KIDSLEARN MATH · PRACTICE ASSIGNMENT

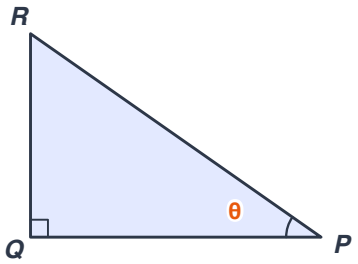
Trigonometry

Name: Date: Score: / 50

SOH-CAH-TOA: $\sin\theta = \frac{\text{opp}}{\text{hyp}}$, $\cos\theta = \frac{\text{adj}}{\text{hyp}}$, $\tan\theta = \frac{\text{opp}}{\text{adj}}$. *Use a calculator in degree mode where needed and round as each question says. Give exact values as fractions or roots. Answers are at the end.*

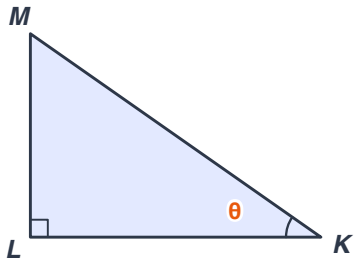
Part A — Warm-up

1. The right angle is at Q. Which side is adjacent to angle θ?



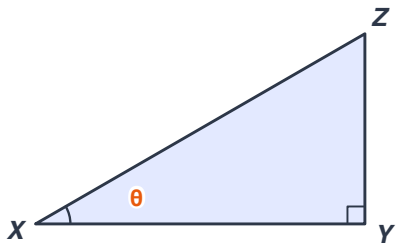
(A) PR (B) PQ (C) QR

2. The right angle is at L. Which side is opposite angle θ?



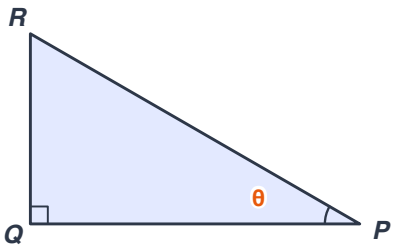
(A) KM (B) LM (C) KL

3. The right angle is at Y. Which fraction equals $\sin\theta$?



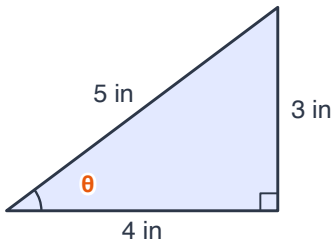
(A) $\frac{XY}{XZ}$ (B) $\frac{XZ}{YZ}$ (C) $\frac{YZ}{XZ}$ (D) $\frac{YZ}{XY}$

4. The right angle is at Q. Which fraction equals $\sin\theta$?

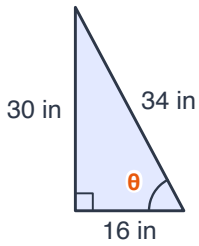


(A) $\frac{QR}{PQ}$ (B) $\frac{PQ}{PR}$ (C) $\frac{PR}{QR}$ (D) $\frac{QR}{PR}$

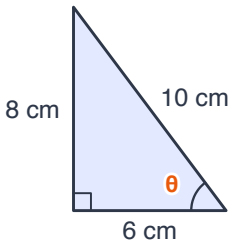
5. Find $\sin\theta$ as a fraction in lowest terms.



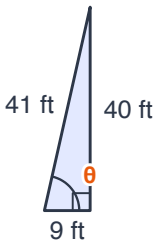
6. Find $\sin\theta$ as a fraction in lowest terms.



7. Find $\sin\theta$ as a fraction in lowest terms.



8. Find $\tan\theta$ as a fraction in lowest terms.



9. θ is an acute angle and $\cos\theta = \frac{1}{2}$. Find θ.

10. What is the exact value of $\sin 90°$?

(A) $\sqrt{3}$ (B) $\frac{\sqrt{2}}{2}$ (C) 0 (D) 1

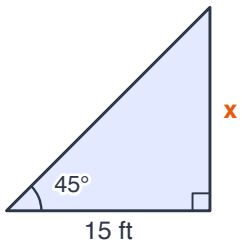
11. What is the exact value of $\sin 45°$?

(A) $\frac{\sqrt{3}}{2}$ (B) $\sqrt{3}$ (C) $\frac{\sqrt{2}}{2}$ (D) $\frac{1}{2}$

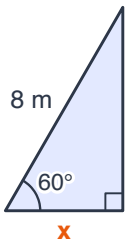
12. What is the exact value of $\tan 45°$?

(A) $\frac{\sqrt{2}}{2}$ (B) 1 (C) $\sqrt{3}$ (D) $\frac{1}{2}$

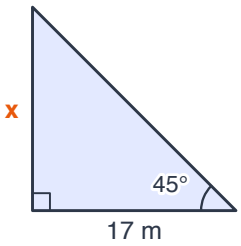
13. Find x.



14. Find x.

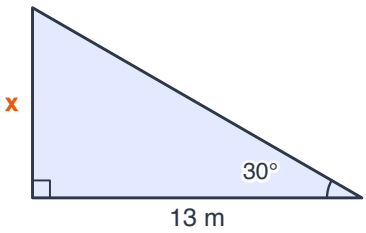


15. Find x.

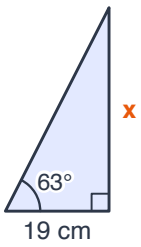


Part B — Core practice

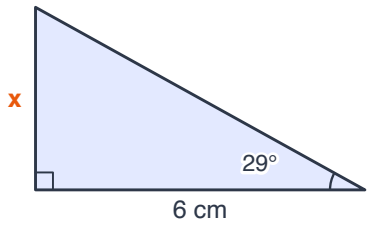
16. Find x, to 1 decimal place.



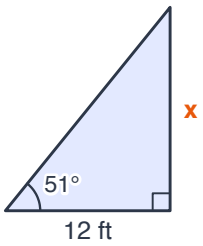
17. Find x, to 1 decimal place.



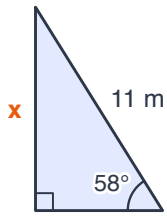
18. Find x, to 1 decimal place.



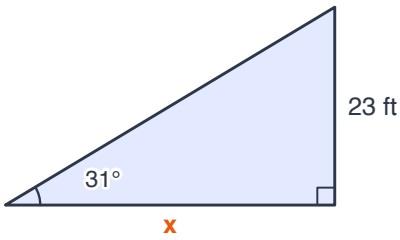
19. Find x, to 1 decimal place.



20. Find x, to 1 decimal place.



21. Find x, to 1 decimal place.



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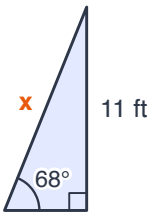
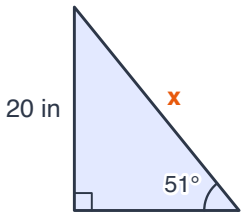


23. Find x, to 1 decimal place.



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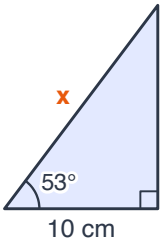
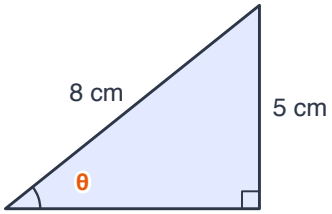
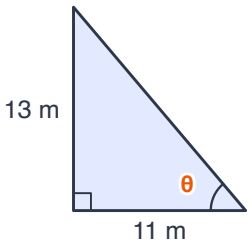


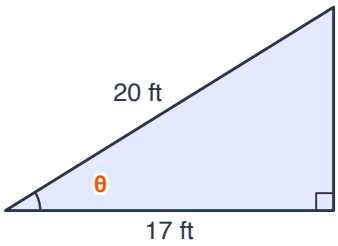
25. Find the angle θ, to the nearest degree.



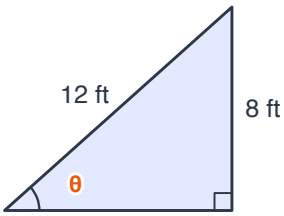
26. Find the angle θ, to the nearest degree.



27. Find the angle θ, to the nearest degree.



28. Find the angle θ, to the nearest degree.



29. Find the angle θ, to the nearest degree.



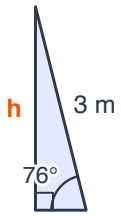
30. θ is acute and $\tan\theta = \frac{8}{15}$. Find $\cos\theta$ as a fraction.

31. θ is acute and $\sin\theta = \frac{20}{29}$. Find $\tan\theta$ as a fraction.

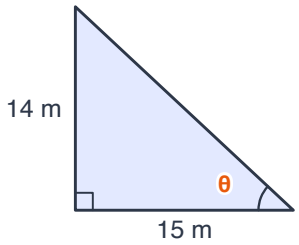
32. θ is acute and $\sin\theta = \frac{35}{37}$. Find $\cos\theta$ as a fraction.

33. θ is acute and $\cos\theta = \frac{21}{29}$. Find $\sin\theta$ as a fraction.

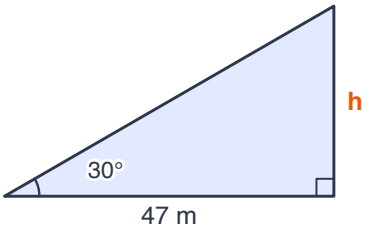
34. A 3 m ladder leans against a wall, making an angle of 76° with the ground. How high up the wall does it reach, to 1 decimal place?



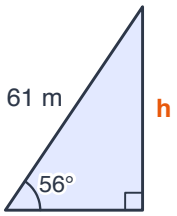
35. A 14 m pole casts a shadow 15 m long on flat ground. What is the angle of elevation of the sun, to the nearest degree?



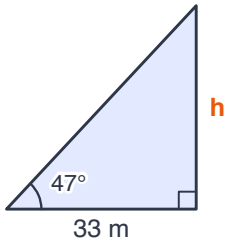
36. From a point 47 m from the foot of a tree, the angle of elevation to its top is 30°. How tall is the tree, to 1 decimal place?



37. A kite string 61 m long is pulled tight and makes an angle of 56° with the ground. How high is the kite above the hand holding the string, to 1 decimal place?



38. From a point 33 m from the foot of a building, the angle of elevation to its top is $47°$. How tall is the building, to 1 decimal place?



Part C — Challenge

39. θ is acute with $\sin\theta = \frac{40}{41}$ and $\cos\theta = \frac{9}{41}$. Find $\sin 2\theta$ as a fraction.

40. θ is acute with $\sin\theta = \frac{20}{29}$ and $\cos\theta = \frac{21}{29}$. Find $\cos 2\theta$ as a fraction.

41. θ is acute with $\sin\theta = \frac{12}{13}$ and $\cos\theta = \frac{5}{13}$. Find $\sin 2\theta$ as a fraction.

42. Use an angle sum formula to find the exact value of $\cos(60° + 45°) = \cos 105°$.

(A) $\dfrac{\sqrt{6}+\sqrt{2}}{4}$ (B) $\dfrac{\sqrt{2}-\sqrt{6}}{4}$

(C) $\dfrac{-\sqrt{2}-\sqrt{6}}{4}$ (D) $\dfrac{\sqrt{6}-\sqrt{2}}{4}$

43. Use an angle sum formula to find the exact value of $\sin(60° + 45°) = \sin 105°$.

(A) $\dfrac{-\sqrt{2}-\sqrt{6}}{4}$ (B) $\dfrac{\sqrt{2}-\sqrt{6}}{4}$

(C) $\dfrac{\sqrt{6}+\sqrt{2}}{4}$ (D) $\dfrac{\sqrt{6}-\sqrt{2}}{4}$

44. Use an angle difference formula to find the exact value of $\sin(45° - 30°) = \sin 15°$.

(A) $\dfrac{\sqrt{2}-\sqrt{6}}{4}$ (B) $\dfrac{\sqrt{6}-\sqrt{2}}{4}$

(C) $\dfrac{\sqrt{6}+\sqrt{2}}{4}$ (D) $\dfrac{-\sqrt{2}-\sqrt{6}}{4}$

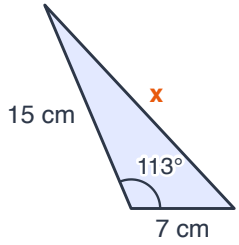
45. θ is acute and $\tan\theta = \frac{5}{12}$. Use $1 + \tan^2\theta = \dfrac{1}{\cos^2\theta}$ to find $\cos^2\theta$ as a fraction.

46. Which of these is equal to $\cos 38°$?

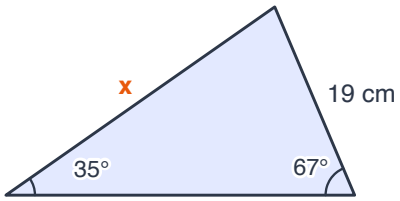
(A) $\cos 52°$ (B) $\sin 52°$ (C) $\sin 142°$ (D) $\sin 38°$

47. θ is acute and $\tan\theta = \frac{9}{40}$. Use $1 + \tan^2\theta = \dfrac{1}{\cos^2\theta}$ to find $\cos^2\theta$ as a fraction.

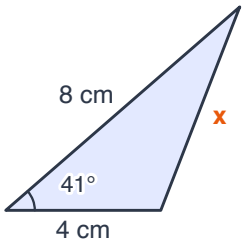
48. Use the law of cosines to find x, to 1 decimal place.



49. Use the law of sines to find x, to 1 decimal place.



50. Use the law of cosines to find x, to 1 decimal place.



Answer Key — Trigonometry

1. **(B) PQ**
   PQ touches θ (at P) and is not the hypotenuse.

2. **(B) LM**
   LM is across from θ — it does not touch K.

3. **(C) $\dfrac{YZ}{XZ}$**
   $\sin\theta = \dfrac{\text{opposite}}{\text{hypotenuse}} = \dfrac{YZ}{XZ}$.

4. **(D) $\dfrac{QR}{PR}$**
   $\sin\theta = \dfrac{\text{opposite}}{\text{hypotenuse}} = \dfrac{QR}{PR}$.

5. $\frac{3}{5}$
   $\sin\theta = \dfrac{\text{opp}}{\text{hyp}} = \dfrac{3}{5}$.

6. $\frac{15}{17}$
   $\sin\theta = \dfrac{\text{opp}}{\text{hyp}} = \dfrac{30}{34} = \frac{15}{17}$.

7. $\frac{4}{5}$
   $\sin\theta = \dfrac{\text{opp}}{\text{hyp}} = \dfrac{8}{10} = \frac{4}{5}$.

8. $\frac{40}{9}$
   $\tan\theta = \dfrac{\text{opp}}{\text{adj}} = \dfrac{40}{9}$.

9. $60°$
   From the special-angle table, $\cos 60^\circ = \frac{1}{2}$, so $\theta = 60^\circ$.

10. **(D)** 1
    $\sin 90^\circ = 1$.

11. **(C)** $\frac{\sqrt{2}}{2}$
    $\sin 45^\circ = \frac{\sqrt{2}}{2}$ (use the 45-45-90 triangle with sides 1, 1, $\sqrt{2}$).

12. **(B)** 1
    $\tan 45^\circ = 1$ (use the 45-45-90 triangle with sides 1, 1, $\sqrt{2}$).

13. 15 **ft**
    $x = 15\tan 45^\circ = 15 \times 1 = 15$ ft.

14. 4 **m**
    $x = 8\cos 60^\circ = 8 \times \frac{1}{2} = 4$ m.

15. 17 **m**
    $x = 17\tan 45^\circ = 17 \times 1 = 17$ m.

16. 7.5 **m**
    TOA: $\tan 30^\circ = \dfrac{x}{13}$, so $x = 13\tan 30^\circ \approx 7.5$ m.

17. 37.3 **cm**
    TOA: $\tan 63^\circ = \dfrac{x}{19}$, so $x = 19\tan 63^\circ \approx 37.3$ cm.

18. 3.3 **cm**
    TOA: $\tan 29^\circ = \dfrac{x}{6}$, so $x = 6\tan 29^\circ \approx 3.3$ cm.

19. 14.8 **ft**
    TOA: $\tan 51^\circ = \dfrac{x}{12}$, so $x = 12\tan 51^\circ \approx 14.8$ ft.

20. 9.3 **m**
    SOH: $\sin 58^\circ = \dfrac{x}{11}$, so $x = 11\sin 58^\circ \approx 9.3$ m.

21. 38.3 **ft**
    $\tan 31^\circ = \dfrac{23}{x}$, so $x = \dfrac{23}{\tan 31^\circ} \approx 38.3$ ft. (The unknown is on the bottom, so divide.)

22. 11.9 **ft**
    $\sin 68^\circ = \dfrac{11}{x}$, so $x = \dfrac{11}{\sin 68^\circ} \approx 11.9$ ft. (The unknown is on the bottom, so divide.)

23. 25.7 **in**
    $\sin 51^\circ = \dfrac{20}{x}$, so $x = \dfrac{20}{\sin 51^\circ} \approx 25.7$ in. (The unknown is on the bottom, so divide.)

24. 16.6 **cm**
    $\cos 53^\circ = \dfrac{10}{x}$, so $x = \dfrac{10}{\cos 53^\circ} \approx 16.6$ cm. (The unknown is on the bottom, so divide.)

25. $39°$
    $\sin\theta = \dfrac{5}{8}$, so $\theta = \sin^{-1}\left(\dfrac{5}{8}\right) \approx 38.68^\circ \approx 39^\circ$.

26. $50°$
    $\tan\theta = \dfrac{13}{11}$, so $\theta = \tan^{-1}\left(\dfrac{13}{11}\right) \approx 49.76^\circ \approx 50^\circ$.

27. $32°$
    $\cos\theta = \dfrac{17}{20}$, so $\theta = \cos^{-1}\left(\dfrac{17}{20}\right) \approx 31.79^\circ \approx 32^\circ$.

28. $42°$
    $\sin\theta = \dfrac{8}{12}$, so $\theta = \sin^{-1}\left(\dfrac{8}{12}\right) \approx 41.81^\circ \approx 42^\circ$.

29. $74°$
    $\cos\theta = \dfrac{7}{25}$, so $\theta = \cos^{-1}\left(\dfrac{7}{25}\right) \approx 73.74^\circ \approx 74^\circ$.

30. $\frac{15}{17}$
    Draw a right triangle with opposite 8, adjacent 15, so hypotenuse $= \sqrt{8^2 + 15^2} = 17$. Then $\cos\theta = \frac{15}{17}$.

31. $\frac{20}{21}$
    Draw a right triangle with opposite 20, hypotenuse 29, so adjacent $= \sqrt{29^2 - 20^2} = 21$. Then $\tan\theta = \frac{20}{21}$.

32. $\frac{12}{37}$
    Draw a right triangle with opposite 35, hypotenuse 37, so adjacent $= \sqrt{37^2 - 35^2} = 12$. Then $\cos\theta = \frac{12}{37}$.

33. $\frac{20}{29}$

Draw a right triangle with adjacent 21, hypotenuse 29, so opposite $= \sqrt{29^2 - 21^2} = 20$. Then $\sin\theta = \frac{20}{29}$.

34. 2.9 **m**

$\sin 76^\circ = \dfrac{h}{3}$, so $h = 3\sin 76^\circ \approx 2.9$ m.

35. 43°

$\tan\theta = \dfrac{14}{15}$, so $\theta = \tan^{-1}\left(\dfrac{14}{15}\right) \approx 43^\circ$.

36. 27.1 **m**

$\tan 30^\circ = \dfrac{h}{47}$, so $h = 47\tan 30^\circ \approx 27.1$ m.

37. 50.6 **m**

$h = 61\sin 56^\circ \approx 50.6$ m.

38. 35.4 **m**

$\tan 47^\circ = \dfrac{h}{33}$, so $h = 33\tan 47^\circ \approx 35.4$ m.

39. $\frac{720}{1681}$

$\sin 2\theta = 2\sin\theta\cos\theta = 2 \times \dfrac{40}{41} \times \dfrac{9}{41} = \frac{720}{1681}$.

40. $\frac{41}{841}$

$\cos 2\theta = \cos^2\theta - \sin^2\theta = \dfrac{441}{841} - \dfrac{400}{841} = \frac{41}{841}$.

41. $\frac{120}{169}$

$\sin 2\theta = 2\sin\theta\cos\theta = 2 \times \dfrac{12}{13} \times \dfrac{5}{13} = \frac{120}{169}$.

42. **(B)** $\dfrac{\sqrt{2} - \sqrt{6}}{4}$

$\cos 60^\circ\cos 45^\circ - \sin 60^\circ\sin 45^\circ = \frac{1}{2}\cdot\frac{\sqrt{2}}{2} - \frac{\sqrt{3}}{2}\cdot\frac{\sqrt{2}}{2}$, which simplifies to $\dfrac{\sqrt{2} - \sqrt{6}}{4}$.

43. **(C)** $\dfrac{\sqrt{6} + \sqrt{2}}{4}$

$\sin 60^\circ\cos 45^\circ + \cos 60^\circ\sin 45^\circ = \frac{\sqrt{3}}{2}\cdot\frac{\sqrt{2}}{2} + \frac{1}{2}\cdot\frac{\sqrt{2}}{2}$, which simplifies to $\dfrac{\sqrt{6} + \sqrt{2}}{4}$.

44. **(B)** $\dfrac{\sqrt{6} - \sqrt{2}}{4}$

$\sin 45^\circ\cos 30^\circ - \cos 45^\circ\sin 30^\circ = \frac{\sqrt{2}}{2}\cdot\frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2}\cdot\frac{1}{2}$, which simplifies to $\dfrac{\sqrt{6} - \sqrt{2}}{4}$.

45. $\frac{144}{169}$

$1 + \dfrac{25}{144} = \dfrac{169}{144} = \dfrac{1}{\cos^2\theta}$, so $\cos^2\theta = \frac{144}{169}$.

46. **(B)** $\sin 52^\circ$

Co-functions: $\cos\theta = \sin(90^\circ - \theta)$, so $\cos 38^\circ = \sin 52^\circ$.

47. $\frac{1600}{1681}$

$1 + \dfrac{81}{1600} = \dfrac{1681}{1600} = \dfrac{1}{\cos^2\theta}$, so $\cos^2\theta = \frac{1600}{1681}$.

48. 18.9 **cm**

$x^2 = 7^2 + 15^2 - 2(7)(15)\cos 113^\circ \approx 356.05$, so $x \approx 18.9$ cm.

49. 30.5 **cm**

$\dfrac{x}{\sin 67^\circ} = \dfrac{19}{\sin 35^\circ}$, so $x = \dfrac{19\sin 67^\circ}{\sin 35^\circ} \approx 30.5$ cm.

50. 5.6 **cm**

$x^2 = 4^2 + 8^2 - 2(4)(8)\cos 41^\circ \approx 31.7$, so $x \approx 5.6$ cm.