# Math 7 Unit 1 worksheet: Distance on a number line (answer key)

**ANSWERS AT A GLANCE**

1. (a) 13 (b) 9 (c) 31 (d) 16 (e) 18.3 (f) 6.55 (g) 4.9 (h) $1\frac{7}{12}$
2. 166 seconds
3. 4 strokes
4. (a) 19 hours (b) 10.5 hours (c) 15 minutes
5. (a) −7 − 5 is −12, not −2; the distance is 12. (b) Subtracting −9 adds 9, and a distance is never negative; the distance is 15.
6. $P$ is at 5.
7. (a) $|x + 5| = |x - (-5)|$; the left side is the distance from $x$ to 3, the right side the distance from $x$ to −5. (b) $x = -1$

**WORKED SOLUTIONS**

**1.** Find the distance between the two points with these coordinates. Write each distance as the absolute value of a difference first.

(a) −9 and 4 (b) −15 and −6 (c) 23 and −8 (d) −31 and −47

(e) −6.3 and 12 (f) −0.45 and −7 (g) $-3\frac{2}{5}$ and 1.5 (h) $-\frac{5}{6}$ and $\frac{3}{4}$

**ANSWER**

(a) 13 (b) 9 (c) 31 (d) 16 (e) 18.3 (f) 6.55 (g) 4.9 (h) $1\frac{7}{12}$

**SOLUTION**

(a) $|4 - (-9)| = |4 + 9| = 13$.

(b) $|-6 - (-15)| = |-6 + 15| = 9$.

(c) $|23 - (-8)| = |23 + 8| = 31$.

(d) $|-31 - (-47)| = |-31 + 47| = 16$. Both points are left of zero, so the distances to zero are subtracted, not added: 47 − 31 = 16.

(e) $|12 - (-6.3)| = |12 + 6.3| = 18.3$.

(f) $|-0.45 - (-7)| = |-0.45 + 7| = 6.55$. Both points are left of zero, so this is 7 − 0.45, not 7 + 0.45.

(g) $-3\frac{2}{5} = -3.4$. Then $|1.5 - (-3.4)| = |1.5 + 3.4| = 4.9$ (or $4\frac{9}{10}$).

(h) $\left|\frac{3}{4} - \left(-\frac{5}{6}\right)\right| = \left|\frac{9}{12} + \frac{10}{12}\right| = \frac{19}{12} = 1\frac{7}{12}$.

**2.** A rocket launch is timed in seconds from liftoff, so 30 seconds before liftoff is the time −30 s. The main engines start at −5 s, and the first stage drops away at 161 s. How many seconds pass between the two events?

**ANSWER**

166 seconds

**SOLUTION**

The two times are coordinates on a time line whose zero is liftoff. The time between them is the distance between −5 and 161:

$$|161 - (-5)| = |161 + 5| = 166$$

Check by counting through zero: 5 seconds up to liftoff and 161 seconds after it, and 5 + 161 = 166. So 166 seconds pass.


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**3.** In golf, a score is reported against par: 4 strokes under par is written −4. After two rounds, Priya is at −5 and the tournament leader is at −9. How many strokes behind the leader is Priya? Show the subtraction and the absolute value.

**ANSWER**
4 strokes

**SOLUTION**
The two scores are points on one number line with par at 0. The gap is their distance:

$$|-5-(-9)| = |-5+9| = 4$$

Both scores are below par, so adding 5 and 9 would count the stretch from −5 to 0 twice. Priya is 4 strokes behind the leader.

**4.** Clocks around the world are set by their offset from UTC (world standard time), in hours. The offsets in January are: Honolulu −10, New York −5, Delhi + 5.5, Kathmandu + 5.75, Tokyo + 9. How far apart are the clocks of:

(a) Honolulu and Tokyo, in hours?

(b) New York and Delhi, in hours?

(c) Delhi and Kathmandu, in minutes?

**ANSWER**
(a) 19 hours (b) 10.5 hours (c) 15 minutes

**SOLUTION**
The offsets are coordinates on one number line whose zero is UTC.

(a) $|9-(-10)| = |9+10| = 19$ hours.

(b) $|5.5-(-5)| = |5.5+5| = 10.5$ hours, that is, 10 hours 30 minutes.

(c) $|5.75-5.5| = 0.25$ hours, and 0.25 × 60 = 15 minutes.

**5.** Each student made a mistake. Explain it, then find the correct distance.

(a) Leah wrote: the distance between −7 and 5 is $|-7-5| = |-2| = 2$.

(b) Omar wrote: the distance between 6 and −9 is 6 − 9 = −3 units.

**ANSWER**
(a) −7 − 5 is −12, not −2; the distance is 12. (b) Subtracting −9 adds 9, and a distance is never negative; the distance is 15.

**SOLUTION**
(a) Leah subtracted 5 from 7 and kept the minus sign, but −7 − 5 = −7 + (−5) = −12: the two moves are both to the left. The distance is $|-12| = 12$. Check: 7 units from −7 to 0 and 5 more to 5, and 7 + 5 = 12.

(b) Omar wrote 6 − 9 in place of 6 − (−9), and he also gave a negative answer, but a distance is a length and is never negative. Correctly, $|6-(-9)| = |6+9| = 15$. Check: 9 units from −9 to 0 and 6 more, 9 + 6 = 15.

**6.** Point $P$ is 6 units from −1 and 4 units from 9. Find the coordinate of $P$, and show that there is only one such point.


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**ANSWER**

$P$ is at 5.

**SOLUTION**

The points 6 units from −1 are −1 + 6 = 5 and −1 − 6 = −7.

The points 4 units from 9 are 9 + 4 = 13 and 9 − 4 = 5.

Only 5 is on both lists, so $P$ is at 5. Check: $|5-(-1)|=6$ and $|5-9|=|-4|=4$.

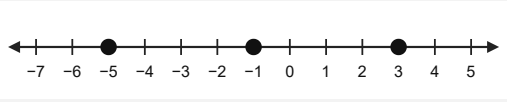
**7.** The number $x$ satisfies $|x-3|=|x+5|$.

(a) Rewrite $|x+5|$ as the absolute value of a difference, and say what each side of the equation measures on a number line.

(b) Use that meaning to find $x$, and explain why there is only one answer.

**ANSWER**

(a) $|x+5|=|x-(-5)|$; the left side is the distance from $x$ to 3, the right side the distance from $x$ to −5. (b) $x=-1$




**SOLUTION**

(a) $x+5=x-(-5)$, so $|x+5|=|x-(-5)|$. The equation says that $x$ is as far from 3 as it is from −5.

(b) A point equally far from −5 and 3 cannot be to the left of −5 (it would be closer to −5) or to the right of 3 (it would be closer to 3), so it is between them, at the middle. The two points are $|3-(-5)|=8$ units apart, so the middle is 4 units from each: −5 + 4 = −1. Only one point sits in the middle, so $x=-1$ is the only answer.

Check: $|-1-3|=|-4|=4$ and $|-1+5|=|4|=4$.


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