INTEGERS

- The set of integers is: $\mathbb{Z} = \{..., -3, -2, -1, 0, 1, 2, 3, ...\}$.
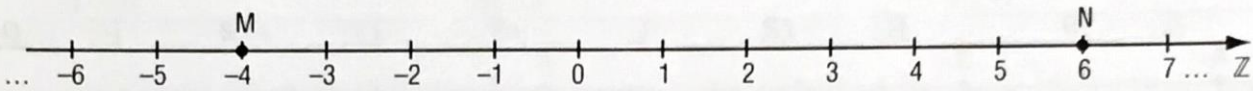 Consider:
  – the **positive integers**   Ex.: +4 or 4;
  – the **negative integers**   Ex.: –7;
  – the **null integer**, 0.

  The set of non-zero integers is: $\mathbb{Z}^* = \{..., -3, -2, -1, 1, 2, 3, ...\}$.
  The set of positive or null integers is: $\mathbb{Z}_+ = \{0, 1, 2, 3, ...\}$.
  The set of negative or null integers is: $\mathbb{Z}_- = \{..., -3, -2, -1, 0\}$.

- The set of integers is represented on the **number line** as follows:

  The point M has an abscissa value of –4 and the point N has an abscissa value of +6.

- Two numbers are **opposites** if they consist of the same natural number, but are of opposite signs.
  The opposite of the integer a is denoted opp(a)
  Ex.: –2 and 2 are opposite numbers. Therefore, opp(+2) = –2 and opp(–2) = +2

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1. Represent each of the following by an integer.

a) a loss of $18: ___–18___ b) 3 km north: ___+3___ c) a retreat of 6 m: ___–6___

d) an increase of $70: _+70_ e) sea level: ___0___ f) 300 A.D.: ___+300___

g) the 3rd level underground: ___–3___ h) 5 years from today: ___+5___

i) an altitude of 2 500 m: ___+ 2500___

**2.** The table below shows the results of five students on a mathematics test.

Student's mark	75	66	95	56	48
Deviation from the average	+7	–2	+27	–12	–20

Calculate the average of the marks of these five students. In the above table, indicate the integer which corresponds to the difference between the student's mark and the average.
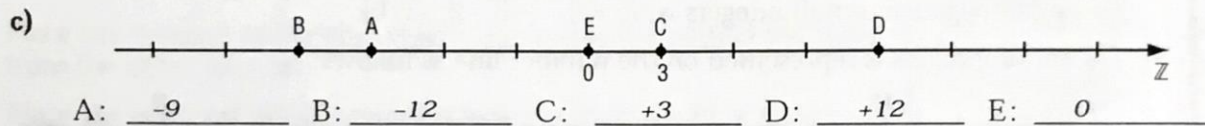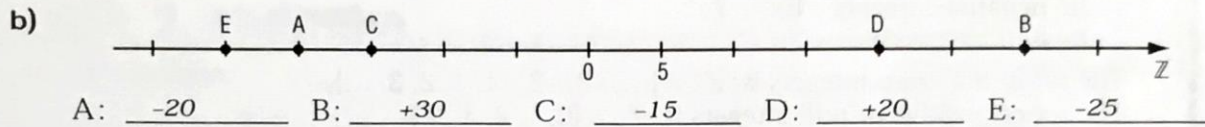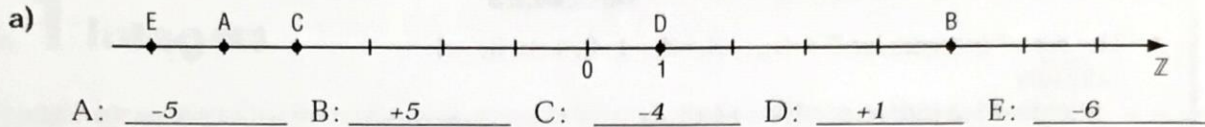
Average = 68

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3. In the following diagram, place the given integers in the appropriate region.
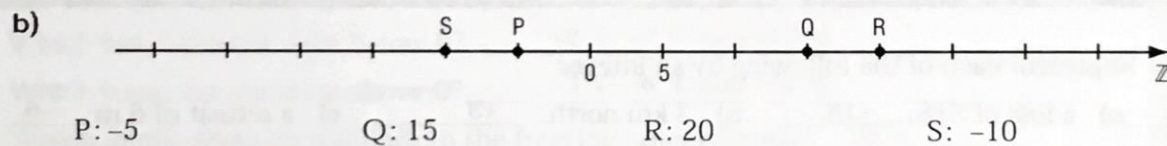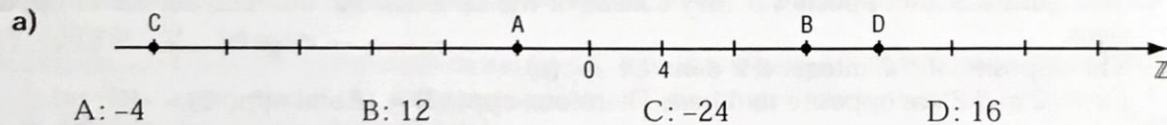
-12, +6, +4, -9, 0, -25, +18, -135, +56
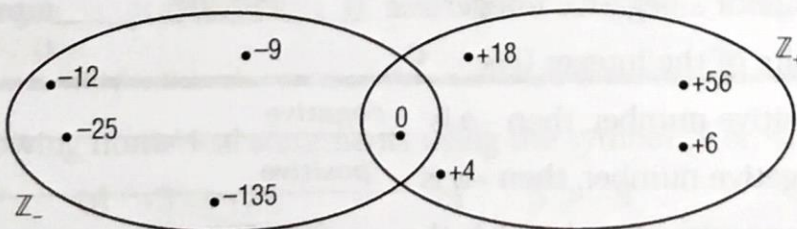
4. On each of the following number lines, determine the abscissa of the points represented.

a)

A: _____–5_____   B: _____+5_____   C: _____–4_____   D: _____+1_____   E: _____–6_____

b)

A: _____–20_____   B: _____+30_____   C: _____–15_____   D: _____+20_____   E: _____–25_____

c)

A: _____–9_____   B: _____–12_____   C: _____+3_____   D: _____+12_____   E: _____0_____

5. On each of the following number lines, choose an appropriate graduation and place the given points.

a)

A: –4   B: 12   C: –24   D: 16

b)

P: –5   Q: 15   R: 20   S: –10

6. Place the following historical events on the number line below, using an appropriate graduation. (Dates have been rounded to the nearest ten.)
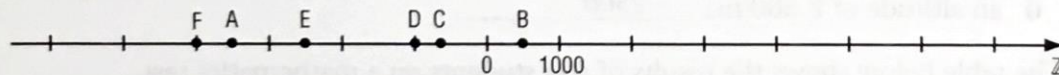
A: The invention of writing (–3500)   B: The fall of the Roman Empire (480)
C: The founding of Rome (–750)   D: The birth of King David (–1000)
E: The great pyramids of Egypt (–2500)   F: The iron age (–4000)

7. **a)** Give the opposite of each of the following numbers.

1. –7: __+7__   2. 8 __–8__   3. –6: __+6__   4. 0: __0__

b) Does every integer have an opposite? ___Yes___

8. Complete each of the statements below.

a) The opposite of a positive integer is a _____negative_____ integer.

b) The opposite of a negative integer is a _____positive_____ integer.

c) The opposite of the integer 0 is ___0___.

d) If a is a positive number, then $-a$ is ___negative___.

e) If a is a negative number, then $-a$ is ___positive___.

f) If a is the opposite of b, then b is the ___opposite of a___.

9. Consider the integer $a = -9$. Find:

opp(a) = __9__   opp(opp(a)) = __-9__   opp(opp(opp(a))) = __9__

10. If a is an integer, simplify:

opp(opp(a)) = __a__   opp(opp(opp(a))) = __-a__   opp(opp(opp(opp(a)))) = __a__

11. In each case below, determine the values of the abscissas of points M, N and P if, respectively, they are the opposites of the abscissas of points A, B and C.

a)

M: +6 _____   N: -4 _____   P: -7 _____

b)

M: -42 _____   N: 6 _____   P: -24 _____
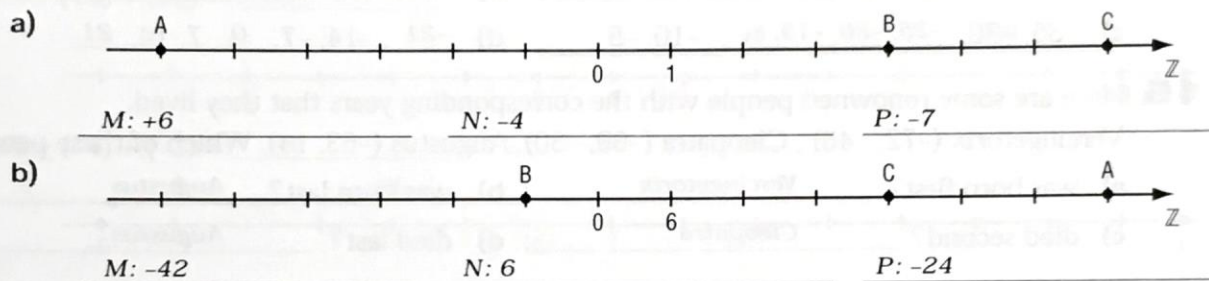
ACTIVITY 4   Order of Integers

The table below indicates the temperatures at Gaspé, recorded at noon one week in March.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Temperature	-7 °C	-4 °C	+1 °C	-2 °C	+3 °C	-10 °C	-8 °C

a) On which of the following days was it colder?
   1. Monday or Saturday? __Saturday__   2. Tuesday or Wednesday? __Tuesday__
   3. Wednesday or Friday? __Wednesday__   4. Monday or Sunday? __Sunday__

b) Arrange the days in increasing order of temperature.
   Saturday, Sunday, Monday, Tuesday, Thursday, Wednesday, Friday

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ORDER IN $\mathbb{Z}$

- When two integers are **positive**, the larger one is the one comprised of the **larger** natural number. Ex.: +8 > +2
- When two integers are **negative**, the larger one is the one comprised of the **smaller** natural number. Ex.: -4 > -6
- When two integers have **opposite signs**, the larger one is the **positive** number. Ex.: +8 > -10
- Every positive integer is greater than 0 and every negative integer is less than 0. Ex.: +7 > 0 and -5 < 0

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12. Complete the following numerical statements using the symbol > or <.

a) -5 < 5   b) -3 > -7   c)   5 > -8   d) -4 < 0

e)   4 > 0   f) -8 < -2   g) -12 < 18   h) -9 < 3