Angle Formulae

Go to the appropriate Past Paper for the answers

2019 Paper 1

15. (a) Solve the equation $\sin 2x° + 6\cos x° = 0$ for $0 \le x < 360$. **4**

(b) Hence solve $\sin 4x° + 6\cos 2x° = 0$ for $0 \le x < 360$. **1**

2019 Paper 1

13. Triangles ABC and ADE are both right angled.

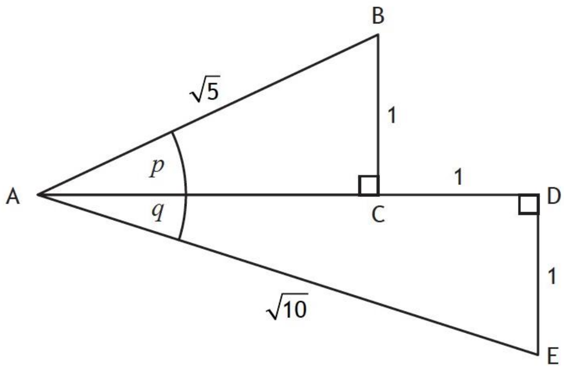
Angles p and q are as shown in the diagram.

(a) Determine the value of

(i) $\cos p$ **1**

(ii) $\cos q$. **1**

(b) Hence determine the value of $\sin(p+q)$. **3**



2018 Paper 2

6. Functions, f and g, are given by $f(x) = 3 + \cos x$ and $g(x) = 2x$, $x \in \mathbb{R}$.

(a) Find expressions for

(i) $f(g(x))$ and **2**

(ii) $g(f(x))$. **1**

(b) Determine the value(s) of x for which $f(g(x)) = g(f(x))$ where $0 \le x < 2\pi$. **6**

2018 Paper 1

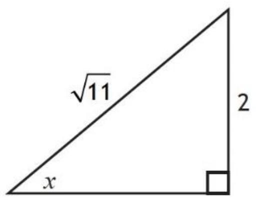
13. The right-angled triangle in the diagram is such that $\sin x = \frac{2}{\sqrt{11}}$ and $0 < x < \frac{\pi}{4}$.

(a) Find the exact value of:

(i) $\sin 2x$ **3**

(ii) $\cos 2x$. **1**

(b) By expressing $\sin 3x$ as $\sin(2x + x)$, find the exact value of $\sin 3x$. **3**



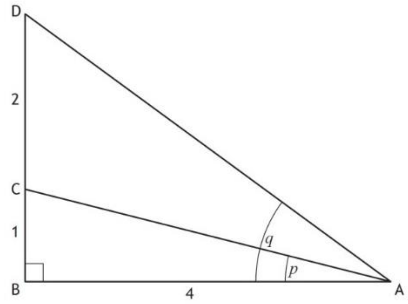
Specimen 5 Paper 2

11. Show that $\frac{\sin 2x}{2\cos x} - \sin x\cos^2 x = \sin^3 x$, where $0 < x < \frac{\pi}{2}$. **3**

Specimen 5 Paper 1

12. Triangle ABD is right-angled at B with angles BAC $= p$ and BAD $= q$ and lengths as shown in the diagram below.

Show that the exact value of $\cos(q - p)$ is $\frac{19\sqrt{17}}{85}$. **5**



Specimen 5 Paper 1

14. (a) Solve $\cos 2x° - 3\cos x° + 2 = 0$ for $0 \leq x < 360$. **5**

(b) Hence solve $\cos 4x° - 3\cos 2x° + 2 = 0$ for $0 \leq x < 360$. **2**

2017 Paper 2

6. Solve $5\sin x - 4 = 2\cos 2x$ for $0 \leq x < 2\pi$. **5**

New 2015 Paper 1

10. Given that $\tan 2x = \frac{3}{4}$, $0 < x < \frac{\pi}{4}$, find the exact value of

(a) $\cos 2x$ **1**

(b) $\cos x$. **2**

Specimen 4 Paper 1

6. (a) Find an equivalent expression for $\sin(x + 60)°$. **1**

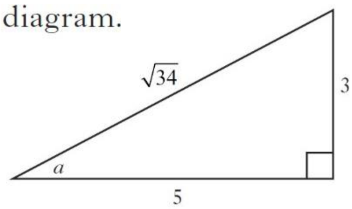
(b) Hence, or otherwise, determine the exact value of $\sin 105°$. **3**

2014 Paper 1

18. What is the value of $1 - 2\sin^2 15°$? **2**

2014 Paper 1

7. A right-angled triangle has sides and angles as shown in the diagram.
What is the value of $\sin 2a$? **2**



2013 Paper 2

8. Solve algebraically the equation **6**

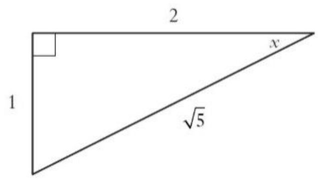
$$\sin 2x = 2\cos^2 x \qquad \text{for } 0 \leq x < 2\pi$$

2013 Paper 1

10. Of 0° < x° < 90°, show that $\cos(270 - a°) = -\sin a°$ **2**

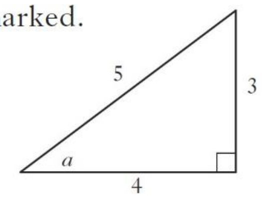
2013 Paper 1

9. The diagram shows a right-angled triangle with sides and angles as marked.
Find the value of $\sin 2x$. **2**



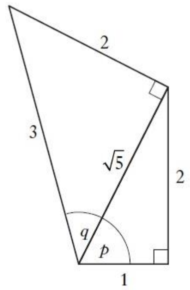
2012 Paper 1

5. The diagram shows a right-angled triangle with sides and angles as marked.
What is the value of $\cos 2a$? **2**



2011 Paper 1

12. The diagram shows two right-angled triangles with sides and angles as given.
What is the value of $\sin(p + q)$? **2**



2011 Paper 1

23. (a) Solve $\cos 2x° - 3\cos x° + 2 = 0$ for $0 \leq x < 360$. **5**

(b) Hence solve $\cos 4x° - 3\cos 2x° + 2 = 0$ for $0 \leq x < 360$. **2**

2010 Paper 2

4. Solve $2\cos 2x - 5\cos x - 4 = 0$ for $0 \le x < 2\pi$. 5

2010 Paper 1

23. (*a*) Diagram 1 shows a right angled triangle, where the line OA has equation $3x - 2y = 0$.

(i) Show that $\tan a = \frac{3}{2}$.

(ii) Find the value of $\sin a$. 4

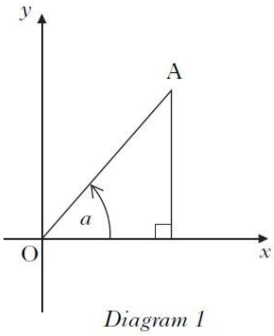


Diagram 1

(*b*) A second right angled triangle is added as shown in Diagram 2.

The line OB has equation $3x - 4y = 0$.

Find the values of $\sin b$ and $\cos b$. 4

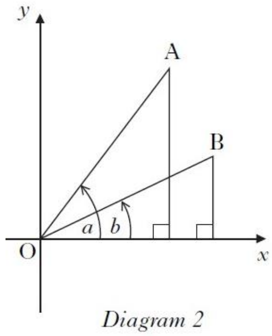


Diagram 2

(*c*) (i) Find the value of $\sin(a - b)$.

(ii) State the value of $\sin(b - a)$. 4

2009 Paper 1

24. (*a*) Using the fact that $\frac{7\pi}{12} = \frac{\pi}{3} + \frac{\pi}{4}$, find the exact value of $\sin\left(\frac{7\pi}{12}\right)$. 3

(*b*) Show that $\sin(A + B) + \sin(A - B) = 2\sin A \cos B$. 2

(*c*) (i) Express $\frac{\pi}{12}$ in terms of $\frac{\pi}{3}$ and $\frac{\pi}{4}$.

(ii) Hence or otherwise find the exact value of $\sin\left(\frac{7\pi}{12}\right) + \sin\left(\frac{\pi}{12}\right)$. 4

2009Paper 1

7. If the exact value of $\cos x$ is $\frac{1}{\sqrt{5}}$, find the exact value of $\cos 2x$. 2

2008 Paper 1

9. Given that $0 \le a \le \frac{\pi}{2}$ and $\sin a = \frac{3}{5}$, find an expression for $\sin(x + a)$. 2

2008 Paper 2

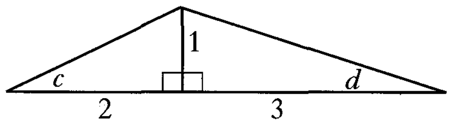
5. Solve the equation $\cos 2x° + 2\sin x° = \sin^2 x°$ in the interval $0 \le x < 360$. 5

2007 Paper 1

6. Solve the equation $\sin 2x° = 6\cos x°$ for $0 \le x \le 360$. **4**

2007 Paper 2

2. The diagram shows two right-angled triangles with angles c and d marked as shown.



(a) Find the exact value of $\sin(c + d)$. **4**

(b) (i) Find the exact value of $\sin 2c$.

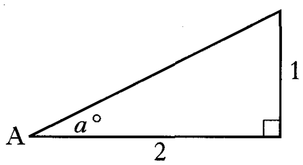
(ii) Show that $\cos 2d$ has the same exact value. **4**

2006 Paper 1

7. Solve the equation $\sin x° - \sin 2x° = 0$ in the interval $0 \le x \le 360$. **4**

2006 Paper 2

8. The diagram shows a right-angled triangle with height 1 unit, base 2 units and an angle of $a°$ at A.



(a) Find the exact values of:

(i) $\sin a°$;

(ii) $\sin 2a°$. **4**

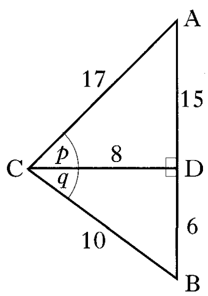
(b) By expressing $\sin 3a°$ as $\sin(2a + a)°$, find the exact value of $\sin 3a°$. **4**

2005 Paper 1

9. If $\cos 2x = \frac{7}{25}$ and $0 < x < \frac{\pi}{2}$, find the exact values of $\cos x$ and $\sin x$. **4**

2005 Paper 2

2. Triangles ACD and BCD are right-angled at D with angles p and q and lengths as shown in the diagram.



(a) Show that the exact value of $\sin(p + q)$ is $\frac{84}{85}$. **4**

(b) Calculate the exact values of:

(i) $\cos(p + q)$; **3**

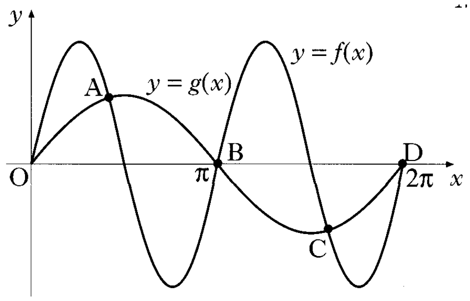
(ii) $\tan(p + q)$.

2005 Paper 2

8. Two functions, f and g, are defined by $f(x) = k\sin 2x$ and $g(x) = \sin x$ where $k > 1$.

The diagram shows the graphs of $y = f(x)$ and $y = g(x)$ intersecting at O, A, B, C and D.

Show that, at A and C, $\cos x = \frac{1}{2k}$.



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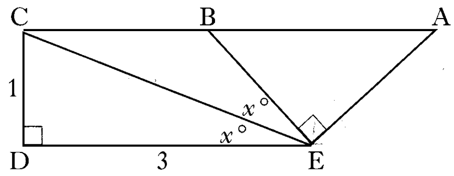
2004 Paper 1

10. In the diagram
angle DEC = angle CEB = $x°$ and
angle CDE = angle BEA = 90°.
CD = 1 unit; DE = 3 units.

By writing angle DEA in terms of $x°$, find the exact value of cos(DÊA).



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