03-06-26 MTH 111

3.3 Graphs with Intercepts-optional

3.3 Exercise Set, page 373 (355): 10,16

3.4 Understand Slope of a Line-optional

3.4 Exercise Set, page 409 (391): 1, 3, 9, 10, 13, 19, 28

3.5 Use the Slope-Intercept Form of an Equation of a Line-optional

3.5 Exercise Set, page 451 (433): 1, 4, 7, 9, 25, 29, 37, 42, 44

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5. Trigonometry

5.1 Use Properties of Angles, Triangles, and the Pythagorean and Theorem

5.1 Exercise Set, page 612 (594): 1, 5, 7, 9, 13, 15, 22

5.2 Applications: Sine, Cosine and Tangent Ratios

5.2 Exercise Set, page 640 (622): 1, 5, 7, 11, 15, 16, 19, 26

I will supply supplementary material about converting between decimal degrees and DMS notation.

Exam 2, Friday, 03/13/26

3.1 - 3.5

3.3: 17

In the following exercises, find the intercepts for each equation.

17. $y = \frac{1}{5}x + 2$

y-intercept = $\boxed{2}$ or the point $(0, 2)$

set $x = 0$, solve for y

$y = \left(\frac{1}{5}\right)(0) + 2 = \boxed{2}$

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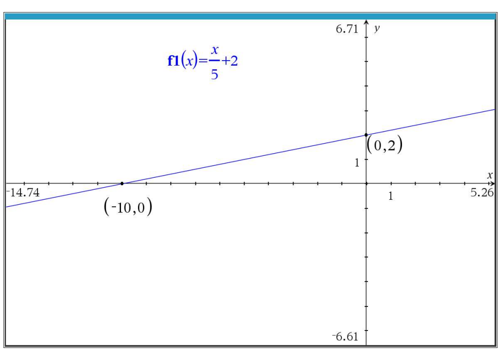
set $y = 0$, solve for x

$0 = \frac{x}{5} + 2$

$\frac{x}{5} = -2$

$x = -10$ or the point $(-10, 0)$



3.5: 42

In the following exercises, use slopes and y-intercepts to determine if the lines are perpendicular.

42. $x - 4y = 8; 4x + y = 2$

rewrite each equation in the form y = mx +b

$x - 4y = 8$

$x - 4y + 4y = 8 + 4y$

$x + (-4y + 4y) = 8 + 4y$

$x + (0) = 8 + 4y$

$x - 4y = 8$

$4y = x - 8$

$\boxed{y = \frac{x}{4} - 2}$

$x + (-4y + 4y) = 8 + 4y$

$x + (0) = 8 + 4y$

$x = 8 + 4y$

$4y + 8 = x$

$4y = x - 8$

$y = \frac{x}{4} - \frac{8}{4}$

$\boxed{y = \frac{x}{4} - 2}$

$\boxed{y = \frac{x}{4} - 2}$

slope $= m_1 = \frac{1}{4}$

y-int $= -2$

$4x + y = 2$

$\boxed{y = -4x + 2}$

$m_2 = -4$

y-int $= 2$

supplied $m_1 m_2 = \left(\frac{1}{4}\right)(-4) = \left(\frac{1}{4}\right)\left(-\frac{4}{1}\right) = -\frac{(1)(4)}{(4)(1)} = \boxed{-1}$

$\therefore$ lines are $\perp$ (perpendicular)

5.1

An angle is formed by two rays that share a common endpoint. Each ray is called a side of the angle and the common endpoint is called the vertex. An angle is named by its vertex. In (Figure 2), $\angle A$ is the angle with vertex at point A. The measure of $\angle A$ is written $m\angle A$.
$\angle A$ is the angle with vertex at point A.

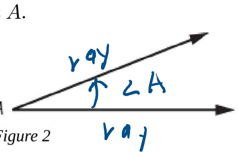


Figure 2

Memorize

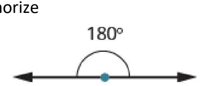


Figure 1

180 degrees = straight angle

Memorize: Two angles are supplementary if they add up to 180°

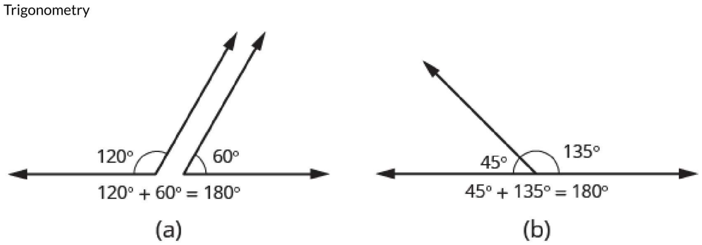


Figure 3

Memorize

Definition: Two angles are complementary, if they add up to 90°

An angle of 90° is called a right angle

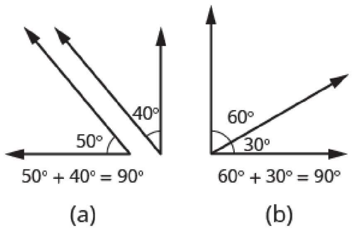


Figure 4

Memorize

The triangle in (Figure 5) is called ΔABC, read 'triangle ABC'

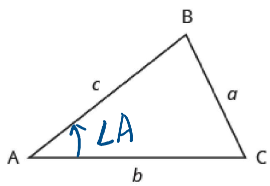


Figure 5

A = vertex

$\angle A$ = angle at A

a = length of side opposite $\angle A$

Memorize

Sum of the Measures of the Angles of a Triangle
For any ΔABC, the sum of the measures of the angles is $180°$. $m\angle A + m\angle B + m\angle C = 180°$

Memorize A triangle with a 90° is called a right triangle.

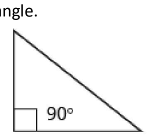
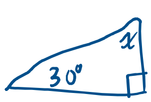


Figure 6



Find x

$x + 30^0 = 90^0$

$x = 90^0 - 30^0$

$\boxed{x = 60^0}$

textbook method

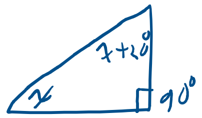
$x + 30^0 + 90^0 = 180^0$

$x = 180^0 - 30^0 - 90^0$

$x = 180^0 - 120^0$

$\boxed{x = 60^0}$

The measure of one angle of a right triangle is $20°$ more than the measure of the smallest angle. Find the measures of all three angles.



Let x = one angle

Then $x+20^\circ$ = 2nd angle

90° = right angle (3rd angle)

$$x + (x + 20^\circ) = 90^\circ$$

$$2x + 20^\circ = 90^\circ$$

$$2x = 70^\circ$$

$$\boxed{x = 35^\circ}$$

$$\boxed{x+20^\circ = 35^\circ + 20^\circ = 55^\circ}$$

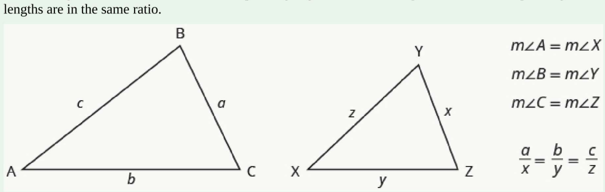
$$\boxed{\text{3rd angle} = 90^\circ}$$

$m\angle A$ or $\angle A$

Memorize

Properties of Similar Triangles

If two triangles are similar, then their corresponding angle measures are equal and their corresponding side lengths are in the same ratio.



$m\angle A = m\angle X$

$m\angle B = m\angle Y$

$m\angle C = m\angle Z$

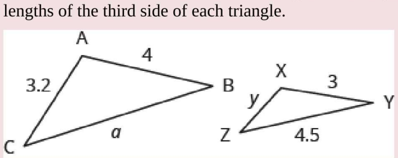
$$\frac{a}{x} = \frac{b}{y} = \frac{c}{z}$$

$$\frac{a}{x} = \frac{b}{y} = \frac{c}{z}$$

$$\frac{a}{b} = \frac{x}{y}$$

EXAMPLE 6

ΔABC and ΔXYZ are similar triangles. The lengths of two sides of each triangle are shown. Find the lengths of the third side of each triangle.



Solution

$$\frac{a}{4} = \frac{4.5}{3}$$

$$a = \frac{4(4.5)}{3} = 4(1.5)$$

$$\frac{a}{4.5} = \frac{4}{3}$$

$$a = \frac{(4)(4.5)}{3}$$

$$a = \frac{4(4.5)}{3} = 4(1.5)$$

$$\boxed{a = 4.2}$$

$$a = \frac{(4)(4.5)}{3}$$

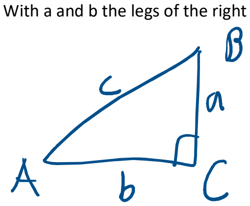
$$\boxed{a = 4.2}$$

Memorize

The Pythagorean Theorem

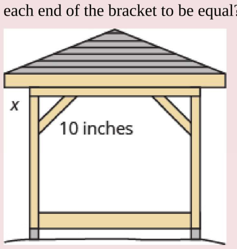
In any right triangle ΔABC,
$a^2 + b^2 = c^2$

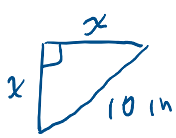
With a and b the legs of the right triangle and c the hypotenuse.



The converse is also true.
If a, b, and c are the lengths of the sides of a triangle, and $a^2 + b^2 = c^2$,
Then the triangle is a right triangle.

Kelvin is building a gazebo and wants to brace each corner by placing a 10-inch wooden bracket diagonally as shown. How far below the corner should he fasten the bracket if he wants the distances from the corner to each end of the bracket to be equal? Approximate to the nearest tenth of an inch.





$$2x^2 = (10 \text{ in})^2$$

$$x^2 = \frac{100 \text{ in}^2}{2}$$

$$x^2 = 50 \text{ in}^2$$

$$x = \sqrt{50 \text{ in}^2}$$

$$x = \sqrt{50}\sqrt{\text{in}^2}$$

$$x = \sqrt{25 \cdot 2} \text{ in}$$

$$x = \sqrt{25}\sqrt{2} \text{ in}$$

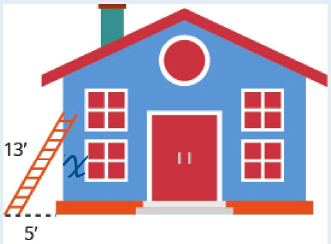
$$x = \boxed{5\sqrt{2} \text{ in} \approx 7.1 \text{ in}}$$

$$\sqrt{ab} = \sqrt{a}\sqrt{b}$$

5*sqrt(2)=7.071067811865475

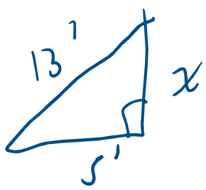
TRY IT 9

John puts the base of a 13-ft ladder 5 feet from the wall of his house. How far up the wall does the ladder reach?



Show answer
12 feet

Let x = distance from top of ladder to the base of the house



$$x^2 + (5\ ft)^2 = (13\ ft)^2$$
$$x^2 = 169\ ft^2 - 25\ ft^2$$
$$x^2 = (169 - 25)\ ft^2$$
$$x^2 = 144\ ft^2$$
$$x = \sqrt{144}\sqrt{ft^2}$$
$$\boxed{x = 12\ ft}$$

1 ← 26^2 → 1 ← 676

47^2 → 11 + 11 = 2 + 2 = 4
2209 → 4

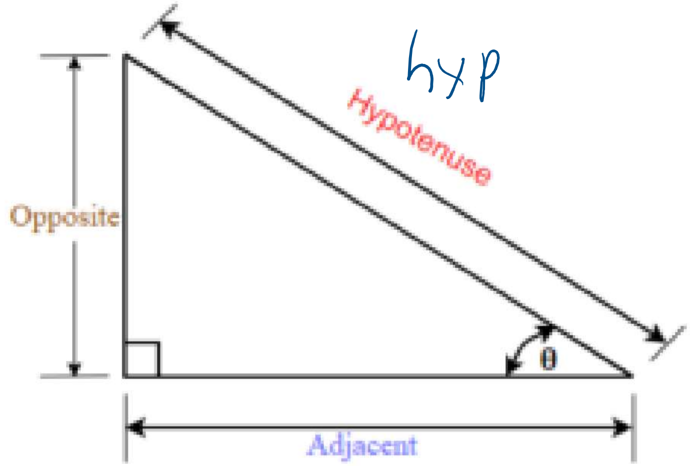
check 169 → 7
− 25 → − 7
144 → 0 = 0

5.2

5.2

hyp

opp



Adj

Memorize

Three Basic Trigonometric Ratios

- sine $\theta = \dfrac{\text{the length of the opposite side}}{\text{the length of the hypotenuse side}}$
- cosine $\theta = \dfrac{\text{the length of the adjacent side}}{\text{the length of the hypotenuse side}}$
- tangent $\theta = \dfrac{\text{the length of the opposite side}}{\text{the length of the adjacent side}}$

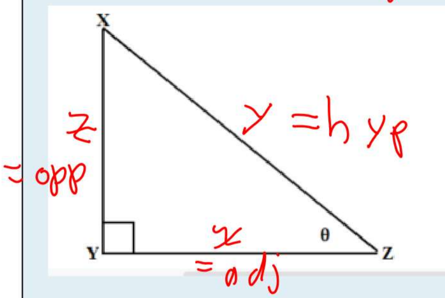
Where θ is the measure of a reference angle measured in degrees.

- $\sin\theta = \dfrac{\text{opp}}{\text{hyp}}$
- $\cos\theta = \dfrac{\text{adj}}{\text{hyp}}$
- $\tan\theta = \dfrac{\text{opp}}{\text{adj}}$

SOH CAH TOA

TRY IT 2

For the given triangle find the sine, cosine, and tangent ratio.



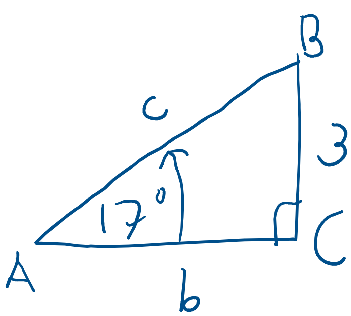
$\theta = \angle Z$

Show answer

$\sin\theta = \frac{z}{y}$

$\cos\theta = \frac{x}{y}$

$\tan\theta = \frac{z}{x}$



$\sin\theta = \frac{opp}{hyp}$

$\cos\theta = \frac{adj}{hyp}$

$\tan\theta = \frac{opp}{adj}$

Find $b, c, \angle B$

$\angle B = 90^\circ - 17^\circ$

$\boxed{\angle B = 73^\circ}$

$\sin 17^\circ = \frac{opp}{hyp} = \frac{3}{c}$

$c \sin 17^\circ = 3$

$c = \frac{3}{\sin 17^\circ}$

```
3/sin(17)
                10.26091086
```

$\boxed{c \approx 10.3}$

$$\boxed{c \approx 10.3}$$

Pyth Thm

$$b^2 + 3^2 = c^2$$

$$b^2 = 10.3^2 - 9$$

$$b = \sqrt{10.3^2 - 9}$$

```
√(10.3^2-9)
                9.8534258
```

$$\boxed{b \approx 9.9}$$

$$\tan(17^\circ) = \frac{opp}{adj} = \frac{3}{b}$$

$$b\tan(17^\circ) = 3$$

$$b = \frac{3}{\tan(17^\circ)}$$

```
3/tan(17)
                9.812557855
```

$$\boxed{b \approx 9.8}$$