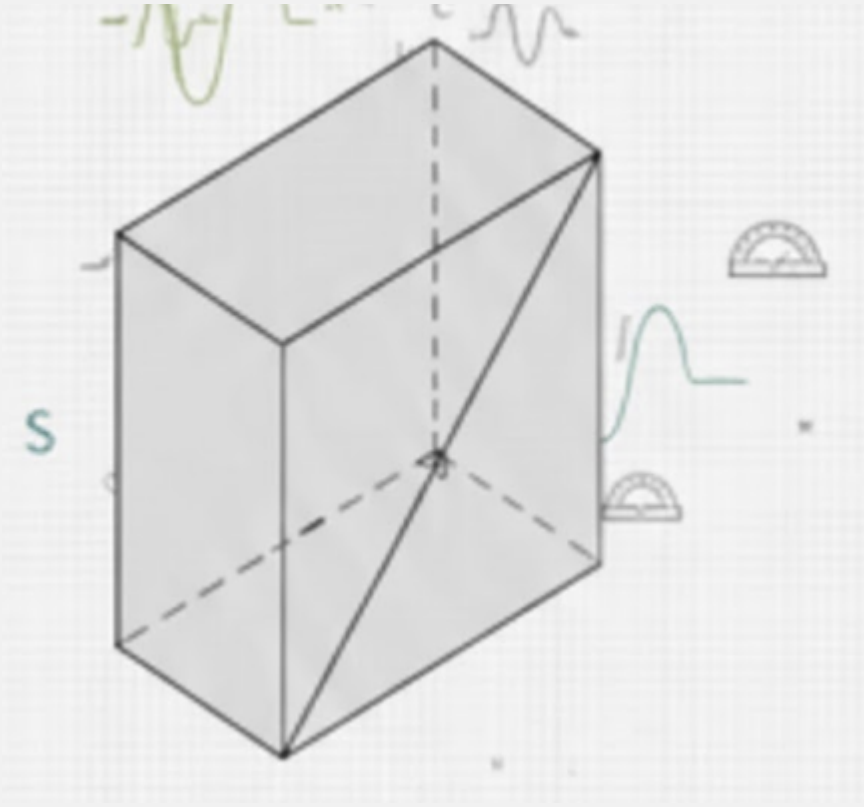
EDEXCEL IGCSE MATHEMATICS

UNIT 1 (MODULAR)

GEOMETRY – TRIGONOMETRY (3D)

QP & MS (2018 - 2025)



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EDEXCEL IGCSE MATHEMATICS MODULAR FOR MAY & OCT 2026

by Sir Muhammad Abdullah Shah

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1. Jan 2023 1HR/Q21

The diagram shows a triangular prism, $ABCDEF$, with a rectangular base $ABCD$

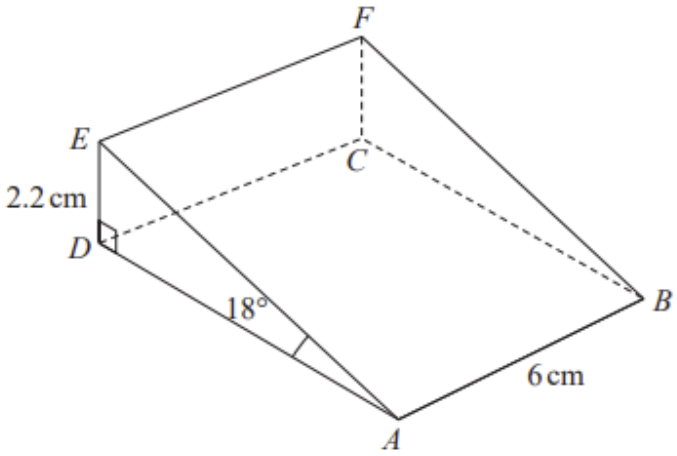

Diagram **NOT** accurately drawn

$AB = 6\,\text{cm}$ $DE = 2.2\,\text{cm}$ angle $DAE = 18°$ angle $ADE = 90°$

Work out the angle that BE makes with the plane $ABCD$
Give your answer correct to one decimal place.

.....°

(Total for Question 21 is 4 marks)

2. Jan 2022 1H/Q21

The diagram shows the prism $ABCDEFGHJK$ with horizontal base $AEFG$

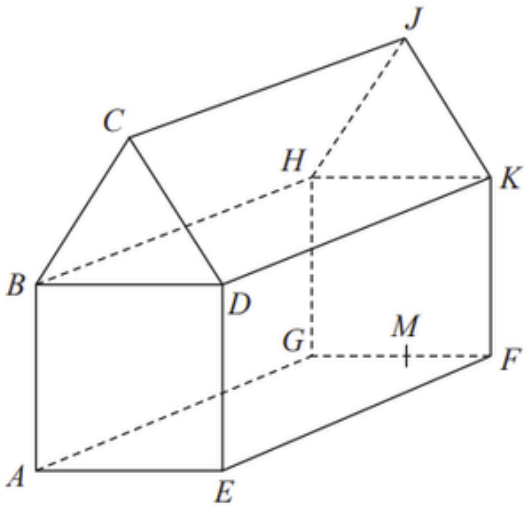

Diagram **NOT** accurately drawn

$ABCDE$ is a cross section of the prism where
$ABDE$ is a square
BCD is an equilateral triangle

$EF = 2 \times AE$
M is the midpoint of GF so that JM is vertical.

Angle $MAJ = y°$

Given that $\tan y° = T$

find the value of T, giving your answer in the form $\dfrac{\sqrt{p} + \sqrt{q}}{17}$ where p and q are integers.

$T =$ .....

(Total for Question 21 is 5 marks)

3. May 2021 1H/Q22

The diagram shows a triangular prism $ABCDEF$ with a horizontal base $ABEF$.

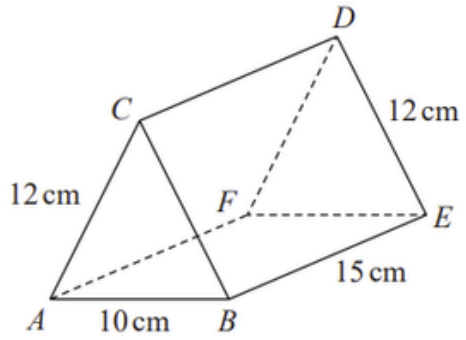

Diagram **NOT** accurately drawn

$AC = BC = FD = ED = 12\,\text{cm}$ $AB = 10\,\text{cm}$ $BE = 15\,\text{cm}$

Calculate the size of the angle between AD and the base $ABEF$.
Give your answer correct to 3 significant figures.

.....°

(Total for Question 22 is 4 marks)

4. Nov 2020 1HR/Q17

The diagram shows a prism *ABCDEFGH* with a horizontal base.

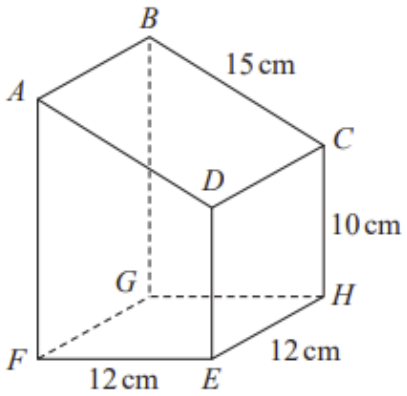

Diagram **NOT** accurately drawn

The base of the prism, *EFGH*, is a square of side 12 cm.
Trapezium *ADEF* is a cross section of the prism where *AF* and *DE* are vertical edges.

$DE = CH = 10$ cm
$AD = BC = 15$ cm

(a) Work out the size of the angle between *CF* and the base *EFGH*.
Give your answer correct to one decimal place.

..... °
(3)

(b) Work out the length of *BE*.
Give your answer correct to one decimal place.

..... cm
(3)

(Total for Question 17 is 6 marks)

5. Jan 2020 1H/Q19

The diagram shows a cuboid $ABCDEFGH$.

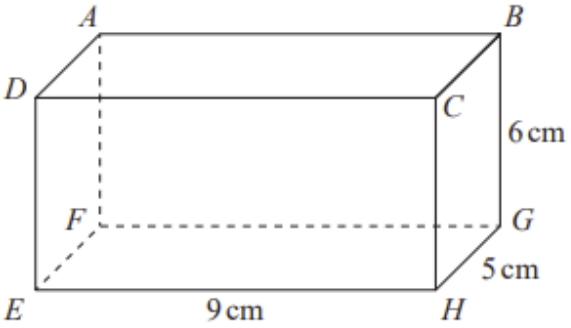

Diagram **NOT** accurately drawn

$EH = 9\,\text{cm}$, $HG = 5\,\text{cm}$ and $GB = 6\,\text{cm}$.

Work out the size of the angle between AH and the plane $EFGH$.
Give your answer correct to 3 significant figures.

.....°

(Total for Question 19 is 4 marks)

6. Jan 2019 1HR/Q20

Here is a cube *ABCDEFGH*.

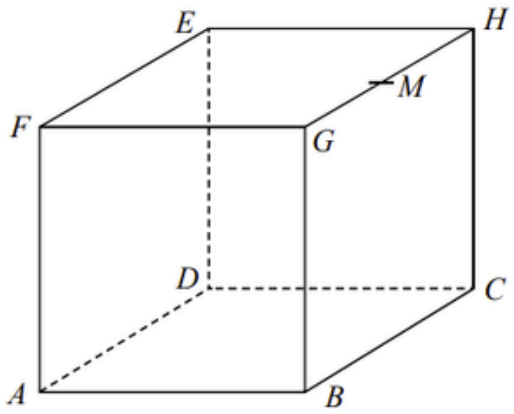

Diagram **NOT** accurately drawn

M is the midpoint of the edge *GH*.

Find the size of the angle between the line *MA* and the plane *ABCD*.
Give your answer correct to 1 decimal place.

.....°

(Total for Question 20 is 4 marks)

MARKING SCHEME

1. Jan 2023 1HR/Q21

21	$(AD=)\dfrac{2.2}{\tan 18}$ $(=6.77...)$ or $(EA=)\dfrac{2.2}{\sin 18}(=7.11...)$		4	M1	a correct method to find *AD* or *AE*
	$(DB=)\sqrt{("6.77...")^2+6^2}$ $(=9.04...)$ or $(EB=)\sqrt{6^2+"7.11..."^2}$ $(=9.31...)$ or $(EB=)\sqrt{6^2+"6.77..."^2+2.2^2}(=9.31...)$			M1	a correct method to find *DB* or *EB*
	$\tan DBE=\dfrac{2.2}{"9.04..."}$ or $\sin DBE=\dfrac{2.2}{"9.31..."}$ or $\sin DBE=\dfrac{2.2\sin 90}{"9.31..."}$ $\cos DBE=\dfrac{"9.04..."}{"9.31..."}$ or use of cosine rule			M1	complete method to find one of tan*DBE* or sin*DBE* or cos*DBE*– NB: if using cosine, the student will need to have found *DB* and *EB* previously
	Correct answer scores full marks (unless from obvious incorrect working)	13.7		A1	Allow answers in range 13.59 – 13.8
					Total 4 marks

2. Jan 2022 1H/Q21

21	eg $(AM=)\sqrt{x^2+(4x)^2}(=\sqrt{17x^2}=x\sqrt{17})$ oe **or** $(AM=)\sqrt{(0.5x)^2+(2x)^2}\left(=\sqrt{\dfrac{17}{4}x^2}=x\dfrac{\sqrt{17}}{2}\right)$ oe **or** $(AM=)\sqrt{20^2+5^2}(=\sqrt{425}=5\sqrt{17})$ oe		5	M1	for a correct method to find *AM* as a numerical value or in algebraic form, must have brackets or recover
	Height of triangle eg $\sqrt{(2x)^2-x^2}(=\sqrt{3x^2}=x\sqrt{3})$ oe **or** $\sqrt{x^2-(0.5x)^2}\left(=\sqrt{\dfrac{3}{4}x^2}=x\dfrac{\sqrt{3}}{2}\right)$ oe **or** $\sqrt{10^2-5^2}(=\sqrt{75}=5\sqrt{3})$ oe			M1	for a correct method to find height of equilateral triangle *HJK* as a numerical value or in algebraic form
	eg $\tan MAJ=\dfrac{\sqrt{3}+2}{\sqrt{17}}$ **or** $\tan MAJ=\dfrac{\frac{\sqrt{3}}{2}+1}{\frac{\sqrt{17}}{2}}$ **or** $\tan MAJ=\dfrac{5\sqrt{3}+10}{5\sqrt{17}}$			M1	for correct values for the correct angle (no algebra) **or** for $\tan MAJ$ is given numerically in the range 0.9 – 0.91
	eg $\dfrac{(\sqrt{3}+2)}{\sqrt{17}}\times\dfrac{\sqrt{17}}{\sqrt{17}}\left(=\dfrac{\sqrt{51}+2\sqrt{17}}{17}\right)$			M1	
		$\dfrac{\sqrt{68}+\sqrt{51}}{17}$		A1	or $\dfrac{\sqrt{51}+\sqrt{68}}{17}$
					Total 5 marks

3. May 2021 1H/Q22

22		$[AM =]\sqrt{5^2+15^2}\ (=\sqrt{250}=15.8...)$ where M is midpoint of EF, oe other correct method to find AM $[AD =]\sqrt{12^2+15^2}\ (=\sqrt{369}=19.2...)$ $[DM =])\sqrt{12^2-5^2}\ (=\sqrt{119}=10.9...)$		4	M2	for a complete method to find **two** of AM, AD, DM (where M is the midpoint of EF) Other longer ways to find AM, AD, DM may be used but must be a complete method eg $\angle DEM = \cos^{-1}(\frac{5}{12})(=65.37...)$ **and** $DM = 12\sin 65.37...$ $\angle DEM = \cos^{-1}(\frac{5}{12})(=65.37...)$ **and** $DM = 5\tan 65.37...$ Use $10 \div 2$ as 5 throughout
					(M1	For a complete method to find **one** of AM, AD, DM (where M is the midpoint of EF))
		eg $\tan DAM = \frac{"\sqrt{119}"}{"\sqrt{250}"}\left(=\frac{"10.9..."}{"15.8..."}\right)$ oe **or** $\sin DAM = \frac{"\sqrt{119}"}{"\sqrt{369}"}\left(=\frac{"10.9..."}{"19.2..."}\right)$ oe **or** $\cos DAM = \frac{"\sqrt{250}"}{"\sqrt{369}"}\left(=\frac{"15.8..."}{"19.2..."}\right)$ oe			M1	a correct method to find the required angle –other longer methods may be used but they must get to the stage of an equation for the required angle eg $\sin DAM = \frac{"10.9..."}{\sqrt{"15.8..."^2+"10.9..."^2}}$ NB: "10.9…" and "15.8…" must come from correct working
		Working not required, so correct answer scores full marks (unless from obvious incorrect working)	34.6		A1	any answer which rounds to 34.6
						Total 4 marks

4. Nov 2020 1HR/Q17

17	(a)	$(FH =)\ \sqrt{12^2+12^2}\ (=16.97...$ or $\sqrt{288}$ or $12\sqrt{2})$		3	M1
		$\tan CFH = \frac{10}{"16.97..."}$ oe **or** e.g. $(CF =)\ \sqrt{"16.97"^2+10^2}\ (=19.69...$ or $\sqrt{388}$ or $2\sqrt{97})$ **and** e.g. $\frac{\sin CFH}{10} = \frac{\sin 90}{"19.69"}$			M1 for a correct trig statement involving CFH
			30.5		A1 accept 30.4 – 30.7
	(b)	$(BG =)\ 10 + \sqrt{15^2-12^2}\ (=19)$		3	M1
		$(BE =)\ \sqrt{"19"^2+"16.97..."^2}$ oe			M1 ft their FH
			25.5		A1 accept 25.4 – 25.6
					Total 6 marks

5. Jan 2020 1H/Q19

19		$(AH =)\sqrt{6^2+5^2+9^2}\ (=\sqrt{142}\ )$ **or** $(FH = GE =)\ \sqrt{5^2+9^2}\ (=\sqrt{106}\ )$		4	M1 for working out AH or FH or GE
		E.g. $\sin AHF = \frac{6}{'\sqrt{142}'}$ **or** $\tan AHF = \frac{6}{'\sqrt{106}'}$ **or** $\cos AHF = \frac{'\sqrt{106}'}{'\sqrt{142}'}$ **or** $\sin FAH = \frac{'\sqrt{106}'}{'\sqrt{142}'}$ **or** $\cos FAH = \frac{6}{'\sqrt{142}'}$ **or** $\tan FAH = \frac{'\sqrt{106}'}{6}$			M1 for a correct method for finding angle AHF **or** finding angle FAH Allow $\cos AHF = \left(\frac{'\sqrt{142}'^2+'\sqrt{106}'^2-6^2}{2\times'\sqrt{142}'\times'\sqrt{106}'}\right)$ oe **or** $\sin AHF = \frac{\sin 90}{'\sqrt{142}'}\times 6$ oe
		E.g. $\sin^{-1}\left(\frac{6}{'\sqrt{142}'}\right)$ **or** $\tan^{-1}\left(\frac{6}{'\sqrt{106}'}\right)$ **or** $\cos^{-1}\left(\frac{'\sqrt{106}'}{'\sqrt{142}'}\right)$ **or** $90-\sin^{-1}\left(\frac{'\sqrt{106}'}{'\sqrt{142}'}\right)$ **or** $90-\cos^{-1}\left(\frac{6}{'\sqrt{142}'}\right)$ **or** $90-\tan^{-1}\left(\frac{'\sqrt{106}'}{6}\right)$			M1 for a complete method Allow $\cos^{-1}\left(\frac{'\sqrt{142}'^2+'\sqrt{106}'^2-6^2}{2\times'\sqrt{142}'\times'\sqrt{106}'}\right)$ oe **or** $\sin^{-1}\left(\frac{\sin 90}{'\sqrt{142}'}\times 6\right)$ oe
			30.2		A1 for 30.2 – 30.3
					Total 4 marks

6. Jan 2019 1HR/Q20

Question	Working	Answer	Mark	Notes
20	Let N be the midpoint of BC Let sides of cube have length $2a$ cm $AN^2 = 4a^2 + a^2 (= 5a^2)$ or $AM^2 = 4a^2 + a^2 + 4a^2 (= 9a^2)$ eg $\tan MAN = \frac{2a}{\sqrt{"5a^2"}}$ or $\sin MAN = \frac{2a}{\sqrt{"9a^2"}}$	41.8	4	B1 for recognising that required angle is MAN (could be marked on a diagram) M1 any $a > 0$ (a could be a number or a letter) M1 correct trig statement for angle MAN, any $a > 0$ (a could be a number or a letter) A1 41.8 - 41.82