Multiplication and Division: Prime Factors

Aim: Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers. **Ready-to-Progress Criteria:** Find factors and multiples of positive whole numbers, including common factors and common multiples, and express a given number as a product of 2 or 3 factors. (5MD-2) To find prime factors of 2-digit numbers.	**Success Criteria:** I can find factors of 2-digit numbers. I can recognise prime numbers. I can write a calculation to match my drawing.	**Resources:** Lesson Pack Multiplication Square
	Key/New Words: Prime, composite, factors, prime factors, product, calculation, factor tree.	**Preparation:** Differentiated Prime Factors Activity Sheets – one per child Diving into Mastery Activity Sheets – as required

Prior Learning: It would be helpful if the children could recap how to find factors of two-digit numbers. You can revise prior learning on factors here.

Learning Sequence

	**Remember It:** Using the corresponding slide on the Lesson Presentation, the children will revise prior learning on factors by finding all possible factor pairs for a selection of two-digit numbers. Children will further be challenged to consider how they can prove that they have found all possible outcomes. The second slide will reveal the answers which will allow children to check their findings and will provide the teacher with an opportunity to assess the children's knowledge. Can the children organise their findings in a systematic fashion? Can the children use knowledge of multiplication and dividing to find factor pairs?	
	**Prime Factors:** Using the corresponding slide of the Lesson Presentation, the children will explore why certain factors have been highlighted. They will consider why certain factors are special and it will be introduced that these are 'prime factors'. Children will recap the fact that prime numbers have only two factors. Can the children consider how the highlighted factors are different to the other numbers? Can the children apply the prior knowledge that prime numbers have two factors?	
	**Factor Trees:** Using the corresponding slide of the Lesson Presentation, the children will be presented with a factor tree and will discuss how they think it has been created. There is an opportunity here to talk about the exact way in which a factor tree is drawn. Children will then have an opportunity, with a partner, to complete partially drawn factor trees before engaging in the challenge of creating their own. For children working towards the expected level, it may be beneficial for them to have access to a multiplication square to assist their thinking. Can the children recall factor pairs for the main number in the factor tree? Can the children spot prime factors by applying their knowledge of prime numbers?	
	**Prime Numbers Multiply to Make a Product:** To extend learning further, the children will be shown how a calculation can be created by taking the prime numbers from the factor tree. They will be shown how this creates a calculation to show the product. The children will have an opportunity to explore the missing numbers that need to go in the calculation on the screen. Can the children see the connection between the numbers in the factor tree and the numbers that go in the written calculation?	
	**Find Prime Factors:** The children work independently to complete the differentiated Prime Factors Activity Sheets.  Children working towards expected level will complete an activity where they spot prime numbers within completed factor trees. They can then be challenged by completing partially drawn factor trees.  Children working at expected level will consolidate their understanding by completing partially drawn factor trees and writing the corresponding calculation. The children will then be challenged by creating their own factor trees before answering a reasoning question to deepen their understanding.  Children working at greater depth will be exploring how factor trees can be created in more than one way. They will further spot errors in a completed factor tree and will problem solve by finding out if 26 or 42 has the most prime factors.	

Diving into Mastery: Schools using a mastery approach may prefer to use the following as an alternative activity. These sheets might not necessarily be used in a linear way. Some children might begin at the 'Deeper' section and in fact, others may 'dive straight in' to the 'Deepest' section if they have already mastered the skill and are applying this to show their depth of understanding.

Children complete fluency related to recalling prime factors and write calculations to show numbers as products of their prime factors.

Children will answer reasoning questions related to prime factors. They will explain if they agree or disagree with statements and will need to prove their answers.

Children work individually or collaboratively on problem-solving questions related to finding unknown values and detecting numbers based on short statements.

Reasoning: Using the corresponding slide of the Lesson Presentation, the children will consider if the statement is always true, sometimes true or never true. Can the children use evidence from their learning to give reasons for their answer? Can the children articulate themselves clearly using key maths vocabulary?

Exploreit

Reviseit: Using this resource, children could recap their prior knowledge on Factor Pairs.

Buildit: Children can create a human factor tree to further find out about prime factors.

Learnit: Children will find this visually exciting Knowledge Organiser a useful tool to support their understanding of prime factors.

Disclaimer

We hope you find the information on our website and resources useful.

Animations

This resource has been designed with animations to make it as fun and engaging as possible. To view the content in the correct formatting, please view the PowerPoint in 'slide show mode'. This takes you from desktop to presentation mode. If you view the slides out of 'slide show mode', you may find that some of the text and images overlap each other and/or are difficult to read.

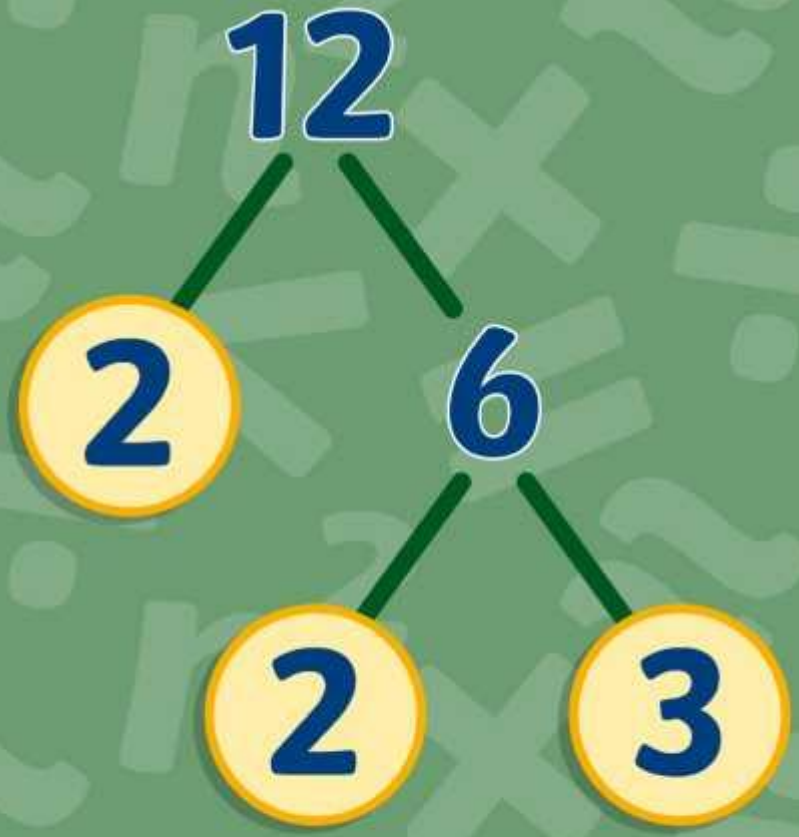
To enter slide show mode, go to the **slide show menu tab** and select either **from beginning or from current slide**.

You may wish to delete this slide before beginning the presentation.

Maths

Multiplication and Division

Prime Factors



Aim

- To find prime factors of 2-digit numbers.

Success Criteria

- I can find factors of 2-digit numbers.
- I can recognise prime numbers.
- I can write a calculation to match my drawing.

Remember It

List all the factors that you can find for the numbers below.

24	14	48	33

How could you organise your findings so that you can be certain that you have found all the possible factors?

Remember It

Click to reveal the factors.

24	14	48	33
		6 × 8	

Next

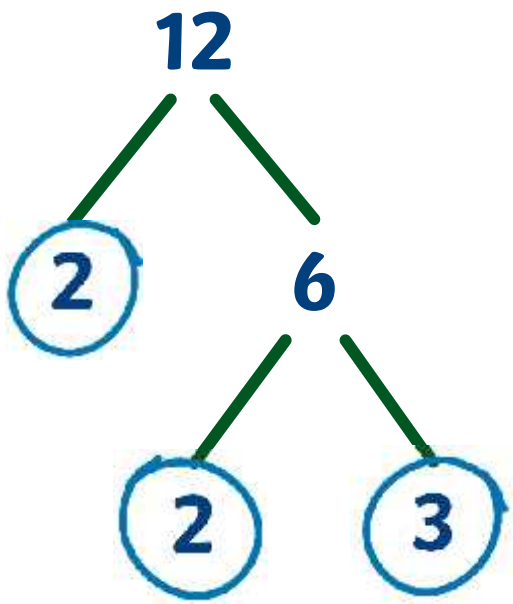
Remember It

24	14	48	33
1 × 24	1 × 14	1 × 48	1 × 33
2 × 12	2 × 7	2 × 24	3 × 11
3 × 8		3 × 16	
4 × 6		4 × 12	
		6 × 8	

They are called prime factors because:

- They are prime numbers.
- This means they are numbers which have only ctors (1 and themselves).

Factor Trees



Jenny likes to use a factor tree to spot prime factors of a number. Can you work out what she has done?

Discuss:

Which type of numbers has she created branches from?

She has created branches from the composite numbers.

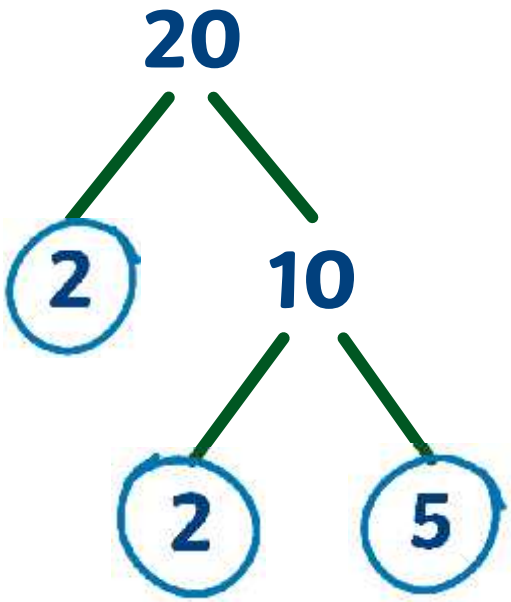
Why has she circled certain factors?

She has circled these factors because they are prime factors.

Why has she not created branches from the numbers 2 and 3?

She has not created branches from 2 and 3 because they are prime factors.

Factor Trees



Jenny made another factor tree, this time for 20.

Discuss:

Which type of numbers has she created branches from?

She has created branches from the composite numbers.

Why has she circled certain factors?

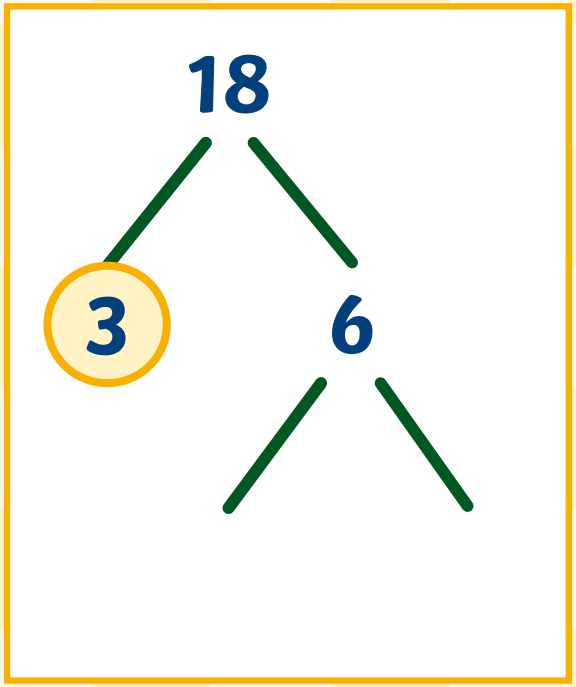
She has circled these factors because they are prime factors.

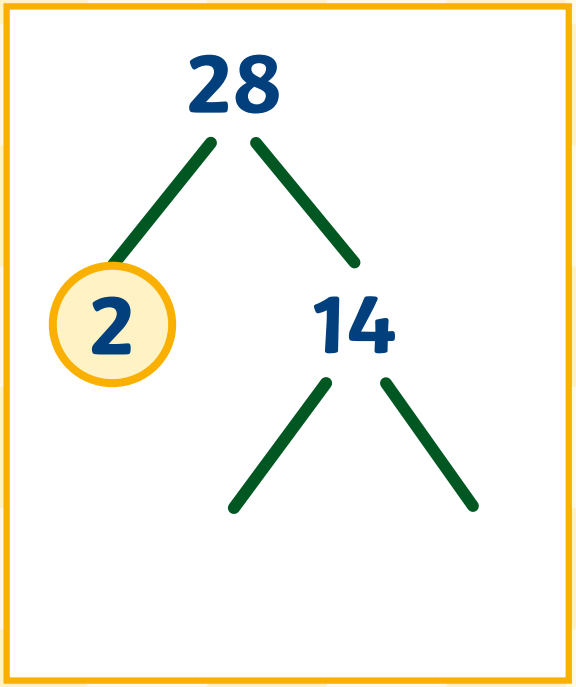
Why has she not created branches from the numbers 2 and 5?

She has not created branches from 2 and 5 because they are prime factors.

Factor Trees

Complete the factor trees with a partner. Can you spot the prime factors? Make sure you circle them!





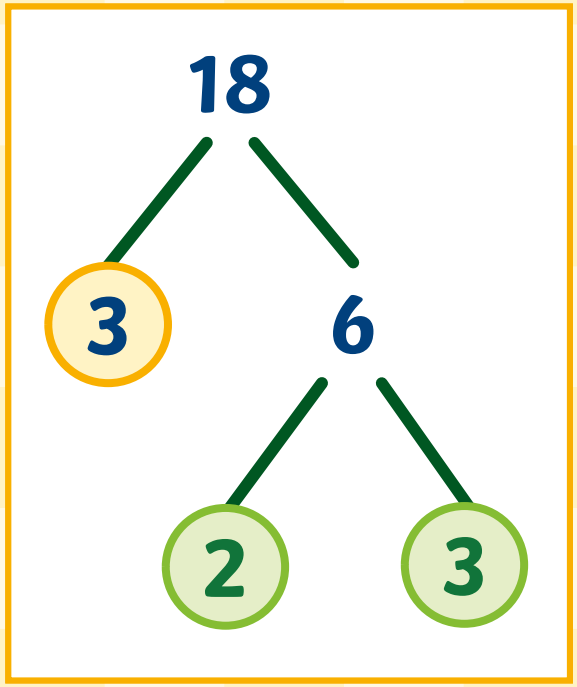
Remember to:
Only create branches from composite numbers.
Circle numbers which are prime factors.

Feeling confident? Have a go at creating your own factor trees for the following numbers.

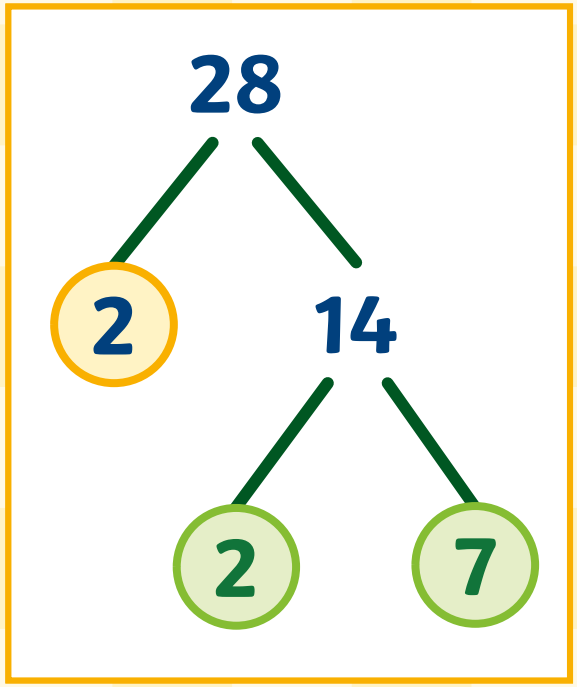
32 44 54 68

Factor Trees

Check your answers!



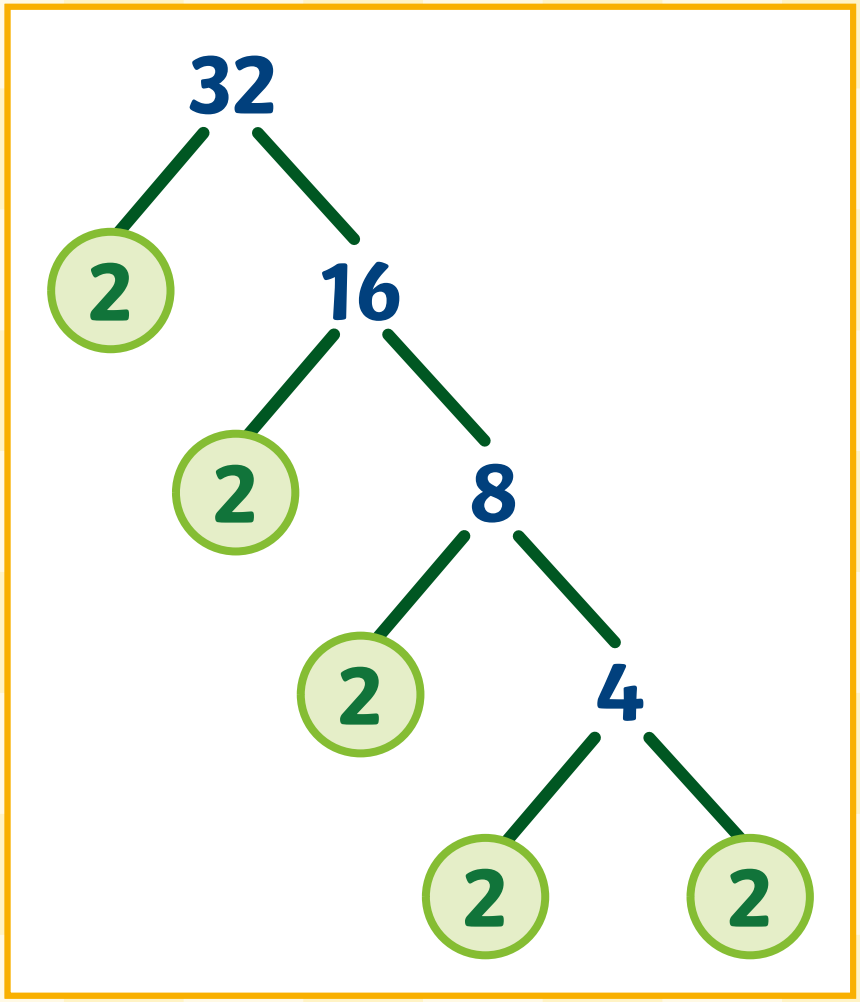
2 and **3** are prime factors of **18**.

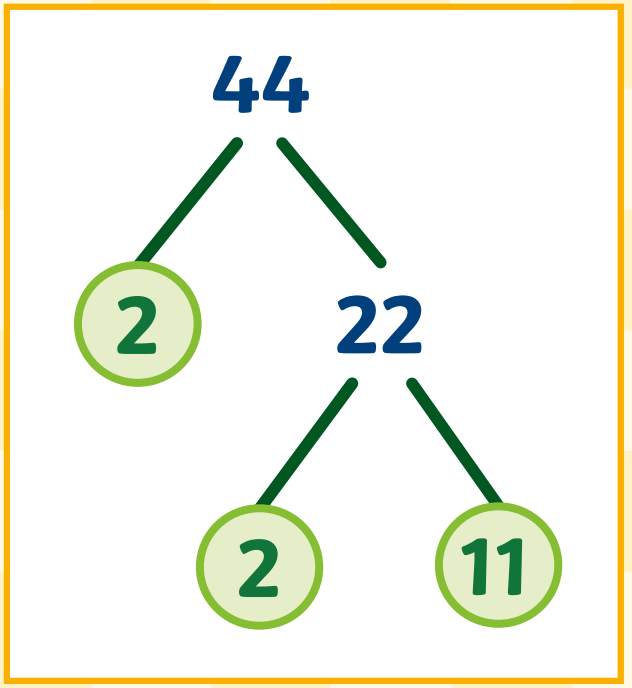


2 and **7** are prime factors of **28**.

Factor Trees

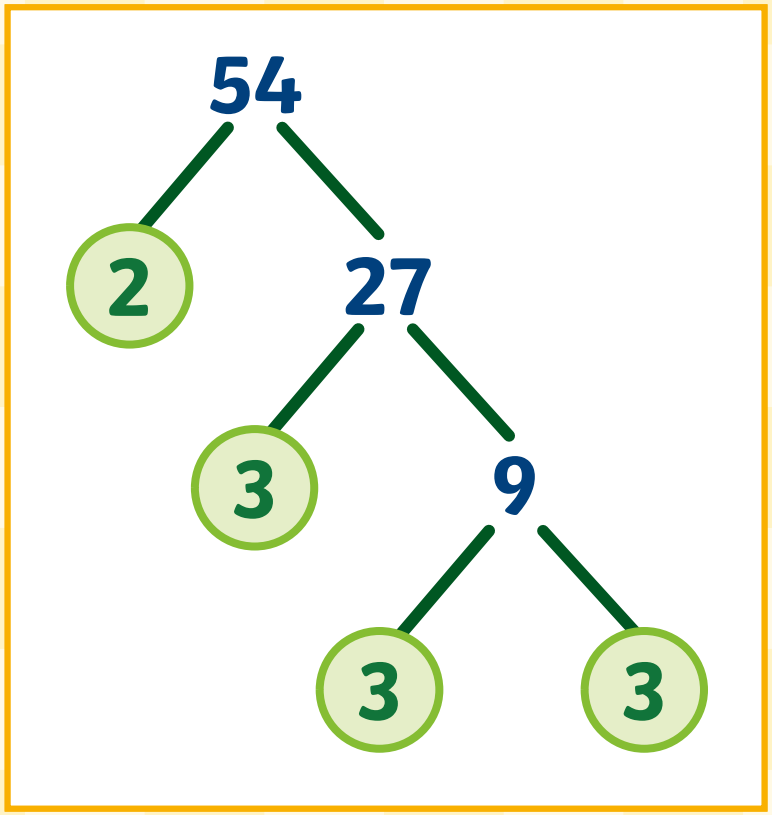
Check your answers!

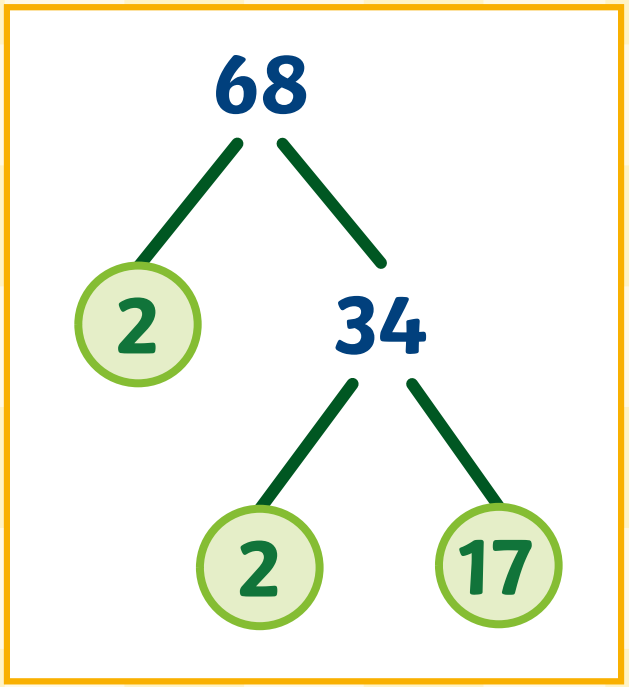




Factor Trees

Check your answers!

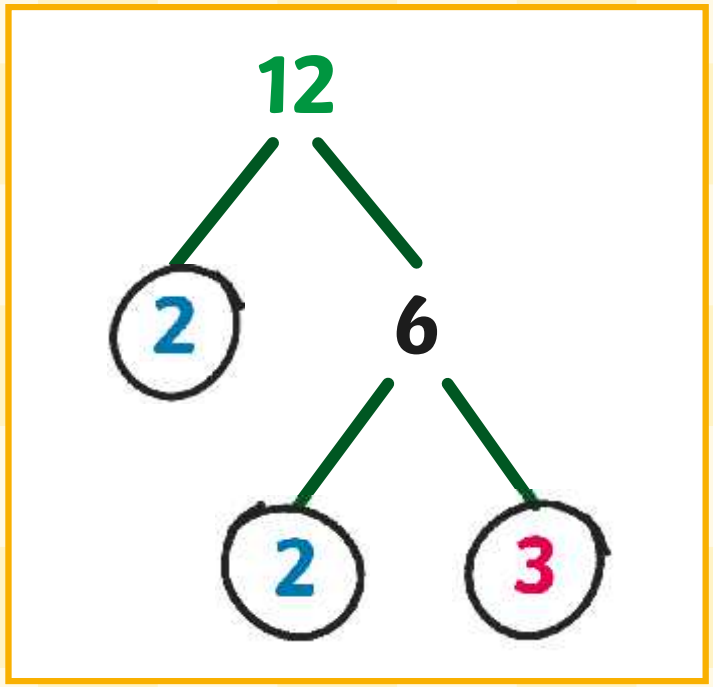




Prime Factors Multiply to Make a Product

Let's go back to Jenny's factor tree.

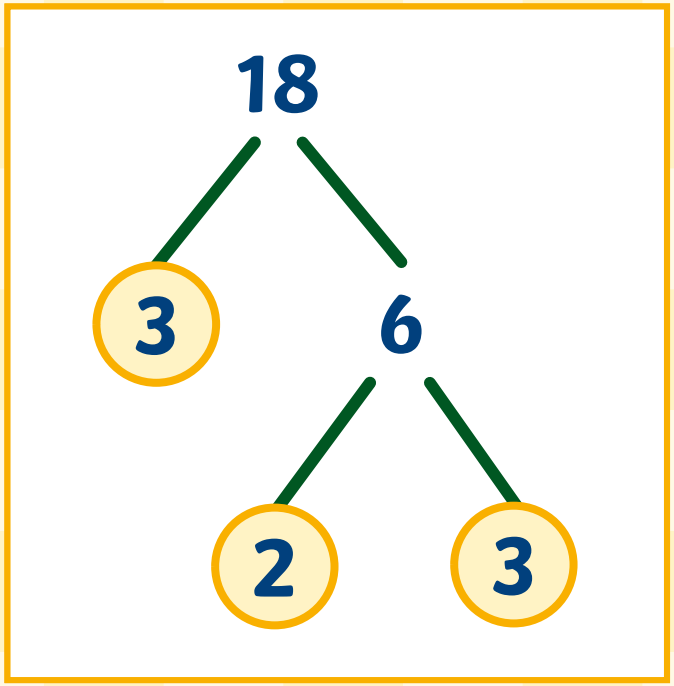
After I have created a factor tree, I can write a calculation to show how the prime numbers are multiplied to create the product.

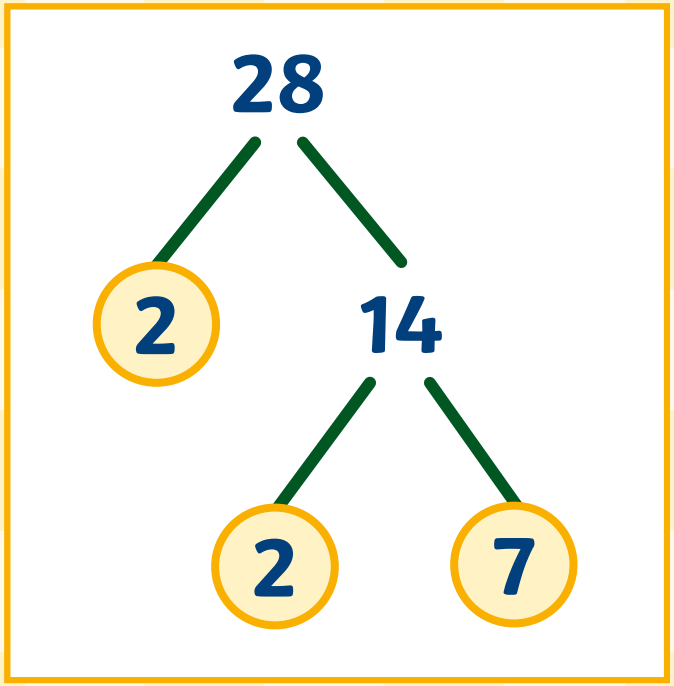


$$2 \times 2 \times 3 = 12$$

Prime Factors Multiply to Make a Product

Can you write the calculations for the factor trees below?
Discuss your calculation with a partner.

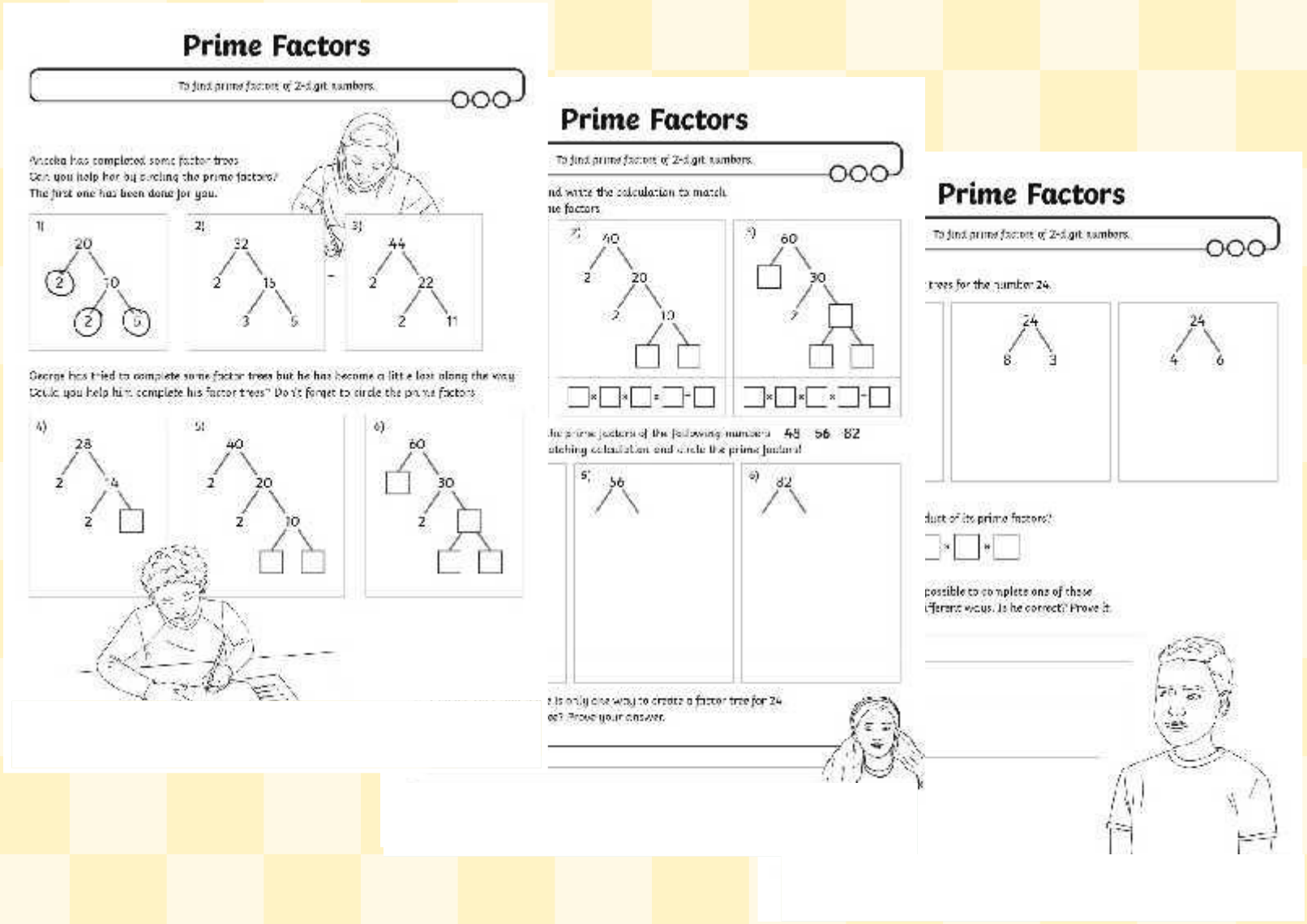




$3 \times 2 \times 3 = 18$

$2 \times 2 \times 7 = 28$

Find Prime Factors



Prime Factors

To find prime factors of 2-digit numbers

Anneka has completed some factor trees
Can you help her by circling the prime factors?
The first one has been done for you.

1) 20 → 2, 10 → 2, 5

2) 32 → 2, 16 → 2, 8 → 2, 4 → 2, 2

3) 44 → 2, 22 → 2, 11

George has tried to complete some factor trees but he has become a little lost along the way.
Could you help him complete his factor trees? Don't forget to circle the prime factors.

4) 28 → 2, 14 → 2, 7

5) 40 → 2, 20 → 2, 10 → 2, 5

6) 60 → 30 → 2, 15 → 3, 5

Prime Factors

To find prime factors of 2-digit numbers

nd write the calculation to match
ne factors

7) 40 → 2, 20 → 2, 10 → 2, 5

8) 60 → 30 → 2, 15 → 3, 5

he prime factors of the following numbers: 49 56 82
atching calculation and circle the prime factors!

9) 56 → 2, 28 → 2, 14 → 2, 7

10) 82 → 2, 41

s only one way to create a factor tree for 24
ect? Prove your answer.

Prime Factors

To find prime factors of 2-d.git numbers

trees for the number 24.

24 → 8, 3 → 4, 2, 3

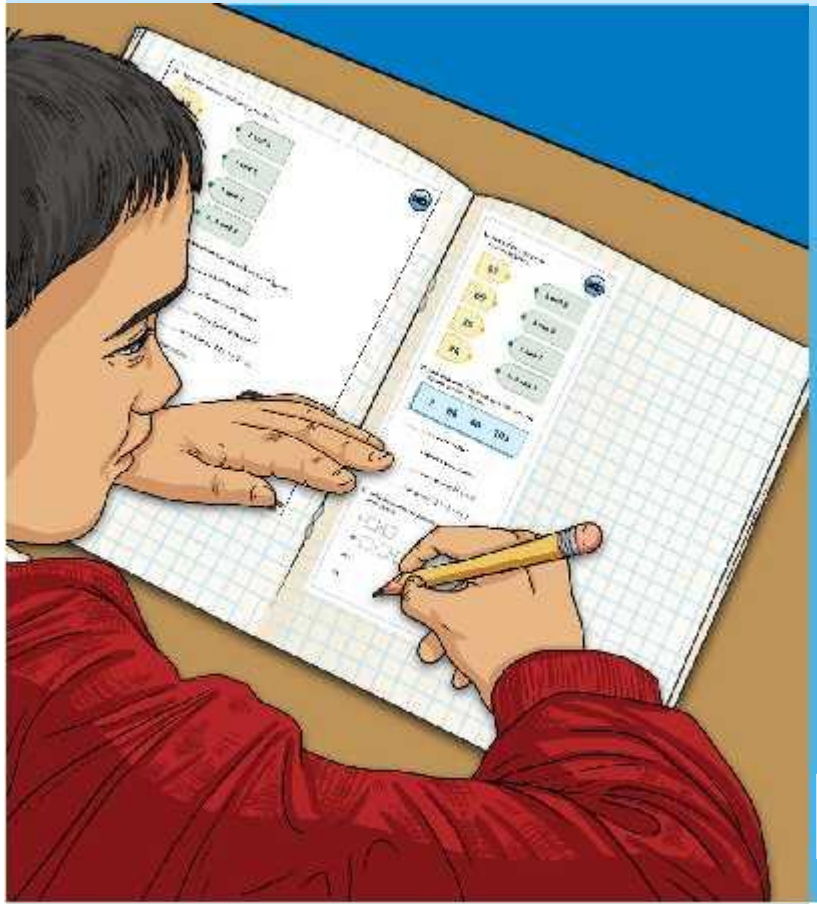
24 → 4, 6 → 2, 2, 3

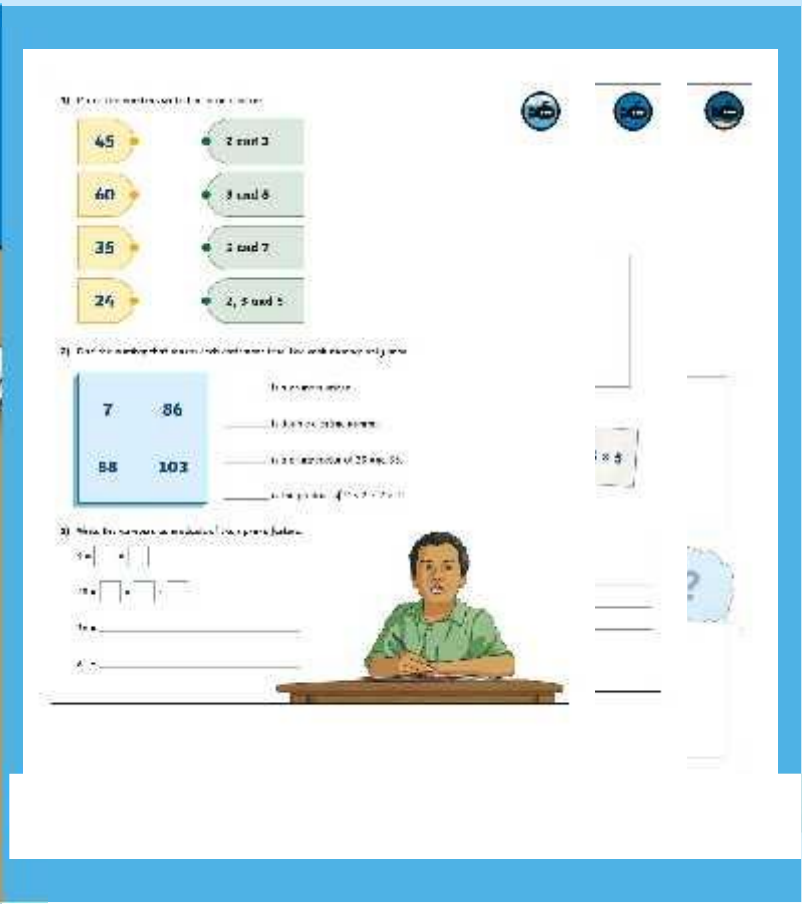
duct of its prime factors?

possible to complete one of these
ifferent ways. Is he correct? Prove it.

Diving into Mastery

Dive in by completing your own activity!





Reasoning

When 2 prime numbers are multiplied, they create a composite number.

Is the above statement: **always true**, **sometimes true** or **never true**?

The above statement is always true.

An example: 2 × 3 = 6

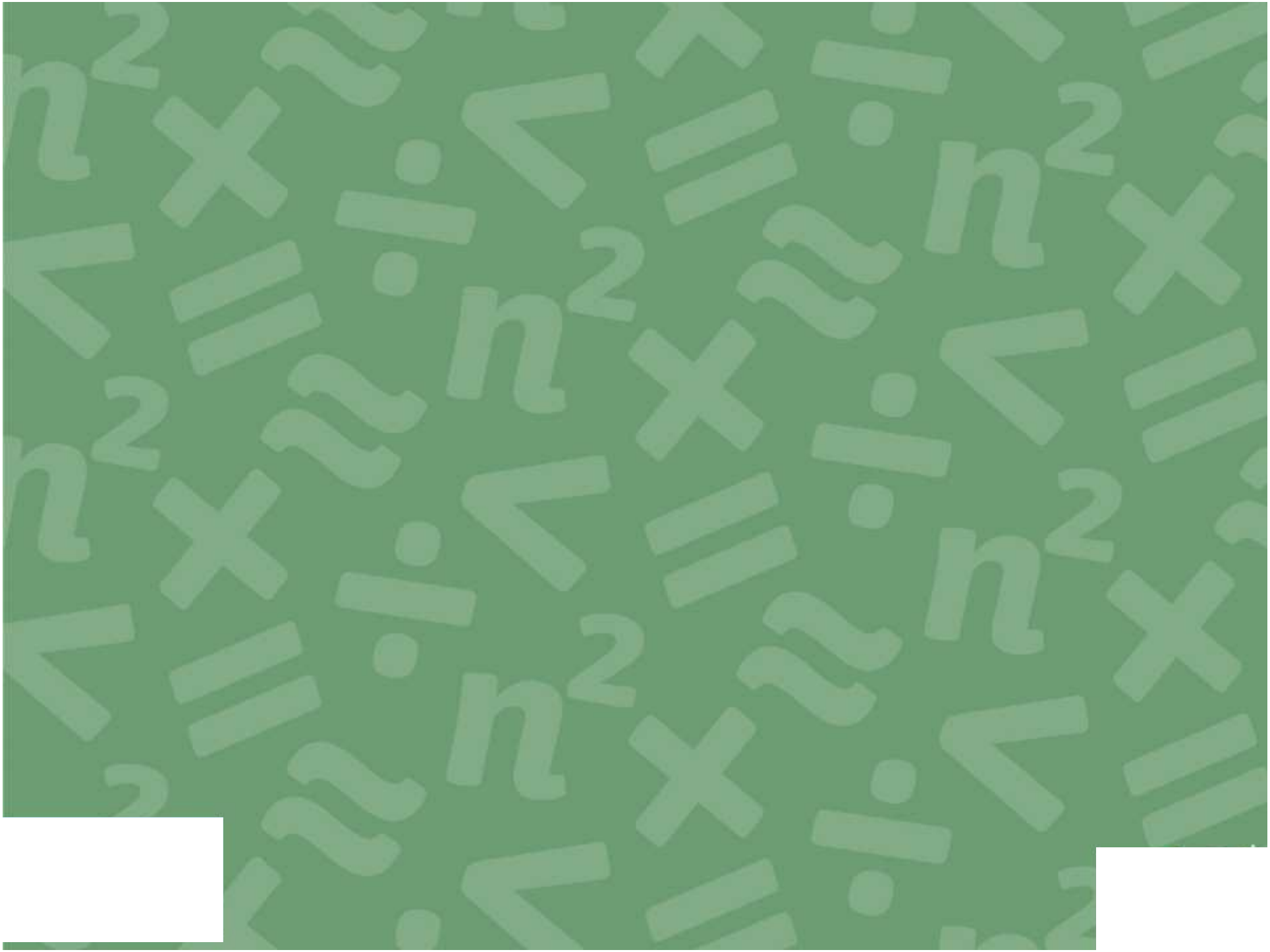
If we multiply two prime numbers, we instantly give the product two factors in addition to 1 and itself. Therefore, it is a composite number.

Aim

- To find prime factors of 2-digit numbers.

Success Criteria

- I can find factors of 2-digit numbers.
- I can recognise prime numbers.
- I can write a calculation to match my drawing.



Aim: To find prime factors of 2-digit numbers.				**Date:**					
				Delivered By:			**Support:**		
Success Criteria	**Me**	**Friend**	**Teacher**	**T**	**PPA**	**S**	**I**	**AL**	**GP**
I can find factors of 2-digit numbers.				**Notes/Evidence**					
I can recognise prime numbers.									
I can write a calculation to match my drawing.									

Next Steps

- _____
- _____

T	Teacher	**I**	Independent
PPA	Planning, Preparation and Assessment	**AL**	Adult Led
S	Supply	**GP**	Guided Practice

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- _____
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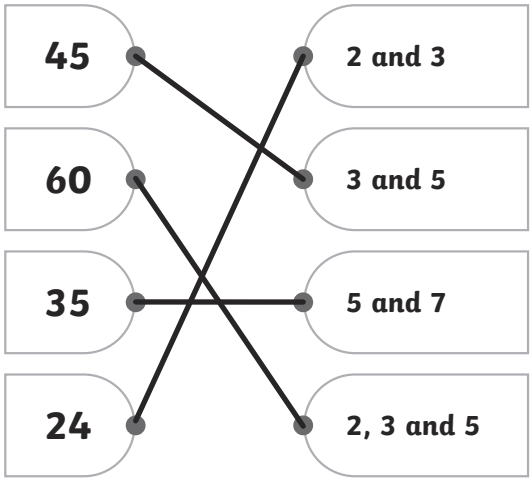
1)



2) **103** is a prime number.

86 is double a prime number.

7 is a prime factor of 28 and 35.

88 is the product of: 2 × 2 × 2 × 11

3) 9 = **3 × 3**

18 = **2 × 3 × 3**

36 = **2 × 2 × 3 × 3**

81 = **3 × 3 × 3 × 3**

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1) **Harry is correct.**
However you create the tree, the prime factors will always be 2 × 2 × 2 × 2 × 3 = 48.
Children should prove this with examples of different factor trees.

2) **The statement is incorrect as 2 × 2 × 2 × 2 × 2 = 32 and the greatest number out of all of the cards is 150 which is the calculation 2 × 3 × 5 × 5.**

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1) **a)** a = **2, 4, 16, 8, 32**
b = **32, 16, 8, 4, 2**

b) 64 = **2 × 2 × 2 × 2 × 2 × 2**

2) **Accept any two of the following:**
48, 54, 72, 96

3) **The answer is 210.**
210 = 2 × 3 × 5 × 7

1) Match the numbers with their prime factors.

45	2 and 3
60	3 and 5
35	5 and 7
24	2, 3 and 5

2) Find the number that makes each statement true. Use each number only once.

7	86
88	103

_____ is a prime number.

_____ is double a prime number.

_____ is a prime factor of 28 and 35.

_____ is the product of 2 × 2 × 2 × 11

3) Write the numbers as products of their prime factors.

9 = ☐ × ☐

18 = ☐ × ☐ × ☐

36 = _____

81 = _____

1) Harry has been creating factor trees to find prime factors.

It doesn't matter how you create the tree for number 48. The prime factors will always be the same.

Prove that Harry is correct.

2) Four numbers have been written on cards as the product of their prime factors.

$2 \times 2 \times 3$

$2 \times 3 \times 5$

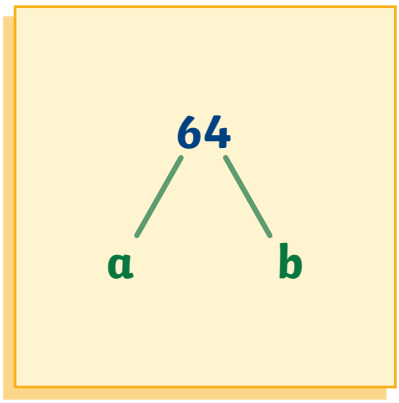
$2 \times 2 \times 2 \times 2 \times 2$

$2 \times 3 \times 5 \times 5$

The greatest number is $2 \times 2 \times 2 \times 2 \times 2$ as that number has the most prime factors.

Do you agree? Explain your answer.

1) a) Which numbers could be the unknown values in the factor tree below?
Write down all the possible outcomes for a and b.



a	b

b) Write 64 as a product of its prime factors.

64 = _____

2) Find two 2-digit numbers greater than 40 that have 2 and 3 as their only prime factors.

3) I am the smallest number possible that has four different prime factors. Can you find me?

1) Match the numbers with their prime factors.

45	2 and 3
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7	86	88	103

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Do you agree?
Explain your answer.

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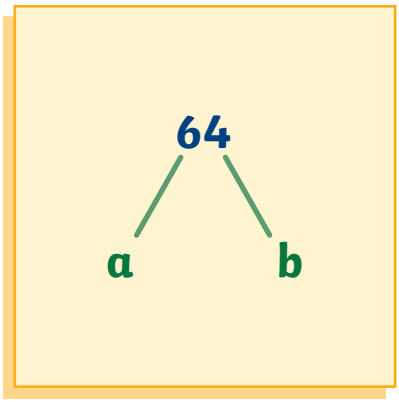

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64 = _____

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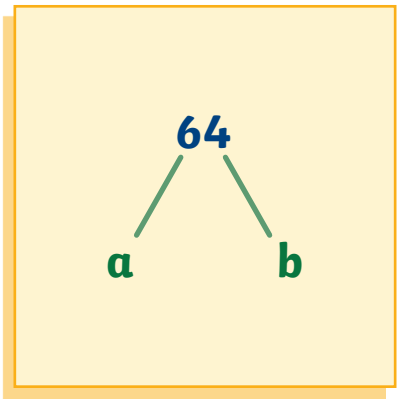

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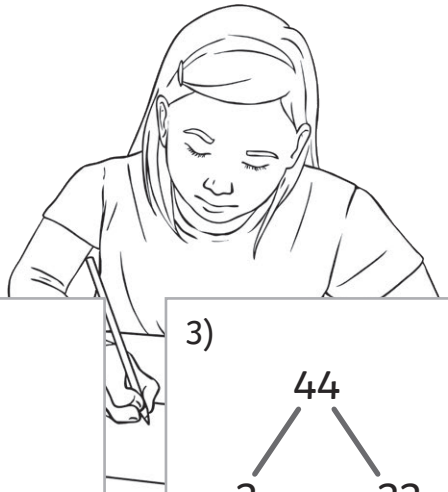
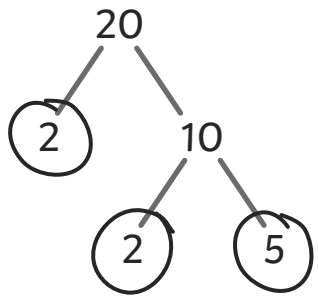
Prime Factors

To find prime factors of 2-digit numbers.

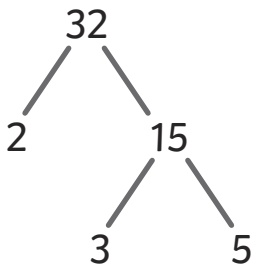


Aneeka has completed some factor trees.
Can you help her by circling the prime factors?
The first one has been done for you.

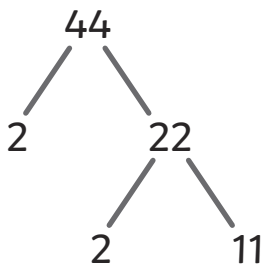
1)



2)

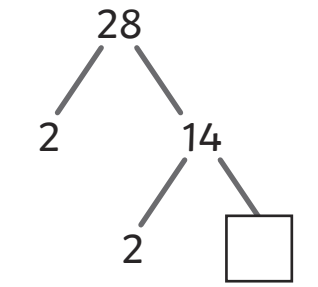


3)

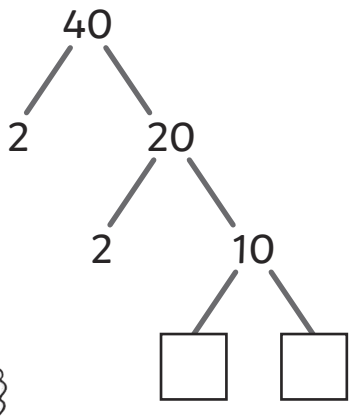


George has tried to complete some factor trees but he has become a little lost along the way.
Could you help him complete his factor trees? Don't forget to circle the prime factors!

4)



5)



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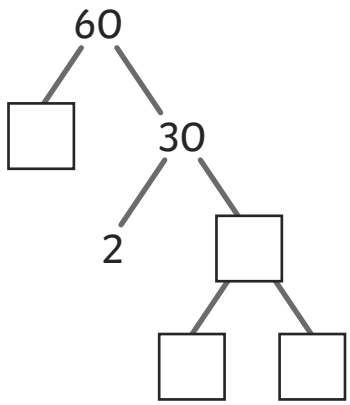
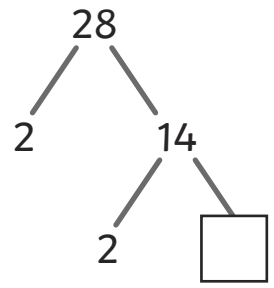


Prime Factors

To find prime factors of 2-digit numbers.

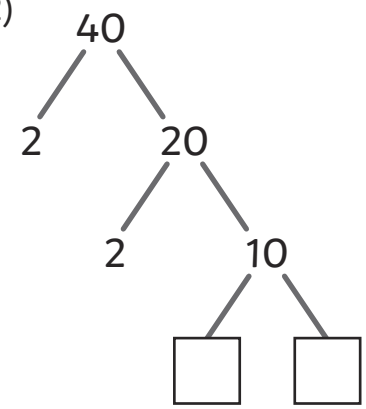
Complete the factor trees and write the calculation to match.
Remember to circle the prime factors.

1)



□ × □ × □ = □

2)



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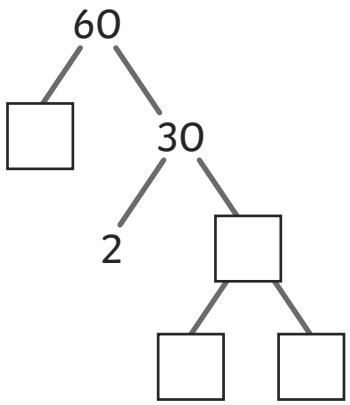
3)

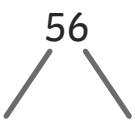


□ × □ × □ × □ = □

Create factor trees to find the prime factors of the following numbers: **48** **56** **84**
Don't forget to write the matching calculation and circle the prime factors!

4)

5)



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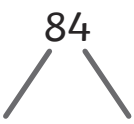
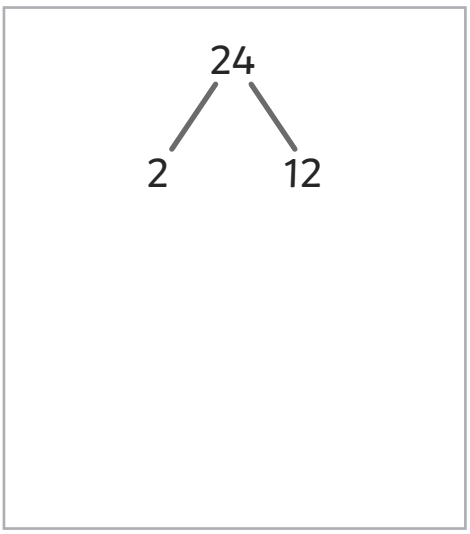


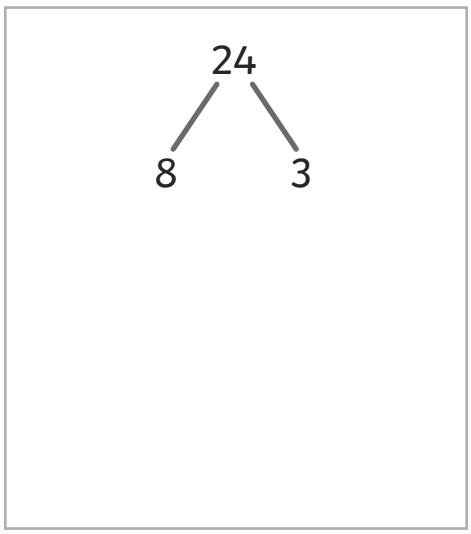
7) Claudia says that there is only one way to create a factor tree for 24.
Do you agree or disagree? Prove your answer.

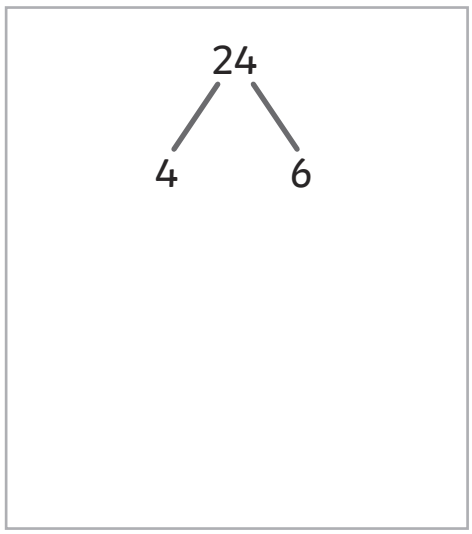
Prime Factors

To find prime factors of 2-digit numbers.

1) a) Complete the factor trees for the number 24.



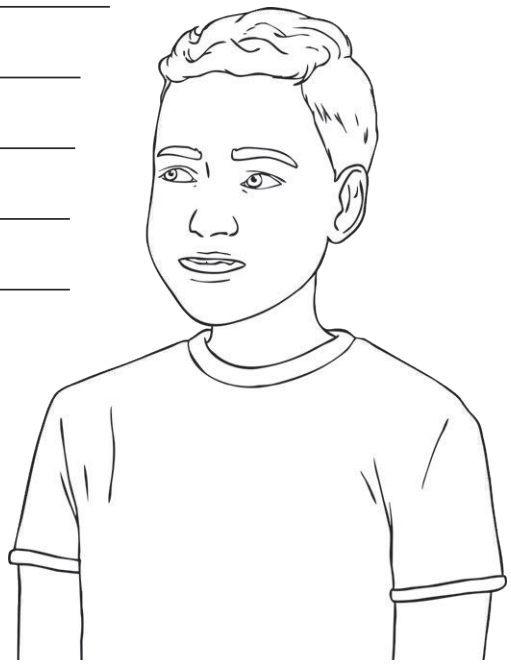




b) What is 24 as a product of its prime factors?

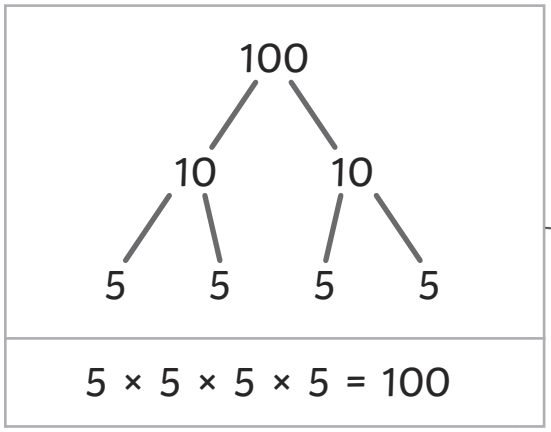
$24 = \square \times \square \times \square \times \square$

c) Isaac says that it is possible to complete one of these factor trees in two different ways. Is he correct? Prove it.



2) Which has more prime factors, 26 or 42? How could you prove it?

3) Abigail has completed a factor tree for the number 100.

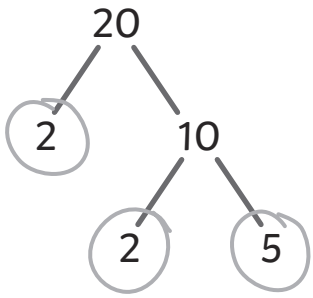


$5 \times 5 \times 5 \times 5 = 100$

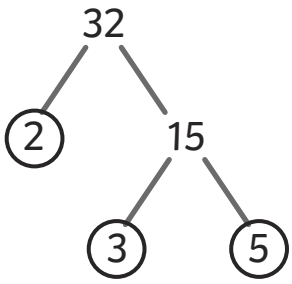
What mistake has she made?

Prime Factors **Answers**

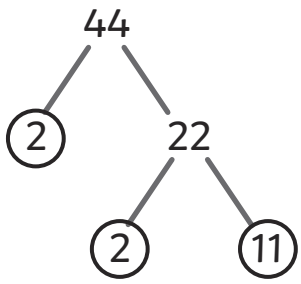
1)



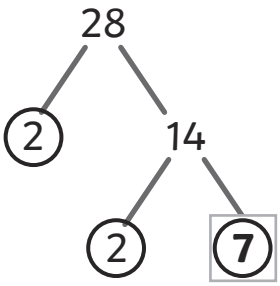
2)



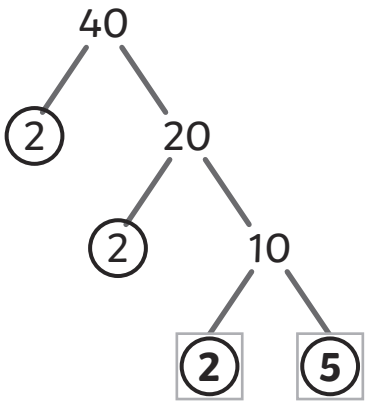
3)



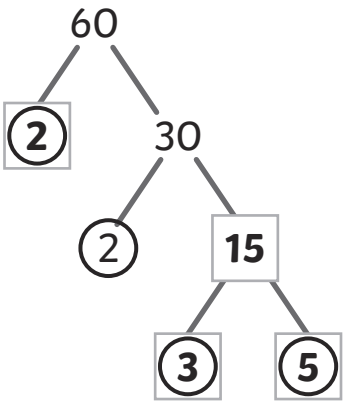
4)



5)

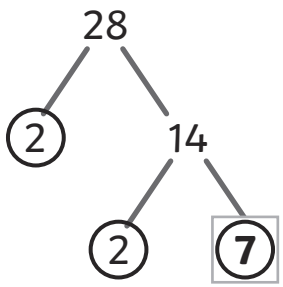


6)



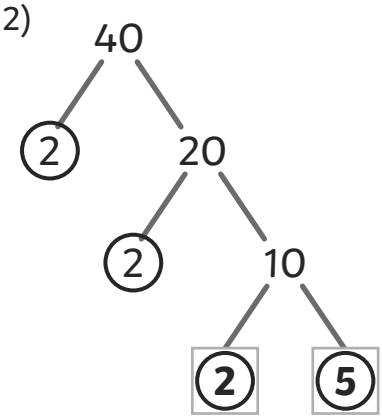
Prime Factors **Answers**

1)



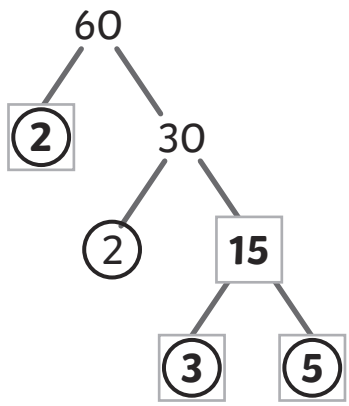
2 × 2 × 7 = 28

2)



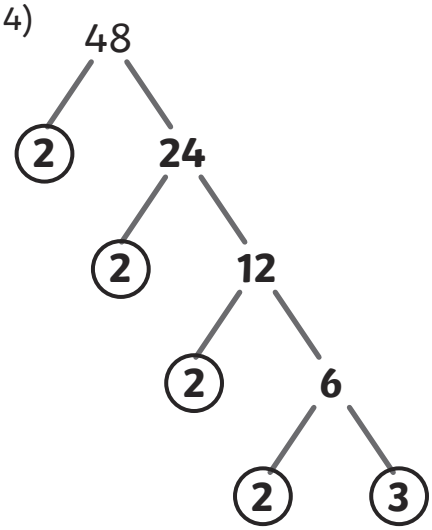
2 × 2 × 2 × 5 = 40

3)



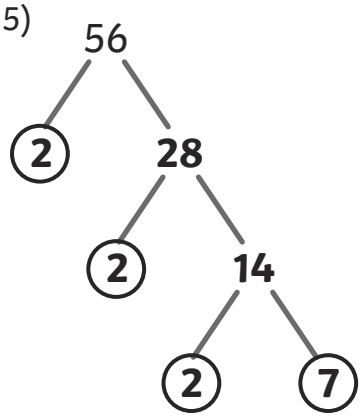
2 × 2 × 3 × 5 = 60

4)



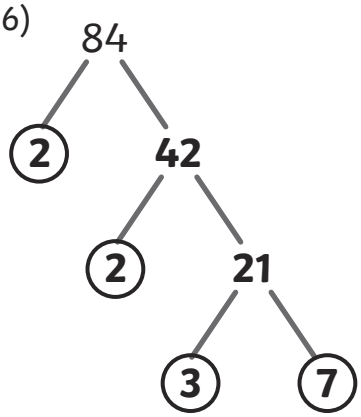
2 × 2 × 2 × 2 × 2 = 48

5)



2 × 2 × 2 × 7 = 56

6)



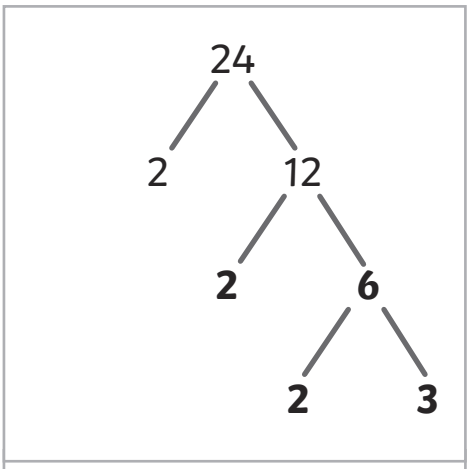
2 × 2 × 3 × 7 = 84

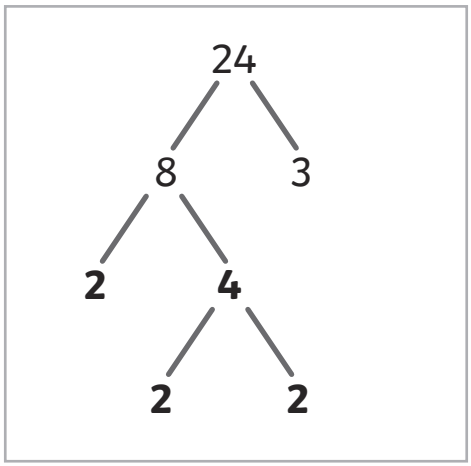
7) Claudia says that there is only one way to create a factor tree for 24.
Do you agree or disagree? Prove your answer.

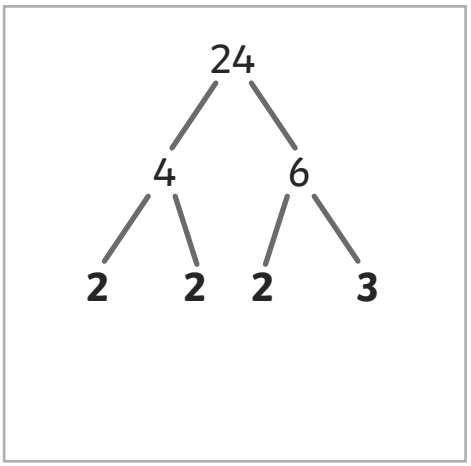
There are three ways. Claudia's first branch could be: 2 and 12, 8 and 3, or 4 and 6.

Prime Factors **Answers**

1) a) Complete the factor trees for the number 24.







Also accept a branch from 12 with factors of 4 and 3, with a branch from 4 showing factors of 2 and 2.

b) What is 24 as a product of its prime factors?

$24 = \boxed{2} \times \boxed{2} \times \boxed{2} \times \boxed{3}$

c) Isaac says that it is possible to complete one of these factor trees in two different ways. Is he correct? Prove it.

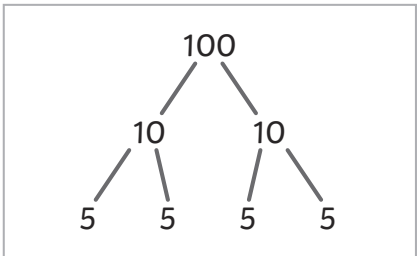
There is more than one way of completing the first tree. You could either create a branch from 12 showing factors of 2 and 6, with a branch from 6 showing factors of 2 and 3; or you could create a branch from 12 showing factors of 4 and 3, with a branch from 4 showing factors of 2 and 2.

2) Which has more prime factors, 26 or 42? How could you prove it?

26 only has 2 and 13 as its prime factors whereas 42 has 2, 3 and 7. Children may prove their answer by drawing a factor tree.

3) Abigail has completed a factor tree for the number 100. What mistake has she made?

Abigail has made a mistake by thinking that 5 × 5 = 10. She probably got confused with adding and multiplying. She has completed her first branches correctly as 10 × 10 = 100. Abigail should have written 2 × 5 for both of her second branches.



5 × 5 × 5 × 5 = 100

Multiplication and Division | Prime Factors

To find prime factors of 2-digit numbers.		
I can find factors of 2-digit numbers.		
I can recognise prime numbers.		
I can write a calculation to match my drawing.		

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