

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.

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6. Health Option

6.1 Measurement; Health Applications

6.1 Exercise Set, page 663 (645): 1, 3, 5, 8, 14, 17, 19,

6.2 Ratio, rate, and percent; Health Applications

6.2 Exercise Set, page 680 (662): 1, 6, 10, 11, 18, 20, 21

I will provide supplementary material about computing values in direct, indirect, and inverse variation.

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Exam 2		stem & leaf	
50.7857	mean		A-0
1			
19.0714	st.dev		B - 1
4			
52	media n	8 2	C - 2
12	min	7 24	D -1
82	max	6 5	F - 10
14	count	5 558	
		4 249	
		3 229	
6 class meetings before final exam			
12 textbook sections + supplementary materials			
2-3 sections per class			

Exam 1		stem & leaf	
65.9375	mean		A-0
13.66001	st.dev		B - 2
71	median	8 14	C - 7
39	min	7 0225599	D -2
84	max	6 13	F - 5
16	count	5 134	
		4 7	
		3 9	

*Memorize*

DD = decimal degree

DMS = degree-minute-second

$360^\circ = 1 \text{ revolution}$

$1^\circ = 60' = 60 \text{ minutes} \Leftrightarrow 1' = \left(\frac{1}{60}\right)^\circ$

$1' = 60'' = 60 \text{ seconds} \Leftrightarrow 1'' = \left(\frac{1}{60}\right)' = \left(\frac{1}{3600}\right)^\circ$

$25^\circ 30' 10''$  convert to DD

$$\begin{aligned}
 & 25^\circ 30' 10'' \text{ convert to DD} \\
 & = 25^\circ + 30' + 10'' \\
 & = 25^\circ + 30\left(\frac{1}{60}\right)^\circ + 10\left(\frac{1}{3600}\right)^\circ \\
 & = 25^\circ + \left(\frac{1}{2}\right)^\circ + \left(\frac{1}{360}\right)^\circ \\
 & = 25^\circ + .5^\circ + 0.0028^\circ \\
 & = \boxed{25.5028^\circ}
 \end{aligned}$$

1/360=0.0028

Convert  $35.47^\circ$  to DMS

$$\begin{aligned}
 35.47^\circ & = 35^\circ + .47^\circ \\
 & = 35^\circ + (.47)(60') \\
 & = 35^\circ + 28.2' \\
 & = 35^\circ + 28' + .2' \\
 & = 35^\circ + 28' + 12'' \\
 & = \boxed{35^\circ 28' 12''}
 \end{aligned}$$

0.47\*60=28.2

(.2)(60'')  
= 12.0''

6.1

memorize ✓

#### Imperial System of Measurement

Length	<ul style="list-style-type: none"> <li>✓ 1 foot (ft.) = 12 inches (in.)</li> <li>✓ 1 yard (yd.) = 3 feet (ft.)</li> <li>1 mile (mi.) = 5,280 feet (ft.)</li> </ul>	Volume	<ul style="list-style-type: none"> <li>3 teaspoons (t) = 1 tablespoon (T)</li> <li>16 tablespoons (T) = 1 cup (C)</li> <li>1 cup (C) = 8 fluid ounces (fl. oz.)</li> <li>1 pint (pt.) = 2 cups (C)</li> <li>1 quart (qt.) = 2 pints (pt.)</li> <li>1 gallon (gal) = 4 quarts (qt.)</li> </ul>
Weight	<ul style="list-style-type: none"> <li>✓ 1 pound (lb.) = 16 ounces (oz.)</li> <li>✓ 1 ton = 2000 pounds (lb.)</li> </ul>	Time	<ul style="list-style-type: none"> <li>✓ 1 minute (min) = 60 seconds (sec)</li> <li>✓ 1 hour (hr) = 60 minutes (min)</li> <li>✓ 1 day = 24 hours (hr)</li> <li>✓ 1 week (wk) = 7 days</li> </ul>

Weight	✓ 1 pound (lb.) = 16 ounces (oz.) ✓ 1 ton = 2000 pounds (lb.)	Time	✓ 1 hour (hr) = 60 minutes (min) ✓ 1 day = 24 hours (hr) ✓ 1 week (wk) = 7 days ✓ 1 year (yr) = 365 days
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Memorize

Identity Property of Multiplication

For any real number  $a$ :

$a \cdot 1 = a$

$1 \cdot a = a$

1 is the **multiplicative identity**.

Memorize

HOW TO: Make unit conversions

1. Multiply the measurement to be converted by 1; write 1 as a fraction relating the units given and the units needed.
2. Multiply.
3. Simplify the fraction.
4. Simplify.

**Metric System of Measurement**

Length	Mass	Capacity
1 kilometre (km) = 1,000 m	1 kilogram (kg) = 1,000 g	1 kilolitre (kL) = 1,000 L
1 hectometre (hm) = 100 m	1 hectogram (hg) = 100 g	1 hectolitre (hL) = 100 L
1 dekametre (dam) = 10 m	1 dekagram (dag) = 10 g	1 dekalitre (daL) = 10 L
1 metre (m) = 1 m	1 gram (g) = 1 g	1 litre (L) = 1 L
1 decimetre (dm) = 0.1 m	1 decigram (dg) = 0.1 g	1 decilitre (dL) = 0.1 L
✓ 1 centimetre (cm) = 0.01 m	1 centigram (cg) = 0.01 g	1 centilitre (cL) = 0.01 L
✓ 1 millimetre (mm) = 0.001 m	1 milligram (mg) = 0.001 g	1 millilitre (mL) = 0.001 L
	1 microgram (mcg) = 0.000001 g	
1 metre = 100 centimetres	1 gram = 100 centigrams	1 litre = 100 centilitre s
1 metre = 1,000 millimetres	1 gram = 1,000 milligrams	1 litre = 1,000 millilitre s

memorize

$$\begin{aligned} \text{kilo} &= 1000 \\ \text{centi} &= \frac{1}{100} \\ \text{milli} &= \frac{1}{1000} \end{aligned}$$

Length = meter  
 Mass (weight?) = gram  
 Capacity (volume) = liter

$$20 \text{ quiz} + 0.2 (\text{high exam score}) + 0.6 (\text{final exam score})$$

$$\begin{aligned} A &= 89.5 - 100 \\ B &= 79.5 - 89.4 \\ C &= 69.5 - 79.4 \\ D &= 59.5 - 69.4 \end{aligned}$$

Plug in your high score of exam 1 and exam 2.  
 Test different final exam scores to find your total course score.

supplied .

#### Conversion Factors Between Imperial and Metric Systems

Length	Mass	Capacity
1 in. = 2.54 cm	1 lb. = 0.45 kg	1 qt. = 0.95 L
1 ft. = 0.305 m	1 oz. = 28 g	1 fl. oz. = 30 mL
1 yd. = 0.914 m	1 kg = 2.2 lb.	1 L = 1.06 qt.
1 mi. = 1.61 km		
1 m = 3.28 ft.		

Supplied, unless I ask you to derive these.

### Temperature Conversion

To convert from Fahrenheit temperature,  $F$ , to Celsius temperature,  $C$ , use the formula

$$C = \frac{5}{9}(F - 32).$$

To convert from Celsius temperature,  $C$ , to Fahrenheit temperature,  $F$ , use the formula

$$F = \frac{9}{5}C + 32.$$

## 6.2

### Memorize

#### Ratios

*not precise*

A ratio compares two numbers or two quantities that are measured with the same unit. The ratio of  $a$  to  $b$  is written  $a$  to  $b$ ,  $\frac{a}{b}$ , or  $a:b$ .

Definition: a ratio is the comparison of two quantities by division.

### Memorize

#### Unit Rate

A unit rate is a rate with denominator of 1 unit.

$$\frac{6 \text{ beats}}{5 \text{ sec}} = \frac{\frac{6}{5} \text{ beats}}{1 \text{ sec}} = \frac{1.2 \text{ beats}}{\text{sec}}$$
  
$$\begin{array}{r} 1.2 \\ 5 \overline{) 6.0} \\ \underline{5} \phantom{0} \\ 10 \phantom{0} \\ \underline{10} \\ 0 \end{array}$$

Topic

6.2 Ratio, Rate, and Percent, Health Applications 653

#### EXAMPLE 4

Marta had 74 heartbeats in 8 minutes. What is Marta's heartbeat rate?

#### Solution

Start with a rate of heartbeats to minutes. Then divide.	74 heartbeats in 8 minutes
Write as a rate.	$\frac{74}{8 \text{ minutes}}$
Divide the numerator by the denominator.	$\frac{74}{8} = 9.25$ <i>37</i>

## EXAMPLE 4

Marta had 74 heartbeats in 8 minutes. What is Marta's heartbeat rate?

**Solution**

Start with a rate of heartbeats to minutes. Then divide.	74 heartbeats in 8 minutes
Write as a rate.	$\frac{74}{8 \text{ minutes}}$
Divide the numerator by the denominator.	$\frac{2}{1 \text{ minute}}$ $\frac{37}{4 \text{ min}}$
Rewrite as a rate.	2/minute

Marta's heartbeat rate is 2 per minute.

$$\frac{37}{4} \text{ min} \approx \frac{36}{4} = 9 \text{ beats per minute}$$

## Percent

A percent is a ratio whose denominator is 100.

Memorize  $\% = \frac{1}{100} = 0.01$

$$\Leftrightarrow 100\% = 1$$

convert 10% to a decimal  
 $= 10(0.01) = 0.1$

convert 10% to a fraction (ratio)

$$10\% = 10\left(\frac{1}{100}\right) = \frac{10}{100} = \frac{1}{10}$$

What percent of 80 is 6?

$$x\% \cdot 80 = 6$$

$$x(0.01)(80) = 6$$

$$x(0.01)(80) = 6$$

$$x(.8) = 6$$

$$x = \frac{6}{.8} = \frac{6}{\frac{8}{10}}$$

invert  
and multiply

$$= (6)\left(\frac{10}{8}\right) = \frac{\cancel{2}(3)(10)}{\cancel{2}(4)} = \frac{3(10)}{4} = \frac{3(5)\cancel{2}}{\cancel{2}\cancel{2}}$$

$$= \frac{15}{2} = \boxed{7.5}$$

7

6 is 7.5% of 80

### TRY IT 11

Convert the fraction to a percent:

According to the Canadian Census 2016, about  $\frac{33}{50}$  people within the population of Canada are between the ages of 15 and 64.

Show answer

66.6%, or  $11\frac{6}{25}\%$  ?

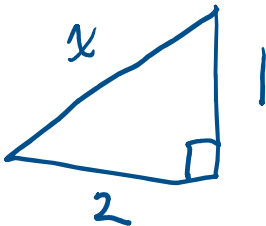
66%

$$\frac{33}{50} = \frac{(33)(2)}{(50)(2)} = \frac{66}{100} = 66\left(\frac{1}{100}\right) = 66\%$$

Your Name MTH 111 Quiz 3

write each problem. Calculator needed.

1.

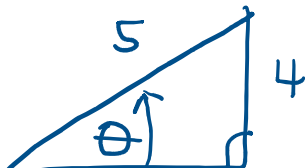


Solve for x exactly. Then, round to the nearest hundredth.

$$x^2 = 2^2 + 1^2 = 4 + 1 = 5$$

$$\boxed{x = \sqrt{5} \approx 2.24}$$

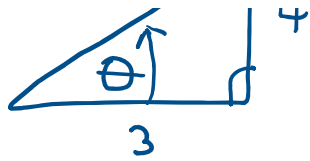
2.



Calculate  $\sin(\theta)$ .

Sqrt(5)=2.23606797749979

$$\sin(\theta) = \frac{\text{opp}}{\text{hyp}} = \frac{4}{5}$$

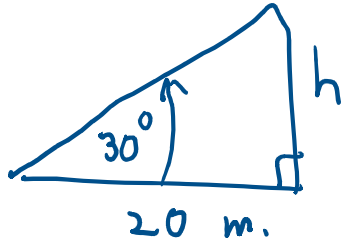


$$\sin(\theta) = \frac{\text{opp}}{\text{hyp}} = \boxed{\frac{4}{5}}$$

3. For the above triangle, calculate  $\tan(\theta)$ .

$$\tan(\theta) = \frac{\text{opp}}{\text{adj}} = \boxed{\frac{4}{3}}$$

4.



Find the height  $h$ .

$$\tan 30^\circ = \frac{\text{opp}}{\text{adj}} = \frac{h}{20 \text{ m}}$$

$$h = (20 \text{ m})(\tan 30^\circ)$$

$$\boxed{h \approx 11.55 \text{ m}}$$

5. Convert 8 inches to feet.

$$\begin{aligned} 8 \text{ in} &= (8 \text{ in})(1) \\ &= (8 \cancel{\text{in}}) \left( \frac{\text{ft}}{12 \cancel{\text{in}}} \right) \end{aligned}$$

$$= \left( \frac{8}{12} \right) \text{ ft} = \left( \frac{2}{3} \right) \text{ ft}$$

$$\approx 0.67 \text{ ft} = 0.\overline{66} \text{ ft}$$

$$12 \text{ in} = 1 \text{ ft}$$

$$1 = \frac{12 \text{ in}}{\text{ft}}$$

$$1 = \frac{\text{ft}}{12 \text{ in}}$$

7. What is 6% of 50?

$$x = 6 \left( \frac{1}{100} \right) 50$$

$$= 6 \left( \frac{50}{100} \right)$$

$$= 6 \left( \frac{1}{2} \right)$$

$$\boxed{3}$$

3 is 6% of 50

$$x = 3$$

3 is 6% of 50

8. How many millimeters are in 1 kilometer?

$$1 \text{ m} = 1000 \text{ mm}$$

$$1 \text{ km} = 1000 \text{ m}$$

$$1 \text{ km} \left( \frac{1000 \text{ m}}{\text{km}} \right) \left( \frac{1000 \text{ mm}}{\text{m}} \right)$$

$$= (1000)(1000) \text{ mm}$$

$$= \boxed{1,000,000 \text{ mm}}$$

$$\frac{3}{11}$$

$$3/11=0.2727$$

$$= 0.2\overline{727}$$

$$= 0.2\overline{727} (1)$$

$$= 0.2\overline{727} (100\%)$$

$$= 27.\overline{27} \%$$

$$\approx 30\%$$