Name: Solutions

6.13 Test Geometry   **HSG.SRT.D.11**

Find exact values or round decimal approximations to three significant figures.

1. As shown, right $\triangle ABC$ has $AC = 8, BC = 15, AB = 17, m\angle C = 90°$.
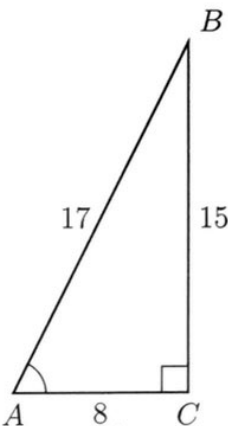
   Express each trigonometric ratio as a fraction.

   (a) $\sin A = \dfrac{15}{17}$

   (b) $\cos A = \dfrac{8}{17}$

   (c) $\tan A = \dfrac{15}{8}$

   (d) Find $m\angle A$. $\tan^{-1}\left(\dfrac{15}{8}\right) = 61.9275... \approx 61.9°$
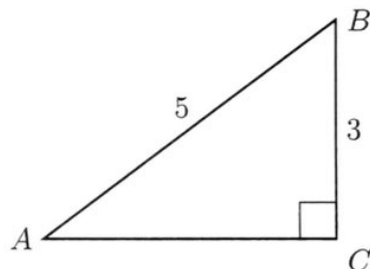
2. Right triangle $\triangle ABC$ is shown with measures as marked.

   (a) Write down $\sin A$. $\dfrac{3}{5}$
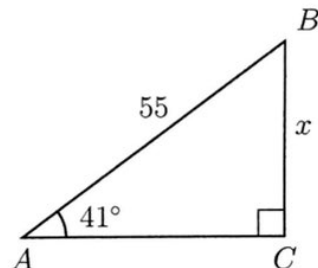
   (b) Find the length of side AC. 4

   (c) Find the angle measure of $\angle A$.
   $\tan^{-1}\left(\dfrac{3}{4}\right) = 36.8698... \approx 36.9°$

3. Right triangle ABC is shown with $AB = 55, m\angle A = 41°$. Find the value of $BC = x$.

   $\sin 41 = \dfrac{x}{55}$

   $x = 55 \sin 41$

   $= 36.0832...$

   ≈ 36.1
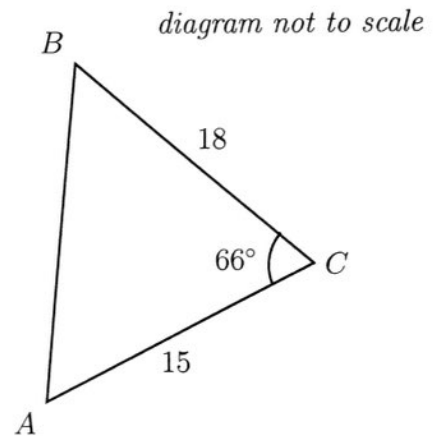
Given formulas

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule: $c^2 = a^2 + b^2 - 2ab\cos C, \quad \cos C = \dfrac{a^2 + b^2 - c^2}{2ab}$

Area of a triangle: $A = \dfrac{1}{2}ab\sin C$

4. Find the area of the given triangle.

$A = \frac{1}{2}\,\text{Sin }66°\,(15)(18)$

$= 123.3286...$
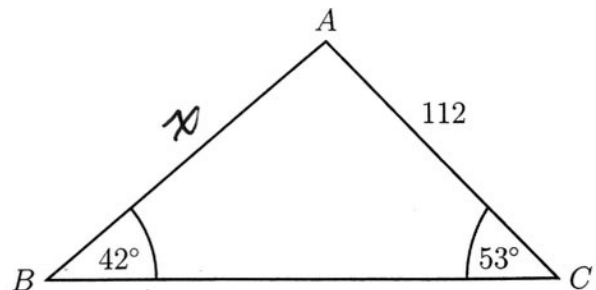
≈ 123

diagram not to scale

B

18

66° C

15

A

5. The following diagram shows triangle ABC, with $A\hat{B}C = 42°$, $A\hat{C}B = 53°$, and $AC = 112$ cm.

Find AB.

diagram not to scale

$\dfrac{x}{\text{Sin }53} = \dfrac{112}{\text{Sin }42}$

$x = 133.67670...$

$x \approx 134$

A

112

x

42°   53°

B   C

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6. Triangle ABC is drawn with $AC = 10.5$ cm, $BC = 11.0$ cm, and $A\hat{B}C = 47°$.
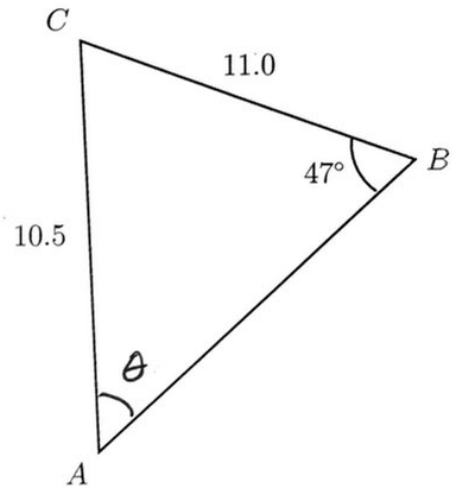
Find $B\hat{A}C$.

diagram not to scale

$$\frac{\sin \theta}{11.0} = \frac{\sin 47}{10.5}$$

$$\theta = \sin^{-1}\left(11.0 \ \frac{\sin 47}{10.5}\right)$$

$$= 50.01209...$$

$$\approx 50.0°$$

C

11.0

47° B

10.5

θ

A

7. As shown in the diagram, triangle ABC has $A\hat{B}C = 31°$, $AB = 88$, and $BC = 103$.
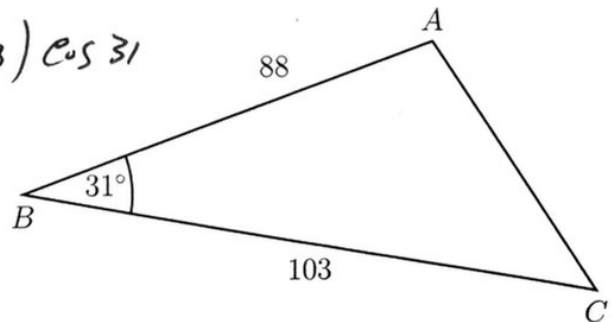
Find AC.

diagram not to scale

$$AC^2 = 88^2 + 103^2 - 2(88)(103)\cos 31$$

$$AC = 53.04970...$$

$$\approx 53.0$$

A

88

31°

B

103

C

8. The following diagram shows triangle PQR. (*not to scale*)

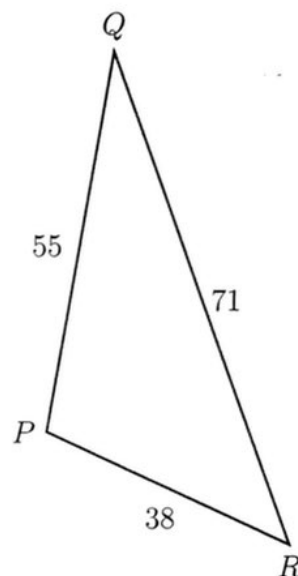 $PQ = 55$ meters, $QR = 71$ m., and $PR = 38$ m.

   Find $Q\hat{P}R$.

   $$\cos P = \frac{55^2 + 39^2 - 71^2}{2(55)(38)}$$

   $$= -0.1368\ldots$$
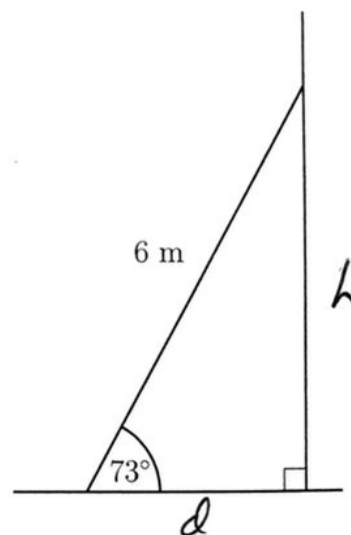
   $$P = 97.8651\ldots$$

   $$\approx 97.9°$$

9. A ladder that is 6 meters long leans against a wall making an angle to the ground of 73°, as shown in the diagram. (not drawn to scale)

   (a) Find the height of the top of the ladder above the ground.

   $$h = 6 \sin 73$$

   $$= 5.7378\ldots$$

   $$\approx 5.74 \text{ m}$$

   (b) Find the distance of the bottom of the ladder to the base of the wall.

   $$d = 6 \cos 73$$

   $$= 1.75423\ldots$$

   $$\approx 1.75 \text{ m}$$

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10. The following diagram shows a triangle ABC.   (diagram not to scale)

The area of the triangle ABC is 75 cm^2, $AB = 15$ cm, $AC = x$ cm, and $B\hat{A}C = 55°$.

(a) Find x.

$A = \frac{1}{2} 15x \sin 55 = 75$

$x = 12.20774...$

≈ 12.2 cm
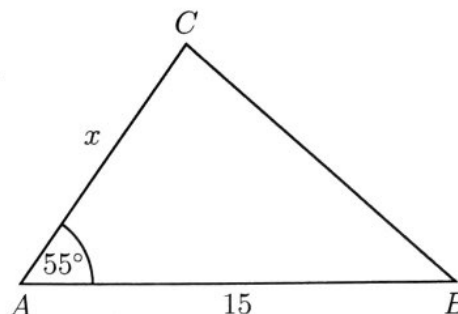
(b) Find BC.

$BC^2 = 12.2^2 + 15^2 - 2\cos 55 (12.2)(15)$

$BC = 12.8049... \approx 12.8$ cm

Diagram: triangle with vertex C at top, A at bottom left with $55°$ angle, B at bottom right. Side x from A to C, side 15 from A to B.

11. The function $T(x) = A\sin(Bx) + D$ is used to model weather for a Caribean island with x the time in months.

$D = 20$

$A = 5$