Further Pure Maths: Radians and Trigonometry: 30-minute Pack

EDEXCEL 4PM1 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

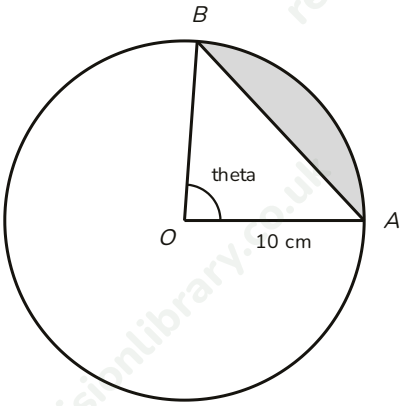
Show your working. Use radians or degrees as stated in each question. Give exact answers unless a degree of accuracy is specified. Questions marked non-calculator should be attempted without a calculator. Accept equivalent exact forms and valid alternative methods for the corresponding marks.

1 Angles a and b are acute. Given sin(a) = 5/13 and cos(b) = 8/17, find the exact values of sin(a + b) and cos(a - b). Show your working.

(Total for Question 1 is 5 marks)

© Revision Library | revisionlibrary.co.uk

2 A minor sector OAB has radius 10 cm and perimeter 35 cm, including OA, OB and the minor arc AB. A straight chord joins A to B. Find the angle AOB in radians, the area of the minor segment between the chord and the arc to 3 significant figures, and the length of chord AB to 3 significant figures.



(Total for Question 2 is 6 marks)

---

3 Starting with the compound-angle formula for sin(x + x), solve sin(2*x) = cos(x) for $0 \leq x < 2*\pi$. Give all solutions exactly in radians and show how you avoid losing any solutions.

(Total for Question 3 is 5 marks)

© Revision Library | revisionlibrary.co.uk

4 An arc of a circle of radius 9 cm subtends an angle of 1.4 radians at the centre. Calculate the length of the arc.

(Total for Question 4 is 2 marks)

---

5 The perimeter of a sector is 28 cm. Its radius is 7 cm. Find its angle at the centre in radians and its area.

(Total for Question 5 is 3 marks)

© Revision Library | revisionlibrary.co.uk

Mark scheme · Further Pure Maths: Radians and Trigonometry: 30-minute Pack

Question 1

Obtain cos(a) = 12/13 and sin(b) = 15/17, using positivity for acute angles.	**B1**
Use sin(a+b) = sin(a)*cos(b) + cos(a)*sin(b).	**M1**
sin(a+b) = 220/221; accept equivalent exact forms.	**A1**
Use cos(a-b) = cos(a)*cos(b) + sin(a)*sin(b).	**M1**
cos(a-b) = 171/221; accept equivalent exact forms.	**A1**

Answer: sin(a + b) = 220/221; cos(a - b) = 171/221

Question 2

Subtract the two radii to obtain arc length 15 cm.	**M1**
Angle AOB = 15/10 = 1.5 radians.	**A1**
Calculate sector area (1/2)*100*1.5 and triangle area (1/2)*100*sin(1.5), using radians.	**M1**
Subtract triangle from sector: segment area = 25.1 cm^2 to 3 significant figures.	**A1**
Use chord = 2*10*sin(1.5/2), or cosine rule in triangle OAB.	**M1**
Chord AB = 13.6 cm to 3 significant figures.	**A1**

Answer: 1.5 radians; 25.1 cm^2; 13.6 cm

Question 3

Derive sin(2*x) = 2*sin(x)*cos(x) from the compound-angle formula.	**M1**
Rearrange and factor to cos(x)*(2*sin(x) - 1) = 0; alternatively separately consider cos(x)=0 before dividing.	**M1**
π/2 and 3*π/2 from cos(x) = 0.	**A1**
π/6 and 5*π/6 from sin(x) = 1/2.	**A1**
Give precisely the four solutions and explain that the cos(x)=0 cases must be kept when dividing by cos(x), or are retained by the zero-product method.	**A1**

Answer: x = π/6, π/2, 5*π/6, 3*π/2

Question 4

Use s = r*θ with θ in radians.	**M1**
12.6 cm; accept equivalent forms.	**A1**

Answer: 12.6 cm

Question 5

Subtract both radii to obtain arc length 14 cm.	**M1**
Angle = 2 radians.	**A1**
Area = 49 cm^2; accept equivalent forms.	**A1**

Answer: 2 radians; 49 cm^2

© Revision Library | revisionlibrary.co.uk