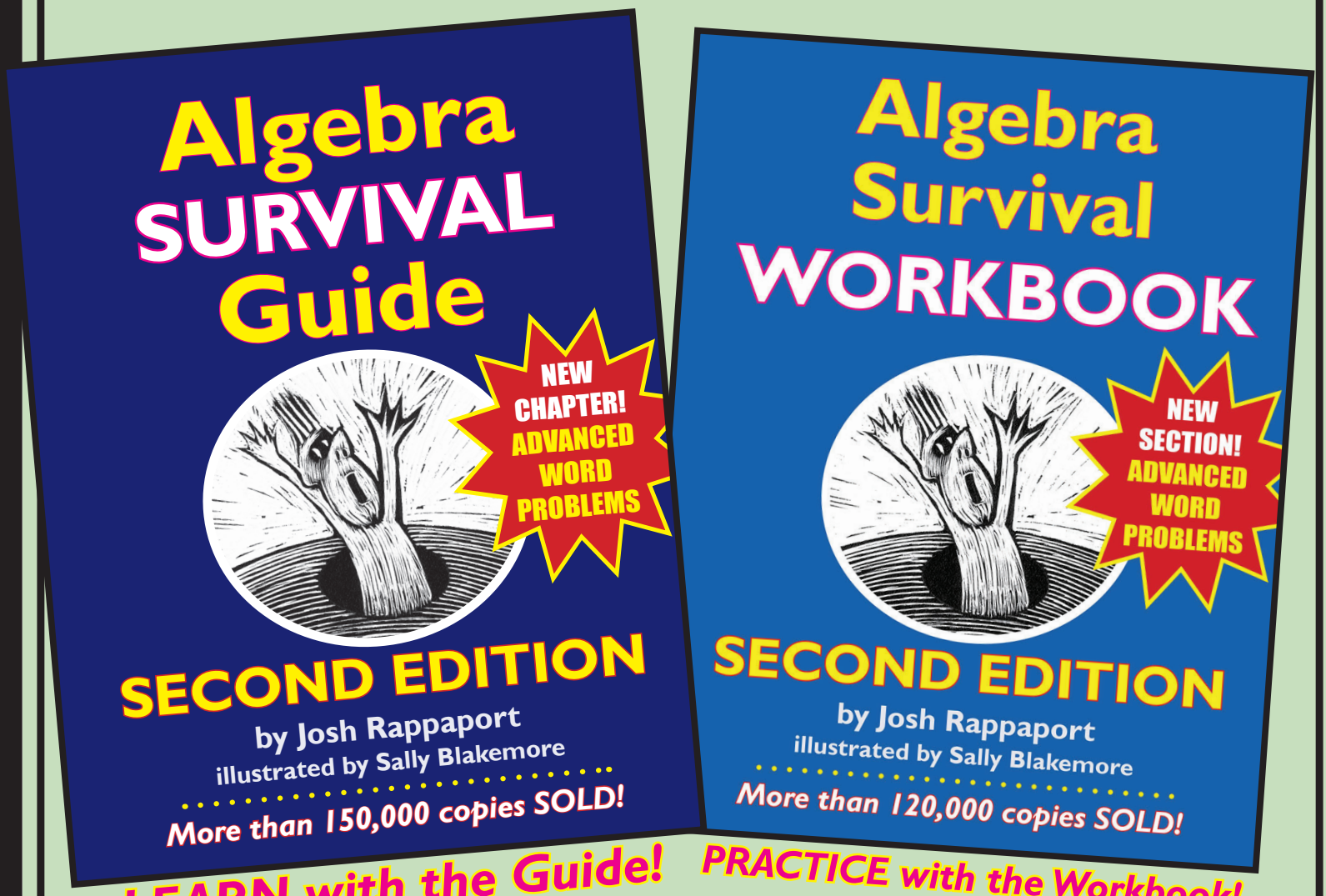
"Algebra Survival" Program – updated in a 2nd Edition



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Algebra SURVIVAL Workbook

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NEW SECTION! ADVANCED WORD PROBLEMS

SECOND EDITION

by Josh Rappaport
illustrated by Sally Blakemore

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PREVIEW: Algebra Survival Guide, 2nd Ed.. 99-104

NAME _____ DATE _____

Use the order of operations to simplify the following problems. See ASG, p. 62

1) $4^2 + 8(3 \cdot 2)$ _____
2) $3 + [8 - (4 + 3)^2]$ _____
3) $2(4 + 3) + (-16)(4 - 6)$ _____
4) $\{15 - (3 \cdot 2)\} \div 3$ _____
5) $3^2 - (-1) + (-30 \div 2)$ _____
6) $7 + ([3 - 7] + 4^2) \div 2$ _____
7) $(-6) - (4 \cdot 3)(3 - 1) - 2^2$ _____
8) $(3 + 4)^2$ _____
9) $(3^2 + 4^2)$ _____
10) $5 - [(4 \cdot 5) \div 2]$ _____
11) $\{[(3 + 5) \div 2]^2 - (3 \cdot 2)\} \cdot (-2)$ _____
12) $[(4 \cdot 6) - (3 \cdot 2)] \div 2$ _____
13) $[3^2 - (2^2 \cdot 4)] + 7$ _____
14) $3 + \{(4 + 3) \cdot 6 - 2\}$ _____
15) $\{(8 - 3) \cdot 4 - [6(2 + 3) - 10]\} + 4$ _____
16) $(2)(3) + (3)(4) - (4)(5)$ _____
17) $[8 + (4)(5)] \div (2 - 6)$ _____
18) $(40 \cdot 2) \div [(12 \cdot 2) - 4]$ _____
19) $7 \cdot 8 \div 4 - 20$ _____
20) $15 \cdot 3 \div 5 + 12 \div 2$ _____

_____ %

Multiply and divide. See ASG, p. 63

1) $50 \div 5 \times 2$ _____
2) $50 \times 2 \div 5$ _____
3) $50 \div 5 \div 2$ _____
4) $50 \div (5 \times 2)$ _____
5) $50 \div 2 \times 5$ _____
6) $50 \times 5 \div 2$ _____
7) $50 \times (5 \div 2)$ _____
8) $6 \times 3 \div 2$ _____
9) $3 \div 2 \times 6$ _____
10) $2 \div 3 \times 6$ _____
11) $3 \times 2 \div 6$ _____
12) $4 \times 7 \div 2 \times 3$ _____
13) $4 \times 7 \times 3 \div 2$ _____
14) $3 \div 2 \times 4 \times 7$ _____
15) $4 \times 3 \div 2 \div 6$ _____
16) $4 \div 3 \times 2 \times 6$ _____
17) $4 \times 3 \div (2 \times 6)$ _____
18) $4 \div 2 \times 3 \div 6$ _____
19) $2 \times 3 \div 4 \times 6$ _____
20) $2 \times 3 \div (4 \times 6)$ _____

_____ %

NAME _____ DATE _____

Use the exponent-to-exponent rule to simplify these terms.

See ASG, p. 106

1) $(3^2)^4$ _____
2) $(a^3)^5$ _____
3) $(c^x)^y$ _____
4) $(4^{-3})^{-2}$ _____
5) $(\text{llama}^{-4})^{-4}$ _____
6) $(k^4)^{-2}$ _____
7) $(\odot^6)^5$ _____
8) $(p^x)^{-z}$ _____
9) $(\text{gum}^6)^6$ _____
10) $(n^{-4})^{-6}$ _____
11) $(6^{-2})^{-5}$ _____
12) $(12^6)^{-3}$ _____
13) $(\diamond^c)^f$ _____
14) $(3^3)^9$ _____
15) $(p^r)^4$ _____
16) $(8^{-8})^6$ _____
17) $(v^{10})^2$ _____
18) $(\star^v)^{-w}$ _____
19) $(e^4)^{-7}$ _____
20) $(\text{bug}^{-3})^d$ _____

_____ %

Simplify these expressions. Use only positive exponents.

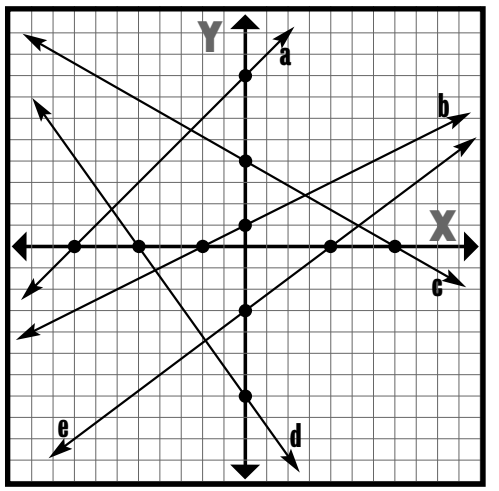
See ASG, p. 108

1) $e^3(e^4)^2e^{-2}$ _____
2) $2^3p^0(p^3)^3$ _____
3) $\dfrac{x^{-3}(x^3)^2}{(x^4)^2x^{-10}}$ _____
4) $(r^3)^4(r^{-2})^3(-2)^2$ _____
5) $\dfrac{(b^{-2})^{-5}b^0b^6}{b^7b^{-2}(b^{-4})^{-4}}$ _____
6) $(4^{-2})^{-1}(z^2)^{-4}(z^{-5})^2$ _____
7) $(5^1)^{-1}t^{-3}(t^3)^4$ _____
8) $\dfrac{(k^{-6})^3k^5(k^3)^{-2}}{k^7(k^4)^6k^{-12}}$ _____
9) $\dfrac{v^9v^6(v^{-3})^3}{v^3(v^2)^{-4}v}$ _____
10) $\dfrac{(3^4)^2r^{-3}}{(3^2)^3(r^2)^6(r^3)^0}$ _____
11) $(w^{-5})^{-3}w^{-10}(w^{-2})^2$ _____
12) $\dfrac{c^4c^{17}(c^{-4})^4}{(c^5)^{-6}c^{14}}$ _____
13) $\dfrac{(4^{-3})^5n^4}{n^3(n^4)^{-2}(4^2)^{-6}}$ _____
14) $(3^{-2})^{-1}(y^{-3})^{-6}y^{-13}$ _____
15) $(d^{-3})^2d^8(d^4)^{-2}d^6$ _____
16) $a^4(a^2)^{-2}(5^{-1})^3$ _____
17) $\dfrac{(6^{-3})^2f^5}{(6^{-2})^2(f^{-3})^4}$ _____
18) $(s^2)^6(s^4)^{-4}s^{-3}$ _____
19) $\dfrac{(8^3)^7q^6(q^{-2})^8}{(q^2)^{-4}(8^{-4})^{-5}}$ _____
20) $(u^{13})^2(4^2)^{-1}(u^{-2})^{10}$ _____

_____ %

NAME _____ DATE _____

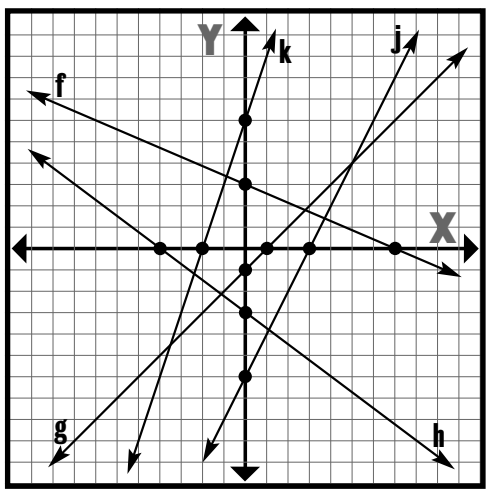
Name the x- and y-intercepts for each of these lines. See ASG, p. 229



COORDINATE PLANE A

a) _____
b) _____
c) _____
d) _____
e) _____

_____ %



COORDINATE PLANE B

f) _____
g) _____
h) _____
j) _____
k) _____

_____ %

Name the slopes and y-intercepts of these lines. See ASG, p. 230

1) $y = 3x + 8$ _____
2) $y = -4x + 2$ _____
3) $y = \frac{1}{2}x - 4$ _____
4) $y = 2x + \frac{1}{2}$ _____
5) $y = -\frac{3}{5}x + 3$ _____
6) $y = 6x + 1$ _____
7) $y = -8x - \frac{4}{5}$ _____
8) $y = x - 2$ _____
9) $y = -\frac{9}{10}x + \frac{3}{2}$ _____
10) $y = \frac{1}{4}x$ _____
11) $y = 7x + 2$ _____
12) $y = -2x - \frac{1}{5}$ _____
13) $y = \frac{1}{8}x - 6$ _____
14) $y = -\frac{5}{8}x + \frac{2}{3}$ _____
15) $y = -x - 3$ _____
16) $y = 5$ _____
17) $y = -2x + \frac{1}{2}$ _____
18) $y = \frac{1}{4}x + 10$ _____
19) $y = \frac{1}{6}x - 4$ _____
20) $y = -8x - 1$ _____

_____ %

NAME _____ DATE _____

For each situation, let a variable stand for the smaller unknown. Then create an expression that stands for the larger unknown.

See ASG, p. 275

_____ %

1) Paul has 50 times as many apples as Sam.
2) Kyle travels 30 miles farther than Zane travels.
3) Abigail has 80 more coins than Ethan.
4) Ned scores 3 more goals than Ted.
5) Daniel eats 3 times faster than Jacob.
6) Avril gains 30 points more than Mason.
7) Noah solves a problem 5 times faster than Liam solves it.
8) Shyan consumes 1,000 more calories than Jack.
9) Karyn gains her energy 8 times faster than Alexander gains his energy.
10) Jayden speaks twice as fast as Sophia.

For each situation, let a variable stand for the smaller unknown. Then create an expression that stands for the larger unknown.

See ASG, p. 276

_____ %

1) Ben is five times shorter than Ned.
2) Paul's savings account has a balance that's 2 times smaller than Ted's savings account balance.
3) Samuel's speed is 3 times less than Jack's speed.
4) Javier loses 3 times less weight than Alexander loses.
5) Madison drinks 5 times less fruit juice than William drinks.
6) Sam drives 13 mph slower than Avril drives.
7) Zombies eat 7 times fewer "things" than aliens eat.
8) In a game of "Candy Crash," Sophia scores 5,000 fewer points than Isabella.
9) Juan's has 300 fewer Facebook friends than Emily.
10) As a daily average, Ava drinks 2 fewer cups of coffee than Mia.

Write an algebraic expression to express the value of each set of coins, in cents:

See ASG, p. 277

_____ %

1) An unknown number of nickels.
2) An unknown number of nickels added to an unstated number of dimes.
3) An unstated number of nickels added to an unknown number of quarters.
4) The difference of an unknown number of half-dollars minus an unspecified number of dimes.
5) The difference of an unknown number of quarters minus an unstated number of dimes.
6) An unknown number of half-dollars added to an unspecified number of nickels.
7) The difference of an unstated number of nickels minus an unspecified number of half-dollars.
8) The difference of an unstated number of dimes minus an unspecified number of quarters.
9) The difference of an unknown number of nickels minus an unspecified number of dimes.
10) The difference of an unstated number of dimes minus an unspecified number of nickels.

NAME _____ DATE _____

Solve, using the technique on pp. 306 - 307. **See ASG, pp. 306-307**

_____ %

1) Flying into a headwind, a passenger plane travels 2,200 miles in 5 hours. Aided by a tailwind, the same plane makes the return trip in 4 hours. What is the speed of the plane in still air, and what is the speed of the wind?

2) Traveling against the current, a boat makes the 450-mile trip from Charleston to Miami in 18 hours. Traveling with the current, the same boat makes the return trip in 15 hours. What's the speed of the boat in still water, and what's the speed of the current?

Express the amount of work completed in each situation. **See ASG, p. 308**

_____ %

1) Kathy can build a treehouse in 6 weeks, and she works on one for 2 weeks.

2) Josie can animate a cartoon in 2 weeks, and she works on one for 1 week.

3) Ari can cook dinner in 3 hours, and he works on it for 2 hours.

4) Steve can clean his room in 60 minutes, and he works on it for 15 minutes.

5) Ella can write a song in 5 hours, and she works on one for 4 hours.

Write the ME/E and the ME/M for each situation. **See ASG, p. 309**

_____ %

1) Ashlynn takes 7 hours to paint a 10′ x 10′ room, while Nadia needs 9 hours to complete the same task. How long will it take the two of them to paint this same size room if they work together?

2) Candace can prepare breakfast for six people in 45 minutes, but it takes Sarah 1 hour to prepare the same meal. How long will it take them to make this same breakfast if they work together?

3) Two birds are building a nest. Working alone, the first bird takes 4 days to build a nest. The second bird needs only 2 days to build her nest. How long will it take the birds to build a nest if they work together?

4) A man completes The New York Times crossword puzzle in 9 minutes, but his daughter can complete the same puzzle in just 3 minutes. Assuming seamless cooperation, how long would it take father and daughter to solve the puzzle if they work on it together?

5) Noah requires 3 days to paint the fence that surrounds his house, while Adam needs only 2 days to do the same task. How long would it take the two of them to complete this task if they work together?

Answers

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1) m
2) 1/p
3) 1/xy
4) a
5) r
6) ce
7) 1/k
8) $1/p^2$

1) a
2) 3 and y
3) (m + n)
4) x
5) x and y
6) m
7) e
8) (s + t)
9) c
10) v and n

1) b
2) 5
3) 3
4) $\frac{p}{q} + 1$
5) 9 − d
6) y
7) $\frac{b + c}{3}$
8) $\frac{u}{v} + 1$
9) 7x − 1
10) rm

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1) x + 2y
2) b + c
3) $\frac{3m + 5n}{2}$
4) $\frac{2}{u - 3v}$
5) 2s − 5t
6) $\frac{1}{e + v}$
7) $\frac{2w}{x + 3y}$
8) 3d − 2e + 5f
9) $\frac{p - 3q}{2}$
10) $\frac{5n + 2r - 6k}{3}$

1) $\frac{m + n}{2(b + c)}$
2) $\frac{1 - 2y}{2 - 3y}$
3) $\frac{d + 3f}{2d - 3f}$
4) $\frac{2(3n - r)}{3n + 2r}$
5) $\frac{4 + 5e}{3(2 + 3e)}$
6) $\frac{2 - 3m}{2(m + 4)}$
7) $\frac{2(a - 2c)}{2a - 3c}$
8) $\frac{rv - 2sq}{3xy + 4wz}$
9) $\frac{2(nr + 2st)}{3ns + 5rt}$
10) $\frac{2x + 3z}{3z - 4x}$

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1) $\frac{3(g^2 - 2)}{g(g + 1)}$
2) $\frac{3y - 2}{y(2y + 5)}$
3) $\frac{2c(1 + 2c^2)}{4c^2 - 1}$
4) $\frac{2n + 3}{2n(n^2 + 1)}$
5) $\frac{2(3 - 4r)}{5(1 + 3r^2)}$
6) 2a + 6
7) $t^2 - 3t$
8) $3u - 4u^2$
9) 2z − 3
10) $2c^2 - 3d$

1) Yes
2) No
3) No
4) Yes
5) No
6) No
7) Yes
8) Yes
9) No
10) Yes

1) num.: 5, (d + g)
   denom.: 3, 5, 15, (d + g)
2) num.: n, (r + t)
   denom.: (r + t)
3) num.: 3, 9, (e + f)
   denom.: 2, 3, 4, 6, 12, e
4) num.: (n + p − r)
   denom.: r, (n + p)
5) num.: (s − t + v)
   denom.: (t + v)
6) num.: (x − y)
   denom.: w, (x − y)
7) num.: 2, 3, 6, m, m^2
   denom.: (u + m)
8) num.: 2, 4, (p − q)
   denom.: 2, 3, 6, (p + q)
9) num.: 3, (b + c)
   denom.: (b + c), $(b + c)^2$
10) num.: x, x^2, (y − z)
    denom.: (y − z), (y + z), $(y^2 - z^2)$

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1) 1/2
2) 3/5
3) 1
4) 1/3
5) 3u/2w
6) 9
7) 1/6
8) x/y
9) 3/7u
10) $2c/d^2$

1) $\frac{x}{z} + \frac{y}{z}$
2) $\frac{a}{c} + \frac{b}{c} - \frac{3}{c}$
3) $\frac{n^2}{r} - \frac{r}{r}$
4) $\frac{\text{ant}}{\text{spider}} - \frac{\text{mouse}}{\text{spider}}$
5) $\frac{11}{21} - \frac{t}{21}$
6) $\frac{p}{z} + \frac{2}{z}$
7) $\frac{\bullet}{\bigstar} + \frac{\odot}{\bigstar}$
8) $\frac{c}{2} + \frac{d}{2}$
9) $\frac{3v}{2x} + \frac{2u}{2x} - \frac{4x}{2x}$
10) $\frac{k^2}{4} - \frac{4k}{4}$

1) $\frac{4}{d} + 1$
2) $1 + \frac{e}{c}$
3) $\frac{1}{x} - \frac{y}{x^2}$
4) $\frac{p^2}{q} - 1$
5) $\frac{a}{b^2} + 1$
6) $\frac{n}{r} - r$
7) $1 + \frac{k}{v} + \frac{w}{v}$
8) $\frac{u}{s} + \frac{t}{s} + 1$
9) $1 - \frac{y^2}{x^2}$
10) $1 + \frac{b}{a} - \frac{c}{a}$

Answers

1) First friend runs for 5 seconds; second friend runs for 3 seconds.
2) Ken's speed is 2 yps; Ben's speed is 4 yps.
3) Graham drives for 5 hours; Janet drives for 3 hours.
4) Sandy drives 20 mph; her mom drives 80 mph.

1) Train 'A' travels 50 mph; Train 'B' travels 70 mph.
2) Sara's speed is 80 mph; Emma's speed is 65 mph.
3) The Yellow Lambo travels 3 fps; the Purple Ferrari travels 5 fps.
4) Ned's speed is 6 fps; Ted's speed is 10 fps.

1) Speed w/ tailwind = 776 mph; speed vs. headwind = 704 mph.
2) Speed w/ tailwind = 932 kph; speed vs. headwind = 838 kph.
3) Speed w/ tailwind = 637 mph; speed vs. headwind = 579 mph.
4) Speed w/ tailwind = 843 kph; speed vs. headwind = 735 kph.

1) (– 2, – 1)
2) (– 3, – 6)
3) (5, – 2)
4) (– 7, – 3)

1) $300 = 1 \times (b + c)$
$300 = 1.5 \times (b - c)$
2) $1{,}700 = 3 \times (p + w)$
$1{,}700 = 4 \times (p - w)$

1) Speed of the plane in still air = 495 mph; wind speed = 55 mph.
2) Speed of the boat in still water = 27.5 mph; current speed = 2.5 mph.

1) Amount of treehouse built = (1/6) x (2) = 1/3
2) Amount of cartoon animated = (1/2) x (1) = 1/2
3) Amount of dinner cooked = (1/3) x (2) = 2/3
4) Amount of room cleaned = (1/60) x (15) = 15/60 = 1/4
5) Amount of song written = (1/5) x (4) = 4/5

---

1) ME/E: Ashlynn's Fractional Work + Nadia's Fractional Work = 1
ME/M: $(r_a \times t_a) + (r_n \times t_n) = 1$
2) ME/E: Candace's Fractional Work + Sarah's Fractional Work = 1
ME/M: $(r_c \times t_c) + (r_s \times t_s) = 1$
3) ME/E: First Bird's Fractional Work + Second Bird's Fractional Work = 1
ME/M: $(r_1 \times t_1) + (r_2 \times t_2) = 1$
4) ME/E: Man's Fractional Work + Daughter's Fractional Work = 1
ME/M: $(r_m \times t_m) + (r_d \times t_d) = 1$
5) ME/E: Noah's Fractional Work + Adam's Fractional Work = 1
ME/M: $(r_n \times t_n) + (r_a \times t_a) = 1$