June 2018

To the Students Taking Algebra at Baines for the 2018-2019 School Year:

Next year will be an exciting and challenging year as you take *high school credit* Pre-AP Algebra I. We spend very little time reviewing concepts from 7^{th} and 8^{th} grade math, as you are already expected to be proficient with all content through 8^{th} grade math before taking Algebra. To prepare students for Algebra I, this material is taught in the 6^{th} and 7^{th} grade Pre-AP courses. Some of the important skills you need to have in order to be successful in Algebra include: Rational number operations, exponents and square roots, order of operations, evaluating expressions, solving multi-step equations and inequalities, functions, statistics, geometry, and measurement concepts.

This packet has been put together with those skills in mind. To help you strengthen and keep your math skills over the summer, we would like you to complete this packet. If you work two to three pages each week, you'll have the packet completed by the beginning of the school year. This packet is not required, but it is strongly recommended that you complete it.

Though graphing calculators will frequently be used in class, a graphing calculator is not required for this packet. Calculators are a tool that you may use to help you solve the problems except on pages that specify "no calculator" in the top corner of the page. 

We also recommend that you look for a graphing calculator over the summer. Class sets of TI *N*spire CX graphing calculators are available for use during the school day, but calculators are not available for check-out. We suggest, but do no require, you purchase a TI *N*spire CX or the TI *N*spire APP (currently only available on iPad.)

We hope you have an enjoyable summer. We look forward to meeting you next year.

Sincerely,

Baines Middle School Algebra Teachers

Objective: Adding and subtracting Rational numbers.

Review the following addition and subtraction rules.

- To add two numbers with the same sign, *add* their absolute values. The sum has the same sign as the numbers.
- To add two numbers with different signs, find the *difference* of their absolute values. The sum has the same sign as the number with the greater absolute value.
- Rewrite subtraction problems as addition problems by adding the opposite of the second value. To subtract a number, add its opposite. (Some students may be familiar with “add a line, change the sign.”)

Objective: Multiplying and dividing Rational numbers.

Review the following multiplication and division rules:

- The product or quotient of two positive numbers is positive.
- The product or quotient of two negative numbers is positive.
- The product or quotient of a negative number and a positive number is negative.
- It is mathematically incorrect to divide by 0. When dividing by zero in arithmetic, the answer is *undefined*.

________ 1) $(-5)(-11)$

________ 2) $7+(-11)$

________ 3) $-15*0$

________ 4) $36+12+(-14)$

________ 5) $-8+15+(-24)+17$

________ 6) $\frac{3}{10}-\frac{3}{4}$

________ 7) $(-56)+24+43+(-17)$

________ 8) $19-31$

________ 9) $7\left(-\frac{6}{14}\right)$

________10) $5*(-3)(-8)$

________ 11) $(-11)(-5)(-3)$

________ 12) $-169\div(-13)$

________ 13) $(-57)-(-43)$

________ 14) $65-(-335)$

________ 15) $-175-(-305)$

________ 16) $(-99)+(-77)+(-1)$

________ 17) $42\div(-54)$

________ 18) $8-56+12-4$

________ 19) $8+(-10)-(-7)$

________ 20) $13-18+10-9$

________ 21) $\frac{-60}{-15}$

________ 22) $13+(-38)-(-42)-17$

________ 23) $-32+(-7)-(-40)+6$

________ 24) $4+(-20)-18-(-13)$

________ 25) $(3)(-2)(6)(-4)$

________ 26) $\frac{-1080}{40}$

________ 27) $(-7)(-2)(-5)(-3)$

________ 28) $(-4)(6)(-5)(-6)$

________ 29) $\frac{0}{-22}$

________ 30) $54\div(-6)$

________ 31) $-84 \div 3$

________ 32) $\dfrac{-15}{0}$

________ 33) $14k - (-2k)$

________ 34) $4xy + 9xy$

________ 35) $6x + 8 - 10x$

________ 36) $\dfrac{2}{3} + \dfrac{5}{6}$

________ 37) $\dfrac{3}{4} - \dfrac{7}{8}$

________ 38) $\dfrac{3}{5}(15)$

________ 39) $\dfrac{x}{5} \bullet \dfrac{5}{9}$

________ 40) $-\dfrac{2}{5} \div 22$

________ 41) $-0.7 - 0.78$

________ 42) $-121 + 121$

________ 43) $10 + 16 \div 4 - 6 \div 2 \bullet 7$

________ 44) $27 \div 3^2 \bullet 2 - 2$

________ 45) $\dfrac{2}{7} \bullet \dfrac{7}{5} + 0.6$

________ 46) $-6 \div 18 \bullet 27$

________ 47) $4(2x - 3)$

________ 48) $-5(3y + 12)$

________ 49) $-(6a - 18)$

________ 50) $\dfrac{2}{3}(12 - 9c)$

________ 51) $\dfrac{4y + 18}{2}$

________ 52) $2 - (x - 7)$

________ 53) $25z - 3\left(\dfrac{2}{3}z + 6\right)$

________ 54) $\dfrac{5}{4}t + \dfrac{2}{3}t$

________ 55) $-\dfrac{2}{3}u - \dfrac{7}{8}u$

________ 56) $\dfrac{1}{11}d - \dfrac{7}{8}d$

________ 57) $-\dfrac{5}{6}\left(-\dfrac{9}{20}x + \dfrac{12}{5}\right)$

________ 58) $\dfrac{18ab - 54}{-9}$

________ 59) $0.4(3x - 0.26)$

________ 60) $\dfrac{0.12 - 1.5x}{0.3}$

Objective: Exponents and Square Roots

Expressions containing repeated factors can be written using exponents.

Example 1 **Write $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$ using exponents.**

Since 7 is used as a factor 5 times, $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 = 7^5$.

Example 2 **Write $p \cdot p \cdot p \cdot q \cdot q$ using exponents.**

Since p is used as a factor 3 times and q is used as a factor 2 times, $p \cdot p \cdot p \cdot q \cdot q = p^3 \cdot q^2$.

The square root of a number is one of two equal factors. The radical sign $\sqrt{}$ is used to indicate the positive square root.

Examples **Find each square root.**

1. $\sqrt{1}$ — Since $1 \cdot 1 = 1$, $\sqrt{1} = 1$.
2. $-\sqrt{16}$ — Since $4 \cdot 4 = 16$, $-\sqrt{16} = -4$.
3. $\sqrt{0.25}$ — Since $0.5 \cdot 0.5 = 0.25$, $\sqrt{0.25} = 0.5$.
4. $\sqrt{\frac{25}{36}}$ — Since $\frac{5}{6} \cdot \frac{5}{6} = \frac{25}{36}$, $\sqrt{\frac{25}{36}} = \frac{5}{6}$.

Example **Estimate $\sqrt{79.3}$ to the nearest whole number.**

- The first perfect square less than 79.3 is 64.
- The first perfect square greater than 79.3 is 81.

$64 < 79.3 < 81$ Write an inequality.

$8^2 < 79.3 < 9^2$ $64 = 8^2$ and $81 = 9^2$

$8 < \sqrt{79.3} < 9$ Take the square root of each number.

So, $\sqrt{79.3}$ is between 8 and 9. Since 79.3 is closer to 81 than 64, the best whole number estimate for $\sqrt{79.3}$ is 9.

Write each expression using exponents.

______ 1. $8 \bullet 8 \bullet a$ ______ 2. $5 \bullet q \bullet 3 \bullet q \bullet q \bullet 3$ __________ 3. $3 \bullet 7 \bullet a \bullet 9 \bullet b \bullet a \bullet 7 \bullet b \bullet 9 \bullet b \bullet a$

Evaluate each expression.

______ 4. 2^3

______ 5. $3^3 \bullet 4^2$

______ 6. $\dfrac{3^3 \bullet 10^2}{3^2 \bullet 10^4}$

______ 7. $\dfrac{4^2 \bullet 3^5 \bullet 2^4}{4^3 \bullet 3^5 \bullet 2^2}$

______ 8. $(0.2)^3 \bullet \left(\dfrac{1}{2}\right)^4$

Find each square root.

______ 9. $\sqrt{81}$

______ 10. $\pm\sqrt{36}$

______ 11. $\sqrt{\dfrac{64}{225}}$

______ 12. $\pm\sqrt{1.44}$

______ 13. $-\sqrt{\dfrac{16}{25}}$

______ 14. $4 \bullet \sqrt{0.25}$

Estimate each square root to the nearest whole number.

______ 15. $\sqrt{44}$

______ 16. $\sqrt{15.6}$

______ 17. $\sqrt{85.1}$

______ 18. $\sqrt{197}$

Order from least to greatest:
$\sqrt{91}, 7, \sqrt{38}, 5$

____

Objective: Evaluate Expressions

To evaluate, or find the value of, an algebraic expression, first replace the variable or variables with the known values to produce a numerical expression, one with only numbers and operations. Then find the value of the expression using the order of operations.

Example 1 **Evaluate the expression $3x^2 - 4y$ if $x = 3$ and $y = 2$.**

$3x^2 - 4y$	$= 3(3)^2 - 4(2)$	Replace x with 3 and y with 2.
	$= 3(9) - 4(2)$	Evaluate the power first.
	$= 27 - 8$	Do all multiplications.
	$= 19$	Subtract.

Evaluate each expression if $w = 2$, $x = 6$, $y = 4$, and $z = 5$.

__________ 1) $2x + y$

__________ 2) $3z - 2w$

__________ 3) $9 + 7x - y$

__________ 4) wx^2

__________ 5) $(wx)^2$

__________ 6) $\dfrac{x^2 - 3}{2z + 1}$

__________ 7) $\dfrac{wz^2}{y + 6}$

Evaluate each expression if $a = 4$, $b = 3$, and $c = 6$.

__________ 8) $a(3 + b) - c$

__________ 9) $2(ab - 9) \div c$

__________ 10) $3b^2 + 2b - 7$

__________ 11) $\dfrac{a^2 + a}{bc + (b - 1)} - c$

__________ 12) $\dfrac{ab + bc}{2b - 8}$

Evaluate each expression if $p = 5$ and $q = 12$.

__________ 13) $\dfrac{4q}{q + 2(p + 1)}$

__________ 14) When a temperature in degrees Fahrenheit F is known, the expression $\dfrac{5F - 160}{9}$ can be used to find the temperature in degrees Celsius, C. If a thermometer shows that the temperature is 50°F, what is the temperature in degrees Celsius?

__________ 15) The cost of renting a car for a day is given by the expression $\dfrac{270 + m}{10}$, where m is he number of miles driven. How much would it cost to rent a car for one day and drive 50 miles?

__________ 16) Philip is able to spin his yo-yo along a circular path. The yo-yo is kept in motion by a force which can be determined by the expression $\dfrac{mv^2}{r}$ (m = mass, v = velocity, and r = radius.) Evaluate the expression when the m = 0.12 kg, the v = 4 m/s and the r = 1.5 m. (Force is measured in Newtons.)

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Objective: Evaluate Expressions, continued.

17) $m + m(-6 + n)$ if $m = -1$ and $n = 2$

18) $p(q^2 - q)$ if $p = 6$ and $q = -1$

19) $j^3 - (2 + k)$ if $j = 1$ and $k = 5$

20) $x - (x - xy)$ if $x = -5$ and $y = 3$

21) $j - (-3 + h^2)$ if $h = 3$ and $j = -4$

22) $\left(x - y^2\right) \div 6$ if $x = 1$ and $y = 5$

23) $-6 - (a - a) - b$ if $a = -\frac{1}{2}$ and $b = \frac{2}{3}$

24) $n(m - (-2 + m))$ if $m = -4$ and $n = -3$

25) $(-6 - x)(y - x)$ if $x = 4$ and $y = 1$

26) $y + 6 - x + z$ if $x = 4$, $y = 5$, and $z = -2$

27) $q^2 - p^3$ if $p = -4$ and $q = 2$

28) $p - q^3 \div 6$ if $p = 3$ and $q = -6$

29) $-3 + y - (z + z)$ if $y = 6$ and $z = -2$

30) $x(y + x) - 5$ if $x = -5$ and $y = -6$

For each function, evaluate *f*(0), *f*(1), *f*(5), and *f*(–2).

31) $f(x) = 2x + 8$

32) $f(x) = -5x + 3$

33) $f(x) = 0.2x + 0.7$

Objective: Write Expressions, Equations, and Inequalities

Translate each phrase into an algebraic expression, an equation, or an inequality.

1. A number decreased by 3 is equal to 9.
2. The quotient of n and 5 is equal to 17.
3. A number decreased by 13 is equal to 25.
4. 6 more than n is less than or equal to 39.
5. Twice u is less than or equal to 32.
6. A number y cubed is 28.
7. x cubed
8. Fourteen less than n is greater than 37.
9. the product of 7 and n
10. A number x added to 11 is greater than 35.
11. Eight less than y is less than or equal to 5.
12. half of z
13. the product of n and 9
14. A number n decreased by 5 is 37.
15. the difference of 27 and x
16. a number increased by 7
17. The quotient of a number and 3 is 41.
18. Eleven more than a is greater than 47.
19. Twice z is greater than 33.
20. A number squared is 23.
21. The sum of a number and 5 is 38.
22. A number squared is less than 20.
23. Half of x is greater than or equal to 22.
24. Twice v is greater than or equal to 34.
25. a number minus fourteen
26. eight more than twice k
27. the sum of twelve and five times a number
28. When a number is multiplied by –6, the result is –90.
29. Twenty-four minus the product of x and –8 is 96.
30. When 22 is subtracted from three times a number, the result is –1.
31. Forty-eight is equal to eight times the quantity r minus 9.

Objective: Translate word problems into equations.
For each word problem, identify the variable and then write an equation. The equation should represent the situation in the problem and NOT the way to solve it. The first one is done as an example.

1. Chelsea and her friend found some money under the couch. They split the money evenly, each getting \$11.55. Write an equation to represent how much money they found.
   a. Let m = the amount of money the girls found.
   b. Equation that represents the situation: $\frac{m}{2} = 11.55$ (NOT $m = 11.55 * 2$)

2. A colony of ants carried away 9 of your muffins. That was $\frac{3}{8}$ of all of them! Write an equation that would represent how many muffins you had before the ants stole some of them.

3. Your father gave you \$12 with which to buy a present. This covered $\frac{6}{7}$ of the cost. What equation would be used to find the cost of the present?

4. Castel and his best friend found some money in an envelope. They split the money evenly, each getting \$25.31. Write an equation to represent how much money they found.

5. Write an equation to represent Daniel's age if he will be 58 years old in 14 years.

6. Last week Kali ran 22.6 miles more than Abhasra. Kali ran 34.9 miles. Write an equation to represent the number of miles that Abhasra ran.

7. Kim sold half her comic books and then bought sixteen more. She now has 42. Write an equation that would represent the number of comic books she started with.

8. Scott had some candy to give to his four children. He first took 7 pieces for himself and then evenly split the rest among his children. If each child received three pieces of candy, write an equation to represent how many pieces Scott started with.

9. Write an equation to represent how old I am if 500 reduced by 4 times my age is 212.

10. Jasmine bought five posters. A week later, half of all of her posters were destroyed in a fire. If there are only 18 posters left, write an equation to represent how many posters she started with.

11. Wilbur's Bikes rents bikes for $20 plus $5 per hour. John paid $50 to rent a bike. Write an equation to represent how many hours he rented the bike.

12. Ron won 43 pieces of gum playing horseshoes at the county fair. At school, he gave three pieces to every student in his Algebra class. Write an equation to represent how many students are in his class if he only has 4 pieces left.

13. Mei was going to sell all of her stamp collection to buy a video game. After selling half of them, she changed her mind. She then bought 16 more stamps. Write an equation to represent the number of stamps she started with if she now has 44 stamps.

14. Half of your baseball card collection got wet and was ruined. You bought 10 cards to replace some that were lost. Write an equation to represent how many cards you had before the fire if you now have 35 cards.

Objective: Translating Expressions

Translate each algebraic expression into a verbal expression. The first has been done for you as an example.

1. $a(b + c)$ the number *a* multiplied by the sum of *b* and *c*
2. $rs - 8$ ______________________________
3. $x(y - z)$ ______________________________
4. $rs + tu$ ______________________________
5. $mn - 4$ ______________________________
6. $j(w + v)$ ______________________________
7. $\frac{u}{p} + 6$ ______________________________
8. $(t - 17)11$ ______________________________
9. $d - xy$ ______________________________
10. $(a + b) - ru$ ______________________________
11. $xy + ab$ ______________________________
12. $\frac{r + t}{r - t}$ ______________________________
13. $abc - 3$ ______________________________
14. $\frac{m}{n} - 25$ ______________________________
15. $j - (t - b)$ ______________________________
16. $(k - 5)u$ ______________________________

Objective: Solve Equations

Addition Property of Equality – If you add the same number to each side of an equation, the two sides remain equal.
Subtraction Property of Equality – If you subtract the same number from each side of an equation, the two sides remain equal.
Multiplication Property of Equality – If you multiply each side of an equation by the same number, the two sides remain equal.
Division Property of Equality – If you divide each side of an equation by the same number, the two sides remain equal.
Distributive Property of Multiplication – the product of a number and a sum is equal to the sum of the individual products of the number and each of the terms. (See the first example)
If there are **variable terms on both sides** of an equation, first collect them on one side. Do this by adding or subtracting. When possible, collect the variables on the side of the equation where the coefficient will be positive.

Solve the equation $5x = 2(x + 6)$

$$\begin{aligned} 5x &= 2x + 12 \\ \underline{-2x} &\;\; \underline{-2x} \\ 3x &= 12 \\ \frac{3x}{3} &= \frac{12}{3} \\ x &= 4 \end{aligned}$$

Distribute the 2 to both terms.

To collect on left side, subtract $2x$ from both sides of the equation.

Divide by 3.

Check: Substitute into the original equation.

$$\begin{aligned} 5x &= 2(x + 6) \\ 5(4) &\stackrel{?}{=} 2(4+6) \\ 20 &\stackrel{?}{=} 2(10) \\ 20 &= 20 \end{aligned}$$

Solve the equation $-6z + 28 = 9z - 2$

$$\begin{aligned} -6z + 28 &= 9z - 2 \\ \underline{+6z} &\;\; \underline{+6z} \\ 28 &= 15z - 2 \\ \underline{+2} &\;\; \underline{+2} \\ 30 &= 15z \\ \frac{30}{15} &= \frac{15z}{15} \\ 2 &= z \end{aligned}$$

To collect on right side, add $6z$ to both sides of the equation.

Add 2 to both sides of the equation.

Divide by 15.

Check: Substitute into the original equation.

$$\begin{aligned} -6z + 28 &= 9z - 2 \\ -6(2) + 28 &\stackrel{?}{=} 9(2) - 2 \\ -12 + 28 &\stackrel{?}{=} 18 - 2 \\ 16 &= 16 \end{aligned}$$

1. $-11 = \dfrac{k}{37}$

2. $n - (-69) = 103$

3. $8 = n - 84$

4. $-71 = -99 - b$

5. $-88x = 968$

6. $-7n - 5 = 51$

7. $x + (-92) = -140$

8. $3 + \frac{m}{4} = -2$

9. $25 = 55 - m$

10. $\frac{x+9}{6} = 4$

11. $2x + 3x + 3 = -12$

12. $5y = 2 - (-7 + y)$

13. $4b + 27 + 6b = 2b - 13$

14. $\frac{-1+n}{25} = -1$

15. $9(x-1) = -189$

16. $x + 11 = x - 11$

17. $\frac{1}{2}x - \frac{1}{3}x - 2 = 10$

18. $3r + 1 = -r + 5$

19. $\frac{3+n}{4} = \frac{3}{4}$

20. $\frac{k}{15} - 11 = -12$

21. $3(2 - 2x) = -6(x - 1)$

22. $\frac{1}{6}(1 + x) = -3$

23. $\frac{1}{2}(6x - 4) = 4 + x$

24. $4x - 1 = 3(x + 1) + x$

25. $6(2x - 3) = 96$

Objective: Multi-Step Equations Practice

______________ 1. Two angles are complementary angles. If one angle measures 37°, write and solve an equation to find the missing angle measure.

____

______________ 2. On one day in Fairfield, Montana, the temperature dropped 84°F from noon to midnight. If the temperature at midnight was -21°F, write and solve an equation to determine the temperature at noon that day.

____

Solve and check.

3. $-v + 5 + 4v = 1 + 5v + 3$

4. $15 - x = 2(x + 3)$

5. $5(r - 1) = 2(r - 4) - 6$

6. $6m - 11 = 2 + 9m - 1$

7. $4(3x - 1) = 3 + 8x - 11$

8. $-2(t + 2) + 5t = 6t + 11$

9. $-\frac{2}{3}(x + 2) = \frac{1}{6}(x + 6)$

10. $0.15 - 0.2x = 0.3(x + 3)$

11. $\frac{2}{5}(r - 2) = \frac{3}{20}(r - 4)$

12. $\frac{1}{3}\left(x + \frac{2}{3}\right) = \frac{1}{6}(x - 4)$

13. $0.4(0.3x - 1) = 2 + 0.75x$

14. $-\frac{1}{2}(t + 9) + 5\frac{3}{4}t = \frac{3}{8}t$

15. If $4\left(x - \frac{2}{3}\right) = -18$, what is the value of $2x$?

16. If $0.9x - 1.3 = -3.1$, what is the value of $x - 0.8$?

Write an equation to represent each relationship. Then solve.

17. Twelve decreased by twice a number is the same as 8 times the sum of the number plus 4. What is the number?

18. Three added to 8 times a number is the same as 3 times the value of 2 times the number minus 1. What is the number?

Objective: Solve and Graph Inequalities

Solve each inequality and then graph the solution set on the number line.

1. $100 + 8x > 160 + 5x$

2. $50 - 3d < 30 - 2d$

3. $46h > 84 + 25h$

4. $6x + 8 \geq 2x + 44$

5. $15 - x < 15$

6. $9 - 5x \geq 39$

7. $3x + 7 > 5x - 6$

8. $5y + 3 \geq 3y - 2$

9. $\frac{3}{4}n > n - 5$

10. $31.2 - 0.12h \leq 28.62 - 0.08h$

11. $x \neq 4$

12. $11.25x - 20 \geq 10.75x - 12.5$

13. $2x + 4 \leq \frac{2}{3}x$

14. $-10 - \frac{1}{4}x > 20 - \frac{1}{2}x$

15. $10x > 5.5x + 31.5$

16. $4x + 2 \neq -22 - 2x$

Objective: Identifying and Representing Functions

A **relation** is a set of ordered pairs. {(1, 2), (3, 4), (5, 6)}

The **input** values are the first numbers in each pair. {(**1**, 2), (**3**, 4), (**5**, 6)}

The **output** values are the second numbers in each pair. {(1, **2**), (3, **4**), (5, **6**)}

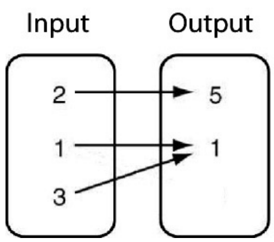
Circle each input value. Underline each output value.

1. {(1, 1), (2, 3), (3, 5)}

2. {(6, 2), (5, 3), (4, 8)}

A relation is a **function** when each input value is paired with *only one* output value.

The relation below is a function.

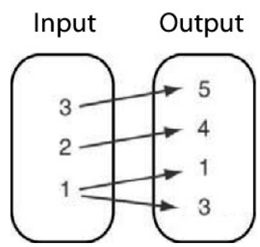


Input value 2 is paired with *only one* output, 5.

Input value 1 is paired with *only one* output, 1.

Input value 3 is paired with *only one* output, 1.

The relation below is **not** a function.



Input value 1 is paired with *two* outputs, 1 and 3.

Tell whether each relation is a function. Explain how you know.

3. {(1, 5), (3, 7), (6, 5), (9, 8)}

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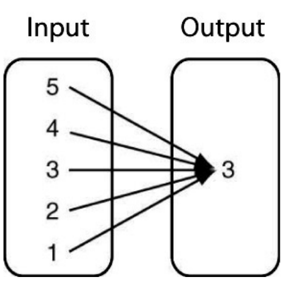
4. {(1, 2), (1, 8), (3, 6), (4, 8)}

____

____

5.



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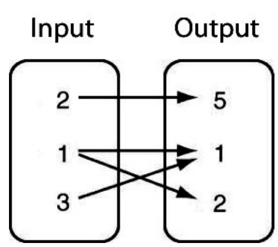
6.



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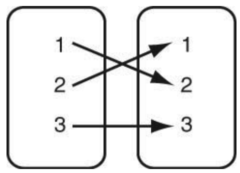
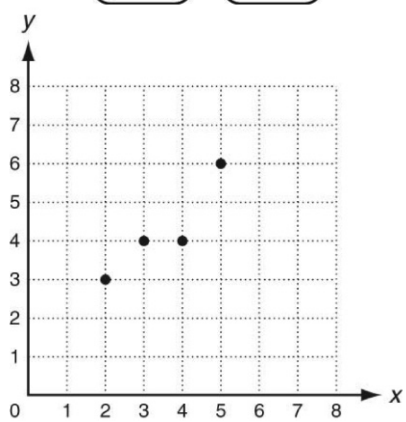
Objective: Identifying and Representing Functions, cont.

In a **function** no input value can have more than one output value. The input values must be unique.

Examples

{(1, 3), (2, 4), (3, 5), (6, 8)}

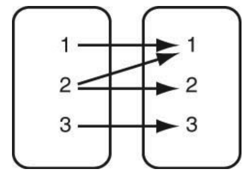


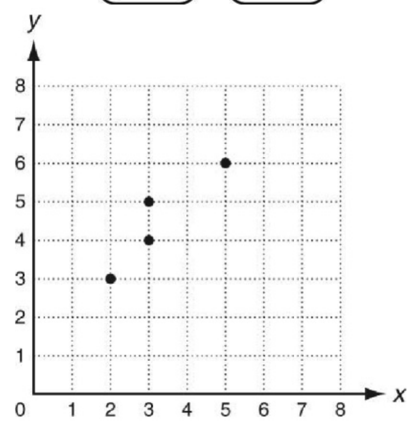


Input	1	2	3	4	5
Output	4	5	6	6	8

Non-Examples

{(1, 3), (2, 4), (3, 5), (3, 8)}





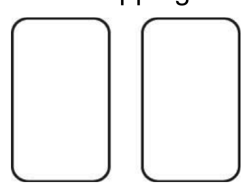
Input	2	2	2	2	2
Output	4	5	6	6	8

Answer the following.

1. Give your own example of a function in table form.

Input				
Output				

2. Draw a mapping that is **not** a function.



3. Explain why the relation in problem 2 is not a function.

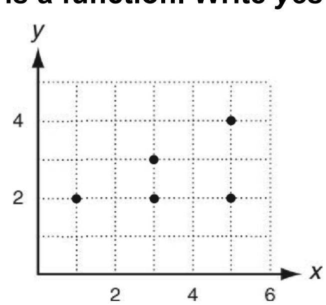
____

Tell whether each of the following is a function. Write *yes* or *no*.

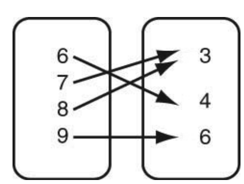
4.

Input	Output
3	8
2	5
1	4
1	6

5.



6.



________________ ________________ ________________

Objective: Describing Functions

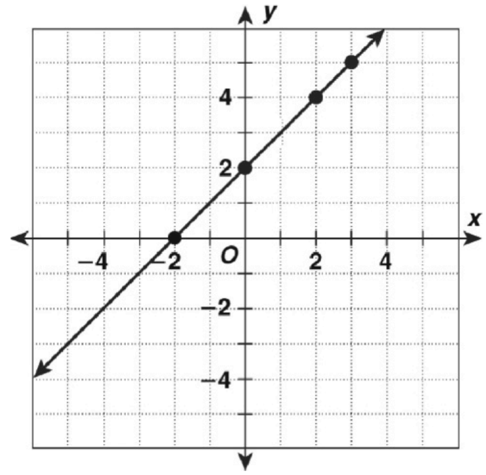
Graph $y = x + 2$.

Step 1: Make a table of values.

Input, x	$x + 2$	Output, y	(x, y)
–2	–2 + 2 = 0	0	(–2, 0)
0	0 + 2 = 2	2	(0, 2)
2	2 + 2 = 4	4	(2, 4)
3	3 + 2 = 5	5	(3, 5)

Step 2: Graph the ordered pairs, (x, y).

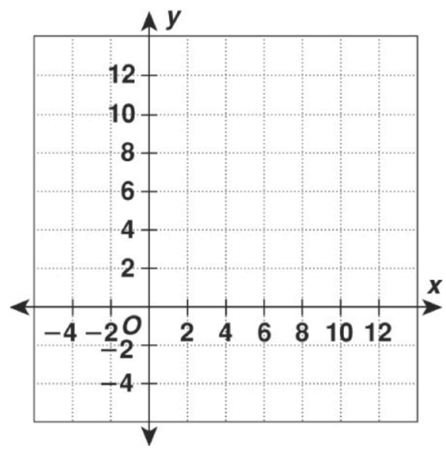
Step 3: Draw a line through the points.



Complete the table. Graph the function.

1. $y = x + 4$

Input, x	$x + 4$	Output, y	(x, y)
–2	–2 + 4 = ___		(–2, ___)
0	___ + 4 = ___		
2			
6			
8			



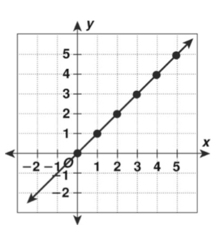
A function is **linear** if:
- the graph is a line, and
- the equation can be written in the form $y = mx + b$.

A linear function is **proportional** if its graph passes through the origin, (0, 0).

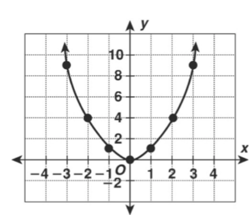
If the graph is not a line, then the function is **nonlinear**.

Linear:	$y = mx + b$
$y = 4 - 3x$ $\longrightarrow$	$y = -3x + 4$
$y = 5x$ $\longrightarrow$	$y = 5x + 0$
Proportional:	$y = 5x$
	$0 = 5(0)$
Not proportional:	$y = 4 - 3x$
	$0 \neq 4 - 3(0)$

Describe each function. Write *linear*, *proportional*, or *nonlinear*.

2. 

3. $y = -2x + 5$

4. 

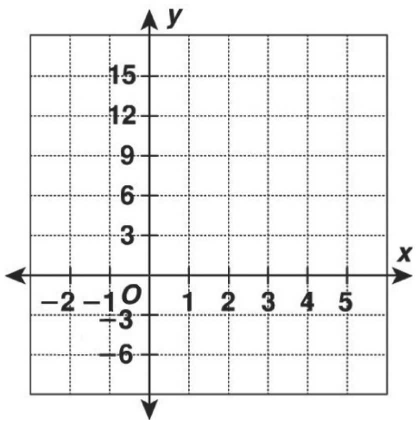
________________ ________________ ________________

Objective: Describing Functions, cont.

Graph each equation. Tell whether the equation is linear or nonlinear.

1. $y = 3x$

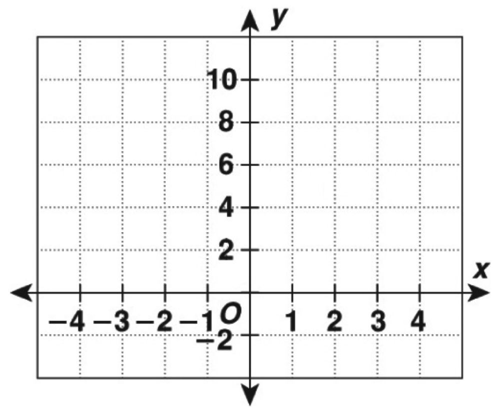
Input, x	−1	0	1	2	4
Output, y					



____

2. $y = x^2 + 1$

Input, x	−2	−1	0	1	2
Output, y					



____

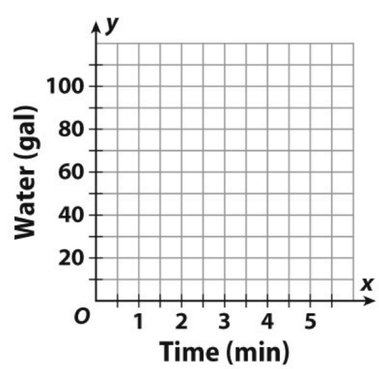
Tell whether each equation is linear or nonlinear.

3. $y = 8 - x^2$ ____________________
4. $y = 4 + x$ ____________________
5. $y = 3 - 2x$ ____________________

The amount of water in a tank being filled is represented by the equation $y = 20x$, where y is the number of gallons in the tank after x minutes.

6. Complete the table of values for this situation.

Time (min), x	0	1	2		4
Water (gal), y				60	



7. Sketch a graph of the equation.

8. Use your graph to predict the amount of water in the tank after 6 minutes.

____

9. Explain how you know whether relationship between x and y is linear or nonlinear.

____

Objective: Comparing Functions

Functions can be represented in many forms. You can identify the slope and *y*-intercept from any format.

Representation	Slope (Rate of Change)	*y*-intercept (initial value)
Equation written in slope-intercept form: $y = mx + b$	Value of m	Value of b
Table of values	Substitute any two ordered pairs into the slope formula. $m = \frac{y_2 - y_1}{x_2 - x_1}$	Substitute the slope and one ordered pair (x, y) into the slope-intercept formula. $y = mx + b$ Solve for b.
Graph	Choose two points on the line. Find the ratio of vertical change to horizontal change.	Find the point where the line crosses the *y*-axis. You may need to extend the graph.

Find the slopes and *y*-intercepts of the linear functions *f* and *g*. Then compare the graphs of the two functions.

1. $f(x) = -\frac{1}{2}x - 2$

x	–2	0	2	4	6
$g(x)$	4	1	–2	–5	–8

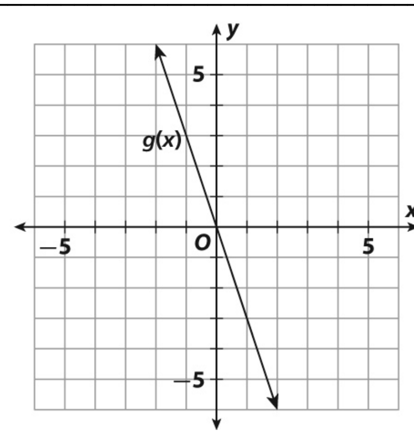
slope of f = _______________ slope of g = _______________

y-intercept of f: _______________ *y*-intercept of g: _______________

____

____

2. $f(x) = 6x - 1$



slope: of f = ______ of g = ______

y-intercept: of f = ______ of g = ______

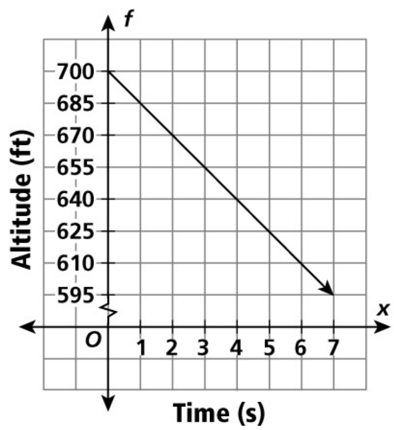
____

____

____

Objective: Comparing Functions, cont.

Four Views of a situation:

<table>
<tr><th></th><th>Example</th><th>Rate of Change (slope)</th><th>Initial Value (y-intercept)</th></tr>
<tr><td>Words</td><td>A bird in the sky flies down.
It starts 700 feet above the ground.
Each second it gets 15 feet lower.</td><td>Flies down 15 ft/s:
$m = -15$</td><td>Starts at 700 ft:
$b = 700$</td></tr>
<tr><td>Graph</td><td>
</td><td>For every 1-second increase on the x-axis (Time), there is a 15-foot decrease on the f-axis.
$m = \frac{-15}{1}$
$= -15$</td><td>The line crosses the f-axis at 700.
$b = 700$</td></tr>
<tr><td>Table</td><td><table><tr><th>Time (s)</th><th>Height (ft)</th></tr><tr><td>0</td><td>700</td></tr><tr><td>1</td><td>685</td></tr><tr><td>2</td><td>670</td></tr><tr><td>3</td><td>655</td></tr><tr><td>4</td><td>640</td></tr></table></td><td>Using points (0, 700) and (1, 685):
$m = \frac{700 - 685}{0 - 1}$
$= \frac{15}{-1}$
$= -15$</td><td>When Time is 0 s, Height is 700 ft.
$b = 700$</td></tr>
<tr><td>Equation</td><td>$f(x) = -15x + 700$</td><td>THINK:
$f(x) = mx + b$
$m = -15$</td><td>THINK:
$f(x) = mx + b$
$b = 700$</td></tr>
</table>

1. How can you find the rate of change from a table?

____

2. Which function representation is easiest for you to use? Explain why you prefer that representation.

____

____

Objective: Comparing Functions, cont.

Find the slopes of linear functions *f* and *g*. Then compare the slopes.

1. $f(x) = 5x - 2$

x	0	1	2	3	4
***g*(*x*)**	–3	–1	1	3	5

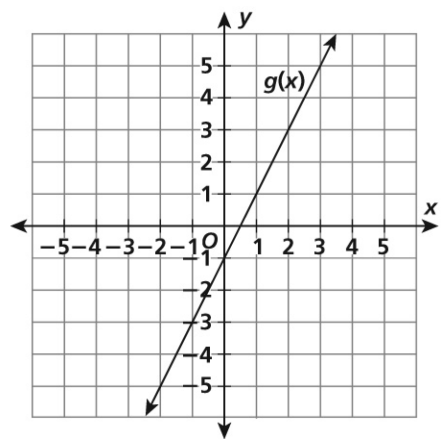
slope of *f* = _______________ slope of *g* = _______________

____

Find the *y*-intercepts of linear functions *f* and *g*. Then compare the two intercepts.

2.

x	0	1	2	3	4
***f*(*x*)**	–3	–1	1	3	5



y-intercept of *f:* _______________

y-intercept of *g*: _______________

____

____

Connor and Pilar are in a rock-climbing club. They are climbing down a canyon wall. Connor starts from a cliff that is 200 feet above the canyon floor and climbs down at an average speed of 10 feet per minute. Pilar climbs down the canyon wall as shown in the table.

Time (min)	0	1	2	3
Pilar's height (ft)	242	234	226	218

3. Interpret the rates of change and initial values of the linear functions in terms of the situations that they model.

Connor

Initial value: _______________

Rate of change: _______________

Pilar

Initial value: _______________

Rate of change: _______________

Compare the results and what they mean.

____

____

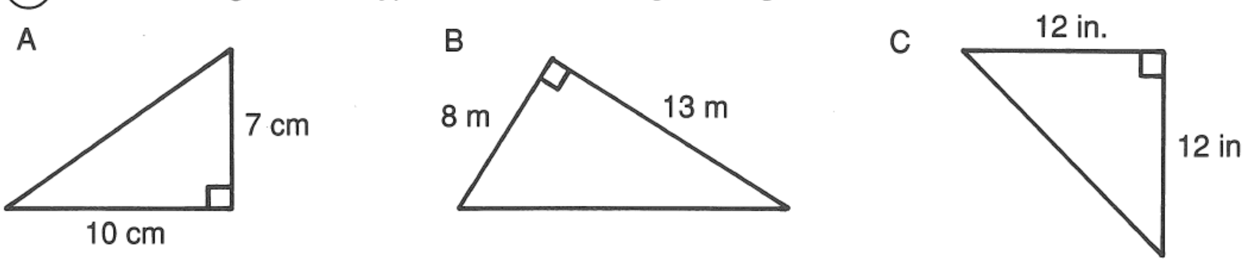
____

Objective: Pythagorean Theorem

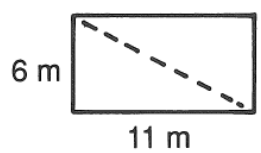
How Would You Describe a Dead Skunk?

Round each answer to the nearest tenth (if necessary). Find each answer at the bottom of the page and cross out the letter above it. When you finish, the answer to the title question will remain.

1. Find the length of the hypotenuse of each right triangle.

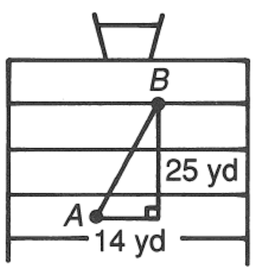


2. A rectangle is 6 m wide and 11m long. How long is the diagonal of the rectangle?



3. A television screen may be described in terms of the diagonal measure of its screen. If a TV screen is 20 in. wide and 15 in. high, what is the length of its diagonal?

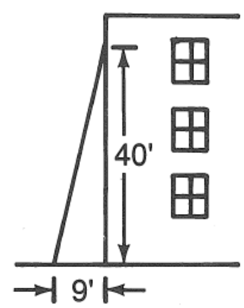
4. A quarterback at point *A* throws the football to a receiver who catches it at point *B*. How long was the pass?



5. A rope is stretched from the top of a 7-foot tent pole to a point on the ground 12 ft from the base of the pole. How long is the rope?

6. Kristin and her family left their campsite for a hike. They hiked 5 mi west and then 2 mi north. How far were they from the campsite?

7. The window of a burning building is 40 feet above the ground. The base of a ladder is placed 9 feet from the building. How long must the ladder be to reach the window?



8. The bases on a baseball diamond are 90 feet apart. How far is it from home plate to second base?

9. The lawn in front of Pythagoras Jr. High is in the shape of a rectangle 24 m long and 10 m wide. How many meters shorter is your walk if you walk diagonally across the lawn rather than along two sides of it?

D	E	S	A	X	D	T	N	O	I	S	N	T	A	C	K	T	E
5.4 mi	29.3 yd	15.3 m	8 m	13.2 m	12.5 m	16.7 in.	41 ft	12.2 cm	6.1 mi	13.9 ft	42.5 ft	127.3 ft	28.7 yd	14.4 ft	17.0 in.	129.8 ft	25 in.

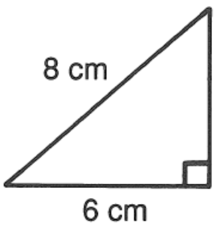
Remember you must ***show ALL steps*** *for credit!*

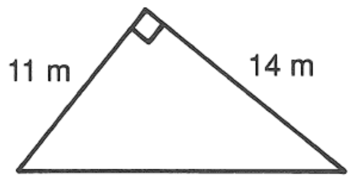
Objective: The Pythagorean Theorem

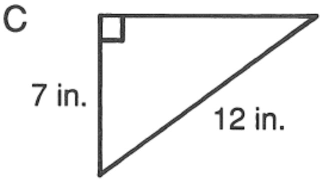
What Relation Is a Doorstep to a Doormat?

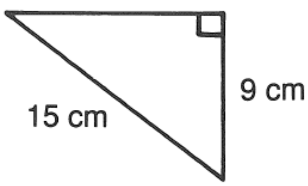
Round each answer to the nearest tenth (if necessary). Cross out the box containing each answer. When you finish, write the letters from the remaining boxes in the spaces at the bottom of the page.

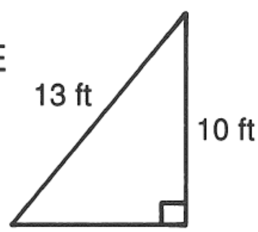
1. For each right triangle, find the length of the side that is not given.

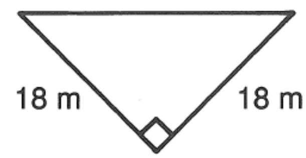
A


B


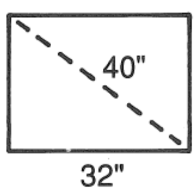
C


D


E


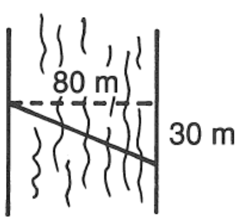
F


2. Yuki just bought a big-screen TV set. The screen has a diagonal measure of 40 in. If the screen is 32 in. wide, how high is it?



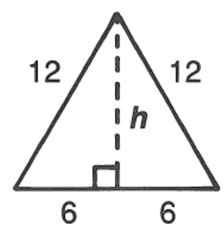
3. A 25-foot ladder is leaned against a wall. If the base of the ladder is 7 ft from the wall, how high up the wall will the ladder reach?

4. As Greg swam across an 80-meter river, the current carried him 30 m downstream. How far did he swim?



5. The mast of a sailing ship is 20 ft tall. A rope is stretched 26 ft from the top of the mast to a cleat on the deck of the ship. How far is the cleat from the base of the mast?

6. Each side of an equilateral triangle measures 12 cm. Find the height, ***h***, of the triangle.

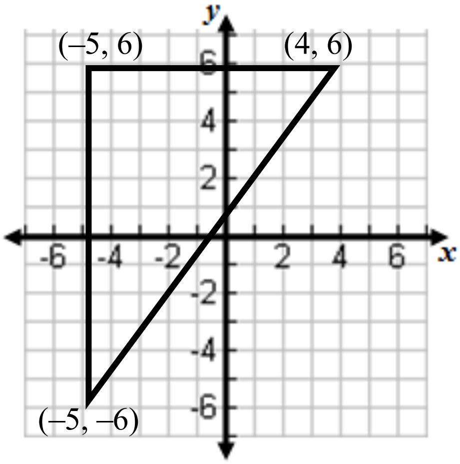


7. Two jets left an airport at the same time. One traveled east at 300 miles per hour. The other traveled south at 400 miles per hour. How far apart were the jets at the end of an hour?

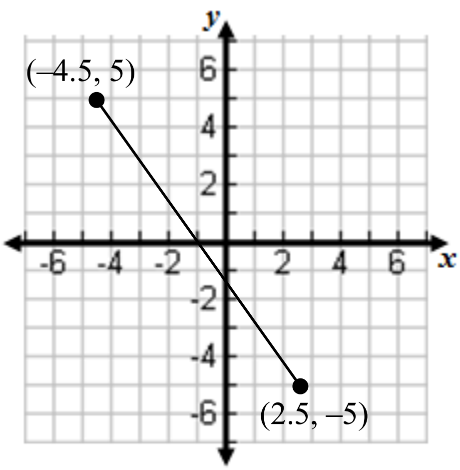
PL	DO	AS	OR	MA	TE	AM	RU	PF
85.4 m	12 cm	9.8 cm	24 in.	500 mi	26 in.	5.3 cm	10.4 cm	520 mi
ON	AR	UN	PA	TH	IN	AT	ER	AN
25.5 in.	9.4 in.	17.8 m	16.6 ft	87.1 m	9.7 in.	24 ft	18.5 ft	8.3 ft

Objective: Applying the Pythagorean Theorem on the Coordinate Plane
Round your answers to the *nearest hundredth* when necessary.

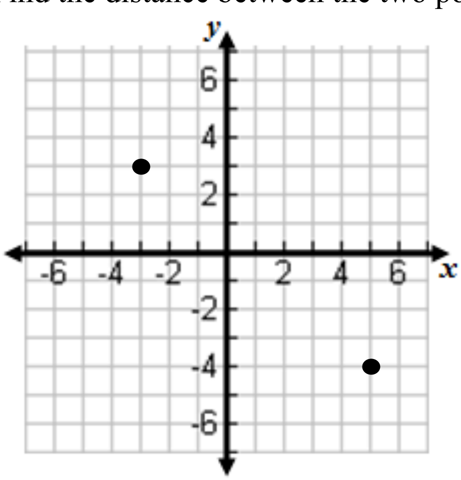
1. Find the length of the hypotenuse.



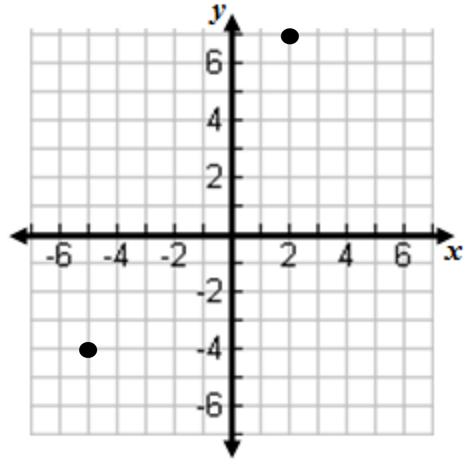
2. Find the length of the line segment.



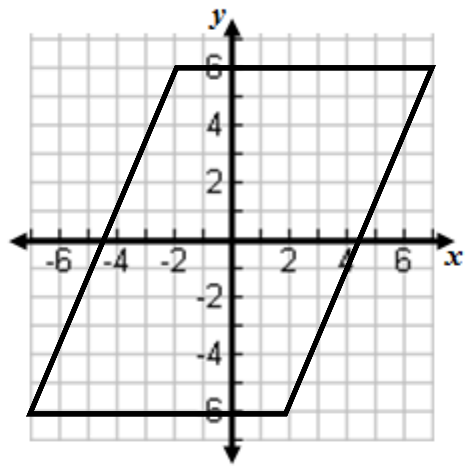
3. Find the distance between the two points.



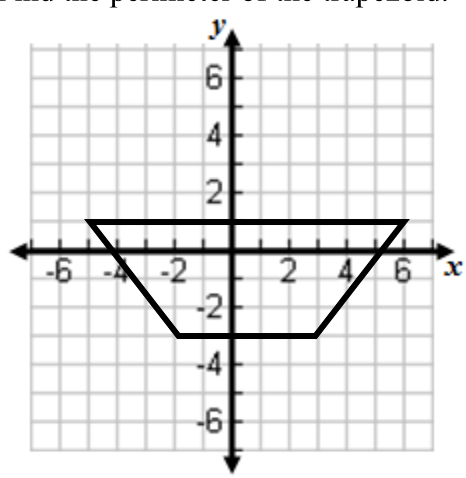
4. Find the distance between the two points.



5. Find the perimeter of the parallelogram.



6. Find the perimeter of the trapezoid.

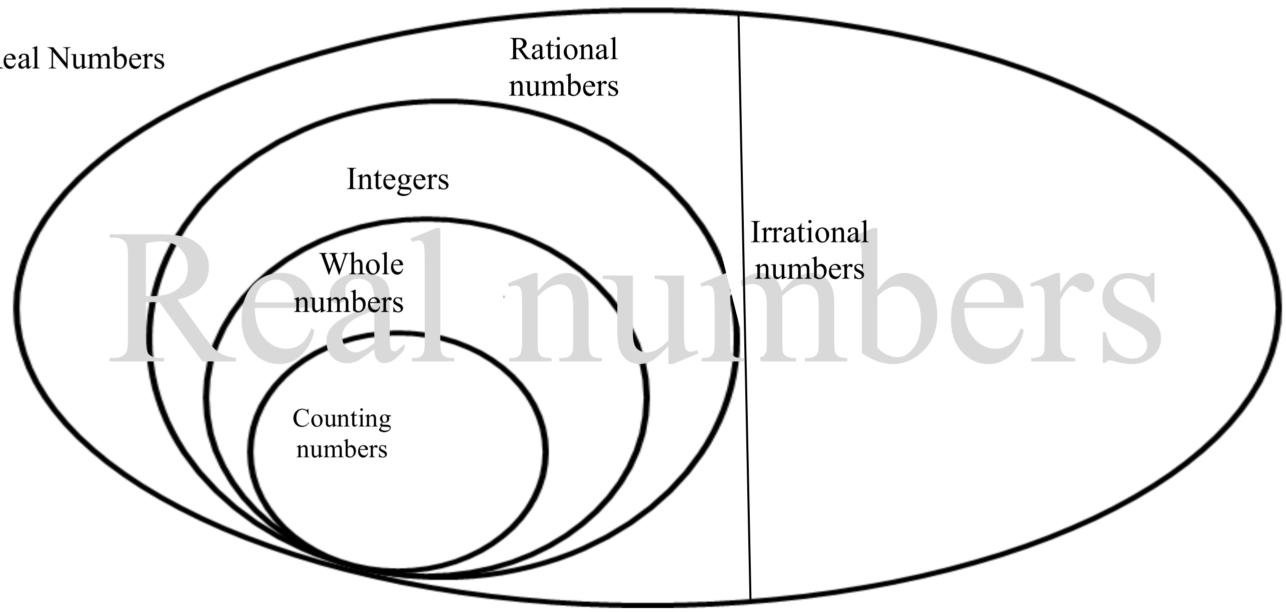


Objective: Sets and Subsets

The Real Number System

Real numbers consist of all of the rational and irrational numbers.
Natural numbers are the set of counting numbers.
Whole numbers are the set of numbers that include 0 plus the set of natural numbers.
Integers are the set of whole numbers and their opposites.
Rational numbers are any numbers that can be expressed in the form of $\frac{a}{b}$, where a and b are integers, and $b \neq 0$. They can always be expressed by using terminating decimals or repeating decimals.
Terminating decimals are decimals that contain a finite number of digits.
Repeating decimals are decimals that contain an infinite number of digits.
Irrational numbers are any numbers that cannot be expressed as $\frac{a}{b}$. They are expressed as ***non-terminating, non-repeating decimals***; decimals that go on forever without repeating a pattern.

Non-Real Numbers



Place the numbers in each region of the diagram to illustrate numbers that are unique to that classification. Tell whether each number is a Real number or non-Real number, irrational or rational number, integer, whole number, and/or counting number. List all that apply.

a) $\sqrt{15}$ b) -10 c) $\frac{3}{5}$ d) 0

e) 5.7 f) $\sqrt{25}$ g) 1 h) $9\frac{1}{2}$

i) 0.333333….. j) π k) $0.\overline{12}$ l) $\sqrt{-40}$

Objective: Sets and Subsets, *cont.*

Respond to each statement with *always*, *sometimes*, or *never*. Explain your reasoning. If *sometimes*, give an example and a non-example. If *never*, change the underlined word or phrase in the statement to make it true.

1. <u>Real numbers</u> are rational numbers.

2. A repeating decimal is a <u>rational number</u>.

3. Fractions are <u>rational numbers</u>.

4. <u>Negative numbers</u> are integers.

5. <u>Irrational numbers</u> can be written as fractions.

6. ½ is classified as <u>an integer</u>.

7. <u>Real numbers</u> are integers.

8. Whole numbers are <u>integers</u>.

9. Integers are <u>whole numbers</u>.

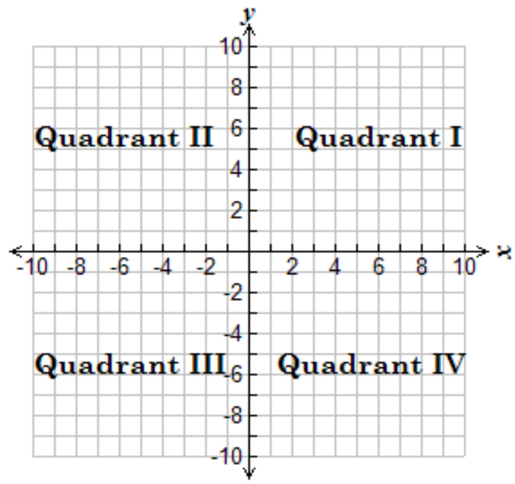
10. A non-terminating decimal is <u>an irrational number</u>.

Objective: Geometry, The Coordinate Plane

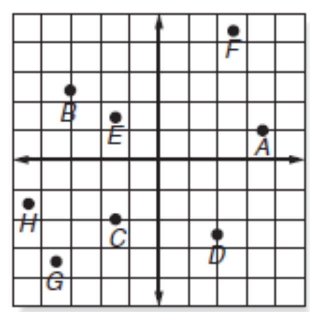
The **coordinate plane** is used to locate points. The horizontal number line is the ***x*-axis**. The vertical number line is the ***y*-axis**. Their intersection is the **origin**.

Points are located using **ordered pairs**. The first number in an ordered pair is the ***x*-coordinate**; the second number is the ***y*-coordinate**.

The coordinate plane is separated into four sections called **quadrants**.



Name the ordered pair for each point. Then identify the Quadrant in which it is located. Each gridline on the graph is one unit.



1. *A*

2. *B*

3. *C*

4. *D*

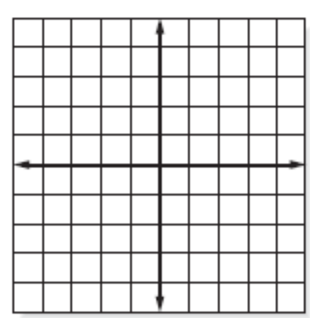
5. *E*

6. *F*

7. *G*

8. *H*

Graph and label each point.



9. $J\left(2\frac{1}{4}, \frac{1}{2}\right)$

10. $K\left(3, -1\frac{2}{3}\right)$

11. $M\left(-3\frac{3}{4}, 4\frac{1}{4}\right)$

12. $N\left(-3\frac{2}{5}, -2\frac{3}{5}\right)$

13. $P\left(-2.1, 1.8\right)$

14. $Q\left(1.75, -3.5\right)$

Objective: Geometry, Transformations

A **transformation** is a mapping of a geometric figure. Transformations include dilations, reflections, and translations. (Rotations will be taught in high school geometry classes.) The original figure (before the transformation is performed) is called the *pre-image*. The new figure is called the *image*. If the vertex of the pre-image is point *A*, the vertex of the image is called *A*' (read *A* prime.)

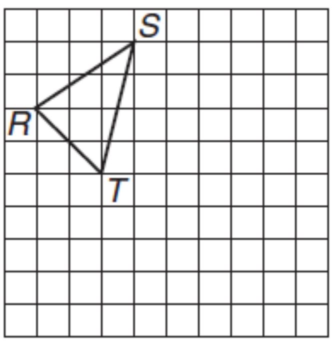
Translations When a figure is translated, every point is moved the same distance and in the same direction. The translated image is congruent to the pre-image and has the same orientation. A translation is sometimes called a slide because it looks like you simply slide the pre-image over to create the image.

Reflections To perform a reflection: For each vertex, count the number of units between the vertex and the line of symmetry. Count the same number of units between the vertex and the line of symmetry but on the other side of the line of symmetry and mark the new points.

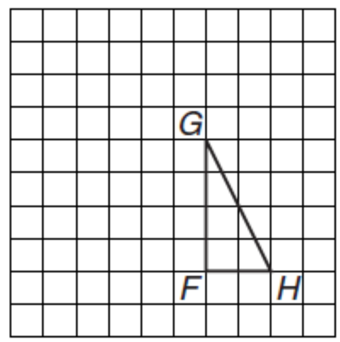
Dilations To perform a dilation, multiply each *x* and *y* value of each point by the scale factor. If the image is larger than the pre-image, the dilation is called an *enlargement*. If the image is smaller than the pre-image, the dilation is called a *reduction*.

Draw the image of the figure after the indicated translation.

1. 5 units right and 4 units down

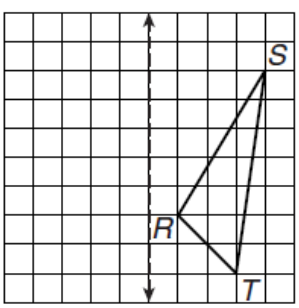


2. 3 units left and 2 units up

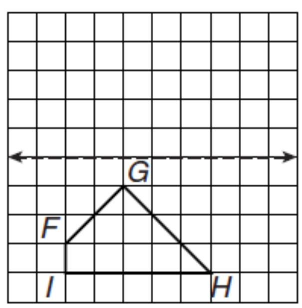


Draw the image of the figure after a reflection over the given line.

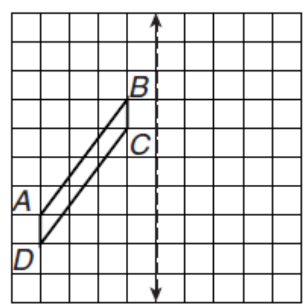
3.



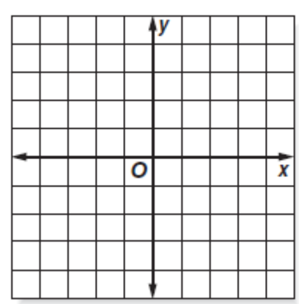
4.



5.



6. Polygon $ABCD$ has vertices $A(2, 4)$, $B(-1, 5)$, $C(-3, -5)$, and $D(3, -4)$. Find the coordinates of its image after a dilation with a scale factor of $\frac{1}{2}$. Then graph polygon $ABCD$ and its dilation.



Objective: Geometry and Measurement
A formula chart can be found on at the following link below and clicking on **Grade 8 Reference Materials**.
http://www.tea.state.tx.us/student.assessment/staar/math/

Sketch the net of each 3-D figure. Shade the base(s).

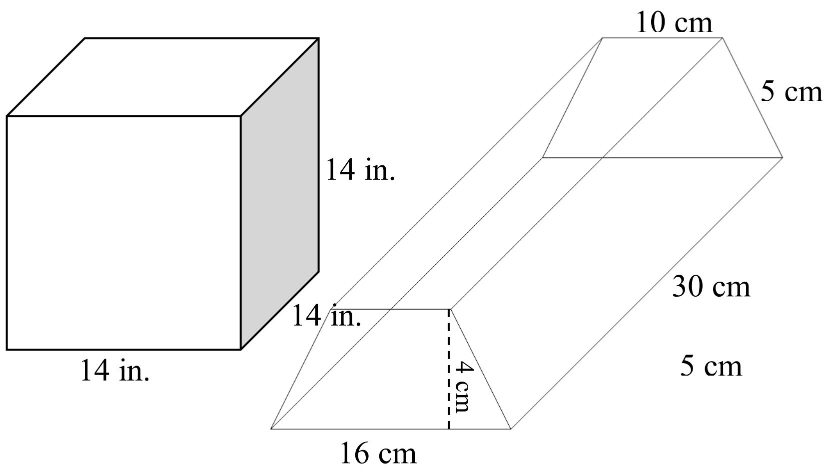
1) Cube

3) cylinder

2) square pyramid

4) triangular prism

Find the surface area and volume for each figure. Be sure to label the units on all answers. Show your work on a separate sheet of notebook paper. Include the formulas you used.



__________________ 5) surface area

__________________ 7) surface area

__________________ 6) volume

__________________ 8) volume

__________________ 9) What is the total surface area of a cylindrical tank with radius of 7 feet and height of 15 feet? (Use $\pi = \frac{22}{7}$)

_________________ 10) Find the volume of a cone with $d = 8$ feet and $h = 14$ feet. (Use $\pi \approx 3.14$) Round the answer to the nearest tenths place.

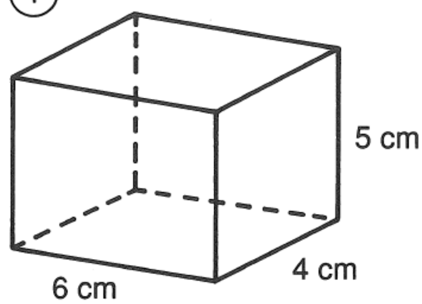
_________________ 11) Find the volume of a square pyramid. The edge of the square is 1.5 cm, and the height of the pyramid is 4 cm.

12) Explain the difference between total surface area and lateral surface area.

Objective: Geometry and Measurement – Surface Area (Prisms and Pyramids)

What Is Cold And Comes In Cans?

Find the surface area of each figure. Cross out the box containing each correct answer. When you finish, write the letters from the remaining boxes in the spaces at the bottom of the page.

1


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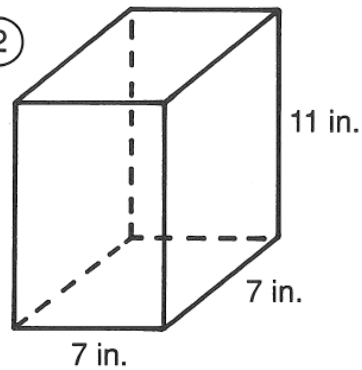

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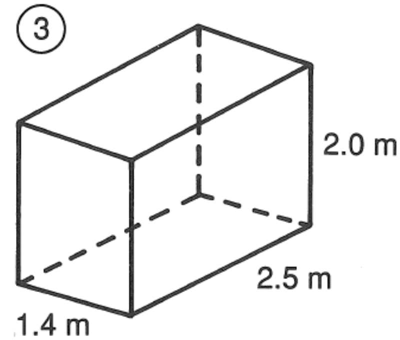

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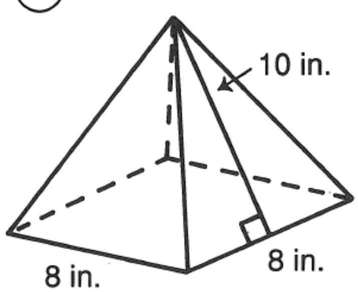

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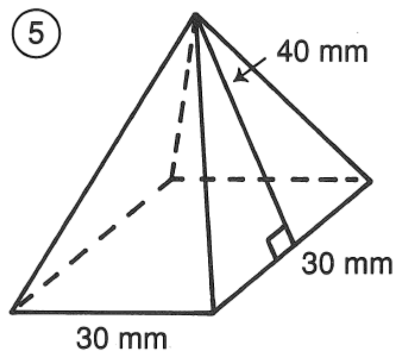

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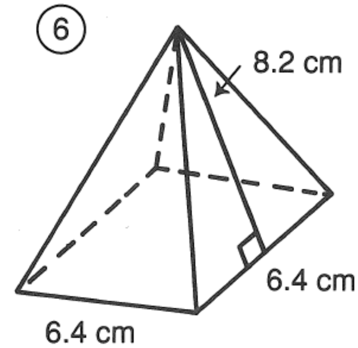

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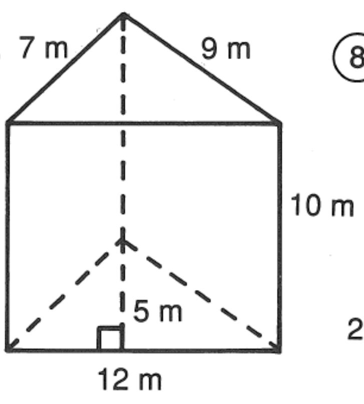

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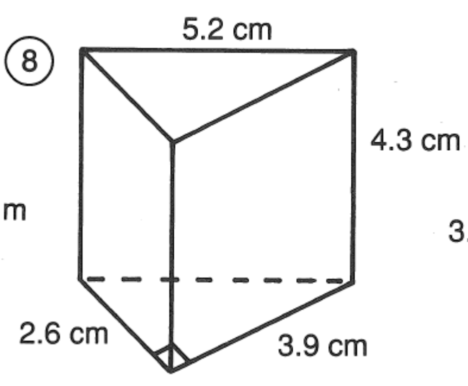
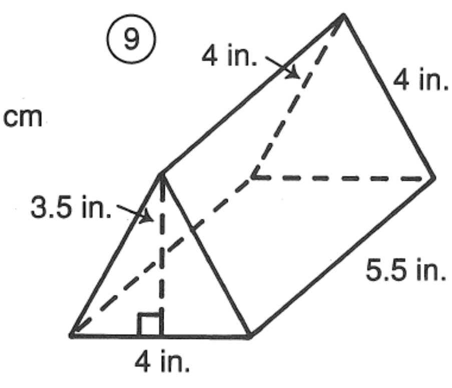


9


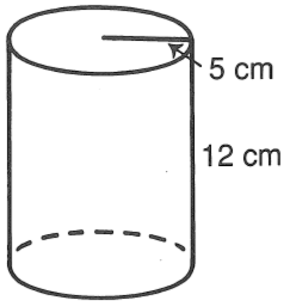
MU 340 m^2	RI 224 $in.^2$	CH 3,120 mm^2	OW 148 cm^2	OP 80 $in.^2$	FO 3,300 mm^2	IL 118 $in.^2$
IB 81.5 cm^2	AR 22.6 m^2	CL 60.45 cm^2	EA 312 m^2	CA 145.92 cm^2	NS 25.8 m^2	KE 406 $in.^2$

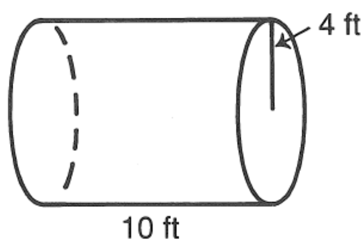
Objective: Geometry and Measurement – Surface Area (Cylinders)

Why Did Humpty Dumpty Have a Great Fall?

Do each exercise and find your answer in the answer column. Write the letter of the answer in each box containing the number of the exercise. Use 3.14 for π.

I. Find the lateral area and the total surface area of each cylinder.



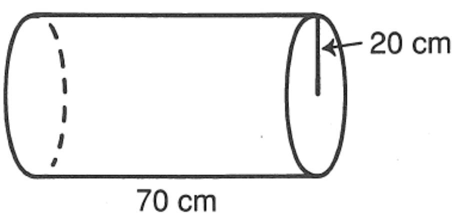


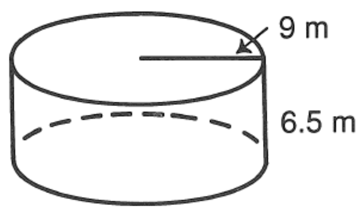
(1) lateral area: ________

(2) total area: ________

(3) lateral area: ________

(4) total area: ________





(5) lateral area: ________

(6) total area: ________

(7) lateral area: ________

(8) total area: ________

II. Find the total surface area of each cylinder.

(9) $r = 3$ cm, $h = 10$ cm

(10) $r = 8$ in., $h = 8$ in.

(11) $d = 10.8$ m, $h = 2.6$ m

III. Solve.

(12) A can of tomato juice is a cylinder with a radius of 7.5 cm and a height of 20 cm. What is the area of the label around the can?

(13) A steel oil tank is a cylinder with a diameter of 12 ft and a height of 18 ft. How many square feet of steel were needed to make the tank?

(Y) 412.18 ft^2
(R) 803.84 $in.^2$
(H) 792.16 m^2
(T) 251.2 ft^2
(M) 904.32 ft^2
(L) 861.6 cm^2
(S) 367.38 m^2
(D) 376.8 cm^2
(P) 244.92 cm^2
(C) 815.18 ft^2
(K) 11,304 cm^2
(B) 942 cm^2
(E) 351.68 ft^2
(N) 775.14 $in.^2$
(U) 533.8 cm^2
(A) 271.296 m^2
(O) 876.06 m^2
(V) 12,412 cm^2
(F) 8,792 cm^2
(I) 311.046 m^2

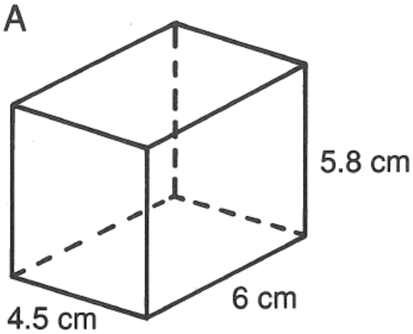
3	8	13	11	6	4	2	9	5	8	10	11	12	11	1	7	2	13	13	4	10

Objective: Geometry and Measurement – Volume (Prisms)

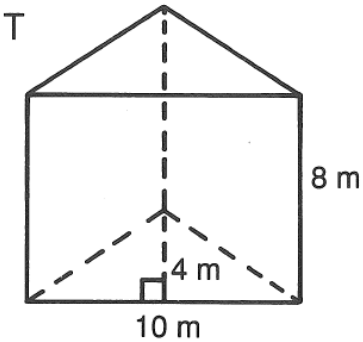
What Is Big, Gray, and Lives in California?

Find the volume of each prism. Write the letter of the exercise in the box above the answer at the bottom of the page.

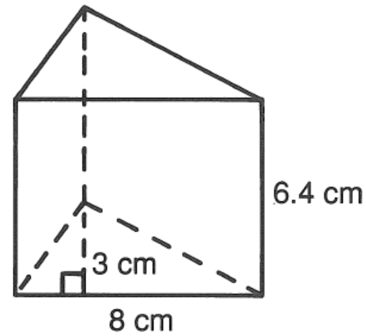
A



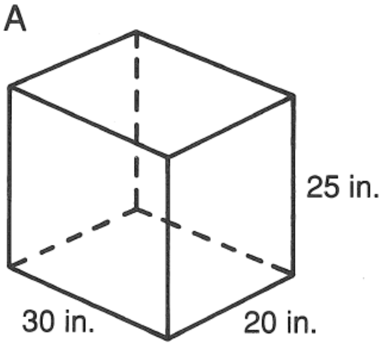
T



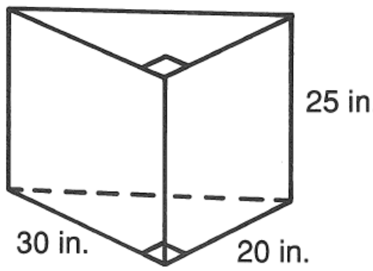
N



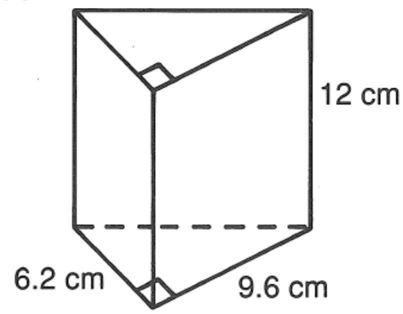
A



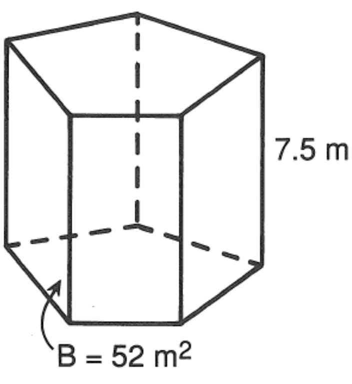
P



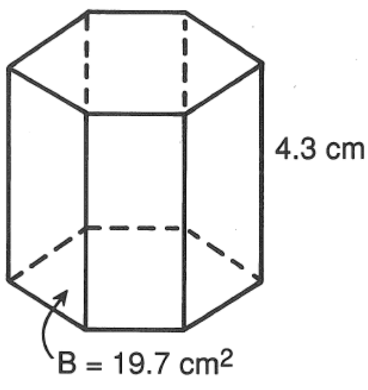
A



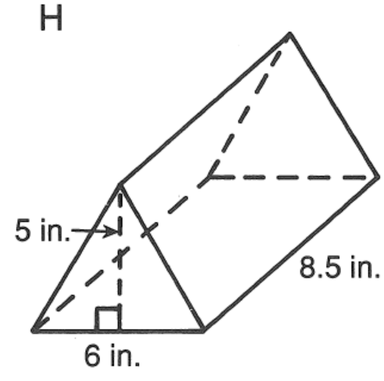
N



L



H



$83.8\ cm^3$	$357.12\ cm^3$	$76.8\ cm^3$	$8{,}800\ in.^3$	$92.31\ cm^3$	$84.71\ cm^3$	$156.6\ cm^3$	$114.5\ in.^3$	$364.5\ m^3$	$7{,}500\ in.^3$	$127.5\ in.^3$	$15{,}000\ in.^3$	$390\ m^3$	$160\ m^3$	$349.22\ cm^3$

Objective: Geometry and Measurement – Volume (Cylinders)

☆ TRIVIA TEST ☆

1. What Is the Best Way to Paint a Rabbit?

__ __ __ __ __ __ __ __ __ __ __ __ __
4 7 2 8 8 3 11 5 10 1 11 3 6

2. What Candy Do Kids Eat on the Playground?

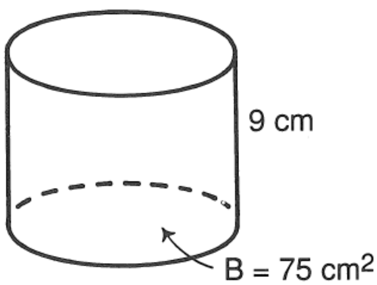
__ __ __ __ __ __ __ __ __ __ __ __
11 5 9 5 10 10 1 7 5 9 5 10

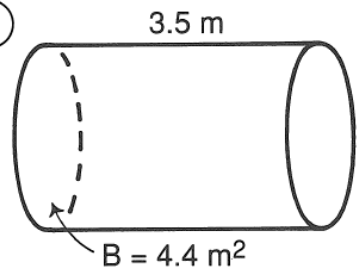
Do each exercise and find your answer in the answer column. Write the letter of the answer above the exercise number each time it appears in the code. Use 3.14 for π.

Answers

- M 814.13 cm^3
- C 565.2 m^3
- N 381.36 mL
- A 141.3 cm^3
- B 14.8 m^3
- I 602.88 in.^{3}
- P 675 cm^3
- U 7,490 m^3
- H 1,177.5 mm^3
- R 452.16 mL
- W 2,260.8 in.^{3}
- L 382.8 cm^3
- T 15.4 m^3
- Y 846.23 cm^3
- O 717.8 in.^{3}
- S 376.8 cm^3
- G 1,224.5 mm^3
- E 7,850 m^3
- D 614.2 m^3

I. Find the volume of each cylinder.

1


2


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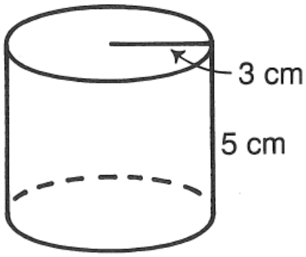

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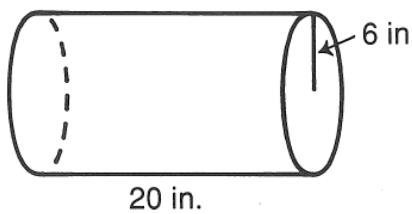

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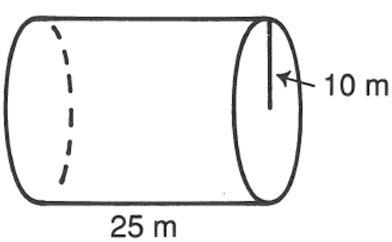
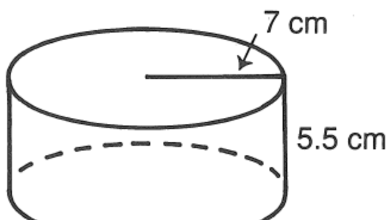


6


7 $r = 8$ in.
$h = 3$ in.

8 $r = 2.5$ mm
$h = 60$ mm

9 $d = 10$ m
$h = 7.2$ m

II. Solve.

10 Shawn is making a candle using a cylindrical mold with a radius of 2 cm and a height of 30 cm. How many cubic centimeters of wax are needed for the candle?

11 A mug in the shape of a cylinder has a base with a radius of 4 cm. How many milliliters of liquid does it hold if filled to a height of 9 cm? (Hint: 1 cm^3 holds 1 mL.)