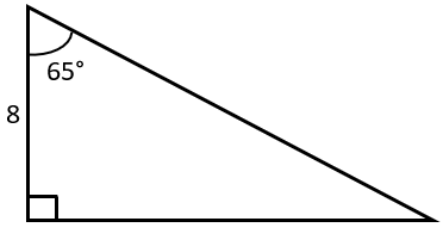
MST124 Unit 4 Tutorial Questions 19_11_24

Section 1: Right-angled triangles

1.

The right-angled triangle drawn below (which is not drawn to scale) has an angle of 65°.
The shorter of the sides adjacent to this angle has length 8.
What is the length, to one decimal place, of the hypotenuse?

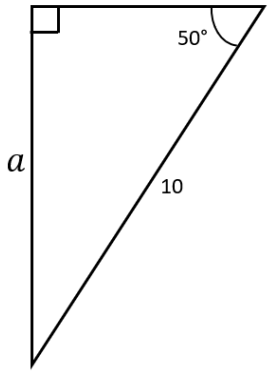


2.

The right-angled triangle drawn below (which is not drawn to scale) has an angle of 50°.

The hypotenuse has length 10.

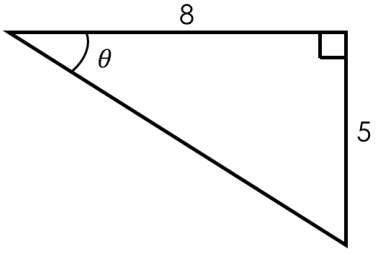
What is the length, to one decimal place, of the side labelled a, opposite to the angle of size 50° in the diagram?



3.

The two shorter sides of the right-angled triangle drawn below (which is not drawn to scale) are 5 and 8 respectively.

What is the size, in radians to 3 decimal places, of the angle $\text{marked } \theta,$ opposite the side of length 5.



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Section 2: Trigonometric functions

4. Find all solutions between 0 and 2π of the equation $\sin\theta = -\frac{1}{\sqrt{2}}$

5. How many values of θ in radians between $-\pi$ and $\frac{\pi}{2}$ satisfy $\sin\theta = 0.3$?

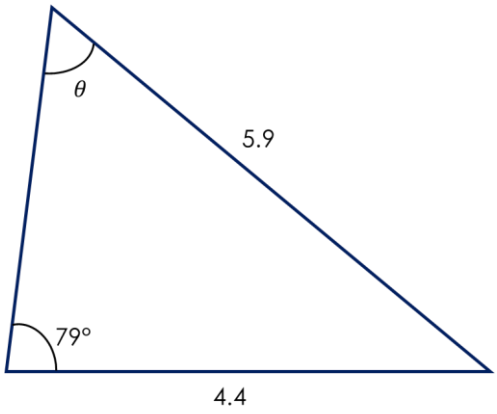
6. How many values of θ in radians between $-\frac{\pi}{2}$ and $\frac{5\pi}{2}$ satisfy $\tan\theta = 0.6$?

7. How many values of θ in radians between -2π and $\frac{3\pi}{2}$ satisfy $\cos\theta = -0.5$?

Section 3: Sine and cosine rules

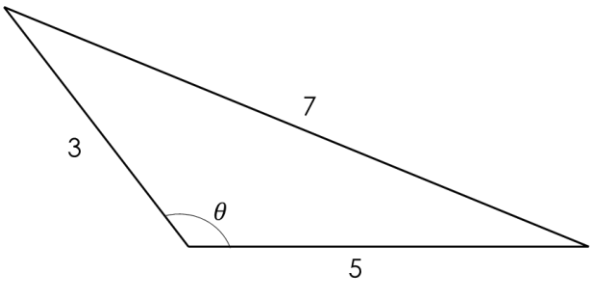
8. The triangle below has sides of lengths 4.4 and 5.9.
The angle opposite the side of length 5.9 is 79°.

What is the size, to the nearest degree, of the angle $\text{marked } \theta,$ opposite the side of length 4.4.



9. The triangle below, which is not drawn to scale, has sides of lengths 3, 5 and 7.

What is the size, to the nearest degree, of the angle $\text{marked } \theta,$ opposite the side of length 7?



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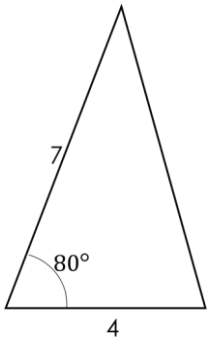
10.

The triangle below, which is not drawn to scale, has two sides of lengths 4 and 7 and the angle between them is 80°.

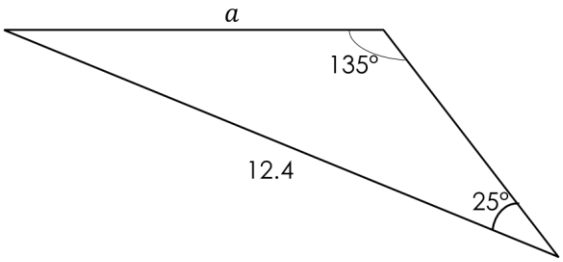
What is the length, to one decimal place, of the third side of the triangle?



11.

The triangle below has angles of size 135° and 25°. The side opposite the angle of size 135° has length 12.4.

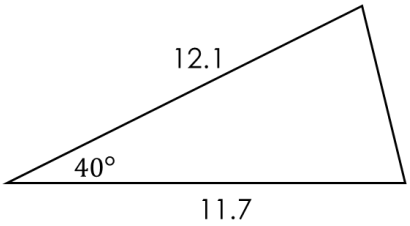
What is the length, to one decimal place, of the side, labelled as a, opposite the angle of size 25°?



12.

The triangle below, which is not drawn to scale, has two sides of lengths 11.7 and 12.1 and the angle between them is 40°.

What is the area of the triangle, to one decimal place?



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Section 4: Further trigonometric identities

13. If $\sin\theta \neq 0$ and $\cos\theta \neq 0$, which of the following is equivalent to $\dfrac{\operatorname{cosec}\theta}{\cot\theta}$?

A $\cos\theta$ **B** $\sin\theta$ **C** $\sec\theta$ **D** $\tan\theta$ **E** $\sec\theta\tan\theta$

14. Which of the following is equivalent to $2\operatorname{cosec}2\theta\cos\theta$?

A $\cot\theta$ **B** $\sin\theta$ **C** $\sec\theta$ **D** $\tan\theta$ **E** $\operatorname{cosec}\theta$

15. Given that $-\pi < \theta < \pi$ such that $\operatorname{cosec}\theta = -\sqrt{2}$ and $\tan\theta = -1$, find the exact value of θ and justify your answer.

16. Given that $\theta \in \left(0, \frac{\pi}{2}\right)$ and $\sin\theta = \frac{2}{5}$, use appropriate trigonometric identities to find:

(i) $\cos(2\theta)$ (ii) $\cos\theta$ (iii) $\sin 2\theta$

17. Use a trigonometric identity to find the exact value of $\cos\frac{\pi}{12}$.

Hence, find the exact value of $\sin\frac{\pi}{24}$.

18. Find all the solutions in the interval [0, 2π] of the equation

$$\sin 3\theta\cos 2\theta - \sin 2\theta\cos 3\theta = 0$$

19. Find all the solutions in the interval (0, π) of the equation $\sqrt{3}\sin 2\theta + 2\sin^2\theta = 1$

20 . (i) By starting with the identity $\sin^2\theta + \cos^2\theta = 1$,

obtain an identity linking $\tan^2\theta$ and $\sec^2\theta$.

(ii) Find all the solutions between 0° and 360° of the equation $\sec^2\theta + \tan\theta = 3$