

## Powers, Square Roots and Order of Operations

Power :  $\left\{ \begin{array}{l} 3^4 \rightarrow \text{exponent} \\ \quad \quad \rightarrow \text{base} \end{array} \right.$

The power,  $3^4$ , reads as "3 to the exponent 4" and is the product,  $3 \times 3 \times 3 \times 3$  which has a value of 81.

**Ex. 1.** Write the product represented by each power. Then, evaluate.

a)  $2^5$   
 $= 2 \times 2 \times 2 \times 2 \times 2$   
 $= 32$

b)  $\left(\frac{3}{7}\right)^2$   
 $= \left(\frac{3}{7}\right)\left(\frac{3}{7}\right)$  or  $\frac{3}{7} \cdot \frac{3}{7}$   
 $= \frac{9}{49}$

c)  $\left(2\frac{1}{2}\right)^3$   
 $= \left(\frac{5}{2}\right)^3$   
 $= \left(\frac{5}{2}\right)\left(\frac{5}{2}\right)\left(\frac{5}{2}\right)$   
 $= \frac{125}{8}$   
 $= 15\frac{5}{8}$

$\frac{125}{8} \rightarrow$  
$$\begin{array}{r} 015 \\ 8 \overline{) 125} \\ \underline{-8} \phantom{0} \\ 45 \\ \underline{-40} \\ 5 \end{array}$$

### Square Root : $\sqrt{16}$

The square root,  $\sqrt{16}$ , reads as "square root of 16" and is the number multiplied by itself or squared giving a value of 16 which in this case is 4.

**Note:** Squaring and taking the square root are **inverse** operations so  $\sqrt{4^2} = \underline{4}$  and  $(\sqrt{4})^2 = \underline{4}$ .

**Ex. 2.** Evaluate.

a)  $\sqrt{49}$   
 $= 7$

b)  $\sqrt{400}$   
 $= 20$

c)  $\sqrt{9^2}$   
 $= 9$

d)  $(\sqrt{25})^2$   
 $= 25$

e)  $(\sqrt{7})^2$   
 $= 7$

f)  $\sqrt{39^2}$   
 $= 39$

## Order of Operations (BEDMAS)

B	E	DM	AS
Brackets <i>* complete the entire inside</i>	Exponents	Division and Multiplication, <u>in order from left to right</u>	Addition and Subtraction, <u>in order from left to right</u>

Ex. 3. Evaluate using the rules for order of operations. "BEDMAS"

$$\begin{aligned}
 \text{a) } & 35 - 2^2(10 - 14 \div 2) \\
 & = 35 - 2^2(10 - 7) \\
 & = 35 - 2^2(3) \\
 & = 35 - 4(3) \\
 & = 35 - 12 \\
 & = 23
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } & (5 - 1)^3 - 5^2 + 1^4 \\
 & = (4)^3 - 25 + 1 \\
 & = 64 - 25 + 1 \\
 & = 40
 \end{aligned}$$

$$\begin{array}{r}
 5 \ 14 \\
 64 \\
 -25 \\
 \hline
 39
 \end{array}$$

$$\begin{aligned}
 \text{c) } & \frac{2(6 - 3)^3}{48 \div (5 - 1)^2} \leftarrow \div \\
 & = \frac{2(3)^3}{48 \div (4)^2} \\
 & = \frac{2(27)}{48 \div 16} \\
 & = \frac{54}{3} \\
 & = 18
 \end{aligned}$$

$$\begin{array}{r}
 27 \\
 \times 2 \\
 \hline
 54
 \end{array}$$

$$\begin{array}{r}
 18 \\
 3 \overline{)54} \\
 \underline{-36} \\
 18 \\
 \underline{-18} \\
 0
 \end{array}$$

$$\begin{aligned}
 \text{d) } & 3[9 \times 5 - (9 + 3^4 \div 9)] \\
 & = 3[45 - (9 + 81 \div 9)] \\
 & = 3[45 - (9 + 9)] \\
 & = 3[45 - 18] \\
 & = 3(27) \\
 & = 81
 \end{aligned}$$

$$\begin{array}{r}
 3 \ 1 \\
 45 \\
 -18 \\
 \hline
 27
 \end{array}$$

$$\begin{array}{r}
 27 \\
 \times 3 \\
 \hline
 81
 \end{array}$$

$$\begin{aligned}
 \text{e) } & \frac{\sqrt{36 + 64}}{\sqrt{64} - \sqrt{36}} \leftarrow \div \\
 & = \frac{\sqrt{100}}{\sqrt{64} - \sqrt{36}} \\
 & = \frac{10}{8 - 6} \\
 & = \frac{10}{2} \\
 & = 5
 \end{aligned}$$

$$\begin{aligned}
 \text{f) } & \frac{17^2 - 8^2}{6^2 + 1^6 - 16 \div 2 \times 4} \\
 & = \frac{289 - 64}{36 + 1 - 8 \times 4} \\
 & = \frac{225}{37 - 32} \\
 & = \frac{225}{5} \\
 & = 45
 \end{aligned}$$

$$\begin{array}{r}
 17 \\
 \times 17 \\
 \hline
 119 \\
 +170 \\
 \hline
 289
 \end{array}$$

$$\begin{array}{r}
 45 \\
 5 \overline{)225} \\
 \underline{-20} \\
 25 \\
 \underline{-25} \\
 0
 \end{array}$$

## Rules for Homework:

1. Copy the question down and follow the appropriate examples from this note.
2. Show **all** work by working down not across.  
(no more than one "=" sign per line with the fraction line centred if applicable)
3. Simplify the final answer if possible.
4. Check your answers in the back of the textbook. Mark correct answers with a checkmark and incorrect answers with a star. Go back and try to correct your solutions. If you can't find your error ask your teacher or a classmate for help.
5. Remember, **no calculators** are allowed . **YOU** are responsible for your own learning and are expected to maintain an organized binder with lessons and homework completed and checked on a daily basis.

## Working With Decimals

**Scientific Notation:** is a way of writing a number given in **standard form** as a decimal between 1 and 10, multiplied by a power of 10

"18 000 =  $1.8 \times 10^4$ "



**Ex. 1** Express in scientific notation.

a) 3 500 =  $3.5 \times 10^3$       b) 765 010 =  $7.6501 \times 10^5$

**Ex. 2.** Express in standard form.

a)  $1.25 \times 10^2 = 125$       b)  $2.096 \times 10^6 = 2\ 096\ 000$

### Rounding Decimals:

**Ex. 3.** Round to the nearest whole number (unit).

a)  $4.5 \approx 5 \approx 5$       b)  $141.48 \approx 141$

**Ex. 4.** Round to the nearest tenth. (1 decimal place)

a)  $6.32 \approx 6.3$       b)  $18.986 \approx 19.0$

### Adding and Subtracting Decimals:

**Ex. 5.** Evaluate exactly. \*Rewrite the question vertically with the decimal places lined up.

a)  $4.9 + 7.48 + 6.96 = 19.34$

$$\begin{array}{r} 4.90 \\ 7.48 \\ + 6.96 \\ \hline 19.34 \end{array}$$

b)  $8.3 - 2.91 = 5.39$

$$\begin{array}{r} 8.30 \\ - 2.91 \\ \hline 5.39 \end{array}$$

### Multiplying Decimals:

**Ex. 6.** Determine the product. Round to the nearest hundredth (2 decimal places) if necessary.

\*The product has the total number of decimal places of all decimal factors.

a)  $2.4 \times 8.6 = 20.64$

$$\begin{array}{r} 2.4 \\ \times 8.6 \\ \hline 144 \\ + 1920 \\ \hline 20.64 \end{array}$$

b)  $4.6 \times 0.01 = 0.046 \approx 0.05$

$$\begin{array}{r} 4.6 \\ \times 0.01 \\ \hline 46 \\ + 000 \\ \hline 0.046 \end{array}$$

c)  $3.93 \times 0.61 = 2.3973 \approx 2.40$

$$\begin{array}{r} 3.93 \\ \times 0.61 \\ \hline 393 \\ + 23580 \\ \hline 2.3973 \end{array}$$

②  $24 \times 86 = 2064$

$$\begin{array}{r} 24 \\ \times 86 \\ \hline 144 \\ + 1920 \\ \hline 2064 \end{array}$$



## Dividing Decimals:

Ex. 7. Determine the quotient using long division. Round to the nearest hundredth if necessary.

\*Rewrite the quotient so you are dividing by a whole number before using long division.

$$\begin{aligned} \text{a) } 0.48 \div 0.6 & \\ &= \frac{0.48 \times 10}{0.6 \times 10} \\ &= \frac{4.8}{6} \\ &= 0.8 \end{aligned}$$

$$\begin{array}{r} 0.8 \\ 6 \overline{) 4.8} \\ \underline{-4.8} \\ 0 \end{array}$$

$$\begin{aligned} \text{b) } 5.5 \div 0.45 & \\ &= \frac{5.5 \times 100}{0.45 \times 100} \\ &= \frac{550 \div 5}{45 \div 5} \\ &= \frac{110}{9} \\ &\approx 12.22 \end{aligned}$$

$$\begin{array}{r} 12.22 \dots \\ 9 \overline{) 110.00} \\ \underline{-9} \phantom{00} \\ 20 \phantom{0} \\ \underline{-18} \phantom{0} \\ 20 \phantom{0} \\ \underline{-18} \phantom{0} \\ 20 \\ \underline{-18} \\ 2 \dots \end{array}$$

$$\text{c) } 0.0435 \div 0.007$$

$$\begin{aligned} &= \frac{0.0435 \times 1000}{0.007 \times 1000} \\ &= \frac{43.5}{7} \\ &\approx 6.21 \end{aligned}$$

$$\begin{array}{r} 6.2142 \dots \\ 7 \overline{) 43.5000} \\ \underline{-42} \phantom{000} \\ 15 \phantom{00} \\ \underline{-14} \phantom{00} \\ 10 \phantom{00} \\ \underline{-7} \phantom{00} \\ 30 \phantom{00} \\ \underline{-28} \phantom{00} \\ 20 \phantom{00} \\ \underline{-14} \phantom{00} \\ 6 \dots \end{array}$$

## Order of Operations:

Ex. 8. Evaluate exactly.

$$\text{a) } (2.5 + 68.7 \div 10^2) \times 10^3$$

$$\text{b) } \sqrt{0.09} + \sqrt{1.44} - \sqrt{0.0001}$$

$$\text{c) } 0.7 \times 0.6 \div 0.4$$

$$\begin{array}{r} 2.500 \\ + 0.687 \\ \hline 3.187 \end{array}$$

$$\begin{aligned} &= (2.5 + 68.7 \div 100) \times 1000 \\ &= (2.5 + 0.687) \times 1000 \\ &= 3.187 \times 1000 \\ &= 3187 \end{aligned}$$

$$\begin{aligned} &= 0.3 + 1.2 - 0.01 \\ &= 1.5 - 0.01 \\ &= 1.49 \end{aligned}$$

$$\begin{aligned} &= 0.42 \div 0.4 \\ &= \frac{0.42 \times 10}{0.4 \times 10} \\ &= \frac{4.2}{4} \\ &= 1.05 \end{aligned}$$

$$\begin{array}{r} 1.05 \\ 4 \overline{) 4.20} \\ \underline{-4} \phantom{0} \\ 02 \phantom{0} \\ \underline{-0} \phantom{0} \\ 20 \\ \underline{-20} \\ 0 \end{array}$$

Ex. 9. Amy's hobby is chemistry. For one experiment she used 3 litres of water and 3 empty beakers. She poured 0.7 litres of water into the first beaker and twice that amount into the second. Choose and use one of the expressions below that will correctly determine the amount of water left for the third beaker.

$$\text{i) } 3 - 0.7 + 2 \times 0.7$$

or

$$\text{ii) } 3 - (0.7 + 2 \times 0.7)$$

$$= 3 - (0.7 + 1.4)$$

$$= 3 - (2.1)$$

$$= 0.9$$

∴ there is 0.9L left in the third beaker.

$$\begin{array}{r} 3.0 \\ - 2.1 \\ \hline 0.9 \end{array}$$

HW:

Worksheets 1 and 2 \*\*Remember to follow the "Rules for Homework"

## Working With Fractions

### Adding and Subtracting Fractions:

- Convert all mixed numbers to improper fractions and give all whole numbers a denominator of 1.
- Find the lowest common denominator, LCD. ← \* only for add/subtract
- Add or subtract the numerators only. Keep the denominator the same.
- Reduce the final answer to lowest terms if possible. (Simplify.)

Ex. 1. Evaluate.

$$\begin{aligned} \text{a) } \frac{2}{15} + \frac{1}{15} \\ = \frac{3}{15} \quad \begin{array}{l} \div 3 \\ \div 3 \end{array} \\ = \frac{1}{5} \end{aligned}$$

$$\begin{aligned} \text{b) } 2 - \frac{5}{8} \\ = \frac{2 \times 8}{1 \times 8} - \frac{5}{8} \\ = \frac{16}{8} - \frac{5}{8} \\ = \frac{11}{8} \\ = 1\frac{3}{8} \end{aligned}$$

$$\begin{aligned} \text{c) } \frac{1 \times 3}{3 \times 3} - \frac{2}{9} \\ = \frac{3}{9} - \frac{2}{9} \\ = \frac{1}{9} \end{aligned}$$

$$\begin{aligned} \text{d) } \frac{1 \times 4}{3 \times 4} + \frac{3 \times 3}{4 \times 3} \\ = \frac{4}{12} + \frac{9}{12} \\ = \frac{13}{12} \\ = 1\frac{1}{12} \end{aligned}$$

$$\begin{aligned} \text{e) } 1\frac{7}{10} - \frac{1}{5} \\ = \frac{17}{10} - \frac{1 \times 2}{5 \times 2} \\ = \frac{17}{10} - \frac{2}{10} \\ = \frac{15}{10} \\ = \frac{3}{2} \\ = 1\frac{1}{2} \end{aligned}$$

$$\begin{aligned} \text{f) } 2\frac{2}{3} + 2\frac{1}{2} \\ = \frac{8 \times 2}{3 \times 2} + \frac{5 \times 3}{2 \times 3} \\ = \frac{16}{6} + \frac{15}{6} \\ = \frac{31}{6} \\ = 5\frac{1}{6} \end{aligned}$$

### Multiplying Fractions:

- Convert all mixed numbers to improper fractions and give all whole numbers a denominator of 1.
- Reduce by dividing out common factors in both the numerator and denominator.
- Multiply numerators and multiply denominators.
- Reduce the final answer to lowest terms if necessary.

Ex. 2. Evaluate.

$$\begin{aligned} \text{a) } \frac{1 \times 5}{8 \times 6} \times \frac{3}{6} = \frac{1}{2} \\ = \frac{1}{8} \times \frac{5}{2} \\ = \frac{5}{16} \end{aligned}$$

$$\begin{aligned} \text{b) } \frac{3 \times 9}{14 \times 2} \times \frac{7}{12 \times 4} \\ = \frac{3}{8} \end{aligned}$$

$$\begin{aligned} \text{c) } 1\frac{11}{14} \times 2\frac{1}{10} \\ = \frac{25}{14} \times \frac{21}{10} \\ = \frac{15}{4} \\ = 3\frac{3}{4} \end{aligned}$$

$$\begin{array}{c} \div 7 \\ \div 5 \end{array}$$

## Dividing Fractions:

- Convert all mixed numbers to improper fractions and give all whole numbers a denominator of 1.
- "Keep" the first fraction. "Change" the  $\div$  to  $\times$ . "Invert" the divisor. "Reduce".  
(Memory Aid: **KCI Raiders**)
- Multiply numerators and multiply denominators.
- Reduce the final answer to lowest terms if necessary.

Ex. 3. Evaluate.

$$\begin{aligned}
 \text{a) } \frac{3}{10} \div 6 & \\
 &= \frac{3}{10} \div \frac{6}{1} \\
 &\quad \text{K C I...Reduce} \\
 &= \frac{\cancel{3}^1}{10} \times \frac{1}{\cancel{6}_2} \\
 &= \frac{1}{20}
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } \frac{15}{44} \div \frac{10}{33} & \\
 &= \frac{\cancel{15}^3}{\cancel{44}_4} \times \frac{\cancel{33}^3}{\cancel{10}_2} \quad \begin{matrix} \div 5 \\ \div 11 \end{matrix} \\
 &= \frac{9}{8} \\
 &= 1\frac{1}{8}
 \end{aligned}$$

$$\begin{aligned}
 \text{c) } 1\frac{7}{8} \div 2\frac{11}{12} & \\
 &= \frac{15}{8} \div \frac{35}{12} \\
 &= \frac{\cancel{15}^3}{\cancel{8}_2} \times \frac{\cancel{12}^3}{\cancel{35}_7} \quad \begin{matrix} \div 3 \\ \div 4 \end{matrix} \\
 &= \frac{9}{14}
 \end{aligned}$$

## Order of Operations:

Ex. 4. Evaluate exactly.

$$\begin{aligned}
 \text{a) } \frac{2}{3} \times 1\frac{3}{4} \div 14 \div \frac{5}{18} & \\
 &= \frac{2}{3} \times \frac{7}{4} \div \frac{14}{1} \div \frac{5}{18} \\
 &= \frac{\cancel{2}^1}{\cancel{3}_1} \times \frac{\cancel{7}^1}{\cancel{4}_2} \times \frac{1}{\cancel{14}_2} \times \frac{\cancel{18}^3}{5} = \frac{6}{20} = \frac{3}{10} \\
 &= \frac{3}{10}
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } 1\frac{1}{2} - \frac{2}{5} \div \frac{1}{5} \left( \frac{3}{8} + \frac{1}{8} \right)^2 + \frac{2}{3} & \\
 &= \frac{3}{2} - \frac{2}{5} \div \frac{1}{5} \left( \frac{4}{8} \right)^2 + \frac{2}{3} \\
 &= \frac{3}{2} - \frac{2}{5} \times \frac{5}{1} \left( \frac{1}{2} \right)^2 + \frac{2}{3} \\
 &= \frac{3}{2} - \frac{\cancel{2}^1}{\cancel{5}_1} \times \frac{\cancel{5}^1}{1} \times \frac{1}{\cancel{4}_2} + \frac{2}{3} \\
 &= \frac{3}{2} - \frac{1}{2} + \frac{2}{3} \\
 &= \frac{2}{2} + \frac{2}{3} \\
 &= \frac{1}{1} + \frac{2}{3} \\
 &= \frac{3}{3} + \frac{2}{3} \\
 &= \frac{5}{3} \\
 &= 1\frac{2}{3}
 \end{aligned}$$

## Ratios and Percent

### Warm up

1. Evaluate.

$$\begin{aligned}
 \text{a) } & 2\frac{1}{6} - 1\frac{3}{8} \quad \text{LCD} = 24 \\
 & = \frac{13 \times 4}{6 \times 4} - \frac{11 \times 3}{8 \times 3} \\
 & = \frac{52}{24} - \frac{33}{24} \\
 & = \frac{19}{24}
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } & 16\frac{1}{2} \div \frac{11}{24} \\
 & = \frac{33}{2} \div \frac{11}{24} \\
 & = \frac{33}{2} \times \frac{24}{11} \\
 & = \frac{36}{1} \\
 & = 36
 \end{aligned}$$

$$\begin{aligned}
 \text{c) } & \frac{8}{39} \times 2\frac{11}{12} \div 2\frac{4}{13} \div 7 \\
 & = \frac{8}{39} \times \frac{35}{12} \div \frac{30}{13} \div \frac{7}{1} \\
 & = \frac{8}{39} \times \frac{35}{12} \times \frac{13}{30} \times \frac{1}{7} \\
 & = \frac{1}{27}
 \end{aligned}$$

$$\begin{aligned}
 \text{d) } & \frac{5}{6} - \frac{1}{4} \times \frac{2}{5} \\
 & = \frac{5 \times 5}{6 \times 5} - \frac{1 \times 3}{10 \times 3} \\
 & = \frac{25}{30} - \frac{3}{30} \\
 & = \frac{22}{30} \\
 & = \frac{11}{15}
 \end{aligned}$$

$$\begin{aligned}
 \text{e) } & \left(\frac{3}{5} - \frac{1}{3}\right)^2 \div \left(1 - \frac{1}{5}\right)^3 \\
 & = \left(\frac{9}{15} - \frac{5}{15}\right)^2 \div \left(\frac{5}{5} - \frac{1}{5}\right)^3 \\
 & = \left(\frac{4}{15}\right)^2 \div \left(\frac{4}{5}\right)^3 \\
 & = \frac{16}{225} \div \frac{64}{125} \\
 & = \frac{16}{225} \times \frac{125}{64} \\
 & = \frac{5}{36}
 \end{aligned}$$

$$\begin{aligned}
 \text{f) } & (12 \div 1.2 - \sqrt{81}) - 0.6 \times 0.9 \\
 & = (10 - 9) - 0.54 \\
 & = 1 - 0.54 \\
 & = 0.46
 \end{aligned}$$

$$\begin{aligned}
 & \frac{12 \times 10}{1.2 \times 10} \\
 & = \frac{120}{12} \\
 & = 10 \\
 & \begin{array}{r} 1.00 \\ -0.54 \\ \hline 0.46 \end{array}
 \end{aligned}$$

2. Jack made a backyard patio area out of square patio stones that are  $1\frac{1}{2}$  ft by  $1\frac{1}{2}$  ft.

The area of his patio is  $175\frac{1}{2}$  sq ft and the length is  $19\frac{1}{2}$  ft.

a) Determine the width of the patio.

$$A = w \times l \rightarrow w = A \div l$$

$$\begin{aligned}
 w & = 175\frac{1}{2} \div 19\frac{1}{2} \\
 & = \frac{351}{2} \div \frac{39}{2} \\
 & = \frac{351}{2} \times \frac{2}{39} \\
 & = 9
 \end{aligned}$$

$$\begin{array}{r} 8 \\ 39 \\ \times 9 \\ \hline 351 \end{array}$$

$\therefore$  the width of the patio is 9 feet.

b) Determine the number of patio stones he used.

$$\begin{aligned}
 A_{\text{patio stones}} & = (1\frac{1}{2}) \times (1\frac{1}{2}) \\
 & = (\frac{3}{2}) \times (\frac{3}{2}) \\
 & = \frac{9}{4} \text{ ft}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{Number of Stones} & = A_{\text{patio}} \div A_{\text{stone}} \\
 & = \frac{351}{2} \div \frac{9}{4} \\
 & = \frac{351}{2} \times \frac{4}{9} \\
 & = 78
 \end{aligned}$$

$\therefore$  78 patio stones are used.

## Review of Ratios:

Ex. 1. Write each comparison as a ratio in lowest terms.

a)  $4:16 = 1:4$

b)  $\frac{12}{64} = \frac{3}{16}$

c)  $9:27:3 = 3:9:1$

d)  $12 \text{ s to } 1 \text{ min} = 12 \text{ s to } 60 \text{ s} = 12:60 = 1:5$

e)  $75 \text{ cm to } 1 \text{ m} = 75 \text{ cm to } 100 \text{ cm} = 75:100 = 3:4$

Ex. 2. Write the missing term(s) for each.

a)  $17:25 = \underline{68}:100$

*(Note:  $17 \times 4 = 68$  and  $25 \times 4 = 100$ )*

b)  $\frac{12}{18} = \frac{2}{3}$

*(Note:  $12 \div 6 = 2$  and  $18 \div 6 = 3$ )*

c)  $\underline{1}:6:5 = \underline{6}:36:\underline{30}$

*(Note:  $1 \times 6 = 6$ ,  $6 \times 6 = 36$ ,  $5 \times 6 = 30$ )*

## Review of Percent: Percent means out of 100.

Ex. 1. Write each percent as a fraction in lowest terms.

a)  $15\% = \frac{15}{100} = \frac{3}{20}$

b)  $120\% = \frac{120}{100} = \frac{12}{10} = \frac{6}{5}$

c)  $5\frac{1}{2}\% = \frac{5\frac{1}{2}}{100} = \frac{5\frac{1}{2} \times 2}{100 \times 2} = \frac{11}{200}$

*(Note:  $5\frac{1}{2} \div 2 = 2\frac{1}{4}$  and  $100 \div 2 = 50$ )*

*(Note:  $2\frac{1}{4} \times 100 = 250$  and  $250 \div 2 = 125$ )*

*(Note:  $125 \div 3 = 41\frac{2}{3}$ )*

Ex. 2. Write each fraction as a percent.

a)  $\frac{3}{50} = \frac{6}{100} = 6\%$

b)  $\frac{63}{70} \div 7 = \frac{9}{10} = \frac{90}{100} = 90\%$

c)  $1\frac{3}{20} = \frac{23}{20} = \frac{115}{100} = 115\%$

Ex. 3. Calculate each percent to one decimal place.

a) 6% of 84

$= \frac{6}{100} \times \frac{84}{1} \text{ or } 0.06 \times 84$

$= 5.04$

$\doteq 5.0$

b) 75% of 55

$= \frac{75}{100} \times \frac{55}{1} \text{ or } 0.75 \times 55$

$= 41.25$

$\doteq 41.3$

$$\begin{array}{r} 84 \\ \times 6 \\ \hline 504 \end{array}$$

$$\begin{array}{r} 75 \\ \times 55 \\ \hline 375 \\ +3750 \\ \hline 4125 \end{array}$$

Ex. 4. Write each decimal as a percent.

a) 0.344

$= 0.344 \times 100\%$

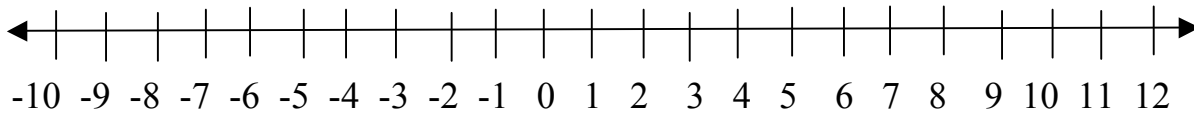
$= 34.4\%$

b) 1.6

$= 1.6 \times 100\%$

$= 160\%$

## Working With Integers



### Adding and Subtracting Integers:

Ex. 1. Evaluate.

$$\begin{array}{l} \text{a) } -6+2 \\ = -4 \end{array}$$

$$\begin{array}{l} \text{b) } -2-8 \\ = -10 \end{array}$$

$$\begin{array}{l} \text{c) } -3+9 \\ = +6 \end{array}$$

$$\begin{array}{l} \text{d) } +10-15 \\ = -5 \end{array}$$

$$\begin{array}{l} \text{e) } -18+30 \\ \underline{30} \\ \underline{-18} \\ = +12 \end{array}$$

$$\begin{array}{l} \text{f) } 25-54 \\ \underline{25} \\ \underline{-54} \\ = -29 \end{array}$$

$$\begin{array}{l} \text{g) } -32-12 \\ = -44 \end{array}$$

$$\begin{array}{l} \text{h) } -18+12 \\ = -6 \end{array}$$

Collect all negatives  
all positives  
then add.

$$\begin{array}{l} \text{i) } +1-4+6-5+7-9 \\ = 14-18 \\ = -4 \end{array}$$

$$\begin{array}{l} \text{j) } -3+2+7-8+1-3+5 \\ = -14+15 \\ = +1 \end{array}$$

$$\begin{array}{l} \text{k) } -22+12-18+41 \\ = -40+53 \\ = +13 \end{array}$$

**Recall:**  $-(-) = +$        $-(+) = -$        $+(-) = -$        $+(+) = +$

Ex. 2. Evaluate by simplifying signs first.

$$\begin{array}{l} \text{a) } (-3)-(-5) \\ = -3+5 \\ = +2 \end{array}$$

$$\begin{array}{l} \text{b) } -5-(+11) \\ = -5-11 \\ = -16 \end{array}$$

$$\begin{array}{l} \text{c) } -(-4)+(-8) \\ = +4-8 \\ = -4 \end{array}$$

$$\begin{array}{l} \text{d) } 2-(+3)-(-1)+(-4) \\ = 2-3+1-4 \\ = 3-7 \\ = -4 \end{array}$$

$$\begin{array}{l} \text{e) } 7-(-9)+(-5)+(+4)-(+2) \\ = 7+9-5+4-2 \\ = 20-7 \\ = 13 \end{array}$$

## Multiplying and Dividing Integers:

<b>Recall:</b> $(-)\times(-) = +$	$(-)\times(+) = -$	$(+)\times(-) = -$	$(+)\times(+) = +$
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Ex. 3. Evaluate each product.

a)  $-8 \times (-5)$   
 $= +40$

b)  $7 \times (-9)$   
 $= -63$

c)  $(-12)(6)$   
 $= -72$

d)  $(10)(50)$   
 $= +500$

<b>Recall:</b> $(-)\div(-) = +$	$(-)\div(+) = -$	$(+)\div(-) = -$	$(+)\div(+) = +$
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Ex. 4. Evaluate each quotient.

a)  $-20 \div (+10)$   
 $= -2$

b)  $64 \div (-8)$   
 $= -8$

c)  $\frac{-155}{-5}$   
 $= +31$

d)  $\frac{[-16(-3)]}{[-2(4)]}$   
 $= \frac{+48}{-8}$   
 $= -6$

## Order of Operations:

Ex. 5. Evaluate.

a)  $(-4)^3$   
 $= (-4)(-4)(-4)$   
 $= -64$

b)  $-10^4$   
 $= -10 \times 10 \times 10 \times 10$   
 $= -10000$

c)  $(-2)^6$   
 $= +64$

d)  $-(-5)^2$   
 $= -(-5)(-5)$   
 $= -25$

e)  $(-1)^{100}$   
 $= +1$

f)  $(-3)(-5)(-2)$   
 $= -30$

g)  $(5)(-15) \div (-3)(5)$   
 $= -75 \div (-3)(5)$   
 $= (+25)(5)$   
 $= +125$

h)  $(5)(-15) \div [(-3)(5)]$   
 $= -75 \div (-15)$   
 $= +5$

i)  $\frac{(-72) \div (-6)(-2)}{-(-2)^2}$   
 $= \frac{(+12)(-2)}{-4}$   
 $= \frac{-24}{-4}$   
 $= +6$

## Working With Integers Continued

### Warm up

1. Evaluate.

$$\begin{aligned} \text{a) } & (-3) + 7 \\ & = -3 + 7 \\ & = 4 \end{aligned}$$

$$\begin{aligned} \text{b) } & 11 - (-4) \\ & = 11 + 4 \\ & = 15 \end{aligned}$$

$$\begin{aligned} \text{c) } & (-15) + (-2) \\ & = -15 - 2 \\ & = -17 \end{aligned}$$

$$\begin{aligned} \text{d) } & -27 - (-19) \\ & = -27 + 19 \\ & = -8 \end{aligned}$$

$$\begin{aligned} \text{e) } & \frac{-12(-6)}{-3^2} \\ & = \frac{+72}{-9} \\ & = -8 \end{aligned}$$

$$\begin{aligned} \text{f) } & 20 \div (-1)^5 \\ & = 20 \div (-1) \\ & = -20 \end{aligned}$$

$$\begin{aligned} \text{g) } & -(-7) + (-9) - (+8) + (+10) \\ & = +7 - 9 - 8 + 10 \\ & = 17 - 17 \\ & = 0 \end{aligned}$$

Ex. 1. Evaluate by following the order of operations.

$$\begin{aligned} \text{a) } & -16 \times 2 - 8 \div (-4) \\ & = -32 - (-2) \\ & = -32 + 2 \\ & = -30 \end{aligned}$$

$$\begin{aligned} \text{b) } & (5 - 7) - [3 - 2(-3)^2] \\ & = (-2) - [3 - 2(9)] \\ & = -2 - (3 - 18) \\ & = -2 - (-15) \\ & = -2 + 15 \\ & = +13 \end{aligned}$$

$$\begin{aligned} \text{c) } & 3(-5) - (-7)(-2) \\ & = -15 - (+14) \\ & = -15 - 14 \\ & = -29 \end{aligned}$$

$$\begin{aligned} \text{d) } & \frac{(-4)^3 - (-2)^5}{-2(22 - 18)} \\ & = \frac{-64 - (-32)}{-2(4)} \\ & = \frac{-64 + 32}{-8} \\ & = \frac{-32}{-8} \\ & = +4 \end{aligned}$$

$$\begin{aligned} \text{e) } & \frac{10 - 5 \times 6}{-2 + 39 \div (-13)} \\ & = \frac{10 - 30}{-2 + (-3)} \\ & = \frac{-20}{-2 - 3} \\ & = \frac{-20}{-5} \\ & = +4 \end{aligned}$$

$$\begin{aligned} \text{f) } & -3(-2 - 3)^2 - (1 - 2)^3 \\ & = -3(-5)^2 - (-1)^3 \\ & = -3(25) - (-1) \\ & = -75 + 1 \\ & = -74 \end{aligned}$$



Ex. 2. Divide the <sup>add</sup>sum of 7 and -16 by -3.

$$\begin{aligned} & [7 + (-16)] \div (-3) \quad \text{or} \quad \frac{7 + (-16)}{-3} \\ & = (7 - 16) \div (-3) \quad = \frac{7 - 16}{-3} \\ & = -9 \div (-3) \quad = \frac{-9}{-3} \\ & = +3 \quad = +3 \end{aligned}$$

Ex. 3. How much more is the <sup>subtract</sup>sum of <sup>add</sup> $-4^2$  and  $(-2)^2$  than the <sup>multiply</sup>product of 5 and -3?

$$\begin{aligned} & [-4^2 + (-2)^2] - [5(-3)] \\ & = (-16 + 4) - (-15) \\ & = (-12) + 15 \\ & = 3 \end{aligned}$$

$\therefore$  The sum is 3 more than the product.

Ex. 4. Evaluate if  $a = -1$  and  $b = -2$  \* substitute in brackets

a)  $3a^2 - b^4$

$$\begin{aligned} & = 3(-1)^2 - (-2)^4 \\ & = 3(+1) - (16) \\ & = 3 - 16 \\ & = -13 \end{aligned}$$

b)  $2(a - b)$

$$\begin{aligned} & = 2[(-1) - (-2)] \\ & = 2(-1 + 2) \\ & = 2(1) \\ & = 2 \end{aligned}$$

c)  $a + (3a + b)^3$

$$\begin{aligned} & = (-1) + [3(-1) + (-2)]^3 \\ & = -1 + (-3 - 2)^3 \\ & = -1 + (-5)^3 \\ & = -1 + (-125) \\ & = -1 - 125 \\ & = -126 \end{aligned}$$