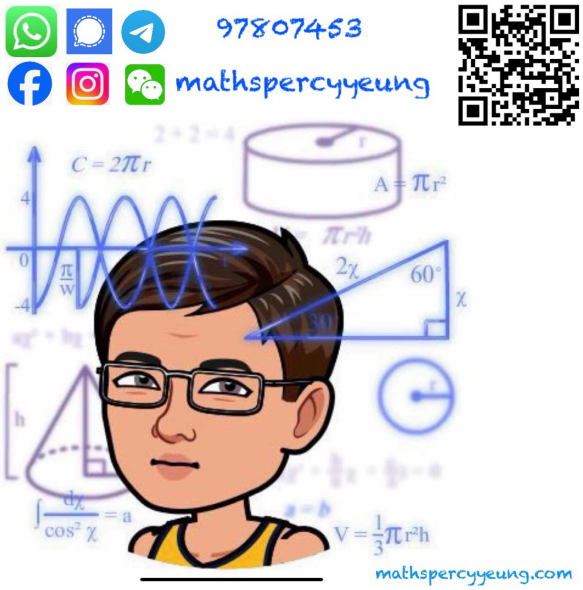
S.2 Mathematics

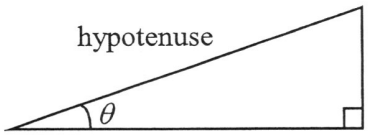
School-Based Exercise (S.B.E.)

Chapter 12
Trigonometric Ratios



Sine Ratio

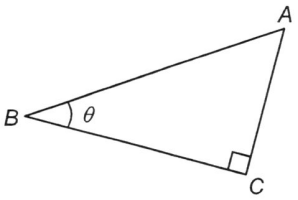
$$\sin\theta = \frac{\text{opposite side}}{\text{hypotenuse}}$$



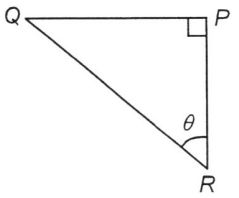
Exercise 12A

1. In each of the following triangles, name the opposite side of θ, the adjacent side of θ and the hypotenuse.

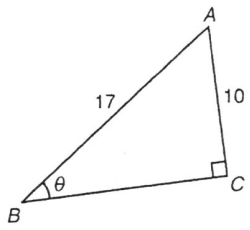
(a)



(b)

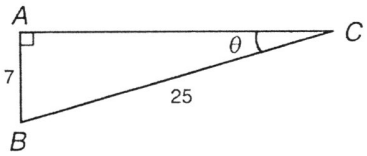


2. In the figure, find
   (a) the opposite side of θ,
   (b) the hypotenuse,
   (c) the value of sin θ.

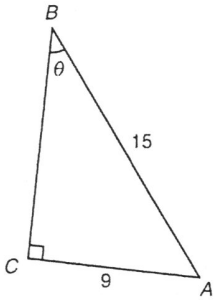


3. In each of the following figures, find the value of sin θ.

(a)

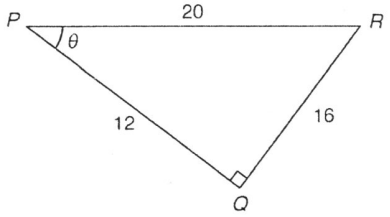


(b)

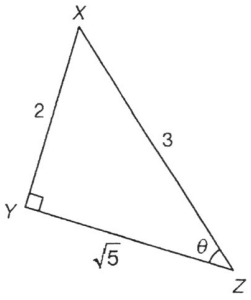


4. In each of the following figures, find the value of sin θ.

(a)

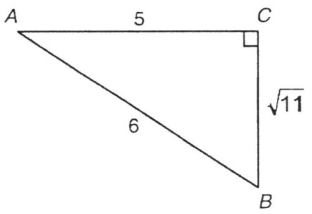


(b)

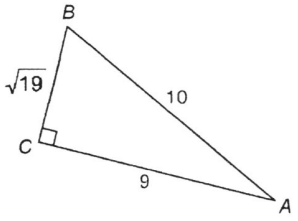


5. In the following figures, find the values of sin $\angle A$ and sin $\angle B$.
(Leave your answers in surd form if necessary.)

(a)



(b)



6. Find the values of the following expressions correct to 3 significant figures.

(a) sin 50° (b) sin 82° (c) sin 26.9°

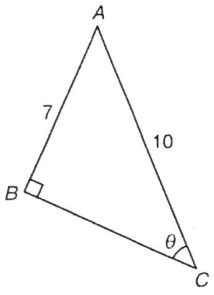
7. In each of the following, find the acute angle θ correct to the nearest 0.1°.

(a) $\sin\theta = 0.2$ (b) $\sin\theta = 0.721$ (c) $\sin\theta = \frac{6}{7}$

8. In the figure, find

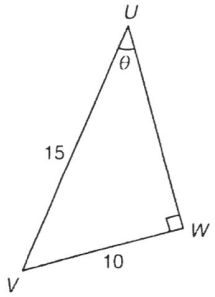
(a) the value of sin θ,

(b) the acute angle θ correct to the nearest degree.

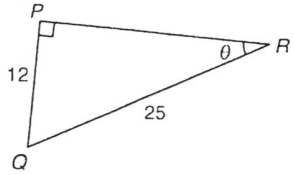


9. In each of the following figures, find θ correct to the nearest 0.1°.

(a)

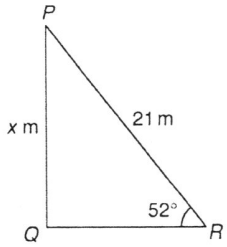


(b)

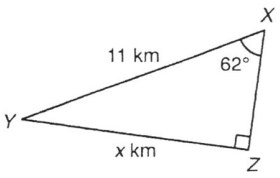


10. In each of the following figures, find the value of x correct to 2 significant figures.

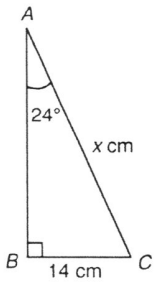
(a)



(b)



(c)



11. Using a calculator, find the values of the following expressions correct to 4 significant figures.

(a) $\sin 52° + \sin 25°$ (b) $\sin 80° - \sin 42°$ (c) $2\sin 57.6° + 1$

12. (a) Find the value of sin 44° – sin 11° correct to 4 significant figures.

(b) If $\sin\theta = \sin 44° - \sin 11°$, find the acute angle θ correct to the nearest 0.1°.

13. In each of the following, find the acute angle θ correct to 4 significant figures.

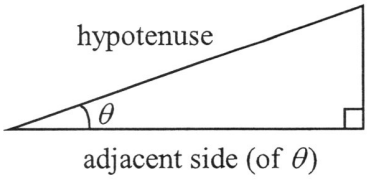
(a) $\sin\theta = \sin 15° + \sin 25°$ (b) $\sin\theta = \sin 32° - \sin 14°$

14. In each of the following, find the acute angle θ correct to 4 significant figures.

(a) $6\sin\theta = 1$ (b) $12\sin\theta = 5$ (c) $8\sin\theta = 7$

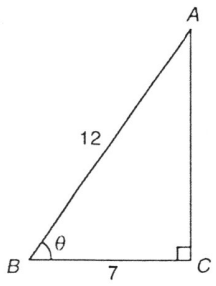
Cosine Ratio

$$\cos\theta = \frac{\text{adjacent side}}{\text{hypotenuse}}$$



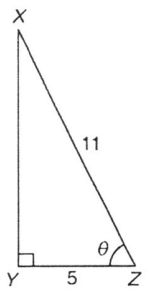
Exercise 12B

1. In the figure, find
   (a) the adjacent side of θ,
   (b) the hypotenuse,
   (c) the value of cos θ.

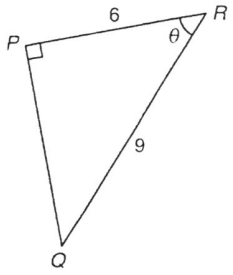


2. In each of the following figures, find the value of cos θ.

(a)

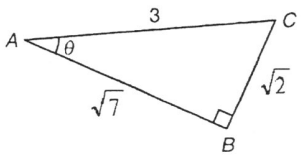


(b)

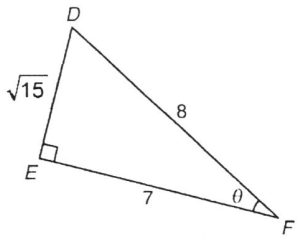


3. In each of the following figures, find the value of cos θ.
   (Leave your answers in surd form if necessary.)

(a)

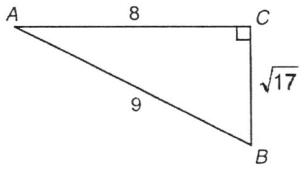


(b)

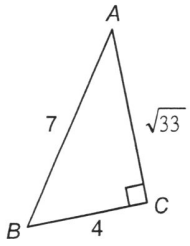


4. In the following figures, find the values of cos $\angle A$ and cos $\angle B$.
(Leave your answers in surd form if necessary.)

(a)



(b)



5. Find the values of the following expressions correct to 3 significant figures.

(a) cos 25° (b) cos 71° (c) cos 69.2°

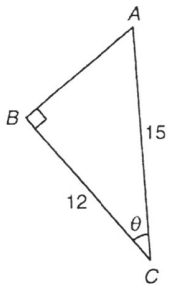
6. In each of the following, find the acute angle θ correct to the nearest 0.1°.

(a) $\cos\theta = 0.7$ (b) $\cos\theta = 0.52$ (c) $\cos\theta = \frac{7}{22}$

7. In the figure, find

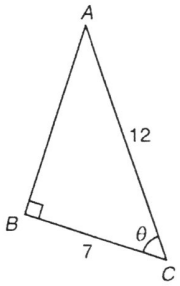
(a) the value of cos θ,

(b) the acute angle θ correct to the nearest degree.

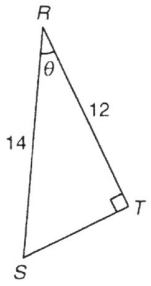


8. In each of the following figures, find θ correct to the nearest 0.1°.

(a)

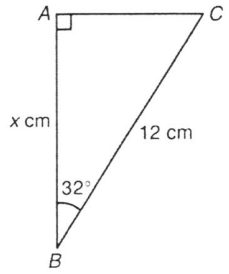


(b)

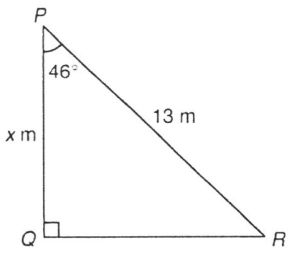


9. In each of the following figures, find the value of x correct to 2 significant figures.

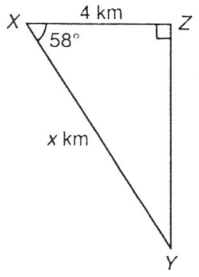
(a)



(b)



(c)



10. Using a calculator, find the values of the following expressions correct to 4 significant figures.

(a) $\cos 42° + \cos 48°$ (b) $\cos 18° - \cos 40°$ (c) $\cos 65° \cos 25°$

11. In each of the following, find the acute angle θ correct to 4 significant figures.

(a) $\cos \theta = \cos 33° + \cos 84°$ (b) $\cos \theta = \cos 12° - \cos 28°$

12. In each of the following, find the acute angle θ correct to 4 significant figures.

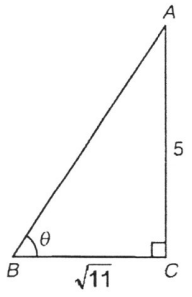
(a) $5\cos \theta = 2$ (b) $8\cos \theta = 5$ (c) $16\cos \theta = 14$

13. The figure shows $\triangle ABC$.

(a) By using Pythagoras' theorem, find the length of AB.

(b) Find the value of $\cos \theta$.

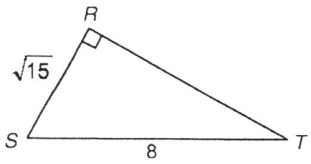
(Give your answers in surd form if necessary.)



14. The figure shows $\triangle RST$.

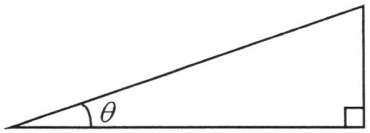
(a) By using Pythagoras' theorem, find the length of RT.

(b) Find the value of $\cos \angle T$.



Tangent Ratio

$$\tan\theta = \frac{\text{opposite side}}{\text{adjacent side}}$$

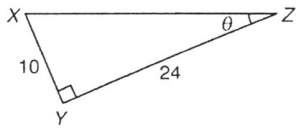


opposite side (of θ)

adjacent side (of θ)

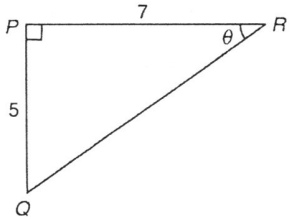
Exercise 12C

1. In the figure, find
   (a) the opposite side of θ,
   (b) the adjacent side of θ,
   (c) the value of tan θ.

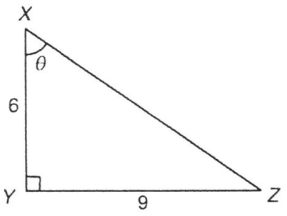


2. In each of the following figures, find the value of tan θ.

(a)

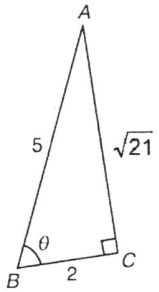


(b)

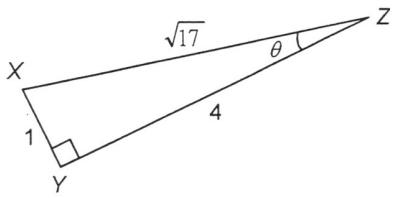


3. In each of the following figures, find the value of tan θ.
   (Leave your answers in surd form if necessary.)

(a)

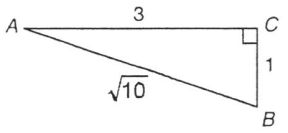


(b)

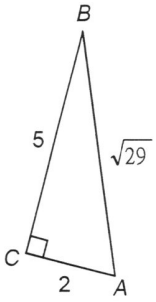


4. In the following figures, find the values of tan $\angle A$ and tan $\angle B$.

(a)



(b)



5. Find the values of the following expressions correct to 3 significant figures.

(a) tan 38° (b) tan 66° (c) tan 23.4°

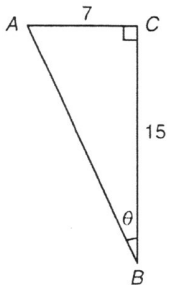
6. In each of the following, find the acute angle θ correct to the nearest 0.1°.

(a) $\tan\theta = 0.8$ (b) $\tan\theta = 1.56$ (c) $\tan\theta = \frac{25}{9}$

7. In the figure, find

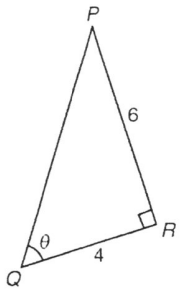
(a) the value of tan θ,

(b) the acute angle θ correct to the nearest degree.

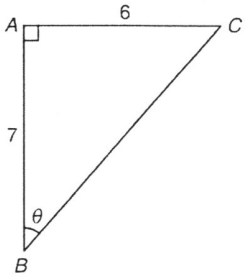


8. In each of the following figures, find θ correct to the nearest 0.1°.

(a)

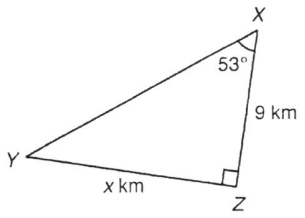


(b)

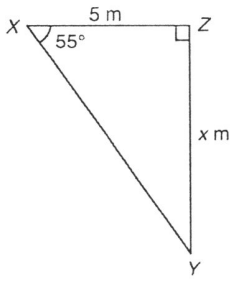


9. In each of the following figures, find the value of x correct to 2 significant figures.

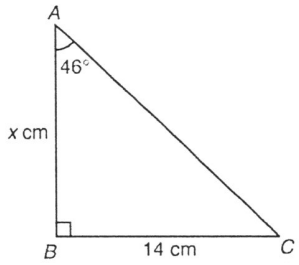
(a)



(b)



(c)



10. Using a calculator, find the values of the following expressions correct to 4 significant figures.

(a) $\tan 62° - \tan 11°$ (b) $\tan 79° + \tan 60°$ (c) $\tan 37° \tan 67.4°$

11. In each of the following, find the acute angle θ correct to 4 significant figures.

(a) $\tan \theta = \tan 32° + \tan 14°$ (b) $\tan \theta = \tan 86° - \tan 53°$

12. In each of the following, find the acute angle θ correct to 4 significant figures.

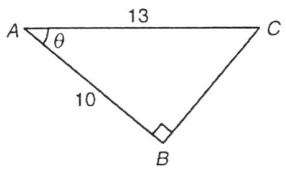
(a) $4\tan \theta = 7$ (b) $5\tan \theta = 2$ (c) $12\tan \theta = 11$

13. The figure shows $\triangle ABC$.

(a) By using Pythagoras' theorem, find the length of BC.

(b) Find the value of $\tan \theta$.

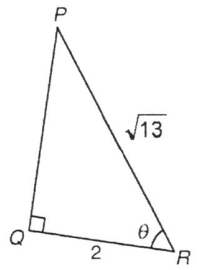
(Give your answers in surd form.)



14. The figure shows $\triangle PQR$.

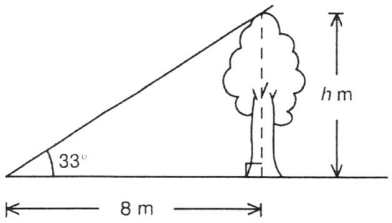
(a) By using Pythagoras' theorem, find the length of PQ.

(b) Find the value of $\tan \theta$.

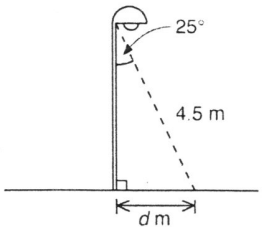


Exercise 12D

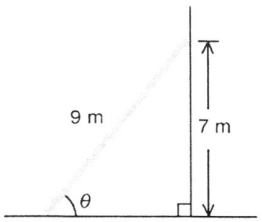
1. By using tangent ratio, find h as shown in the figure.



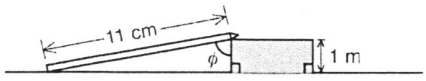
2. By using sine ratio, find d as shown in the figure.



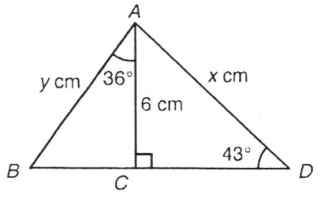
3. By using sine ratio, find θ as shown in the figure.



4. By using cosine ratio, find ϕ as shown in the figure.



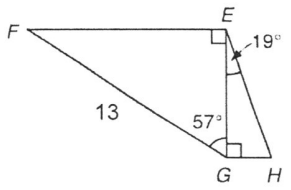
5. In the figure, BCD is a straight line.
   (a) Find x.
   (b) Find y.



6. Refer to the figure.

(a) Find EG.

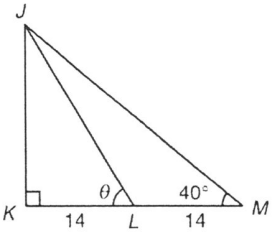
(b) Hence find GH.



7. In the figure, KLM is a straight line.

(a) Find JK.

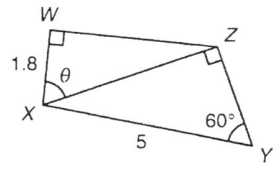
(b) Hence find θ.



8. Refer to the figure.

(a) Find XZ.

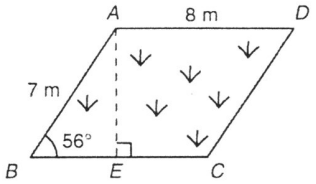
(b) Hence find θ.



9. In the figure, $ABCD$ is a lawn which is in the shape of a parallelogram. AE is a path from A to BC.

(a) Find the length of the path AE.

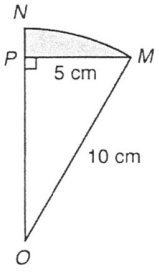
(b) Find the area of the lawn.



10. In the figure, OMN is a sector of radius 10 cm. P is a point on ON such that $MP \perp ON$.

(a) Find $\angle MOP$.

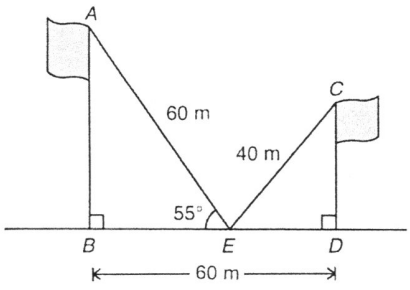
(b) Find the area of the shaded region.



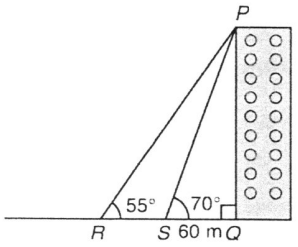
11. The figure shows two flagpoles AB and CD. E is a point between B and D.

(a) Find BE.

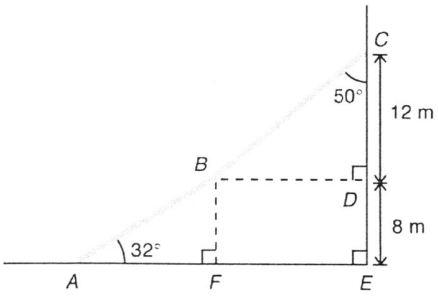
(b) Find $\angle ECD$.



12. As shown in the figure, a man walks 60 m from building PQ to a point S. Then he walks further to point R. It is known that R, S and the building lie on the same straight road.
    (a) Find the height of building PQ.
    (b) Find the distance between R and S.



13. The figure shows a water pipe ABC connecting A and C. Find the total length of the pipe.



Multiple Choice Questions

1. Find the value of $\sin 30° + 4\sin 50°$ correct to 2 decimal places.

   A. 0.43
   B. 0.55
   C. 3.56
   D. 3.94

2. If $\sin\theta = \frac{327}{541}$, find θ correct to 3 significant figures.

   A. 37.2°
   B. 46.5°
   C. 52.8°
   D. 54.4°

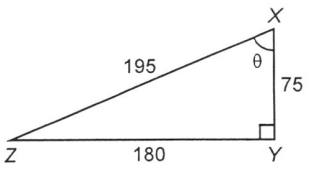
3. If $\sin\theta = 2\sin 75° - 1$, find θ.

   A. 11.9° (corr. to 1 d.p.)
   B. 38.3° (corr. to 1 d.p.)
   C. 68.7° (corr. to 1 d.p.)
   D. 75°

4. If $2\sin\theta = \sin 18° + \sin 58°$, find θ.

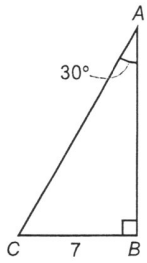
   A. 18.5° (corr. to 3 sig. fig.)
   B. 29.0° (corr. to 3 sig. fig.)
   C. 35.3° (corr. to 3 sig. fig.)
   D. 38°

5. In the figure, $\sin\theta =$



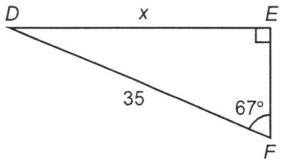
   A. $\frac{12}{13}$.
   B. $\frac{5}{13}$.
   C. $\frac{5}{12}$.
   D. $\frac{12}{5}$.

6. In the figure, $\angle CAB = 30°$ and $BC = 7$. Find AC.



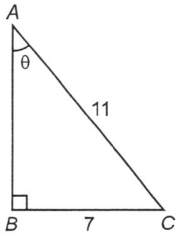
A. 14
B. 12.1 (corr. to 3 sig. fig.)
C. 8.08 (corr. to 3 sig. fig.)
D. 6.06 (corr. to 3 sig. fig.)

7. In the figure, $DF = 35$ and $\angle DFE = 67°$. Find x correct to 3 significant figures.



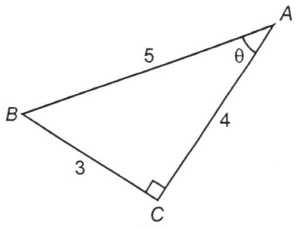
A. 35.9
B. 32.2
C. 14.9
D. 13.7

8. In the figure, $\theta =$



A. 0.636° (corr. to 3 sig. fig.).
B. 32.5° (corr. to 3 sig. fig.).
C. 39.5° (corr. to 3 sig. fig.).
D. 50.5° (corr. to 3 sig. fig.).

9. In the figure, $\theta =$



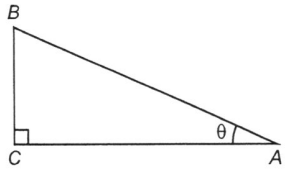
A. 31° (corr. to the nearest degree).

B. 37° (corr. to the nearest degree).

C. 53° (corr. to the nearest degree).

D. 59° (corr. to the nearest degree).

10. In the figure, $2AB = 5BC$. Find θ correct to the nearest degree.



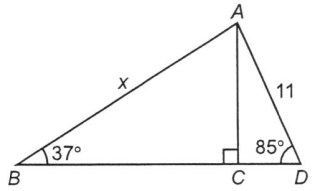
A. 22°

B. 24°

C. 27°

D. 30°

11. In the figure, BCD is a straight line. Find x correct to 3 significant figures.



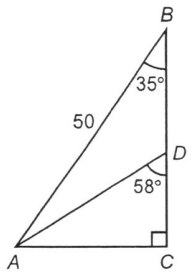
A. 14.6

B. 18.2

C. 18.3

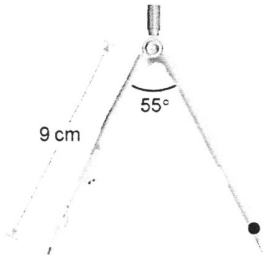
D. 19.5

12. In the figure, BDC is a straight line. Find AD correct to 3 significant figures.



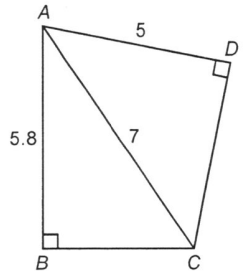
A. 24.3
B. 24.8
C. 33.0
D. 33.8

13. The lengths of the arms of a pair of compasses are 9 cm each. When the angle between the arms is 55°, what is the radius of the circle to be drawn?



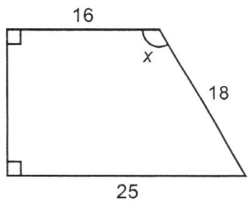
A. 4.16 cm (corr. to 3 sig. fig.)
B. 7.37 cm (corr. to 3 sig. fig.)
C. 7.98 cm (corr. to 3 sig. fig.)
D. 8.31 cm (corr. to 3 sig. fig.)

14. Find $\angle BCD$ correct to the nearest degree.



A. 101°
B. 102°
C. 105°
D. 112°

15. In the figure, $x =$



A. 117° (corr. to the nearest degree).

B. 120°.

C. 134° (corr. to the nearest degree).

D. 140° (corr. to the nearest degree).

16. Find the value of $5\cos 50° - 2\cos 35°$ correct to 2 decimal places.

A. 1.58

B. 2.74

C. 2.90

D. 3.32

17. If $\cos\theta = 0.391\,42$, find θ correct to 4 significant figures.

A. 21.38°

B. 23.04°

C. 66.96°

D. 68.62°

18. If $\cos\theta = \cos 25° + \frac{14}{3}\cos 45° - 4$, find θ correct to 1 decimal place.

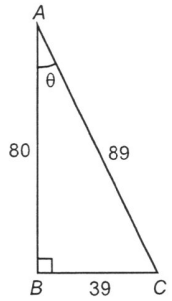
A. 0.2°

B. 28.5°

C. 76.8°

D. 78.1°

19. In the figure, $\cos\theta =$



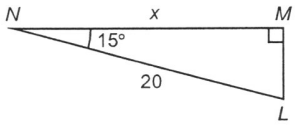
A. $\frac{39}{89}$.

B. $\frac{80}{89}$.

C. $\frac{39}{80}$.

D. $\frac{80}{39}$.

20. In the figure, $\angle MNL = 15°$ and $NL = 20$. Find x correct to 1 decimal place.



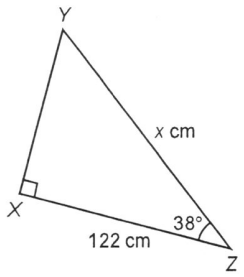
A. 15.2

B. 16.8

C. 19.3

D. 20.7

21. In the figure, $\angle XZY = 38°$ and $XZ = 122$ cm. Find x correct to 1 decimal place.



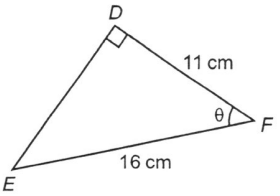
A. 141.5

B. 154.8

C. 156.2

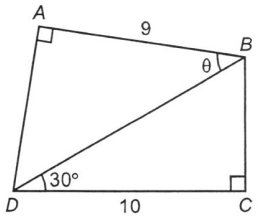
D. 198.2

22. In the figure, $\theta =$



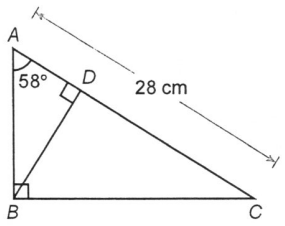
A. 34.5° (corr. to 1 d.p.).
B. 43.4° (corr. to 1 d.p.).
C. 46.6° (corr. to 1 d.p.).
D. 55.5° (corr. to 1 d.p.).

23. Find θ in the figure correct to the nearest degree.



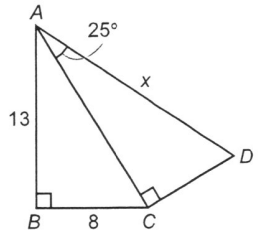
A. 39°
B. 41°
C. 47°
D. 63°

24. In the figure, *ADC* is a straight line. Find *AD* correct to 3 significant figures.



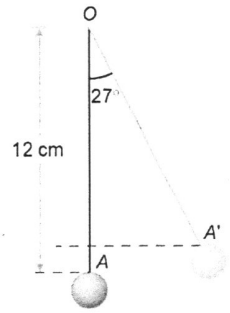
A. 6.46 cm
B. 6.93 cm
C. 7.86 cm
D. 12.6 cm

25. Find x in the figure correct to 1 decimal place.



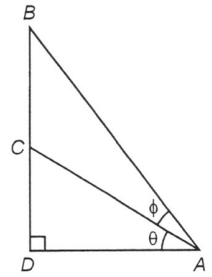
A. 13.8
B. 15.3
C. 16.8
D. 23.6

26. In the figure, a string OA of length 12 cm is held vertically with a marble attached to the end A. When the marble is pulled up until the end of the string reaches A', the angle between OA and OA' is 27°. Find the vertical distance between A and A' correct to 3 significant figures.



A. 0.872 cm
B. 1.31 cm
C. 1.47 cm
D. 3.16 cm

27. In the figure, BCD is a straight line. $AB:AC:AD=48:34:29$. If $\theta:\phi=n:1$, find n correct to 3 significant figures.



A. 1.12
B. 1.41
C. 1.47
D. 1.68

28. Find the value of $\tan 30° + \tan 50° \tan 75°$ correct to 2 decimal places.

A. 0.58
B. 0.69
C. 5.03
D. 6.60

29. If $\tan\theta = 2\tan 30°$, find θ correct to the nearest degree.

A. 18°
B. 49°
C. 60°
D. 69°

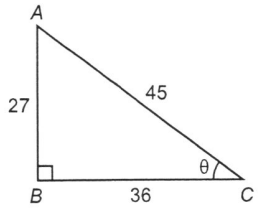
30. If $\tan\theta = 3\tan 55° + \tan 15°$, find θ correct to 3 significant figures.

A. 77.0°
B. 77.6°
C. 78.9°
D. 83.1°

31. If $2(\tan\theta + 4) = 3(\tan\theta + 1)$, find θ correct to 2 decimal places.

A. 65.56°
B. 71.57°
C. 78.69°
D. 81.87°

32. In the figure, $\tan\theta =$



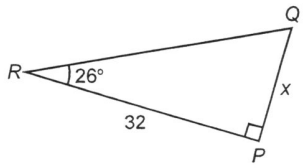
A. $\frac{4}{3}$.

B. $\frac{3}{4}$.

C. $\frac{3}{5}$.

D. $\frac{4}{5}$.

33. In the figure, $PR = 32$ and $\angle QRP = 26°$. Find x correct to 3 significant figures.



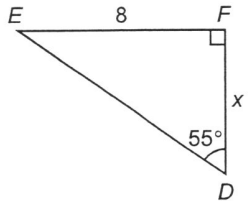
A. 13.8

B. 14.0

C. 15.6

D. 16.2

34. In the figure, $EF = 8$ and $\angle EDF = 55°$. Find x correct to 2 decimal places.



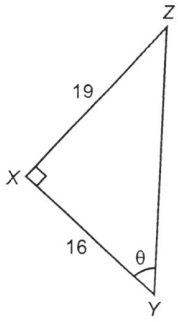
A. 5.60

B. 6.55

C. 9.77

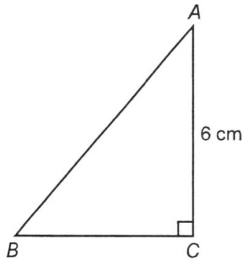
D. 11.42

35. Find θ in the figure correct to 1 decimal place.



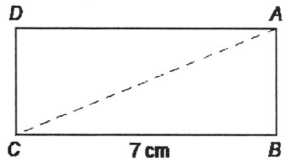
A. 32.6°
B. 40.1°
C. 49.9°
D. 57.4°

36. In the figure, the area of ΔABC is 15 cm^2. Find $\angle ABC$ correct to the nearest degree.



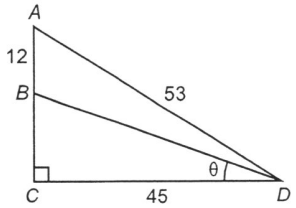
A. 40°
B. 50°
C. 56°
D. 67°

37. In the figure, the area of rectangle $ABCD$ is 20 cm^2. Find $\angle ACB$ correct to 3 significant figures.



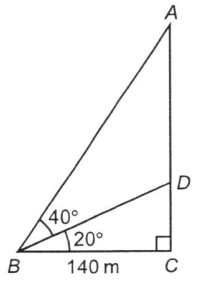
A. 19.3°
B. 20.5°
C. 22.2°
D. 24.1°

38. In the figure, ABC is a straight line. Find θ correct to 3 significant figures.



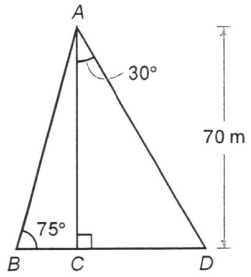
A. 13.1°
B. 14.9°
C. 15.9°
D. 19.6°

39. In the figure, ADC is a straight line. If $\angle ABD = 40°$ and $\angle DBC = 20°$, find the length of AD correct to the nearest 0.1 m.



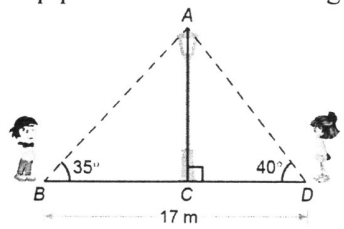
A. 117.5 m
B. 131.0 m
C. 191.5 m
D. 303.8 m

40. In the figure, BCD is a straight line. Find BD.



A. 59.2 m (corr. to 1 d.p.)
B. 70 m
C. 78.7 m (corr. to 1 d.p.)
D. 382.5 m (corr. to 1 d.p.)

41. In the figure, Jacky and Sarah are 17 m apart, where BCD is a straight line. Find the height of the lamp post AC correct to 3 significant figures.



A. 6.49 m
B. 7.99 m
C. 8.37 m
D. 11.0 m

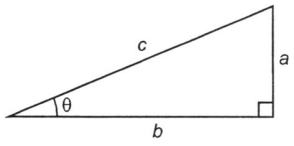
42. Find the value of $\sin 30° + \cos 30° + \tan 30°$ correct to 3 significant figures.

A. 0.513
B. 1.09
C. 1.36
D. 1.94

43. If $\tan\theta = \sin 30° + \cos 30°$, find θ.

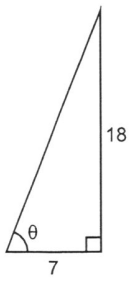
A. 27.16° (corr. to 2 d.p.)
B. 45°
C. 53.79° (corr. to 2 d.p.)
D. 60°

44. In the figure, $\sin\theta + \tan\theta =$



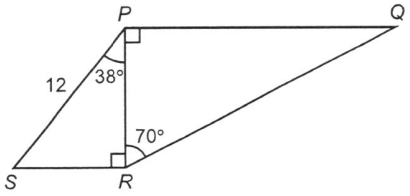
A. $\frac{a}{bc}$.
B. $\frac{a+b}{c}$.
C. $\frac{ac+b^2}{bc}$.
D. $\frac{a(b+c)}{bc}$.

45. In the figure, find $3\sin\theta+\cos\theta$ correct to 1 decimal place.



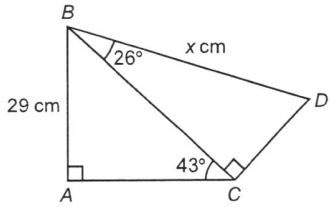
A. 1.3
B. 2.0
C. 3.2
D. 3.9

46. Find PQ in the figure correct to 3 significant figures.



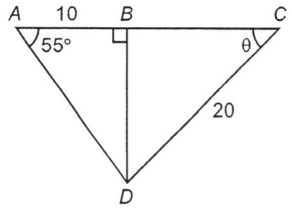
A. 20.3
B. 21.6
C. 26.0
D. 27.6

47. Find x in the figure correct to 3 significant figures.



A. 38.2
B. 47.3
C. 48.4
D. 90.5

48. In the figure, ABC is a straight line. Find θ correct to 1 decimal place.



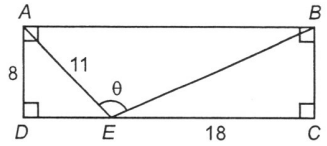
A. 20.5°

B. 44.4°

C. 45.6°

D. 69.5°

49. In the figure, $ABCD$ is a rectangle and E is a point on CD. Find θ correct to 3 significant figures.



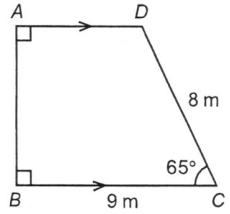
A. 102°

B. 105°

C. 109°

D. 113°

50. Find the area of trapezium $ABCD$ in the figure correct to 3 significant figures.



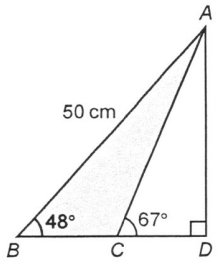
A. 29.9 m^2

B. 53.0 m^2

C. 58.5 m^2

D. 106 m^2

51. In the figure, BCD is a straight line. Find the area of ΔABC correct to 3 significant figures.



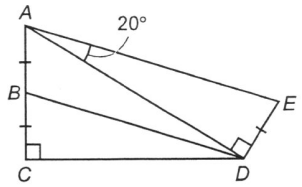
A. 172 cm^2

B. 329 cm^2

C. 384 cm^2

D. 445 cm^2

52. In the figure, ABC is a straight line. Find $\cos\angle CAD$.



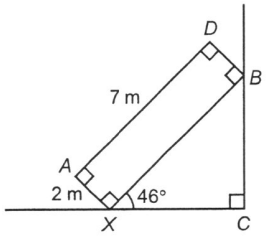
A. $2\tan 20°$

B. $\dfrac{\tan 20°}{2}$

C. $\dfrac{2}{\tan 20°}$

D. $\tan 40°$

53. In the figure, a rectangular block leans against the wall. Find the height of point D above the ground XC correct to 3 significant figures.



A. 6.25 m

B. 6.36 m

C. 6.42 m

D. 6.47 m