

Reflect and turn in!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: <u>11/13</u> Topic: <u>20E Problem Solving</u>	0 1 2	
Tuesday Date: <u>11/14</u> Topic: <u>Quiz 3.1 Review</u>	0 1 2	Turn in FRL forms!
Wednesday Date: <u>11/15</u> Topic: <u>Quiz 3.1 - No homework</u>	0 1 2	
Thursday Date: <u>11/16</u> Topic: <u>13A Parts of right triangles</u>	0 1 2	
Friday Date: <u>11/17</u> Topic: <u>13B Ratios of right triangles</u>	0 1 2	

Class Plan:

1. Warm-up

2. How can we use trigonometry to find missing side lengths?

3. Joke Break!

4. Practice

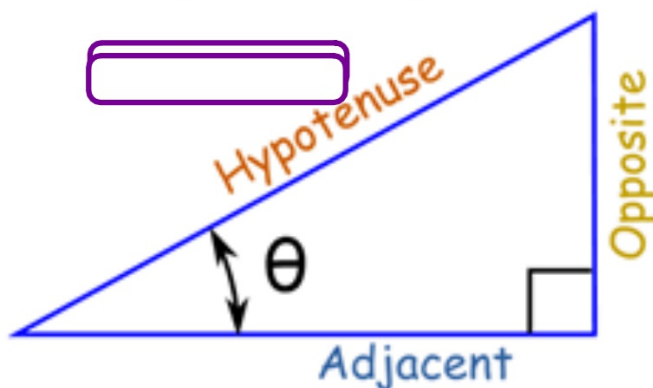
Warm-up: Right Triangle Trig Ratios

Fill in the blanks.

$$\sin \theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

$$\cos \theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\tan \theta = \frac{\text{Opposite}}{\text{Adjacent}}$$

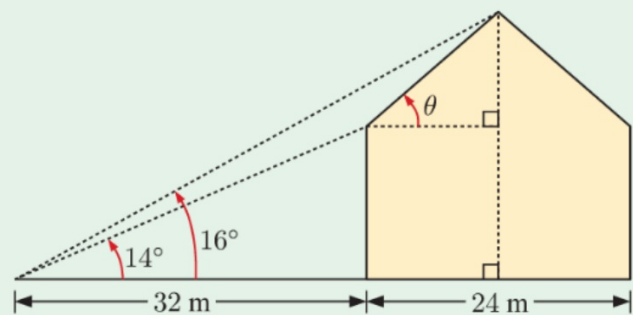


For a given angle θ each ratio stays the same
no matter how big or small the triangle is

C**FINDING SIDE LENGTHS****OPENING PROBLEM**

A group of students is asked to measure the height of the school gymnasium. It is a symmetric building 24 m wide, as shown.

From a point 32 m from the side wall, the students measure the angles of elevation to the top of the side wall, and to the top of the roof.

**Things to think about:**

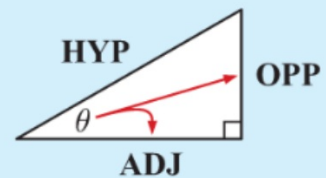
- a** How high is:
 - i** the side wall of the gymnasium
 - ii** the top of the roof?
- b** Can you find the angle θ which is the pitch of the roof?

C**FINDING SIDE LENGTHS**

Suppose we are given the angles of a right angled triangle, and the length of a side. We can use the trigonometric ratios to find the other side lengths.

In any right angled triangle with one angle θ , we have:

$$\sin \theta = \frac{\text{OPP}}{\text{HYP}}, \quad \cos \theta = \frac{\text{ADJ}}{\text{HYP}}, \quad \tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$



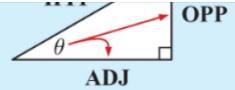
Step 1: Redraw the figure and mark on it HYP, OPP, and ADJ relative to a given angle.

Step 2: Choose an appropriate trigonometric ratio, and construct an equation.

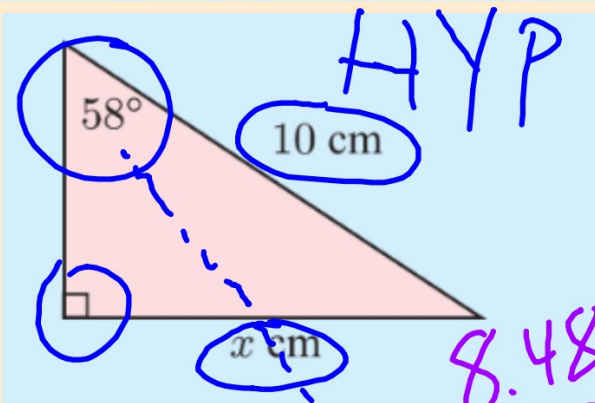
Step 3: Solve the equation to find the unknown side length.

Example:

$$\sin \theta = \frac{\text{OPP}}{\text{HYP}}, \quad \cos \theta = \frac{\text{ADJ}}{\text{HYP}}, \quad \tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$



Find x , giving your answer rounded to 2 decimal places:



$$\frac{\sin(58)}{10} = \frac{x}{10}$$

$$\sin(58) = .8480$$

$$x = 10 \cdot \sin(58)$$
$$x = 10(.8480)$$

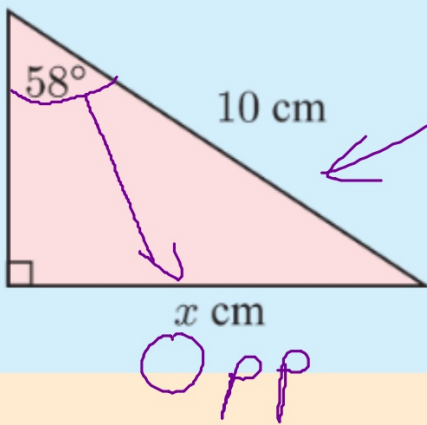
$$x = 8.48 \text{ cm}$$

Example:

$$\sin \theta = \frac{\text{OPP}}{\text{HYP}}, \quad \cos \theta = \frac{\text{ADJ}}{\text{HYP}}, \quad \tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$



Find x , giving your answer rounded to 2 decimal places:



$$\sin(58) = \frac{\text{opp}}{\text{hyp}}$$

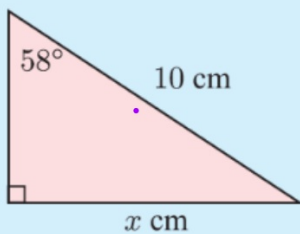
$$(10) \sin(58) = \frac{x}{10} (10)$$

$$(10) \sin(58) = x$$

$$8.48 \approx x$$

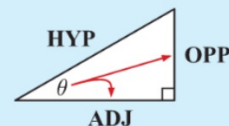
Example:

Find x , giving your answer rounded to 2 decimal places:

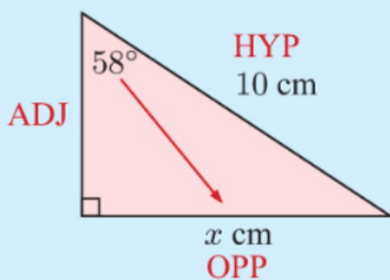


In any right angled triangle with one angle θ , we have:

$$\sin \theta = \frac{\text{OPP}}{\text{HYP}}, \quad \cos \theta = \frac{\text{ADJ}}{\text{HYP}}, \quad \tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$



The relevant sides are OPP and HYP, so we use the *sine* ratio.



$$\sin 58^\circ = \frac{x}{10} \quad \left\{ \sin \theta = \frac{\text{OPP}}{\text{HYP}} \right\}$$

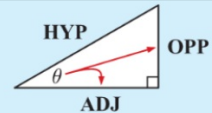
$$\therefore \sin 58^\circ \times 10 = x \quad \left\{ \text{multiplying both sides by 10} \right\}$$

$$\therefore x \approx 8.48 \quad \left\{ \text{calculator} \right\}$$

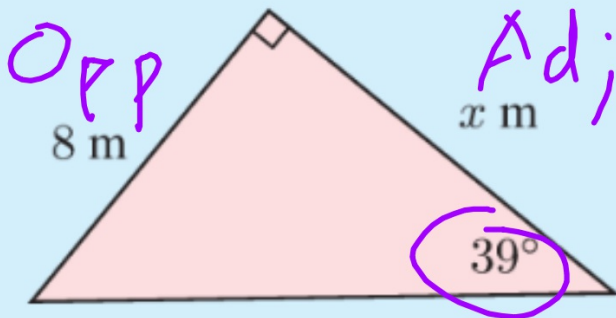
Example:

In any right angled triangle with one angle θ , we have:

$$\sin \theta = \frac{\text{OPP}}{\text{HYP}}, \quad \cos \theta = \frac{\text{ADJ}}{\text{HYP}}, \quad \tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$



Find x , giving your answer rounded to 2 decimal places:



$$\tan(\theta) = \frac{\text{OPP}}{\text{ADJ}}$$

$$\tan(39) = \frac{8}{x}$$

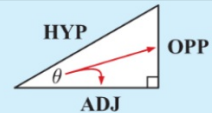
$$\frac{8}{.809} = \frac{.809x}{.809} \text{ m}$$
$$\boxed{9.88 = x}$$

$$.809 = x \frac{8}{x}$$

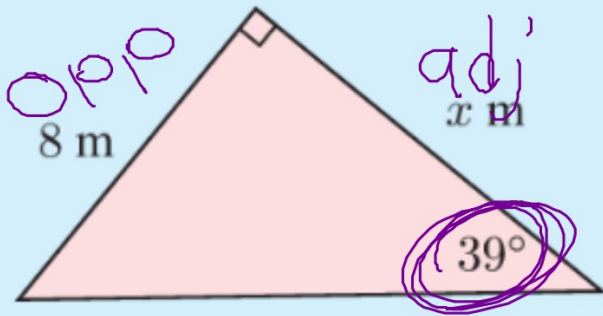
Example:

In any right angled triangle with one angle θ , we have:

$$\sin \theta = \frac{\text{OPP}}{\text{HYP}}, \quad \cos \theta = \frac{\text{ADJ}}{\text{HYP}}, \quad \tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$



Find x , giving your answer rounded to 2 decimal places:



$$\tan 39 = \frac{\text{opp}}{\text{adj}}$$

$$\frac{\tan 39 \cdot 8}{\tan 39} = \frac{8}{x}$$

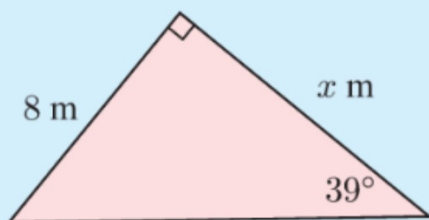
$$\frac{8}{3} = \frac{x \cdot 3}{3}$$

$$\frac{8}{3} = x$$

$$\frac{8}{\tan 39} = x \approx \boxed{9.88 \text{ m}}$$

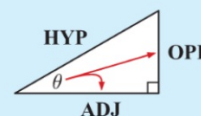
Example:

Find x , giving your answer rounded to 2 decimal places:

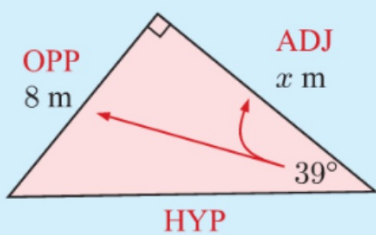


In any right angled triangle with one angle θ , we have:

$$\sin \theta = \frac{\text{OPP}}{\text{HYP}}, \quad \cos \theta = \frac{\text{ADJ}}{\text{HYP}}, \quad \tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$



The relevant sides are OPP and ADJ, so we use the *tangent* ratio.



$$\tan 39^\circ = \frac{8}{x} \quad \left\{ \tan \theta = \frac{\text{OPP}}{\text{ADJ}} \right\}$$

$$\therefore x \times \tan 39^\circ = 8 \quad \left\{ \text{multiplying both sides by } x \right\}$$

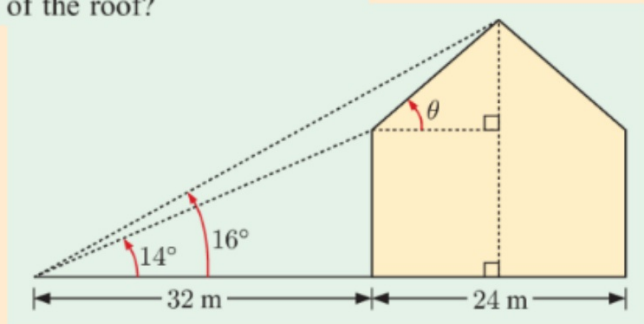
$$\therefore x = \frac{8}{\tan 39^\circ} \quad \left\{ \text{dividing both sides by } \tan 39^\circ \right\}$$

$$\therefore x \approx 9.88 \quad \left\{ \text{calculator} \right\}$$

Example: Real Life Application

Things to think about:

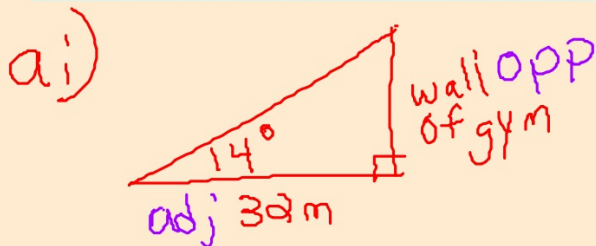
- a** How high is:
- i** the side wall of the gymnasium
 - ii** the top of the roof?
- b** Can you find the angle θ which is the pitch of the roof?



Example: Real Life Application

Things to think about:

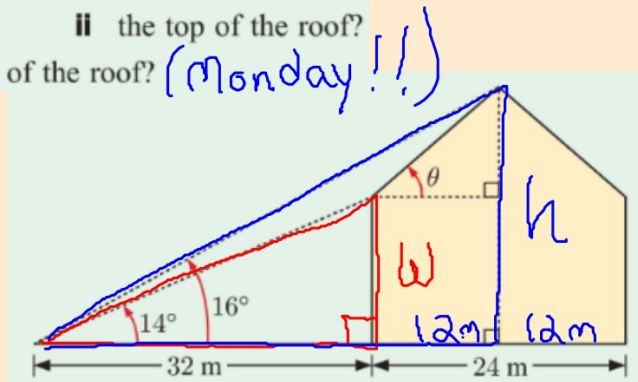
- a How high is:
- i the side wall of the gymnasium
 - ii the top of the roof?
- b Can you find the angle θ which is the pitch of the roof? (Monday!!)



$$\tan 14 = \frac{w}{32}$$

$$w = 32 \tan 14$$

$$w \approx 7.98 \text{ meters}$$



$$\tan 16 = \frac{h}{12}$$

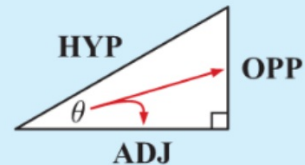
$$h = 12 \tan 16$$

$$h \approx 3.26 \text{ meters}$$

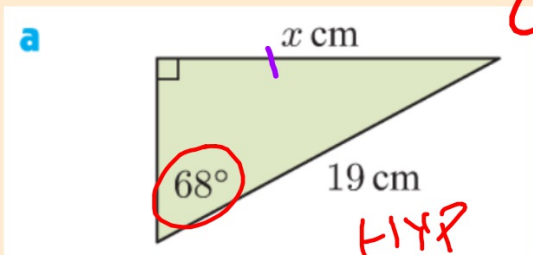
C**FINDING SIDE LENGTHS****Exercises...****13C p.257 #2 (a-i)**

In any right angled triangle with one angle θ , we have:

$$\sin \theta = \frac{\text{OPP}}{\text{HYP}}, \quad \cos \theta = \frac{\text{ADJ}}{\text{HYP}}, \quad \tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$



- Step 1:* Redraw the figure and mark on it HYP, OPP, and ADJ relative to a given angle.
- Step 2:* Choose an appropriate trigonometric ratio, and construct an equation.
- Step 3:* Solve the equation to find the unknown side length.



OPP

HYP

$$\sin(\theta) = \frac{\text{OPP}}{\text{HYP}}$$

$$\sin(68) = \frac{x}{19}$$

$$\frac{.927}{1} \times \frac{x}{19}$$

$$\sin(68) = \frac{x}{19}$$

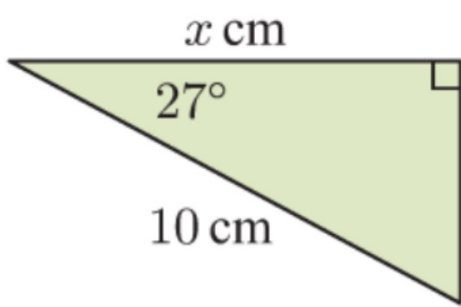
$$1x = 19 \cdot \sin(68)$$

$$x = 17.61$$

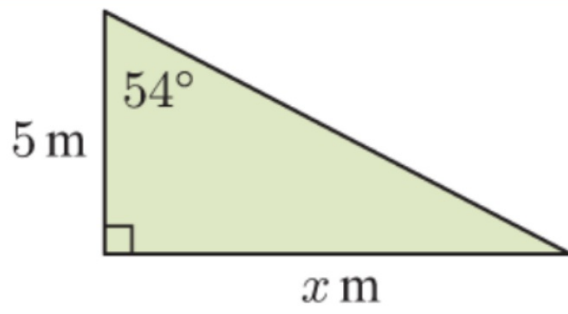
$$1x = .927(19)$$

$$x = 17.61 \text{ cm}$$

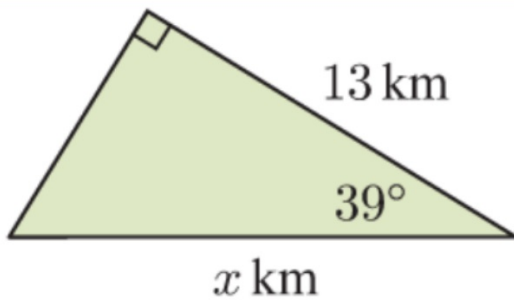
b



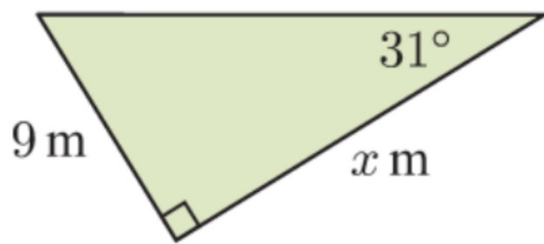
c



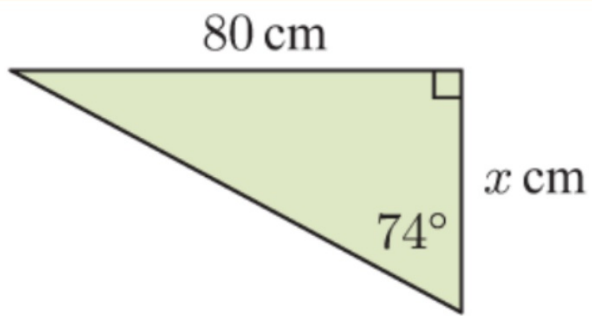
d



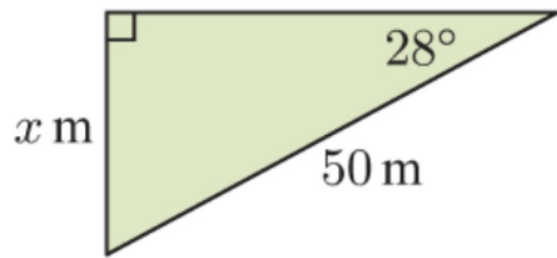
e



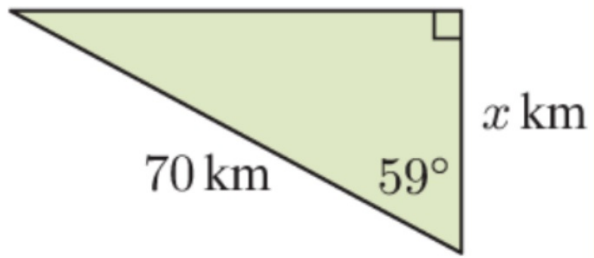
f



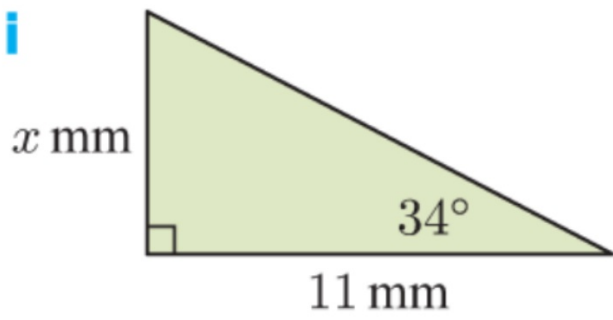
g



h

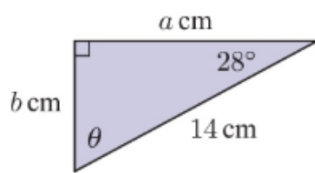


i

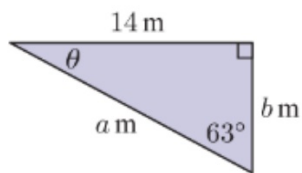


3 Find, to 1 decimal place, *all* unknown angles and sides:

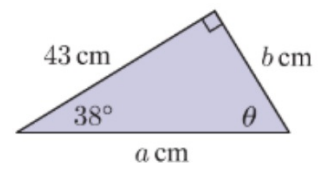
a



b



c



SOLUTIONS

EXERCISE 13C

- 1**
- | | | |
|--|--|--|
| a $\sin 65^\circ = \frac{x}{a}$ | b $\cos 32^\circ = \frac{x}{b}$ | c $\tan 56^\circ = \frac{x}{c}$ |
| d $\cos 37^\circ = \frac{d}{x}$ | e $\tan 49^\circ = \frac{e}{x}$ | f $\tan 73^\circ = \frac{f}{x}$ |
| g $\sin 54^\circ = \frac{g}{x}$ | h $\tan 27^\circ = \frac{x}{h}$ | i $\cos 59^\circ = \frac{i}{x}$ |
- 2**
- | | | |
|----------------------------|----------------------------|----------------------------|
| a $x \approx 17.62$ | b $x \approx 8.91$ | c $x \approx 6.88$ |
| d $x \approx 16.73$ | e $x \approx 14.98$ | f $x \approx 22.94$ |
| g $x \approx 23.47$ | h $x \approx 36.05$ | i $x \approx 7.42$ |
| j $x \approx 13.77$ | k $x \approx 13.07$ | l $x \approx 20.78$ |
- 3**
- | |
|--|
| a $\theta = 62^\circ, a \approx 12.4, b \approx 6.6$ |
| b $\theta = 27^\circ, a \approx 15.7, b \approx 7.1$ |
| c $\theta = 52^\circ, a \approx 54.6, b \approx 33.6$ |

C

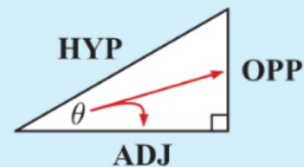
FINDING SIDE LENGTHS

Additional Practice...

13C p.257 #1(g-i), 3

In any right angled triangle with one angle θ , we have:

$$\sin \theta = \frac{\text{OPP}}{\text{HYP}}, \quad \cos \theta = \frac{\text{ADJ}}{\text{HYP}}, \quad \tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$



(Use technology or print outs
to access exercises)

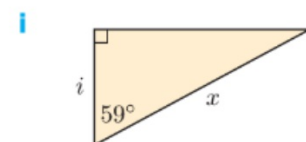
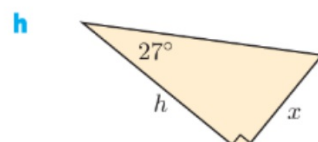
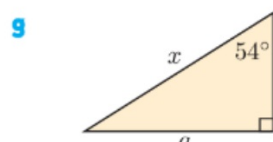
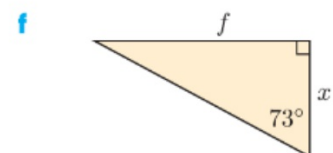
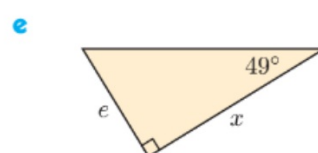
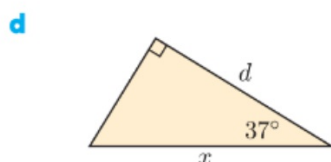
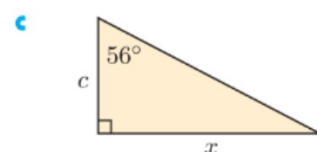
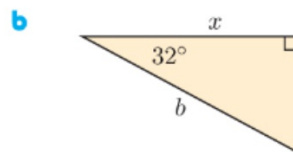
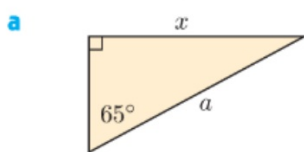
Exercises...

Additional Practice...

13C p.257 #1(g-i), 3

EXERCISE 13C

1 Write down a trigonometric equation connecting the angle and the sides given:



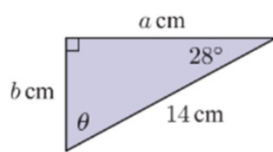
Exercises...

Additional Practice...

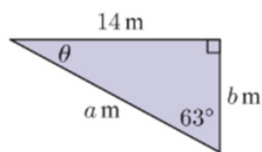
13C p.257 #1(g-i), 3

3 Find, to 1 decimal place, *all* unknown angles and sides:

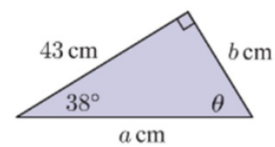
a



b



c



13C p.257 #1(g-i), 2 (a-c,g-i), 3 SOLUTIONS

EXERCISE 13C

- | | | | |
|----------|--|--|--|
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