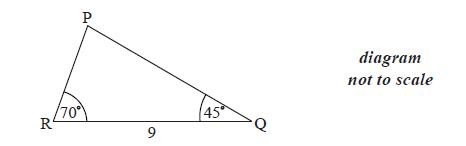
# Chp 9 IB SL maths Qs ms

Note there are a couple of circle Qs & Radians Qs that you can ignore at the moment. Will delete them one day.

**1a.** *[1 mark]*

The following diagram shows  , where RQ = 9 cm,  and  .



Find  .

**1b.** *[3 marks]*

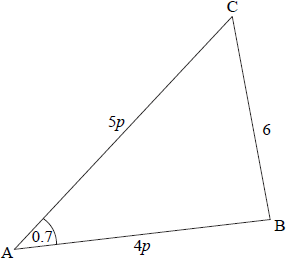
Find PR .

**1c.** *[2 marks]*

Find the area of  .

**2a.** *[4 marks]*

The following diagram shows a triangle ABC.



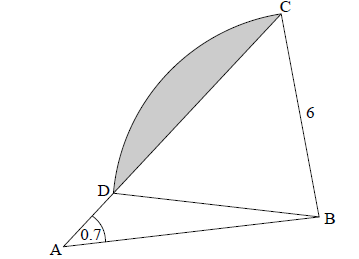
 ,  radians ,  ,  , where  .

(i) Show that  .

(ii) Find *p* .

**2b.** *[1 mark]*

Consider the circle with centre B that passes through the point C. The circle cuts the line CA at D, and  is obtuse. Part of the circle is shown in the following diagram.



Write down the length of BD.

**2c.** *[4 marks]*

Find  .

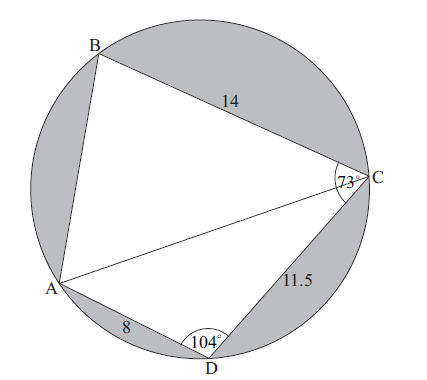
**2d.** *[6 marks]*

(i) Show that  radians, correct to 2 decimal places.

(ii) Hence, find the area of the shaded region.

**3a.** *[3 marks]*

The diagram shows a circle of radius  metres. The points ABCD lie on the circumference of the circle.



BC =  m, CD =  m, AD =  m,  , and  .

Find AC.

**3b.** *[5 marks]*

(i) Find  .

(ii) Hence, find  .

**3c.** *[2 marks]*

Find the area of triangle ADC.

**3d.** *[6 marks]*

(c) Find the area of triangle ADC.

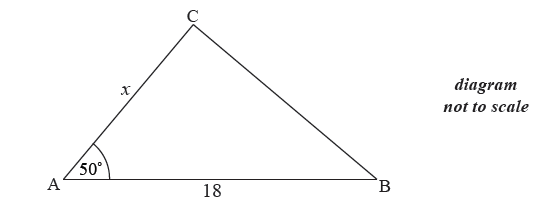
(d) Hence or otherwise, find the total area of the shaded regions.

**3e.** *[4 marks]*

Hence or otherwise, find the total area of the shaded regions.

**4a.** *[3 marks]*

The following diagram shows a triangle ABC.



The area of triangle ABC is  cm , AB  cm , AC  cm and  .

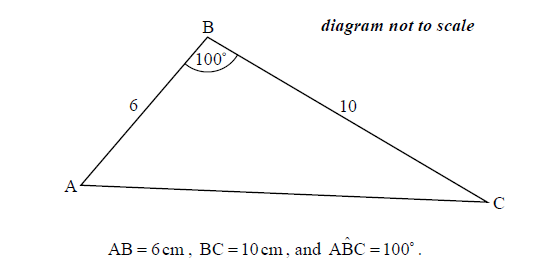
Find  .

**4b.** *[3 marks]*

Find BC.

**5a.** *[3 marks]*

The following diagram shows triangle ABC.



Find AC.

**5b.** *[3 marks]*

Find .

**6a.** *[4 marks]*

In triangle ,  and . The area of the triangle is .

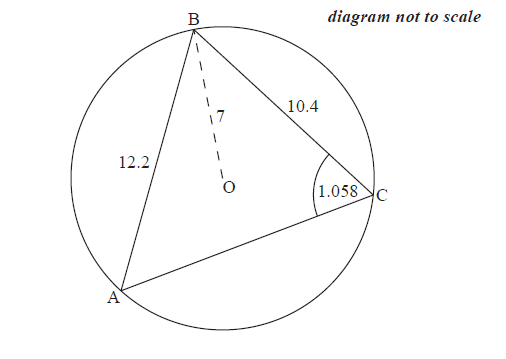
Find the two possible values for .

**6b.** *[3 marks]*

Given that  is obtuse, find .

**7a.** *[3 marks]*

Consider a circle with centre  and radius  cm. Triangle  is drawn such that its vertices are on the circumference of the circle.



 cm,  cm and  radians.

Find .

**7b.** *[5 marks]*

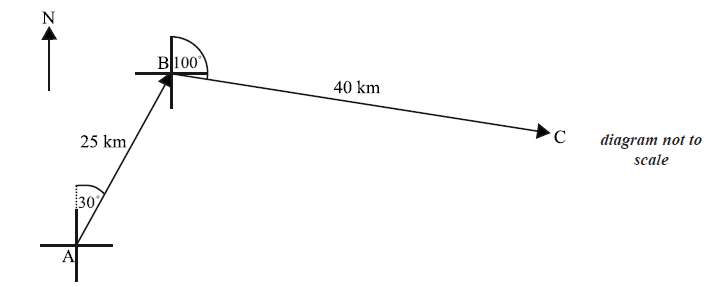
Find .

**7c.** *[6 marks]*

Hence or otherwise, find the length of arc .

**8a.** *[4 marks]*

A ship leaves port A on a bearing of  . It sails a distance of  to point B. At B, the ship changes direction to a bearing of  . It sails a distance of  to reach point C. This information is shown in the diagram below.



A second ship leaves port A and sails directly to C.

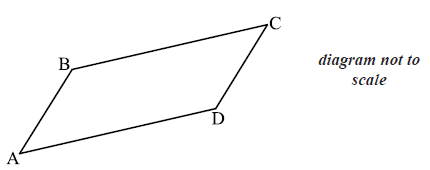
Find the distance the second ship will travel.

**8b.** *[3 marks]*

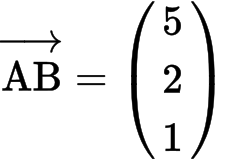
Find the bearing of the course taken by the second ship.

**9a.** *[5 marks]*

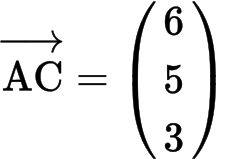
The diagram shows a parallelogram ABCD.



The coordinates of A, B and D are A(1, 2, 3) , B(6, 4,4 ) and D(2, 5, 5) .

(i) Show that  .

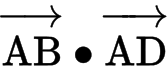
(ii) Find  .

(iii) **Hence** show that  .

**9b.** *[3 marks]*

Find the coordinates of point C.

**9c.** *[7 marks]*

(i) Find .

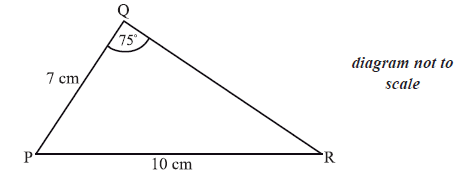
(ii) **Hence** find angle *A*.

**9d.** *[3 marks]*

Hence, or otherwise, find the area of the parallelogram.

**10a.** *[3 marks]*

The diagram below shows triangle PQR. The length of [PQ] is 7 cm , the length of [PR] is 10 cm , and  is  .



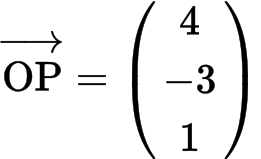
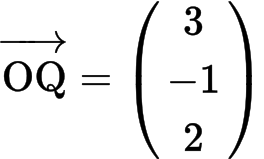
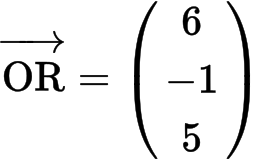
Find  .

**10b.** *[3 marks]*

Find the area of triangle PQR.

**11a.** *[3 marks]*

The vertices of the triangle PQR are defined by the position vectors

 ,  and  .

Find

(i) ;

(ii) .

**11b.** *[7 marks]*

Show that  .

**11c.** *[6 marks]*

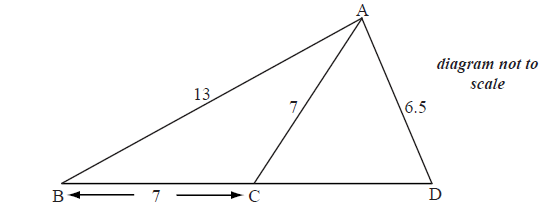
(i) Find  .

(ii) Hence, find the area of triangle PQR, giving your answer in the form  .

**12a.** *[3 marks]*

The diagram below shows a triangle ABD with AB =13 cm and AD = 6.5 cm.

Let C be a point on the line BD such that BC = AC = 7 cm.



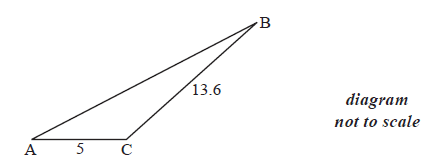
Find the size of angle ACB.

**12b.** *[5 marks]*

Find the size of angle CAD.

**13a.** *[4 marks]*

The following diagram shows the triangle ABC.



The angle at C is obtuse, ,  and the area is  .

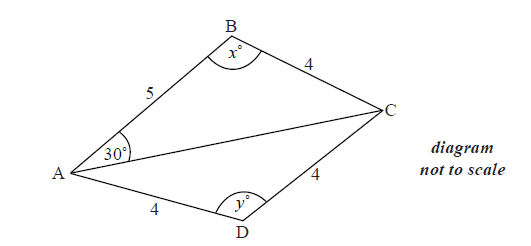
Find  .

**13b.** *[3 marks]*

Find AB.

**14a.** *[1 mark]*

The diagram below shows a quadrilateral ABCD with obtuse angles  and .



AB = 5 cm, BC = 4 cm, CD = 4 cm, AD = 4 cm ,  ,  ,  .

Use the cosine rule to show that  .

**14b.** *[2 marks]*

Use the sine rule in triangle ABC to find another expression for AC.

**14c.** *[6 marks]*

(i) Hence, find *x*, giving your answer to two decimal places.

(ii) Find AC .

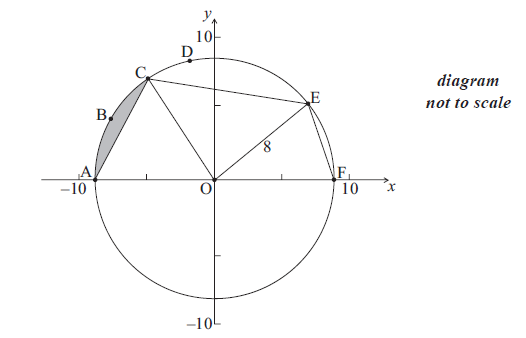
**14d.** *[5 marks]*

(i) Find *y*.

(ii) Hence, or otherwise, find the area of triangle ACD.

**15a.** *[2 marks]*

The diagram below shows a circle with centre O and radius 8 cm.



The points A, B, C, D, E and F are on the circle, and [AF] is a diameter. The length of arc ABC is 6 cm.

Find the size of angle AOC .

**15b.** *[6 marks]*

Hence find the area of the shaded region.

**15c.** *[2 marks]*

The area of sector OCDE is .

Find the size of angle COE .

**15d.** *[5 marks]*

Find EF .

**16a.** *[4 marks]*

Consider the triangle ABC, where AB =10 , BC = 7 and  =  .

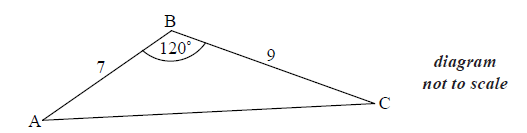
Find the two possible values of  .

**16b.** *[2 marks]*

Hence, find  , given that it is acute.

**17a.** *[3 marks]*

The following diagram shows triangle ABC .



AB = 7 cm, BC = 9 cm and  .

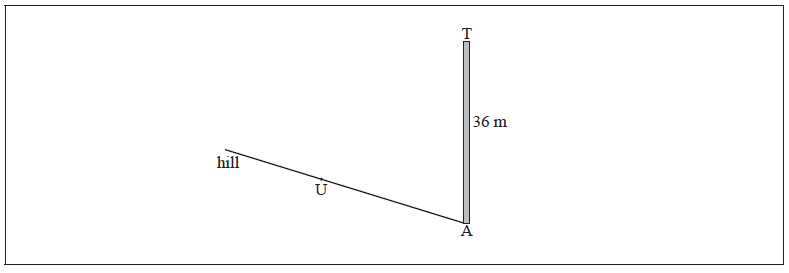
Find AC .

**17b.** *[3 marks]*

Find  .

**18a.** *[3 marks]*

There is a vertical tower TA of height 36 m at the base A of a hill. A straight path goes up the hill from A to a point U. This information is represented by the following diagram.



The path makes a  angle with the horizontal.

The point U on the path is  away from the base of the tower.

The top of the tower is fixed to U by a wire of length .

Complete the diagram, showing clearly all the information above.

**18b.** *[4 marks]*

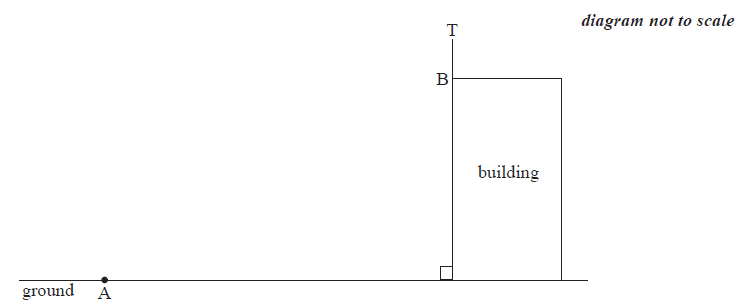
Find *x* .

**19.** *[7 marks]*

The following diagram shows a pole BT 1.6 m tall on the roof of a vertical building.

The angle of depression from T to a point A on the horizontal ground is  .

The angle of elevation of the top of the building from A is  .



Find the height of the building.

Printed for British School of Beijing

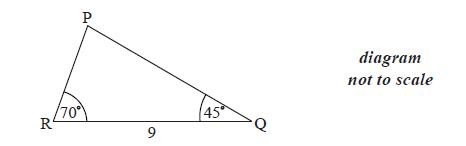
© International Baccalaureate Organization 2015

International Baccalaureate® - Baccalauréat International® - Bachillerato Internacional®

# Chp 9 IB SL maths Qs ms

**1a.** *[1 mark]*

The following diagram shows  , where RQ = 9 cm,  and  .



## Markscheme

***A1 N1***

***[1 mark]***

**1b.** *[3 marks]*

## Markscheme

evidence of choosing sine rule ***(M1)***

correct substitution ***A1***

e.g. 

7.021854078

***A1 N2***

***[3 marks]***

**1c.** *[2 marks]*

## Markscheme

correct substitution  ***(A1)***

e.g. 

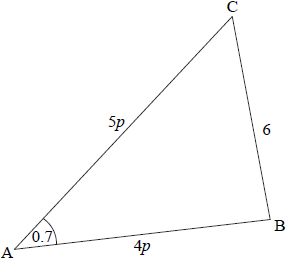


***A1 N2***

***[2 marks]***

**2a.** *[4 marks]*

The following diagram shows a triangle ABC.



 ,  radians ,  ,  , where  .

## Markscheme

(i) evidence of valid approach ***(M1)***

e.g. choosing cosine rule

correct substitution ***(A1)***

e.g. 

simplification ***A1***

e.g. 

***AG N0***

(ii) 

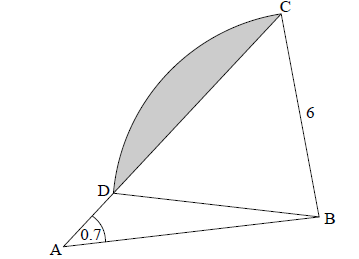
***A1 N1***

**Note**: Award ***A0*** for  , i.e. not rejecting the negative value.

***[4 marks]***

**2b.** *[1 mark]*

Consider the circle with centre B that passes through the point C. The circle cuts the line CA at D, and  is obtuse. Part of the circle is shown in the following diagram.



## Markscheme

***A1 N1***

***[1 mark]***

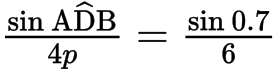
**2c.** *[4 marks]*

## Markscheme

evidence of valid approach ***(M1)***

e.g. choosing sine rule

correct substitution ***A1***

e.g. 

***(A1)***



***A1 N3***

***[4 marks]***

**2d.** *[6 marks]*

## Markscheme

(i) evidence of valid approach ***(M1)***

e.g. recognize isosceles triangle, base angles equal

***A1***

***AG N0***

(ii) area of sector BCD ***(A1)***

e.g. 

area of triangle BCD ***(A1)***

e.g. 

evidence of subtraction ***M1***



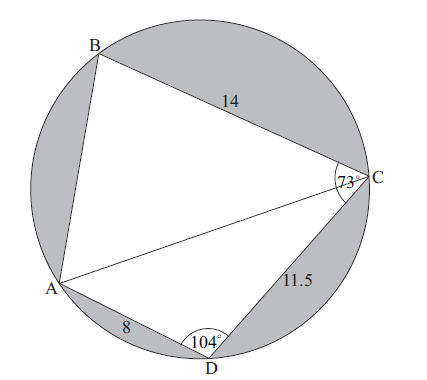


***A1 N3***

***[6 marks]***

**3a.** *[3 marks]*

The diagram shows a circle of radius  metres. The points ABCD lie on the circumference of the circle.



BC =  m, CD =  m, AD =  m,  , and  .

## Markscheme

evidence of choosing cosine rule ***(M1)***

*eg*   , 

correct substitution ***A1***

*eg*   , 

AC  (m) ***A1 N2***

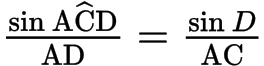
***[3 marks]***

**3b.** *[5 marks]*

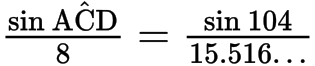
## Markscheme

(i) **METHOD 1**

evidence of choosing sine rule ***(M1)***

*eg*   , 

correct substitution  ***A1***

*eg*  

***A1 N2***

**METHOD 2**

evidence of choosing cosine rule ***(M1)***

*eg*  

correct substitution ***A1***

e.g. 

***A1 N2***

(ii) subtracting **their**  from  ***(M1)***

*eg*   , 

***A1 N2***

***[5 marks]***

**3c.** *[2 marks]*

## Markscheme

correct substitution  ***(A1)***

*eg* area 

area  (m) ***A1 N2***

***[2 marks]***

**3d.** *[6 marks]*

## Markscheme

(c) correct substitution  ***(A1)***

*eg* area 

area  (m) ***A1 N2***

***[2 marks]***

(d) attempt to subtract  ***(M1)***

*eg*   , 

area  ***(A1)***

correct working ***A1***

*eg*   , 

shaded area is  (m) ***A1 N3***

***[4 marks]***

***Total [6 marks]***

**3e.** *[4 marks]*

## Markscheme

attempt to subtract  ***(M1)***

*eg*   , 

area  ***(A1)***

correct working ***A1***

*eg*   , 

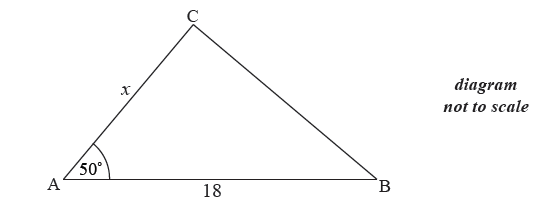
shaded area is  (m) ***A1 N3***

***[4 marks]***

***Total [6 marks]***

**4a.** *[3 marks]*

The following diagram shows a triangle ABC.



The area of triangle ABC is  cm , AB  cm , AC  cm and  .

## Markscheme

correct substitution into area formula ***(A1)***

*eg*  

setting **their** area expression equal to ***(M1)***

*eg*  

***A1 N2***

***[3 marks]***

**4b.** *[3 marks]*

## Markscheme

evidence of choosing cosine rule  ***(M1)***

*eg*  

correct substitution into right hand side (may be in terms of ) ***(A1)***

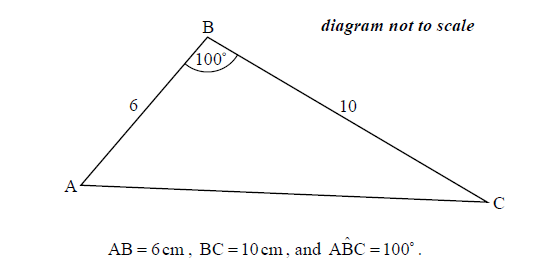
*eg*  

BC ***A1 N2***

***[3 marks]***

**5a.** *[3 marks]*

The following diagram shows triangle ABC.



## Markscheme

evidence of choosing cosine rule ***(M1)***

*eg* 

correct substitution into the right-hand side ***(A1)***

*eg* 



***A1 N2***

***[3 marks]***

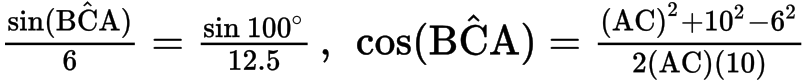
**5b.** *[3 marks]*

## Markscheme

evidence of choosing a valid approach ***(M1)***

*eg* sine rule, cosine rule

correct substitution ***(A1)***

*eg* 



***A1 N2***

***[3 marks]***

**6a.** *[4 marks]*

In triangle ,  and . The area of the triangle is .

## Markscheme

correct substitution into area formula ***(A1)***

*eg* 

correct working ***(A1)***

*eg* 

; 

; ***A1A1 N3***

(accept degrees *ie* ; )

***[4 marks]***

**6b.** *[3 marks]*

## Markscheme

evidence of choosing cosine rule ***(M1)***

*eg* 

correct substitution into RHS (angle must be obtuse) ***(A1)***

*eg* ,



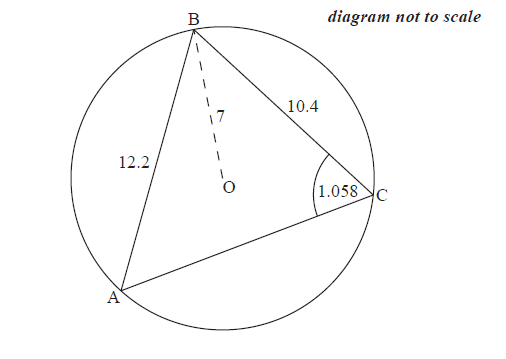


***A1 N2***

***[3 marks]***

**7a.** *[3 marks]*

Consider a circle with centre  and radius  cm. Triangle  is drawn such that its vertices are on the circumference of the circle.



 cm,  cm and  radians.

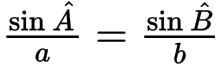
## Markscheme

**Notes:** In this question, there may be slight differences in answers, depending on which values candidates carry through in subsequent parts. Accept answers that are consistent with their working.

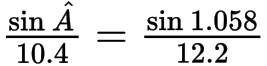
Candidates may have their GDCs in degree mode, leading to incorrect answers. If working shown, award marks in line with the markscheme, with ***FT*** as appropriate.

Ignore missing or incorrect units.

evidence of choosing sine rule ***(M1)***

*eg* 

correct substitution ***(A1)***

*eg* 

***A1 N2***

***[3 marks]***

**7b.** *[5 marks]*

## Markscheme

**Notes:** In this question, there may be slight differences in answers, depending on which values candidates carry through in subsequent parts. Accept answers that are consistent with their working.

Candidates may have their GDCs in degree mode, leading to incorrect answers. If working shown, award marks in line with the markscheme, with ***FT*** as appropriate.

Ignore missing or incorrect units.

**METHOD 1**

evidence of subtracting angles from ***(M1)***

*eg* 

correct angle (seen anywhere) ***A1***



attempt to substitute into cosine or sine rule ***(M1)***

correct substitution ***(A1)***

*eg* 

***A1 N3***

**METHOD 2**

evidence of choosing cosine rule ***M1***

*eg* 

correct substitution ***(A2)***

*eg* 

***A2 N3***

***[5 marks]***

**7c.** *[6 marks]*

## Markscheme

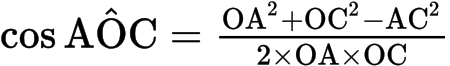
**Notes:** In this question, there may be slight differences in answers, depending on which values candidates carry through in subsequent parts. Accept answers that are consistent with their working.

Candidates may have their GDCs in degree mode, leading to incorrect answers. If working shown, award marks in line with the markscheme, with ***FT*** as appropriate.

Ignore missing or incorrect units.

**METHOD 1**

valid approach ***(M1)***

*eg* , 

correct working ***(A1)***

*eg* 

***(A1)***

**EITHER**

correct substitution for arc length (seen anywhere) ***A1***

*eg* 

subtracting arc from circumference ***(M1)***

*eg* 

**OR**

attempt to find  reflex ***(M1)***

*eg* 

correct substitution for arc length (seen anywhere) ***A1***

*eg* 

**THEN**

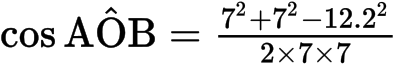
***A1 N4***

**METHOD 2**

valid approach to find  or ***(M1)***

*eg* choosing cos rule, twice angle at circumference

correct working for finding **one** value,  or ***(A1)***

*eg* , 

**two** correct calculations for arc lengths

*eg* ***(A1)(A1)***

adding **their** arc lengths (seen anywhere)

*eg* ***M1***

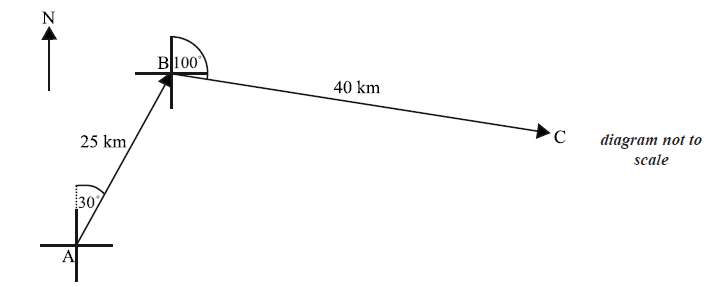
***A1 N4***

**Note:** Candidates may work with other interior triangles using a similar method. Check calculations carefully and award marks in line with markscheme.

***[6 marks]***

**8a.** *[4 marks]*

A ship leaves port A on a bearing of  . It sails a distance of  to point B. At B, the ship changes direction to a bearing of  . It sails a distance of  to reach point C. This information is shown in the diagram below.



A second ship leaves port A and sails directly to C.

## Markscheme

finding  ( radians) ***(A1)***

evidence of choosing cosine rule ***(M1)***

e.g. 

correct substitution ***A1***

e.g. 

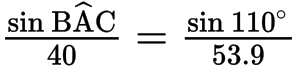
 (km) ***A1***

**8b.** *[3 marks]*

## Markscheme

**METHOD 1**

correct substitution into the sine rule ***A1***

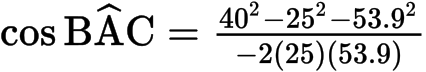
e.g. ***A1***



bearing ***A1 N1***

**METHOD 2**

correct substitution into the cosine rule ***A1***

e.g. ***A1***

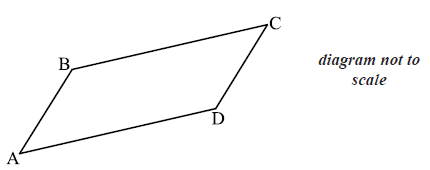


bearing ***A1 N1***

***[3 marks]***

**9a.** *[5 marks]*

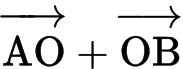
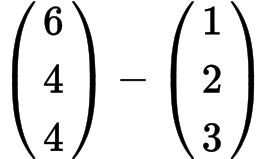
The diagram shows a parallelogram ABCD.



The coordinates of A, B and D are A(1, 2, 3) , B(6, 4,4 ) and D(2, 5, 5) .

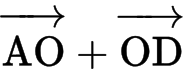
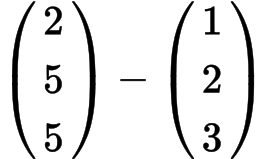
## Markscheme

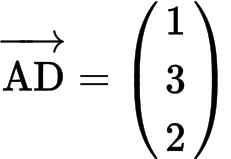
(i) evidence of approach ***M1***

e.g.  ,  , 

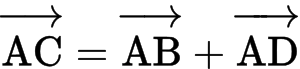
***AG N0***

(ii) evidence of approach ***(M1)***

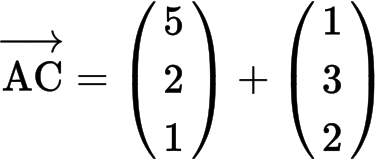
e.g.  ,  , 

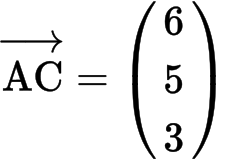
 ***A1 N2***

(iii) evidence of approach ***(M1)***

e.g. 

correct substitution ***A1***

e.g. 

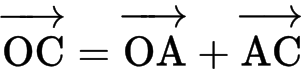
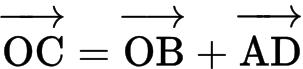
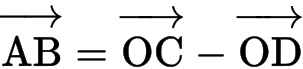
***AG N0***

***[5 marks]***

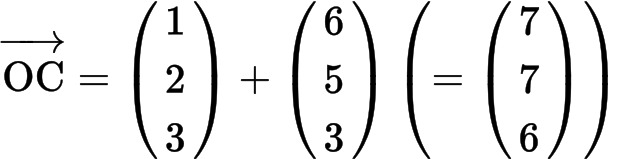
**9b.** *[3 marks]*

## Markscheme

evidence of combining vectors (there are at least 5 ways) ***(M1)***

e.g.  , , 

correct substitution ***A1***



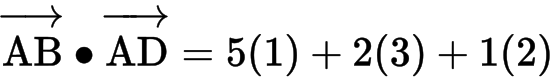
e.g. coordinates of C are ***A1 N1***

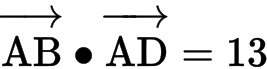
***[3 marks]***

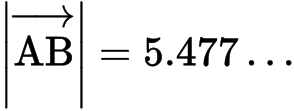
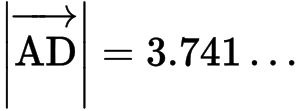
**9c.** *[7 marks]*

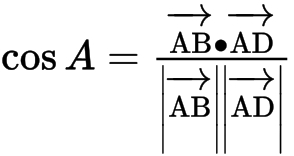
## Markscheme

(i) evidence of using scalar product on  and ***(M1)***

e.g. 

***A1 N2***

(ii)  , ***(A1)(A1)***

evidence of using ***(M1)***

correct substitution ***A1***

e.g. 

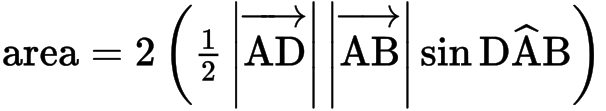
***A1 N3***

***[7 marks]***

**9d.** *[3 marks]*

## Markscheme

**METHOD 1**

evidence of using  ***(M1)***

correct substitution ***A1***

e.g. 

***A1 N2***

**METHOD 2**

evidence of using ***(M1)***

finding height of parallelogram ***A1***

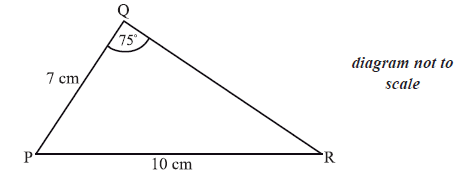
e.g.  , 

***A1 N2***

***[3 marks]***

**10a.** *[3 marks]*

The diagram below shows triangle PQR. The length of [PQ] is 7 cm , the length of [PR] is 10 cm , and  is  .



## Markscheme

choosing sine rule ***(M1)***

correct substitution ***A1***



***A1 N2***

***[3 marks]***

**10b.** *[3 marks]*

## Markscheme



***(A1)***

substitution into any correct formula ***A1***

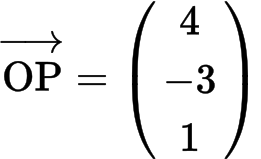
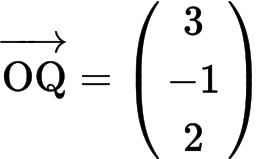
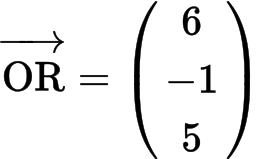
e.g. 

 (cm) ***A1 N2***

***[3 marks]***

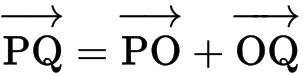
**11a.** *[3 marks]*

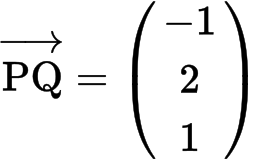
The vertices of the triangle PQR are defined by the position vectors

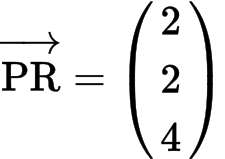
 ,  and  .

## Markscheme

(i) evidence of approach ***(M1)***

e.g.  , 

***A1 N2***

(ii) ***A1 N1***

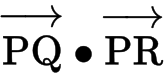
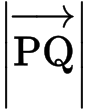
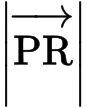
***[3 marks]***

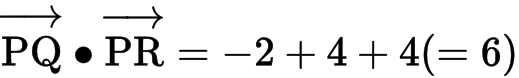
**11b.** *[7 marks]*

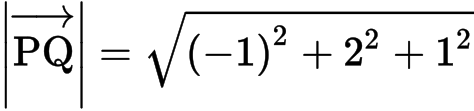
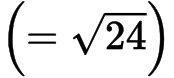
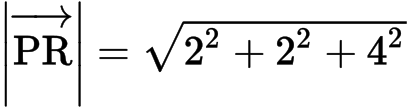
## Markscheme

**METHOD 1**

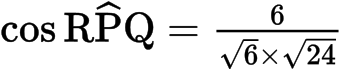
choosing correct vectors  and ***(A1)(A1)***

finding  ,  , ***(A1) (A1)(A1)***

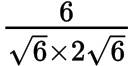


 , 

substituting into formula for angle between two vectors ***M1***

e.g. 

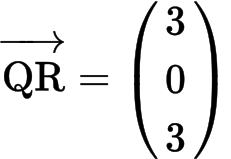
simplifying to expression clearly leading to ***A1***

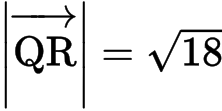
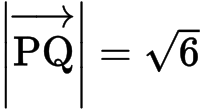
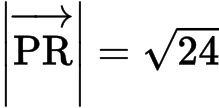
e.g.  ,  , 

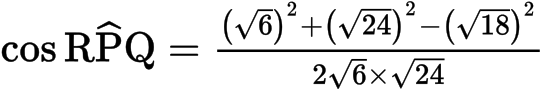
  ***AG N0***

**METHOD 2**

evidence of choosing cosine rule (seen anywhere) ***(M1)***

***A1***

 ,  and ***(A1)(A1)(A1)***

***A1***

***A1***

 ***AG N0***

***[7 marks]***

**11c.** *[6 marks]*

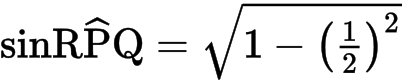
## Markscheme

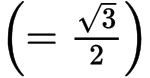
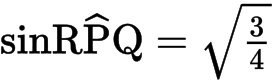
(i) **METHOD 1**

evidence of appropriate approach ***(M1)***

e.g. using  , diagram

substituting correctly ***(A1)***

e.g. 

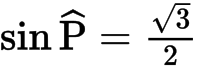
***A1 N3***

**METHOD 2**

since  , ***(A1)***

evidence of approach

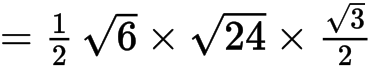
e.g. drawing a right triangle, finding the missing side ***(A1)***

***A1 N3***

(ii) evidence of appropriate approach  ***(M1)***

e.g. attempt to substitute into 

correct substitution

e.g. area ***A1***

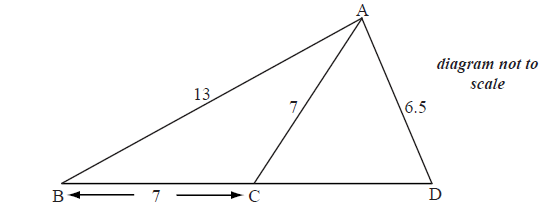
area  ***A1 N2***

***[6 marks]***

**12a.** *[3 marks]*

The diagram below shows a triangle ABD with AB =13 cm and AD = 6.5 cm.

Let C be a point on the line BD such that BC = AC = 7 cm.

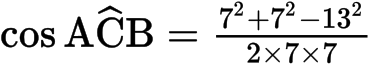


## Markscheme

**METHOD 1**

evidence of choosing the cosine formula ***(M1)***

correct substitution ***A1***

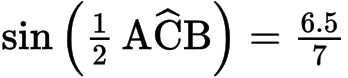
e.g. 

 radians ***A1 N2***

**METHOD 2**

evidence of **appropriate** approach involving right-angled triangles ***(M1)***

correct substitution ***A1***

e.g. 

 radians ***A1 N2***

***[3 marks]***

**12b.** *[5 marks]*

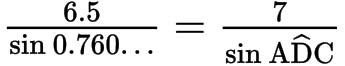
## Markscheme

**METHOD 1**

 ***(A1)***

evidence of choosing the sine rule in triangle ACD ***(M1)***

correct substitution ***A1***

e.g. 

***A1***



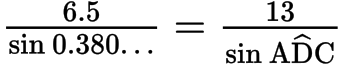
***A1 N3***

**METHOD 2**

 ***(A1)***

evidence of choosing the sine rule in triangle ABD ***(M1)***

correct substitution ***A1***

e.g. 

***A1***



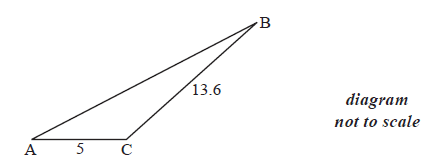
***A1 N3***

**Note**: Two triangles are possible with the given information. If candidate finds  leading to  , award marks as per markscheme.

***[5 marks]***

**13a.** *[4 marks]*

The following diagram shows the triangle ABC.



The angle at C is obtuse, ,  and the area is  .

## Markscheme

correct substitution into the formula for the area of a triangle ***A1***

e.g.  , 

attempt to solve ***(M1)***

e.g.  , 

() ***(A1)***

***A1 N3***

***[4 marks]***

**13b.** *[3 marks]*

## Markscheme

evidence of choosing the cosine rule  ***(M1)***

correct substitution ***A1***

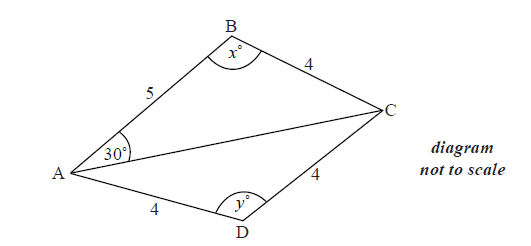
e.g. 

***A1 N2***

***[3 marks]***

**14a.** *[1 mark]*

The diagram below shows a quadrilateral ABCD with obtuse angles  and .



AB = 5 cm, BC = 4 cm, CD = 4 cm, AD = 4 cm ,  ,  ,  .

## Markscheme

correct substitution ***A1***

e.g.  , 

***AG***

***[1 mark]***

**14b.** *[2 marks]*

## Markscheme

correct substitution ***A1***

e.g.  , 

 (accept ) ***A1 N1***

***[2 marks]***

**14c.** *[6 marks]*

## Markscheme

(i) evidence of appropriate approach using AC  ***M1***

e.g.  , sketch showing intersection

correct solution , ***(A1)***

obtuse value ***(A1)***

 to 2 dp (do **not** accept the radian answer 1.94 ) ***A1 N2***

(ii) substituting value of *x* into either expression for AC ***(M1)***

e.g. 

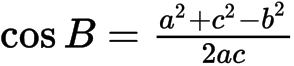
***A1 N2***

***[6 marks]***

**14d.** *[5 marks]*

## Markscheme

(i) evidence of choosing cosine rule ***(M1)***

e.g. 

correct substitution ***A1***

e.g.  ,  , 

***A1 N2***

(ii) correct substitution into area formula ***(A1)***

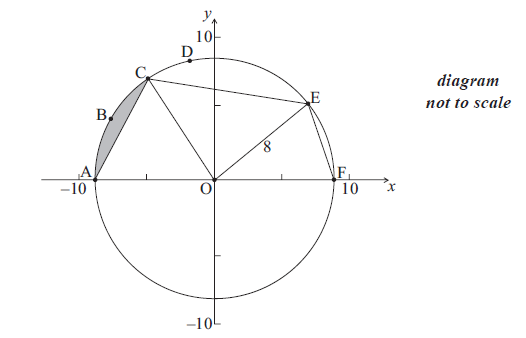
e.g.  , 

area ***A1 N2***

***[5 marks]***

**15a.** *[2 marks]*

The diagram below shows a circle with centre O and radius 8 cm.



The points A, B, C, D, E and F are on the circle, and [AF] is a diameter. The length of arc ABC is 6 cm.

## Markscheme

appropriate approach  ***(M1)***

e.g. 

***A1 N2***

***[2 marks]***

**15b.** *[6 marks]*

## Markscheme

evidence of substitution into formula for area of triangle ***(M1)***

e.g. 

area ***(A1)***

evidence of substitution into formula for area of sector ***(M1)***

e.g. 

area of sector  ***(A1)***

evidence of substituting areas ***(M1)***

e.g. , 

area of shaded region ***A1 N4***

***[6 marks]***

**15c.** *[2 marks]*

## Markscheme

attempt to set up an equation for area of sector ***(M1)***

e.g. 

 (1.41 to 3 sf) ***A1 N2***

***[2 marks]***

**15d.** *[5 marks]*

## Markscheme

**METHOD 1**

attempting to find angle EOF  ***(M1)***

e.g. 

 (seen anywhere) ***A1***

evidence of choosing cosine rule ***(M1)***

correct substitution ***A1***

e.g. 

EF ***A1 N3***

**METHOD 2**

attempting to find angles that are needed ***(M1)***

e.g. angle EOF and angle OEF

**and** ***A1***

evidence of choosing sine rule ***(M1)***

correct substitution  ***(A1)***

e.g. 

EF ***A1 N3***

**METHOD 3**

attempting to find angle EOF ***(M1)***

e.g. 

 (seen anywhere) ***A1***

evidence of using half of triangle EOF  ***(M1)***

e.g. 

correct calculation ***A1***

e.g. 

EF ***A1 N3***

***[5 marks]***

**16a.** *[4 marks]*

Consider the triangle ABC, where AB =10 , BC = 7 and  =  .

## Markscheme

**Note**: accept answers given in degrees, and minutes.

evidence of choosing sine rule ***(M1)***

e.g. 

correct substitution ***A1***

e.g.  , 

 , ***A1A1 N1N1***

**Note**: If candidates only find the acute angle in part (a), award no marks for (b).

***[4 marks]***

**16b.** *[2 marks]*

## Markscheme

attempt to substitute their larger value into angle sum of triangle ***(M1)***

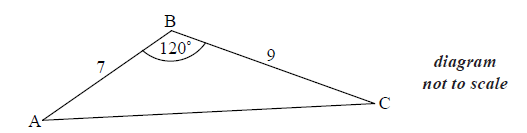
e.g. 

***A1 N2***

***[2 marks]***

**17a.** *[3 marks]*

The following diagram shows triangle ABC .



AB = 7 cm, BC = 9 cm and  .

## Markscheme

evidence of choosing cosine rule ***(M1)***

e.g. 

correct substitution ***A1***

e.g. 

***A1 N2***

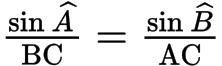
***[3 marks]***

**17b.** *[3 marks]*

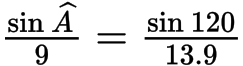
## Markscheme

**METHOD 1**

evidence of choosing sine rule ***(M1)***

e.g. 

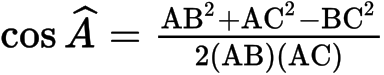
correct substitution  ***A1***

e.g. 

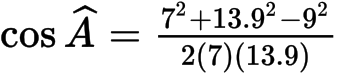
***A1 N2***

**METHOD 2**

evidence of choosing cosine rule ***(M1)***

e.g. 

correct substitution ***A1***

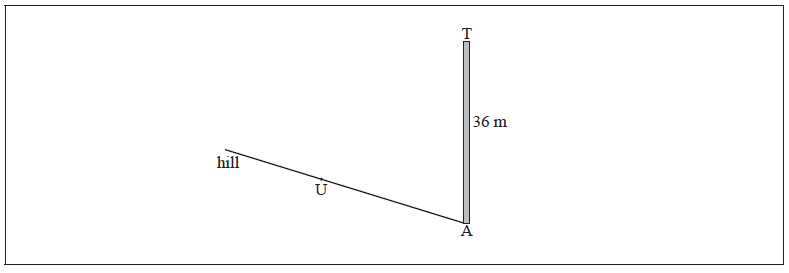
e.g. 

***A1 N2***

***[3 marks]***

**18a.** *[3 marks]*

There is a vertical tower TA of height 36 m at the base A of a hill. A straight path goes up the hill from A to a point U. This information is represented by the following diagram.

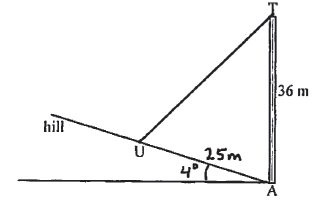


The path makes a  angle with the horizontal.

The point U on the path is  away from the base of the tower.

The top of the tower is fixed to U by a wire of length .

## Markscheme

 ***A1A1A1 N3***

**Note**: Award ***A1*** for labelling  with horizontal, ***A1*** for labelling [AU] 25 metres, ***A1*** for drawing [TU].

***[3 marks]***

**18b.** *[4 marks]*

## Markscheme

***(A1)***

evidence of choosing cosine rule  ***(M1)***

correct substitution ***A1***

e.g. 

***A1 N3***

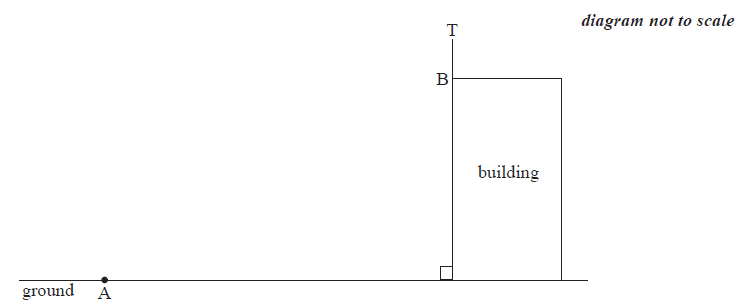
***[4 marks]***

**19.** *[7 marks]*

The following diagram shows a pole BT 1.6 m tall on the roof of a vertical building.

The angle of depression from T to a point A on the horizontal ground is  .

The angle of elevation of the top of the building from A is  .



## Markscheme

**METHOD 1**

appropriate approach  ***M1***

e.g. completed diagram

attempt at set up ***A1***

e.g. correct placement of one angle

 , ***A1A1***

attempt to set up equation ***M1***

e.g. isolate *x*

correct equation ***A1***

e.g. 

***A1 N3***

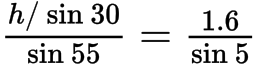
**METHOD 2**

***A1***

in triangle ATB,  , ***A1A1***

choosing sine rule ***M1***

correct substitution

e.g. ***A1***

***A1***

***A1 N3***

***[7 marks]***

Printed for British School of Beijing

© International Baccalaureate Organization 2015

International Baccalaureate® - Baccalauréat International® - Bachillerato Internacional®