3D Trigonometry and Pythagoras Theorem
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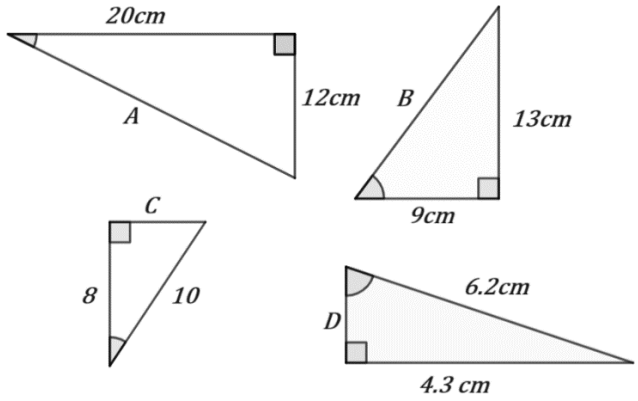
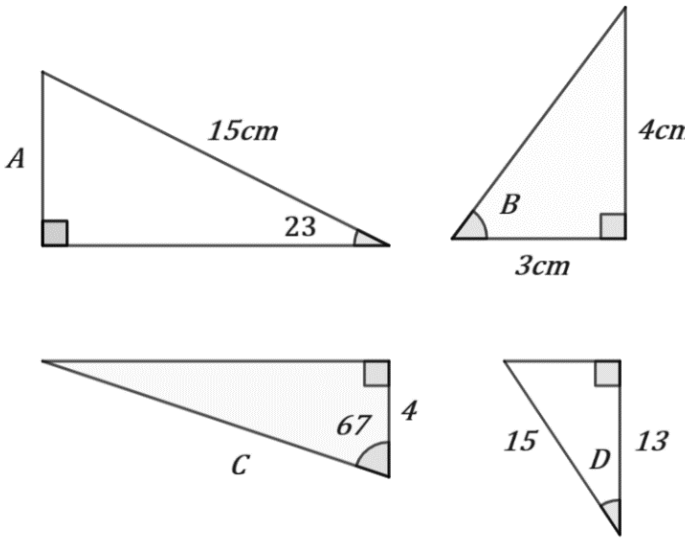
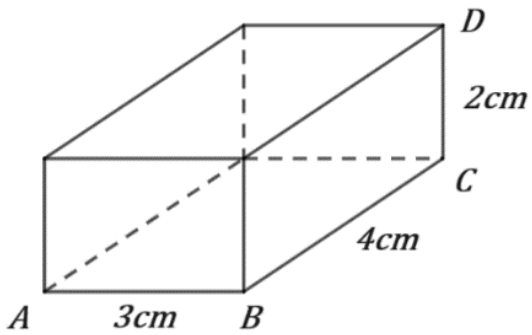
(1) Find the missing values in the triangles. Give any non-integer answers to 3 SF.



(2) Find the missing values in the triangles. Give any non-Integer answers to 3SF.

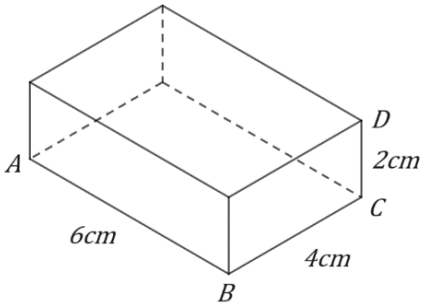


(3) A cuboid is shown below.



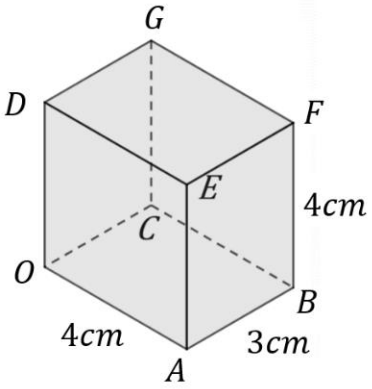
(a) Draw the 2D triangle ABC and show that $AC = 5cm$.
(b) Draw the 2D triangle DAC and show that $AD = \sqrt{29}$
(c) Using your answers to part (a) and (b), find the size of $< DAC$ to 3 significant figures.
(d) On the diagram, draw all lines that have length $\sqrt{29}$.

(4) The diagram below shows a cuboid.



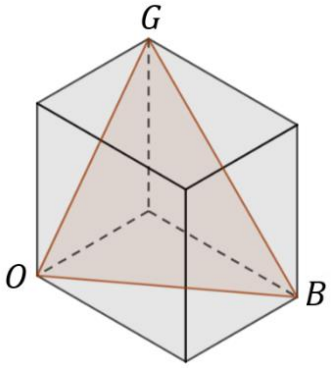
(a) Use Pythagoras Theorem in 3D to show that the length on the diagonal $AD = 2\sqrt{14}\ cm$ long.
(b) On the diagram mark the vertex E such that the length $BE = 2\sqrt{14}$.
(c) Show that $AC = 2\sqrt{13}\ cm$ long
(d) Draw the right-angled triangle ACD showing the lengths of AC and DC on your diagram.
(e) Hence, using trigonometry in 3D, show that the angle $DAC = 15.5^o$ correct to 3 significant figures.

(5) The diagram below shows a cuboid $OABCDEFG$.



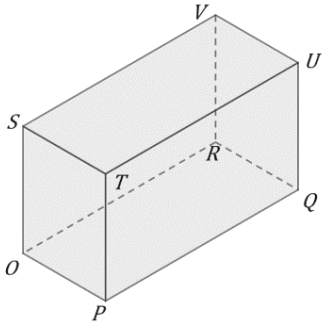
(a) Show that $OB = 5cm$.
(b) Hence or otherwise, show that $OF = \sqrt{41}$.
(c) Explain why AG also has length $\sqrt{41}$.
(d) Find the size of $< FOB$ using the answers you have found previously.
(e) Find another angle that has the same size as $< FOB$.

The triangle OBG is drawn within the cuboid $OABCDEFG$ as shown below.



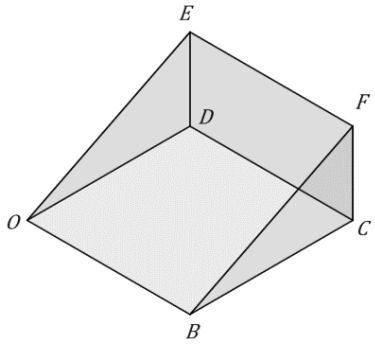
(f) Show that ΔOBG is an isosceles triangle.
(g) Find the size of $< OBG$.
(h) Find the area of ΔOBG.

(6) The diagram below shows a cuboid $OPQRSTUV$.



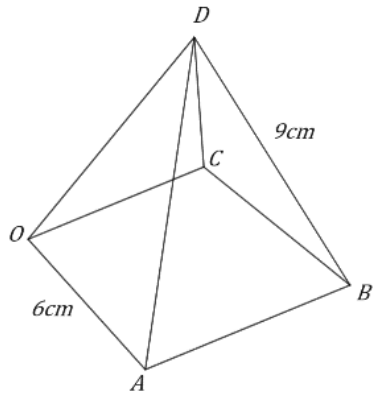
Given that $UQ = 6cm$ and $< UOQ = 30^o$ find:
(a) OU (b) OQ (c) VP (d) OS
Given further that $OP = 5cm$:
(e) Find the volume of the cuboid.
(f) Find the area of ΔVPR.
X is the midpoint of the line SV.
(g) Find the area of the triangle PQX.
Point Y lies on VR such that $RY:YV$ Is $2:1$.
(h) Find the size of $< YPR$.

(7) The diagram below shows a 'right wedge'
$BC = 8cm, < FCB = 90^o, < EOD = 90^o$ & $< FBC = 24^0$



(a) Find the length BF.
(b) Hence write down the length OE.
(c) Find OC.
(d) Find $< FOC$.

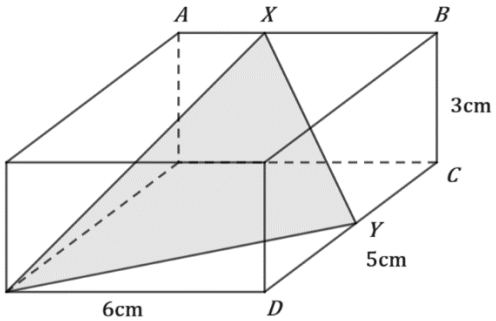
(8) The diagram shows a square based pyramid $OABD$ where point D is directly above the centre of the base.



(a) Show that the perpendicular height of the pyramid is $3\sqrt{7}\,cm$ long.
(b) Hence, find the volume of the pyramid.
(c) Find the size of $< DOB$.
(d) Find the total surface area of the solid pyramid.

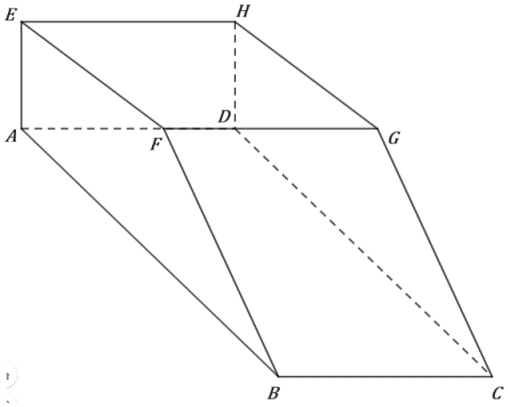
(9) A cube has side length a.
Find a simplified expression in terms of a for the length of the longest diagonal in the cube

(10)* The diagram below shows a cuboid.



Given that $AX:XB = 1:2$ and $AY:YC = 1:1$ find the area of the shaded triangle.

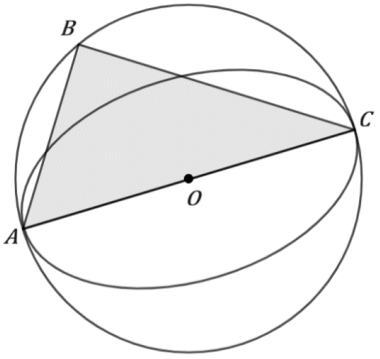
(11) The diagram below shows a 'right wedge' or, if you like a 'trapezoidal prism'.



$< BAC = < AEF = < BAD = < ABC = < BCD = 90^o$
$AB = 12,\ BF = 7$ and $AF = 6$

Find the volume of the prism to 3SF.

(12) The diagram below shows a sphere centre O, and diameter AB. Point C touches the outer of the sphere and ΔABC is a right-angled triangle.



Given that $AB = 2x$ and that $\tan < BCA = \frac{1}{\sqrt{3}}$, without a calculator, show that the volume of the sphere is $\frac{32x^3\pi}{3}$