MATH 6

REVIEW OF MATH 5 — FULL 2026–27

Welcome Back!

Last year in Math 5 you built a big toolkit: fractions and decimals, negative numbers, ratios, exponents and roots, algebra, inequalities, geometry, and the beginnings of counting, probability, and logic. This handout is a fast tour back through all of it. Each theme gets a quick **refresher**, one **worked example**, and a short **Quick Check**; then there is a mixed Practice Problems and Homework set that spirals across every topic. Use it to knock the rust off before we build something new.

Fractions, Decimals, and Percents

Refresher

- In every fraction, the denominator must be nonzero.
- **Add/subtract:** put over a common denominator, then combine: $\frac{a}{b} \pm \frac{c}{d} = \frac{ad \pm bc}{bd}$, where $b, d \neq 0$.
- **Multiply:** $\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$. **Divide:** multiply by the reciprocal, $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}$, where $b, c, d \neq 0$.
- **Simplify** by dividing top and bottom by their GCD.
- **Decimals:** a terminating decimal is a fraction over a power of 10 (e.g. $0.7 = \frac{7}{10}$); a fraction becomes a decimal by dividing.
- **Percent:** $x\% = \frac{x}{100}$. "$p\%$ of N" means $\frac{p}{100} \cdot N$.

Example 1. Compute $\frac{5}{6} - \frac{3}{8}$, write 0.24 as a fraction in lowest terms, and find 15% of 80.

Solution. Common denominator 24: $\frac{5}{6} - \frac{3}{8} = \frac{20}{24} - \frac{9}{24} = \frac{11}{24}$.

$0.24 = \frac{24}{100} = \frac{6}{25}$.

15% of $80 = \frac{15}{100} \cdot 80 = 12$.

Quick Check

1. Compute $\frac{3}{4} + \frac{1}{6}$.
2. Write $\frac{7}{10}$ as a percent.
3. Find 20% of 45.

Negative Numbers and Absolute Value

Refresher

- **Subtracting** is adding the opposite: $a - b = a + (-b)$.
- **Signs in $\times$ and $\div$:** same signs give a *positive* result, different signs give a *negative* one. (For example $(-3)(-4) = 12$ and $(-3)(4) = -12$.)
- **Absolute value** $|x|$ is the distance from x to 0, so $|x| \geq 0$ always.
- $|a - b|$ is the distance between a and b on the number line.

Example 2. Compute $(-3) - (-7) + (-4) \cdot 2$ and $|-5| + |3 - 9|$.

Solution. $(-3) - (-7) = (-3) + 7 = 4$, and $(-4) \cdot 2 = -8$, so $4 + (-8) = -4$.
$|-5| + |3 - 9| = 5 + |-6| = 5 + 6 = 11$.

Quick Check

4. Compute $(-6)(-4)$.
5. Compute $-5 - 8$.
6. Evaluate $|4 - 11|$.

Ratios and Proportions

Refresher

- A **ratio** $a : b$ compares two quantities; express measured quantities in compatible units, then simplify the ratio like a fraction.
- A **proportion** is an equality of ratios: $\frac{a}{b} = \frac{c}{d}$. If $b, d \neq 0$, **cross-multiply** to get $ad = bc$.
- A **unit rate** is "how much per one" (e.g. miles per gallon, cost per item).
- Proportions scale recipes, maps, and similar shapes.

Example 3. A recipe uses 3 cups of flour for 12 cookies. How much flour is needed for 20 cookies? Also solve $\frac{4}{5} = \frac{x}{35}$.

Solution. $\frac{3}{12} = \frac{x}{20} \Rightarrow 12x = 60 \Rightarrow x = 5$ cups.
$\frac{4}{5} = \frac{x}{35} \Rightarrow 5x = 140 \Rightarrow x = 28$.

Quick Check

7. Simplify the ratio $18 : 24$.
8. Solve $\frac{x}{6} = \frac{10}{15}$.
9. If 5 pens cost \$2, how much do 15 pens cost?

Exponents and Roots

Refresher

- $a^m \cdot a^n = a^{m+n}$, $\dfrac{a^m}{a^n} = a^{m-n}$ for $a \neq 0$, $(a^m)^n = a^{mn}$, $(ab)^n = a^n b^n$.
- $a^0 = 1$ (for $a \neq 0$), $a^{-n} = \dfrac{1}{a^n}$ (for $a \neq 0$).
- For real numbers, $\sqrt{x^2} = |x|$. If $a, b \geq 0$, then $\sqrt{ab} = \sqrt{a}\sqrt{b}$, so pull out perfect squares (e.g. $\sqrt{50} = \sqrt{25 \cdot 2} = 5\sqrt{2}$).
- If a nonnegative integer a is not a perfect square, then $\sqrt{a}$ is **irrational** (like $\sqrt{2}$): it cannot be written as a fraction.

Example 4. Simplify $2^3 \cdot 2^4$, $(3^2)^2$, and $\sqrt{72}$.

Solution. $2^3 \cdot 2^4 = 2^7 = 128$.
$(3^2)^2 = 3^4 = 81$.
$\sqrt{72} = \sqrt{36 \cdot 2} = 6\sqrt{2}$.

Quick Check

10. Simplify $5^2 \cdot 5^3$.
11. Evaluate 2^{-3}.
12. Simplify $\sqrt{48}$.

Algebraic Expressions and Equations

Refresher

- **Combine like terms** (same variable part): $3x + 5x = 8x$.
- **Distribute:** $a(b + c) = ab + ac$.
- **Solve a linear equation** by undoing operations, doing the *same thing to both sides*, until x is alone.
- **Word problems:** name the unknown, translate the words into an equation, solve, and check.

Example 5. Simplify $3(x + 2) - 2(x - 1)$, then solve $5x - 7 = 2x + 8$.

Solution. $3(x + 2) - 2(x - 1) = 3x + 6 - 2x + 2 = x + 8$.
$5x - 7 = 2x + 8 \Rightarrow 3x = 15 \Rightarrow x = 5$.

Quick Check

13. Simplify $4(2x - 1) + 3$.
14. Solve $2x + 9 = 1$.
15. Solve $\dfrac{x}{3} + 4 = 10$.

Inequalities

Refresher

- Solve like an equation, with **one rule change**: multiplying or dividing both sides by a *negative* number **flips** the inequality sign.
- **Graph** on a number line: open circle ($\circ$) for $<, >$; closed circle ($\bullet$) for $\leq, \geq$.
- **Compound:** "AND" means satisfying both inequalities—the intersection of their solution sets. "OR" means satisfying at least one—the union. In common two-bound problems, AND gives values between two bounds ($2 < x \leq 7$), while OR can give values outside them ($x < 1$ or $x > 5$).

Example 6. Solve $3x - 5 < 7$ and solve $-2x \geq 6$.

Solution. $3x - 5 < 7 \Rightarrow 3x < 12 \Rightarrow x < 4$.
$-2x \geq 6 \Rightarrow x \leq -3$ (divide by -2, **flip**).

Quick Check

16. Solve $x + 4 > 1$.
17. Solve $-x < 5$.
18. Solve $2x - 3 \leq 7$.

Geometry Essentials

Refresher

- **Angles:** a right angle is $90°$, a straight angle is $180°$. Complementary angles sum to $90°$; supplementary angles sum to $180°$; *vertical* angles (across an X) are equal.
- **Triangle angle sum** $= 180°$. A triangle is acute (all $< 90°$), right (one $= 90°$), or obtuse (one $> 90°$).
- **Areas:** rectangle $= bh$; triangle $= \frac{1}{2}bh$; parallelogram $= bh$; trapezoid $= \frac{1}{2}(b_1 + b_2)h$; circle $= \pi r^2$.
- **Circle:** circumference $= 2\pi r$.
- **Pythagorean theorem** (right triangle, legs a, b, hypotenuse c): $a^2 + b^2 = c^2$.
- **Similar triangles** have equal corresponding angles and *proportional* corresponding sides.

Example 7. A triangle has angles $50°$ and $60°$. Find the third angle. Then find the area of a triangle with base 8 and height 5, and the area of a circle of radius 3.

Solution. Third angle $= 180° - 50° - 60° = 70°$.
Triangle area $= \frac{1}{2}(8)(5) = 20$.
Circle area $= \pi(3)^2 = 9\pi \approx 28.3$.

Quick Check

19. Two angles are supplementary and one is $110°$. What is the other?
20. Find the area of a rectangle with sides 6 and 4.
21. Find the circumference of a circle of radius 5 (in terms of π).

Counting, Probability, and Sets

Refresher

- **Probability** (equally likely outcomes) $= \dfrac{\text{favorable}}{\text{total}}$, a number between 0 and 1.
  Complement: $P(\text{not } A) = 1 - P(A)$.
- **Counting multiplication principle:** if one choice has m options and each of those choices allows n options for the next choice, together there are $m \cdot n$ possibilities.
- **Probability multiplication rule:** for independent events, $P(A \text{ and } B) = P(A) \cdot P(B)$.
- **Arrangements:** n different objects can be ordered in $n! = n \cdot (n-1) \cdots 2 \cdot 1$ ways.
- **Sets:** $\cup$ is "or", $\cap$ is "and". **Inclusion–exclusion:** $|A \cup B| = |A| + |B| - |A \cap B|$.
- **Pigeonhole:** if n items go into k boxes and $n > k$, some box holds at least two.

Example 8. Roll a fair die: what is $P(\text{even})$? Flip two coins: what is $P(\text{two heads})$? In a class of 30, 18 play soccer, 15 play basketball, and 8 play both — how many play at least one?

Solution. $P(\text{even}) = \dfrac{3}{6} = \dfrac{1}{2}$.
$P(\text{two heads}) = \dfrac{1}{2} \cdot \dfrac{1}{2} = \dfrac{1}{4}$.
At least one $= 18 + 15 - 8 = 25$ students.

Quick Check

22. What is the probability of rolling a 5 on a fair die?
23. In how many ways can 4 different books be arranged in a row?
24. If $A = \{1, 2, 3\}$ and $B = \{3, 4\}$, what is $A \cup B$?

Key Takeaways

- Fractions: common denominator to add; multiply straight across; divide by flipping.
- Signs: same signs multiply to $+$, different to $-$; $|x|$ is a distance (≥ 0).
- Proportions: cross-multiply. Exponents: add powers to multiply, subtract to divide.
- Equations: same operation to both sides. Inequalities: same idea, but *flip* on a negative multiply/divide.
- Triangle angles sum to $180°$; circle area $= \pi r^2$, circumference $= 2\pi r$; right triangles obey $a^2 + b^2 = c^2$.
- Probability $= \frac{\text{favorable}}{\text{total}}$; independent events multiply; $|A \cup B| = |A| + |B| - |A \cap B|$.

Practice Problems

1. Compute $\dfrac{5}{8} + \dfrac{1}{6}$.
2. Compute $(-7) + 12 - (-3)$.
3. Evaluate $|-9| - |3 - 8|$.
4. Solve the proportion $\dfrac{6}{9} = \dfrac{x}{15}$.
5. A map has scale 1 cm : 5 km. Two towns are 7 cm apart on the map. How far apart are they in reality?
6. Simplify $\dfrac{3^4 \cdot 3^2}{3^3}$.
7. Evaluate $2^{-2} + 2^0$.
8. Simplify $\sqrt{98}$.
9. Simplify $5(x - 3) - 2(2x + 1)$.
10. Solve $7x + 4 = 3x - 12$.
11. The sum of three consecutive integers is 48. Find the integers.
12. Solve and graph $4 - 2x \geq 10$.
13. Solve the compound inequality $-3 < 2x + 1 \leq 7$.
14. In a triangle two angles measure 45° and 85°. Find the third angle and classify the triangle by its angles.
15. Find the area of a trapezoid with parallel sides 6 and 10 and height 4.
16. A circle has radius 7. Find its area and circumference (in terms of π).
17. A right triangle has legs 6 and 8. Find the length of the hypotenuse.
18. A bag holds 4 red and 6 blue marbles. Find $P(\text{red})$ and $P(\text{not red})$.
19. How many 3-letter "words" (arrangements) can be made from the letters A, B, C, D with no letter repeated?
20. Explain why, in any group of 13 people, at least two must share the same birth month.

Practice Problems: Solutions

1. Common denominator 24: $\dfrac{15}{24} + \dfrac{4}{24} = \dfrac{19}{24}$.
2. $(-7) + 12 + 3 = 8$.
3. $9 - |-5| = 9 - 5 = 4$.
4. $9x = 90 \Rightarrow x = 10$ (or $\frac{6}{9} = \frac{2}{3}$, so $x = 10$).
5. 7 cm $\times$ 5 km/cm $= 35$ km.
6. $3^{4+2-3} = 3^3 = 27$.
7. $\dfrac{1}{4} + 1 = \dfrac{5}{4}$.
8. $\sqrt{98} = \sqrt{49 \cdot 2} = 7\sqrt{2}$.
9. $5x - 15 - 4x - 2 = x - 17$.
10. $4x = -16 \Rightarrow x = -4$.
11. $n + (n+1) + (n+2) = 3n + 3 = 48 \Rightarrow n = 15$. The integers are $15, 16, 17$.
12. $-2x \geq 6 \Rightarrow x \leq -3$ (flip). Number line: closed circle at -3, arrow to the left.
13. $-4 < 2x \leq 6 \Rightarrow -2 < x \leq 3$.
14. Third angle $= 180^\circ - 45^\circ - 85^\circ = 50^\circ$. All three angles are less than 90°, so the triangle is **acute**.
15. $\frac{1}{2}(6 + 10)(4) = \frac{1}{2}(16)(4) = 32$.
16. Area $= \pi(7)^2 = 49\pi$; circumference $= 2\pi(7) = 14\pi$.
17. $c = \sqrt{6^2 + 8^2} = \sqrt{36 + 64} = \sqrt{100} = 10$.
18. $P(\text{red}) = \dfrac{4}{10} = \dfrac{2}{5}$; $P(\text{not red}) = \dfrac{6}{10} = \dfrac{3}{5}$.
19. $4 \cdot 3 \cdot 2 = 24$.
20. There are only 12 possible birth months (the "boxes") but 13 people (the "items"). Since $13 > 12$, by the Pigeonhole Principle at least two people fall in the same month.

Homework

1. Write 0.45 as a fraction in lowest terms, and write $\dfrac{3}{8}$ as a decimal.
2. Evaluate $(-4)(5) - (-3)(2)$.
3. A car travels 150 miles on 5 gallons of gas. At the same rate, how far can it travel on 8 gallons?
4. Evaluate $3^{-2} + 5^{0}$.
5. Solve $4(x - 2) = 2x + 6$.
6. Solve $|x| = 7$.
7. Two angles of a triangle are equal, and the third is 80°. Find all three angles.
8. A 15-foot ladder leans against a wall with its base 9 feet from the wall. How high up the wall does the ladder reach?
9. M Two fair dice are rolled. What is the probability that the sum is 7?
10. H In how many ways can 5 people sit in a row? In how many of those ways do two particular people, Alice and Bob, sit next to each other?
11. M A number is increased by 20% and then decreased by 20%. The final value is 96. Find the original number. Explain why the two changes do not cancel.
12. A jacket is discounted by 20%, and then 8% sales tax is added to the discounted price. The total paid is 86.40. What was the original price, and how much tax was paid?

Quick Check Answers

Fractions, Decimals, and Percents

1. $\frac{3}{4} + \frac{1}{6} = \frac{9}{12} + \frac{2}{12} = \frac{11}{12}$.
2. $\frac{7}{10} = 70\%$.
3. 20% of $45 = 9$.

Negative Numbers and Absolute Value

4. $(-6)(-4) = 24$.
5. $-5 - 8 = -13$.
6. $|4 - 11| = 7$.

Ratios and Proportions

7. $18 : 24 = 3 : 4$.
8. $15x = 60 \Rightarrow x = 4$.
9. Three times as many pens cost three times as much: \$6.

Exponents and Roots

10. $5^2 \cdot 5^3 = 5^5 = 3125$.
11. $2^{-3} = \frac{1}{8}$.
12. $\sqrt{48} = 4\sqrt{3}$.

Expressions and Equations

13. $4(2x - 1) + 3 = 8x - 1$.
14. $x = -4$.
15. $x = 18$.

Inequalities

16. $x > -3$.
17. $x > -5$.
18. $x \leq 5$.

Geometry Essentials

19. 70°.
20. 24 square units.
21. 10π units.

Counting, Probability, and Sets

22. $\frac{1}{6}$.
23. $4! = 24$.
24. $A \cup B = \{1, 2, 3, 4\}$.