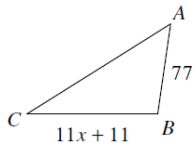
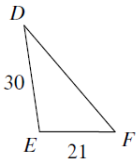
Maths 4th ESO

EXAM 3_1 (Geometry)

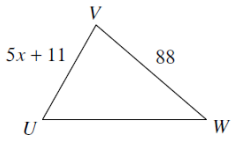
1. Calculate and write the *values for x* using the similarity of the triangles shown below. (2 points)

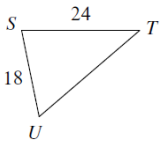
a)





b)

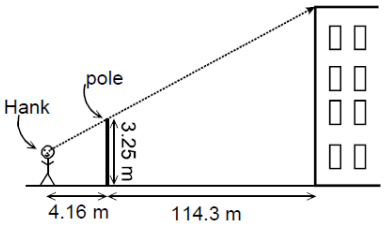




2. The diagonal of a cube is 9 dm. Find the length of a side of the cube.(1.5 pts)

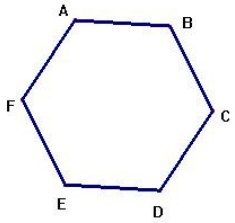
3. Firefighters have a 17 foot extension ladder. In order to reach 15 feet up a building, how far away from the building should the foot of the ladder be placed? (1.25 points)

4. Hank wishes to determine the height of a tall building.
Hank takes the measurements shown in the picture.
Determine if this information is enough to calculate the height of the building, and if it is, do so for Hank. (1.25 points)



5. The length of the hypotenuse of a right isosceles triangle is $6\sqrt{5}$ metres. What is the perimeter of the triangle? (1.5 points)

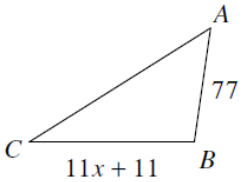
6. In regular hexagon ABCDEF, AB = 8cm. Find AD and CE. (1.5 points)

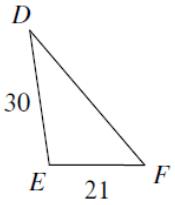


7. Two similar triangles have areas of 18 cm^2 and 32 cm^2 respectively. If the base of the smaller triangle is 6 cm, find the base of the larger triangle. (1 point)

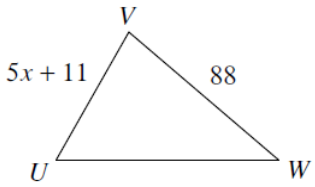
SOLUTION

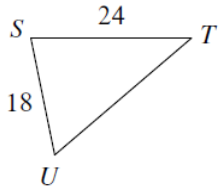
2. a)





b)



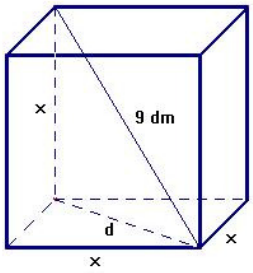


$$\frac{77}{21}=\frac{11x+11}{30}\rightarrow\frac{11}{3}=\frac{11x+11}{30} \qquad \frac{5x+11}{18}=\frac{88}{24}\rightarrow\frac{5x+11}{18}=\frac{11}{3}$$

$$11\times30=(11x+11)\times3\rightarrow10=x+1 \qquad (5x+11)\times3=11\times18\rightarrow5x+11=66$$

$$x=9 \qquad 5x=55\rightarrow x=11$$

2. The diagonal of a cube is 9 dm. Find the length of a side of the cube.



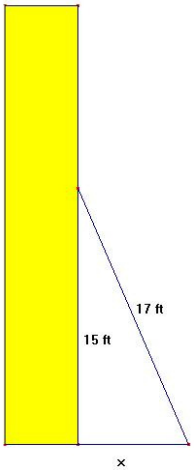
$$d^2=x^2+x^2\rightarrow d^2=2x^2$$

$$9^2=x^2+d^2\rightarrow81=x^2+2x^2\rightarrow81=3x^2$$

$$x^2=\frac{81}{3}=27\rightarrow x=\sqrt{27}=3\sqrt{3}\text{dm}$$

The side is $3\sqrt{3}$dm long

3. Firefighters have a 17 foot extension ladder. In order to reach 15 feet up a building, how far away from the building should the foot of the ladder be placed?

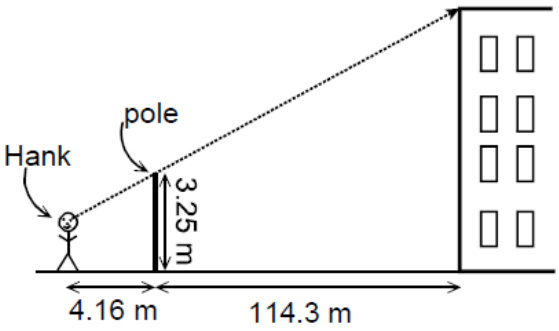


$$17^2=15^2+x^2\rightarrow x^2=17^2-15^2$$

$$x=64^2=17^2-15^2\rightarrow x=8$$

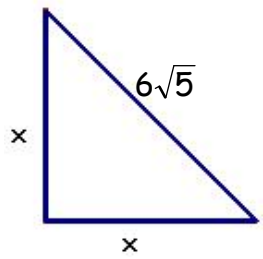
The ladder should be placed 8 feet from the building

4. Hank wishes to determine the height of a tall building.
Hank takes the measurements shown in the picture.
Determine if this information is enough to calculate the height of the building, and if it is, do so for Hank.



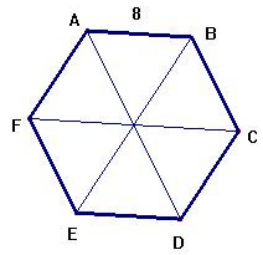
We cannot calculate the height of the building, we need the height of Hank, because we cannot know if the quadrilateral are similar (or we only know one side of the similar triangles).

5. The length of the hypotenuse of a right isosceles triangle is $6\sqrt{5}$ metres. What is the perimeter of the triangle? Pythagorean theorem:

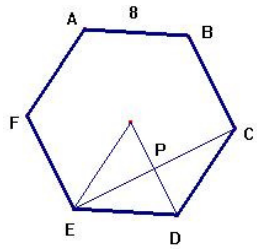


$$\left(6\sqrt{5}\right)^2 = x^2 + x^2 \rightarrow 36 \times 5 = 2x^2$$
$$180 = 2x^2 \rightarrow x^2 = 90 \rightarrow x = \sqrt{90} = 3\sqrt{10}$$
$$P = 2x + 6\sqrt{5} = 6\sqrt{10} + 6\sqrt{5} \text{ dm}$$

6. In regular hexagon ABCDEF, AB = 8 cm. Find AD and CE.



AD is the double of the side of the hexagon, because there are six equilateral triangles, so AD is 16 cm long



EP is the height of the equilateral triangle, so we can use the Pytagorean theorem:

$$8^2 = 4^2 + EP^2 \rightarrow EP^2 = 64 - 16 = 48$$

$$EP = \sqrt{48} = 4\sqrt{3}\text{cm} \rightarrow EC = 2 \times 4\sqrt{3} = 8\sqrt{3}\text{cm}$$

7. Two similar triangles have areas of 18 cm^2 and 32 cm^2 respectively. If the base of the smaller triangle is 6 cm, find the base of the larger triangle.

Ratio of areas: $\frac{32}{18} = \frac{16}{9} = r^2 \rightarrow r = \sqrt{\frac{16}{9}} = \frac{4}{3} \rightarrow \text{Base} = 6 \times r = 6 \times \frac{4}{3} \rightarrow = 8\,\text{cm}$