

13. [Integers]

continues on page 92

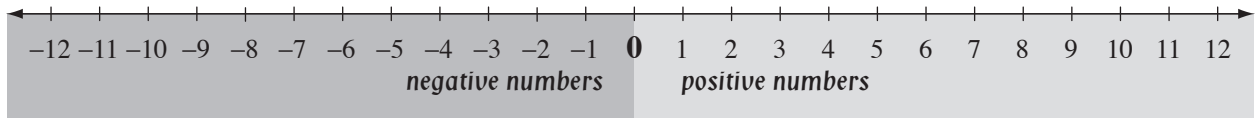
MM7 1 1 2 2 3 3 4 4
MM8 1 1 2 2 3 3 4 4

Skill 13.1 Comparing and ordering integers (1).

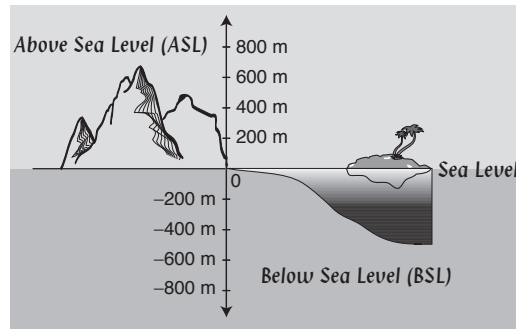
- Use a number line.

Hint: Numbers decrease as you move to the left or down and increase as you move to the right or up.

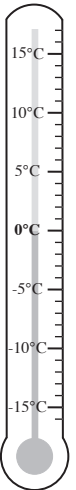
A negative number is always smaller than a positive number.



An altitude is lower when further down, below sea level (BSL) and higher when further up, above sea level (ASL).



Temperatures below zero are lower than temperatures above zero.

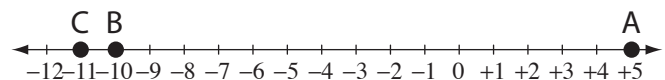


Q. Who won the 2010 Women's British Open Golf Tournament?

[Hint: In golf the lowest score wins.]

- A) +5 K. Webb
- B) -10 K. Hull
- C) -11 Y. Tseng

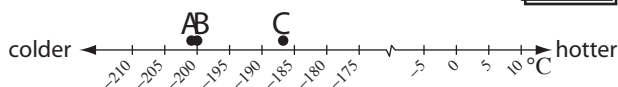
A. **C** Find the lowest score to determine the winner.



a) Which of Saturn's moons has the highest temperature?

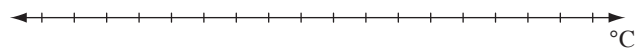
- A) -201°C Enceladus
- B) -200°C Mimas
- C) -187°C Tethys

C



b) Which temperature for oxygen is higher?

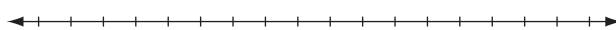
- A) -183°C boiling point
- B) -218°C melting point



c) Who won the 2010 British Open Golf Tournament?

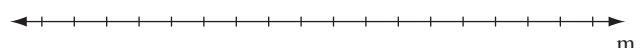
[Hint: In golf the lowest score wins.]

- A) -16 L. Oosthuizen
- B) +3 P. Senior
- C) -2 R. Allenby



d) Which body of water is at the lowest altitude?

- A) -28 m Caspian Sea
- B) -408 m Dead Sea
- C) -15 m Lake Eyre

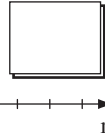


Skill 13.1 Comparing and ordering integers (2).

MM7 11 22 33 44
MM8 11 22 33 44

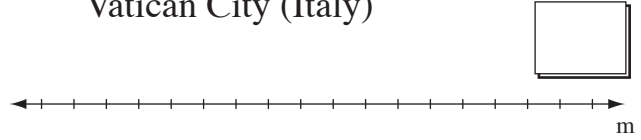
e) Which location has the lowest altitude?

- A) 3 m above sea level
Amsterdam (Netherlands)
- B) 133 m below sea level
Qattara Depression (Egypt)
- C) 2430 m above sea level
Machu Picchu (Peru)



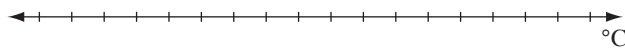
f) Which location has the highest altitude?

- A) 10 m below sea level
Laguna Salada (Mexico)
- B) 7 m below sea level
Lammefjord (Denmark)
- C) 19 m above sea level
Vatican City (Italy)



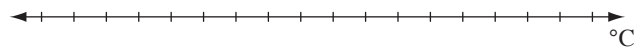
g) Which location recorded the lowest temperature?

- A) -25.6°C Kabul
- B) $+14.1^{\circ}\text{C}$ Christmas Island
- C) -15.2°C La Paz

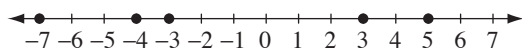


h) Which continent has the lowest recorded temperature?

- A) -63°C North America
- B) -23°C Australia
- C) -55°C Europe

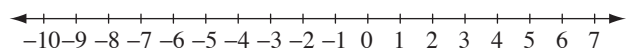


i) Arrange in ascending order:
 $-4, -7, 5, -3, 3$

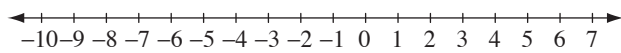


-7, -4, -3, 3, 5

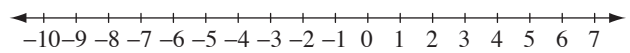
j) Arrange in order from largest to smallest:
 $0, 8, -9, 6, -4$



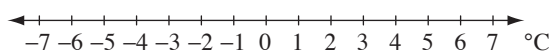
k) Arrange in descending order:
 $-10, 8, 1, -8, 4$



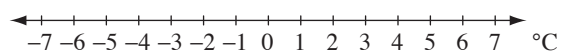
l) Arrange in order from smallest to largest:
 $-2, -6, 0, -3, 5$



m) Arrange in order from coldest to warmest:
 $2^{\circ}\text{C}, -3^{\circ}\text{C}, 4^{\circ}\text{C}, -5^{\circ}\text{C}$



n) Arrange in order from warmest to coldest:
 $-1^{\circ}\text{C}, -5^{\circ}\text{C}, 5^{\circ}\text{C}, -3^{\circ}\text{C}$



- Use a number line.

Hint: A negative number is always smaller than a positive number.

The larger the negative number the lesser the value, e.g. -9 is less than ($<$) -2

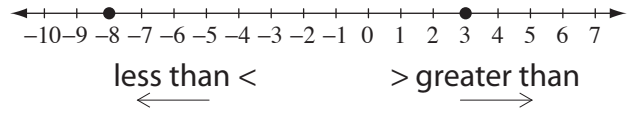
The smaller the negative number the greater the value, e.g. -4 is greater than ($>$) -6

Q. Use $<$ or $>$ to make a true statement.

$$3 \quad \square \quad -8$$

A. $3 > -8$

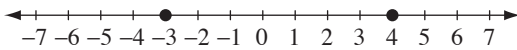
3 is greater than -8



a) Use $<$ or $>$ to make a true statement.

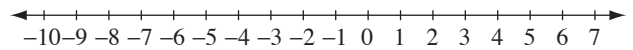
a negative number is less than a positive number

$$-3 \quad \square \quad 4$$



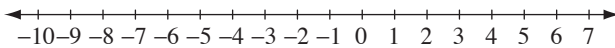
b) Use $<$ or $>$ to make a true statement.

$$-5 \quad \square \quad 0$$



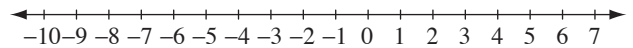
c) Use $<$ or $>$ to make a true statement.

$$-4 \quad \square \quad -9$$



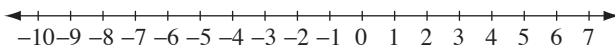
d) Use $<$ or $>$ to make a true statement.

$$-6 \quad \square \quad 3$$



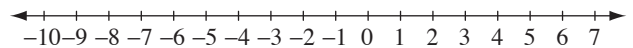
e) Use $<$ or $>$ to make a true statement.

$$2 \quad \square \quad -1$$



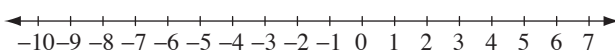
f) Use $<$ or $>$ to make a true statement.

$$-3 \quad \square \quad -7$$



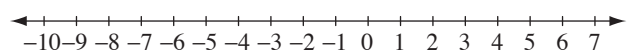
g) Use $<$ or $>$ to make a true statement.

$$-9 \quad \square \quad 0$$



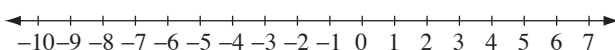
h) Use $<$ or $>$ to make a true statement.

$$3 \quad \square \quad -5$$



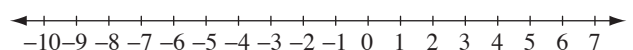
i) Use $<$ or $>$ to make a true statement.

$$4 \quad \square \quad -7$$



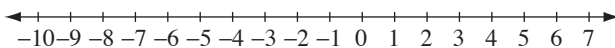
j) Use $<$ or $>$ to make a true statement.

$$-4 \quad \square \quad -2$$



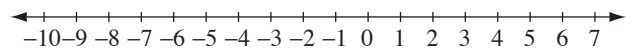
k) Use $<$ or $>$ to make a true statement.

$$-8 \quad \square \quad -5$$



l) Use $<$ or $>$ to make a true statement.

$$-2 \quad \square \quad -4$$

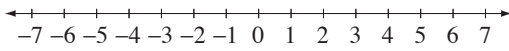


Skill 13.3 Modelling integer subtraction on a number line.

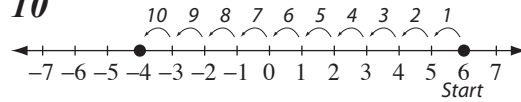
MM7 11 2 33 44
MM8 1 22 33 44

- Determine the value of each mark on the number line.
 - Count the number of spaces between the integers using the number line.
- Hint: Use short cuts such as: counting to zero, counting by tens.*

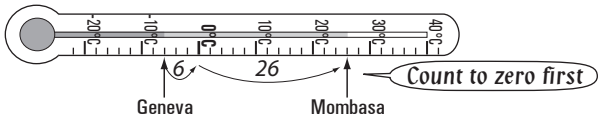
Q. How many units between 6 and -4 ?



A. 10

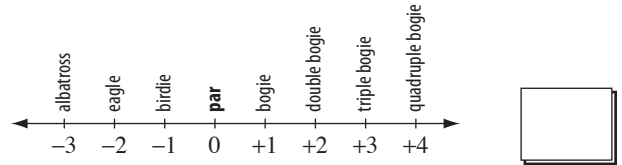


a) How much cooler is it in Geneva than Mombasa?

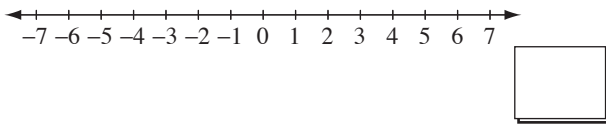


$6 + 26 = \boxed{32} \text{ } ^\circ\text{C}$

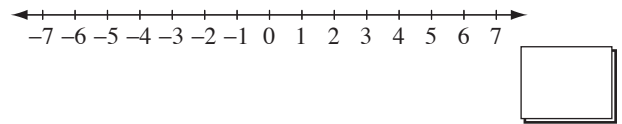
b) If Karrie Webb scores a triple bogie and Greg Norman scores an eagle, what is the difference between their scores?



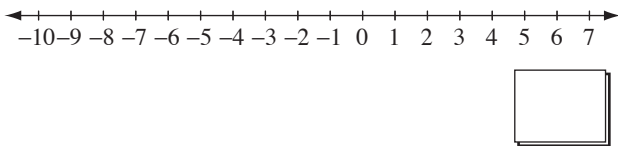
c) How many units between 5 and -4 ?



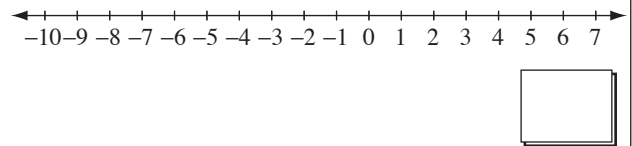
d) How many units between -5 and 3?



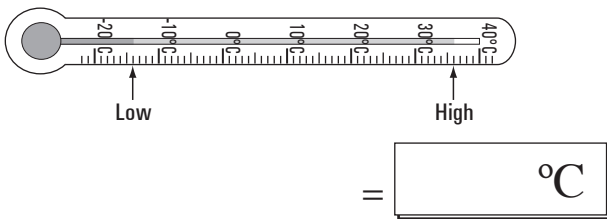
e) How many units between -9 and 2?



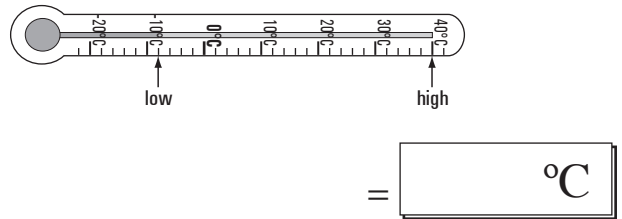
f) How many units between 6 and -7 ?



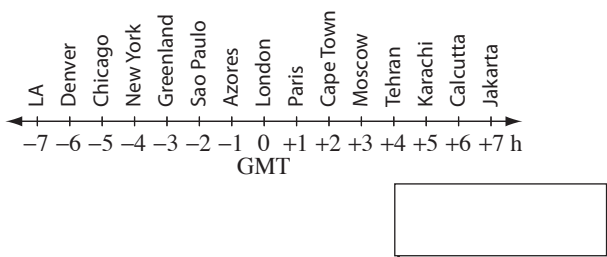
g) What is the difference between the highest and the lowest temperatures recorded in Dunedin, New Zealand?



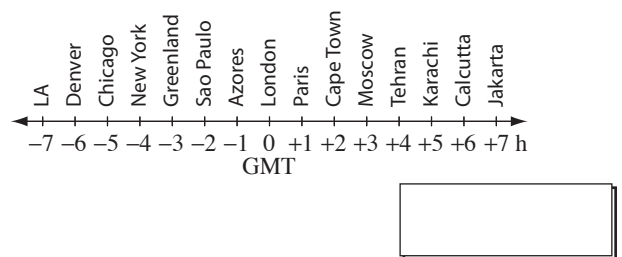
h) What is the difference between the highest and the lowest temperatures recorded in Rome, Italy?



i) What is the time difference in hours between Denver and Cape Town?



j) What is the time difference in hours between Karachi and New York?



Skill 13.4 Finding the difference between a positive and a negative integer.

MM7 11 22 33 44
MM8 11 22 33 44

- Visualise the position of the values on a number line.
- Translate the words to number sentences.
- Add the numbers ignoring their signs.

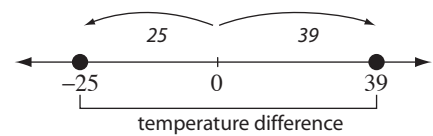
Hint: Taking away negative 5 is the same as adding positive 5.

$$0 - (-5) = +5$$

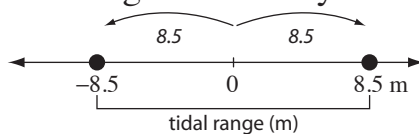
Q. In Vienna (Austria) the highest recorded temperature is 39°C and the lowest is -25°C . What is the temperature difference?

$$\begin{aligned} \mathbf{A.} \quad & 39 - (-25) \\ & = 39 + 25 \\ & = \mathbf{64^{\circ}\text{C}} \end{aligned}$$

Instead of subtracting negative 25, add positive 25 to 39.



a) The Bay of Fundy, Canada has a high tide of 8.5 m and a low tide of -8.5 m. What is the tidal range for the Bay of Fundy?

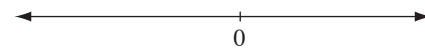


$$= 8.5 - (-8.5)$$

$$8.5 + 8.5$$

$$= \mathbf{17 \text{ m}}$$

b) The lowest point in Japan is Lake Hachirogata at -4 m and the highest point is Mt Fujiyama at 3776 m. What is the height difference?



$$=$$

$$= \mathbf{m}$$

c) Sparrow Hills station is the highest station in the Russian metro rail system with an altitude of 220 m above sea level. Park Pobedy is the lowest station at 90 m below sea level. What is their height difference?

$$= \mathbf{m}$$

d) In Reykjavik (Iceland) the highest recorded temperature is 26°C and the lowest is -25°C . What is the temperature difference?

$$= \mathbf{^{\circ}\text{C}}$$

e) In Luxembourg the highest recorded temperature is 38°C and the lowest is -23°C . What is the temperature difference?

$$= \mathbf{^{\circ}\text{C}}$$

f) In Shanghai (China) the highest recorded temperature is 40°C and the lowest is -12°C . What is the temperature difference?

$$= \mathbf{^{\circ}\text{C}}$$

g) The lowest point on the African continent is -156 m at Lake Assal and the highest is 5895 m at Mt Kilimanjaro. What is the height difference?

$$= \mathbf{m}$$

h) The highest point in Europe is 5642 m at Mt Elbrus and the lowest is -22 m in the Caspian Sea. What is the height difference in Europe?

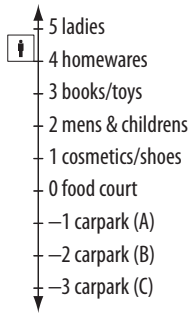
$$= \mathbf{m}$$

Skill 13.5 Modelling integer addition on a number line.

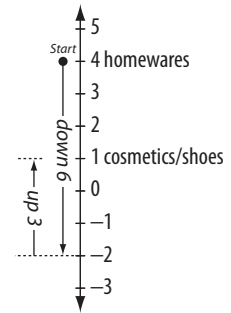
MM7 11 22 3 44
MM8 11 22 33 44

- Start at the given point on the number line.
- Count up or down the number of spaces as directed.

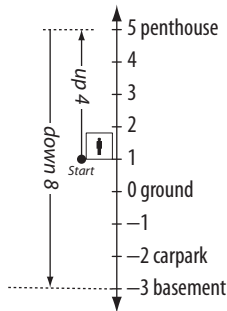
Q. From homewares Marion rides the elevator down 6 levels and up 3 levels. At what level is Marion now?



A. down 6 levels (add -6)
up 3 levels (add $+3$)
⇒ **Cosmetics/shoes**



a) From level 1 Hutch rides the elevator up 4 levels and down 8. At what level is Hutch now?

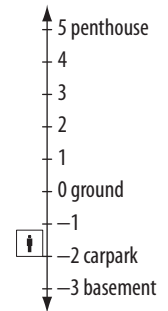


up 4 levels (add $+4$)

down 8 levels (add -8)

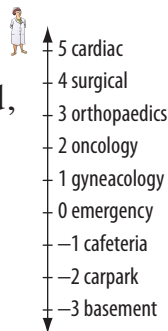
basement

b) From the carpark Kwong rides the elevator down 1 level and up 3 levels. At what level is Kwong now?



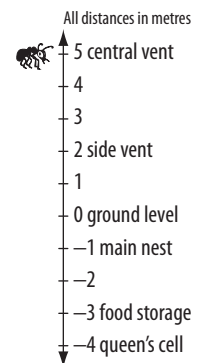
⇒

c) A nurse starts in cardiac ward, goes down 6 levels and then up 3 levels. Where does she finish?



⇒

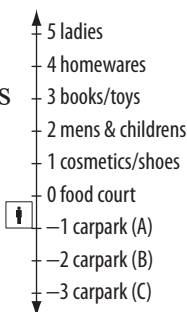
d) A termite entered his tower via the central vent and went to the main nest. How far did the termite travel?



⇒

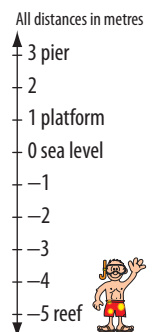
m

e) From carpark (A) Todd rides the elevator down 2 levels and up 7 levels. At what level is Todd now?



⇒

f) A snorkeller at the reef surfaces for lunch on the pier and then goes back to the reef. How far does he travel?



⇒

m

- Start at the given point.
- Work in the given order.
- Visualise the position of the values on a number line.

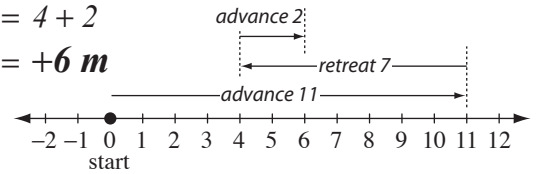
Hint: Positive words: up, above, over, forward, advance, gained, earned, later
Negative words: down, below, under, backward, retreat, lost, owed, earlier

Q. During a football game the ball advanced 11 m, retreated 7 m and then advanced 2 m. Where did the ball finish in relation to its starting point?

A. Start: $0 + 11 - 7 + 2$

$$= 4 + 2$$

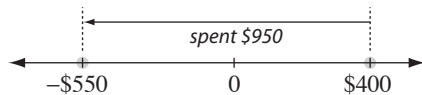
$$= +6 \text{ m}$$



a) If Pip had \$400 and spent \$950, what is her bank balance?

$$= 400 - 950$$

$$= \boxed{-\$550}$$



b) Harry owed \$350. If he earned \$420, how much does Harry now have?

$$=$$

$$= \boxed{}$$

c) Chan owes \$420. If he earned \$280, what is Chan's bank balance?

$$=$$

$$= \boxed{}$$

d) Carbon dioxide boils at -78°C . At 21°C below this, carbon dioxide solidifies. At what temperature does carbon dioxide solidify?

$$=$$

$$= \boxed{}^{\circ}\text{C}$$

e) The Persians destroyed the original Acropolis in 480 BC. Pericles rebuilt it 31 years later. What year was that?

$$=$$

$$= \boxed{}$$

f) Tutankhamun reigned for 9 years up until 1323 BC. What year did Tutankhamun come to the throne?

$$=$$

$$= \boxed{}$$

g) Oxygen boils at -183°C . At 35°C below this, oxygen solidifies. What is the temperature of solid oxygen?

$$=$$

$$= \boxed{}^{\circ}\text{C}$$

h) Helium boils at -269°C . At 3°C below this, helium solidifies. At what temperature does helium solidify?

$$=$$

$$= \boxed{}^{\circ}\text{C}$$

i) You bought \$1000 worth of stock. After the first year you lost \$480, but after the second year you gained \$220. What is the current value of your stock?

$$=$$

$$= \boxed{}$$

j) A bear weighs 67 kg. During hibernation it loses 20 kg. After hibernation it gains 14 kg. What does the bear weigh now?

$$=$$

$$= \boxed{} \text{ kg}$$

Hint: Every number has a sign attached to it, so if there is no sign, the number is positive. These signs should not be confused with the operations of addition and subtraction.

Using a **number line:**

- Start at 0.
- When the number is “+” move that many to the right.
- When the number is “-” move that many to the left.

Using **rules:**

- If the numbers to be added have the

Rule 1: same sign - add the numbers ignoring their signs and keep that sign.

(N.B. Brackets added to help)

$$(+4) + (+3) = +(4 + 3) = +7 = 7 \quad \text{or simply} \quad 4 + 3 = 7$$

$$(-5) + (-8) = -(5 + 8) = -13 \quad \text{or simply} \quad -5 + -8 = -13$$

Rule 2: different signs - subtract the numbers ignoring their signs and keep the sign of the larger number.

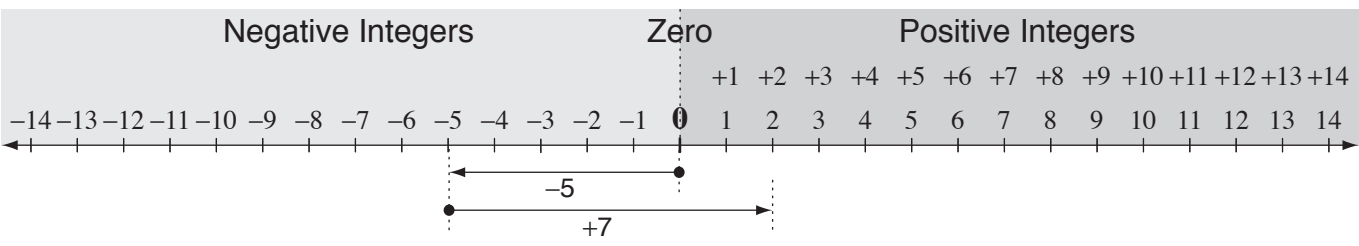
$$(-9) + (+3) = -(9 - 3) = -6 \quad \text{or simply} \quad -9 + 3 = -6$$

$$(-4) + (+11) = +(11 - 4) = +7 = 7 \quad \text{or simply} \quad -4 + 11 = 7$$

Q. $-5 + 7 =$

A. $-5 + 7 =$
 $= +(7 - 5)$
 $= 2$

Starting at 0 go 5 units to the left. From this point, move 7 units right. You stop at positive 2.



a) $-2 + (-3) =$

$= -(2 + 3) =$ -5

both negative keep "-" *same signs, add*

b) $-4 + 3 =$

$=$

c) $-8 + 6 =$

$=$

d) $8 + (-5) =$

$=$

e) $2 + (-6) =$

$=$

f) $5 + (-3) =$

$=$

g) $-2 + 4 =$

$=$

h) $9 + (-2) =$

$=$

i) $-4 + (-2) =$

$=$

j) $-8 + 3 =$

$=$

k) $-2 + (-6) =$

$=$

l) $-3 + (-6) =$

$=$

Hint: Every number has a sign attached to it, so if there is no sign, the number is positive. These signs should not be confused with the operations of addition and subtraction.

Using a **number line**:

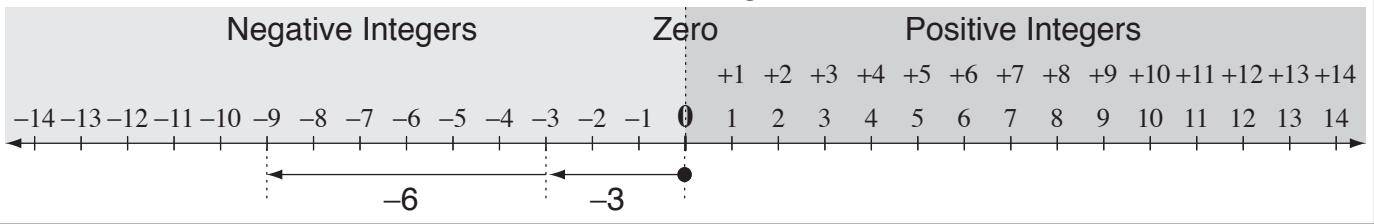
- Start at 0.
- When the number is “+” move that many to the right.
- When the number is “-” move that many to the left.

Using **rules**:

- Consider subtracting an integer as adding its opposite. Example: $0 - (+5) = -5$
- Follow the addition rules. (see skill 13.7, page 98)

Examples: $(+4) - (-3) = (+4) + (+3) = +(4 + 3) = +7 = 7$ or simply $4 + 3 = 7$
 $(-5) - (+8) = (-5) + (-8) = -(5 + 8) = -13$ $-5 + -8 = -13$
 $(-9) - (-3) = (-9) + (+3) = -(9 - 3) = -6$ or simply $-9 + 3 = -6$
 $(-4) - (-11) = (-4) + (+11) = +(11 - 4) = +7 = 7$ $-4 + 11 = 7$

Q. $-3 - 6 =$ **A.** $-3 - 6 =$ Negative 3 take away positive 6 is the same as negative 3 plus negative 6.
start at -3, move backward 6
 $= -3 + (-6)$ OR Using a number line:
 $= -(3 + 6)$ Starting at 0 go 3 units to the left.
 $= -9$ From this point, move 6 units left. You stop at negative 9.



a) $1 - 7 =$ subtract 7 means add -7 **b)** $0 - 8 =$ **c)** $4 - 8 =$
 $= +1 + (-7)$ $=$ $=$
different signs, subtract
 $= -(7 - 1) = \boxed{-6}$ $=$ $=$
 $=$ $=$ $=$

d) $-3 - 5 =$ **e)** $-9 - 2 =$ **f)** $2 - (-1) =$
 $=$ $=$ $=$
 $=$ $=$ $=$
 $=$ $=$ $=$

g) $3 - (-4) =$ **h)** $-8 - (-4) =$ **i)** $-2 - (-2) =$
 $=$ $=$ $=$
 $=$ $=$ $=$
 $=$ $=$ $=$

j) $-8 - 5 =$ **k)** $9 - (-6) =$ **l)** $-7 - (-3) =$
 $=$ $=$ $=$
 $=$ $=$ $=$
 $=$ $=$ $=$

Skill 13.9 Multiplying integers.

MM7 11 22 33 44
MM8 11 22 33 44

- Multiply the integers ignoring the signs.
- Determine the sign of the result. If the numbers to be multiplied have the:

same sign: $++ = +$
 $-- = +$ positive result

different sign: $+- = -$
 $-+ = -$ negative result

Example: $-9 \times (-3)$
 $= 27$ ---=+

Example: $9 \times (-3)$
 $= -27$ +---

Q. $-4 \times (-7) =$

A. $-4 \times (-7) =$
 $= 28$ ---=+

$4 \times 7 = 28$

Same signs, both negative
 \Rightarrow positive result.

$\Rightarrow +28$

a) $-6 \times 7 =$

-+=-
-42

b) $-2 \times 6 =$

c) $-8 \times 3 =$

d) $3 \times (-5) =$

e) $2 \times (-9) =$

f) $-8 \times (-8) =$

g) $-8 \times (-5) =$

h) $-9 \times 4 =$

i) $5 \times (-6) =$

j) $7 \times (-8) =$

k) $-4 \times 6 =$

l) $-7 \times 7 =$

m) $3 \times (-9) =$

n) $-7 \times (-4) =$

o) $-6 \times (-3) =$

p) $-4 \times (-4) =$

q) $5 \times (-9) =$

r) $-8 \times (-2) =$

s) $-5 \times (-5) =$

t) $-4 \times 5 =$

u) $-9 \times 9 =$

Skill 13.10 Dividing integers.

MM7 11 22 33 44
MM8 11 22 33 44

- Divide the integers ignoring the signs.
- Determine the sign of the result. If the numbers to be divided have the:

same sign: $++=+$
 $--=+$ positive result

different sign: $+--=-$
 $-+=-$ negative result

Example: $-9 \div (-3) = 3$
(-)(-) = +

Example: $9 \div (-3) = -3$
(+)(-) = -

Q. $-30 \div 6 =$

A. $-30 \div +6 = -5$
(-)(+) = -

$30 \div 6 = 5$
 Different signs
 \Rightarrow negative result.
 $\Rightarrow -5$

a) $12 \div (-4) = -3$
(+)(-) = -

b) $27 \div (-3) =$

c) $-54 \div (-9) =$

d) $-72 \div (-12) =$

e) $-45 \div 9 =$

f) $-32 \div 8 =$

g) $-18 \div 2 =$

h) $-24 \div (-8) =$

i) $-63 \div 9 =$

j) $25 \div (-5) =$

k) $-56 \div (-7) =$

l) $-21 \div 7 =$

m) $-45 \div 5 =$

n) $-28 \div (-7) =$

o) $-54 \div 6 =$

p) $28 \div (-4) =$

q) $-35 \div (-7) =$

r) $-40 \div (-5) =$

s) $-36 \div 6 =$

t) $63 \div (-7) =$

u) $-36 \div 9 =$