

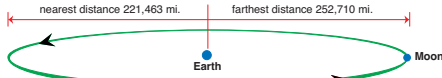
✓ Self-Check: Questions 1-4

Planet Problems

Before you solve the following problems, decide if you need to find an exact answer or an estimated answer. Then choose a strategy to solve each problem. Be ready to share your problem solving strategy with the class.

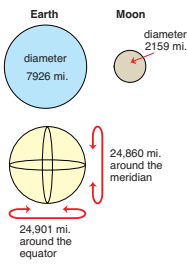
The Earth's closest neighbor in space is our moon. It is the Earth's only natural satellite.

- The average distance from the Earth to the moon is about 238,800 miles; however, it can be as far away as 252,710 miles and as close as 221,463 miles.



Tanya said that the difference between the farthest distance and the nearest distance is about 33,000 miles. Do you agree with Tanya's estimate? Why or why not?

- There have been six manned Apollo space missions to the moon and back. About how many total miles were traveled during those six trips?
- Measured to the nearest mile, the Earth's diameter is 7926 miles and the moon's diameter is 2159 miles. What is the difference between the diameters of the moon and the Earth to the nearest mile?
- Although from space the Earth may look like a perfect ball, it really is not quite. The circumference around the Earth at the equator measures 24,901 miles. The circumference around the Earth at the meridian (an imaginary line drawn circling the Earth through both poles) measures 24,860 miles. Find the difference between these two circumferences.



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Workshop: Addition and Subtraction Strategies (SG pp. 162–165)

Questions 1–16

- Estimate: Possible response: Yes, I agree. Tanya rounded each number to the nearest thousand. She rounded 221,463 to 221,000 and 252,710 to 253,000. The difference between 253,000 and 221,000 is 32,000.

- Estimate: One possible estimate 2,900,000 miles. Possible strategy: 238,800 is close to 240,000. If you double that each trip will be 480,000. You can add $480,000 + 480,000 + 480,000 + 480,000 + 480,000 + 480,000 = 2,880,000$ or about 2,900,000 miles

- Exact answer: 5767 miles: Possible strategy:

$$\begin{array}{r} 8116 \\ 7926 \\ -2159 \\ \hline 5767 \end{array}$$

- Exact answer; 41 miles; possible strategy: $24,901 - 24,860$
 $24,900 - 24,860 = 40$
 $40 + 1 = 41$ miles

- A. Answers will vary. Students should notice that Jerome's estimate is too large. It is larger than the distance from the sun to Neptune.

- B. estimate

- C. Answers will vary. Shannon's observation is correct. Jerome's estimate cannot be larger than the longest distance. It must be smaller.

- D. $2,700,000,000$; $2,800,000,000 - 100,000,000 = 2,700,000,000$ miles. My estimate is less than the largest distance in the subtraction problem.

- 365 miles; Possible response:

$$\begin{array}{l} 1485 + (5) = 1490 \\ 1490 + (10) = 1500 \\ 1500 + (350) = 1850 \\ 5 + 10 + 350 = 365 \end{array}$$

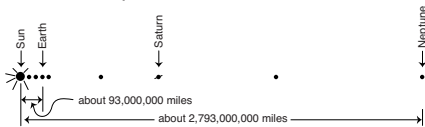
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Use Self-Check: Questions 1–4 and the Workshop Menu: Planet Problems to select practice for choosing appropriate strategies and for solving multistep addition and subtraction problems.

Workshop Menu: Planet Problems

Can I Do This?	Working On It!	Getting It!	Got It!
Choose an appropriate strategy to find sums and differences.	*Q# 5A–B, 6, 7, 9, 13	●Q# 5C–D, 9, 11, 14	■Q# 5C–D, 12, 15
Solve multistep addition and subtraction problems.	*Q# 8, 10A–B	●Q# 10A–B, 16	■Q# 10C, 16

Use the distances and picture below to solve Question 5.



- Jerome said the distance between Neptune's orbit and the Earth's orbit is about 2,800,000,000 miles.
 - *A. Do you agree with Jerome's estimate? Why or why not?
 - *B. Did you need to find an exact answer or an estimate to solve this problem?
 - C. Shannon told Jerome that the distance could not be larger than 2,793,000,000 miles because that is the distance between the sun and Neptune. Your estimate must be smaller than the largest distance. Do you agree with Shannon's response to Jerome? Why or why not?
 - D. Find a reasonable estimate to Jerome's problem.

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7. Exact: 26,000,000 miles; Possible response:

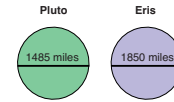
$$\begin{array}{r} 81 \\ 93,000,000 \\ -67,000,000 \\ \hline 26,000,000 \end{array}$$

8. Estimate: Students should agree with Jacob. $4000 + 3000 = 7000$ miles. The sum of the diameters of Mercury and Mars is a little more than 7000 since I rounded both numbers down. The diameter of Venus is a little larger than 7000 miles.
9. Estimate: $900,000,000 - 500,000,000 = 400,000,000$ miles. Students should disagree with Maria's estimate.
10. **A.** Exact: 31,704 miles
B. Exact: More; 31,763 miles is more than 31,704 miles.
C. Estimate: 11 Earth diameters is about 88,000 miles this is about the same as Jupiter's diameter of 88,846 miles. Students should agree with Irma.
11. Estimate: about 16,000 miles. 7926 miles is about 8000 miles, so $8000 \text{ miles} + 8000 \text{ miles} = 16,000$ miles. This is a reasonable estimate since the diameter of Jupiter is almost 90,000 miles.
12. Estimate: students should agree with John. $900,000,000 + 900,000,000 = 1,800,000,000$ miles; 1,784,000,000 is close to 1,800,000,000 miles.
13. Estimate: 3900 days; 4331 is about 4300 and 365 is about 400; $4300 - 400 = 3900$.
14. Either: students should disagree with Nila. There are 365 days in one Earth year. $365 + 365 = 730$ days; 687 is less than 730 so, it takes less than 2 Earth years for Mars to revolve around the Sun.
15. Estimate: Romesh could have used convenient numbers. It takes about 31,000 Earth days for Uranus to revolve around the Sun and about 60,000 days for Neptune to revolve around the Sun. 31,000 is about half of 60,000.
16. Estimate: If you round all of the distances to the nearest hundred thousand, the distance between Earth and Jupiter is about $500,000,000 - 100,000,000 = 400,000,000$ miles. The distance between Jupiter and Saturn

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Pluto is an object that orbits the sun about 3,647,000,000 miles from the sun in the outermost parts of the Solar System. This tiny object was discovered in 1930. It was called a planet because scientists thought it might be the largest object past Neptune. It measures about 1485 miles across. In 2005, scientist found another object in the neighborhood of Pluto, Eris, which measures about 1850 miles across. Because of this discovery, scientists decided that Pluto was no longer going to be called a planet. It would be called a dwarf planet.

- *6. How much larger is the diameter of Eris than the diameter of Pluto? Show or tell the strategy you used to solve this problem.



The table below gives information about the planets in our Solar System. Use it to solve the problems you chose on the Workshop Menu: Planet Problems.

Our Solar System

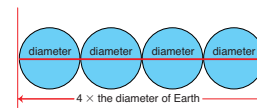
Planet	Average Distance From the Sun in Miles (Approx.)	Revolution around the Sun in Earth days (Approx.)	Diameter at Equator in Miles
Mercury	36,000,000	88	3032
Venus	67,000,000	225	7521
Earth	93,000,000	365	7926
Mars	141,000,000	687	4221
Jupiter	484,000,000	4331	88,846
Saturn	891,000,000	10,747	74,897
Uranus	1,784,000,000	30,589	31,763
Neptune	2,793,000,000	59,800	30,775

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- *7. What is the average distance between the Earth's orbit and Venus's orbit? Show or tell the strategy you used to find your answer.
- *8. Jacob said that the diameters of Mars and Mercury together are about the same as the diameter of Venus. Do you agree with Jacob? Explain.
- *9. Maria said that the distance between Saturn's orbit and Jupiter's orbit is about 600,000,000 miles. Do you agree with Maria's estimate? Why or why not?
10. *A. If you could line up the diameters of four Earths, how many miles long would that line-up be?



- *B. Is the diameter of Uranus more or less than 4 diameters of Earth? How did you decide?
- *C. Irma decided that the diameter of Jupiter was equal to about 11 diameters of Earth. Do you agree? Why or why not.
- *11. There is a giant red spot on Jupiter that is estimated to be the size of 2 Earths. About how big is the diameter of the giant red spot?
- *12. John said that Saturn is 891,000,000 miles from the sun and that Uranus is about twice that distance from the sun. Do you agree with John? Why or why not?
- *13. It takes Earth 365 days, or 1 year to travel in an orbit (revolve) around the sun. About how many more Earth days does it take Jupiter to revolve around the sun? Show or tell the strategy you used to find your solution.
- *14. Nila decided it takes a little more than two Earth years for Mars to revolve around the sun. Do you agree with her answer? Why or why not?
- *15. Romesh said that Uranus orbits around the sun about 2 times for each one orbit of Neptune. Show or tell how he decided.
- *16. Frank said that the distance between Earth and Jupiter is about the same as the distance between Jupiter and Saturn. Do you agree with Frank? Why or why not?

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Use Addition and Subtraction Strategies

A Closer Look at the Digits Game

✓ **Self-Check: Questions 1-4**

1. Romesh and Jacob are playing the digits game. They need to find the largest sum. Seven numbers were placed on each board.

A. Use an estimation strategy to decide who found the largest sum. Show your strategy.

Romesh

7	8	4	1
+	6	5	3

Estimation Strategy

Jacob

7	4	5	3
+	6	8	1

Estimation Strategy

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is about $900,000,000 - 500,000,000 = 400,000,000$, so they are about the same. If you round each number to the nearest ten thousand the distance between Earth and Jupiter is $480,000,000 - 90,000,000 = 390,000,000$ and the distance between Jupiter and Saturn is $890,000,000 - 480,000,000 = 410,000,000$. These two distances are still close as both are about $400,000,000$.

Student Activity Book

Use Addition and Subtraction Strategies (SAB. pp. 151–158) Questions 1–13

1. A. Possible response: I used convenient numbers $7840 + 650 = 8490$ for Romesh and $7450 + 680 = 8130$ for Jacob. Romesh found the largest sum.
- B. Possible strategy for Romesh:

$$\begin{array}{r} 7841 \\ + 653 \\ \hline 8494 \end{array}$$

Possible strategy for Jacob:

$$\begin{array}{r} 7453 \\ + 681 \\ \hline 7000 \\ 1000 \\ 130 \\ \hline 4 \\ \hline 8134 \end{array}$$

2. I used mental math. I added 2 to 1498 to make it 1500 and then I added 1000 to get to 2500 and then another 3 to get to 2503. $2 + 1000 + 3 = 1005$. This is reasonable because $2500 - 1500$ is 1000 and that is very close to 1005.
3. A. Possible response: I do not agree with Jessie because she added the ones and tens and then subtracted the 100s. The answer will be 179.
- B. Since Grace could not subtract 5 from 3 she regrouped by taking the ten to make 13 ones then she subtracted $13 - 5 = 8$. Then Grace could not subtract 8 tens from 0 tens so she regrouped taking 10 ten or 100 from the 600 leaving 500. That left $10 - 8$ in the tens column and $5 - 4$ in the hundreds column.
- C. Jessie found the largest difference.

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B. Find the solution for each boy's game board. Use a different strategy for each problem.

Problem	My Strategy								
<p>Romesh</p> <table border="1" style="border-collapse: collapse; margin: auto;"> <tr><td>7</td><td>8</td><td>4</td><td>1</td></tr> <tr><td>+</td><td>6</td><td>5</td><td>3</td></tr> </table>	7	8	4	1	+	6	5	3	
7	8	4	1						
+	6	5	3						
<p>Jacob</p> <table border="1" style="border-collapse: collapse; margin: auto;"> <tr><td>7</td><td>4</td><td>5</td><td>3</td></tr> <tr><td>+</td><td>6</td><td>8</td><td>1</td></tr> </table>	7	4	5	3	+	6	8	1	
7	4	5	3						
+	6	8	1						

2. Shannon is playing for the smallest difference. Here is her game board. Find the difference. Then use estimation to decide if your answer is reasonable. Explain your estimation strategy.

2	5	0	3
-	1	4	9

Estimation Strategy

3. Jessie and Grace played a game for the largest difference.

A. Look at Jessie's game board. Do you agree with Jessie's solution? Why or why not?

Jessie's Board

8	1	4
-	6	3
2 4 9		

Estimation Strategy

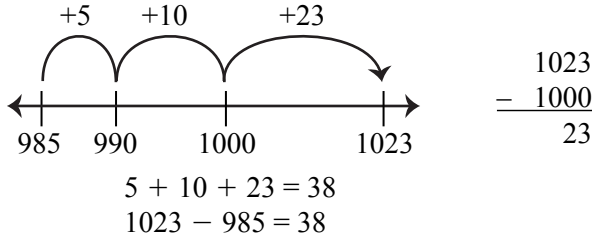
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4. 1116; 38, Maya won.

$$\begin{array}{r} 4 \ 10 \\ 1\cancel{3}08 \\ - 392 \\ \hline 1116 \end{array} \qquad \begin{array}{r} 1500 \\ - 400 \\ \hline 1100 \end{array}$$



5. A. John added $70 + 50 = 120$.

B. Possible solution:

$$\begin{array}{r} 853 \\ + 742 \\ \hline 1500 \\ 90 \\ + 5 \\ \hline 1595 \end{array}$$

6. A.

$$\begin{array}{r} 472 \\ + 358 \\ \hline \end{array}$$

B. Possible solution:

$$\begin{array}{r} 853 \\ + 742 \\ \hline 1500 \\ 90 \\ + 5 \\ \hline 1595 \end{array}$$

C. Possible solution:

$$\begin{array}{r} 11 \\ 248 \\ + 357 \\ \hline 605 \end{array}$$

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B. Look at Grace's game board. Explain how Grace found her solution.

5	10	13
4	8	5
1	2	8

C. Who found the largest difference, Jessie or Grace?

4. Jerome and Maya played a game for the smallest difference. Finish the solutions started by Jerome and Maya. Then use an estimation strategy to decide if your answers are reasonable. Circle the winner.

Jerome

1	7	8
3	9	2
<hr style="width: 100%;"/>		
6		

Estimation Strategy

Maya

1	0	2	3
9	8	5	
<hr style="width: 100%;"/>			

Estimation Strategy

$1023 - 985 =$

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Use Self-Check: Questions 1-4 and the Workshop Menu: A Closer Look at the Digits Game to choose practice for using strategies in addition and subtraction.

Workshop Menu: A Closer Look at the Digits Game

Can I Do This?	Working On It!	Getting It!	Got It!
Use place value concepts to make trades in addition and subtraction.	*Q# 5, 7B, 13A	● Q# 5, 7B, 13A	■ Q# 6A, 8, 13A
Use more than one strategy to add and subtract multidigit numbers.	*Q# 9-10, 13B	● Q# 11, 13B	■ Q# 6B-C, 13B
Estimate sums and differences.	*Q# 7A, 10	● Q# 7A, 12	■ Q# 12

★5. John was playing for the largest sum. Look at his game board and solution.

4	7	2
3	5	8
<hr style="width: 100%;"/>		
7	0	0
1	2	0
+	1	0
<hr style="width: 100%;"/>		
8	3	0

A. Explain how John got 120 in his solution.

B. Using the same digits John used, arrange the digits to find a larger sum. Use John's strategy to find the sum.

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6. ■A. John was playing for the largest sum. Some of the digits are missing from his solution. Find the missing digits.

$$\begin{array}{r} 4 \square \square 2 \\ + \square \square 5 \square \\ \hline 7 \ 0 \ 0 \\ 1 \ 2 \ 0 \\ + \square \ 1 \ 0 \\ \hline 8 \ 3 \ 0 \end{array}$$

■B. Use John's six digits to make a problem with the largest possible sum. Use any strategy to solve the problem.

■C. Use John's six digits to make a problem with the smallest possible sum. Use any strategy to solve the problem.

7. Ana is playing for the smallest difference. Look at her game board and solution.

$$\begin{array}{r} 7 \ 1 \ 3 \\ - \square \ 8 \ 9 \\ \hline 7 \ 9 \ 6 \end{array}$$

★A. Use estimation to decide if Ana's solution is reasonable. Explain your thinking.

★B. Show or tell Ana how to find the correct solution for her game board.

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8. ■B. Luis is playing for the smallest difference. He left some numbers out on his game board and solution. Find the missing numbers. Explain your thinking.

$$\begin{array}{r} 2 \square \square 4 \\ - \square \ 3 \ 9 \ 8 \\ \hline 6 \ 5 \ 6 \end{array}$$

★9. Sam placed 6 digits on his game board. Explain how Sam can use a mental math strategy to find the solution.

$$\begin{array}{r} 5 \ 0 \ 2 \\ + \square \ 4 \ 9 \\ \hline \end{array}$$

★10. Nisha and Roberto are playing a game for the largest sum. Finish the solution strategies started by Nisha and Roberto. Estimate to show the solutions are reasonable. Circle the winner.

Nisha's Board	Nisha's Strategy	Estimation
$\begin{array}{r} 4 \ 6 \ 3 \ 0 \\ + 8 \ 5 \ 9 \ 1 \\ \hline \end{array}$	$\begin{array}{r} 4630 \\ + 8591 \\ \hline 12000 \\ + 120 \\ \hline \end{array}$	
Roberto's Board	Roberto's Strategy	Estimation
$\begin{array}{r} 9 \ 3 \ 4 \ 1 \\ + 5 \ 8 \ 6 \ 0 \\ \hline \end{array}$	$\begin{array}{r} 9341 \\ + 5860 \\ \hline \end{array}$	

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7. A. Ana's solution is not reasonable. Her answer is bigger than the biggest number in the subtraction problem. The answer will be closer to 600.

B. Possible response: Ana could use mental math. She could first do $700 - 90 = 610$. Since the number was really 89 she would need to add 1 from 610 to make it 611 and then add the 13 she took away from 713 so, $611 + 13 = 624$.

8.
$$\begin{array}{r} 2054 \\ - 1398 \\ \hline 656 \end{array}$$

Possible response: I thought about addition:

$$\begin{array}{r} 1 \ 1 \ 1 \\ \square 398 \\ + 656 \\ \hline 2054 \end{array}$$

Since the digit in the thousands place had to equal 2, I knew the digit in the thousands place in the lower number would be a 1.

9. Sam can think about $500 + 350 = 850$. Then since he took 2 away from the top number and added one to the bottom number he will have to add 1 to his answer: 851.

10. Nisha's Boards

$$\begin{array}{r} 4630 \\ + 8591 \\ \hline 12000 \\ 120 \\ \hline 13,221 \end{array}$$

A possible estimation strategy:
 $4600 + 8600 = 13200$.

Roberto's Board

$$\begin{array}{r} 1 \ 1 \\ 9341 \\ + 5860 \\ \hline 15,201 \end{array}$$

A possible estimation strategy
 $9000 + 6000 = 15,000$

11. Possible strategies:

$$\begin{array}{r} 2643 \\ + 958 \\ \hline 2000 \\ 1500 \\ 90 \\ \hline 11 \\ \hline 3601 \end{array}$$

12. A. Rosa will win.

B. Possible response: Rosa's top number is close to 2500 and her bottom number is close to 600. $2500 - 600 = 1900$. Suzanne's top number is close to 2700 and her bottom number is close to 700. $2700 - 700 = 2000$. Rosa's difference is smaller than Suzanne's.

13. A.* I think Jackie will win because she can make a bigger number on the top and her number on the bottom will be smaller than Tanya's so her difference will be larger.

B.*

$$\begin{array}{r} 432 \\ - 51 \\ \hline 381 \end{array}$$

$$\begin{array}{r} 300 \quad 130 \\ \del{400} + \del{30} + 2 \\ \hline 50 + 1 \\ \hline 300 + 80 + 1 = 381 \end{array}$$

Name _____ Date _____

•11. Emily placed 7 digits on her game board. Find the solution for Emily's game board using two different strategies.

Game Board	One Strategy	Another Strategy
$\begin{array}{r} \boxed{2} \boxed{6} \boxed{4} \boxed{3} \\ + \quad \boxed{9} \boxed{5} \boxed{8} \\ \hline \end{array}$		

•12. Rosa and Suzanne are playing for the smallest difference.

A. Use estimation to decide who will win this round. Circle the winner.

Rosa's Board

$$\begin{array}{r} \boxed{2} \boxed{4} \boxed{9} \boxed{3} \\ - \quad \boxed{6} \boxed{1} \boxed{7} \\ \hline \end{array}$$

Suzanne's Board

$$\begin{array}{r} \boxed{2} \boxed{6} \boxed{9} \boxed{4} \\ - \quad \boxed{7} \boxed{3} \boxed{1} \\ \hline \end{array}$$

B. Explain your reasoning.

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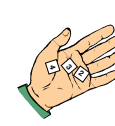
✓ **Check-In: Question 13**

•13. Tanya and Jackie are playing a version of the Digits Game. They are making subtraction problems using cards numbered 1 to 5. The player whose subtraction problem gives the largest difference wins the game. Look at where each girl placed the first two of her cards.

Tanya

$$\begin{array}{r} \square \boxed{1} \square \\ - \quad \boxed{5} \square \\ \hline \end{array}$$


Jackie

$$\begin{array}{r} \square \square \square \\ - \quad \boxed{5} \boxed{1} \\ \hline \end{array}$$


A. Without placing the missing numbers decide who will win the game. Explain how you know this person will win.

B. Look at Tanya's and Jackie's boards. Write the subtraction problem that will win the game. Show how to solve it in two different ways.

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*Answers and/or discussion are included in the lesson.