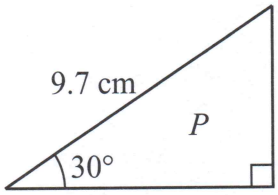
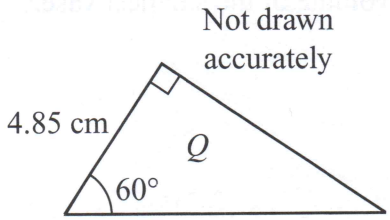
# Trigonometry

**1** Triangles $P$ and $Q$ are shown below.



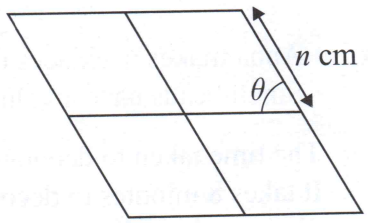




Prove that triangle $P$ is congruent to triangle $Q$.

*[Total 4 marks]*

**2** The diagram below shows a large rhombus made up from four smaller rhombuses.

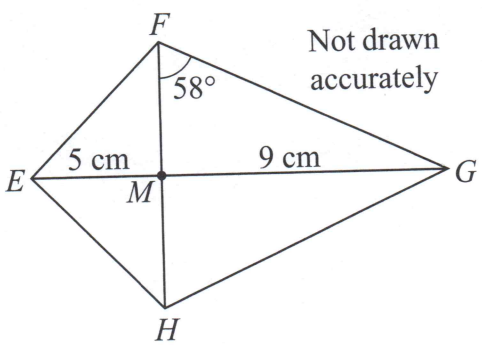
Show that the area of the large rhombus is $4n^2\sin\theta$ cm$^2$.




*[Total 3 marks]*

**3** The diagram on the right shows a kite $EFGH$.
Diagonal $EG$ bisects the diagonal $HF$ at $M$.
$EM = 5$ cm and $MG = 9$ cm.

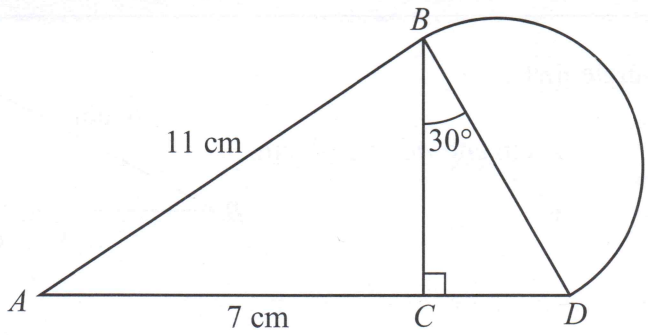
Calculate the size of angle $FEH$.
Give your answer to 1 decimal place.




.....°

*[Total 3 marks]*

**4** The diagram shows two right-angled triangles, $ABC$ and $BCD$, and a semicircle.




Not drawn accurately

$AB = 11$ cm, $AC = 7$ cm and angle $CBD = 30°$.
Calculate the exact area of the semicircle.

..... cm$^2$

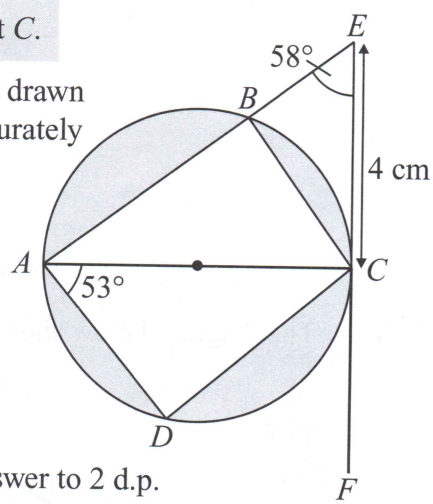
*[Total 5 marks]*

**5** $A$, $B$, $C$ and $D$ are points on a circle. $EF$ is a tangent to the circle at $C$.

$AC$ is a diameter of the circle. $EC = 4$ cm.
Angle $BEC = 58°$ and angle $DAC = 53°$.

a) Find the area of the circle. Give your answer to 2 d.p.

Not drawn accurately




..... cm$^2$

*[3]*

b) Find the total area of the shaded parts of the circle. Give your answer to 2 d.p.

..... cm$^2$

*[5]*

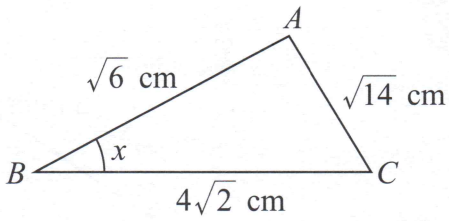
*[Total 8 marks]*

**Score:** ☐/**23**

# The Sine and Cosine Rules

**1** The diagram shows triangle $ABC$.

$AB = \sqrt{6}$ cm, $BC = 4\sqrt{2}$ cm and $AC = \sqrt{14}$ cm.
Show that $x = 30°$.



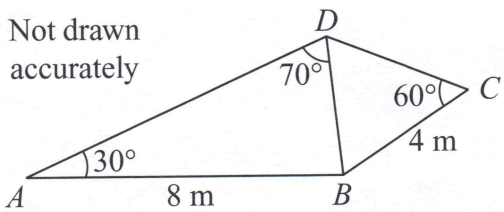

Not drawn accurately

*[Total 4 marks]*

**2** The diagram on the right is a sketch of a metal framework.
Some of the information needed to manufacture the framework has been lost.

Complete the specification for the framework by calculating the size of angle $BDC$.
Give your answer to 3 significant figures.

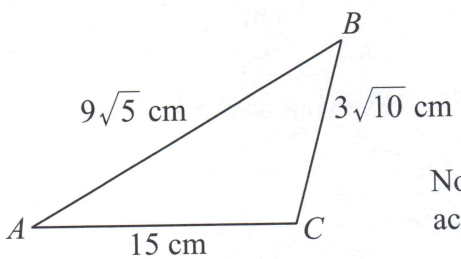
Not drawn accurately



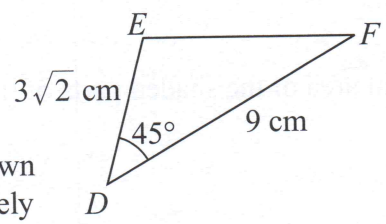

.....°

*[Total 5 marks]*

**3** The diagram below shows two triangles, $ABC$ and $DEF$.



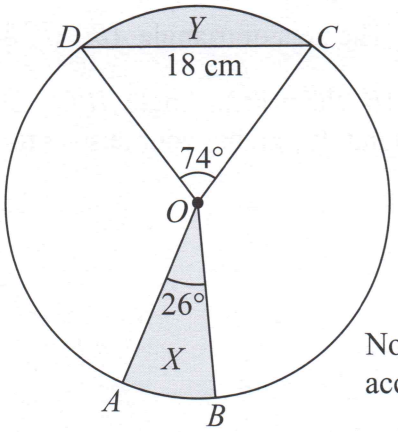

Not drawn accurately




Show that triangle $ABC$ and triangle $DEF$ are similar.

*[Total 4 marks]*

**4** Points $A$, $B$, $C$ and $D$ are points on the circumference of a circle with centre $O$.
$DC = 18$ cm, angle $DOC = 74°$ and angle $AOB = 26°$.



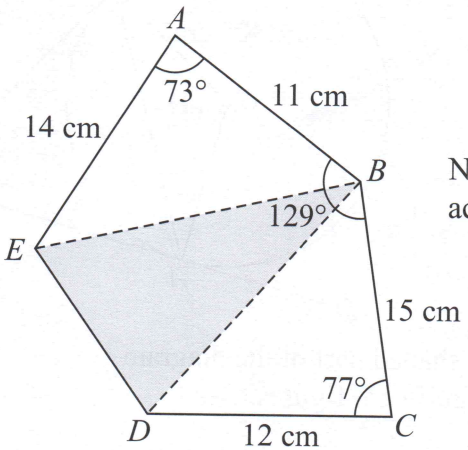

Not drawn accurately

Work out which shaded area, $X$ or $Y$, is bigger.
Show your working.

.....

*[Total 6 marks]*

**5** $ABCDE$ is an irregular pentagon.




Not drawn accurately

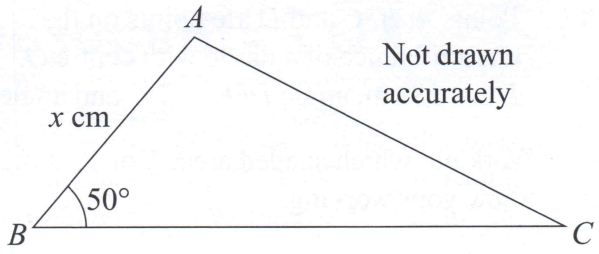
What is the area of triangle $BED$? Give your answer to 3 significant figures.

..... $cm^2$

*[Total 5 marks]*

**6** The area of triangle $ABC$ is 38 cm$^2$.

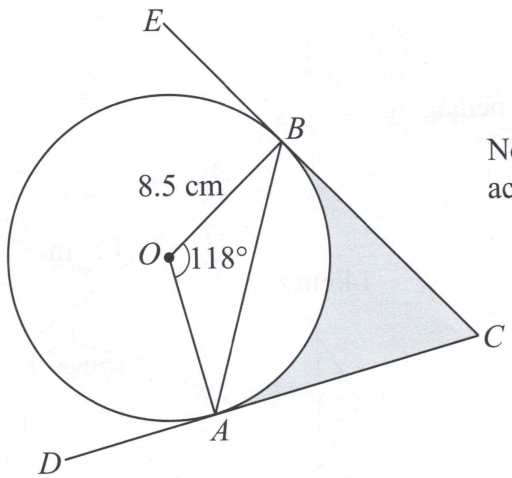
$AB : BC = 1 : 2$. Angle $ABC = 50°$.
Find $AC$, giving your answer to 3 significant figures.




..... cm

*[Total 4 marks]*

**7** $A$ and $B$ are points on a circle with centre $O$.
$CD$ is a tangent to the circle at $A$ and $CE$ is a tangent to the circle at $B$.




Not drawn accurately

Calculate the area of the shaded part of the diagram.
Give your answer to 3 significant figures.

Find the area of the minor segment, then subtract it from the area of triangle ABC.

..... cm$^2$

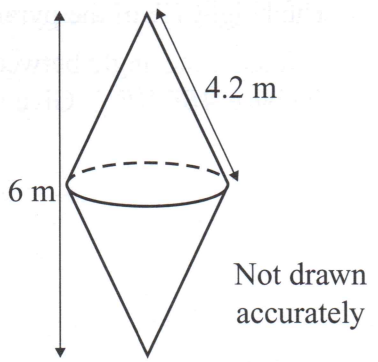
*[Total 7 marks]*

**Score:** ☐ / **35**

# 3D Pythagoras and Trigonometry

**1** The solid on the right is made from two identical cones joined at their bases. The slant height of each cone is 4.2 m and the overall vertical height of the solid is 6 m.

Work out the volume of the solid.
Give your answer to 3 significant figures.

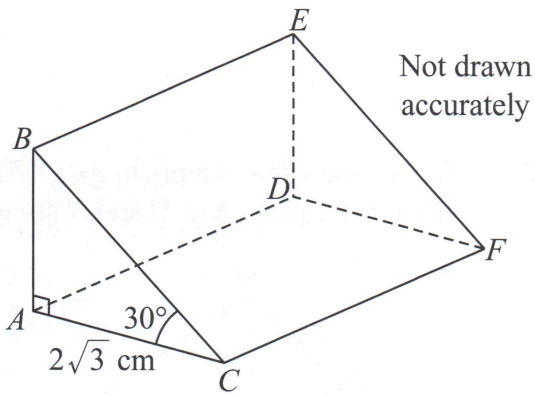



..... $m^3$

*[Total 3 marks]*

**2** The triangular prism *ABCDEF* is shown on the right.

Angle $ACB = 30°$, $AC = 2\sqrt{3}$ cm.
Area of rectangle $BCFE = 32$ cm$^2$.
Work out the exact volume of the prism.

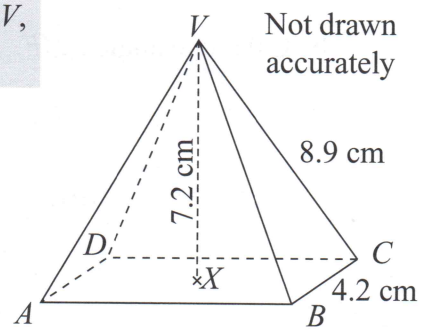



..... $cm^3$

*[Total 4 marks]*

**3** The diagram shows a pyramid with a rectangular base. The vertex, *V*, of the pyramid is directly above the centre of the base *ABCD*.

$VC = 8.9$ cm, $VX = 7.2$ cm and $BC = 4.2$ cm.
Work out the length *AB*. Give your answer to 3 significant figures.



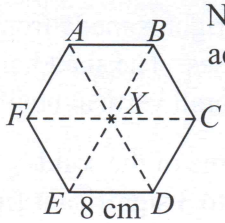

..... cm

*[Total 4 marks]*

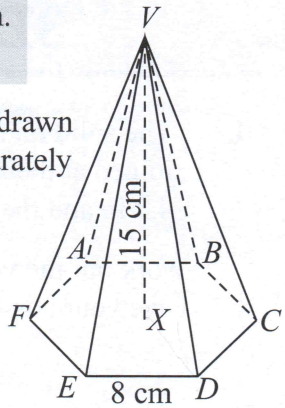
**4** The base of the pyramid *ABCDEFV* is a regular hexagon with side length 8 cm. The vertex, *V*, of the pyramid is directly above the centre of the base, *X*.

The height *VX* of the pyramid is 15 cm.

Calculate the angle between the plane *VED* and the base *ABCDEF*. Give your answer to 1 decimal place.




Not drawn accurately

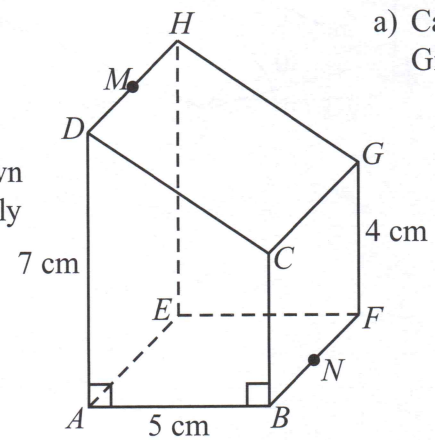



.....°

*[Total 3 marks]*

**5** The diagram shows a prism *ABCDEFGH*.
*ABFE* is a square, and *M* and *N* are the midpoints of *DH* and *BF* respectively.

Not drawn accurately




a) Calculate the angle between the line *HB* and the base *ABFE*. Give your answer to 3 significant figures.

.....°

*[3]*

b) Calculate angle *BMF*. Give your answer to 3 significant figures.

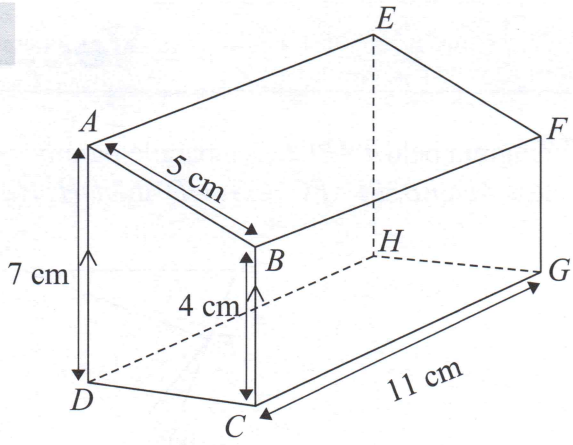
.....°

*[3]*

*[Total 6 marks]*

**6** The diagram shows a prism *ABCDEFGH*.

Calculate the angle *DEG*.
Give your answer to 3 significant figures.



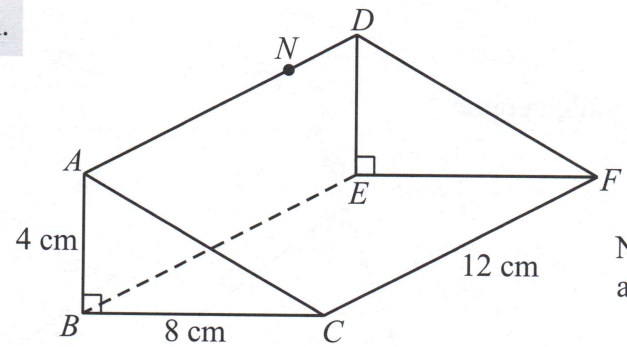

Not drawn accurately

°

.....

*[Total 5 marks]*

**7** *ABCDEF* is a triangular prism.




Not drawn accurately

*A* is vertically above *B* with $AB = 4$ cm. $BC = 8$ cm and $CF = 12$ cm.
*N* is the point on *AD* such that $AN : ND = 3 : 1$.
Calculate the angle *CNF*. Give your answer to 1 decimal place.

°

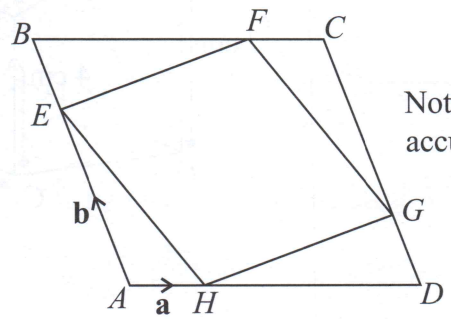
.....

*[Total 5 marks]*

**Score:** ☐/30

# Vectors

**1** In the diagram below $ABCD$ is a parallelogram.
The ratios $AE : EB$, $BF : FC$, $CG : GD$ and $DH : HA$ are all $2 : 1$.

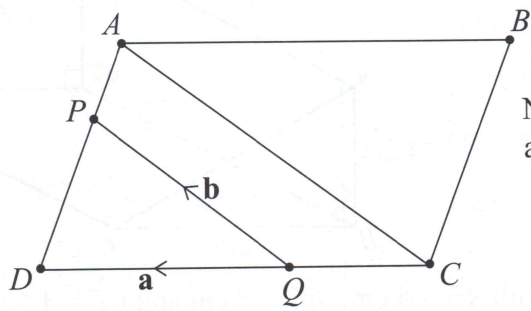



Not drawn accurately

$\overrightarrow{AH} = \mathbf{a}$ and $\overrightarrow{AE} = \mathbf{b}$. Show that $EFGH$ is parallelogram.

*[Total 3 marks]*

**2** $ABCD$ is a parallelogram.




Not drawn accurately

$\overrightarrow{QP} = \mathbf{b}$ and $\overrightarrow{QD} = \mathbf{a}$. Triangles $PQD$ and $ACD$ are similar and $AD : PD = 5 : 3$

a) Find $\overrightarrow{CA}$ in terms of **a** and **b**.

.....

*[1]*

$R$ is a point on $AC$ such that $5\overrightarrow{AR} = 2\overrightarrow{AC}$.

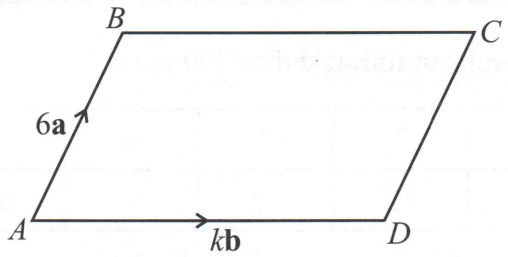
b) Given that $\overrightarrow{PR} = k\overrightarrow{DQ}$, find the value of $k$.

$k =$ .....

*[3]*

*[Total 4 marks]*

**3** *ABCD* is a parallelogram.




Not drawn accurately

$\overrightarrow{AB} = 6\mathbf{a}$ and $\overrightarrow{AD} = k\mathbf{b}$.

When the line *AC* is extended, *E* is a point on *AC* such that $\overrightarrow{BE} = 4\mathbf{a} + 25\mathbf{b}$.

Calculate the value of *k*.

*k* = .....

*[Total 4 marks]*

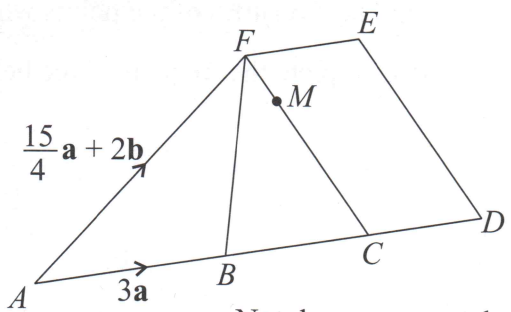
**4** The shape below is made up of two triangles, *ABF* and *BCF*, and a parallelogram *CDEF*.

$\overrightarrow{AB} = 3\mathbf{a}$ and $\overrightarrow{AF} = \frac{15}{4}\mathbf{a} + 2\mathbf{b}$.

*ABCD* is a straight line with $AB : BC : CD = 4 : 3 : 4$.

*M* is a point on *CF* such that $4\overrightarrow{FM} = \overrightarrow{MC}$.

Is *AME* a straight line? Explain your answer.




Not drawn accurately

*[Total 5 marks]*

**Score:** ☐ / **16**