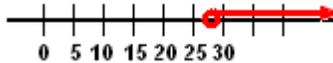MR1   Solve and Graph:

$$x - 3 > 25$$

First, add 3.

$$x > 28$$

Graph:

Leave circle open, since inequality has greater than symbol.

MR2   True or False?:

Multiply by common denominator to clear fractions and simplify problem.

$$-\frac{2}{3} > -\frac{5}{6}$$

$$(-6)-\frac{2}{3} > -\frac{5}{6}(-6)$$

$$4 < 5 \qquad \text{True.}$$

MR3   Write as single inequality:

$$3x > 8 \text{ and } 5x + y > 40$$

$$
\begin{aligned}
5x + y &> 40 \\
+\quad 3x &> 8 \\
\hline
8x + y &> 48
\end{aligned}
$$

MR4   Add:

$$\frac{1}{3} + \frac{3}{5}$$

Must find a common denominator.

$$\frac{1}{3} + \frac{3}{5}$$

$$\frac{5}{15} + \frac{9}{15}$$

$$\frac{14}{15}$$

MR 5   In a marching band of 275 members, 36% have been in the band for 3 years or more. How many students have been in the band less than 3 years?

36% in band ≥ 3 years

64% in band < 3 years

What is 64% of 275?

$$\frac{is}{of} = \frac{\%}{100} \qquad \frac{X}{275} = \frac{64}{100}$$

(275)(64) = 100x

x = 176 students

MR6   If the water in a lake rose from 40 feet to 48 feet, what is the percent of increase?

What percent of 40 feet is 8 feet?
(8 feet is amount of change)

$$\frac{change}{original} \times 100$$

$$\frac{8}{40} \times 100 = 20\%$$

MR 7   Tom gave his friend Bob 60 of his baseball cards, which is 15% of Tom's collection. How many cards did Tom have in his collection?

Rephrase: 60 is 15% of what?

$$\frac{is}{of} = \frac{\%}{100} \qquad \frac{60}{x} = \frac{15}{100}$$

$$(60)(100) = 15x$$

$$x = 400$$

MR 8   How much money would someone have to invest at the rate of 7 percent interest per year to have $4,547.50 at the end of the year?

$$x \quad + \quad .07x \quad = \quad \$4{,}547.50$$

$$1.07x \quad = \quad \$4{,}547.50$$

$$x \quad = \quad \$4{,}250$$

MR9A

To convert a <u>Decimal to a Percent </u>add a percent sign and then move the decimal point 2 places to the right.

To convert a <u>Percent to a Decimal</u> remove the percent sign and then move the decimal point 2 places to the left

MR 9B

To convert a <u>Fraction to a Decimal</u>, divide the numerator by the denominator.

To convert a <u>Fraction to a Percent</u>, change the fraction to a decimal by dividing the numerator (number on top) by the denominator (number on bottom), then add a percent sign and move the decimal point 2 places to the right

MR10   Which is greater A or B?

Factor out common factor in column B to simplify problem.

A	B
(500) (267)	(331) (267) + (189) (267)

$$(500)(267)$$
$$(267)(189 + 331)$$

$$(500)$$
$$(331) + (189)$$

Column B is greater

MR11   Multiply:

$$(2x - 7)(x + 8)$$

Multiplying Binomials: F.O.I.L.

$$2x^2 + 16x -7x – 56$$

$$2x^2 + 9x - 56$$

MR 12   Exponents - Important Rules:

    *Any number raised to the power of one is equal to itself.

    * Any number raised to the power of zero is equal to one.

$$x^0 = 1 \quad 5^0 = 1 \quad -2^0 = -1 \quad 2^0 = 1$$

* When multiplying numbers with exponents, add the exponents.

(must have same base) $(x^9)(x^7) = x^{16}$

* When dividing numbers with exponents, you subtract the exponents. (must have same base)

$x^9 \div x^7 = x^2$

MR13   Simplify: $\sqrt{175}$ = $\sqrt{25 \times 7}$ = $5\sqrt{7}$

MR14   Simplify: $a\sqrt{bc^2}$ = $ac\sqrt{b}$ = $a|c|\sqrt{b}$

MR15   If 246 is the average of x, 2x, x, 130, and 384, then x equals what?

Total of the numbers ÷ Number of Terms

$$\frac{x + 2x + x + 130 + 384}{5} = 246$$

$$x + 2x + x + 130 + 384 = (246)(5)$$

$$4x + 514 = 1230$$

$$4x = 716$$

$$x = 179$$

MR 16   What is Brenda's average speed if she drives 80 miles in 2 hours and 30 minutes?

rate x time = distance

distance ÷ time = rate

80 miles ÷ 2.5 hours = 32 mph

Direct Proportions

MR 17   Two tanks contain the same proportion of gas to its capacity. The 26-gallon tank has 14 gallons of gas in it. The second tank has 112 gallons in it. How many gallons can the 2nd tank hold?

$$\frac{part}{whole} \quad \frac{14}{26} = \frac{112}{x}$$

$$(26)(112) = 14x$$

$$x = 208$$

MR 18   If f pair of socks cost $10.00, how much will 8 pairs cost?

$$\frac{f}{8} = \frac{10}{x}$$

$$fx = 80$$

$$x = \frac{80}{f} \text{ dollars}$$

Indirect Proportions

MR 19   If 6 men take 4 hours to paint a house, how long would 8 men working at the same rate take to paint the house?

$$\frac{6 \text{ men}}{8 \text{ men}} = \frac{4 \text{ hours}}{x \text{ hours}}$$

x = 5.3 hours wrong answer!

This is an indirect proportion. Switch second part of proportion.

$$\frac{6 \text{ men}}{8 \text{ men}} = \frac{x \text{ hours}}{4 \text{ hours}}$$

x = 3 hours correct answer!

Work Problems

MR 20   Bob can trim the shrubs in his yard in 4 hours, while his brother Ted can trim them in only 2.5 hours. Approximately how many hours would it take to trim the shrubs if both boys worked together?

$$\frac{1}{4} + \frac{1}{2.5} = \frac{1}{x}$$

x = 1.54 hours

MR 21   Four even consecutive integers have a sum of 124. Find the value of the largest of these integers.

$$n + n + 2 + n + 4 + n + 6 = 124$$

$$4n + 12 = 124$$

$$4n = 112$$

$$n = 28$$

the largest integer is $n + 6 = 34$

MR 22   Mr. Ilstrup invested $7,000, part at an annual rate of 7% and part at 8%. His income after one year from these investments was $500. How many dollars did he invest at 8%?

$$.08x + .07(7,000 - x) = 500$$

$$.08x + 490 - .07x = 500$$
$$.01x = 10$$
$$x = 1000$$

$1000 invested at 8% and $6000 invested at 7%

Check: 1000(.08) = $80   6000(.07) = $420
Total $500 ✓

MR23   If $X\varphi = X(2){+}5$

                $X\lambda = X/2$

                $X\varphi\blacklozenge = (X/2)(1/2)$

Then what is $8\lambda(3\varphi) + 12\varphi\blacklozenge$?

             $(4)(6 + 5) + (6)(1/2)$

                  $44 + 3 = 47$

MR 24   If a ladder is leaned against the side of a barn exactly 10 feet up from the ground and 5 feet from the base of the barn, how many feet long is the ladder? (Assume the side of the barn is perpendicular to the ground).
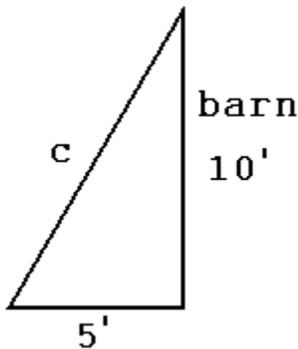
Use the Pythagorean Theorem

$$5^2 + 10^2 = c^2$$

$$25 + 100 = c^2$$

$$\sqrt{125} = c$$

$$\sqrt{25 \times 5} = c$$

$$5\sqrt{5} = c$$

MR 25　In the figure below, MN is tangent to the circle at N. PN is the diameter of the circle. If PM = 13 and MN = 5, what is the area of the circle?

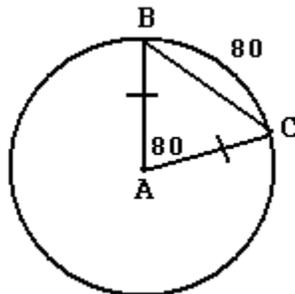Since MN is tangent to the circle, the diameter meeting the tangent line forms a right angle.
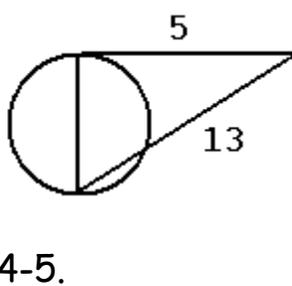
The missing side is 12, since 5-12-13 is a Pythagorean Triple. The other most common Pythagorean Triple is 3-4-5.
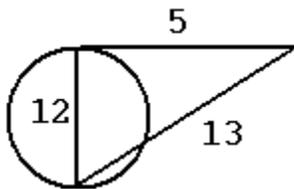
Since the diameter is 12, the radius is 6. So the area is $\pi r^2 = 6^2\pi = 36\pi$

MR 26　In a circle whose center is A, arc BC contains 80°. How many degrees are in angle ABC?

△ ABC is an isosceles △, so ∠B ≅ ∠C.
Since ∠A = 80°, ∠B + ∠C = 100° and
∠ABC = 50°

MR 27   A rectangular truck bed 8 ft. x 8 ft x 4 ft is filled with soil. If the soil is to be poured into sand boxes which are in the form of cubes 4 ft. on the side, how many sand boxes can be filled?

Truck Bed Volume 8 x 8 x 4 = 256 cubic feet
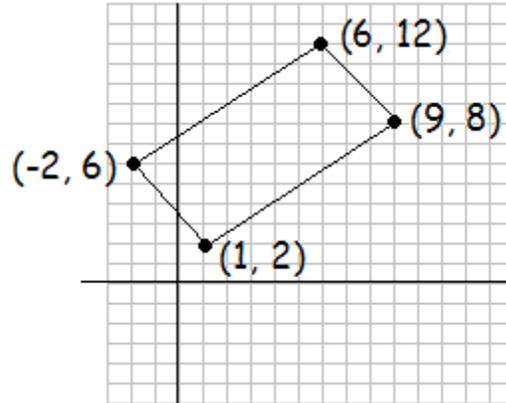Sand Box Volume 4 x 4 x 4 = 64 cubic feet
Answer: 256 ÷ 64 = 4 boxes

MR 28 Which of the following is the graph of 4x+2y ≤ 16?

First rewrite the equation into $y = mx + b$ for easy graphing and shading.

4x + 2y ≤ 16   →   2y ≤ -4x + 16   →   y ≤ -2x + 8

MR 29   The coordinates for the corners of a rectangle are (-2, 6), (1, 2), (6, 12), and (9, 8). What is the area of the rectangle?

Use the distance formula twice: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$\sqrt{(9-6)^2 + (8-12)^2} = \sqrt{(3)^2 + (-4)^2} = \sqrt{9+16} = \sqrt{25} = 5$$

$$\sqrt{(9-1)^2 + (8-2)^2} = \sqrt{(8)^2 + (6)^2} = \sqrt{64+36} = \sqrt{100} = 10$$

The area of the rectangle is $A = lw \rightarrow (5)(10) = 50$

MR 30   Two points (2, 10) and (-4, 4) lie on a line. What
is the y-intercept of that line?

$$\text{Slope} = m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{10-4}{2-^-4} = \frac{6}{6} = 1$$ Now use $y = mx + b$

with point (2, 10)

$10 = 1(2) + b \rightarrow b = 8$ Since b is the y-intercept,
the answer is 8.

Trigonometry Review – for right triangles

opp = side opposite to given angle

hyp = hypotenuse (longest side of right triangle)

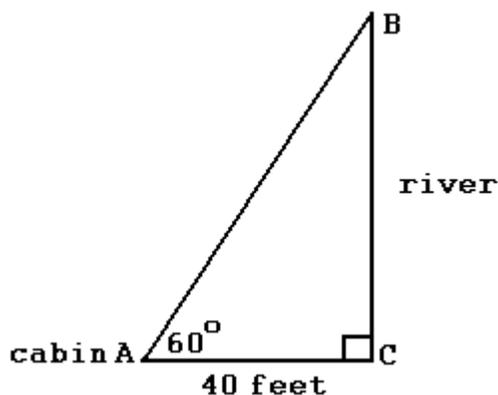adj = side adjacent to given angle

SOHCAHTOA

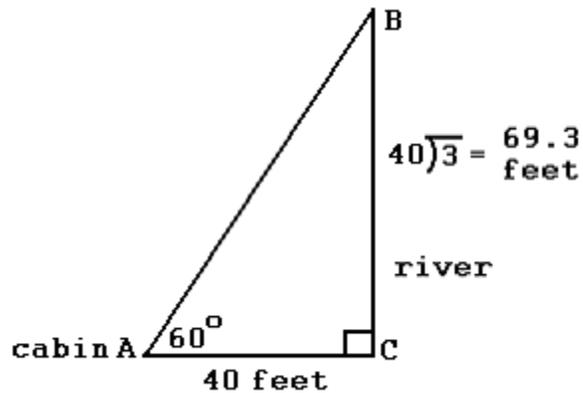$$\sin x = \frac{opp}{hyp} \qquad \cos x = \frac{adj}{hyp} \qquad \tan x = \frac{opp}{adj}$$
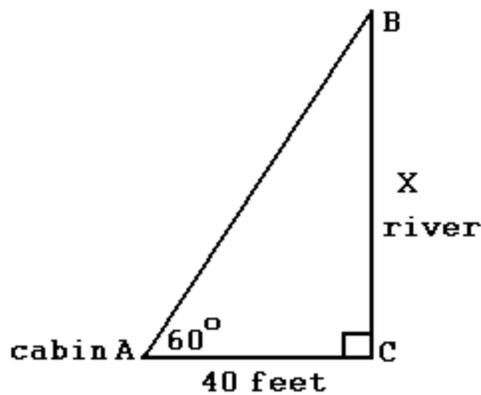

MR 31   Two docks B and C stand on opposite banks of a river directly across from one another. Cabin A, on the same side of the river as dock C is 40 feet from that dock, and angle CAB 60°. How wide is the river?

Method 1: Use the geometry and the 30-60-90 Rule

B

$40\overline{)3} = \begin{matrix} 69.3 \\ \text{feet} \end{matrix}$

river

cabin A $\angle 60°$ ⌐C

40 feet

Method 2: Use trigonometry

B

X
river

cabin A $\angle 60°$ ⌐C

40 feet

We need the opposite side of the known   angle (60º) and we have the adjacent side. So we use tangent.

tan 60 = opp/adj

tan 60 = x /40

(tan 60)(40) = x
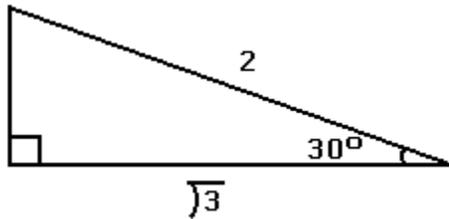x = 69.3 feet

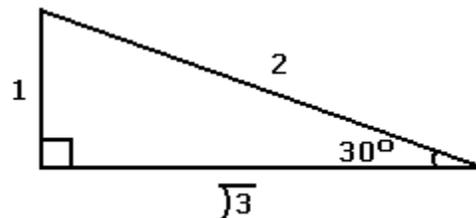(Make sure calculator is set in degrees mode, not radians mode)

MR32   If $\cos 30° = \dfrac{\sqrt{3}}{2}$, what is the value of tan 30°?

$$\cos x = \frac{\sqrt{3}}{2} \qquad\qquad \cos x = \frac{adj}{hyp}$$

By Pythagorean Theorem, the missing side is 1.

$$\tan x = \frac{opp}{adj} \qquad \tan 30 = \frac{1}{\sqrt{3}} \bullet \left(\frac{\sqrt{3}}{\sqrt{3}}\right) = \frac{\sqrt{3}}{3}$$