



## Trigonometry 2 – Questions Handout

### Trigonometric formulae

#### Question 1.

2014 Paper 2, Q2

(a) Prove that  $\cos 2A = \cos^2 A - \sin^2 A$ .

#### Question 2.

2015 Paper 2, Q5

(a) Prove that  $\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$ .

#### Question 3.

2016 Paper 2, Q3

(a) Show that  $\frac{\cos 7A + \cos A}{\sin 7A - \sin A} = \cot 3A$ .



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### Radians

#### Question 4.

2014 Paper 2, Q2

- (b) The diagram shows part of the circular end of a running track with three running lanes shown. The centre of each of the circular boundaries of the lanes is at  $O$ .

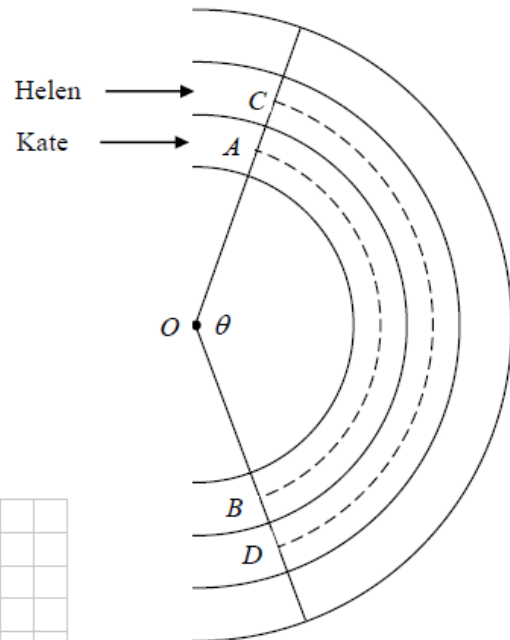
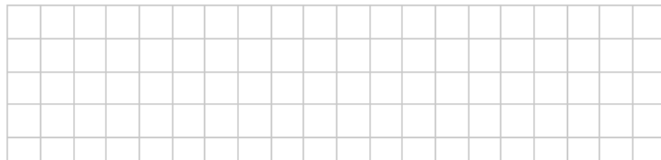
Kate runs in the middle of lane 1, from  $A$  to  $B$  as shown.

Helen runs in the middle of lane 2, from  $C$  to  $D$  as shown.

Helen runs 3 m further than Kate.

$|\angle AOB| = |\angle COD| = \theta$  radians.

If each lane is 1.2 m wide, find  $\theta$ .



### Solving equations

#### Question 5.

2015 Paper 2, Q5

- (b) Find all the values of  $x$  for which  $\sin(3x) = \frac{\sqrt{3}}{2}$ ,  $0 \leq x \leq 360$ ,  $x$  in degrees.

#### Question 6.

2016 Paper 2, Q3

- (b) Given that  $\cos 2\theta = \frac{1}{9}$ , find  $\cos \theta$  in the form  $\pm \frac{\sqrt{a}}{b}$ , where  $a, b \in \mathbb{N}$ .



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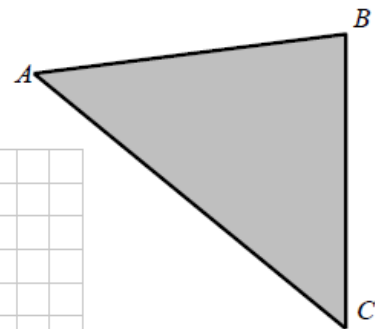
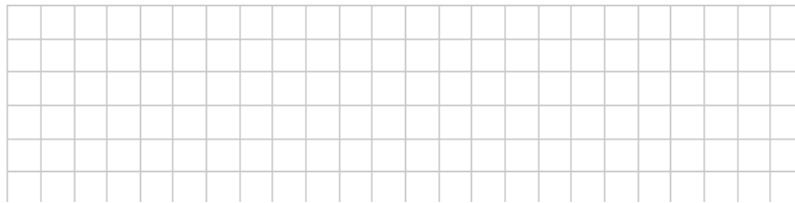
### Sine rule, cosine rule, area of a triangle

#### Question 7.

2014 Paper 2, Q1

The lengths of the sides of a flat triangular field  $ACB$  are,  
 $|AB| = 120$  m,  $|BC| = 134$  m and  $|AC| = 150$  m.

- (a) (i) Find  $|\angle CBA|$ . Give your answer, in degrees, correct to two decimal places.



- (ii) Find the area of the triangle  $ACB$  correct to the nearest whole number.

#### Question 8.

2013 Paper 2, Q5

- (b) In a triangle  $XYZ$ ,  $|XY| = 5$  cm,  $|XZ| = 3$  cm and  $|\angle XYZ| = 27^\circ$ .

- (i) Find the two possible values of  $|\angle XZY|$ . Give your answers correct to the nearest degree.
- (c) In the case that  $|\angle XZY| < 90^\circ$ , write down  $|\angle ZXY|$ , and hence find the area of the triangle  $XYZ$ , correct to the nearest integer.



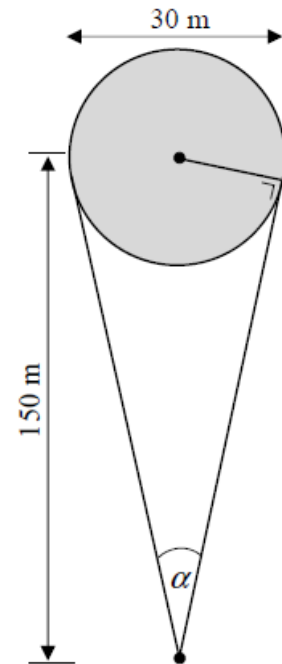
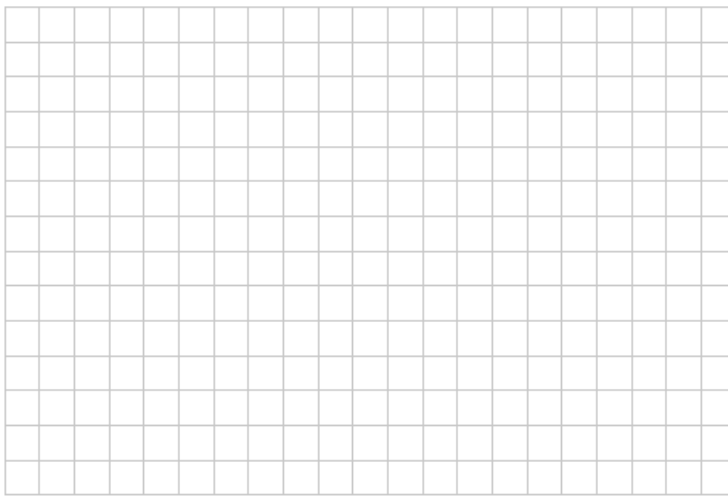
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### Longer questions

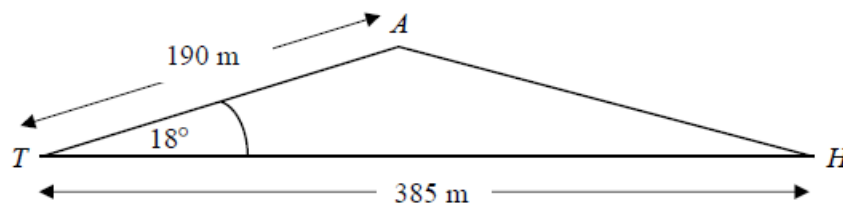
#### Question 9.

2015 Paper 2, Q9 [45 marks]

- (a) Joan is playing golf. She is 150 m from the centre of a circular green of diameter 30 m. The diagram shows the range of directions in which Joan can hit the ball so that it could land on the green. Find  $\alpha$ , the measure of the angle of this range of directions. Give your answer, in degrees, correct to one decimal place.



- (b) At the next hole, Joan, at  $T$ , attempts to hit the ball in the direction of the hole  $H$ . Her shot is off target and the ball lands at  $A$ , a distance of 190 metres from  $T$ , where  $|\angle ATH| = 18^\circ$ .  $|TH|$  is 385 metres. Find  $|AH|$ , the distance from the ball to the hole, correct to the nearest metre.







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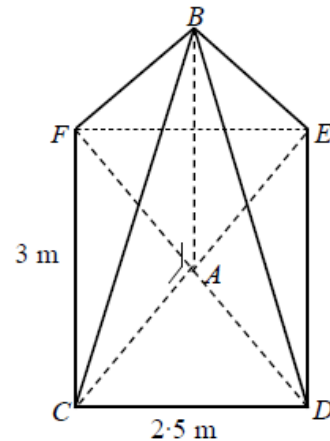
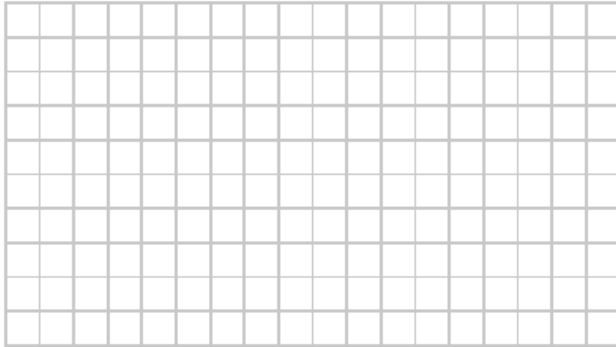
### Question 10.

2016 Paper 2, Q7 [55 marks]

A glass Roof Lantern in the shape of a pyramid has a rectangular base  $CDEF$  and its apex is at  $B$  as shown. The vertical height of the pyramid is  $|AB|$ , where  $A$  is the point of intersection of the diagonals of the base as shown in the diagram.

Also  $|CD| = 2.5$  m and  $|CF| = 3$  m.

- (a) (i) Show that  $|AC| = 1.95$  m, correct to two decimal places.



- (ii) The angle of elevation of  $B$  from  $C$  is  $50^\circ$  (i.e.  $|\angle BCA| = 50^\circ$ ).  
Show that  $|AB| = 2.3$  m, correct to one decimal place.

- (iii) Find  $|BC|$ , correct to the nearest metre.

- (iv) Find  $|\angle BCD|$ , correct to the nearest degree.

- (v) Find the area of glass required to glaze all four triangular sides of the pyramid.  
Give your answer correct to the nearest  $\text{m}^2$ .

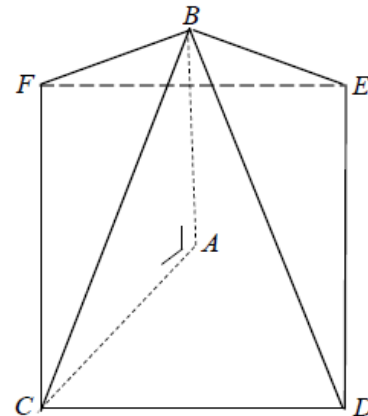
- (b) Another Roof Lantern, in the shape of a pyramid, has a square base  $CDEF$ . The vertical height  $|AB| = 3$  m, where  $A$  is the point of intersection of the diagonals of the base as shown.

The angle of elevation of  $B$  from  $C$  is  $60^\circ$

(i.e.  $|\angle BCA| = 60^\circ$ ).

Find the length of the side of the square base of the lantern.

Give your answer in the form  $\sqrt{a}$  m, where  $a \in \mathbb{N}$ .



Qs 11 (Paper 2 – 2019 – Qs 4)

- (a) Show that  $\cos 2\theta = 1 - 2 \sin^2 \theta$

- (b) Find the cosine of the acute angle between two diagonals of a cube.

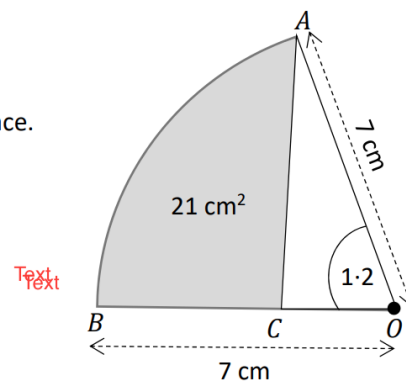


## Trigonometry 2 – Questions Handout

Qs 12 (Paper 2 – 2020 – Q4)

(a) Find the two values of  $\theta$  for which  $\tan \theta/2 = 1/\sqrt{3}$ , where  $0 \leq \theta \leq 4\pi$ .

- (b) The diagram shows  $OAB$ , a sector of a circle of radius 7 cm with centre  $O$ .  
In the sector,  $|\angle BOA| = 1.2$  radians.  
The area of the shaded region is  $21 \text{ cm}^2$ .  
Find  $|BC|$ .  
Give your answer correct to 1 decimal place.



Solutions: <https://web.actuaries.ie/students/maths-tutorials-higher-level-leaving-certificate-20182019> or google 'actuaries maths tutorials'