

INTRO TO FACTORS

ANSWERS - PAGE 1

IN THE NEXT FEW PAGES WE ARE GOING TO TALK ABOUT FACTORS.

THERE'S ACTUALLY TWO WAYS TO LOOK AT FACTORS. ONE INVOLVES DIVISION AND THE OTHER MULTIPLICATION.

DON'T FORGET, MULTIPLICATION AND DIVISION ARE RELATED. THEY ARE OPPOSITES OF EACH OTHER, BUT THEY ARE A FAMILY.

WHAT MAX IS TRYING TO SAY IS IF YOU TAKE THREE NUMBERS LIKE: 2, 3, AND 6, YOU CAN MAKE A MULTIPLICATION AND DIVISION FAMILY.

I GET IT. $2 \times 3 = 6$, BUT IF YOU CHANGE THE ORDER AND READ IT BACKWARDS, $6 \div 3 = 2$.

$2 \times 3 = 6 \rightarrow 6 \div 3 = 2$
AND
 $3 \times 2 = 6 \rightarrow 6 \div 2 = 3$

LET'S GET BACK TO FACTORS. A FACTOR IS A WHOLE NUMBER MULTIPLIED BY ANOTHER WHOLE NUMBER TO FIND A PRODUCT.

WOW, ANOTHER CONFUSING MATH DEFINITION. I THINK YOU NEED TO TELL US IN A SIMPLER WAY...MAYBE AN EXAMPLE WILL HELP.

CHECK THIS OUT. IF WE USE 2, 3, AND 6 AGAIN.

FACTORS
 $2 \times 3 = 6$
OR
 $3 \times 2 = 6$

WAIT A SECOND, BUT WE KNOW THAT DIVISION IS THE OPPOSITE OF MULTIPLICATION. SO...WE COULD ALSO JUST ASK, "WHAT CAN WE DIVIDE SIX BY?"

FACTORS
 $6 \div 3 = 2$
 $6 \div 2 = 3$

YOU KNOW, POE, THAT DOES SOUND A LOT EASIER THAN THE OTHER DEFINITION. SO A FACTOR IS ASKING, WHAT CAN WE DIVIDE THE NUMBER BY?

IF YOU THINK ABOUT IT THERE ARE TWO OTHER FACTORS OF 6. HOW ABOUT:
 $6 \div 6 = 1$ AND $6 \div 1 = 6$.

FINDING FACTORS

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ON THIS PAGE, YOU NEED TO FIND AT LEAST FOUR FACTORS FOR EACH NUMBER. CHECK OUT THIS EXAMPLE BEFORE YOU BEGIN.

LIST FOUR FACTORS OF 8.

FACTORS
 $8 \div 2 = 4$
 $8 \div 4 = 2$
 $8 \div 8 = 1$
 $8 \div 1 = 8$

OR

FACTORS
 $2 \times 4 = 8$
 $8 \times 1 = 8$

2, 4, 8, AND 1 ARE ALL FACTORS OF 8.

USE MULTIPLICATION OR DIVISION TO FIND AT LEAST FOUR FACTORS FOR EACH NUMBER.

- FACTORS OF 10 ?
1, 2, 5, 10
- FACTORS OF 14 ?
1, 2, 7, 14
- FACTORS OF 15 ?
1, 3, 5, 15
- FACTORS OF 21 ?
1, 3, 7, 21
- FACTORS OF 18 ?
1, 2, 3, 6, 9, 18
- FACTORS OF 20 ?
1, 2, 4, 5, 10, 20
- FACTORS OF 30 ?
1, 2, 3, 5, 6, 10, 15, 30
- FACTORS OF 24 ?
1, 2, 3, 4, 6, 8, 12, 24
- FACTORS OF 36 ?
1, 2, 3, 4, 6, 9, 12, 18, 36
- FACTORS OF 28 ?
1, 2, 4, 7, 14, 28
- FACTORS OF 22 ?
1, 2, 11, 22
- FACTORS OF 12 ?
1, 2, 3, 4, 6, 12
- FACTORS OF 64 ?
1, 2, 4, 8, 16, 32, 64
- FACTORS OF 42 ?
1, 2, 3, 6, 7, 14, 21, 42
- FACTORS OF 60 ?
1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60

COMMON FACTORS

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SOMETIMES YOU'LL NEED TO FIND A COMMON FACTOR OF TWO OR MORE NUMBERS. THIS IS VERY IMPORTANT TO KNOW WHEN YOU SIMPLIFY FRACTIONS.

THE WORD, **COMMON**, MEANS THE **SAME**. IF YOU NEED TO FIND A COMMON FACTOR YOU ARE LOOKING FOR A FACTOR THAT THE NUMBERS HAVE THE SAME.

CHECK OUT THIS EXAMPLE. DO YOU SEE THE FACTORS OF 12 AND 20?
12: 1, 12, 6, 2, 3, 4
20: 1, 2, 4, 5, 10, 20
DO YOU SEE WHAT THEY HAVE IN COMMON?

FIND AT LEAST THREE COMMON FACTORS OF 12 AND 20.

12 **20**

$12 \div 1 = 12$ $20 \div 1 = 20$
 $12 \div 12 = 1$ $20 \div 2 = 10$
 $12 \div 6 = 2$ $20 \div 4 = 5$
 $12 \div 2 = 6$ $20 \div 5 = 4$
 $12 \div 3 = 4$ $20 \div 10 = 2$
 $12 \div 4 = 3$ $20 \div 20 = 1$

ANSWER: 1, 2, AND 4

FIND AT LEAST THREE COMMON FACTORS FOR EACH SET OF NUMBERS.

- COMMON FACTORS OF 8 & 12 ?
1, 2, 4
- COMMON FACTORS OF 10 & 20 ?
1, 2, 5
- COMMON FACTORS OF 16 & 4 ?
1, 2, 4
- COMMON FACTORS OF 9 & 27 ?
1, 3, 9
- COMMON FACTORS OF 24 & 18 ?
1, 2, 3, 6
- COMMON FACTORS OF 42 & 21 ?
1, 3, 7, 21
- COMMON FACTORS OF 30 & 36 ?
1, 2, 3, 6
- COMMON FACTORS OF 64 & 40 ?
1, 2, 4, 8
- COMMON FACTORS OF 54 & 45 ?
1, 3, 9
- COMMON FACTORS OF 44 & 66 ?
1, 2, 11, 22

GREATEST COMMON FACTOR (GCF)

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SO HOW'S IT GOING? THE NEXT STEP TO FACTORS IS FINDING THE GREATEST COMMON FACTOR OF TWO NUMBERS.

WHEN SOMEONE ASK FOR THE GREATEST COMMON FACTOR ALL THEY WANT TO KNOW IS WHAT IS THE BIGGEST FACTOR THEY HAVE THE SAME.

YOU CAN SAY GCF INSTEAD OF GREATEST COMMON FACTOR.

CHECK OUT THIS EXAMPLE. YOU DO THE SAME THING AS THE PREVIOUS PAGE. EXCEPT YOU ARE TRYING TO FIND THE LARGEST FACTOR THEY HAVE IN COMMON.

FIND THE GREATEST COMMON FACTOR OF 9 AND 15.

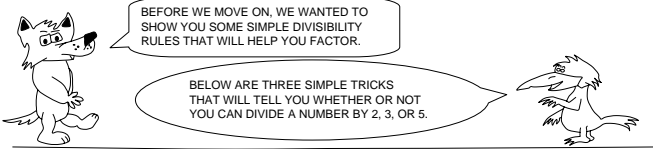
$15 \div 1 = 15$ $9 \div 1 = 9$
 $15 \div 3 = 5$ $9 \div 3 = 3$
 $15 \div 5 = 3$ $9 \div 9 = 1$
 $15 \div 15 = 1$

9 AND 15 HAVE 1 AND 3 AS COMMON FACTORS, BUT WHICH ONE IS THE GCF?

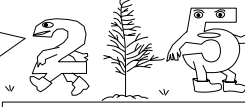
FIND THE GREATEST COMMON FACTOR FOR EACH SET OF NUMBERS.

- WHAT IS THE GCF OF 6 & 14 ?
2
- WHAT IS THE GCF OF 16 & 24 ?
8
- WHAT IS THE GCF OF 21 & 7 ?
7
- WHAT IS THE GCF OF 15 & 20 ?
5
- WHAT IS THE GCF OF 32 & 16 ?
16
- WHAT IS THE GCF OF 27 & 18 ?
9
- WHAT IS THE GCF OF 36 & 42 ?
6
- WHAT IS THE GCF OF 44 & 20 ?
4
- WHAT IS THE GCF OF 39 & 26 ?
13
- WHAT IS THE GCF OF 54 & 72 ?
18

DIVISIBILITY RULES



YOU CAN DIVIDE ANY EVEN NUMBER BY 2.
SO, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, AND SO ON, CAN BE DIVIDED BY 2.



ANY NUMBER ENDING IN A 0 OR 5 CAN BE DIVIDED BY 5.
SO, 5, 10, 15, 20, 25, 30, 35, 40, 50, AND SO ON, CAN BE DIVIDED BY 5.

IF YOU ADD THE DIGITS OF A NUMBER AND CAN DIVIDE IT BY 3, THEN YOU CAN DIVIDE THE ACTUAL NUMBER BY 3.

EXAMPLE: $207 = 2 + 0 + 7 = 9$. SINCE YOU CAN DIVIDE 9 BY 3, YOU CAN DIVIDE 207 BY 3.

CAN THESE NUMBERS BE DIVIDED BY 2, 3, OR 5?

HELPFUL EXAMPLE

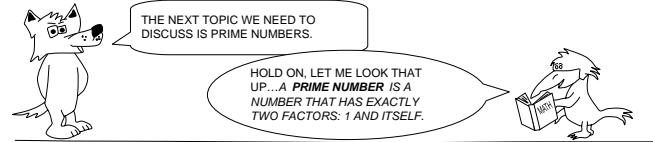
- 40 → 40 ENDS IN A 0, SO YOU KNOW IT'S EVEN. → $40 \div 2 = 20$
 3 → ADD 40'S DIGITS, $4 + 0 = 4$ YOU CAN'T DIVIDE 4 BY 3. → NO
 5 → 40 ENDS IN A 0. → $40 \div 5 = 8$

2 AND 5 ARE FACTORS OF 40.

THESE THREE RULES ARE VERY IMPORTANT, BECAUSE MOST NUMBERS CAN BE DIVIDED BY 2, 3, OR 5.

1. 54 → 2, 3 ARE FACTORS OF 54.
 2. 87 → 3 IS A FACTOR OF 87.
 3. 75 → 3, 5 ARE FACTORS OF 75.
 4. 48 → 2, 3 ARE FACTORS OF 48.
 5. 96 → 2, 3 ARE FACTORS OF 96.
 6. 80 → 2, 5 ARE FACTORS OF 80.
 7. 95 → 5 IS A FACTOR OF 95.
 8. 72 → 2, 3 ARE FACTORS OF 72.

PRIME NUMBERS



HUH, I THINK WE CAN MAKE AN EASIER DEFINITION THAN THAT. HOW ABOUT... A **PRIME NUMBER** IS A NUMBER THAT CAN NOT BE DIVIDED BY ANOTHER NUMBER AND MADE SMALLER.

EXAMPLES OF PRIME NUMBERS

$2 \div 1 = 2$ $3 \div 1 = 3$ $5 \div 1 = 5$
 $2 \div 2 = 1$ $3 \div 3 = 1$ $5 \div 5 = 1$

I GET IT. THE NUMBER TWO CAN ONLY BE DIVIDED BY 1 OR 2. IF YOU DIVIDE BY ONE YOU STILL GET TWO, SO THE NUMBER IS THE SAME. YOU ALSO SAID IT HAS TO BE ANOTHER NUMBER, SO DIVIDING BY TWO DOES NOT COUNT. THE SAME THING HAPPENS WITH 3 AND 5.

CHECK THESE TWO PROBLEMS OUT. DO YOU SEE WHICH ONE IS A PRIME NUMBER?

9 $9 \div 1 = 9$ 13 $13 \div 1 = 13$
 $9 \div 9 = 1$ $13 \div 13 = 1$
 $9 \div 3 = 3$

13 ONLY HAS TWO FACTORS.

THAT'S TOTALLY CORRECT. LET'S SEE IF YOU GET IT. TRY THE PROBLEMS BELOW ON YOUR OWN.

I KNOW, 9 CAN BE DIVIDED BY THREE AND MADE SMALLER, SO IT'S NOT A PRIME NUMBER. 13 CAN NOT BE DIVIDED BY ANOTHER NUMBER AND MADE SMALLER. 13 IS THE PRIME NUMBER.

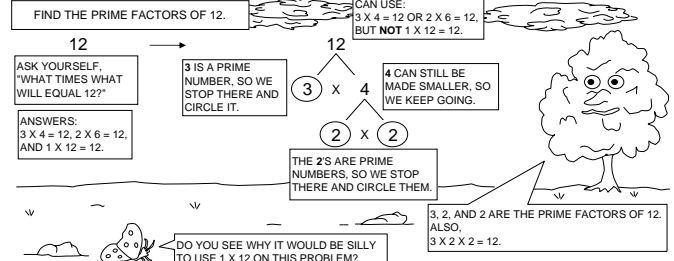
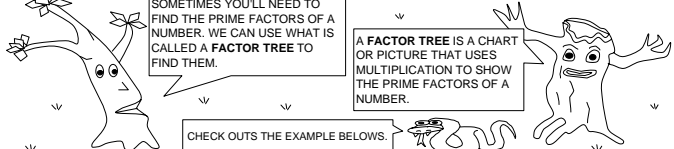
WRITE YES IF THE NUMBER IS A PRIME NUMBER OR NO IF IT IS NOT.

1. 20 → NO 2. 7 → YES 3. 19 → YES 4. 25 → NO
 5. 34 → NO 6. 23 → YES 7. 8 → NO 8. 31 → YES
 9. 17 → YES 10. 42 → NO 11. 21 → NO 12. 27 → NO

CIRCLE ALL THE PRIME NUMBERS. USE THE 2, 3, AND 5 RULES FROM THE PREVIOUS PAGE TO HELP.

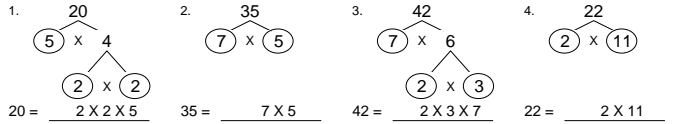
- (2) (3) (4) (5) (6) (7) 8 9 10 (11) (12) (13) 14 15 16 (17) (18) (19) (20) 21 22 (23) 24 25 26 27 28 (29) 30
 (31) 32 33 34 35 36 (37) 38 39 40 (41) (42) (43) 44 45 46 (47) 48 49 50 51 52 (53) 54 55 56 57 58 (59) 60
 (61) 62 63 64 65 66 (67) 68 69 70 (71) (72) (73) 74 75 76 77 78 (79) 80 81 82 (83) 84 85 86 87 88 (89) 90

FACTOR TREES



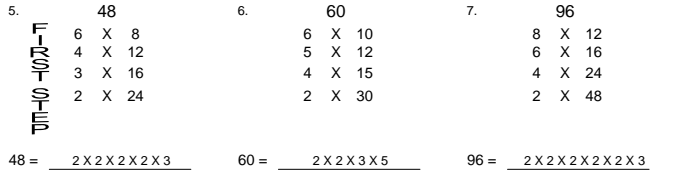
USE THE DIAGRAMS TO FIND THE PRIME FACTORS OF EACH NUMBER.

WAYS OF SOLVING MAY VARY



MAKE YOUR OWN FACTOR TREE TO FIND THE PRIME FACTORS OF EACH NUMBER.

WAYS OF SOLVING MAY VARY



CHECK FOR UNDERSTANDING



USE MULTIPLICATION OR DIVISION TO FIND AT LEAST FOUR FACTORS FOR EACH NUMBER.

1. FACTORS OF 50 ? → 1, 2, 5, 25, 50
 2. FACTORS OF 64 ? → 1, 2, 4, 8, 16, 32, 64
 3. FACTORS OF 78 ? → 1, 2, 3, 6, 13, 26, 39, 78

FIND AT LEAST THREE COMMON FACTORS FOR EACH SET OF NUMBERS.

4. COMMON FACTORS OF 42 & 36 ? → 1, 2, 3, 6
 5. COMMON FACTORS OF 60 & 80 ? → 1, 2, 10, 20

FIND THE GREATEST COMMON FACTOR FOR EACH SET OF NUMBERS.

6. WHAT IS THE GCF OF 24 & 32 ? → 8
 7. WHAT IS THE GCF OF 28 & 42 ? → 14

CAN THESE NUMBERS BE DIVIDED BY 2, 3, OR 5?

8. 135 → 3, 5 ARE FACTORS OF 135.
 9. 102 → 2, 3 ARE FACTORS OF 102.

MAKE YOUR OWN FACTOR TREE TO FIND THE PRIME FACTORS OF EACH NUMBER.

