

Chapter 4 - Equations - Exam Review

MPM1D

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Section 1: 4.1 Solving Simple Equations

1. Solve the following equations

a) $x + 4 = 7$

$$x = 3$$

b) $y - 3 = 5$

$$y = 8$$

c) $4m = 12$

$$m = 3$$

d) $\frac{c}{3} = 2$

$$c = 6$$

e) $g - 5 = -3$

$$g = 2$$

f) $5u = -20$

$$u = -4$$

g) $\frac{w}{5} = -2$

$$w = -10$$

h) $5x + 3 = 13$

$$5x = 10$$

$$x = 2$$

i) $7w - 3 = 11$

$$7w = 14$$

$$w = 2$$

j) $-4h - 5 = -1$

$$-4h = 4$$

$$h = -1$$

k) $5r + 7 = 42$

$$5r = 35$$

$$r = 7$$

l) $-3x + 5 = 8$

$$-3x = 3$$

$$x = -1$$

m) $8 + 7y = 15$

$$7y = 7$$

$$y = 1$$

n) $-8x - 2 = 0$

$$-8x = 2$$

$$x = \frac{2}{-8}$$

$$x = -\frac{1}{4}$$

o) $-6 + 4u = -3$

$$4u = 3$$

$$u = \frac{3}{4}$$

2. At a computer store, packages of DVDs sell for \$15 each. One customer buys \$120 worth of DVDs.

a) Write an equation to model the number of packages of DVDs the customer bought.

$$15x = 120$$

b) Solve the equation.

$$x = \frac{120}{15}$$

$$x = 8$$

8 DVDs

3. Solve each equation. Express fraction answers in lowest terms.

a) $3h + 4 = 6$

$$3h = 2$$

$$h = \frac{2}{3}$$

b) $5x - 3 = -2$

$$5x = 1$$

$$x = \frac{1}{5}$$

c) $-7w + 2 = -3$

$$-7w = -5$$

$$w = \frac{5}{7}$$

d) $-4d - 3 = -1$

$$-4d = 2$$

$$d = -\frac{1}{2}$$

e) $3r + \frac{2}{5} = -4$

$$3r = -\frac{20}{5} - \frac{2}{5} \quad r = -\frac{22}{15}$$

$$3r = -\frac{22}{5}$$

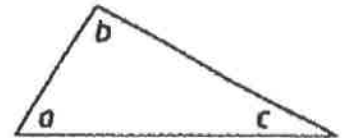
f) $5t - 4 = \frac{2}{3}$

$$5t = \frac{2}{3} + \frac{12}{3}$$

$$5t = \frac{14}{3}$$

$$t = \frac{14}{15}$$

4. The equation $a + b + c = 180$ describes the sum of the angles in a triangle.



a) Use this formula to find the values of a , b and c when $b = 2a$ and $c = 3a$

$$a + 2a + 3a = 180$$

$$6a = 180$$

$$a = 30$$

b) Use this formula to find the values of a , b and c when $b = 3a$ and $c = 5a$

$$a + 3a + 5a = 180$$

$$9a = 180$$

$$a = 20$$

Section 2: 4.2 Solving Multi-Step Equations

5. Solve the following equations.

a) $5 + 3x + 4x = 19$

$$7x = 14$$

$$x = 2$$

b) $15y - 6 - 10y = 9$

$$5y = 15$$

$$y = 3$$

c) $32 = 5 - 4a - 5a$

$$27 = -9a$$

$$-3 = a$$

d) $5m + 3 - 9m + 13 = 0$

$$-4m = -16$$

$$m = 4$$

e) $6w + 8 = 4w + 18$

$$6w - 4w = 18 - 8$$

$$2w = 10$$

$$w = 5$$

f) $-8x - 5 = 2x + 15$

$$-8x - 2x = 15 + 5$$

$$-10x = 20$$

$$x = -2$$

$3x - 6 = -x - 2$

$$3x + x = -2 + 6$$

$$4x = 4$$

$$x = 1$$

h) $5 + 4x = -13 - 2x$

$$4x + 2x = -13 - 5$$

$$6x = -18$$

$$x = -3$$

i) $14 - n - 7 = 5n + 1$

$$7 - 1 = 5n + n$$

$$6 = 6n$$

$$1 = n$$

6. Find the root of each equation.

a) $5(x + 4) = 3x + 14$

$$5x + 20 = 3x + 14$$

$$5x - 3x = 14 - 20$$

$$2x = -6$$

$$x = -3$$

b) $5x - 6 = 2(x + 3)$

$$5x - 6 = 2x + 6$$

$$5x - 2x = 6 + 6$$

$$3x = 12$$

$$x = 4$$

c) $4y + 3(2 - y) = 13$

$$4y + 6 - 3y = 13$$

$$y = 13 - 6$$

$$y = 7$$

$$d) x = 3(5 - x) + 1$$

$$x = 15 - 3x + 1$$

$$x + 3x = 15 + 1$$

$$4x = 16$$

$$x = 4$$

$$e) 3(r + 4) + 2(r + 5) = 32$$

$$3r + 12 + 2r + 10 = 32$$

$$5r + 22 = 32$$

$$5r = 10$$

$$r = 2$$

$$f) 5(y - 3) - 3(y - 4) = 12$$

$$5y - 15 - 3y + 12 = 12$$

$$2y - 3 = 12$$

$$2y = 15$$

$$y = \frac{15}{2}$$

$$g) 4(x + 3) = 2(x + 6) - 8$$

$$4x + 12 = 2x + 12 - 8$$

$$4x - 2x = 12 - 8 - 12$$

$$2x = -8$$

$$x = -4$$

$$h) 2(y - 4) = -3(y + 2) + 8$$

$$2y - 8 = -3y - 6 + 8$$

$$2y + 3y = 2 + 8$$

$$5y = 10$$

$$y = 2$$

$$i) 0 = 4x + 3 - x - 9$$

$$0 = 3x - 6$$

$$6 = 3x$$

$$2 = x$$

7. Solve each equation. Express fraction answers in lowest terms.

$$a) 5x - 2 = 2x + 3$$

$$5x - 2x = 3 + 2$$

$$3x = 5$$

$$x = \frac{5}{3}$$

$$b) 4 + 5x = x - 2$$

$$5x - x = -2 - 4$$

$$4x = -6$$

$$x = \frac{-6}{4}$$

$$x = -\frac{3}{2}$$

$$c) 4(x+3) + 2(x-3) = 3(x-2)$$

$$4x+12+2x-6 = 3x-6$$

$$6x-3x = -6-6$$

$$3x = -12$$

$$x = -4$$

$$d) 7 - (4x+3) = -3(x+2) - (2x+3)$$

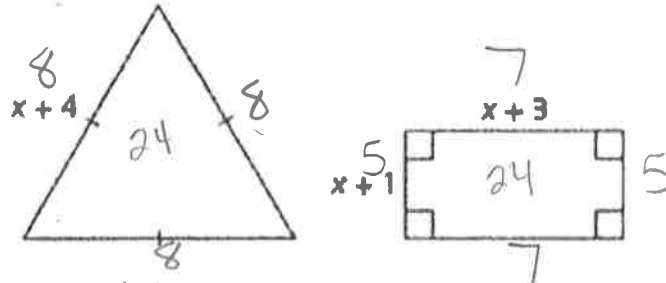
$$7-4x-3 = -3x-6-2x-3$$

$$-4x+4 = -5x-9$$

$$-4x+5x = -9-4$$

$$x = -13$$

8. An equilateral triangle and a rectangle have the same perimeter. Find the side lengths of the equilateral triangle and the rectangle.



$$3(x+4) = 2(x+1) + 2(x+3)$$

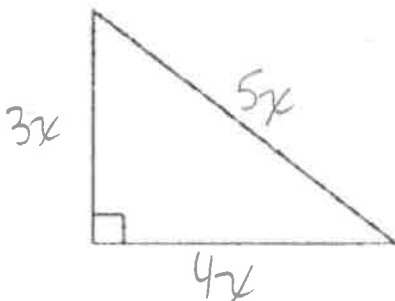
$$3x+12 = 2x+2+2x+6$$

$$3x+12 = 4x+8$$

$$12-8 = 4x-3x$$

$$4 = x$$

9. A family of right triangles has side lengths in the approximate ratio 3:4:5. One right triangle belonging to the family has a perimeter of 180 cm. Find its area. (Remember that the legs of a right triangle are the base and height)



$$3x+4x+5x = 180$$

$$12x = 180$$

$$x = 15$$

$$\begin{aligned} \text{Base} &= 3x \\ &= 3(15) \\ &= 45 \end{aligned}$$

$$\begin{aligned} \text{Height} &= 4x \\ &= 4(15) \\ &= 60 \end{aligned}$$

$$\text{Area} = \frac{bh}{2}$$

$$= \frac{(45)(60)}{2}$$

$$= 1350 \text{ cm}^2$$

Section 3: 4.3 Solving Equations Involving Fractions

10. Solve the following equations.

$$a) \frac{1}{4}(x-3) = -2$$

$$\frac{(x-3)}{4} = -2$$

$$x-3 = -8$$

$$x = -5$$

$$b) 6 = -\frac{3}{5}(a-7)$$

$$6 = \frac{-3(a-7)}{5}$$

$$30 = -3a + 21$$

$$9 = -3a$$

$$-3 = a$$

$$c) \frac{m+7}{5} = 3$$

$$m+7 = 15$$

$$m = 8$$

$$d) 9 = \frac{3(x+4)}{2}$$

$$18 = 3x + 12$$

$$6 = 3x$$

$$2 = x$$

$$e) \frac{3x+5}{2} = 10$$

$$3x+5 = 20$$

$$3x = 15$$

$$x = 5$$

$$f) 1 = \frac{2y-3}{5}$$

$$5 = 2y - 3$$

$$8 = 2y$$

$$4 = y$$

$$g) \frac{x-4}{5} = \frac{x-3}{6}$$

$$6(x-4) = 5(x-3)$$

$$6x - 24 = 5x - 15$$

$$x = 9$$

$$h) \frac{x-2}{4} = \frac{x+1}{3}$$

$$3(x-2) = 4(x+1)$$

$$3x - 6 = 4x + 4$$

$$-6 - 4 = 4x - 3x$$

$$-10 = x$$

$$i) \frac{1}{3}(x+4) = \frac{1}{5}(x+2)$$

$$\frac{x+4}{3} = \frac{x+2}{5}$$

$$5(x+4) = 3(x+2)$$

$$5x + 20 = 3x + 6$$

$$2x = -14$$

$$x = -7$$

$$j) \frac{1}{4}(x-7) = \frac{1}{6}(x-3)$$

$$12 \times \frac{1}{4}(x-7) = 12 \times \frac{1}{6}(x-3)$$

$$3(x-7) = 2(x-3)$$

$$3x - 21 = 2x - 6$$

$$x = 15$$

$$k) \frac{2(x-5)}{3} = \frac{4(x+2)}{5}$$

$$5(2)(x-5) = 3(4)(x+2)$$

$$10(x-5) = 12(x+2)$$

$$10x - 50 = 12x + 24$$

$$-50 - 24 = 12x - 10x$$

$$-74 = 2x$$

$$-37 = x$$

$$l) \frac{3(x-4)}{4} = \frac{2(x-3)}{3}$$

$$3(3)(x-4) = 4(2)(x-3)$$

$$9(x-4) = 8(x-3)$$

$$9x - 36 = 8x - 24$$

$$x = 12$$

11. Solve each equation.

$$a) \frac{2a}{3} + \frac{a-4}{5} = \frac{1}{2}$$

$$(30)\left(\frac{2a}{3}\right) + (30)\left(\frac{a-4}{5}\right) = 30\left(\frac{1}{2}\right)$$

$$10(2a) + 6(a-4) = 15$$

$$20a + 6a - 24 = 15$$

$$26a = 39$$

$$a = \frac{3}{2}$$

$$b) \frac{x+1}{2} + \frac{2x+3}{3} = \frac{x}{4}$$

$$12\left(\frac{x+1}{2}\right) + 12\left(\frac{2x+3}{3}\right) = 12\left(\frac{x}{4}\right)$$

$$6(x+1) + 4(2x+3) = 3x$$

$$6x + 6 + 8x + 12 = 3x$$

$$14x - 3x = -18$$

$$11x = -18$$

$$x = -\frac{18}{11}$$

$$c) \frac{w+3}{4} = \frac{w}{3} + \frac{2w-1}{5}$$

$$60\left(\frac{w+3}{4}\right) = 60\left(\frac{w}{3}\right) + 60\left(\frac{2w-1}{5}\right)$$

$$15w + 45 = 20w + 24w - 12$$

$$57 = 29w$$

$$\frac{57}{29} = w$$

12. The equation $F = \frac{9}{5}C + 32$ allows you to convert between Fahrenheit and Celsius temperatures.

a) The temperature at a resort is 30 degrees Celsius. What is the equivalent temperature in degrees Fahrenheit?

$$F = \left(\frac{9}{5}\right)(30) + 32$$

$$= 9(6) + 32$$

$$= 54 + 32$$

$$= 86$$

86°F

b) The temperature in the living room of a house is 77 degrees Fahrenheit. What is this equivalent to in degrees Celsius?

$$77 = \left(\frac{9}{5}\right)C + 32$$

$$45 = \left(\frac{9}{5}\right)C$$

$$\frac{45}{1} \div \frac{9}{5} = C$$

$$25 = C$$

25°C

13. Find the base of a triangle with height 8 cm and area 72 cm²

$$A = \frac{bh}{2}$$

$$72 = \frac{b(8)}{2}$$

$$72 = 4b$$

$$18 = b$$

18 cm

Section 4: 4.4 Modeling With Algebra

14. Rearrange each formula to isolate the variable indicated

a) $C = \pi d$ for d

$$d = \frac{C}{\pi}$$

b) $d = vt$ for t

$$t = \frac{d}{v}$$

c) $A = P + I$ for I

$$A - P = I$$

d) $y = mx + b$ for m

$$y - b = mx$$

$$\frac{y - b}{x} = m$$

e) $Ax + By + C = 0$ for y

$$By = -Ax - C$$

$$y = \frac{-Ax - C}{B}$$

f) $F = ma$ for a

$$\frac{F}{m} = a$$

g) $V = s^3$ for s

$$\sqrt[3]{V} = s$$

h) $P = I^2 R$ for R

$$\frac{P}{I^2} = R$$

i) $V = \pi r^2 h$ for h

$$\frac{V}{\pi r^2} = h$$

j) $P = 2l + 2w$ for l

$$P - 2w = 2l$$

$$\frac{P - 2w}{2} = l$$

k) $c^2 = a^2 + b^2$ for a

$$c^2 - b^2 = a^2$$

$$\sqrt{c^2 - b^2} = a$$

l) $A = \frac{1}{2}bh$ for h

$$2A = bh$$

$$\frac{2A}{b} = h$$

15. The surface area, A , of a cube is related to the length of a side of the cube, s , by the formula $A = 6s^2$.

a) Rearrange this formula to express s in terms of A .

$$s = \sqrt{\frac{A}{6}}$$

b) Find the length of the side of a cube with surface area 800 cm^2 . Round your answer to the nearest tenth of a centimeter.

$$s = \sqrt{\frac{800}{6}}$$

$$s = 11.5$$

Section 5: 4.5 Modeling With Algebra

16. Write an algebraic expression to represent each description.

a) quadruple a number

$$4x$$

c) one third a number

$$\frac{x}{3}$$

e) six more than twice a number

$$2x + 6$$

b) three more than a number

$$x + 3$$

d) four less than triple a number

$$3x - 4$$

f) three fifths of a number

$$\frac{3x}{5}$$

17. Write an equation to represent each sentence, then solve the equation.

a) five times a number is 85

$$5x = 85$$

b) a number increased by 8 is 177

$$x + 8 = 177$$

c) three more than double a number is 33

$$2x + 3 = 33$$

d) the sum of three consecutive integers is 168

$$x + (x+1) + (x+2) = 168$$

18. Two friends are collecting pop-can tabs. Natasha has 250 more pop-can tabs than Krysten. Together they have collected 880 pop-can tabs. How many pop-can tabs has each friend collected?

$$\begin{aligned} \text{Krysten} &= x \\ \text{Natasha} &= x + 250 \end{aligned}$$

$$\begin{aligned} x + x + 250 &= 880 \\ 2x &= 630 \\ x &= 315 \end{aligned}$$

$$\begin{aligned} \text{Krysten} &= 315 \\ \text{Natasha} &= 565 \end{aligned}$$

19. Jacinth is 4 years older than her sister Naomi. The sum of their ages is 30. How old are the sisters?

$$\text{Jacinth} = x+4$$

$$\text{Naomi} = x$$

$$x+x+4 = 30$$

$$2x = 26$$

$$x = 13$$

$$\text{Jacinth} = 13+4$$

$$= 17$$

$$\text{Naomi} = 13$$

20. The sum of three consecutive integers is 120. Find the numbers.

$$x+x+1+x+2 = 120$$

$$3x+3 = 120$$

$$3x = 117$$

$$x = 39$$

39, 40, 41

21. Anoja, Amani, and Azra are three friends who each have part-time jobs. Last week, Anoja earned twice as much money as Azra, while Amani earned \$25 more than Anoja. The total earnings of the three friends last week was \$450. How much money did each of them earn last week?

$$\text{Anoja} : 2x$$

$$x+2x+2x+25 = 450$$

$$\text{Anoja} = 2(85) = 170$$

$$\text{Amani} : 2x+25$$

$$5x = 425$$

$$\text{Amani} = (2)(85)+25 = 195$$

$$x = 85$$

$$\text{Azra} : x$$

$$\text{Azra} = 85$$

22. Raza works at a flea market selling sunglasses. He is paid \$7.50/h plus \$0.75 commission for every pair of sunglasses he sells.

a) Write an equation to model Raza's earnings.

$$E = 7.5x + 0.75y$$

b) Find Raza's earnings if he sells 25 pairs of sunglasses during a 6 hour shift.

$$E = 7.5(6) + 0.75(25)$$

$$E = \$63.75$$

c) How many pairs of sunglasses must he sell to earn \$90 in 8 hours.

$$90 = 7.5(8) + 0.75(y)$$

$$30 = 0.75y$$

$$40 = y$$

40 pairs