COMPARING AND ROUNDING NUMBERS

A COMPARING NUMBERS

A.1 COMPARING NUMBERS

Ex 1: Compare:

$$352 \boxed{>} 289$$

Answer:

- Both numbers have 3 digits. We proceed to compare the leftmost digit (hundreds place).
- The number 352 has a **3** in the hundreds place.
- The number 289 has a **2** in the hundreds place.
- Since $3 > 2$, it is concluded that $\mathbf{352} > \mathbf{289}$. No further comparison is necessary.

Ex 2: Compare:

$$461 \boxed{>} 438$$

Answer:

- Both numbers have 3 digits. We compare from the leftmost digit.
- The hundreds digits are identical (4). We proceed to the tens place.
- The number 461 has a **6** in the tens place.
- The number 438 has a **3** in the tens place.
- Since $6 > 3$, it is concluded that $\mathbf{461} > \mathbf{438}$.

Ex 3: Compare:

$$989 \boxed{<} 1\,023$$

Answer:

- First, we compare the number of digits.
- The number 989 has **3 digits**.
- The number 1 023 has **4 digits**.
- The number with more digits is always greater.
- Therefore, it is concluded that $\mathbf{989} < 1\,023$.

Ex 4: Compare:

$$8\,456 \boxed{<} 8\,459$$

Answer:

- Both numbers have 4 digits. We compare from the leftmost digit.
- The thousands digits are identical (8).
- The hundreds digits are identical (4).
- The tens digits are identical (5). We proceed to the ones place.
- The number 8 456 has a **6** in the ones place.
- The number 8 459 has a **9** in the ones place.
- Since $6 < 9$, it is concluded that $8\,456 < 8\,459$.

Ex 5: Compare:

$$5\,109 \boxed{>} 5\,091$$

Answer:

- Both numbers have 4 digits. We compare from the leftmost digit.
- The thousands digits are identical (5). We proceed to the hundreds place.
- The number 5 109 has a **1** in the hundreds place.
- The number 5 091 has a **0** in the hundreds place.
- Since $1 > 0$, it is concluded that $5\,109 > 5\,091$.

Ex 6: Compare:

$$23\,456 \boxed{>} 23\,198$$

Answer:

- Both numbers have 5 digits. We compare from the leftmost digit.
- The ten thousands digits are identical (2).
- The thousands digits are identical (3). We proceed to the hundreds place.
- The number 23 456 has a **4** in the hundreds place.
- The number 23 198 has a **1** in the hundreds place.
- Since $4 > 1$, it is concluded that $23\,456 > 23\,198$.

B BOUNDING A NUMBER

B.1 BOUNDING BY PLACE VALUE

Ex 7: Bound the number 482 by the nearest ten.

$$\boxed{480} \leq 482 < \boxed{490}$$

Answer:

- The target place value is the tens. The digit is 8.
- **Lower Bound**: Keep the digits to the left and the target digit (48), replace subsequent digits with zeros. The lower bound is 480.
- **Upper Bound**: Add 1 to the tens digit ($8 + 1 = 9$). The upper bound is 490.
- Therefore, 482 is bounded by 480 and 490.

So $480 \leq 482 < 490$.

Ex 8: Bound the number 7 291 by the nearest thousand.

$$\boxed{7000} \leq 7\,291 < \boxed{8000}$$

Answer:

- The target place value is the thousands. The digit is 7.
- **Lower Bound**: Keep the 7, replace subsequent digits with zeros. The lower bound is 7 000.
- **Upper Bound**: Add 1 to the thousands digit ($7 + 1 = 8$), replace subsequent digits with zeros. The upper bound is 8 000.
- Therefore, 7 291 is bounded by 7 000 and 8 000.

So $7\,000 \leq 7\,291 < 8\,000$.

Ex 9: Bound the number 5 814 by the nearest hundred.

$$\boxed{5800} \leq 5\,814 < \boxed{5900}$$

Answer:

- The target place value is the hundreds. The digit is 8.
- **Lower Bound**: Keep the digits to the left and the target digit (58), replace subsequent digits with zeros. The lower bound is 5 800.
- **Upper Bound**: Add 1 to the hundreds digit ($8 + 1 = 9$). The upper bound is 5 900.
- Therefore, 5 814 is bounded by 5 800 and 5 900.

So $5\,800 \leq 5\,814 < 5\,900$.

Ex 10: Bound the number 45 678 by the nearest ten thousand.

$$\boxed{40000} \leq 45\,678 < \boxed{50000}$$

Answer:

- The target place value is the ten thousands. The digit is 4.
- **Lower Bound**: Keep the 4, replace subsequent digits with zeros. The lower bound is 40 000.
- **Upper Bound**: Add 1 to the ten thousands digit ($4 + 1 = 5$), replace subsequent digits with zeros. The upper bound is 50 000.
- Therefore, 45 678 is bounded by 40 000 and 50 000.

So $40\,000 \leq 45\,678 < 50\,000$.

Ex 11: Bound the number 2 956 by the nearest hundred.

$$\boxed{2900} \leq 2\,956 < \boxed{3000}$$

Answer:

- The target place value is the hundreds. The digit is 9.
- **Lower Bound**: Keep the digits to the left and the target digit (29), replace subsequent digits with zeros. The lower bound is 2 900.
- **Upper Bound**: Add 1 to the hundreds digit ($9 + 1 = 10$). This carries over, changing the thousands digit from 2 to 3. The upper bound is 3 000.
- Therefore, 2 956 is bounded by 2 900 and 3 000.

So $2\,900 \leq 2\,956 < 3\,000$.

Ex 12: Bound the number 8 041 by the nearest hundred.

$$\boxed{8000} \leq 8\,041 < \boxed{8100}$$

Answer:

- The target place value is the hundreds. The digit is 0.
- **Lower Bound**: Keep the digits to the left and the target digit (80), replace subsequent digits with zeros. The lower bound is 8 000.
- **Upper Bound**: Add 1 to the hundreds digit ($0 + 1 = 1$). The upper bound is 8 100.
- Therefore, 8 041 is bounded by 8 000 and 8 100.

So $8\,000 \leq 8\,041 < 8\,100$.

C ROUNDING NUMBERS

C.1 ROUNDING TO THE NEAREST TEN

Ex 13: Round the number 263 to the nearest ten.

$$263 \approx \boxed{260}$$

Answer:

263 Find the digit in the tens place: 6
263 Look at the digit to the right: 3
Since $3 < 5$, round down: 6 stays the same.
260 Replace all digits to the right with zeros.

$$263 \approx 260$$

Ex 14: Round the number 389 to the nearest ten.

$$389 \approx \boxed{390}$$

Answer:

389 Find the digit in the tens place: 8
389 Look at the digit to the right: 9
Since $9 \geq 5$, round up: $8 + 1 = 9$
390 Replace all digits to the right with zeros.

$$389 \approx 390$$

Ex 15: Round the number 2 342 to the nearest ten.

$$2\,342 \approx \boxed{2340}$$

Answer:

2 342 Find the digit in the tens place: 4
2 342 Look at the digit to the right: 2
Since $2 < 5$, round down: 4 stays the same.
2 340 Replace all digits to the right with zeros.

$$2\,342 \approx 2\,340$$

Ex 16: Round the number 6 779 to the nearest ten.

$$6\,779 \approx \boxed{6780}$$

Answer:

$6\,7\underline{7}9$	Find the digit in the tens place: 7
$6\,7\underline{7}\underline{9}$	Look at the digit to the right: 9
	Since $9 \geq 5$, round up: $7+1=8$
$6\,780$	Replace all digits to the right with zeros.

$$6\,779 \approx 6\,780$$

C.2 ROUNDING TO THE NEAREST HUNDRED

Ex 17: Round the number 365 to the nearest hundred.

$$365 \approx \boxed{400}$$

Answer:

$\underline{3}65$	Find the digit in the hundreds place: 3
$\underline{3}\underline{6}5$	Look at the digit to the right: 6
	Since $6 \geq 5$, round up by adding 1: $3+1=4$
400	Replace all digits to the right with zeros.

$$365 \approx 400$$

Ex 18: Round the number 2 032 to the nearest hundred.

$$2\,032 \approx \boxed{2000}$$

Answer:

$2\underline{0}32$	Find the digit in the hundreds place: 0
$2\underline{0}\underline{3}2$	Look at the digit to the right: 3
	Since $3 < 5$, round down: 0 stays the same.
2000	Replace all digits to the right with zeros.

$$2\,032 \approx 2\,000$$

Ex 19: Round the number 35 695 to the nearest hundred.

$$35\,695 \approx \boxed{35700}$$

Answer:

$356\underline{9}5$	Find the digit in the hundreds place: 6
$356\underline{9}\underline{5}$	Look at the digit to the right: 9
	Since $9 \geq 5$, add 1: $6+1=7$.
35700	Replace all digits to the right with zeros.

$$35\,695 \approx 35\,700$$

Ex 20: Round the number 40 239 to the nearest hundred.

$$40\,239 \approx \boxed{40200}$$

Answer:

$402\underline{3}9$	Find the digit in the hundreds place: 2
$402\underline{3}\underline{9}$	Look at the digit to the right: 3
	Since $3 < 5$, round down: 2 stays the same.
40200	Replace all digits to the right with zeros.

$$40\,239 \approx 40\,200$$

C.3 ROUNDING TO THE NEAREST THOUSAND

Ex 21: Round the number 23 100 to the nearest thousand.

$$23\,100 \approx \boxed{23000}$$

Answer:

$2\underline{3}\,100$	Find the digit in the thousands place: 3
$2\underline{3}\,\underline{1}00$	Look at the digit to the right: 1
	Since $1 < 5$, round down: 3 stays the same.
$23\,000$	Replace all digits to the right with zeros.

$$23\,100 \approx 23\,000$$

Ex 22: Round the number 67 645 to the nearest thousand.

$$67\,645 \approx \boxed{68000}$$

Answer:

$6\underline{7}\,645$	Find the digit in the thousands place: 7
$6\underline{7}\,\underline{6}45$	Look at the digit to the right: 6
	Since $6 \geq 5$, round up: $7+1=8$
$68\,000$	Replace all digits to the right with zeros.

$$67\,645 \approx 68\,000$$

Ex 23: Round the number 9 200 to the nearest thousand.

$$9\,200 \approx \boxed{9000}$$

Answer:

$\underline{9}\,200$	Find the digit in the thousands place: 9
$9\,\underline{2}00$	Look at the digit to the right: 2
	Since $2 < 5$, round down: 9 stays the same.
9000	Replace all digits to the right with zeros.

$$9\,200 \approx 9\,000$$

Ex 24: Round the number 9 999 to the nearest thousand.

$$9\,999 \approx \boxed{10000}$$

Answer:

$\underline{9}\,999$	Find the digit in the thousands place: 9
$9\,\underline{9}99$	Look at the digit to the right: 9
	Since $9 \geq 5$, round up: $9+1=10$
10000	Replace all digits to the right with zeros.

$$9\,999 \approx 10\,000$$