OPERATIONS WITH INTEGERS

Definition: Integers are the _____ of _____ numbers (no decimals) which include _____ numbers, _____ numbers and the number _____

KEY WORDS
Set
Whole
Positive
Negative
Zero

ADDITION

CASE 1: SAME SIGN (+) + (+) or (-) + (-)

SIGN: KEEP the common sign
QUANTITY: ADD the numbers

Example 1: *(+2) + (+1)*	**Example 2**: *(–2) + (–4)*
SIGN → Both are (+) so the answer will be (+)	**SIGN** → Both are (-) so the answer will be (-)
QUANTITY → 2 + 1 = 3	**QUANTITY** → 2 + 4 = 6
ANSWER → Therefore the answer is __+3__	**ANSWER** → Therefore the answer is __– 6__

Try Some:
a. (+3) + (+7) = **+ 10**   b. (–9) + (–3) = **–12**   c. (+3) + (+2) = **+5**   d. (–8) + (–5) = **–13**

CASE 2: OPPOSITE SIGN (+) + (-) OR (-) + (+)

SIGN: Keep the sign of the larger number (ignoring the sign)
QUANTITY: Then find the difference between the two numbers (without the signs)

Example 3: *(-8) + (+1)*	**Example 4:** *(-2) + (+4)*
SIGN → Which number is larger, 8 or 1?	**SIGN** → Which number is larger, 4 or 2?
8 is (–) therefore the answer will be (–)	4 is (+) therefore the answer will be (+)
QUANTITY → 8 is larger than 1 by how much? (or 8-1)	**QUANTITY** → 4 is larger than 2 by how much? (4 - 2)
= 7	= 2
ANSWER → Therefore the answer is __–7__	**ANSWER** → Therefore the answer is __+2__

Try Some:
a. (–3) + (+7) = **+(7-3)**   b. (–9) + (+3) = **–(9-3)**   c. (–3) + (+2) = **–(3-2)**   d. (+8) + (–5) + (-3) + (+4) =
   = +4   **= –6**   **= –1**

Left to Right
= +3 + (-3) + (+4)
= 0 + (4)
= 4

SUBTRACTION - Adding the opposite!

Subtracting can get tricky! To avoid this, we are able to change the question from subtract to add, if you change whatever follows the subtract sign to '*the opposite'*. This is referred to as *'adding the opposite or the additive inverse'.* Once it is +, we follow the rules of addition

2 is the opposite of -2, or -4 is the opposite of 4. Simply switch the sign from positive to negative or negative to positive.

Example 1: *(+8) – (+1)*	**Example 2:** *(–2) – (+4)*
Add the opposite: (+8) + (–1)	Add the opposite: (–2) + (-4)
SIGN → Which number is larger, 8 or 1? 8 is (+) therefore the answer will be (+)	**SIGN** → Both numbers are (–), so the answer will be (–)
QUANTITY→ 8 is larger than 1 by how much? 7	**QUANTITY** → 2 + 4 = 6
ANSWER → Therefore the answer is __7__	**ANSWER**→ Therefore the answer is __−6__

Try Some:

a. $(-6) - (+4) = (-6) + (-4)$
$= -10$

b. $(-9) - (-9) = (-9) + (+9)$
$= -(9-9)$
$= 0$

c. $(-3) - (+3) = (-3) + (-3)$
$= -6$

d. $(+8) - (-5) + (+3) - (-2) =$
$= (+8) + (+5) + (3) + (2)$
$= 18$

MULTIPLYING & DIVIDING

When multiplying or dividing integers:
- If the two integers have **THE SAME SIGN** then the answer is **POSITIVE**
  Examples: $2 \times 3 = 6 \ or -2 \times -3 = 6$

- If the two integers have **THE OPPOSITE SIGN** then the answer is **NEGATIVE**
  Examples: $-2 \times 3 = -6 \ or \ 2 \times -3 = -6$

Example 1: *(+8)* x *(-4)*	**Example 2**: $\frac{(-6)}{(-2)}$
SIGN → (+) x (-) = (**−**) **QUANTITY** → 8 x 4 = 32 **ANSWER** → Therefore the answer is _−32_	**SIGN** → (–) ÷ (–) = (**+**) **QUANTITY** → 6 ÷ 2 = 3 **ANSWER** → Therefore the answer is __+3__

Try Some:

a. (–6) x (+4) =
$= -24$

b. (–9)(–9)(+4) =
81
$= (81)(+4)$
$= 324$

c. (–1) ÷ (+4) =
$= -0.25$
OR
$= \frac{-1}{4}$

d. $(-9) ÷ (-9) = +1$

ORDERS OF OPERATIONS

BEDMAS is an acronym we can use to remember the order in which mathematical operations are to be performed.

Example 1: $4 - (5 - 6) =$ $4 - (-1)$ Brackets first
$= 4 + (+1)$ Add the opposite
$= 5$

Example 2: $48 \div 2(9 + 3)$
$= 48 \div 2(12)$ Brackets first
              left to Right
$= 24(12)$
$= 288$

Example 3: $3 + 16 \div 2^2 \times 5 - 4$
$= 3 + 16 \div 4 \times 5 - 4$
$= 3 + 4 \times 5 - 4$
$= 3 + 20 - 4$
$= 19$

| **BEDMAS** |
|---|
| **B** – Brackets |
| **E** – Exponents / Roots |
| **D** – Division |
| **M** – Multiplication * |
| **A** – Addition |
| **S** – Subtraction ** |
| *division & multiplication in the order they appear from left to right |
| **addition & subtraction in the order they |

Try these:

a. $(3 - 6) \div (9 - 10) + (24 - 4) \div (-5)$ Brackets	**b.** $12 - 2[18 - (-1)^2 + 3]$
$= \underbrace{(-3) \div (-1)}_{} + \underbrace{(20) \div (-5)}_{}$ Divisions	$= 12 - 2[18 - (-1)(-1) + 3]$
$= (3) + (-4)$	$= 12 - 2(18 - (1) + 3)$
$= -1$	$= 12 - 2(20)$
	$= 12 - 40$
	$= -28$
c. $32 \div [16 \times (-2)] + 20 - (4^2 + 3)$	**d.** $\dfrac{(-6)(-3) - 7(6) + 9}{-3} = \dfrac{18 - 42 + 9}{-3}$
$= 32 \div (-32) + 20 - (4 \times 4 + 3)$	
$= (-1) + 20 - (16 + 3)$	$= \dfrac{-15}{-3}$
$= 19 - (19)$	
$= 0$	$= 5$
e. $-4(2^3) - 6$	**f.** $\dfrac{7^2 - 8^2 + 1^3}{2^3 + 3^2 - 2^3}$
$= -4(2 \times 2 \times 2) - 6$	$= \dfrac{49 - 64 + 1}{8 + 9 - 8}$
$= -32 - 6$	
$= -38$	$= \dfrac{-14}{9}$

PRACTICAL PROBLEMS

1. In wiring eight houses, you are to install outlets. The graph below shows the number of outlets to be installed in each house. Find the total number of outlets that must be roughed in.
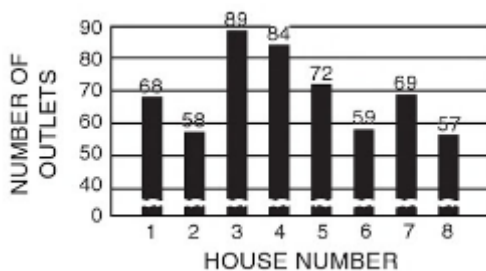
Total = 68 + 58 + 89 + 84 + 72 + 59 + 69 + 57

= 556

∴ 556 outlets must be routhed in.

2. The materials charged to a wiring job are as follows: 100-ampere distribution panel $118; meter switch $38; conduit $64; number 2 wire $88; BX cable $73; conduit fittings $26; outlet boxes $153; switches $112; fixtures $215 and $64 for wire nuts, grounding clips, staples and pipe clams. What is the total amount charged for these materials?

Total amount = 118 + 38 + 64 + 88 + 73 + 26 + 153 + 112 + 215 + 64

= 951

∴ Total amount charged is $951.

3. A bearing on a large machine is tested over a period of 8 hours at a speed of 40500 revolutions per hour. How many revolutions does the shaft turn in the bearing during the test period?
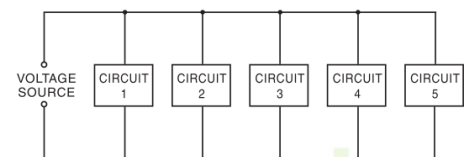
40500 × 8 = 324000

∴ It turns 324,000 in 8 hours.

4. A total load of 25,620 watts is distributed equally over the 5 branch circuits shown. What is the average load per circuit in watts?

25620 ÷ 5 = 5124

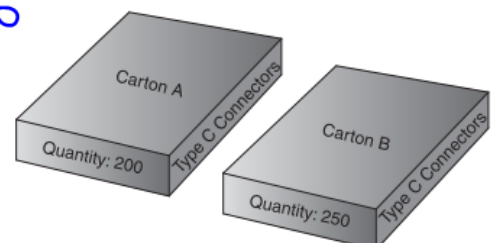∴ Average load per circuit is 5124 watts.

5. Box A and box B each contain type C connectors. Box A contains 200 connectors and costs $30. Find the cost of box B, which contains 250 connectors. The unit price is the same for both boxes. [$37.50]

Unit price = $\frac{30}{200}$

= $0.15

Cost of Carton B = 0.15 × 250

= $37.50

∴ It costs $37.50

6. A child weighing 23 kg is prescribed 8 mcg/kg/day 12 hourly. How much should be given in a single dose?

Total dose per day (24 hr) = 23 × 8
= 184 mcg for 24 hr.

Single dose (12 hr) = 184 ÷ 2
= 92 mcg   ∴ single dose is 92 mcg.

7. A client who weighs 60 kg is to be given a drug at 2 mg/kg. Stock strength is 40 mg/2 ml. What volume of the drug should they be given?

Step 1 Total amount of drug in mg = 60 × 2
= 120 mg

Step 2
×3 $\left(\begin{array}{cc} 2mL & 40\,mg \\ ? & 120mg \end{array} \right)$ ×3   ∴ It must be 6 ml.

8. Betsy recently graduated from St. Lawrence College Personal Support Worker Program. She is trying to decide what environment she would enjoy working in. Betsy's annual income will vary depending on where she decides to work.

Location	Wage ($/hr)
Home/Residential Care	15
Independent/ Private long term care homes (Nursing homes)	19
Hospitals	23

a) How much would Betsy earn in one week if she works with homes/residential care? (Assume that she will work 40 hours per week.)

Wages earned in a week = 15 × 40   ∴ Betsy earns $600 per week.
= 600

b) How much would Betsy earn in one week if she works in an independent/private long-term care home? (Assume that she will work 40 hours per week.)

= 19 × 40
= 760   ∴ Betsy earns $760 in one week.

c) How much would Betsy earn in one week if she works in the hospital? (Assume she will work 40 hours.)

= 23 × 40   ∴ Betsy earns $920 in one week.
= 920

d) How much would Betsy make in one year (52 weeks), in the home/residential, nursing home/private long-term care homes and in a hospital?

H/Res
600 × 52
= $31,200

NH/PHome
760 × 52
= $39,520

Hospital
920×52
= $47,820

6. On occasion, when working in a nursing home, PSWs will be responsible for making orders of essential supplies.

The following items are needed for the nursing home:

- 500 adult diapers
- 12 bottles of powder
- 6 antibiotic ointments
- 5 boxes of gloves
- 125 syringes

To make the order, the following chart will to be completed. Keep in your mind what is NEEDED, and then make sure that amount is covered by the order. You cannot order small parts of anything listed, just one or more.

Supplies	Cost per package $	Number of units	Cost $
Adult diapers 100 per box	65.62	1 unit 100 box thus 5 units	5 x 65.62 = 328.10
Powder 6 bottles per package	42.20	2	= 2 x 42.20 = 84.40
Antibiotic ointment 2 per package	22.50	3	= 3 x 22.50 = 67.50
Gloves 120 per box	34.79	5	= 5 x 34.79 = 173.95
Syringes 75 per box	52.85	2	= 2 x 52.85 = 105.70
		Total Cost:	= 759.65

add them up