

IB SL Review Questions

1. Solve the equation $3 \cos x = 5 \sin x$, for x in the interval $0^\circ \leq x \leq 360^\circ$, giving your answers to the nearest degree.

(Total 4 marks)

2. Given that $\sin \theta = \frac{1}{2}$, $\cos \theta = -\frac{\sqrt{3}}{2}$ and $0^\circ < \theta < 360^\circ$,

- (a) find the value of θ ;
(b) write down the **exact** value of $\tan \theta$.

(Total 4 marks)

3. (a) Express $2 \cos^2 x + \sin x$ in terms of $\sin x$ only.
(b) Solve the equation $2 \cos^2 x + \sin x = 2$ for x in the interval $0 \leq x \leq \pi$, giving your answers exactly.

(Total 4 marks)

4. Given that $\sin x = \frac{1}{3}$, where x is an acute angle, find the **exact** value of

- (a) $\cos x$;
(b) $\cos 2x$.

(Total 6 marks)

5. The depth, y metres, of sea water in a bay t hours after midnight may be represented by the function

$$y = a + b \cos\left(\frac{2\pi}{k}t\right), \text{ where } a, b \text{ and } k \text{ are constants.}$$

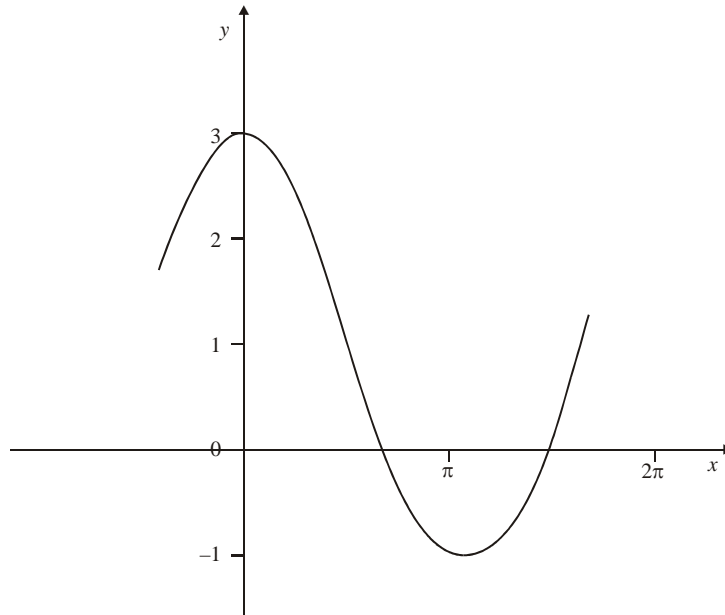
The water is at a maximum depth of 14.3 m at midnight and noon, and is at a minimum depth of 10.3 m at 06:00 and at 18:00.

Write down the value of

- (a) a ;
(b) b ;
(c) k .

(Total 4 marks)

6. Part of the graph of $y = p + q \cos x$ is shown below. The graph passes through the points $(0, 3)$ and $(\pi, -1)$.



Find the value of

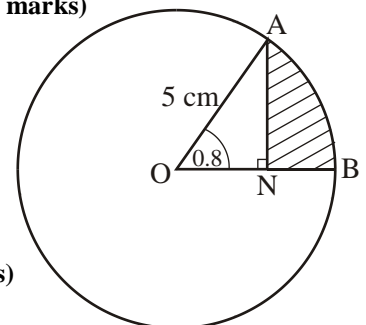
- (a) p ;
 (b) q .

7. Find all solutions of the equation $\cos 3x = \cos(0.5x)$, for $0 \leq x \leq \pi$.

(Total 6 marks)

8. The diagram below shows a circle of radius 5 cm with centre O. Points A and B are on the circle, and \widehat{AOB} is 0.8 radians. The point N is on [OB] such that [AN] is perpendicular to [OB].

(Total 6 marks)



Find the area of the shaded region.

(Total 6 marks)

9. The diagram below shows a triangle and two arcs of circles.

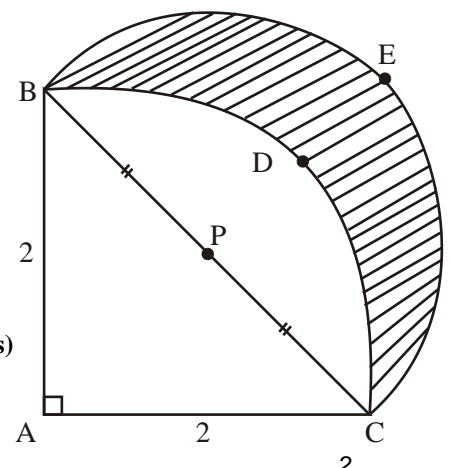
The triangle ABC is a right-angled isosceles triangle, with $AB = AC = 2$. The point P is the midpoint of [BC].

The arc BDC is part of a circle with centre A.

The arc BEC is part of a circle with centre P.

- (a) Calculate the area of the segment BDCP.
 (b) Calculate the area of the shaded region BECD.

(Total 6 marks)



10. The depth y metres of water in a harbour is given by the equation

$$y = 10 + 4\sin\left(\frac{t}{2}\right),$$

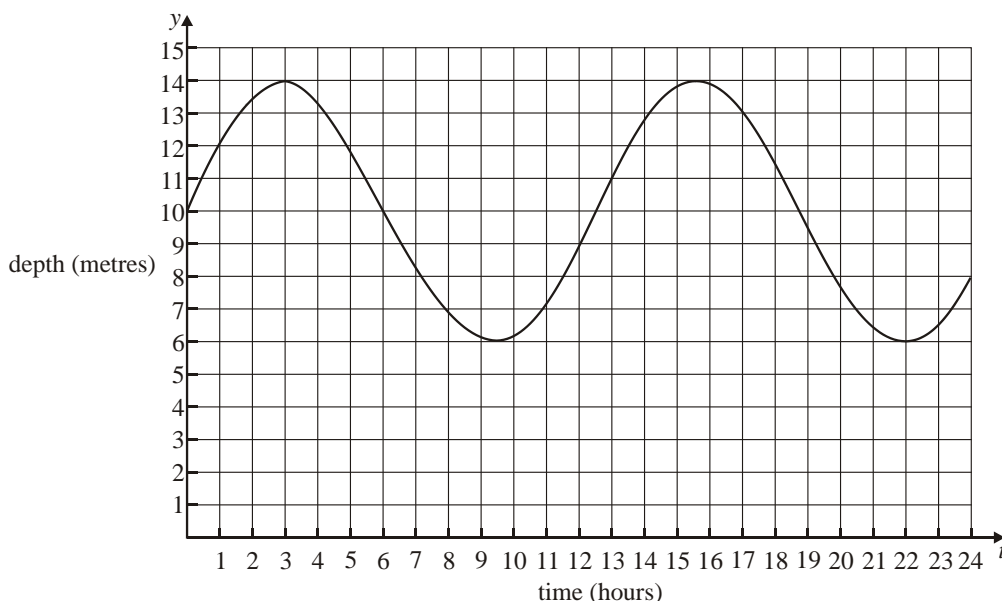
where t is the number of hours after midnight.

- (a) Calculate the depth of the water

- (i) when $t = 2$;
(ii) at 2100.

(3)

The sketch below shows the depth y , of water, at time t , during one day (24 hours).



- (b) (i) Write down the maximum depth of water in the harbour.
(ii) Calculate the value of t when the water is first at its maximum depth during the day.

(3)

The harbour gates are closed when the depth of the water is less than seven metres. An alarm rings when the gates are opened or closed.

- (c) (i) How many times does the alarm sound during the day?
(ii) Find the value of t when the alarm sounds first.
(iii) Use the graph to find the length of time during the day when the harbour gates are closed. Give your answer in hours, to the nearest hour.

(7)

(Total 13 marks)

Name _____

IB Math SL 1 Trig Graphing Quiz – No calculator section. Write in pen.

1. Evaluate.

- (a) $\sin 270^\circ$ (b) $\cos^2 \frac{7\pi}{6}$

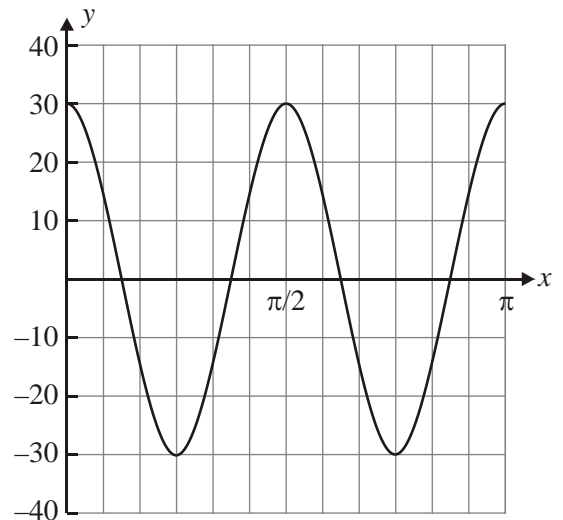
(Total 2 marks)

2. Solve $\sin \theta = -\frac{1}{\sqrt{2}}$, given that $0 \leq \theta \leq 2\pi$.

(Total 2 marks)

3. The graph of a function of the form $y = p \cos qx$ is given in the diagram below.

- (a) Write down the value of p .
 (b) Calculate the value of q .

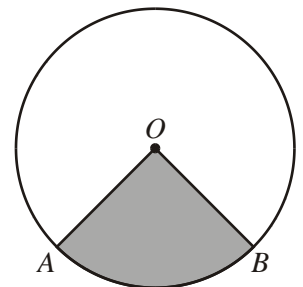


(Total 6 marks)

4. O is the centre of the circle which has a radius of 5.4 cm.

The area of the shaded sector OAB is 21.6 cm^2 . Find the length of the minor arc AB .

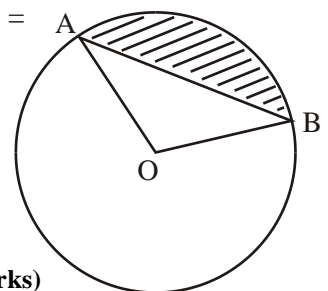
(Total 4 marks)



5. The diagram below shows a circle centre O and radius $OA = 5 \text{ cm}$. The angle $AOB = 135^\circ$.

Find the area of the shaded region.

(Total 6 marks)

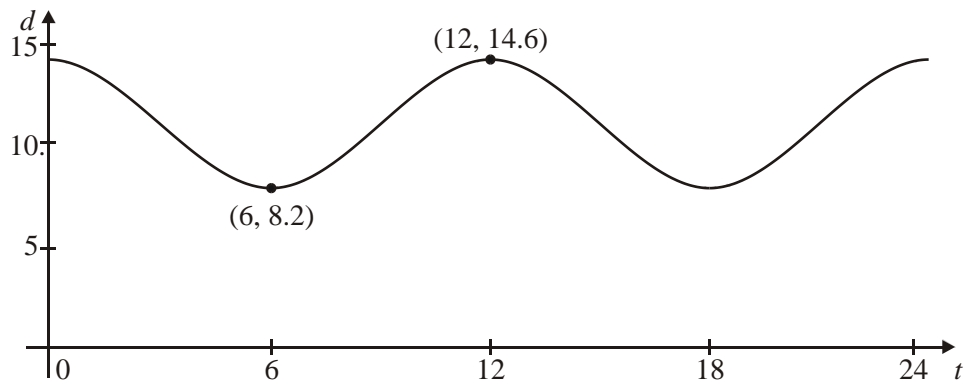


Note: Complete question 6 on attached paper

6. A formula for the depth d metres of water in a harbour at a time t hours after midnight is

$$d = P + Q \cos \left(\frac{\pi}{6} t \right), \quad 0 \leq t \leq 24,$$

where P and Q are positive constants. In the following graph the point $(6, 8.2)$ is a minimum point and the point $(12, 14.6)$ is a maximum point.



- (a) Find the value of
- (i) Q ;
 - (ii) P .
- (3)
- (b) Find the **first** time in the 24-hour period when the depth of the water is 10 metres. (3)
- (c) (i) Find the **next** time when the depth of the water is 10 metres.
- (ii) Find the time intervals in the 24-hour period during which the water is less than 10 metres deep.
- (4)
- (Total 10 marks)**

Write all working, answers and/or explanations on the lined spaces provided. Answers should be exact or to 3 significant figures.

1. Consider $g(x) = \sqrt{2} \sin\left(\frac{1}{2}x\right) - 1$; where $0 \leq x \leq 4\pi$.

- (a) Write down the period of $g(x)$.
- (b) Write down the range of $g(x)$.
- (c) Solve for $g(x) = 0$ over the given domain.

(Total 8 marks)

2. The depth, y metres, of sea water in a bay t hours after midnight may be represented by the function

$$y = a + b \cos\left(\frac{2\pi}{k}t\right), \text{ where } a, b \text{ and } k \text{ are constants.}$$

The water is at a maximum depth of 14.3 m at midnight and noon, and is at a minimum depth of 10.3 m at 06:00 and at 18:00.

Write down the value of (a) a ; (b) b ; (c) k .

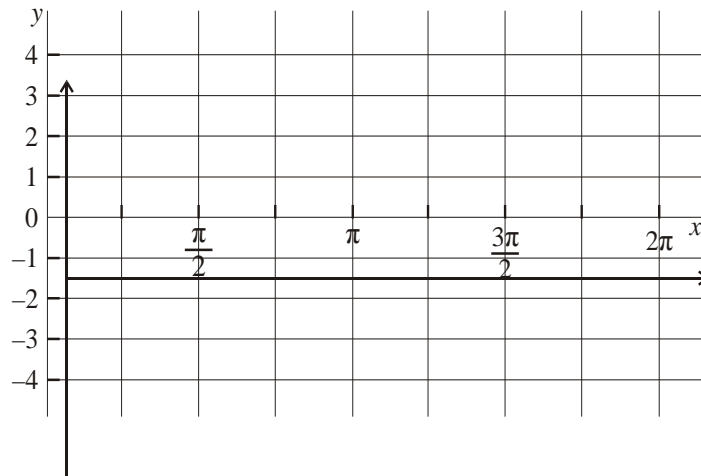
(Total 4 marks)

3. Consider $g(x) = 3 \sin 2x$.

(a) Write down the period of g .

(1)

(b) On the diagram below, sketch the curve of g , for $0 \leq x \leq 2\pi$.



(3)

(c) Write down the number of solutions to the equation $g(x) = 2$, for $0 \leq x \leq 2\pi$.

4. (a) Factorize the expression $3 \sin^2 x - 11 \sin x + 6$.

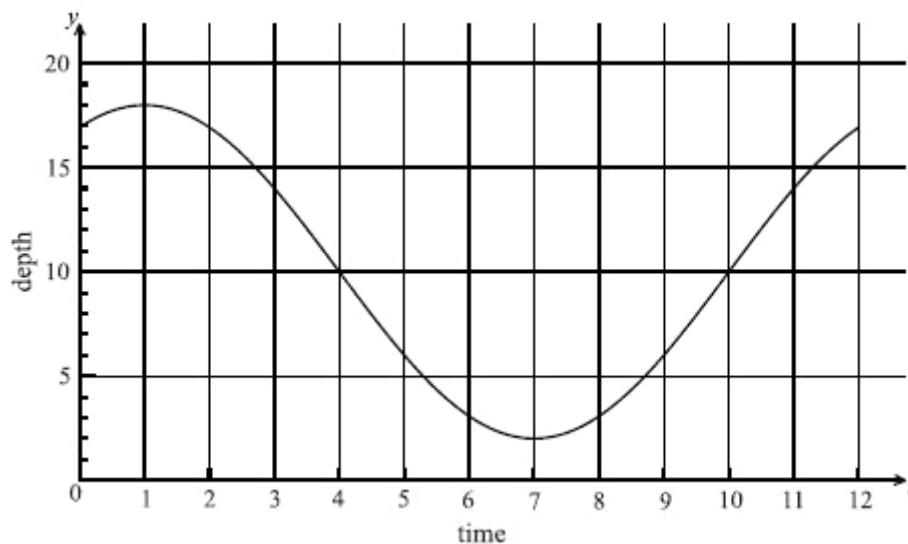
(b) Consider the equation $3 \sin^2 x - 11 \sin x + 6 = 0$.

(i) Find the two values of $\sin x$ which satisfy this equation,

(ii) Solve the equation, for $0^\circ \leq x \leq 180^\circ$.

(Total 6 marks)

5. The following graph shows the depth of water, y metres, at a point P, during one day. The time t is given in hours, from midnight to noon.



(a) Use the graph to write down an estimate of the value of t when

(i) the depth of water is minimum;

(ii) the depth of water is maximum;

(iii) the depth of the water is increasing most rapidly.

(3)

(b) The depth of water can be modelled by the function $y = A \cos(B(t-1)) + C$.

(i) Show that $A = 8$.

(ii) Write down the value of C .

(iii) Find the value of B .

(6)

(c) A sailor knows that he cannot sail past P when the depth of the water is less than 12 m. Calculate the values of t between which he cannot sail past P.

(2)

(Total 11 marks)

Name _____

IB Math SL 1 – Trigonometry Test – No calculator section. Write in pen.

2. Given that $\sin x = \frac{1}{3}$, where x is an acute angle, find the **exact** value of

(a) $\cos x$;

(b) $\cos 2x$.

(Total 6 marks)

3. Consider the trigonometric equation $2 \sin^2 x = 1 + \cos x$.

(a) Write this equation in the form $f(x) = 0$, where $f(x) = a \cos^2 x + b \cos x + c$, and $a, b, c \in \mathbb{Z}$.

(b) Factorize $f(x)$.

(c) Show that $x = 60^\circ$ is one solution for $f(x) = 0$ for $0^\circ \leq x \leq 360^\circ$. Then find all other solutions.

(Total 5 marks)

4. Solve the equation $2 \cos^2 x = \sin 2x$ for $0 \leq x \leq \pi$, giving your answer(s) in terms of π .

(Total 6 marks)

IB Math SL 1 – Trigonometry Test – Calculator section. Write in pen.

5. The following diagram shows a circle of centre O, and radius 15 cm. The arc ACB subtends an angle of 2 radians at the centre O.

Find

(a) the length of the arc ACB;

(b) the area of the shaded region.

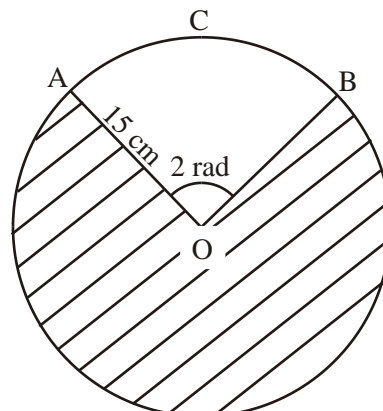


Diagram not to scale

$\hat{A}OB = 2$ radians
 $OA = 15$ cm

(Total 5 marks)

6. Solve the equation $3 \cos x = 5 \sin x$, for x in the interval $0^\circ \leq x \leq 360^\circ$, giving your answer(s) to the nearest degree.

(Total 4 marks)

7. In the following diagram, O is the centre of the circle and (AT) is the tangent to the circle at T.

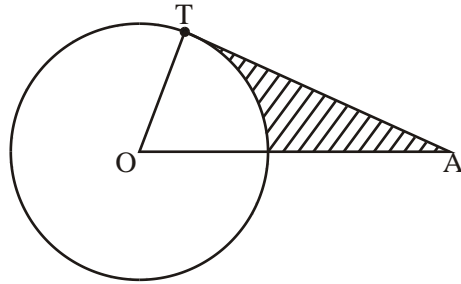


diagram not to scale

If $OA = 12$ cm, and the circle has a radius of 6 cm, find the area of the shaded region.

(Total 6 marks)

8. Find all solutions of the equation $\cos 3x = \cos(0.5x)$, for $0 \leq x \leq \pi$.

(Total 4 marks)