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Year 6 Number

Table of Contents	
Presentation: Year 6 Number	
Classroom Display: Number Families at a Glance	
Classroom Display: Divisibility Rules Toolkit	
Game 1: Factor Detective Sort	
Game 2: Number Family Quest	
Worksheet 1: Divisibility Detectives	
Worksheet 2: Prime and Composite Factor Lab	
Worksheet 3: Sieve of Eratosthenes Investigation	
Worksheet 4: Square Numbers and Roots	
Worksheet 5: Triangular Number Patterns	
Quiz: Year 6 Number	
Assessment: Number Patterns and Properties Assessment	
Rubric: Year 6 Number Rubric	

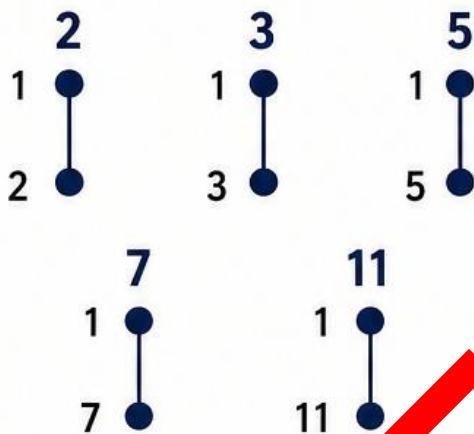


NUMBER FAMILIES AT A GLANCE

PRIME

Exactly two factors: 1 and itself.

Examples: 2, 3, 5, 7, 11



COMPOSITE

More than two factors.

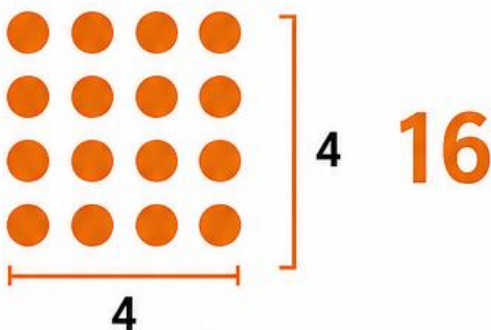
Examples: 4, 6, 8, 9, 10



SQUARE

A whole number multiplied by itself.

Examples: 4, 9, 16, 25, 36



TRIANGULAR

A growing pattern made by adding the next whole number.

Examples: 1, 3, 6, 10, 15, 21



Remember: 1 is neither prime nor composite.



DIVISIBILITY

RULES TOOLKIT



2

Last digit is
0, 2, 4, 6 or 8.

Example: 734



3

Digit sum is
divisible by 3.

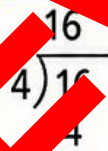
Example: 462
 $4 + 6 + 2 = 12$



4

Last two digits
are divisible by 4.

Example: 316 →
 $16 \div 4 = 4$



5

Last digit is
0 or 5.

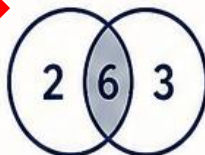
Example: 1,245



6

Divisible
by both 2 and 3.

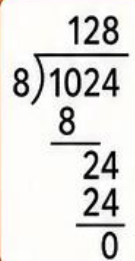
Example: 942



8

Last three digits
are divisible by 8.

Example: 1,024



9

Digit sum is
divisible by 9.

Example: 729 →
 $7 + 2 + 9 = 18$



10

Last digit is 0.

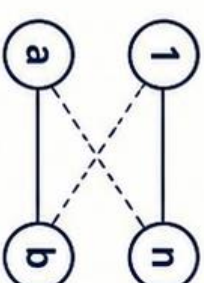
Example: 3,570



Test the rule. Then explain your reasoning.



FACTOR DETECTIVE SORT



HOW TO PLAY

1. Shuffle the cards.
2. Take turns choosing a card.
3. Explain your factor evidence.
4. Place the card in the correct zone.

PRIME

Exactly two factors



COMPOSITE

More than two factors



NEITHER

Use for the number 1



PREVIEW



Challenge:

Can a square number also be composite?

FACTOR DETECTIVE SORT

Cut out the cards. Sort each number using factor evidence.

1

2

3

4

5

7

9

11

13

15

17

19

21

23

25

29

31

33

35

37

49

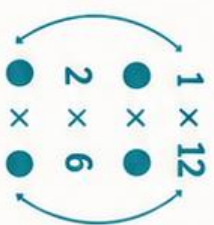
51

57

97

PREVIEW

NUMBER FAMILY QUEST



START
→

1	2	3	4	5	6
			PRIME		



7	8	9	10	11	12
		COMPOSITE			

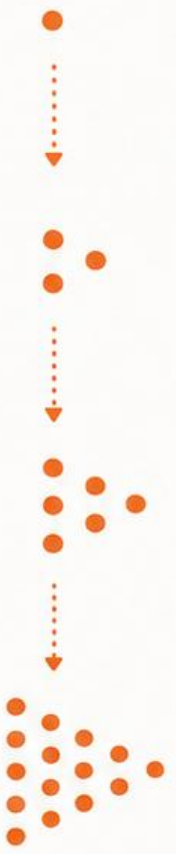
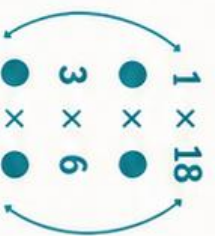


13	14	15	16	17	18
			SQUARE		



19	20	21	22	23	24
		TRIANGULAR			

FINISH
★



HOW TO PLAY

- 1 Roll and move.
- 2 Draw a challenge card.
- 3 Explain your thinking.
- 4 Correct answer: stay.
Try again: move back 1.

First player to
FINISH wins.

NUMBER FAMILY QUEST



CHALLENGE CARDS



Read a card aloud. Explain your answer.



PRIME

Is 31 prime or composite?



FACTORS

List every factor of 36.



SQUARE ROOT

Find $\sqrt{144}$.



SQUARE

Find 11^2 .



TRIANGULAR

Find the 6th triangular number.



DIVISIBILITY

Name a number divisible by 3 and 5.



PRIME

Is 1 prime, composite or neither?



COMPOSITE

What is the smallest composite number?



NUMBER FAMILY

Name a number greater than 1 that is both square and triangular.



PRIME

List the prime numbers between 10 and 20.



DIVISIBILITY

Is 456 divisible by 3? Explain.



TRIANGULAR

What comes after 15 in the triangular sequence?

NUMBER FAMILY QUEST

TEACHER ANSWER GUIDE

1

31 is prime. Its factors are 1 and 31.



2

Factors of 36:
1, 2, 3, 4, 6, 9,
12, 18, 36.



3

$$\sqrt{144} = 12.$$



4

$$11^2 = 121.$$



5

The 8th triangular number is 36.



6

Example: 15 is divisible by 3 and 5.



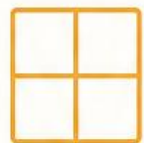
7

1 is neither prime nor composite.



8

The smallest composite number is 4.



9

36 is both square and triangular.



10

11, 13, 17 and 19.



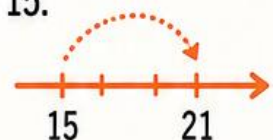
11

Yes. $4 + 5 + 6 = 15$, which is divisible by 3.



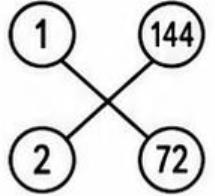
12

21 comes after 15.





DIVISIBILITY DETECTIVES



Name: _____

For each number, list every rule from 2, 3, 4, 5, 6, 8, 9 and 10 that applies. Then classify the number.

144

Rules: _____

Classification: _____

225

Rules: _____

Classification: _____

308

Rules: _____

Classification: _____

486

Rules: _____

Classification: _____

735

Rules: _____

Classification: _____

1,024

Rules: _____

Classification: _____

97

Rules: _____

Classification: _____

101

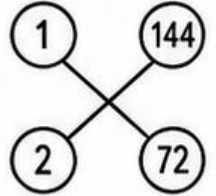
Rules: _____

Classification: _____

Why is 1 neither prime nor composite?



DIVISIBILITY DETECTIVES



Name: ANSWERS

For each number, list every rule from 2, 3, 4, 5, 6, 8, 9 and 10 that applies. Then classify the number.

144

Rules: 2, 3, 4, 6, 8, 9

Classification: Composite

225

Rules: 3, 5, 9

Classification: Composite

308

Rules: 2, 4

Classification: Composite

486

Rules: 2, 3, 6, 9

Classification: Composite

735

Rules: 3, 5

Classification: Composite

1,024

Rules: 2, 4, 8

Classification: Composite

97

Rules: None

Classification: Prime

101

Rules: None

Classification: Prime

Why is 1 neither prime nor composite?

1 has only one factor, so it has neither exactly two factors nor more than two factors.

Name: _____ Date: _____

List every factor pair, then decide whether each number is prime or composite.

A. Factor Pairs and Classification

1. 24

Classification: _____

2. 35

Classification: _____

3. 49

Classification: _____

4. 5

Classification: _____

B. Classify and justify

Number	Prime / Composite / Neither	Reason or factor pair
1	_____	_____
2	_____	_____
57	_____	_____
91	_____	_____
97	_____	_____

Why is 1 neither prime nor composite?

Name: _____ Date: _____

List every factor pair, then decide whether each number is prime or composite.

A. Factor Pairs and Classification

1. 24

1×24

2×12

3×8

4×6

Classification: Composite

2. 35

1×35

5×7

Classification: Composite

3. 49

1×49

7×7

Classification: Composite

4. 3

1×3

Classification: Prime

B. Classify and justify

Number	Prime / Composite / Neither	Reason or factor pair
1	Neither	Only one factor
2	Prime	Factors: 1 and 2
57	Composite	3×19
91	Composite	7×13
97	Prime	Factors: 1 and 97

Why is 1 neither prime nor composite?

Prime numbers have exactly two factors; composite numbers have more than two. The number 1 has only one factor.

Sieve of Eratosthenes Investigation

Name: _____

Date: _____

Use the grid to find every prime number to 100.

1. Cross out 1.
2. Circle 2, then cross out its other multiples.
3. Repeat with 3, 5 and 7.
4. Stop when every number is circled or crossed out.

1	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
91	92	93	94	95	96	97	98	99	100

List all the prime numbers you found:

What are the first five prime numbers?

What is the greatest prime number below 100?

Why can the sieve stop after testing 7?

Sieve of Eratosthenes Investigation

Name: _____

Date: _____

Use the grid to find every prime number to 100.

1. Cross out 1.
2. Circle 2, then cross out its other multiples.
3. Repeat with 3, 5 and 7.
4. Stop when every number is circled or crossed out.

1	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
91	92	93	94	95	96	97	98	99	100

List all the prime numbers you found:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59,
61, 67, 71, 73, 79, 83, 89, 97

What are the first five prime numbers?

2, 3, 5, 7, 11

What is the greatest prime number below 100?

97

Why can the sieve stop after testing 7?

Every composite number to 100 has a prime factor no greater than 10. The primes below 10 are 2, 3, 5 and 7.

Square Numbers and Square Roots

Name: _____

Date: _____

A square number is made by multiplying a whole number by itself.

A square root tells which whole number was multiplied by itself.

A. Find each square number

1. $3^2 =$ _____

Sketch an array if helpful.

2. $6^2 =$ _____

Sketch an array if helpful.

3. $9^2 =$ _____

Sketch an array if helpful.

4. $12^2 =$ _____

Sketch an array if helpful.

B. Find each square root

5. $\sqrt{25} =$ _____

6. $\sqrt{64} =$ _____

7. $\sqrt{121} =$ _____

8. $\sqrt{196} =$ _____

C. Apply your thinking

9. A square garden has an area of 169 m^2 . What is the side length?

10. A square number is 225. Which whole number was multiplied by itself?

Final challenge: Write one equation that links a square number and its square root.

Square Numbers and Square Roots

Name: _____

Date: _____

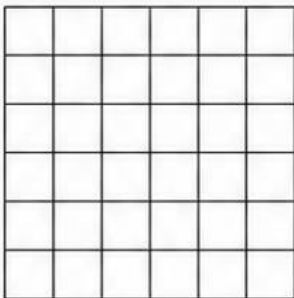
A square number is made by multiplying a whole number by itself.

A square root tells which whole number was multiplied by itself.

A. Find each square number

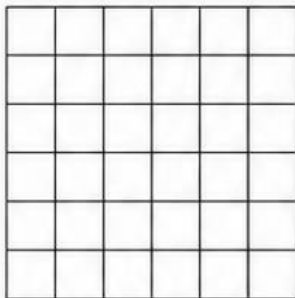
1. $3^2 =$ 9

Sketch an array if helpful.



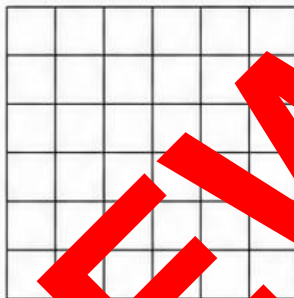
2. $6^2 =$ 36

Sketch an array if helpful.



3. $9^2 =$ 81

Sketch an array if helpful.



4. $12^2 =$ 144

Sketch an array if helpful.



B. Find each square root

5. $\sqrt{25} =$ 5

6. $\sqrt{64} =$ 8

7. $\sqrt{121} =$ 11

8. $\sqrt{196} =$ 14

C. Apply your thinking

9. A square garden has an area of 169 m^2 . What is the side length?

The side length is 13 because $\sqrt{169} = 13$.

10. A square number is 225. Which whole number was multiplied by itself?

15, because $15 \times 15 = 225$.

Final challenge: Write one equation that links a square number and its square root.

$8^2 = 64$ and $\sqrt{64} = 8$.

Triangular Number Patterns

Name: _____

Date: _____

Each triangular number adds the next whole number.

$$T_n = n(n + 1) \div 2$$

A. Build the pattern

n	1	2	3	4	5	6	7	8
T_n	1	3	6					

Show how the total grows from one term to the next:

B. Use the formula

1. Find T_{10} .

2. Find T_{20} .

3. Find T_{25} .

4. Which triangular number is 45?

C. Reason about the pattern

5. Is 50 a triangular number? Prove your answer.

6. Explain why the differences between consecutive triangular numbers increase by 1.

Final challenge: Create a real-life situation that could be represented by a triangular number.

Triangular Number Patterns

Name: _____

Date: _____

Each triangular number adds the next whole number.

$$T_n = n(n + 1) \div 2$$

A. Build the pattern

n	1	2	3	4	5	6	7	8
T_n	1	3	6	10	15	21	28	36

Show how the total grows from one term to the next:

$1 + 2 = 3$; $3 + 3 = 6$; $6 + 4 = 10$; then add 5, 6, 7 and

B. Use the formula

1. Find T_{10} .

$$T_{10} = 10 \times 11 \div 2 = 55.$$

2. Find T_{20} .

$$T_{20} = 20 \times 21 \div 2 = 210.$$

3. Find T_{25} .

$$T_{25} = 25 \times 26 \div 2 = 325.$$

4. Which triangular number is 45?

$$45 \text{ is } T_9 \text{ because } 9 \times 10 \div 2 = 45.$$

C. Reason about the pattern

5. Is 50 a triangular number? Prove your answer.

No. $T_9 = 45$ and $T_{10} = 55$, so 50 is between consecutive triangular numbers.

6. Explain why the differences between consecutive triangular numbers increase by 1.

Each new term adds the next whole number, so the differences are 2, 3, 4, 5, ...

Final challenge: Create a real-life situation that could be represented by a triangular number.

Bowling pins in four rows: $1 + 2 + 3 + 4 = 10$ pins.

Year 6 Number Assessment

Name: _____

Date: _____

Page 1 of 2

Section A — Divisibility and factors

1. Show that 360 is divisible by both 8 and 9. Use each divisibility test.

2. From 2, 3, 4, 5, 6, 8, 9 and 10, list every divisibility rule that 234 satisfies.

3. List every factor pair of 42.

4. Find the highest common factor of 36 and 48. Show your working.

5. Write two multiples of 15 that are between 70 and 90.

Section B — Prime and composite numbers

Number	Prime / Composite / Neither	Reason or factor pair
1		
2		
51		
83		
91		

6. Is 119 prime or composite? Prove your answer with a factor pair or a clear test.

Teacher use: Page 1 score ____ / 15

Year 6 Number Assessment

Name: _____

Date: _____

Page 1 of 2

Section A — Divisibility and factors

1. Show that 360 is divisible by both 8 and 9. Use each divisibility test.

8: the last three digits are 360 and $360 \div 8 = 45$.

9: the digit sum is $3 + 6 + 0 = 9$.

2. From 2, 3, 4, 5, 6, 8, 9 and 10, list every divisibility rule that 234 satisfies.

2, 3, 6 and 9

3. List every factor pair of 42.

1×42 , 2×21 , 3×14 , 6×7

4. Find the highest common factor of 36 and 48. Show your working.

Common factors are 1, 2, 3, 4, 6 and 12. HCF = 12.

5. Write two multiples of 12 that are between 70 and 90.

72 and 84

Section B — Prime and composite numbers

Number	Prime / Composite / Neither	Reason or factor pair
1	Neither	Only one factor
2	Prime	Factors: 1 and 2
51	Composite	3×17
83	Prime	Factors: 1 and 83
91	Composite	7×13

6. Is 119 prime or composite? Prove your answer with a factor pair or a clear test.

Composite, because $119 = 7 \times 17$.

Teacher use: Page 1 score ____ / 15

Year 6 Number Assessment

Name: _____

Date: _____

Page 2 of 2

Section C — Square numbers and square roots

7. Calculate: a) $7^2 =$ _____ b) $11^2 =$ _____ c) $\sqrt{81} =$ _____ d) $\sqrt{225} =$ _____

8. A square courtyard has an area of 196 m^2 . What is its side length? Show how you know.

Section D — Triangular numbers

9. Complete the first eight triangular numbers: 1, 3, 6, _____, _____, _____, _____, _____

10. Use $T_n = n(n + 1) \div 2$ to find T_{15} .

11. Is 66 a triangular number? Prove your answer.

12. Write a number greater than 1 and less than 50 that is both square and triangular. Prove both properties.

Section E — Reasoning and challenge

13. Ava says, '97 is composite because it is odd.' Explain Ava's error and classify 97 correctly.

14. Create a number greater than 100 that is divisible by both 3 and 4, but not by 5. Prove that your number works.

Teacher use: Page 2 score _____ / 15 Total _____ / 30

Year 6 Number Assessment

Name: _____

Date: _____

Page 2 of 2

Section C — Square numbers and square roots

7. Calculate: a) $7^2 =$ 49 b) $11^2 =$ 121 c) $\sqrt{81} =$ 9 d) $\sqrt{225} =$ 15

8. A square courtyard has an area of 196 m^2 . What is its side length? Show how you know.

The side length is 14 m because $\sqrt{196} = 14$.

Section D — Triangular numbers

9. Complete the first eight triangular numbers: 1, 3, 6, 10, 15, 21, 28, 36

10. Use $T_n = n(n + 1) \div 2$ to find T_{15} .

$T_{15} = 15 \times 16 \div 2 = 120$.

11. Is 66 a triangular number? Prove your answer.

Yes. $T_{11} = 11 \times 12 \div 2 = 66$

12. Write a number greater than 1 and less than 50 that is both square and triangular. Prove both properties.

36. It is square because $6^2 = 36$ and triangular because $T_8 = 8 \times 9 \div 2 = 36$.

Section E — Reasoning and challenge

13. Ava says, '97 is composite because it is odd.' Explain Ava's error and classify 97 correctly.

Being odd does not make a number composite. The only factors of 97 are 1 and 97, so 97 is prime.

14. Create a number greater than 100 that is divisible by both 3 and 4, but not by 5. Prove that your number works.

108. Its digit sum is 9, so it is divisible by 3; 08 is divisible by 4; it does not end in 0 or 5.

Teacher use: Page 2 score _____ / 15 Total _____ / 30

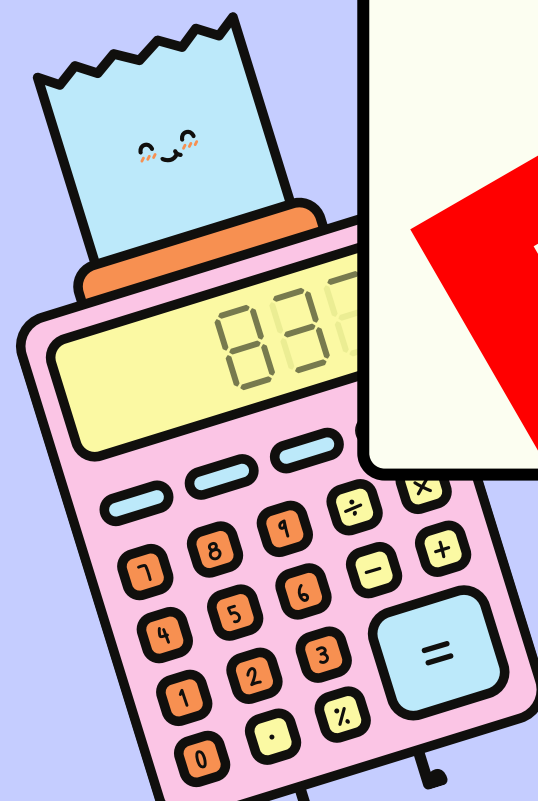
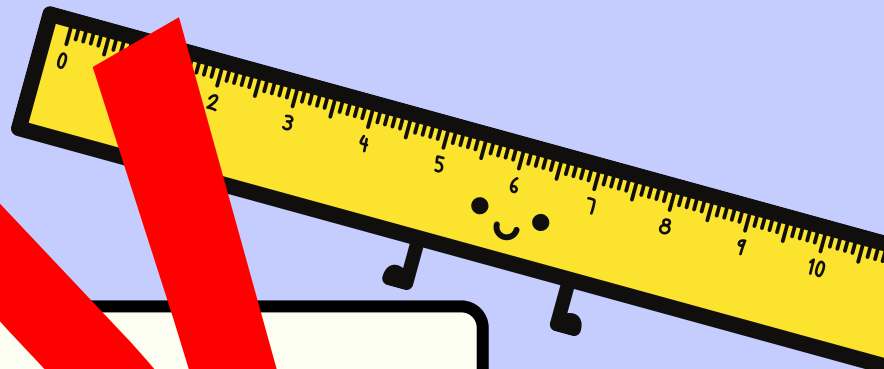
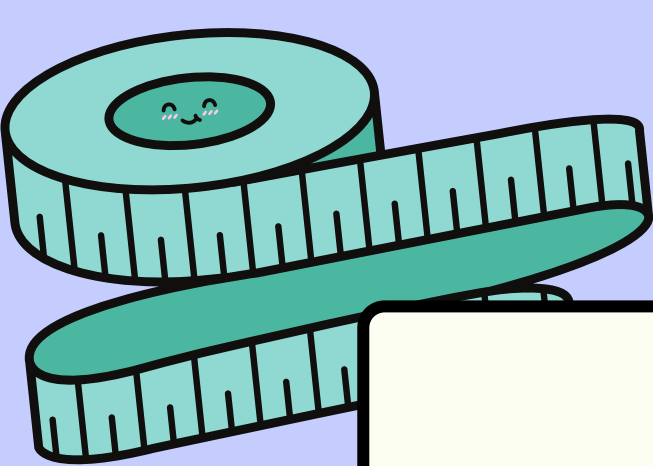
Year 6 Number Rubric

Student: _____ Date: _____

Criteria	BEGINNING	DEVELOPING	ACHIEVING	CONFIDENT	EXCEEDING
1. Divisibility and factors	Needs support to apply rules or list factors.	Applies some rules; finds some factor pairs.	Accurately applies rules and finds factor pairs.	Selects efficient tests and explains factor links.	Generalises divisibility and factor relationships.
2. Prime and composite	Classification is often inaccurate.	Classifies familiar numbers with some accuracy.	Classifies accurately using factors.	Justifies unfamiliar cases efficiently.	Compares and generalises number classes.
3. Square numbers and roots	Needs support with squares and roots.	Calculates familiar examples.	Calculates and connects squares and roots.	Applies the inverse relationship in problems.	Explains and extends square-number patterns.
4. Triangular numbers	Needs support to continue the pattern.	Continues pattern with some accuracy.	Uses the pattern and formula accurately.	Justifies whether a number is triangular.	Generalises and applies triangular patterns.
5. Reasoning and working	Shows little relevant working.	Shows partial working or explanation.	Shows clear logical working.	Chooses efficient strategies and justifies them.	Builds convincing multi-step arguments.
6. Accuracy and communication	Responses are incomplete or unclear.	Some accurate notation and vocabulary.	Accurate notation and clear explanations.	Precise language supports conclusions.	Communicates insightfully and checks results.

Overall judgement: _____

Teacher feedback:



PREVIEW

**Year
Number**



Our Number Family Toolkit

Use divisibility tests, factor pairs and patterns to classify numbers—and justify every decision.



Factors and Multiples

Factors divide exactly; multiples are products. Example: 6 is a factor of 42, and 42 is a multiple of 6.



Fast Checks: 2, 5 and 10

2: even last digit • 5: ends in 0 or 5 • 10: ends in 0 or 5. Test the ones digit



Digit-Sum Checks: 3 and 9

For 3, the digit sum is a multiple of 3. For 9, it is a multiple of 9.

Example. $1 + 1 + 2 = 12$.



Check 4, 6 and 8

4: last two digits • 6: passes 2 and 3 • 8: last three digits. Example:

1,024 • 8 • 128.



Prime or Composite?

Prime: exactly two factors. Composite: more than two factors. The number is neither.



Build Factor Pairs

Start with $1 \times n$, then test divisors in order until pairs repeat. For 36:

$1 \times 36, 2 \times 18, 3 \times 12, 4 \times 9, 6 \times 6$.



Use the Sieve

Cross out 1; circle 2; remove other multiples of 2, 3, 5 and 7. The numbers left 1-10 are prime.



Square Numbers Form Arrays

n^2 means $n \times n$ and forms an n -by- n array. Example: $6^2 = 36$.



Square Roots Reverse Squaring

A square root reverses squaring. Because $12^2 = 144$, $\sqrt{144} = 12$.



Triangular Numbers Grow

Add the next whole number 1, 3, 10, 15, 21, 28, 36, ...

PREVIEW



Use the Triangular Formula

$$T_n = n(n + 1) \div 2 \text{ So } T_{11} = 11 \times 12 \div 2 = 66.$$

PREVIEW



Number Families Can Overlap

A number may belong to several families. The number 36 is composite, square, and triangular.



Worked Example: Classify 36

Factor pairs: 1×36 , 2×18 , 3×12 , 4×9 and 6×6 . Therefore 36 is composite, square and triangular.



Worked Example: Test 462

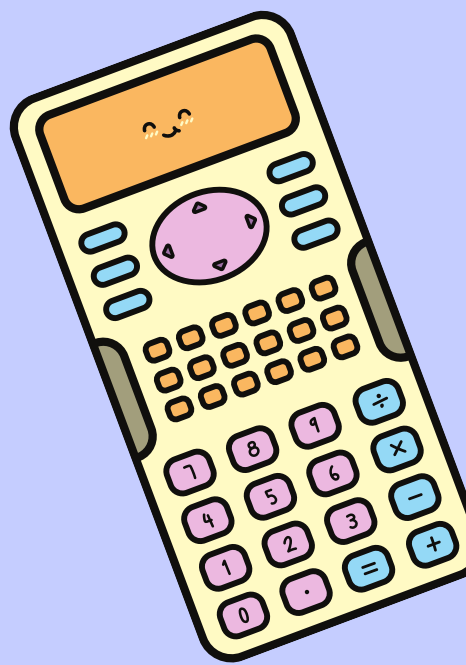
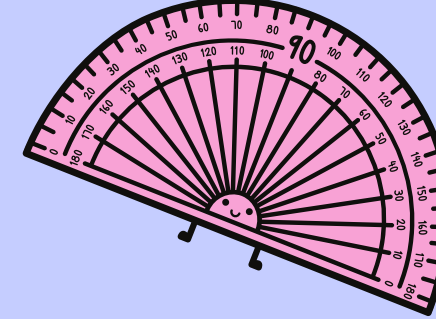
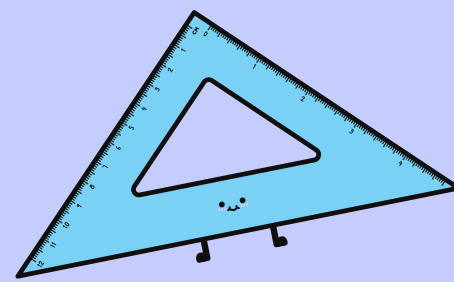
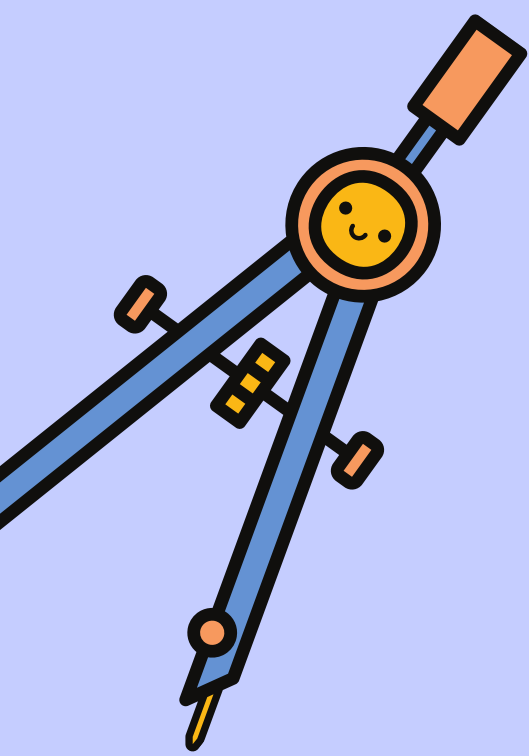
462 is even; its digit sum is 12; its last two digits are 62. It is divisible by 2, 3, and 6.



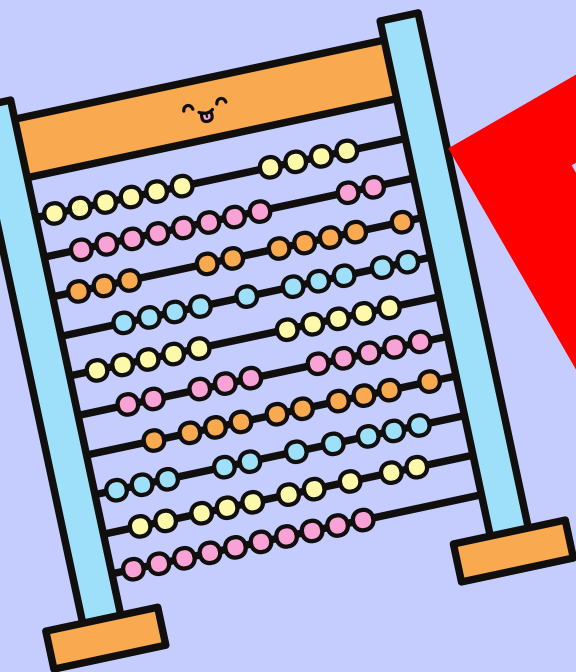
Choose a Reliable Strategy

- 1) Try quick divisibility tests
- 2) Build from previous
- 3) Check square and triangular patterns
- 4) State evidence.

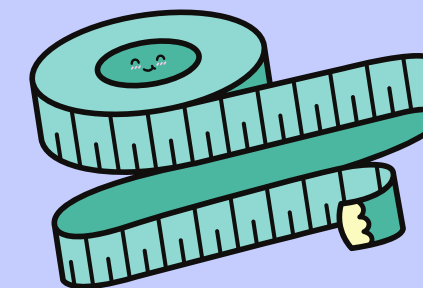
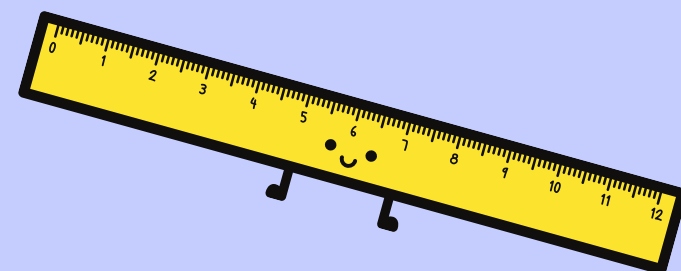
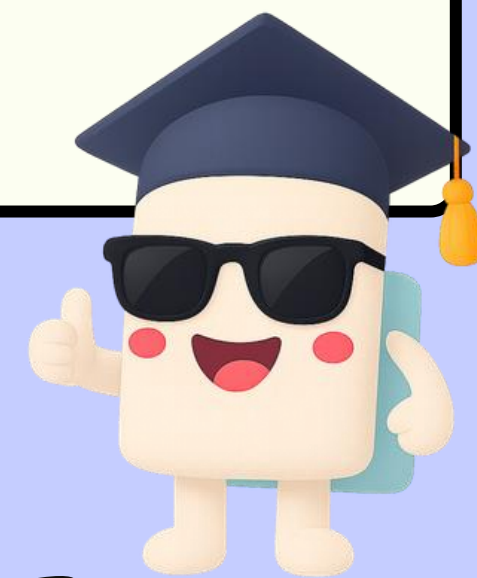




Well Done!



PREVIEW



Year 6 Number Quiz

PREVIEW



Question 1 • True or False

The number 1 is prime

PREVIEW



Answer 1

False. The number 1 has only one factor, so it is neither prime nor composite.



Question 2 · Multiple Choice

Which is the complete factor set of 29? A 1, 2, 29 B 1, 2, 29 C 1, 3, 29
D 2 only



Answer 2

A: 1 and 29. Exactly two factors, mod 29 prime.

PREVIEW



Question 3 · Short Answer

Classify 57 as prime, composite or neither with evidence.

PREVIEW



Answer 3

Composite because $5 \times 3 = 15$.

PREVIEW



Question 4 • Multiple Choice

Which number is divisible by 9? A 215 B 345 C 432 D 650

PREVIEW



Answer 4

C: 432. Its digit sum is $4 + 3 + 2 = 9$.

PREVIEW



Question 5 • True or False

100 is divisible by both 4 and 5.

PREVIEW



Answer 5

True. The last two digits, 00, are divisible by 100 and 100 ends in 0.

PREVIEW



Question 6 · Short Answer

Calculate both: 2^2 and $\sqrt{4}$

PREVIEW



Answer 6

$$12^2 = 144 \text{ and } \sqrt{144} = 12$$

PREVIEW



Question 7 • Multiple Choice

Which number is both square and triangular? A 16 B 25 C 36 D 49

PREVIEW



Answer 7

C: 36 It is 6 and 58.

PREVIEW



Question 8 · Short Answer

What is the seventh triangular number?

PREVIEW



Answer 8

$$T_7 = 7 \times 8 - 2 = 54.$$



Question 9 • Multiple Choice

Which factor set for 48 is complete? A 1,2,4,6,8,12,16,24,48 B

1,2,4,6,8,12,24,48 C 1,3,6,12,24,48



Answer d

A: 1, 2, 3, 4, 6, 8, 12, 16, 24 and 32.

PREVIEW



Question 10 • Reasoning

Classify 49 in every number family suggested. Explain.

PREVIEW

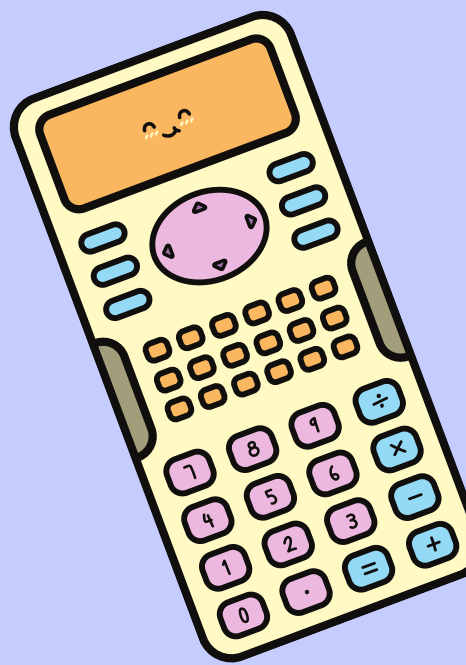
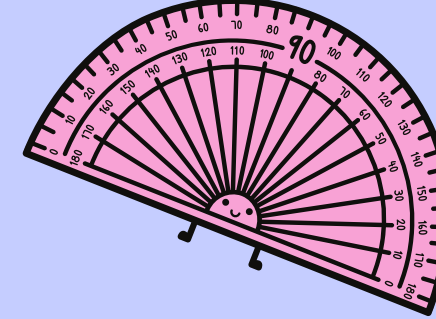
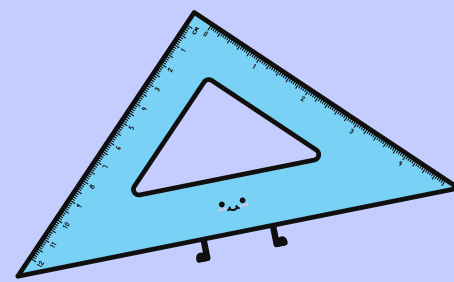
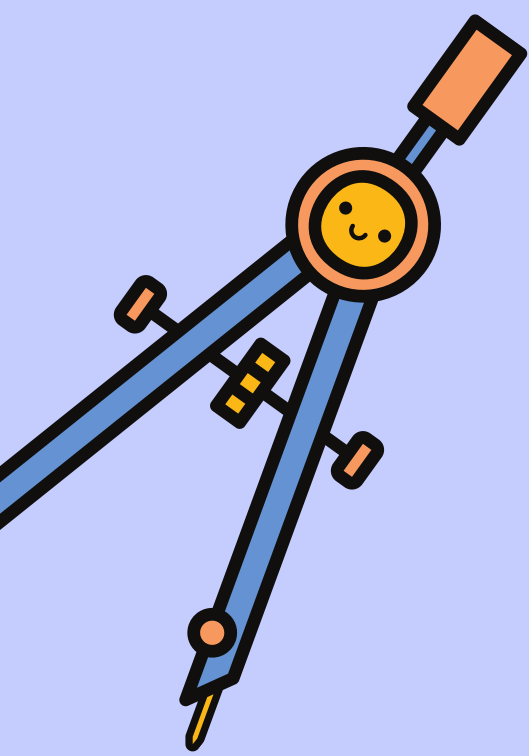


Answer 10

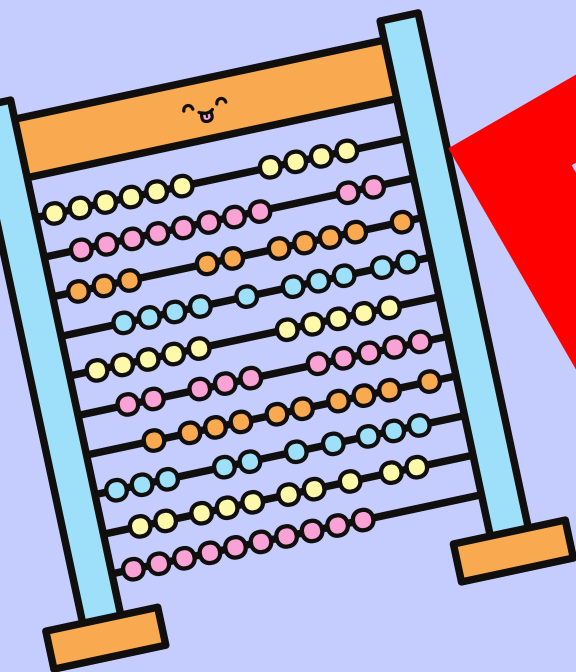
49 is composite and square because $49 = 7 \times 7$. It is not triangular:

$$r_9 = 45 \text{ and } r_{10} = 55.$$





Well Done!



PREVIEW

