Index of Multi-Step Multiplication Problems

24 Two Pos Integers w/ Smallest Sum

Name _____ Date _____

The Problem

What two positive integers whose product is 24 will have the smallest sum?

24 Two Pos Integers w/ Smallest Sum (continued)

Solution Strategy: Make a List

First of all, what are the positive integers whose product is 24. We need to think of all the factors of 24.

1 x 24 = 24
2 x 12 = 24
3 x 8 = 24
4 x 6 = 24

Now let's see which of the above has the smallest sum.

Factor	Factor	Sum
1	24	25
2	12	14
3	8	11
4	6	10

← This is the smallest sum.

ANSWER: The numers 4 and 6 are the two positive integers whose product is 24 and have the smallest sum.

Houses on Pickett Lane

Name _____ Date _____

The Problem

All of the houses on Pickett Lane are either blue, tan, green, or white. There are twice as many tan houses as there are blue houses. There are 5 more green houses than blue houses. There are 3 times as many green houses as there are white houses. There are 2 white houses. How many houses are there on Pickett Lane?

Houses on Pickett Lane (continued)

Solution Strategy: Work Backwards

When we use a work backwards strategy, we start with the ending piece of information. In this problem, the ending piece of information is that there are 2 white houses.

White houses = 2

Then as we work backwards, we find that there are 3 times as many green houses as there are white houses. We know that there are 2 white houses, so our equation looks like this:

Green houses = 3 * 2 = 6

The next piece of information we have is that there are 5 more green houses than blue houses. We know there are 6 green houses, so our equation looks like this:

Blue houses = 6 – 5 = 1

Then our final piece of information, working our way backwards, is that there are twice as many tan houses as there are blue houses. We have 1 blue house, so our equation looks like this:

Tan houses = 2 * 1 = 2

We have discovered the following information by working our way backwards through the problem:

White houses = 2 Green houses = 6 Blue houses = 1 Tan houses = 2

There are 2 + 6 + 1 + 2 or 11 houses on Pickett Lane.

ANSWER: There are 11 houses on Pickett Lane.

Dani's Coins

Name _____ Date _____

The Problem

Dani gave the store clerk $5.02 in quarters, nickels, dimes, and pennies. There were 5 times as many quarters as there were pennies. There were 3 times as many nickels as there were dimes. How many of each coin did Dani give the clerk?

Dani's Coins (continued)

Solution Strategy: Guess and Check

Let's first look at the quarters and the pennies. We are told that there are 5 times as many quarters as pennies. Our total is $5.02. Let's start with 5 quarters and 1 penny.

5 quarters = 5 * $0.25 = $1.25 1 penny = $0.01

$1.25 + $0.01 = $1.26

We now have a total of $1.26. We need $3.76 more. Let's now look at the dimes and nickels. We are told that we have 3 times as many nickels as dimes. Let's try 10 dimes and 30 nickels.

30 nickels = 30 * $0.05 = $1.50 10 dimes = $1.00

$1.50 + $1.00 = $2.50

That's not enough. Let's try 2 pennies and 10 quarters.

10 quarters = 10 * $0.25 = $2.50 2 pennies = $0.02

$2.50 + $0.02 = $2.52

We now have a total of $2.52 and we need $2.50 more. That's the amount we arrived at with 10 dimes and 30 nickels. So our total for each coin is:

2 pennies, 10 quarters, 10 dimes, and 30 nickels

$0.02 + $2.50 + $1.00 + $1.50 = $5.02

ANSWER: Dani gave the clerk 2 pennies, 10 quarters, 10 dimes, and 30 nickels.

3 to the 50th Power

Name _____ Date _____

The Problem

What is the digit in the ones place in the number three to the fiftieth power?

3 to the 50th Power (continued)

Solution Strategy: Make a Simpler Problem

Three to the fiftieth power is long and difficult to compute. Let's take a look at three to the eighth power first. What does it look like? It is the equation:

3 x 3 x 3 x 3 x 3 x 3 x 3 x 3 = ?

Next, let's see what this would look like if we were computing it by hand:

3 x 3	=	***9***	243 x 3 = 72***9***
9 x 3	=	2***7***	729 x 3 = 2,18***7***
27 x 3	=	8***1***	2,187 x 3 = 6,56***1***
81 x 3	=	24***3***	6,561 x 3 = 19,68***3***

Now that we've done a simpler case of the problem, we can begin looking for patterns or strategies for solving the larger problem.

Solution Strategy: Look for a Pattern

Let's examine what we have discovered about the ones place in our calculations above. Why are we looking at the ones place? That's what the problem is asking for. Notice the pattern in the ones place. The pattern is:

9……7…….1…….3

Will it continue? Let's try the next 4 numbers and see if the pattern stays consistent:

3	x	19,683	=	59,04***9***	YES
3	x	59,049	=	177,14***7***	YES
3	x	177,147	=	531,44***1***	YES
3	x	531,441	=	1,594,32***3***	YES

Yes, the pattern seems to stay consistent. Given this information, how can we determine what the digit will be in the ones place for the fiftieth power? We can see that every time we add 4 to the exponent, the pattern repeats itself.

Therefore, if there is a 9 in the ones place for the power of 2, there will also be a 9 in the ones place for the following powers: 6, 10, 14, 18, 22, 26, 30, 34, 38, 42, 46, and ***50.*** That's it! We're looking for the digit in the ones place for the fiftieth power. By examining the pattern, we have discovered that the digit in the ones place in the number three to the fiftieth power is 9.

ANSWER: There is a 9 in the ones place in the number three to the fiftieth power.

Michael & Maureen Plan a Bike Trip

Name _____ Date _____

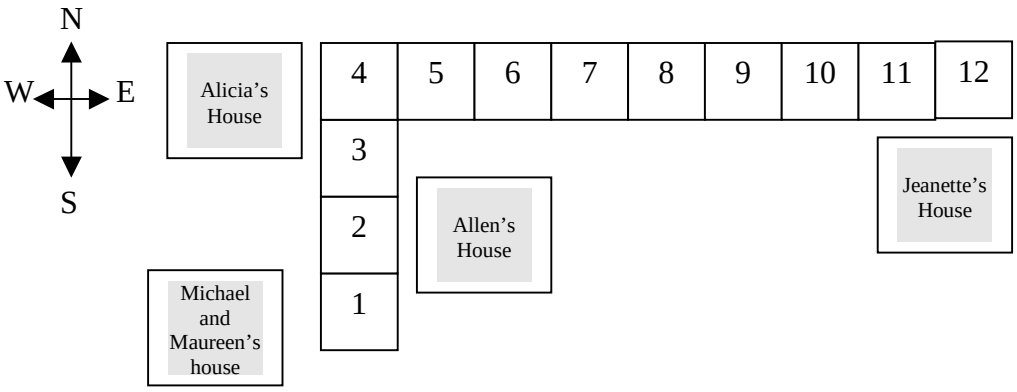
The Problem

Michael and his sister, Maureen, are planning a bike trip to visit each of their neighborhood friends. They will first stop at Allen's house which is 2 blocks away, straight north, and then they will travel to Alicia's house, which is twice as far from Michael and Maureen's house as Allen's house, also straight north. Then they will go east and travel 2 times as far as they've already traveled to get to Jeanette's house. Finally, they will return home. How many blocks will they travel in their entire trip?

Michael & Maureen Plan a Bike Trip (continued)

Solution Strategy: Draw a Picture

This problem is difficult because there are so many parts to it. Let's draw a picture so we can see it a little more clearly.



We see that it is 2 blocks from the starting point to Allen's house. It's 2 times as far (from the starting point) to Alicia's house, so it's (2 * 2) or 4 blocks to Alicia's house. Michael and Maureen have traveled a total of 4 blocks. Now we are told that they travel 2 times as far as the distance already traveled to Jeanette's house. They have traveled 4 blocks thus far, so they need to travel (2 * 4) or 8 blocks more. That is a total of 4 + 8 or 12 blocks altogether.

They have traveled 12 blocks by the time they get to Jeanette's house.

Then they need to return home. We need to double their one-way trip.

12 * 2 = 24 blocks

ANSWER: Michael and Maureen will travel a total of 24 blocks.

Sean & Kevin Play a Card Tournament

Name _____ Date _____

The Problem

Sean and Kevin like to play a card game together. It's a strategy game that involves collecting cards. Sean is the better player so he agrees to give Kevin 2 of his cards every time Kevin wins a game. Kevin gives Sean 1 of his cards every time Sean wins a game. They decide to play a 21-game tournament. After they played the 21 games, they both ended up with the same number of cards that they started with. How many games did each boy win?

Sean & Kevin Play a Card Tournament (continued)

Solution Strategy: Guess and Check

In order to end up with the same number of cards that they started with, they need to give away the same number of cards that they receive. Therefore, the number of cards given away by each boy ***must be equal***.

Let's start by randomly selecting numbers of victories. Let's say that Kevin won 11 games and Sean won 10 games. That adds up to 21, which is the number of games they played. Let's organize our guesses by using a table.

Sean's Victories	Kevin's Victories	Sean Must Give Away	Kevin Must Give Away
10	11	11 * 2 = 22	10 * 1 = 10

That's too many victories for Kevin. Sean had to give away more than twice as many cards. We are looking for about half as many victories for Kevin. With that in mind, let's say that Sean won 15 games and Kevin won 6 games.

Sean's Victories	Kevin's Victories	Sean Must Give Away	Kevin Must Give Away
15	6	6 * 2 = 12	15 * 1 = 15

That's much closer. We were within 3 this time. Now we see that Sean's number of victories is a little high. Let's try one less victory for Sean.

Sean's Victories	Kevin's Victories	Sean Must Give Away	Kevin Must Give Away
14	7	7 * 2 = 14	1 * 14 = 14

That's it! We have discovered that if Sean has 14 victories and Kevin has 7 victories, both boys will have to give away 14 cards and that will give them the same number of cards that they started with – they will give away 14 and they will receive 14.

ANSWER: Sean won 14 games and Kevin won 7 games.

Joe's Earnings at the Grocery Store

Name _____ Date _____

The Problem

Joe works at the local grocery store. He usually works 40 hours a week and gets paid $10 per hour. Sometimes, however, he is asked to work over 40 hours per week and he is paid overtime for the extra hours. He gets paid "time and a half" for overtime; that is, his regular rate of pay plus another half of his rate of pay. Last week, Joe worked 60 hours. How much did he earn?

Joe's Earnings at the Grocery Store

Solution Strategy: Make a Diagram

Let's first calculate his regular pay. 40 hours a week at $10 per hour.

Let's draw a rate diagram.

Units	Hours Per Week	$ Per Hour	Total Pay
Numbers	40	$10	?

40 * $10 = $400 regular pay

Now let's calculate his overtime pay. Joe gets paid time and a half for overtime.

- His regular rate of pay = $10 per hour
- ½ of that is $5
- $10 + $5 = $15

Joe's overtime rate of pay is ***$15 per hour.***

Joe worked 20 hours of overtime (60 – 40 = 20).

Let's draw a rate diagram.

Units	Overtime Hours	Overtime Rate of Pay	Total Pay
Numbers	20	$15	?

20 * $15 = $300 overtime pay

Now, let's add together his regular pay and his overtime pay.

$400 + $300 = $700 total pay

ANSWER: Joe earned $700 last week.

48 Two Pos Integers w/ Largest Sum

Name _____ Date _____

The Problem

What two positive integers whose product is 48 have the largest sum?

48 Two Pos Integers w/ Largest Sum (continued)

Solution Strategy: Make a List

First of all, let's look at the factors of 48.

1 x 48 = 48
2 x 24 = 48
3 x 16 = 48
4 x 12 = 48
6 x 8 = 48

Now let's see which of the above has the largest sum

Factor	Factor	Sum
1	48	49
2	24	26
3	16	19
4	12	16
6	8	14

◄—— This is the largest sum.

ANSWER: The numbers 1 and 48 are the 2 factors of 48 that have the largest sum.

Chelsea's Shirts

Name _____ Date _____

The Problem

Chelsea has 4 colors of shirts in her closet. She has black, pink, blue, and white. There are twice as many blue shirts as there are black ones. There are 3 times as many black shirts as there are pink shirts. There are 2 times as many pink shirts as there are white shirts. There is 1 white shirt. How many shirts does Chelsea have all together?

Chelsea's Shirts (continued)

Solution Strategy: Work Backwards

When we use a work backward strategy, we start with the ending piece of information. In this problem, the ending piece of information is that Chelsea has 1 white shirt.

White shirt = 1

As we work backwards, we find that she has 2 times as many pink shirts as she has white shirts.

Pink shirts = 2 * 1 = 2

The next piece of information we have is that she has 3 times more black shirts than pink shirts.

Black shirts = 3 * 2 = 6

Our final piece of information, working our way backward, is that she has twice as many blue shirts as black shirts.

Blue shirts = 6 * 2 = 12

We have discovered the following information by working our way backward through the problem:

White Shirt	Pink Shirts	Black Shirts	Blue Shirts
1	2	6	12

Chelsea has 1 + 2 + 6 + 12 or 21 shirts all together.

ANSWER: Chelsea has 21 shirts all together.

Pamela's Piggy Bank

Name _____ Date _____

The Problem

Pamela had $4.08 in her piggy bank. She had 10 times as many nickels as dimes. She had 3 times as many quarters as pennies. How many of each coin did Pamela have in her piggy bank?

Pamela's Piggy Bank (continued)

Solution Strategy: Guess and Check

We know that there must be ***3 times as many quarters as pennies***. We might use a formula like:

3 * P = Q

We also know that there must be ***10 times as many nickels as dimes***. We might use a formula like:

10 * D = N

We will then need to make guesses at the amount of pennies and dimes, and then use our formulas to compute quarters and nickels. Let's start with a guess of 1 penny and 1 dime.

Pennies	Quarters	Dimes	Nickels
1	3 * 1 = 3	1	10 * 1 = 10

Then we compute the total money value.

1 Penny = $ .01
3 Quarters = $ .75
1 Dime = $ .10
10 Nickels = $ .05
TOTAL…… $0.93 **No. This guess is too low.**

Let's try 2 pennies and 2 dimes. We will use our formulas to compute quarters and nickels. Remember, they are: **3 * P = Q** and **10 * N = D**.

Pennies	Quarters	Dimes	Nickels
2	3 * 2 = 6	2	10 * 2 = 20

Then we compute the total money value.

2 Pennies = $ .02
6 Quarters = $1.50
2 Dimes = $ .20
20 Nickels = $1.00
TOTAL…… $2.72 **No. This guess is too high.**

Pamela's Piggy Bank (continued)

Let's try 3 pennies and 3 dimes. We will use our formulas to compute quarters and nickels. Remember, they are: **3 * P = Q** and **10 * N = D**.

Pennies	Quarters	Dimes	Nickels
3	3 * 3 = 9	3	10 * 3 = 30

Then we compute the total money value.

3 Pennies = $ .03
9 Quarters = $2.25
3 Dimes = $ .30
30 Nickels = $1.50
TOTAL…… $4.08 **That's it!**

ANSWER: Pamela had 3 pennies, 9 quarters, 3 dimes, and 30 nickels in her piggy bank.

Christopher the Multiplier

Name _____ Date _____

The Problem

Christopher is a budding young mathematician who likes to multiply by 2. One evening, just for fun, he decided to see how many times he could multiply by 2. He multiplied by 2 a total of a hundred times before his mom finally told him to go to bed. If he started at 1 (1 x 2 = 2, 2 x 2 = 4, 4 x 2 = 8, etc.), what is the digit in the ones place of the final product after multiplying by 2 a hundred times?

Christopher the Multiplier (continued)

Solution Strategy: Make a Simpler Problem

It is very overwhelming to think of this problem of multiplying by 2 a hundred times. So, let's look at a simpler problem first. Let's look at the results after multiplying by 2 ten times.

Number of Times	Number Model	Result
1	1 x 2	2
2	2 x 2	4
3	4 x 2	8
4	8 x 2	16
5	16 x 2	32
6	32 x 2	64
7	64 x 2	128
8	128 x 2	256
9	256 x 2	512
10	512 x 2	1,024

Solution Strategy: Look for a Pattern

Next, let's take a look at the digit in the ones place for the 10 answers given above:

2, 4, 8, 6, 2, 4, 8, 6, 2, 4

We are beginning to see that there is a pattern. Let's take a look at the next 10 results (11 through 20) and see if the pattern continues. If it does, we may be able to make a conclusion that will lead to the solution of the larger problem.

Number of Times	Number Model	Result
11	1,024 x 2	2,048
12	2,048 x 2	4,096
13	4,096 x 2	8,192
14	8,192 x 2	16,384
15	16,384 x 2	32,768
16	32,768 x 2	65,536
17	65,536 x 2	131,072
18	131,072 x 2	262,144
19	262,144 x 2	524,288
20	524,288 x 2	1,048,576

Christopher the Multiplier (continued)

Let's take a look at the number in the ones place of the next 10 results of multiplying by 2 to see if our pattern holds. Combining this result with the first 10 results, we see that the pattern holds for the next 10 times Christopher multiplied by 2.

1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***
2	4	8	6	2	4	8	6	2	4	8	6	2	4	8	6	2	4	8	6

With these observations in mind, what can we conclude about the number in the ones place after multiplying by 2 a hundred times?

We have observed the pattern through 5 ***complete*** cycles, ending with the 20^{th} time. We can then state that on the 40^{th} time, the digit in the ones place will be 6, as well as on the 60^{th} time, the 80^{th} time and the 100^{th} time. Therefore, we can conclude that the digit in the ones place after multiplying 2 a hundred times is a 6.

ANSWER: The digit in the ones place after multiplying by 2 a hundred times (starting at 1) is 6.

Geri & Sari and the Party Streamers

Name _____ Date _____

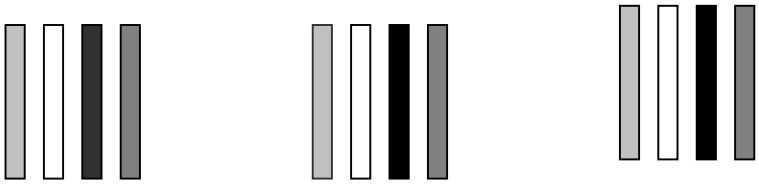
The Problem

Two sisters were planning a party. They wanted the room to be filled with colorful streamers. The older sister, Geri, put up 3 rows of 4 different colors of streamers. The younger sister, Sari, put up 5 rows of 3 different colors of streamers. How many streamers did they put up in all?

Geri & Sari and the Party Streamers (continued)

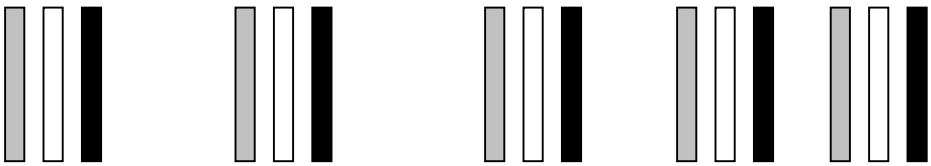
Solution Strategy: Draw a Picture

Let's draw a picture to help organize our thoughts. Geri put up 3 rows of 4 different colors of streamers.



3 x 4 = 12 streamers

Sari put up 5 rows of 3 different colors of streamers.



5 x 3 = 15 streamers

Geri put up 12 streamers and Sari put up 15 streamers so there was a total of 27 (12 + 15) streamers all together.

ANSWER: The 2 girls put up a total of 27 streamers for the party.

Calen & Randy Play a Sim Tournament

Name _____ Date _____

The Problem

Calen and Randy like to play a game called Sim. They decide to play a tournament based on points. Since they both agree that Calen is the better player, Calen agrees to give Randy 4 points for every victory and 2 points for each loss. Calen will get 3 points for each of his victories and will get 1 point for a loss. At the end of the tournament, they played a total of 80 games and each boy had 200 points. How many games did each boy win?

Calen & Randy Play a Sim Tournament (continued)

Solution Strategy: Guess and Check

Let's make a guess that Calen and Randy each won 40 games. Why? Well, it's in the middle and it adds up to 80 (40 + 40 = 80). It seems like a logical starting point.

Player's Name	Number of Wins	Points for Wins	Number of Losses	Points for Losses	Total Points
Calen	40	40 x 3 = 120	40	40 x 1 = 40	120 + 40 = 160
Randy	40	40 x 4 = 160	40	40 x 2 = 80	160 + 80 = 240

No. That guess gave Calen too few points and Randy too many points. Let's give more victories to Calen and less to Randy. Let's try 50 and 30.

Player's Name	Number of Wins	Points for Wins	Number of Losses	Points for Losses	Total Points
Calen	50	50 x 3 = 150	30	30 x 1 = 30	150 + 30 = 180
Randy	30	30 x 4 = 120	50	50 x 2 = 100	120 + 100 = 220

No. But that guess is closer. Let's adjust Calen's number of victories up to 60 and Randy's number of victories down to 20.

Player's Name	Number of Wins	Points for Wins	Number of Losses	Points for Losses	Total Points
Calen	60	60 x 3 = 180	20	20 x 1 = 20	180 + 20 = 200
Randy	20	20 x 4 = 80	60	60 x 2 = 120	120 + 80 = 200

That's it! The number of wins and losses adds up to 80, and the total points for each boy is 200.

ANSWER: Randy won 20 games and Calen won 60 games in the tournament.

The Tuttle's Trip to Gettysburg

Name _____ Date _____

The Problem

The Tuttles took a trip to Gettysburg to visit the battlefields of the Civil War. They drove the first 8 hours of their trip at a speed of 60 miles per hour. The last 2 hours of their trip were on a curvy, mountain road, on a foggy and dark night, so they were only able to drive 20 miles per hour. How many miles did they travel in all?

The Tuttle's Trip to Gettysburg (continued)

Solution Strategy: Make a Diagram

Let's first calculate the first part of the trip. They traveled for 8 hours at a speed of 60 miles per hour. How many miles is that?

Let's draw a rate diagram.

Units	Hours	Miles Per Hour	Total Miles
Numbers	8	60	?

60 * 8 = 480 miles

Now let's calculate the second part of the trip. They traveled for 2 hours at a speed of 20 miles per hour.

Let's draw a rate diagram.

Units	Hours	Miles Per Hour	Total Miles
Numbers	2	20	?

20 * 2 = 40 miles

Now, let's add together the miles from the first part of the trip and the miles from the second part of the trip.

480 + 40 = 520 miles

ANSWER: The Tuttles traveled a total of 520 miles on their trip.

Index of Multi-Step Subtraction Problems

Eric's Science Fair Rocket

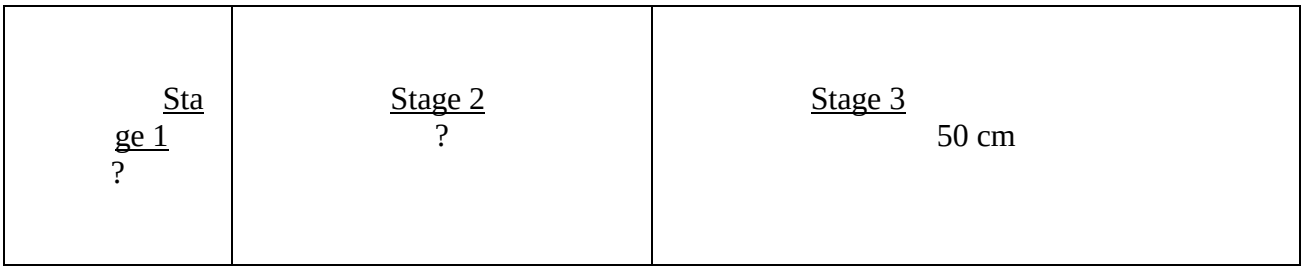
Name _____ Date _____

The Problem

Eric is building a rocket for his science fair project. It is 100 cm long. When he removes the first stage, the rocket is 80 cm long. When he removes the second stage, the last stage is 50 cm long. Which of the 3 stages is the longest?

Eric's Science Fair Rocket (continued)

Solution Strategy: Draw a Picture



|---------- 80 cm----------|

|---------- 100cm----------|

Step 1: We need to determine the length of the first stage. We take the total length of the rocket and subtract the combined length of Stage 2 and Stage 3 (this is given in the problem, 80 cm):

100 – 80 = 20 cm

Step 2: How many stages are left? 2 How long are these stages together (given in the problem)? 80 cm Do we know the length of one of these stages? Yes, we know the length of the final stage – it's given in the problem – 50 cm. Subtract the final stage from the combined length of Stage 2 and Stage 3 to get the length of Stage 2:

80 – 50 = 30 cm

Step 3: Evaluate the information you have just discovered.

Stage 1 = 20 cm
Stage 2 = 30 cm
Stage 3 = 50 cm ←

Stage 3 is the largest. Let's check the answers to make sure they make sense:

20 + 30 + 50 = 100 cm

Which stage is the largest? Stage 3

ANSWER: Stage 3 of Eric's model rocket is the largest stage.

Mrs. Connor's History Test

Name _____ Date _____

The Problem

Mrs. Connor's class got their history test back. Thomas compared his score with Trista's score. His score was 10 points lower than her score. Trista's score was 27 points lower than Tanya's score. Tanya got a 99 on the test. The grading scale for the test was as follows:

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
59 and below	F

What was Thomas's letter grade on the test?

Mrs. Connor's History Test (continued)

Solution Strategy: Work Backwards

When we use a work backwards strategy, we start with the ending piece of information given in the problem. In this problem, we are given that Tanya got a 99 on the test.

99 is Tanya's score.

We are told that Trista's score is 27 points lower than Tanya's score. So we subtract:

99 – 27 = 72 is Trista's score

We are told that Thomas's score is 10 points lower than Trista's score. So we subtract:

72 – 10 = 62 is Thomas's score

Now we look up the scores in the grading scale. Thomas's score of 62 is a D.

ANSWER: Thomas got a D on the test.

Dismissal to Lunch Room

Name _____ Date _____

The Problem

A class of 25 students is divided up into 5 teams with 5 students in each team. The class is dismissed by teams to go to the lunch room. The first team is dismissed and then the remaining teams go every 5 minutes after that. How long does it take for the entire class to be dismissed?

Dismissal to Lunch Room (continued)

Solution Strategy: Make a Chart

Let's make a chart that shows what happens each time a group of students is dismissed. Notice that we don't start counting the elapsed time until ***the second group*** of students is dismissed.

Number of Students Still in the Classroom	Number of Students Dismissed	Number Model	Elapsed Time
25	5	25 –5 = 20	--
20	5	20 – 5 = 15	5 min.
15	5	15 – 5 = 10	10 min.
10	5	10 – 5 = 5	15 min.
5	5	5 – 5 = 0	20 min.
0	---	---	---

Solution Strategy: Find a Pattern

Notice that there is a pattern after the first group goes to lunch — counting by 5s — which indicates the elapsed time before the next group is dismissed.

Action	Group 1 is Dismissed	Group 2 is Dismissed	Group 3 is Dismissed	Group 4 is Dismissed	Group 5 is Dismissed
Elapsed Time	0	5	10	15	20

ANSWER: It takes 20 minutes for the entire class to be dismissed.

Meeting of Doctors

Name _____ Date _____

The Problem

There were 55 doctors at the hospital staff meeting. As soon as the meeting was over, 5 doctors left the room. After 5 minutes, 2 more doctors left the room. Every 5 minutes after that, the number of doctors leaving the room was 2 more than the last group that left the room. How many doctors were remaining in the room after 30 minutes?

Meeting of Doctors (continued)

Solution Strategy: Make a Table

Let's make a table that shows elapsed time and the number of doctors in the room after each 5-minute interval.

Elapsed Time	Number of Doctors in the Room	Number of Doctors Leaving the Room	Number of Doctors Remaining in the Room
0	55	5	55 –5 = **50**
5 min	50	2	50 – 2 = **48**
10 min	48	4	48 – 4 = **44**
15 min	46	6	44 – 6 = **38**
20 min	44	8	38 – 8 = **30**
25 min	42	10	30 – 10 = **20**
30 min	40	12	20 – 12 = **8**

Solution Strategy: Look For a Pattern

We start with 55 doctors in the room. We know we need to start counting backwards from 50 since 5 doctors leave the room right away. After that, we can see a pattern. We need to subtract consecutive multiples of 2 each time, i.e. 2, 4, 6, 8, 10, 12. How do we know to stop at 12? We are told to find the total after 30 minutes, and we are talking about 5-minute intervals. There are 6 five-minute intervals in 30 minutes, therefore we take the first 6 multiples of 2. Our number model will look like this:

$50 - 2 - 4 - 6 - 8 - 10 - 12 =$ 8 doctors

ANSWER: There were 8 doctors remaining in the room.

76 What Number Am I?

Name _____ Date _____

The Problem

I am a number between 1 and 100. I am an even number and when you subtract me from 100 and then subtract 10, I am equal to 76. What number am I?

76 What Number Am I? (continued)

Solution Strategy: Guess and Check

Let's choose an even number between 1 and 100 to start checking. Let's try something in the middle like **50**:

100 – **50** = 50
50 – 10 = 40

No. We're looking for 76. Our original number needs to be smaller so that when it is subtracted from 100, we get a larger number.

Let's try **20**. It's even and it's smaller.

100 – **20** = 80
80 – 10 = 70

No. That's still not it, but it is much closer. We need a number even smaller than 20. Let's try **10**. It's even and it's smaller.

100 – **10** = 90
90 – 10 = 80

No. 10 was too small. Let's try something in between 10 and 20. Let's try **14.**

100 – **14** = 86
86 – 10 = 76

That's it!

ANSWER: The number is 14.

Set for School Play

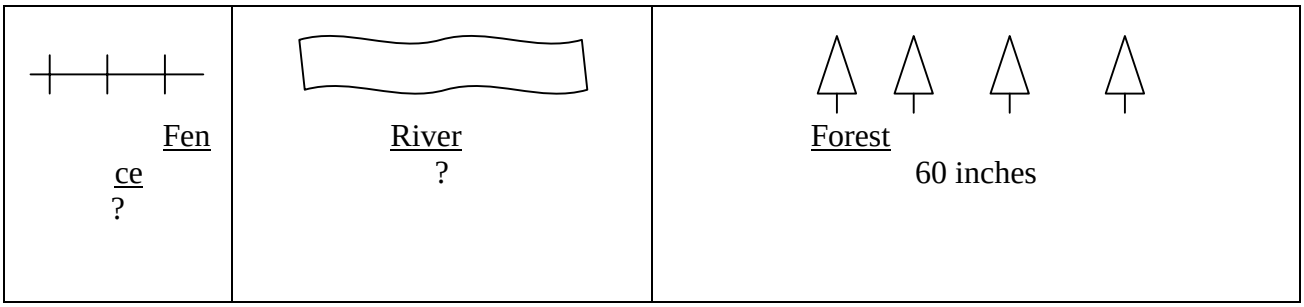
Name _____ Date _____

The Problem

The stage crew for the school play is building a set for a scene that takes place in the forest, by a river, next to a fence. The entire length of the set needs to be 120 inches. The portion of the set that is the forest needs to be 60 inches long. The forest and the river together need to measure 85 inches long. The stage manager wants the crew to mark off the length of each section so the artists know where to draw the fence, the river, and the forest. How long is each section of the set?

Set for School Play (continued)

Solution Strategy: Draw a Picture



|---------- 85 inches ----------|

|---------- 120 inches----------|

Step 1: We are told that the river and the forest have a combined length of 85 inches. We are given the length of the forest, so all we need to do is subtract that number from 85 to get the length of the river.

85 – 60 = 25 inches

Step 2: We are told that the length of the entire set is 120 inches. We already know that the combined length of the river and forest is 85 inches, so all we need to do is subtract that from the total in order to find the length of the fence.

120 – 85 = 35 inches

Step 3: Now we evaluate the information we have found.

Fence = 35 inches
River = 25 inches
Forest = 60 inches

Step 4: Let's check our answers to be sure that they add up.

35 + 25 + 60 = 120 inches

That's it! They add up.

ANSWER: The sections of the set for the school play need to be the following lengths: the fence needs to be 35 inches, the river needs to be 25 inches, and the forest needs to be 60 inches.

Jillian's Math Test

Name _____ Date _____

The Problem

Jillian got her math test back. She had 10 points less than Joey. Joey's score was lower than Terri's score but 1 point more than Tommy's score. Terri's score was the highest in the class and it was 2 more than Tommy's. Terri got a 95. What was Jillian's score and letter grade? Use the chart below to determine the letter grade.

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
59 and below	F

Jillian's Math Test (continued)

Solution Strategy: Work Backwards

When we use a work backwards strategy, we start with the ending piece of information given in the problem. In this problem, we are given that Terri got a 95 on the test.

95 is Terri's score.

Moving backwards through the problem, we see that Terri's score is 2 more than Tommy's score, so we subtract 2 from 95 to get Tommy's score.

95 – 2 = 93 is Tommy's score.

Continuing backwards through the problem, we are told that Joey's score is lower than Terri's score but 1 more than Tommy's score. We add 1 to Tommy's score to get Joey's score.

93 + 1 = 94 is Joey's score.

We are told that Joey's score is lower than Terri's score so we check to see if that's true. It is true. Terri's score is one more than Joey's. Continuing backwards through the problem, we are told that Jillian had 10 points less than Joey. So we subtract 10 from Joey's score to get Jillian's score.

94 – 10 = 84 is Jillian's score.

That's it! We are looking for Jillian's score. We have determined that it is 84. We look in the chart and see that an 84 is a B.

Now, let's go "forward" through the problem to check our answer. If Jillian's score is 84, we are told that's 10 less than Joey's score, so Joey's score is 94 (84 + 10). Joey's score is 1 more than Tommy's score, so Tommy's score is 93 (94 – 1), and Terri's score is 2 more than Tommy's score, so Terri's score is 95 (93 + 2). That's it! Our answer checks out.

ANSWER: Jillian got a B on the test with a score of 84 points.

Dismissal to Vision & Hearing Test

Name _____ Date _____

The Problem

There are 20 students in Mrs. Adam's class, and they are going to be dismissed from class one at a time to go for a vision and hearing test. The test takes approximately 3 minutes per student and the next student is dismissed as soon as the last student returns. How many students will have been tested after 30 minutes?

Dismissal to Vision & Hearing Test (continued)

Solution Strategy: Make a Chart

Let's make a chart that counts backwards from 30 minutes. This way, when we get to 0, we will be able to easily look up the number of students who have been tested.

Student Being Dismissed for Vision/Hearing Test	Subtract the Testing Time (3 minutes per student)	Time Left until 30-Minute Mark
Student 1	30 minutes – 3 minutes	27 minutes
Student 2	27 minutes – 3 minutes	24 minutes
Student 3	24 minutes – 3 minutes	21 minutes
Student 4	21 minutes – 3 minutes	18 minutes
Student 5	18 minutes – 3 minutes	16 minutes
Student 6	16 minutes – 3 minutes	13 minutes
Student 7	13 minutes – 3 minutes	10 minutes
Student 8	10 minutes – 3 minutes	7 minutes
Student 9	7 minutes – 3 minutes	4 minutes
Student 10	4 minutes – 3 minutes	1 minute
Student 11	That's it!	

Using our chart, we have discovered that after 30 minutes, 10 students have been dismissed and tested and the 11^{th} is currently being tested.

Solution Strategy: Find a Pattern

We know that it takes 3 minutes to test each student. We can use a pattern of counting by 3s to get to the 30-minute mark.

STUDENT	**ELAPSED TIME**
Student 1	3 minutes
Student 2	6 minutes
Student 3	9 minutes
Student 4	12 minutes
Student 5	15 minutes
Student 6	18 minutes
Student 7	21 minutes
Student 8	24 minutes
Student 9	27 minutes
Student 10	30 minutes

ANSWER: After 30 minutes, 10 students have completed the vision and hearing test.

Student Council Meeting

Name _____ Date _____

The Problem

There were 24 student representatives at the student council meeting, plus the 4 officers of the student council. The meeting started right after school (3:30) and was to go until 5:00. Five of the students had to leave at 4:00 to go to soccer practice. After that, 3 students left every 10 minutes until the end of the meeting. How many students were still remaining at the meeting at 5:00?

Student Council Meeting (continued)

Solution Strategy: Make a Table

Let's make a table that shows the number of students at the meeting at various times.

Time	Number of Students at the Meeting	Number of Students Leaving the Room	New Number of Students at the Meeting
3:30	24 + 4 = 28	0	28
4:00	28	28 – 5 = 23	23
4:10	23	23 – 3 = 20	20
4:20	20	20 – 3 = 17	17
4:30	17	17 – 3 = 14	14
4:40	14	14 – 3 = 11	11
4:50	11	11 – 3 = 8	8
5:00	8		

We see that there were 8 students remaining at the meeting at 5:00.

Solution Strategy: Look For a Pattern

We see that we are counting backward by 3s after we subtract the initial 5 students from our total of 28. So, we start at 23 (28 – 5). We know that there are 6 ten-minute intervals between 4:00 and 5:00 (10 minutes * 6 = 60 minutes = 1 hour). So, let's count backward by 3s, starting at 23, 6 times:

23, 20, 17, 14, 11, **8**

ANSWER: There were 8 students remaining at the meeting at 5:00.

6 What Number Am I?

Name _____ Date _____

The Problem

I am an even number between 2 and 50. When you take ½ of me and then subtract 14, you get 6. What number am I?

6 What Number Am I? (continued)

Solution Strategy: Guess and Check

Let's choose an even number between 2 and 50 to start checking. Let's try something in the middle like **24**:

½ of **24** is 12.
12 – 14 = □ 2

That's not it. We are looking for 6. Let's try something a little bigger.
Let's try **30**. It's even and it's a little bit bigger.

½ of **30** is 15.
15 – 14 = 1

That's not it. We are looking for 6. Our guess is still too small. Let's try **40**.

½ of **40** is 20.
20 – 14 = 6

That's it!

ANSWER: The number is 40.