MATH GRADE 7 UNIT 5

ALGEBRAIC REASONING

ANSWERS
FOR EXERCISES

LESSON 2: EXPRESSIONS AND EQUATIONS

ANSWERS

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1. **C** $c + 6 = h$

2. **B** $c = 2.54i$

   C $i = \dfrac{c}{2.54}$

3. **D** $F = (C \cdot \dfrac{9}{5}) + 32$

4. **A** $s = 4c - 7$

5. a. An algebraic expression for Marcus's height is $b + 4$ or $4 + b$.

   b. Marcus is 65 in. tall.

      $b + 4 = 61 + 4 = 65$

6. a. An algebraic expression for Jack's height is $s - 5$.

   b. Sophie is 120 cm tall.

      $115 = s - 5$
      $120 = s$

7. a. An equation for the rule of thumb is $b = \dfrac{w}{13}$ or an equivalent equation such as
      $b = w \div 13$ or $\dfrac{1}{13}w = b$.

   b. The person weighs about 65 kg.

      $\dfrac{1}{13}w = 5$
      $w = 65$

Challenge Problem

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8. a. An equation for the rule of thumb is $c = \dfrac{1}{2}g$.

   b. You should buy $7\dfrac{1}{2}$ oz of cheese.

      $c = \dfrac{1}{2}g$

      $c = \dfrac{1}{2}(15)$

      $c = 7\dfrac{1}{2}$

PEARSON

LESSON 3: EXPRESSIONS IN GEOMETRY

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1. **A** $x + x + 6$

   C $2(x + 3)$

2. **C** $12x$

3. **B** $12n$

4. **B** $4d$

5. The perimeter is $3n + 3n + 3n$, or $9n$. Since the triangle is equilateral, all three sides are the same length. Since one side is $3n$, the other two sides must also be $3n$. Thus, all three sides added together must be $9n$.

6. a. Examples of a correct rectangle include 50 by 1, 25 by 2, or 10 by 5, and a sketch of the rectangle should include the correct labels for the sides (i.e., $25x$ and $2x$).

   b. An example of a correct expression for the perimeter of the rectangle with sides $25x$ and $2x$ is $2(25x + 2x)$.

   c. Use the sketch and the definition of a rectangle to provide a thorough explanation about how to find the correct expression for the rectangle.

7. a. $4 + x + 1 + 2 + 3 + (x + 2)$ or $2x + 12$

   b. $4(x + 2) - 2$ or $3(x + 2)$ or $4x + 6$

Challenge Problem

8. The width of the rectangle is 10 in.

   $10x + 20 = 2(5x + w)$
   $10x + 20 = 10x + 2w$
   $20 = 2w$
   $10 = w$

PEARSON

LESSON 4: SIMPLIFYING EXPRESSIONS

ANSWERS

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1. a. $7x + 14$ or $14 + 7x$

   b. $6m + 15$ or $15 + 6m$

   c. $2n + 30$ or $30 + 2n$

2. **B** $6d + 27$

3. **A** $9h + 9$

   B $9(h + 1)$

   D $3(3h + 3)$

4. $(4 \cdot 2) + 2x$ or $(4 \cdot 4) - 2(4 - x)$
   $8 + 2x$ or $2x + 8$

5. $\dfrac{(4x + 6)(3)}{2}$

   $\dfrac{12x + 18}{2}$

   $6x + 9$

6. Lucy made a mistake when distributing the first term—she added 3 and 7 instead of multiplying them to get 21. She also didn't distribute the minus sign through the second term. The correct simplification process looks like:

   $3(4x + 7) - (8x + 4)$
   $12x + 21 - 8x - 4$
   $4x + 17$

7. $5(3x + 1) = 15x + 5$

Challenge Problem

8. Marcus is incorrect. Possible explanation: Marcus is correct that when $x = 0$, the two expressions have the same value. But to be equivalent, the expressions must have the same value for every value of x. For any other value of x besides $x = 0$, the expressions do not have the same value. For example, when $x = 2$, the value of $4x + 3$ is 11 and the value of $2x + 3$ is 7.

LESSON 5: SOLVE PERCENT PROBLEMS

ANSWERS

ANSWERS

1. $1.5a$

2. **B** $0.8x$

    D $\dfrac{4}{5}x$

    E $x - 0.2x$

3. a. $1.05d$
    b. $0.75r$

4. If you sell at the shop, you will get $0.40(60) = \$24$.
    If you sell online, you will make $0.95(30) = \$28.50$.
    To make the most money, you should sell the game online, since you will make $4.50 more than if you sell the game at the shop.

5. a. Jack's method is a reasonable approximation for low cost items. It will be off by about $0.25 in this case.

    b. The cost of the T-shirt using his approximation is $14.50 + $1.45 = $15.95.

    c. But the actual total cost will be $1.0825 \cdot \$14.50 = \$15.70$ (rounded to the nearest cent).

    d. Jack's approximation gets worse as the cost goes up. For the $1,000 TV, his estimate is $1,100, but the real cost is $1,082.50. Now he is off by more than $17.

6. An expression that represents the entire cost is $1.25s$.

7. a. The total area is $12 \cdot 6 = 72$ sq units. The area of rectangle A is $8 \cdot 6 = 48$ sq units. So, rectangle A takes up $\dfrac{2}{3}$ of the total area, or about 66.67%.

    b. $B + C$ makes up the remaining third of the total area. Since $a = 48$ sq units, and $(B + C) = 24$ sq units, you can express the remaining area as $0.5a$.

Challenge Problem

8. Disagree. You can use the equation $0.75x = 75$ to find the original price. The original price was $100.

PEARSON

LESSON 6: PROPERTIES OF EQUALITY   ANSWERS

ANSWERS

1. a. Multiplication property of equality

    b. Addition property of equality

    c. Multiplication property of equality

2. $4x - 6 = 30$
    $4x - 6 + 6 = 30 + 6$ Addition property of equality
    $4x = 36$
    $\dfrac{4}{4}x = \dfrac{36}{4}$ Multiplication property of equality
    $x = 9$

    Check:
    $4(9) - 6 = 30$
    $36 - 6 = 30$
    $30 = 30$

3. $7 - 2x = 19$
    $7 - 7 - 2x = 19 - 7$ Addition property of equality
    $-2x = 12$
    $\dfrac{-2}{-2}x = \dfrac{12}{-2}$ Multiplication property of equality
    $x = -6$

    Check:
    $7 - 2(-6) = 19$
    $7 + 12 = 19$
    $19 = 19$

4. $\dfrac{1}{3}x + 5 = 19$

    $\dfrac{1}{3}x + 5 - 5 = 19 - 5$ Addition property of equality

    $\dfrac{1}{3}x = 14$

    $3\left(\dfrac{1}{3}\right)x = (3)14$ Multiplication property of equality
    $x = 42$

    Check:
    $\dfrac{1}{3}(42) + 5 = 19$

    $14 + 5 = 19$
    $19 = 19$

LESSON 6: PROPERTIES OF EQUALITY

ANSWERS

5. Amir is 4 years old.

   Let a = Amir's age.
   $3a + 2 = 14$
   $3a = 12$
   $a = 4$

6. He had 4 heart cards.

   Let h = the number of heart cards.
   $3h + 13 = 25$
   $3h = 12$
   $h = 4$

7. Each shoe rental cost $3.50.

   Let s = the cost per shoe rental.
   $4s + 6 = 20$
   $4s = 14$
   $s = 3.5$

Challenge Problem

8. Possible steps:
   $2(x - 8) = -20$
   $2x - 16 = -20$
   $2x - 16 + 16 = -20 + 16$
   $2x = -4$
   $x = -2$

LESSON 7: STEPS TO SOLVING EQUATIONS

ANSWERS

ANSWERS

1. **A** $2n + 4 = 16$

2. **C** $n = 11$

3. Possible steps:
$2n + 4 = 16$	
$2n + 4 - 4 = 16 - 4$	Addition property of equality
$2n = 12$	Add
$\dfrac{1}{2}(2n) = \dfrac{1}{2}(12)$	Multiplication property of equality
$n = 6$	Multiply

4.
$2(n + 4) = 16$	
$\dfrac{2(n + 4)}{2} = \dfrac{16}{2}$	Multiplication property of equality
$n + 4 = 8$	Multiply
$n + 4 - 4 = 8 - 4$	Addition property of equality
$n = 4$	Add

5. Lucy is 10 years old now.

   Let x = Lucy's current age.
   $45 = 3(x + 5)$
   $x = 10$

6. a. These equations represent each plan's cost based on m, the number of movies rented.

   $N = 6 + 1m$
   $R = 3m$

   b. I would use the Netblix plan, because I watch a lot of movies. For $m < 3$, Redblocks is the better choice, since the total cost is cheaper. At $m = 3$, the plans are equal. And for $m > 3$, Netblix is cheaper.

m	Netblix Cost ($)	Redblocks Cost ($)
0	6	0
1	7	3
2	8	6
3	9	9
4	10	12
5	11	15

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LESSON 7: STEPS TO SOLVING EQUATIONS

ANSWERS

7. Marcus needs to save for 26 weeks, about $6\frac{1}{2}$ months.

   Let w = the number of weeks.
   $$140 + 10w = 400$$
   $$10w = 260$$
   $$w = 26$$

   Challenge Problem
   ....

8. $x = -0.7$

   $$-2\left(x - 4\frac{1}{2}\right) = 10.4$$
   $$-2x + 9 = 10.4$$
   $$-2x = 1.4$$
   $$x = -0.7$$

PEARSON

LESSON 8: WRITING EQUATIONS

ANSWERS

ANSWERS

1. **A** a little less than $46

2. **D** 11 bleacher seat tickets

3. **A** $3g + 2y + c = 19.57$

4. Each package of cheese costs $2.99.

   Let c = the cost of each package of cheese.
   $3(\$1.98) + 4c = \$17.90$

   Estimate: $\$6 + 4c = \$18$, $c \approx \$3$

   $$3(\$1.98) + 4c = \$17.90$$
   $$\$5.94 + 4c = \$17.90$$
   $$4c = \$11.96$$
   $$c = \$2.99$$

5. The children's tickets cost $4.50 each.

   Let t = the cost of a child's ticket.
   $3(\$8.75) + 2t = \$35.25$

   Estimate: $\$27 + 2t = \$35$, $t \approx \$4$

   $$3(\$8.75) + 2t = \$35.25$$
   $$\$26.25 + 2t = \$35.25$$
   $$2t = \$9.00$$
   $$t = \$4.50$$

6. Each game costs $30.49.

   Let g = the cost of a game.
   $\$231.46 = \$139.99 + 3g$

   Estimate: $\$230 = \$140 + 3g$, $g \approx \$30$

   $$\$231.46 = \$139.99 + 3g$$
   $$\$91.47 = 3g$$
   $$\$30.49 = g$$

7. Jack gets paid $19 altogether.

   Let d = the number of dogs
   $\$4 + \$3d$
   $\$4 + \$3(5)$
   $\$4 + \$15$
   $\$19$

LESSON 8: WRITING EQUATIONS

ANSWERS

Challenge Problem

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8. Word problems will vary. Here is a possible answer:
Mrs. Martin pays $100 for tickets to a local theater performance. She buys 6 children's tickets at $7.50 each and 5 adult tickets. What is the price of an adult ticket?

$$6(\$7.50) + 5x = \$100$$
$$\$45 + 5x = \$100$$
$$5x = \$55$$
$$x = \$11$$

An adult ticket costs $11.
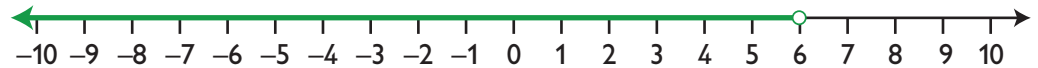
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LESSON 13: PROPERTIES OF INEQUALITY

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1. $x < 3$
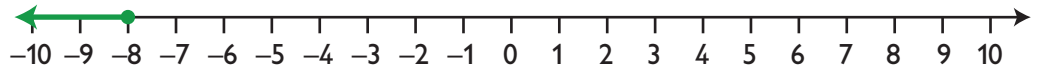
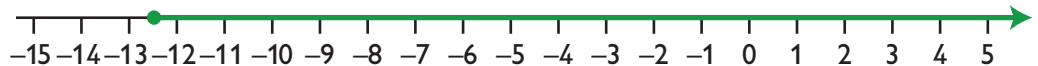2. Ⓓ $x > 5$

3. Ⓐ $x \geq -14$

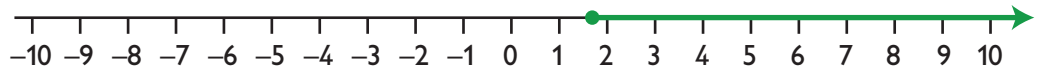4. $x < 6$

5. $x \leq -8$

6. $x \leq 0$

7. $x \geq -12.5$

Challenge Problem

8. $x \geq 1\frac{2}{3}$

LESSON 14: SALES PER WEEK

ANSWERS

ANSWERS

1. An inequality representing Jack's age is $x \geq 5$.

2. **B** $x + 2 \geq 45$

3. **C** $10g + 30e \geq 100$

4. **A** $b > 30$

5. Marcus bought 1 or 2 pairs of socks.

    $15 + 2.5x < 22.50$
    $x < 3$

6. Karen must work more than 4 hours of overtime.

    $350 + 15x > 410$
    $x > 4$

7. Lucy needs more than 3 sales to earn more than Jack.

    $320 + 50x > 470$
    $x > 3$

Challenge Problem

8. Karen is between her 16th and 17th birthdays.

PEARSON

LESSON 15: REAL ESTATE AND TRIANGLES

ANSWERS

ANSWERS

1. $x \geq 20$

2. **C** $x < 11$

3. **B** $500{,}000 \leq p - 0.08p$

4. The aquariums cost more than $160 each.

   $500 - 3a < 20$
   $a > 160$

5. Marcus sold at least 51 bananas each day.

   $450 - 2b < 350$
   $b > 50$

6. You can mail something weighing up to 10 oz.

   $4.50 + 0.25x < 7$
   $x < 10$

7. This inequality shows when the total cost using Quickship will be less than using Fast Send.

   $5.50 + 0.15x < 4.50 + 0.25x$
   $x > 10$

   Quickship is the less expensive choice for packages weighing more than 10 oz. Your decision depends on the weight of the package you want to send.

Challenge Problem

8. $6x + 6 < -3(x + 7)$
   $6x + 6 < -3x - 21$
   $9x < -27$
   $x < -3$

PEARSON

LESSON 16: INTERPRETING SOLUTIONS

ANSWERS

ANSWERS

1. 6

2. a. $4\dfrac{2}{3}$
    b. none
    c. 0
    d. 4

3. a. $8.4\overline{9}$
    b. none
    c. 0
    d. 8

4. a. none
    b. −4
    c. −4
    d. none

5. He cannot afford any T-shirts if he buys the jacket.

    $50 \geq 35 + 20t$
    $15 \geq 20t$
    $\dfrac{3}{4} \geq t$

6. She can buy 3 USB drives. A fourth one would put her over budget.

    $80 \geq 7 + 19.50d$
    $73 \geq 19.50d$
    $3.7435 \geq d$

7. The tank had been leaking for more than 8 hours.

    $14 - 0.5t < 10$
    $-0.5t < -4$
    $t > 8$

LESSON 16: INTERPRETING SOLUTIONS

ANSWERS

Challenge Problem

8. a. 1

    b. none

    c. 1

    d. none