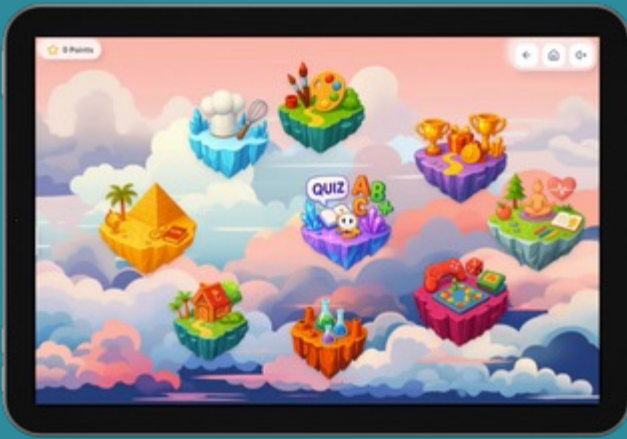


## Homework without the hassle

Sukindi is an Australian learning platform that supports Teachers, Parents and Students with an interactive homework app and downloadable resources.



Scan to start your  
free 7-day trial

[www.sukindi.com.au](http://www.sukindi.com.au)



## Unknown Values (pre-algebra) – Year 5

| Table of Contents                          |  |
|--------------------------------------------|--|
| Presentation: Unknown Values (pre-algebra) |  |
| Display: Unlock the Unknown                |  |
| Game: Balance Builder                      |  |
| Game: Unknown Value Relay                  |  |
| Worksheet 1: Missing Pieces                |  |
| Worksheet 2: Inverse Moves                 |  |
| Worksheet 3: Equivalent Equations          |  |
| Worksheet 4: Simplify First                |  |
| Worksheet 4: Multi-Step Challenge          |  |
| Worksheet 5: Word Problems and Reasoning   |  |
| Quiz: Unknown Values (pre-algebra)         |  |
| Assessment: Unknown Values Assessment      |  |
| Rubric: Unknown Values (pre-algebra)       |  |



# Unlock the Unknown



|                     |                |                |
|---------------------|----------------|----------------|
| $\square + 27 = 63$ | $63 - 27 = 36$ | $\square = 36$ |
|---------------------|----------------|----------------|

|                         |                 |               |
|-------------------------|-----------------|---------------|
| $8 \times \square = 56$ | $56 \div 8 = 7$ | $\square = 7$ |
|-------------------------|-----------------|---------------|

|                         |                  |                          |               |
|-------------------------|------------------|--------------------------|---------------|
| $4 \times \square = 48$ | $48 \div 4 = 12$ | $12 \times \square = 84$ | $\square = 7$ |
|-------------------------|------------------|--------------------------|---------------|



**Check:** put the value back into the original equation.

# Balance Builder

$$3 \times + 4 =$$



$$7 - 2 + 5 =$$



## HOW TO PLAY

1. Shuffle the Expression Cards.
2. Draw two cards and solve the equation.
3. Place an equal-value pair on the mat.

4. Explain how you know they balance.
5. Score 1 point. First to 5 wins.



Challenge: use an Operation Card and keep the equation balanced.

1

2

3

4

5



# Balance Builder - Expression Cards




$$6 \times 8$$



$$76 \div 2$$



$$72 - 19$$



$$41 + 12$$



$$9 \times 7$$



$$81 - 18$$



$$14 \times 12$$



$$5 + 7$$



$$100 \div 4$$



$$5 \times 5$$



$$6 \times 6$$



$$72 \div 2$$


PREVIEW



# Balance Builder - Unknown Cards



$$\square + 18 = 45$$

$$3 \times \square = 81$$

$$\square - 16 = 28$$

$$4 \times \square = 176$$

$$7 \times \square = 84$$

$$96 \div \square = 8$$

$$\square \div 6 = 9$$

$$\square + 21 = 75$$

$$5 \times \square = 65$$

$$91 \div \square = 7$$

$$120 - \square = 72$$

$$\square \div 8 = 6$$



# ★ Balance Builder - Operation Cards & Record ☆

✂

$+10$

✂

$-10$

✂

$\times 2$

✂

$\div 2$

✂

$+5$

✂

$-5$

✂

$\times 3$

✂

$\div 3$

| LEFT EXPRESSION | VALUE | RIGHT EXPRESSION | VALUE | BALANCED? |
|-----------------|-------|------------------|-------|-----------|
|                 |       |                  |       |           |
|                 |       |                  |       |           |
|                 |       |                  |       |           |
|                 |       |                  |       |           |
|                 |       |                  |       |           |



Explain one match: \_\_\_\_\_





# UNKNOWN VALUE RELAY

Read the UNKNOWN VALUE equation. Solve the WHO HAS? equation. Continue until the chain returns to 8.



**I HAVE 8**

$\times$

**WHO HAS?**

$6 \times \square = 144$

**I HAVE 24**

$\div$

**WHO HAS?**

$\square \div 3 = 8$

**I HAVE 15**

$-$

**WHO HAS?**

$\square - 18 = 24$

**I HAVE 42**

$\div$

**WHO HAS?**

$77 \div \square = 7$

**I HAVE 144**

$\times$

**WHO HAS?**

$4 \times \square = 144$

**I HAVE 36**

$+$

**WHO HAS?**

$\square + 17 = 26$



# Unknown Value Relay - Cards 7-12



**I HAVE 9**

**WHO HAS?**

$\square \div 6 = 9$

**I HAVE 54**

**WHO HAS?**

$72 \div \square = 4$

**I HAVE 18**

**WHO HAS?**

$3 \times \square = 81$

**I HAVE 27**

**WHO HAS?**

$\square + 16 = 28$

**I HAVE 18**

**WHO HAS?**

$9 \times \square = 567$

**I HAVE 63**

**WHO HAS?**

$49 \div \square = 7$



# Unknown Value Relay - Cards 13-18



I HAVE

7

WHO HAS?

$6 \times \square = 288$

I HAVE

48

WHO HAS?

$\square \div 9 = 5$

I HAVE

14

WHO HAS?

$64 \div \square = 2$

I HAVE

32

WHO HAS?

$\square + 19 = 44$

I HAVE

25

WHO HAS?

$5 \times \square = 250$

I HAVE

50

WHO HAS?

$64 \div \square = 8$

# Missing Pieces: One-Step Equations



Name: \_\_\_\_\_

Solve each equation. Write the inverse operation you used in the small space underneath.

1.  $\square + 19 = 47$

\_\_\_\_\_

2.  $63 - \square = 28$

\_\_\_\_\_

3.  $7 \times \square = 56$

\_\_\_\_\_

4.  $90 \div \square = 12$

\_\_\_\_\_

5.  $\square - 24 = 39$

\_\_\_\_\_

6.  $\square \div 6 = 11$

\_\_\_\_\_

7.  $9 \times \square = 10$

\_\_\_\_\_

8.  $81 \div \square = 9$

\_\_\_\_\_

9.  $\square + 38 = 75$

\_\_\_\_\_

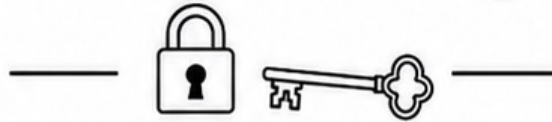
10.  $120 - \square = 46$

\_\_\_\_\_

Check two answers by substitution:



# Missing Pieces: One-Step Equations



Name: ANSWERS

Solve each equation. Write the inverse operation you used in the small space underneath.

1.  $\boxed{28} + 19 = 47$

$47 - 19 = 28$

2.  $63 - \boxed{35} = 28$

$63 - 28 = 35$

3.  $7 \times \boxed{8} = 56$

$56 \div 7 = 8$

4.  $96 \div \boxed{8} = 12$

$12 \times 8 = 96$

5.  $\boxed{63} - 24 = 39$

$39 + 24 = 63$

6.  $\boxed{66} \div 6 = 11$

$11 \times 6 = 66$

7.  $9 \times \boxed{12} = 108$

$108 \div 9 = 12$

8.  $81 \div \boxed{9} = 9$

$9 \times 9 = 81$

9.  $\boxed{113} + 38 = 75$

$75 - 38 = 37$

10.  $120 - \boxed{74} = 46$

$120 - 46 = 74$

Check two answers by substitution:



$7 \times 8$   
 $= 56$

$74 + 46$   
 $= 120$



# Inverse Moves



Name: \_\_\_\_\_

Solve each equation. Then write an inverse equation that proves your answer.

1.  $5 \times \square = 65$

|              |                   |
|--------------|-------------------|
| Solve:       | Inverse equation: |
| <br><br><br> | <br><br><br>      |

2.  $\square \div 8 = 7$

|              |                   |
|--------------|-------------------|
| Solve:       | Inverse equation: |
| <br><br><br> | <br><br><br>      |

3.  $94 - \square = 37$

|              |                   |
|--------------|-------------------|
| Solve:       | Inverse equation: |
| <br><br><br> | <br><br><br>      |

4.  $\square + 5 = 83$

|              |                   |
|--------------|-------------------|
| Solve:       | Inverse equation: |
| <br><br><br> | <br><br><br>      |

5.  $132 \div \square = 11$

|              |                   |
|--------------|-------------------|
| Solve:       | Inverse equation: |
| <br><br><br> | <br><br><br>      |

6.  $\square - 29 = 58$

|              |                   |
|--------------|-------------------|
| Solve:       | Inverse equation: |
| <br><br><br> | <br><br><br>      |

7.  $4 \times \square = 92$

|              |                   |
|--------------|-------------------|
| Solve:       | Inverse equation: |
| <br><br><br> | <br><br><br>      |

8.  $\square \div 12 = 9$

|              |                   |
|--------------|-------------------|
| Solve:       | Inverse equation: |
| <br><br><br> | <br><br><br>      |

9.  $205 - \square = 87$

|              |                   |
|--------------|-------------------|
| Solve:       | Inverse equation: |
| <br><br><br> | <br><br><br>      |

10.  $\square + 67 = 150$

|              |                   |
|--------------|-------------------|
| Solve:       | Inverse equation: |
| <br><br><br> | <br><br><br>      |

Which inverse pair did you use most? \_\_\_\_\_



# Inverse Moves



Name: ANSWERS

Solve each equation. Then write an inverse equation that proves your answer.

1.  $5 \times \square = 65$

|           |                                    |
|-----------|------------------------------------|
| Solve:    | Inverse equation:                  |
| <b>13</b> | <b><math>65 \div 5 = 13</math></b> |

2.  $\square \div 8 = 7$

|           |                                     |
|-----------|-------------------------------------|
| Solve:    | Inverse equation:                   |
| <b>56</b> | <b><math>7 \times 8 = 56</math></b> |

3.  $94 - \square = 37$

|           |                                  |
|-----------|----------------------------------|
| Solve:    | Inverse equation:                |
| <b>57</b> | <b><math>94 - 37 = 57</math></b> |

4.  $\square + 46 = 83$

|           |                                  |
|-----------|----------------------------------|
| Solve:    | Inverse equation:                |
| <b>37</b> | <b><math>83 - 46 = 37</math></b> |

5.  $132 \div \square = 11$

|           |                                        |
|-----------|----------------------------------------|
| Solve:    | Inverse equation:                      |
| <b>12</b> | <b><math>11 \times 12 = 132</math></b> |

6.  $\square - 29 = 58$

|           |                                  |
|-----------|----------------------------------|
| Solve:    | Inverse equation:                |
| <b>87</b> | <b><math>58 + 29 = 87</math></b> |

7.  $4 \times \square = 92$

|           |                                    |
|-----------|------------------------------------|
| Solve:    | Inverse equation:                  |
| <b>23</b> | <b><math>92 \div 4 = 23</math></b> |

8.  $\square \div 12 = 9$

|            |                                       |
|------------|---------------------------------------|
| Solve:     | Inverse equation:                     |
| <b>108</b> | <b><math>9 \times 12 = 108</math></b> |

9.  $205 - \square = 87$

|            |                                    |
|------------|------------------------------------|
| Solve:     | Inverse equation:                  |
| <b>118</b> | <b><math>205 - 87 = 118</math></b> |

10.  $\square + 67 = 150$

|           |                                   |
|-----------|-----------------------------------|
| Solve:    | Inverse equation:                 |
| <b>83</b> | <b><math>150 - 67 = 83</math></b> |

Which inverse pair did you use most? multiplication and division



## Equivalent Equations - Core



Name: \_\_\_\_\_

Write **YES** if each pair has the same value. Write **NO** if it does not. Repair every **NO** pair.1.  $3 \times 8$  and  $48 \div 2$  YES / NO Repair: \_\_\_\_\_2.  $72 \div 9$  and  $4 + 4$  YES / NO Repair: \_\_\_\_\_3.  $96 \div 12$  and  $3 \times 3$  YES / NO Repair: \_\_\_\_\_4.  $63 \div 7$  and  $14 - 6$  YES / NO Repair: \_\_\_\_\_5.  $45 + 18$  and  $9 \times 7$  YES / NO Repair: \_\_\_\_\_6.  $55 - 17$  and  $6 \times 6$  YES / NO Repair: \_\_\_\_\_7.  $1/2 \times 12$  and  $2 \times 6$  YES / NO Repair: \_\_\_\_\_8.  $5 \times 51$  and  $9 \times 7$  YES / NO Repair: \_\_\_\_\_

Explain how you checked one pair:

---

---

---

---



# Equivalent Equations - Core

Name: ANSWERS

Write **YES** if each pair has the same value. Write **NO** if it does not. Repair every **NO** pair.

1.  $3 \times 8$  and  $48 \div 2$  YES Repair: \_\_\_\_\_

2.  $72 \div 9$  and  $4 + 4$  YES Repair: \_\_\_\_\_

3.  $96 \div 12$  and  $3 \times 3$  NO Repair:  $96 \div 12 = 24 \div 3$

4.  $63 \div 7$  and  $14 - 6$  NO Repair:  $63 \div 7 = 15 - 6$

5.  $45 + 18$  and  $9 \times 7$  YES Repair: \_\_\_\_\_

6.  $55 - 17$  and  $6 \times 6$  NO Repair:  $55 - 19 = 6 \times 6$

7.  $1/2 \times 12$  and  $2 \times 6$  YES Repair: \_\_\_\_\_

8.  $5 \times 31$  and  $9 \times 7$  YES Repair: \_\_\_\_\_

Explain how you checked one pair:

**Sample: I evaluated both expressions. A pair is equivalent when both sides have the same value.**

# Equivalent Equations - Extension



Name: \_\_\_\_\_

Fill each square so the two sides have the same value. Show a quick check.



1.  $6 \times 8 = \square + 18$

Check: \_\_\_\_\_

2.  $96 \div 4 = 3 \times \square$

Check: \_\_\_\_\_

3.  $125 - 47 = \square \div 2$

Check: \_\_\_\_\_

4.  $7 \times 51 = \square$

Check: \_\_\_\_\_

5.  $\square + 36 = 12 \times 8$

Check: \_\_\_\_\_

6.  $144 \div \square = 4 \times 3$

Check: \_\_\_\_\_

7.  $7 \times \square = 100 - 25$

Check: \_\_\_\_\_

8.  $\square - 29 = 8 \times 7$

Check: \_\_\_\_\_

Choose one equation and explain why both sides balance:

---

---

---

---

---

# Equivalent Equations - Extension



Name: ANSWERS

Fill each square so the two sides have the same value. Show a quick check.



1.  $6 \times 8 = \boxed{30} + 18$

Check:  $48 = 48$

2.  $96 \div 4 = 3 \times \boxed{8}$

Check:  $24 = 24$

3.  $125 - 47 = \boxed{156} \div 2$

Check:  $78 = 78$

4.  $7 \times 51 = \boxed{18}$

Check:  $63 = 63$

5.  $\boxed{60} + 36 = 12 \times 8$

Check:  $96 = 96$

6.  $144 \div \boxed{12} = 4 \times 3$

Check:  $12 = 12$

7.  $7 \times \boxed{11} = 100 - 23$

Check:  $77 = 77$

8.  $\boxed{85} - 29 = 8 \times 7$

Check:  $56 = 56$

Choose one equation and explain why both sides balance:

Sample:  $7 \times 11 = 77$  and  $100 - 23 = 77$ , so both sides balance.

---

---

---

---



# Simplify First - Multi-Step Unknowns

Name: \_\_\_\_\_

Simplify the known side. Then solve for the unknown and check it.

1.  $5 \times \square = 80 - 20$

Simplify: \_\_\_\_\_

Solve: \_\_\_\_\_

Check: \_\_\_\_\_

2.  $\square + 18 = 9 \times 7$

Simplify: \_\_\_\_\_

Solve: \_\_\_\_\_

Check: \_\_\_\_\_

3.  $4 \times \square = 120 \div 3$

Simplify: \_\_\_\_\_

Solve: \_\_\_\_\_

Check: \_\_\_\_\_

4.  $\square - 12 = 14 \times 9$

Simplify: \_\_\_\_\_

Solve: \_\_\_\_\_

Check: \_\_\_\_\_

5.  $\square \div 6 = 48 \div 4$

Simplify: \_\_\_\_\_

Solve: \_\_\_\_\_

Check: \_\_\_\_\_

6.  $7 \times \square = 100 - 37$

Simplify: \_\_\_\_\_

Solve: \_\_\_\_\_

Check: \_\_\_\_\_

7.  $14 \times \square = 8 \times 11$

Simplify: \_\_\_\_\_

Solve: \_\_\_\_\_

Check: \_\_\_\_\_

8.  $\square + 35 = 6 \times 15$

Simplify: \_\_\_\_\_

Solve: \_\_\_\_\_

Check: \_\_\_\_\_



Show the three stages for each: simplify, solve, check.



# Simplify First - Multi-Step Unknowns

Name: **ANSWERS**

Simplify the known side. Then solve for the unknown and check it.

1.  $5 \times \square = 80 - 20$

Simplify:  $80 - 20 = 60$

Solve:  $\square = 12$

Check:  $5 \times 12 = 60$

2.  $\square + 18 = 9 \times 7$

Simplify:  $9 \times 7 = 63$

Solve:  $\square = 45$

Check:  $45 + 18 = 63$

3.  $4 \times \square = 120 \div 3$

Simplify:  $120 \div 3 = 40$

Solve:  $\square = 10$

Check:  $4 \times 10 = 40$

4.  $\square - 14 = 14 + 19$

Simplify:  $14 + 19 = 33$

Solve:  $\square = 59$

Check:  $59 - 14 = 45$

5.  $\square \div 6 = 48 \div 4$

Simplify:  $48 \div 4 = 12$

Solve:  $\square = 72$

Check:  $72 \div 6 = 12$

6.  $7 \times \square = 100 - 37$

Simplify:  $100 - 37 = 63$

Solve:  $\square = 9$

Check:  $7 \times 9 = 63$

7.  $144 - \square = 8 \times 11$

Simplify:  $8 \times 11 = 88$

Solve:  $\square = 56$

Check:  $144 - 56 = 88$

8.  $\square + 35 = 6 \times 15$

Simplify:  $6 \times 15 = 90$

Solve:  $\square = 55$

Check:  $55 + 35 = 90$



Show the three stages for each: simplify, solve, check.



# Multi-Step Unknowns - Challenge



Name: \_\_\_\_\_

Undo the operations in reverse order. Show every step.

1.  $3 \times \square + 5 = 32$

---

---

2.  $5 \times \square - 7 = 48$

---

---

3.  $\square \div 4 + 6 = 15$

---

---

4.  $2 \times \square + 18 = 70$

---

---

5.  $\square \div 5 - 3 = 9$

---

---

6.  $4 \times \square - 12 = 76$

---

---

7.  $3 \times (\square + 4) = 33$

---

---

8.  $96 \div (\square + 4) = 8$

---

---

Choose one answer and prove it by substitution:

---

---

---

---



# Multi-Step Unknowns - Challenge



Name: ANSWERS

Undo the operations in reverse order. Show every step.

1.  $3 \times \square + 5 = 32$

$32 - 5 = 27; 27 \div 3 = 9; \square = 9$

2.  $5 \times \square - 7 = 48$

$48 + 7 = 55; 55 \div 5 = 11; \square = 11$

3.  $\square \div 4 + 6 = 15$

$15 - 6 = 9; 9 \times 4 = 36; \square = 36$

4.  $2 \times \square + 18 = 70$

$70 - 18 = 52; 52 \div 2 = 26; \square = 26$

5.  $\square \div 5 - 3 = 9$

$9 + 3 = 12; 12 \times 5 = 60; \square = 60$

6.  $4 \times \square - 12 = 76$

$76 + 12 = 88; 88 \div 4 = 22; \square = 22$

7.  $3 \times (\square + 4) = 33$

$33 \div 3 = 11; 11 - 4 = 7; \square = 7$

8.  $96 \div (\square + 4) = 8$

$96 \div 8 = 12; 12 - 4 = 8; \square = 8$

Choose one answer and prove it by substitution:

Sample:  $3 \times (7 + 4) = 3 \times 11 = 33$ .

# Unknown Value Word Problems

Name: \_\_\_\_\_



**Write an equation with a square for the unknown. Solve it and check.**

1. Six notebooks cost \$54 altogether. What is the cost of one notebook?

Equation:

Working:

Answer:

2. Mia had some stickers. After receiving 28 more, she had 75. How many did she start with?

Equation:

Working:

Answer:

3. I multiply a number by 4 and subtract 5. The result is 11. What is the number?

Equation:

Working:

Answer:

4. A 96 km route is split into equal stages of 12 km. How many stages are there?

Equation:

Working:

Answer:

5. A book had 120 pages. After some pages were read, 72 remained. How many pages were read?

Equation:

Working:

Answer:

6. Five equal boxes and 15 loose counters make 65 counters. How many are in each box?

Equation:

Working:

Answer:



# Unknown Value Word Problems

Name: ANSWERS



Write an equation with a square for the unknown. Solve it and check.

1. Six notebooks cost \$54 altogether. What is the cost of one notebook?

Equation:

$$6 \times \square = 54$$

Working:

$$54 \div 6 = 9$$

Answer:

\$9

2. Mia had some stickers. After receiving 28 more, she had 75. How many did she start with?

Equation:

$$\square + 28 = 75$$

Working:

$$75 - 28 = 47$$

Answer:

47 stickers

3. I multiply a number by 4 and subtract 5. The result is 43. What is the number?

Equation:

$$4 \times \square - 5 = 43$$

Working:

$$43 + 5 = 48; 48 \div 4 = 12$$

Answer:

12

4. A 96 km route is split into equal stages of 12 km. How many stages are there?

Equation:

$$96 \div \square = 8$$

$$96 \div 12 = 8$$

Answer:

8 stages

5. A book had 180 pages. After some pages were read, 72 remained. How many pages were read?

Equation:

$$180 - \square = 72$$

Working:

$$180 - 72 = 108$$

Answer:

108 pages

6. Five equal boxes and 15 loose counters make 65 counters. How many are in each box?

Equation:

$$5 \times \square + 15 = 65$$

Working:

$$65 - 15 = 50; 50 \div 5 = 10$$

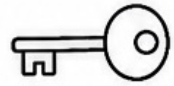
Answer:

10 counters





# Reason and Prove



Use words, equations or diagrams to justify your thinking.

1. Write two different equations with an unknown value of 14.

---

---

---

---

2. Sam says  $8 \times \square = 72$  has an unknown value of 8. Explain & correct the error.

---

---

---

---

3. Which does not belong?  $\square + 35 = 80$  |  $\square \times \square = 2$  |  $90 - \square = 45$  |  $144 \div \square = 3$

---

---

---

---

4. Create a multi-step equation with an unknown value of 12.

---

---

---

---

5. Show two ways to solve  $84 \div \square = 7$ .

---

---

---

---

6. Challenge: solve and check  $3 \times \square + 8 = 50$ .

---

---

---

---



# Reason and Prove



Use words, equations or diagrams to justify your thinking.

1. Write two different equations with an unknown value of 14.

**Sample:  $\square + 6 = 20$  and  $3 \times \square = 42$ .**

2. Sam says  $8 \times \square = 72$  has an unknown value of 8. Explain & correct the error.

**$8 \times 8 = 64$ , not 72.  $72 \div 8 = 9$ , so  $\square = 9$**

3. Which does not belong?  $\square + 35 = 80$  |  $2 \times \square = 20$  |  $90 - \square = 45$  |  $144 \div \square = 3$

**$144 \div \square = 3$  does not belong. Unknown is 48; the others have unknown 45.**

4. Create a multi-step equation with an unknown value of 12.

**Sample:  $2 \times \square + 8 = 52$**

5. Show two ways to solve  $84 \div \square = 7$ .

**Method 1:  $7 \times \square = 84$ , so  $\square = 12$ . Method 2:  $84 \div 7 = 12$ .**

6. Challenge: solve and check  $3 \times \square + 8 = 50$ .

**$50 - 8 = 42$ ;  $42 \div 3 = 14$ ; check:  $3 \times 14 + 8 = 50$ .**



# Unknown Values Assessment - Part A



Name: \_\_\_\_\_

Date: \_\_\_\_\_



Find each unknown. Show clear working and check where asked.

1.  $\square + 27 = 64$

2.  $85 - \square = 39$

3.  $8 \times \square = 72$

4.  $132 \div \square = 11$

5.  $\square \div 7 = 9$

6.  $6 \times \square = 120 - 30$

7.  $\square + 18 = 7 + 9$

8.  $4 \times \square - 5 = 43$

9. Which equation is equivalent to  $9 \times \square = 81$ ? Circle one.

A.  $81 \div 9 = \square$

B.  $81 - 9 = \square$

C.  $9 + 9 = \square$

D.  $9 \div 81 = \square$

10. Explain how an inverse operation can help you solve or check an unknown value.



# Unknown Values Assessment - Part B



Name: \_\_\_\_\_ Date: \_\_\_\_\_

Apply what you know. Write an equation, solve it and justify your thinking.

1. Four equal bags and 6 loose counters make 54 counters altogether. How many counters are in each bag?



Equation: \_\_\_\_\_

Working: \_\_\_\_\_

Answer: \_\_\_\_\_

2. A student says the unknown in  $96 \div \square = 8$  is 8. Explain the error and give the correct value.



3. Which two equations have the same unknown value? Show how you know.



A.  $\square + 17 = 58$

B.  $\square \times 246$

C.  $90 - \square = 52$

D.  $160 \div \square = 4$

4. Create a two-step equation whose unknown value is 15. Then prove your answer by substitution.



Equation: \_\_\_\_\_

Working: \_\_\_\_\_

Answer: \_\_\_\_\_

5. Solve and check:  $3 \times \square + 8 = 50$





# Unknown Values Assessment - Part A



Name: **ANSWERS**

Date: \_\_\_\_\_



Find each unknown. Show clear working and check where asked.

1.  $\square + 27 = 64$

$\square = 37$

check:  $37 + 27 = 64$

2.  $85 - \square = 39$

$\square = 46$

check:  $85 - 46 = 39$

3.  $8 \times \square = 72$

$\square = 9$

check:  $8 \times 9 = 72$

4.  $132 \div \square = 11$

$\square = 12$

check:  $132 \div 12 = 11$

5.  $\square \div 7 = 9$

$\square = 63$

check:  $63 \div 7 = 9$

6.  $6 \times \square = 120 - 30$

$120 - 30 = 90$

$\square = 15$

check:  $6 \times 15 = 90$

7.  $\square + 18 = 7 \times 9$

$7 \times 9 = 63$

$\square = 45$

check:  $45 + 18 = 63$

8.  $4 \times \square - 5 = 43$

$43 + 5 = 48$

$48 \div 4 = 12$

$\square = 12$

9. Which equation is equivalent to  $9 \times \square = 81$ ? Circle one.

☒ A.  $81 \div 9 = \square$   
 $81 \div 9 = 9$

B.  $81 - 9 = \square$

C.  $9 + 9 = \square$

D.  $9 \div 81 = \square$

10. Explain how an inverse operation can help you solve or check an unknown value.

Inverse operations undo each other. For  $\square + 27 = 64$ ,  
use  $64 - 27 = 37$ . Substitute to check:  $37 + 27 = 64$ .



# Unknown Values Assessment - Part B



Name: \_\_\_\_\_ **ANSWERS** \_\_\_\_\_ Date: \_\_\_\_\_

Apply what you know. Write an equation, solve it and justify your thinking.

1. Four equal bags and 6 loose counters make 54 counters altogether. How many counters are in each bag?



Equation:  $4 \times \square + 6 = 54$

Working:  $54 - 6 = 48; 48 \div 4 = 12$

Answer: **12 counters**

2. A student says the unknown in  $96 \div \square = 8$  is 8. Explain the error and give the correct value.



$96 \div 8 = 12$ , so 8 is not the divisor.  $\square = 12$ . Check:  $96 \div 12 = 8$ .

3. Which two equations have the same unknown value? Show how you know.



A.  $\square + 17 = 58$

B.  $\square \times 4 = 146$

C.  $90 - \square = 52$

D.  $160 \div \square = 4$

A and B.  $58 - 17 = 41$  and  $146 \div 4 = 41$ , so both have  $\square = 41$ .

4. Create a two-step equation whose unknown value is 15. Then prove your answer by substitution.



Equation: Sample equation:  $5 \times \square - 10 = 65$

Working:  $65 + 10 = 75; 75 \div 5 = 15$

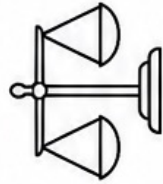
Check:  $5 \times 15 - 10 = 65$ .

Answer: **15**

5. Solve and check:  $3 \times \square + 8 = 50$



$50 - 8 = 42; 42 \div 3 = 14; \square = 14$ . Check:  $3 \times 14 + 8 = 50$ .



# Unknown Values (pre-algebra) Rubric



Student: \_\_\_\_\_

Date: \_\_\_\_\_

Use the descriptors to identify the student's current level of achievement.

| CRITERIA                    | BEGINNING                                   | DEVELOPING                                | ACHIEVING                              | CONFIDENT                                   | EXCEEDING                                    |
|-----------------------------|---------------------------------------------|-------------------------------------------|----------------------------------------|---------------------------------------------|----------------------------------------------|
| Understands equality        | Needs support to interpret the equals sign. | Recognises that both sides must match.    | Explains equality as balance.          | Uses equality to form equivalent equations. | Justifies equivalent forms flexibly.         |
| Selects inverse operations  | Needs prompts to choose an inverse.         | Chooses an inverse for familiar examples. | Uses inverse operations accurately.    | Selects efficient inverse steps.            | Compares and explains multiple methods.      |
| Solves unknown values       | Solves simple examples with support.        | Solves one-step unknowns.                 | Solves one-step multi-step unknowns.   | Solves varied unknown positions accurately. | Generalises strategies to complex equations. |
| Shows and checks reasoning  | Records limited working.                    | Shows some steps.                         | Shows clear and checked solutions.     | Explains and verifies reasoning.            | Critiques errors and proves solutions.       |
| Applies learning in context | Needs help to model a context.              | Matches familiar contexts to equations.   | Forms and solves contextual equations. | Explains solutions and interpretations.     | Creates and solves original problems.        |

Overall achievement: \_\_\_\_\_

Teacher comment: \_\_\_\_\_

Next step: \_\_\_\_\_

# Learning goals

We are learning:

- interpret an unknown as a value to find
- keep both sides of an equation equal
- use inverse operations to solve
- identify and solve multi-step equations
- substitute to check every solution



# What is an unknown?

An unknown is a value we do not know yet.

It may be shown by  $\square$ ,  $\Delta$ , a letter or a blank.

The sum is a placeholder for one exact value.

Example:  $\square + 7 = 19$



# Equality means balance

The equals sign means both sides have the same value.

Think of an equation as a balanced scale.

Whatever value represents the unknown must keep that balance true.

Example:  $24 + 8 = 4 \times 8$



# Addition unknown your turn

Solve  $\square + 27 = 64$

Ask: what operation will undo  $+ 27$ ?

Use the same relationship to keep the equation balanced.

prepare a solution and prepare a check.



# Addition unknown reversal

Undo addition with subtraction.

$$64 - 27 = 37, \text{ so } 37 = 37.$$

Check by substitution:

$$37 + 27 = 64 \checkmark$$



# Subtraction unknown – you turn

Solve  $85 - \square = 39$

The unknown is the amount being subtracted.

Find the difference between 85 and 39.

pro... solve and prepare a check.



# Subtraction unknown = reveal

$$85 - 39 = 46, \text{ so } \square = 46$$

Check by subtraction:

$$85 - 46 = 39 \checkmark$$

The two sides are equal.



# Inverse operation pairs

Addition and subtraction undo each other.

Multiplication and division undo each other.

Choose the inverse that isolates the unknown.

Then substitute the value into the original equation to check.



# Multiplication unknown in your turn

Solve  $8 \times \square = 72$

Ask: what operation will undo  $\times 8$ ?

Write the related division fact.

Answer, solve and check.



# Multiplication unknown – $\square$ ved

Undo multiplication with division.

$$72 \div 8 = 9, 8 \times 9 = 72$$

Check by substitution:

$$8 \times 9 = 72 \checkmark$$



# Division unknown – your turn

Solve:  $132 \div \square = 11$

The unknown is the divisor.

Use the related fact  $11 \times \square = 132$ .

Always, solve and check.



# Division unknown - remainder

$$132 \div 11 = 12 \text{ so } \square = 12.$$

check by substitution:

$$132 \div 12 = 11 \checkmark$$



# Equivalent equations

Equivalent equations express the same relationship.  
They can reveal an unknown through an inverse operation.

Example.

$$7 \times \square = 84 \quad \leftrightarrow \quad 84 \div 7 = \square$$

Both give  $\square = 12$ .



# Guided practice

Simplify any known expression first. Then solve.

$$2 \square + 1 = 1 \times 9$$

$$P \square \div 6 = 48 \div 4$$

$$4 \square = 120 \div 3$$

Pause before the answers.



# Guided practice – answers

A.  $7 \times 9 = 63$ ,  $63 - 18 = 45$ ,  $45 \div 1 = 45$

B.  $48 \div 4 = 12$ ;  $12 \times 6 = 72$ ;  $\square = 72$

C.  $20 \times 2 = 40$ ;  $40 \div 4 = 10$ ;  $\square = 10$

Substitute each value to check.



# Unknowns can change position

$$\square + 35 = 80 \rightarrow \text{subtract 35}$$

$$90 - \square = 4 \rightarrow \text{find the difference}$$

$$5 \times \square = 25 \rightarrow \text{divide by 5}$$

$$144 \div \square = 3 \rightarrow \text{use } 3 \times \square = 144$$

Remember to check the unknown's position before choosing a strategy.



# Simplify first

Solve:  $6 \times \square = 20 - 10$

Step 1: simplify the known side.

$$20 - 10 = 10$$

Step 2: solve  $6 \times \square = 10$ .

Step 3: check in the original equation.



# Worked multi-step example

Solve:  $4 \times \square - 5 =$

Undo  $-5$  first:  $43 + 5 = 48$

Undo  $\times$  next:  $48 \div 4 = 12$

Therefore  $\square = 12$ .

Check:  $4 \times 12 - 5 = 43 \checkmark$



# Multi-step practice

Undo operations in reverse order.

$$3 \times \square = 32$$

$$\square \div 4 + 6 = 15$$

$$2 \square + 18 = 70$$

Show every inverse step.



# Multi-step answers

A.  $32 - 5 = 27 \div 3 = 9, \square = 9$

B.  $15 \div 6 = 9; 9 \times 4 = 36; \square = 36$

C.  $70 - 44 = 26; 52 \div 2 = 26; \square = 26$

Students must be able to prove each result.



# Model a word problem

Five equal boxes and 15 loose counters make 65 counters.

Equation:  $5 \square + 15 = 65$

$$5 - 15 = 50$$

$$5 \div 5 = 10$$

There are 10 counters in each box.



# Spot and correct the error

Sam says  $8 \times \square = 72$  has an unknown value of 8.

Test Sam's value:  $8 \times 8 = 64$ , not 72.

Which inverse operation finds the correct value?

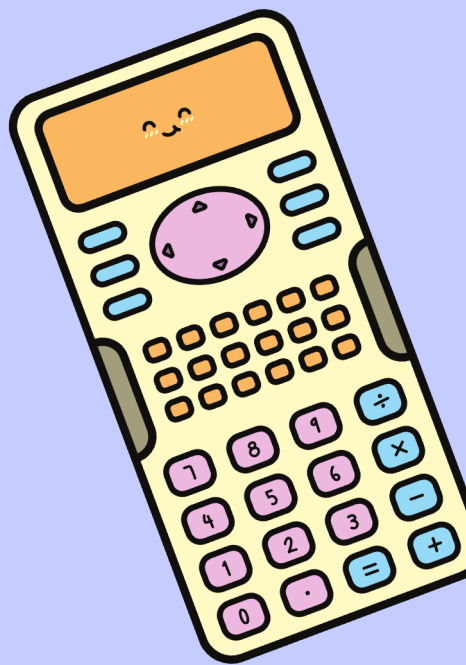
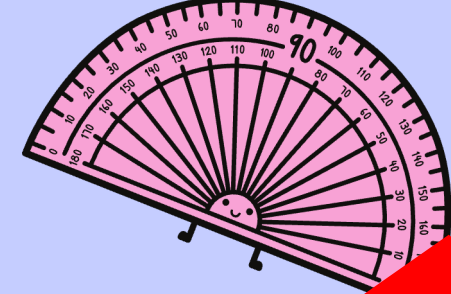
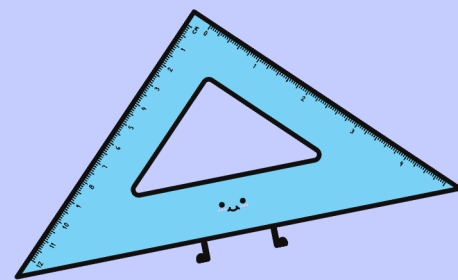
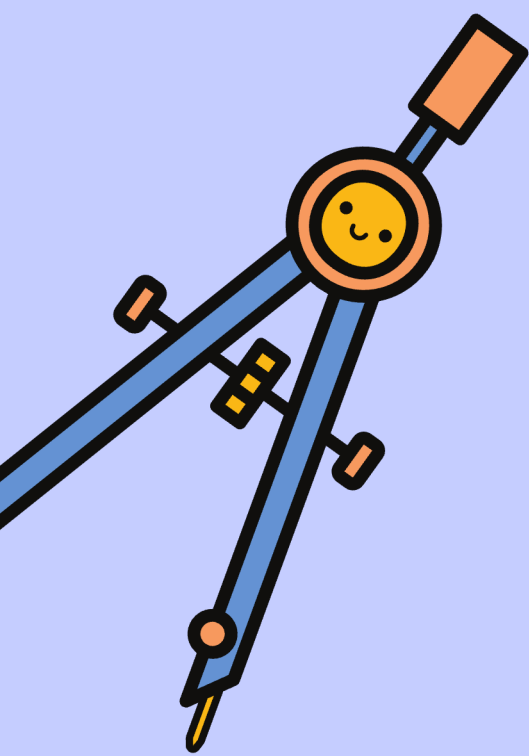
Explain the error, solve and check.



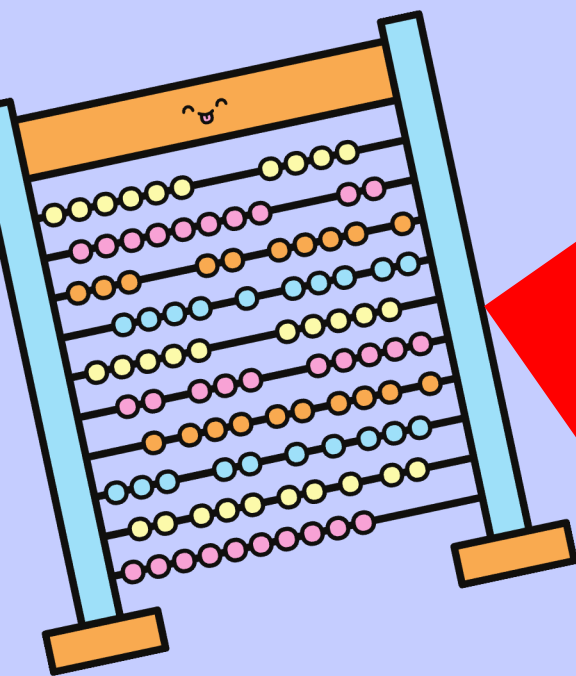
# Five-step review

1. Read the equality and locate the unknown.
2. Simplify any fully known side.
3. Choose the inverse operation.
4. Solve one step at a time.
5. Substitute into the original equation and check.

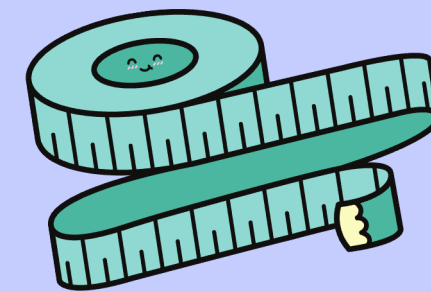
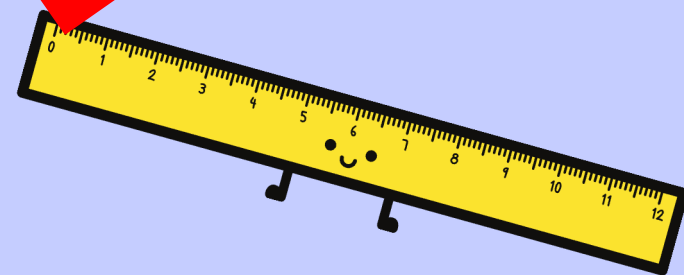




Well Done!



PREF



# Unknown Values Quiz



# Question 1 – Multiple choice

What is the unknown in  $\square \div 28 = 5$ ?

A. 5

B. 45

C. 55

D. 101



# Answer 1

B. 5

$$73 - 28 = 45.$$

$$\text{Check: } 45 + 28 = 73 \checkmark$$



## Question 2 – True or false

If  $9 \times \square = 63$ , the unknown value is 7.

True or false?

Be ready to prove your choice.



## Answer 2

11

$$63 \div 9 = 7.$$

$$63 \div 9 \times 7 = 63 \checkmark$$



## Question 3 – Short answer

Solve:  $96 - 41$

Show an inverse operation and a substitution check.



# Answer 3

$$\square = 55$$

$$55 - 41 = 55.$$

$$\text{Check: } 55 - 55 = 41 \checkmark$$



## Question 4 – Multiple choice

Which equation is equivalent to  $7 \times 12 = 84$ ?

A.  $84 \div 7 = \square$

B.  $84 - 7 = \square$

C.  $7 + 7 = \square$

D.  $7 \div 84 = \square$



Answer 4

A.  $84 \div 7 = \square$

$4 \times 12 = 12$ , so  $\square = 12$ .

Check  $\square \times 12 = 84 \checkmark$



## Question 5 – True or false

The unknown in  $7 + 6 = 8$  is 14.

True or false?

Explain using a related fact.



Answer 5

For

$\times = 48$ , so  $\square = 48$ .

Check:  $48 \div 6 = 8 \checkmark$



## Question 6 – Short answer

Solve:  $5 \times \square = 52$

Show the inverse steps in reverse order.



# Answer 6

$$52 - 7 = 45$$

$$45 \div 5 = 9$$

$$\square = 9$$

$$\text{Check: } 5 \times 9 + 7 = 52 \checkmark$$



## Question 7 – Multiple choice

What is the unknown in  $14 \div \square = 2$ ?

- A. 2
- B. 10
- C. 12
- D. 14



**Answer 7**

C. 9

Use the related fact  $12 \times \square = 144$ .

$144 \div 12 = 12$ , so  $\square = 12$ .



## Question 8 – True or false

The equation  $3 \times (x + 4) = 23$  has unknown value 7.

True or false?

Show the reverse steps.



# Answer 8

True.

$$33 \div 3 =$$

$$11 \div 4 = 7$$

$$\text{check } 3 \times (7 + 4) = 33 \checkmark$$



## Question 9 – Short answer

Four equal bags and loose counters make 54 counters.

How many counters are in each bag?

Write and solve an equation.



Answer a

Equation:  $4 \times 6 = 54$

$48 \div 4 = 12$ ;  $48 \div 4 = 12$

There are 2 counters in each bag.



# Question 10 – Error analysis

Jamie says the unknown in  $90 - \square = 38$  is 38.

Is Jamie correct? Explain, solve and check.



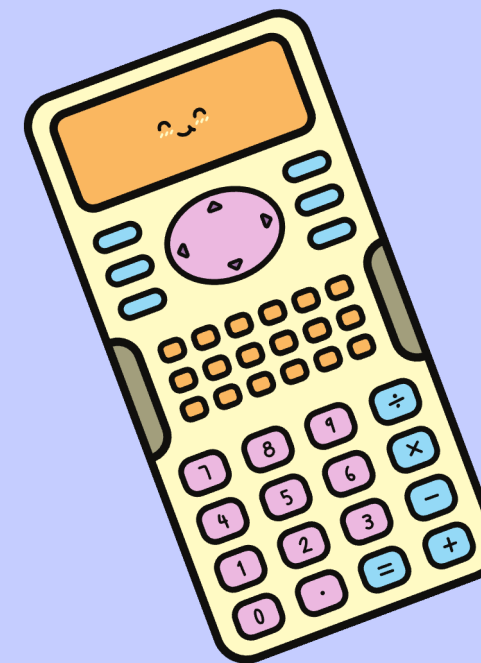
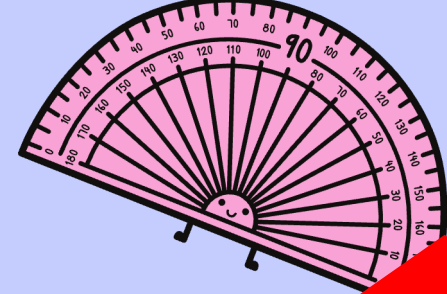
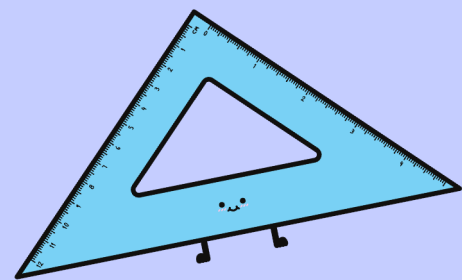
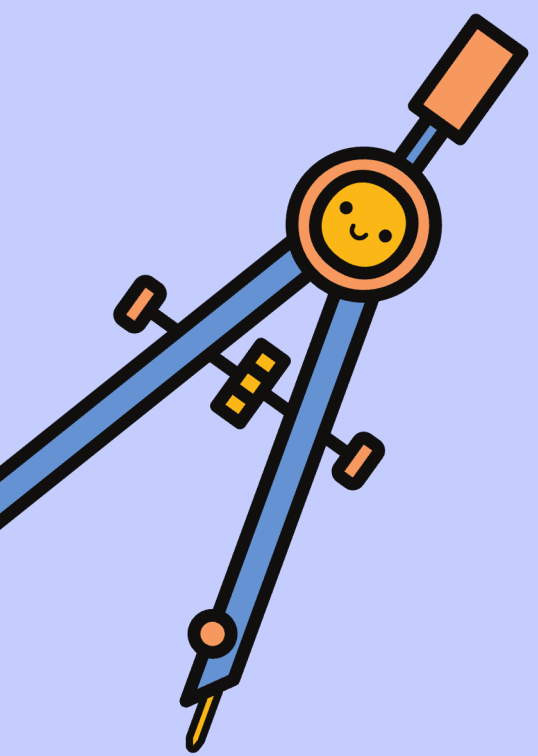
# Answer 10

Jane is not correct.

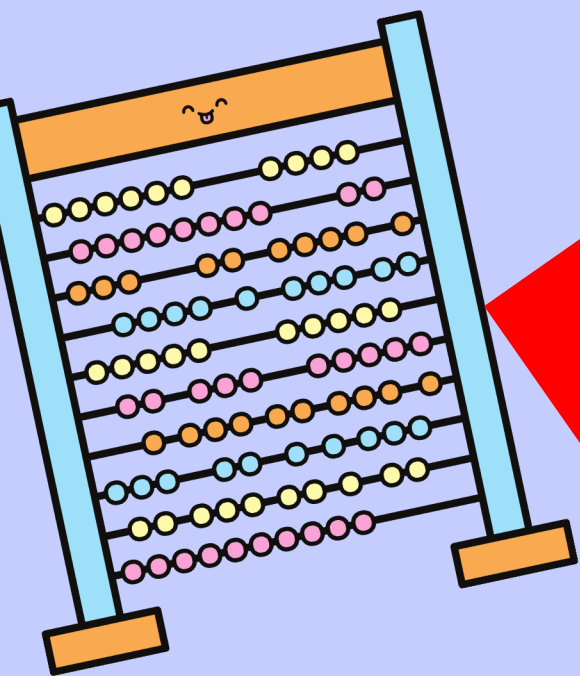
$$90 - 38 = 52, \text{ so } \square = 52.$$

$$\text{Check: } 90 - 52 = 38 \checkmark$$





Well Done!



PREF

