BECA / Huson / 12.1 IB Math SL Name:
11 March 2019

6-5 Problem Set: Trig Unit Circle Practice (first part without calculator)

1a. Let $f(x) = \cos 2x$ and $g(x) = 2x^2 - 1$.

Find $f\left(\frac{\pi}{2}\right)$. *[2 marks]*

1b. Find $(g \circ f)\left(\frac{\pi}{2}\right)$. *[2 marks]*

1c. Given that $(g \circ f)(x)$ can be written as $\cos(kx)$, find the value of *k*, $k \in \mathbb{Z}$. *[3 marks]*

2a. Let $p = \sin 40^\circ$ and $q = \cos 110^\circ$. Give your answers to the following in terms of *p* and/or *q*.

Write down an expression for

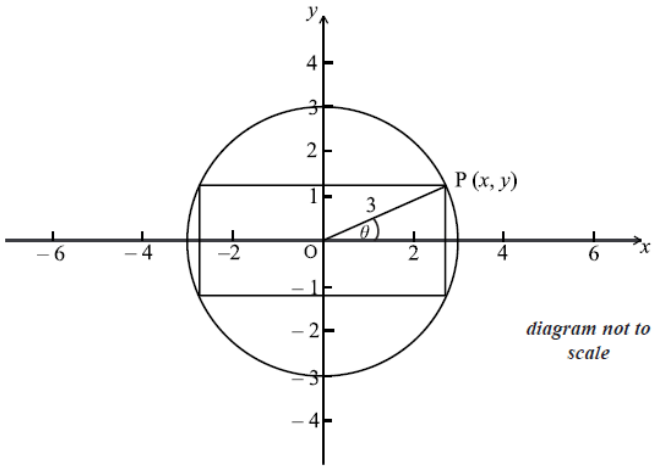
(i) $\sin 140^\circ$;

(ii) $\cos 70^\circ$. *[2 marks]*

2b. Find an expression for $\cos 140^\circ$. *[3 marks]*

2c. Find an expression for $\tan 140^\circ$. *[1 mark]*

3a. A rectangle is inscribed in a circle of radius 3 cm and centre O, as shown below. *[2 marks]*



The point P(*x* , *y*) is a vertex of the rectangle and also lies on the circle. The angle between (OP) and the *x*-axis is θ radians, where $0 \leq \theta \leq \frac{\pi}{2}$. Write down an expression in terms of θ for

(i) x;

(ii) y.

3b. The point P(*x* , *y*) is a vertex of the rectangle and also lies on the circle. The angle between (OP) and the *x*-axis is θ radians, where $0 \leq \theta \leq \frac{\pi}{2}$. Let the area of the rectangle be *A*.

Show that $A = 18 \sin 2\theta$. *[3 marks]*

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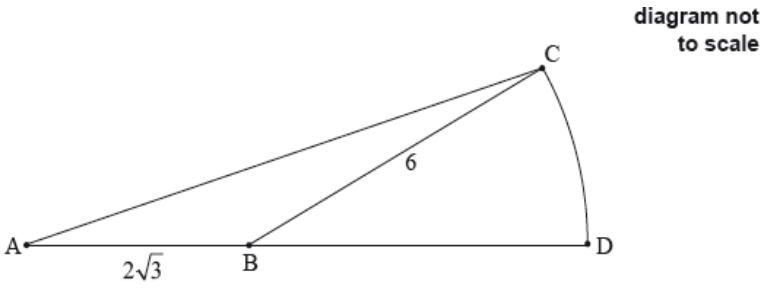
4a. The following diagram shows a triangle ABC and a sector BDC of a circle with centre B and radius 6 cm. The points A , B and D are on the same line.



$\mathrm{AB} = 2\sqrt{3}$ cm, $\mathrm{BC} = 6$ cm, area of triangle $\mathrm{ABC} = 3\sqrt{3}$ cm^2, $\mathrm{A\hat{B}C}$ is obtuse.

Find $\mathrm{A\hat{B}C}$. *[5 marks]*

4b. Find the exact area of the sector BDC. *[3 marks]*

Calculator section

5a. Consider the following circle with centre O and radius 6.8 cm.

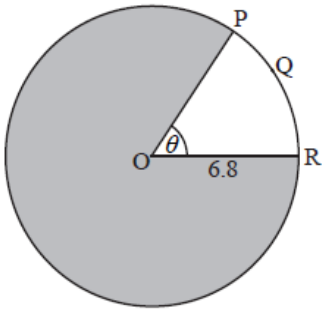


diagram not to scale

The length of the arc PQR is 8.5 cm.

Find the value of θ. *[2 marks]*

5b. Find the area of the shaded region. *[4 marks]*

6a. The diagram below shows a circle centre O, with radius *r*. The length of arc ABC is 3π cm and $\text{A}\widehat{\text{O}}\text{C} = \frac{2\pi}{9}$.

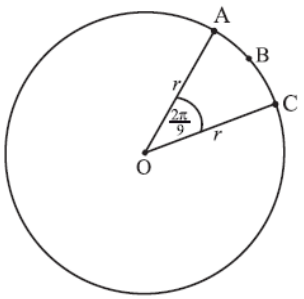


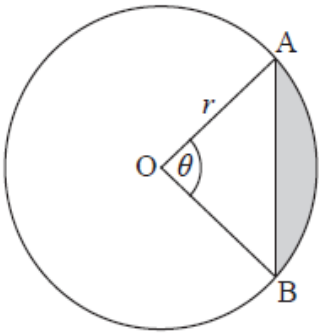
diagram not to scale

Find the value of *r*. *[2 marks]*

6b. Find the perimeter of sector OABC. *[2 marks]*

6c. Find the area of sector OABC. *[2 marks]*

7a. A circle centre O and radius r is shown below. The chord [AB] divides the area of the circle into two parts. Angle AOB is θ.



Find an expression for the area of the shaded region. *[3 marks]*

7b. The chord [AB] divides the area of the circle in the ratio 1:7. Find the value of θ. *[5 marks]*