Math 60, Sections 2.1-2.2 Notes and Practice Name: Solutions

Section 2.1 Variables and Evaluating Expressions

An **expression** is a combination of variables, numbers and operations.

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1. Make up some examples of algebraic expressions:

$x+5$ $5x^2$

$2y-3q$ $x^2+17x-4$ ( )( ) factoring in Math 65

To **evaluate** an expression, we replace the variable(s) with their values and calculate the result.

2. Evaluate each expression for $x=-4$

a. $22x$ $= 22(-4)$
$= -88$

b. $-5(x-7)$ $= -5(-4-7)$
$= -5(-11)$
$= 55$

c. $\frac{|x-16|}{x}$ $= \frac{|-4-16|}{-4}$
$= \frac{|20|}{-4}$
$= \frac{20}{-4}$
$= -5$

$-4^2 = -16$

d. $\sqrt{-2x+1}-5$ $= \sqrt{-2(-4)+1}-5$
$= \sqrt{8+1}-5$
$= \sqrt{9}-5$
$= 3-5$
$= -2$

e. x^2 $= (-4)^2$
$= 16$

f. $-x^2$ $= -(-4)^2$
$= -16$

3. Evaluate each expression for $x=7$ and $y=5$

a. $4(x-y)$ $= 4(7-5)$
$= 4(2)$
$= 8$

b. $2xy+3$ $= 2(7)(5)+3$
$= 70+3$
$= 73$

c. $\frac{\frac{40}{y}-\frac{7}{x}}{}$ $= \frac{40}{5}-\frac{7}{7}$
$= 8-1$
$= 7$

or

$\frac{40\cdot 7}{5\cdot 7}-\frac{7\cdot 5}{7\cdot 5}$

$\frac{280}{35}-\frac{35}{35}$

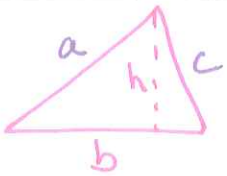
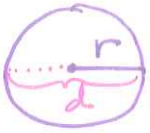
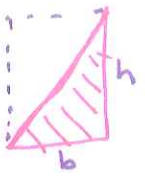
$= \frac{245}{35}$

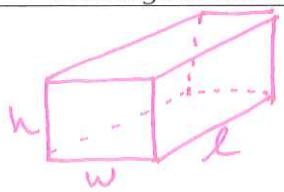
$= 7$

d. $\frac{3x+4y-1}{4y}$ $= \frac{3(7)+4(5)-1}{4(5)}$
$= \frac{21+20-1}{20}$
$= \frac{40}{20} = 2$

Evaluating Geometric Formulas

****Memorize these 8 formulas and their corresponding units****

	Rectangle	Triangle	Circle
Perimeter Units: feet	 $P = \ell + w + \ell + w$ $P = 2\ell + 2w$	 $P = a + b + c$	 Circumference $C = 2\pi r$ diameter $= 2r$
Area Units: ft^2 sq ft	$A = \ell \cdot w$	$A = \frac{1}{2} b \cdot h$  	$A = \pi r^2$

	Rectangular Solid – Box	Right Cylinder
Volume Units: ft^3 cu. ft cubic ft	 $V = \ell \cdot w \cdot h$	 $V = \pi r^2 h$

4. Evaluate each geometric formula using the information given. Include units in your answer.

a. Find the area of a triangular sail that has a height of 15 feet and a width of 8 feet.

$A = \frac{1}{2} \cdot b \cdot h$

$= \frac{1}{2}(8)(15)$

$= 4(15)$

$= 60\ ft^2$

The area is $60\ ft^2$.

b. Find the circumference and area of a 16-inch diameter pizza, which sells for $19.00 at Pizzicato.

i. The pizza's circumference, in terms of π, is

$d = 16$

$r = 8$ inches

$C = 2\pi r$

$= 2\pi(8)$

$= 16\pi$ inches

In webwork: 16pi in

16*pi in

ii. The pizza's circumference, rounded to the hundredth's place is:

$C \approx 50.27$ inches

50.27 in

iii. The pizza's area, in terms of π, is

$A = \pi r^2$

$= \pi \cdot 8^2$

$= 64\pi$ in^2

In webwork:

64pi in^2

iv. The pizza's area, rounded to the hundredth's place is:

$A \approx 201.06$ in^2

201.06 in^2

c. Find the volume of a can that has a diameter of 7 cm and a height of 11 cm.

$r = 3.5$ cm

i. The can's volume, in terms of π, is

$V = \pi r^2 h$

$= \pi(3.5)^2 \cdot 11$

$= \pi \cdot 12.25(11) = 134.75\pi$ cm^3

ii. The can's volume, rounded to the hundredth's place is:

$V \approx 423.33$ cm^3

5. Evaluating other formulas.

To convert a temperature measured in degrees Fahrenheit, F, to degrees Celsius, C, we use the formula $C = \frac{5}{9}(F - 32)$. Convert the room temperature of $68^\circ F$ to Celsius. Write your answer in a complete sentence including units.

$C = \frac{5}{9}(68 - 32)$

$= \frac{5}{9}\left(\frac{36}{1}\right)^4$

$= 20^\circ C$

Room temperature is 20°C.

Section 2.2 Equations and Inequalities as True/False Statements

An **equation** is a statement that two expressions are equal. An **inequality** compares two expressions with an inequality symbol.

6. Make up some examples of equations and inequalities. What is the difference between an expression and an equation?

equations

$x-1=5x$

$x-1=5y$

$xy^2=3x-2y+4$

inequality

$2x>4$

$3+y\leq y-1$

$2\geq 7+1+x$

$4y<3y$

$3x\neq 2x+1$

Equations and inequalities can be very complex with multiple variables and operations. In Math 60 we will study **linear equations and inequalities,** which have one variable and cannot have any exponents on the variable (other than 1). There cannot be any variables in a square root or denominator.

7. Make up some examples of <u>linear</u> equations and inequalities.

$x-1=5x$

$3x=10$

$3x+2=4x$

$\frac{x}{4}=10$

$3(x+2)=7$

$\sqrt{7}x=4$

$4^2x=10$

8. Make up some examples of equations and inequalities that are <u>not linear</u>.

$\sqrt{x}=4$

$x^4=16$

$\frac{4}{x}=2$

<u>Checking Possible Solutions</u>

A solution to an equation or inequality is a value that makes the statement true.

9. Check each equation or inequality to see whether the given number is a solution.

a. Is 5 a solution to $y+10=15$?

$5+10\stackrel{?}{=}15$

$15=15$ ✓

5 is a solution

b. Is -4 a solution to $3x=12$?

$3(-4)\stackrel{?}{=}12$

$-12\neq 12$

-4 is not a solution

c. Is -3 a solution to $2x+7\leq 15$?

$2(-3)+7\stackrel{?}{\leq}15$

$-6+7\stackrel{?}{\leq}15$

$1\leq 15$

-3 is a solution

d. Is -2 a solution to $\frac{1}{2}r-5<2(r-1)$?

$\frac{1}{2}(-2)-5\stackrel{?}{<}2(-2-1)$

$-1-5\stackrel{?}{<}2(-3)$

$-6\not<-6$

-2 is not a solution

More Practice

10. Check each equation or inequality to see whether the given number is a solution.

a. Is 3 a solution to $2(t+5)=16$?

$2(3+5) \stackrel{?}{=} 16$

$2(8) \stackrel{?}{=} 16$

$16 = 16$

3 is a solution

b. Is -2 a solution to $-3x+5 \geq 1$?

$-3(-2)+5 \stackrel{?}{\geq} 1$

$6+5 \stackrel{?}{\geq} 1$

$11 \geq 1$

-2 is a solution

c. Is -3 a solution to $5t+1 \leq -7-t$?

$5(-3)+1 \stackrel{?}{\leq} -7-(-3)$

$-15+1 \stackrel{?}{\leq} -7+3$

$-14 \leq -4$ T

-3 is a solution

d. Is -6 a solution to $y+5>1$?

$-6+5 \stackrel{?}{>} 1$

$-1 \not> 1$

-6 is not a solution

11. Evaluate each expression for $a=4$ and $b=-6$

a. $a+4b^2$

$= 4+4(-6)^2$

$= 4+4(36)$

$= 4+144$

$= 148$

b. $5ab-8a$

$= 5(4)(-6)-8(4)$

$= 20(-6)-32$

$= -120-32$

$= -152$

c. $\frac{1}{2}a-\frac{1}{3}b$

$= \frac{1}{2}\frac{(4)}{1}-\frac{1}{3}\frac{(-6)}{1}$

$= 2+2 = 4$

d. $\frac{2a-3b+10}{ab}$

$= \frac{2(4)-3(-6)+10}{4(-6)}$

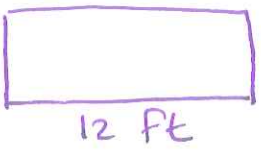
$= \frac{8+18+10}{-24}$

$= \frac{36}{-24} = -\frac{3}{2}$

12. Use a geometric formula and the information given. Write your answer in a complete sentence, including units.

a. A garden bed has a length of 12 feet and a width of 4 feet. How much material would you need to make a border?

perimeter



$P = 2\ell+2w$

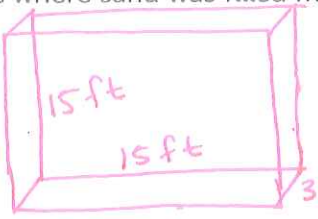
$= 2(12)+2(4)$

$= 24+8$

$= 32$ feet

We would need 32 feet of border material.

b. When a backyard patio was built, the sod was dug out and then filled with sand before bricks were placed on top. The space where sand was filled measured 15 feet by 15 feet by 3 inches. How much sand was needed?



T different units

$\frac{3 \text{ in}}{1} \cdot \frac{1 \text{ ft}}{12 \text{ in}} = \frac{1}{4} \text{ ft}$

$V = l \times w \times h$

$= 15(15 \times \frac{1}{4})$

$= 56.25 \text{ ft}^3$

They would need 56.25 ft^3 of sand.

c. A paper cone for drinking water has a base diameter of 2.5 inches and a height of 4 inches. How much water can the cone hold?

$d = 2.5$

$r = 1.25$ in

Write the answer in terms of π:

$V = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi(1.25)^2 \cdot 4$

$= \frac{1}{3} \cdot \frac{4}{1}(1.25)^2 \cdot \pi$

$= \frac{4}{3}(1.5625) \cdot \pi$ $\quad \frac{6.25}{3}\pi$ or $2.08\bar{3}\pi$

Write the answer rounded to the nearest hundredths place:

$V \approx 6.54 \text{ in}^3$

13. When a plant was purchased, it was 3.2 inches tall and it grows at a rate of 0.2 inches per day. The expression $3.2 + 0.2d$ represents the height of the plant after d days.

a. How tall is the plant after 10 days?

$3.2 + .2(10)$ in

$= 3.2 + 2$

$= 5.2$ inches

The plant is 5.2 inches tall after 10 days.

b. The equation $3.2 + 0.2d = 10$ describes the number of days it takes for the plant to be 10 inches tall. Is 22 a solution for this equation?

$3.2 + .2(22) \stackrel{?}{=} 10$

$3.2 + 4.4 \stackrel{?}{=} 10$

$7.6 \neq 10$

22 is not a solution, so the plant is not 10 inches tall at 22 days

c. Challenge: Can you figure out how many days it will take the plant to reach 10 inches in height?

Trial + error: We will learn how to solve these in Chapter 3.

$3.2 + .2(25) = 8.2$

$3.2 + .2(30) = 9.2$

$3.2 + .2(38) = 10.8$

$3.2 + .2(34) = 10$

It will take 34 days!