Chapter 2: Fractions

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Exercise 2.1 — Let Us Do — Equivalent Fractions with Fraction Kit (p. 19)

Q1 In groups of 3 or 4, find different ways of making a whole with different fraction pieces from your kit. Write the equivalent fractions for the following that you may find in the process.
(a) 1/3 = ___ = ___ = ___
(b) 1/4 = ___ = ___ = ___
(c) 1/5 = ___ = ___ = ___
(d) 1/6 = ___ = ___ = ___

SOLUTION

To make a whole with 1/3 pieces you need 3 of them. You can also make the same whole using smaller pieces and find fractions that name the same amount.

(a) 1/3 = 2/6 = 3/9 = 4/12
(Multiply top and bottom by 2, 3, 4 to get equivalent fractions.)

(b) 1/4 = 2/8 = 3/12 = 4/16
(Multiply top and bottom by 2, 3, 4.)

(c) 1/5 = 2/10 = 3/15 = 4/20
(Multiply top and bottom by 2, 3, 4.)

(d) 1/6 = 2/12 = 3/18 = 4/24
(Multiply top and bottom by 2, 3, 4.)

Answer: (a) 1/3 = 2/6 = 3/9 = 4/12 (b) 1/4 = 2/8 = 3/12 = 4/16 (c) 1/5 = 2/10 = 3/15 = 4/20 (d) 1/6 = 2/12 = 3/18 = 4/24

Q2 Find the following using your kit. You can also shade and check.
A. How many 1/6 s make 1/3?
B. How many 1/8 s make (a) 1/4? (b) 1/2?
C. How many 1/12 s make (a) 1/2? (b) 1/3? (c) 1/4? (d) 1/6?

SOLUTION

A. How many 1/6 s make 1/3?
1/3 = 2/6, so 2 pieces of 1/6 fit into 1/3.
Answer: 2

B. How many 1/8 s make:
(a) 1/4 = 2/8, so 2 pieces of 1/8.
(b) 1/2 = 4/8, so 4 pieces of 1/8.

C. How many 1/12 s make:
(a) 1/2 = 6/12, so 6 pieces of 1/12.
(b) 1/3 = 4/12, so 4 pieces of 1/12.
(c) 1/4 = 3/12, so 3 pieces of 1/12.
(d) 1/6 = 2/12, so 2 pieces of 1/12.

Answer: A: 2 B: (a) 2 (b) 4 C: (a) 6 (b) 4 (c) 3 (d) 2

Q3 Do as instructed using your fraction kit.
- Make a whole using only 1/6 and 1/12 pieces.
- Make a whole using 1/12, 1/4, and 1/2 pieces.
- Make a whole using any five pieces of the same size.
- Make a whole using any seven pieces.

SOLUTION

This is a hands-on activity with your fraction kit. Here is one combination that works for each part:

- Using only 1/6 and 1/12: take 2 pieces of 1/6 and 8 pieces of 1/12.
2/6 + 8/12 = 4/12 + 8/12 = 12/12 = 1 whole.

- Using 1/12, 1/4, and 1/2: take 1 piece of 1/2, 1 piece of 1/4, and 3 pieces of 1/12.
6/12 + 3/12 + 3/12 = 12/12 = 1 whole.

- Any five pieces of the same size: take 5 pieces of 1/5.
5 x 1/5 = 5/5 = 1 whole.

- Any seven pieces: take 5 pieces of 1/6 and 2 pieces of 1/12.
5/6 + 2/12 = 10/12 + 2/12 = 12/12 = 1 whole. That is 7 pieces in all.

Many other combinations are also possible. Write your own findings in the space provided in the book.

Answer: Sample answers: (a) 2 x 1/6 + 8 x 1/12 = 1 (b) 1 x 1/2 + 1 x 1/4 + 3 x 1/12 = 1 (c) 5 pieces of 1/5 = 1 (d) 5 x 1/6 + 2 x 1/12 = 1 (7 pieces). Many other combinations are possible.

Exercise 2.2 — Let Us Do — Making Equivalent Fractions (p. 21)

Q1 Fill in the blanks with equivalent fractions. There may be more than one answer.
(a) 1/7 = ___
(b) 2/3 = ___
(c) 3/4 = ___
(d) 3/5 = ___

SOLUTION

To make an equivalent fraction, multiply both numerator and denominator by the same number.

(a) 1/7: multiply by 2 => 2/14. Or by 3 => 3/21.
(b) 2/3: multiply by 2 => 4/6. Or by 3 => 6/9.
(c) 3/4: multiply by 2 => 6/8. Or by 3 => 9/12.
(d) 3/5: multiply by 2 => 6/10. Or by 3 => 9/15.

Answer: (a) 2/14 (or 3/21 etc.) (b) 4/6 (or 6/9 etc.) (c) 6/8 (or 9/12 etc.) (d) 6/10 (or 9/15 etc.)

Q2 Put a tick against the fractions that are equivalent.
(a) 2/3 and 3/4
(b) 3/5 and 6/10
(c) 4/12 and 2/6
(d) 6/9 and 1/3

SOLUTION

Two fractions are equivalent if cross-multiplication gives equal products (a/b = c/d when a x d = b x c).

(a) 2/3 and 3/4: 2 x 4 = 8, 3 x 3 = 9. 8 ≠ 9. NOT equivalent.
(b) 3/5 and 6/10: 3 x 10 = 30, 5 x 6 = 30. Equal. EQUIVALENT. ✓
(c) 4/12 and 2/6: 4 x 6 = 24, 12 x 2 = 24. Equal. EQUIVALENT. ✓
(d) 6/9 and 1/3: 6 x 3 = 18, 9 x 1 = 9. 18 ≠ 9. NOT equivalent.
(6/9 = 2/3, which is not equal to 1/3.)

Answer: Tick (b) 3/5 and 6/10 (c) 4/12 and 2/6. Parts (a) and (d) are not equivalent.

Q3 Fill in the boxes such that the fractions become equivalent.
(a) 2/5 = box/10
(b) 3/4 = box/16
(c) 4/7 = 8/box
(d) 5/9 = 25/box

SOLUTION

(a) 2/5 = ?/10: 10 = 5 x 2, so multiply numerator by 2 also: 2 x 2 = 4.
2/5 = 4/10. Check: 2 x 10 = 20, 5 x 4 = 20. ✓

(b) 3/4 = ?/16: 16 = 4 x 4, so multiply numerator by 4: 3 x 4 = 12.
3/4 = 12/16. Check: 3 x 16 = 48, 4 x 12 = 48. ✓

(c) 4/7 = 8/?: 8 = 4 x 2, so multiply denominator by 2: 7 x 2 = 14.
4/7 = 8/14. Check: 4 x 14 = 56, 7 x 8 = 56. ✓

(d) 5/9 = 25/?: 25 = 5 x 5, so multiply denominator by 5: 9 x 5 = 45.
5/9 = 25/45. Check: 5 x 45 = 225, 9 x 25 = 225. ✓

Answer: (a) 4 (b) 12 (c) 14 (d) 45

Exercise 2.3 — Let Us Do — Comparing Fractions, Same Denominator (p. 22–23)

Q1 Compare the fractions given below using < and > signs.

(a) 1/4 ___ 3/4
(b) 3/5 ___ 4/5
(c) 5/7 ___ 2/7
(d) 7/8 ___ 3/8
(e) 5/10 ___ 6/10
(f) 2/6 ___ 1/6

SOLUTION

When denominators are the same, the fraction with the bigger numerator is larger.

(a) 1/4 < 3/4 (1 < 3)
(b) 3/5 < 4/5 (3 < 4)
(c) 5/7 > 2/7 (5 > 2)
(d) 7/8 > 3/8 (7 > 3)
(e) 5/10 < 6/10 (5 < 6)
(f) 2/6 > 1/6 (2 > 1)

Answer: (a) < (b) < (c) > (d) > (e) < (f) >

Exercise 2.4 — Let Us Do — Comparing Fractions, Same Numerator (p. 23)

Q1 Compare the following fractions using < and > signs.

(a) 3/8 ___ 3/7
(b) 4/9 ___ 4/10
(c) 2/7 ___ 2/5
(d) 5/7 ___ 5/6
(e) 6/9 ___ 6/10
(f) 7/9 ___ 7/11

SOLUTION

When numerators are the same, the fraction with the bigger denominator is smaller (each piece is a smaller share).

(a) 3/8 < 3/7 (8 > 7, so each 1/8 piece is smaller than each 1/7 piece)
(b) 4/9 > 4/10 (9 < 10, so each 1/9 piece is bigger than each 1/10 piece)
(c) 2/7 < 2/5 (7 > 5, so 1/7 < 1/5)
(d) 5/7 < 5/6 (7 > 6, so 1/7 < 1/6)
(e) 6/9 > 6/10 (9 < 10, so 1/9 > 1/10)
(f) 7/9 > 7/11 (9 < 11, so 1/9 > 1/11)

Answer: (a) < (b) > (c) < (d) < (e) > (f) >

Exercise 2.5 — Let Us Do — Fractions Greater Than 1 (p. 28)

Q1 Use parathas and number lines to show the following fractions in your notebook.
(a) 2/3 and 5/3
(b) 3/4 and 5/4
(c) 4/8 and 9/8

SOLUTION

Draw parathas cut into equal pieces and shade the right number of pieces. Then mark the fractions on a number line.

(a) 2/3: shade 2 of the 3 pieces of 1 paratha. On the number line: 0, 1/3, 2/3, 3/3=1.
5/3: this is more than 1 whole. 3/3=1, so 5/3 = 1 whole paratha + 2/3 of another = 1 and 2/3. Mark 5/3 on the number line past 1.

(b) 3/4: shade 3 of the 4 pieces. 3/4 is less than 1.
5/4: 4/4=1, so 5/4 = 1 and 1/4. Mark past 1 on the number line.

(c) 4/8: shade 4 of the 8 pieces = 1/2 of a paratha. 4/8 = 1/2.
9/8: 8/8=1, so 9/8 = 1 and 1/8. Mark just past 1 on the number line.

Answer: (a) 2/3 < 1; 5/3 = 1 and 2/3 > 1. (b) 3/4 < 1; 5/4 = 1 and 1/4 > 1. (c) 4/8 = 1/2 < 1; 9/8 = 1 and 1/8 > 1.

Q2 Circle the fractions that are greater than one (whole). How do you know?
7/9 3/9 7/11 9/4 4/9 9/4 5/4 2/5 7/3 13/11 12/5 12/8

SOLUTION

A fraction is greater than 1 when the numerator is bigger than the denominator.

7/9: 7 < 9 — less than 1
3/9: 3 < 9 — less than 1
7/11: 7 < 11 — less than 1
9/4: 9 > 4 — GREATER than 1 ✓
4/9: 4 < 9 — less than 1
9/4: 9 > 4 — GREATER than 1 ✓
5/4: 5 > 4 — GREATER than 1 ✓
2/5: 2 < 5 — less than 1
7/3: 7 > 3 — GREATER than 1 ✓
13/11: 13 > 11 — GREATER than 1 ✓
12/5: 12 > 5 — GREATER than 1 ✓
12/8: 12 > 8 — GREATER than 1 ✓

Answer: Circle: 9/4, 9/4, 5/4, 7/3, 13/11, 12/5, 12/8. These all have numerator > denominator.

Exercise 2.6 — Let Us Do — Comparing Fractions with Reference to 1 (p. 29)

Q1 Compare the following fractions using 1 as a reference. Share your reasoning in the class.

(a) 8/7 ___ 9/15
(b) 13/20 ___ 17/15
(c) 7/6 ___ 8/8
(d) 6/6 ___ 19/12
(e) 12/9 ___ 4/5
(f) 15/5 ___ 16/4

SOLUTION

Compare each fraction to 1: if numerator > denominator it is more than 1; if equal it is exactly 1; if smaller it is less than 1.

(a) 8/7: 8 > 7, so 8/7 > 1. 9/15: 9 < 15, so 9/15 < 1.
A fraction greater than 1 is always bigger than a fraction less than 1.
8/7 > 9/15

(b) 13/20: 13 < 20, so 13/20 < 1. 17/15: 17 > 15, so 17/15 > 1.
13/20 < 17/15

(c) 7/6: 7 > 6, so 7/6 > 1. 8/8: 8 = 8, so 8/8 = 1.
7/6 > 8/8

(d) 6/6: 6 = 6, so 6/6 = 1. 19/12: 19 > 12, so 19/12 > 1.
6/6 < 19/12

(e) 12/9: 12 > 9, so 12/9 > 1. 4/5: 4 < 5, so 4/5 < 1.
12/9 > 4/5

(f) 15/5 = 3 (a whole number). 16/4 = 4 (a whole number).
Both are greater than 1, so compare directly: 3 < 4.
15/5 < 16/4

Answer: (a) > (b) < (c) > (d) < (e) > (f) <

Exercise 2.7 — Let Us Do — Comparing Fractions with Reference to 1/2 (p. 30)

Q1 Circle the fractions below that are equal to 1/2.
2/4 3/5 5/7 7/14 5/10 8/16 5/9 6/12 10/20 6/8

SOLUTION

A fraction equals 1/2 when the numerator is exactly half the denominator (numerator x 2 = denominator).

2/4: 2 x 2 = 4. Equal to 1/2. ✓
3/5: 3 x 2 = 6 ≠ 5. Not equal.
5/7: 5 x 2 = 10 ≠ 7. Not equal.
7/14: 7 x 2 = 14. Equal to 1/2. ✓
5/10: 5 x 2 = 10. Equal to 1/2. ✓
8/16: 8 x 2 = 16. Equal to 1/2. ✓
5/9: 5 x 2 = 10 ≠ 9. Not equal.
6/12: 6 x 2 = 12. Equal to 1/2. ✓
10/20: 10 x 2 = 20. Equal to 1/2. ✓
6/8: 6 x 2 = 12 ≠ 8. Not equal. (6/8 = 3/4)

Answer: Circle: 2/4, 7/14, 5/10, 8/16, 6/12, 10/20

Q2 Some fractions are written in the box below. Circle the fractions that are less than half. How do you know? Discuss your reasoning in the class.
3/9 2/4 12/15 8/15 11/12 3/15 4/8 1/3 7/11 11/16 15/31 6/18

SOLUTION

A fraction is less than 1/2 when the numerator is less than half the denominator (numerator x 2 < denominator).

3/9: 3 x 2 = 6 < 9. Less than 1/2. ✓
2/4: 2 x 2 = 4 = 4. Equal to 1/2. Not less.
12/15: 12 x 2 = 24 > 15. Greater than 1/2. Not less.
8/15: 8 x 2 = 16 > 15. Just over 1/2. Not less.
11/12: 11 x 2 = 22 > 12. Greater than 1/2. Not less.
3/15: 3 x 2 = 6 < 15. Less than 1/2. ✓
4/8: 4 x 2 = 8 = 8. Equal to 1/2. Not less.
1/3: 1 x 2 = 2 < 3. Less than 1/2. ✓
7/11: 7 x 2 = 14 > 11. Greater than 1/2. Not less.
11/16: 11 x 2 = 22 > 16. Greater than 1/2. Not less.
15/31: 15 x 2 = 30 < 31. Less than 1/2. ✓
6/18: 6 x 2 = 12 < 18. Less than 1/2. ✓

Answer: Circle: 3/9, 3/15, 1/3, 15/31, 6/18

Q3 Compare the following fractions. Where possible, compare the fractions with 1/2.
2/9 and 4/7 | 11/14 and 7/20 | 5/7 and 3/9 | 6/7 and 4/10
9/17 and 3/15 | 7/12 and 3/11 | 1/3 and 5/9 | 3/9 and 4/7

SOLUTION

Check each fraction against 1/2 (is numerator x 2 less than, equal to, or greater than denominator?).

2/9 and 4/7:
2/9: 2x2=4 < 9, so 2/9 < 1/2.
4/7: 4x2=8 > 7, so 4/7 > 1/2.
One is below half, the other above, so 2/9 < 4/7.

11/14 and 7/20:
11/14: 11x2=22 > 14, so 11/14 > 1/2.
7/20: 7x2=14 < 20, so 7/20 < 1/2.
So 11/14 > 7/20.

5/7 and 3/9:
5/7: 5x2=10 > 7, so 5/7 > 1/2.
3/9: 3x2=6 < 9 (3/9 = 1/3), so 3/9 < 1/2.
So 5/7 > 3/9.

6/7 and 4/10:
6/7: 6x2=12 > 7, so 6/7 > 1/2.
4/10: 4x2=8 < 10 (4/10 = 2/5), so 4/10 < 1/2.
So 6/7 > 4/10.

9/17 and 3/15:
9/17: 9x2=18 > 17, so 9/17 > 1/2.
3/15: 3x2=6 < 15 (3/15 = 1/5), so 3/15 < 1/2.
So 9/17 > 3/15.

7/12 and 3/11:
7/12: 7x2=14 > 12, so 7/12 > 1/2.
3/11: 3x2=6 < 11, so 3/11 < 1/2.
So 7/12 > 3/11.

1/3 and 5/9:
1/3: 1x2=2 < 3, so 1/3 < 1/2.
5/9: 5x2=10 > 9, so 5/9 > 1/2.
So 1/3 < 5/9.

3/9 and 4/7:
3/9 = 1/3: 1x2=2 < 3, so 3/9 < 1/2.
4/7: 4x2=8 > 7, so 4/7 > 1/2.
So 3/9 < 4/7.

Answer: 2/9 < 4/7 | 11/14 > 7/20 | 5/7 > 3/9 | 6/7 > 4/10 | 9/17 > 3/15 | 7/12 > 3/11 | 1/3 < 5/9 | 3/9 < 4/7

Exercise 2.8 — Try This — Ants on a Number Line (p. 31)

Q1 If the length of an ant is 1/4 cm, then what is the total length of 16 such ants walking in a line? Use the number line given below.

SOLUTION

Total length = number of ants x length of each ant.
= 16 x 1/4 cm
= 16/4 cm
= 4 cm

On the number line: each unit is 1/4 cm. Count 16 jumps of 1/4 cm from 0.
After 4 jumps you reach 1 cm, after 8 jumps you reach 2 cm, after 12 jumps you reach 3 cm, after 16 jumps you reach 4 cm.

Answer: 4 cm

Exercise 2.9 — Fun with Relations — Puzzle (p. 31)

Q1 If the only brother of your father's sister had a child, what would be the child's relationship with you?

SOLUTION

Let us trace the relationship step by step.
Your father's sister = your aunt (bua).
The only brother of your father's sister = your father himself (since she has only one brother).
Your father's child = you (or your sibling).

So the child would be your brother or sister (sibling).

Answer: The child would be your brother or sister (sibling), because the only brother of your father's sister is your father himself.