimal place. [3]

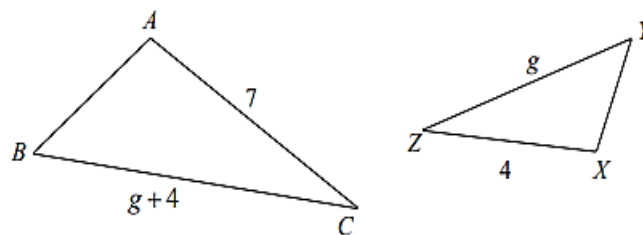


5 The diagram below shows two similar trapeziums,  $ABCF$  and  $FCDE$ . Given that  $FC = 3.6$  cm,  $DE = 9$  cm and  $AF = 1.5$  cm, find the

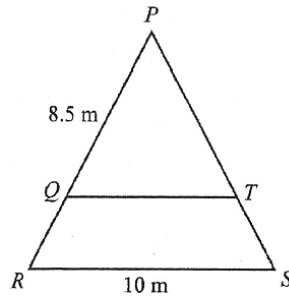


- (a) value of  $\frac{AB}{FC}$ ,
- (b) the length of  $FE$ .

6 Triangle  $ABC$  is similar to triangle  $XYZ$ . It is given that  $AC = 7$  cm,  $BC = (g + 4)$  cm,  $YZ = g$  cm and  $XZ = 4$  cm. Calculate the value of  $g$ . [2]



7  $\Delta PQT$  is similar to  $\Delta PRS$ . It is given that  $PO = 8.5$  m and  $RS = 10$  m.



Given that the ratio of the length of  $QT : RS$  is 13:20, find the length of

(a)  $QT$ ,

(b)  $QR$ .

[2]

[3]

**Answer Key**

1	<p>Solutions:</p> <p>(a)(i) <math>\angle BFD = 180^\circ - 96^\circ = 84^\circ</math>                      (ii) <math>\angle FDE = \frac{180^\circ - 96^\circ}{2} = 42^\circ</math>                      (iii) <math>BF = 2\frac{2}{3}, BE = 6\frac{2}{3}</math> or 6.67</p> <p>(b) <math>AB = CD</math> (opp side of parallelogram)  <math>AD = CB</math> (opp side of parallelogram)  <math>BD = DB</math> (same side)                      Triangle ABD is congruent to CDB via SSS.</p> <p>Ans: (a)(i) <math>84^\circ</math> (ii) <math>42^\circ</math> (iii) <math>6\frac{2}{3}</math> or 6.67</p>			
2	<p>Solution:</p> <p><math>x = 6</math> cm  <math>y = 27^\circ</math>  <math>z = 180^\circ - 27^\circ - 68^\circ = 85^\circ</math></p> <p>Ans: <math>85^\circ</math></p>			
3	<p>Solution:</p> <p><math>x = 180^\circ - 70^\circ - 62^\circ = 48^\circ</math>  <math>y = \frac{2}{10} \times 15 = 3</math></p> <p>Ans: 3</p>			
4	<p>Ans:</p> <p>Let the height of the man be <math>x</math>.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%; vertical-align: top;"> <math display="block">\frac{2.5}{1.07 + 2.5} = \frac{6 - x}{6}</math> <math display="block">6(2.5) = (6 - x)(3.57)</math> <math display="block">21.42 - 3.57x = 15</math> <math display="block">-3.57x = -6.42</math> <math display="block">x = 1.8 \text{ (1d.p)}</math> <p>The man's height is 1.8 m.</p> </td> <td style="width: 33%; vertical-align: top; text-align: center;"> <p>OR</p> <math display="block">\frac{1.07}{2.5 + 1.07} = \frac{CE}{6}</math> <math display="block">CE = \frac{6(1.07)}{3.57}</math> <math display="block">CE = 1.8 \text{ (1d.p)}</math> <p>The man's height is 1.8m</p> </td> <td style="width: 33%; vertical-align: top;"> <math display="block">\frac{2.5}{2.5 + 1.07} = \frac{BE}{6}</math> <math display="block">BE = \frac{2.5}{3.57} \times 6</math> <math display="block">BE = 4.201680672</math> <math display="block">6 - 4.201680672 = 1.798319328 \approx 1</math> </td> </tr> </table>	$\frac{2.5}{1.07 + 2.5} = \frac{6 - x}{6}$ $6(2.5) = (6 - x)(3.57)$ $21.42 - 3.57x = 15$ $-3.57x = -6.42$ $x = 1.8 \text{ (1d.p)}$ <p>The man's height is 1.8 m.</p>	<p>OR</p> $\frac{1.07}{2.5 + 1.07} = \frac{CE}{6}$ $CE = \frac{6(1.07)}{3.57}$ $CE = 1.8 \text{ (1d.p)}$ <p>The man's height is 1.8m</p>	$\frac{2.5}{2.5 + 1.07} = \frac{BE}{6}$ $BE = \frac{2.5}{3.57} \times 6$ $BE = 4.201680672$ $6 - 4.201680672 = 1.798319328 \approx 1$
$\frac{2.5}{1.07 + 2.5} = \frac{6 - x}{6}$ $6(2.5) = (6 - x)(3.57)$ $21.42 - 3.57x = 15$ $-3.57x = -6.42$ $x = 1.8 \text{ (1d.p)}$ <p>The man's height is 1.8 m.</p>	<p>OR</p> $\frac{1.07}{2.5 + 1.07} = \frac{CE}{6}$ $CE = \frac{6(1.07)}{3.57}$ $CE = 1.8 \text{ (1d.p)}$ <p>The man's height is 1.8m</p>	$\frac{2.5}{2.5 + 1.07} = \frac{BE}{6}$ $BE = \frac{2.5}{3.57} \times 6$ $BE = 4.201680672$ $6 - 4.201680672 = 1.798319328 \approx 1$		
5	<p>Solutions:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>(a) <math>\frac{AB}{FC} = \frac{FC}{ED}</math></p> <math display="block">= \frac{3.6}{9}</math> <math display="block">= \frac{2}{5}</math> </td> <td style="width: 50%; vertical-align: top;"> <p>(b) <math>\frac{FE}{AF} = \frac{ED}{FC}</math></p> <math display="block">\frac{FE}{1.5} = \frac{9}{3.6}</math> <math display="block">FE = \frac{9}{3.6} \times 1.5</math> <math display="block">= 3.75 \text{ cm}</math> </td> </tr> </table> <p>Ans: (a) <math>\frac{2}{5}</math> (b) 3.75 cm</p>	<p>(a) <math>\frac{AB}{FC} = \frac{FC}{ED}</math></p> $= \frac{3.6}{9}$ $= \frac{2}{5}$	<p>(b) <math>\frac{FE}{AF} = \frac{ED}{FC}</math></p> $\frac{FE}{1.5} = \frac{9}{3.6}$ $FE = \frac{9}{3.6} \times 1.5$ $= 3.75 \text{ cm}$	
<p>(a) <math>\frac{AB}{FC} = \frac{FC}{ED}</math></p> $= \frac{3.6}{9}$ $= \frac{2}{5}$	<p>(b) <math>\frac{FE}{AF} = \frac{ED}{FC}</math></p> $\frac{FE}{1.5} = \frac{9}{3.6}$ $FE = \frac{9}{3.6} \times 1.5$ $= 3.75 \text{ cm}$			

6	Solution:  $\frac{BC}{YZ} = \frac{AC}{XZ}$ $\frac{g+4}{g} = \frac{7}{4}$ $4g + 16 = 7g$ $3g = 16$ $g = 5\frac{1}{3}$  Ans: $5\frac{1}{3}$	
7	Solutions:  (a) $\frac{QT}{RS} = \frac{13}{20}$ (given) $\frac{QT}{10} = \frac{13}{20}$ $QT = 10 \times \frac{13}{20}$ $= 6.5 \text{ or } \frac{13}{2} \text{ or } 6\frac{1}{2}$ (b) $\frac{PQ}{PR} = \frac{QT}{RS} = \frac{13}{20}$ $\frac{8.5}{PR} = \frac{13}{20}$ $PR = 8.5 \times \frac{20}{13}$ $= \frac{170}{13} \text{ or } 13\frac{1}{3}$ $QR = PR - PQ$ $= 13\frac{1}{3} - 8.5$ $= \frac{119}{26} \text{ or } 4\frac{15}{26} \text{ or } 4.58$ <div style="text-align: center; margin: 10px 0;">OR</div> $\frac{8.5}{8.5 + QR} = \frac{13}{20}$ $110.5 + 13QR = 170$ $13QR = 59.5$ $QR = \frac{59.5}{13}$ $= 4\frac{15}{26}$ $\approx 4.58 \text{ (3 sig. fig.)}$	(a)
	Ans: (a) = $6.5$ or $\frac{13}{2}$ or $6\frac{1}{2}$ (b) $\frac{119}{26}$ or $4\frac{15}{26}$ or $4.58$	