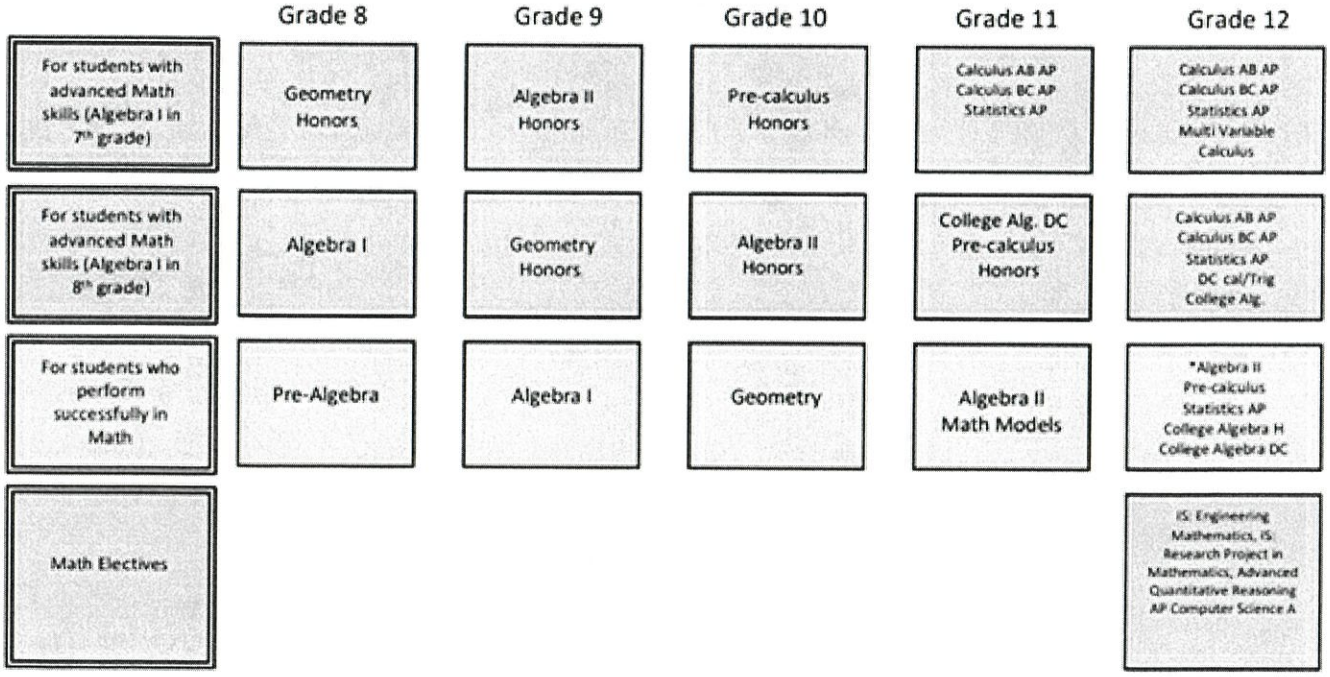
Incoming Algebra Summer Review Packet

This packet is designed for students who are enrolled in **Honors Algebra in the fall at Knox JHS**. Please read all of the information below before starting.

- This packet is optional, will not be taken as a grade, and will not be turned in to your teacher.
- It was created to give you practice in topics that you should be confident in prior to starting Honors Algebra in the fall.
- These are topics that:
  - were taught in Honors Pre-Algebra at Knox
  - are prerequisite skills for success in Honors Algebra
  - will be built upon in Honors Algebra
- We encourage you to look at this packet and practice topics that you do not feel fully confident in. The packet includes both questions and the worked out solutions, by topic.
- If you need more help on a topic, we encourage you to look at videos online to get a mini-lesson before practicing. Suggestions for videos:
  - https://www.khanacademy.org/
  - http://www.math-videos-online.com/
  - https://www.mathtv.com/
- Keep in mind that we quiz and test both with and without a calculator. You should be able to do many of these skills without a calculator. We also have timed require quizzes and tests to be completed in one class period so your confidence level on these topics will be important.
- This information was taken from the CISD Program of Studies. It describes a typical path for high school mathematics courses.



Knox Junior High Student and Parent Agreement

for Enrollment in Honors Algebra

Knox Junior High encourages students to enroll in classes to enhance their academic experience at the appropriate level. The purpose of an Honors course is to prepare students for success at the college-level work they will experience in AP classes during high school.

Characteristics of an Honors Algebra class are:

- Fast-paced curriculum
- Student-initiated learning with an emphasis on strong work ethic
- Depth and complexity of rigorous academic content
- Consistent use of higher-level thinking skills
- Assessment of performance at the analysis, synthesis, and application levels
- Required commitment to the course inside and outside the classroom

Honors Algebra differs from other courses in junior high because it is a high school credit course.

- If a student does not pass the second semester of algebra, the student will not earn credit for the course, regardless of the first semester average.
- Algebra requires a STAAR EOC (end of course) test that the student must pass in order to earn credit for the course.
- There is no summer school available for junior high students who do not pass Honors Algebra. Students will need to repeat the course during their freshman year of high school.
- Semester exams in a high school course count as 15% of the semester average, unlike 10% in a junior high course.
- Tests and quizzes must be finished in one class period.
- If students do not pass a test, they are allowed one retest per grading period, earning up to a 70%.
- Homework is given almost daily, including weekends, and late work is not accepted.
- Quizzes and tests have both calculator and non-calculator sections.

Each student is responsible for his/her own success. A struggling student should attend tutorials and conference with the teacher to devise a plan. Administration, parents, teacher, and student may evaluate the student's progress and may make an adjustment to the student's schedule.

Substitute and Evaluate using Order of Operations

Substitute the values for each varible and simplify to one value. Follow order of operations. Use fractions instead of decimals for your final answer.

1. $2x + 9y$ for $x = -5$ and $y = -3$

2. $2x - 7y$ for $x = -8$ and $y = -7$

3. $3(t - k)$ for $k = -7$ and $t = 15$

4. $4x - 7y - g$ for $x = -4$, $y = 9$ and $g = -3$

5. $-c - a - t$ for $t = -9$, $c = -3$, and $a = -11$

6. $2x^2 - 5x + 19$ for $x = -3$

7. $-4x^2 + 10x - 7$ for $x = -2$

8. $-x^2 - 3x - 1$ for $x = -2$

9. $-f^2 - 8g - (h + i)$ for $f = -2$, $g = 5$, $h = -1$, and $i = 6$

10. $Q(r + s)$ for $Q = -3$, $r = -15$, and $s = -1$

Substitute and Evaluate using Order of Operations

Substitute the values for each varible and simplify to one value. Follow order of operations. Use fractions instead of decimals for your final answer.

1. 2x + 9y for x = -5 and y= -3

$2(-5)+9(-3)$
$-10-27$
-37

2. 2x - 7y for x = -8 and y= -7

$2(-8)-7(-7)$
$-16+49$
33

3. 3(t - k) for k = -7 and t= 15

$3(15--7)$ ← minus a negative becomes positive
$3(15+7)$
$3(22) = 66$

4. 4x - 7y - g for x = -4, y = 9 and g = -3

$4(-4)-7(9)-(-3)$
$-16-63+3$
-76

5. -c - a - t for t = -9, c = -3, and a = - 11

$-(-3)-(-11)-(-9)$
$3+11+9$
23

6. $2x^2$ - 5x + 19 for x = -3

$2(-3)^2-5(-3)+19$
$2(9)+15+19$
$18+15+19$
52

7. $-4x^2$ + 10x -7 for x = -2

$-4(-2)^2+10(-2)-7$
$-4(4)-20-7$
$-16-20-7$
-43

8. $-x^2$ - 3x - 1 for x = -2

$-(-2)^2-3(-2)-1$
$-4+6-1$
1

9. $-f^2$ - 8g - (h + i) for f = -2, g = 5, h = -1, and i = 6

$-(-2)^2-8(5)-(-1+6)$
$-4-40-5$
-49

10. Q(r + s) for Q = -3, r = -15, and s = -1

$-3(-15-1)$
$-3(-16)$
48

Distributive Property

Simplify each question using the distributive property. Always combine like terms.

1. $-3(4x - 9)$

2. $-\frac{2}{3}(-12x - 18)$

3. $-(3x - 15)$

4. $6(7x - 20) + 6x - 3$

5. $5 - 2(10x + 9) - 3$

6. $4 - (6x + 4) - 3x$

7. $\frac{1}{2}(12x - 6) - 3(2x + 7)$

8. $-3 - 9(-2x - 1)$

9. $x(3x - 5)$

10. $2x(-7x - 9) - x$

11. $-x(x^2 - 3x + 11) - x$

12. $3x^2 - 5 - x(2x^2 + 7x - 9) + 1$

Distributive Property

Simplify each question using the distributive property. Always combine like terms.

1. $-3(4x - 9)$

$-12x+27$

2. $-\frac{2}{3}(-12x - 18)$

$8x+12$

3. $-(3x - 15)$

-1

$-3x+15$

4. $6(7x - 20) + 6x - 3$

$42x-120+6x-3$

$48x-123$

5. $5 - 2(10x + 9) - 3$

$5-20x-18-3$

$-20x-16$

6. $4 - (6x + 4) - 3x$

$4-6x-4-3x$

$-9x$

7. $\frac{1}{2}(12x - 6) - 3(2x + 7)$

$6x-3-6x-21$

-24

8. $-3 - 9(-2x - 1)$

$-3+18x+9$

$18x+6$

9. $x(3x - 5)$

$x(x)=x^2$

$3x^2-5x$

10. $2x(-7x - 9) - x$

$-14x^2-18x-x$

$-14x^2-19x$

11. $-x(x^2 - 3x + 11) - x$

$x(x^2)=x^3$

$-x^3+3x^2-11x-x$

$-x^3+3x^2-12x$

12. $3x^2 - 5 - x(2x^2 + 7x - 9) + 1$

$3x^2-5-2x^3-7x^2+9x+1$

$-2x^3-4x^2+9x-4$

Solve Multi-Step Equations

Solve each equation. Write your answer as a whole number or a simplified fraction unless the problem has decimals.

1. $4b - 13b - 10 = 10 - 7b + 20b$

2. $10k - 12k + 7 = 9 - 10k + 2k$

3. $-4 - t = 3t + 8$

4. $2(4x - 3) - 8 = 4 + 2x$

5. $6(1 + 4m) = 2(3 + 10m)$

6. $4(-8x + 5) = -42x$

7. $2(8g + 1) + 2 = \frac{1}{2}(12g + 8)$

8. $2 - 7t - 8t = 5(-4t + 2)$

9. $5x - 2(x - 3) = 4 - 3(2x + 7)$

10. $3.4w + 5 - 0.4w = -7.6 + 4.6w$

11. $\frac{3}{2} + \frac{3}{4}w = \frac{1}{4}w - \frac{1}{2}$

12. $\frac{1}{5}m + \frac{2}{3} - 2 = m - \frac{2}{5}$

13. $\frac{6}{4+2p} = \frac{-2}{p-10}$

14. $\frac{1}{6} = \frac{x-21}{x+5}$

15. $\frac{4}{m+1} = \frac{7}{3m+6}$

Solve Multi-Step Equations

Solve each equation. Write your answer as a whole number or a simplified fraction unless the problem has decimals.

1. $4b - 13b - 10 = 10 - 7b + 20b$

$-9b - 10 = 13b + 10$

$-13b + 10 \quad -13b + 10$

$\frac{-22b}{-22} = \frac{20}{-22}$

$b = \frac{-10}{11}$

2. $10k - 12k + 7 = 9 - 10k + 2k$

$-2k + 7 = -8k + 9$

$+8k - 7 \quad +8k - 7$

$\frac{6k}{6} = \frac{2}{6}$

$k = \frac{1}{3}$

Simplify

3. $-4 - t = 3t + 8$

$+4 - 3t \quad -3t + 4$

$\frac{-4t}{-4} = \frac{12}{-4}$

$t = -3$

4. $2(4x - 3) - 8 = 4 + 2x$

$8x - 6 - 8 = 4 + 2x$

$8x - 14 = 2x + 4$

$-2x + 14 \quad -2x + 14$

$\frac{6x}{6} = \frac{18}{6}$

$x = 3$

5. $6(1 + 4m) = 2(3 + 10m)$

$6 + 24m = 6 + 20m$

$-6 - 20m \quad -6 - 20m$

$\frac{4m}{4} = \frac{0}{4}$

$m = 0$

6. $4(-8x + 5) = -42x$

$-32x + 20 = -42x$

$+32x \quad +32x$

$\frac{20}{-10} = \frac{-10x}{-10}$

$x = -2$

7. $2(8g + 1) + 2 = \frac{1}{2}(12g + 8)$

$16g + 2 + 2 = 6g + 4$

$16g + 4 = 6g + 4$

$-6g \quad -4 \quad -6g - 4$

$\frac{10g}{10} = \frac{0}{10}$

$g = 0$

8. $2 - 7t - 8t = 5(-4t + 2)$

$-15t + 2 = -20t + 10$

$+20t \quad +2 \quad +20t \quad -2$

$\frac{5t}{5} = \frac{8}{5}$

$t = \frac{8}{5}$

9. $5x - 2(x - 3) = 4 - 3(2x + 7)$

$5x - 2x + 6 = 4 - 6x - 21$

$3x + 6 = -6x - 17$

$+6x \quad -6 \quad +6x \quad -6$

$\frac{9x}{9} = \frac{-23}{9}$

$x = \frac{-23}{9}$

10. $3.4w + 5 - 0.4w = -7.6 + 4.6w$

$3w + 5 = 4.6w - 7.6$

$-4.6w \quad -5 \quad -4.6w \quad -5$

$\frac{-1.6w}{-1.6} = \frac{-12.6}{-1.6}$

$w = 7.875$

11. $4\left(\frac{3}{2} + \frac{3}{4}w\right) = \left(\frac{1}{4}w - \frac{1}{2}\right)4$

$6 + 3w = w - 2$

$-6 \quad -w \quad -w - 6$

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

$w = -4$

12. $15\left(\frac{1}{5}m + \frac{2}{3} - 2\right) = \left(m - \frac{2}{5}\right)15$

$3m + 10 - 30 = 15m - 6$

$3m - 20 = 15m - 6$

$-15m + 20 \quad -15m + 20$

$\frac{-12m}{-12} = \frac{14}{-12}$

$m = \frac{-7}{6}$

↑ simplify

cross multiply

13. $\frac{6}{4+2p} = \frac{-2}{p-10}$

$6(p-10) = -2(4+2p)$

$6p - 60 = -8 - 4p$

$+4p \quad +60 \quad +60 \quad +4p$

$\frac{10p}{10} = \frac{52}{10} \qquad p = \frac{26}{5}$

14. $\frac{1}{6} = \frac{x-21}{x+5}$

$1(x+5) = 6(x-21)$

$x + 5 = 6x - 126$

$-6x - 5 \quad -6x \quad -5$

$\frac{-5x}{-5} = \frac{-131}{-5}$

$x = \frac{131}{5}$

15. $\frac{4}{m+1} = \frac{7}{3m+6}$

$7(m+1) = 4(3m+6)$

$7m + 7 = 12m + 24$

$-12m - 7 \quad -12m \quad -7$

$\frac{-5m}{-5} = \frac{17}{-5}$

$m = \frac{-17}{5}$

remember:

cross multiply to solve a proportion

$\frac{2}{x} = \frac{17}{76.5}$

$17x = 2(76.5)$

$\frac{17x}{17} = \frac{153}{17}$

$x = 9$

apply this to the other questions

Solve Multi Step Inequalities

Solve each inequality. Write your answer as a whole number or a simplified fraction unless the problem has decimals.

1. $-13 < 5(1 + 4x) - 2x$

2. $10(1 + 3t) \geq -20 + t$

3. $-8(7k - 2) < -92 + 5k - 14$

4. $15 + g > -2(g - 15)$

5. $-8(-4x - 6) < \frac{1}{2}(12x + 44)$

6. $\frac{2}{3} + \frac{1}{3}x + \frac{1}{3} < x - 4 - \frac{1}{3}x + 1$

7. $-(-4x - 12) \geq 5(4x - 6)$

8. $-0.3(1 + 0.2x) + 5.2 > -1.3 - 0.5x + 10.6$

9. $\frac{1}{2}a - 7 < \frac{2}{3}(a - 9)$

10. $4 - \frac{1}{2}(4h - 2) > 6h - 4h + 5$

FLIP the inequality symbol when you multiply or divide by a negative!

Solve Multi Step Inequalities

Solve each inequality. Write your answer as a whole number or a simplified fraction unless the problem has decimals.

1. $-13 < 5(1 + 4x) - 2x$

$-13 < 5 + 20x - 2x$

$-13 < 18x + 5$

$-5 \quad -5$

$\frac{-18}{18} < \frac{18x}{18}$

$-1 < x$

$x > -1$

2. $10(1 + 3t) \geq -20 + t$

$10 + 30t \geq -20 + t$

$-10 \quad -t \quad -10 \quad -t$

$\frac{29t}{29} \geq \frac{-30}{29}$

$t \geq \frac{-30}{29}$

3. $-8(7k - 2) < -92 + 5k - 14$

$-56k + 16 < 5k - 106$

$-5k \quad -16 \quad -5k \quad -16$

$\frac{-61k}{-61} < \frac{-122}{-61}$

$k > 2$

flip the inequality symbol if you multiply or divide by a negative

4. $15 + g > -2(g - 15)$

$g + 15 > -2g + 30$

$+2g \quad -15 \quad +2g \quad -15$

$\frac{3g}{3} > \frac{15}{3}$

$g > 5$

5. $-8(-4x - 6) < \frac{1}{2}(12x + 44)$

$32x + 48 < 6x + 22$

$-6x \quad -48 \quad -6x \quad -48$

$\frac{26x}{26} < \frac{-26}{26}$

$x < -1$

6. $3\left(\frac{2}{3} + \frac{1}{3}x + \frac{1}{3}\right) < \left(x - 4 - \frac{1}{3}x + 1\right)3$

$2 + x + 1 < 3x - 12 - x + 3$

$x + 3 < 2x - 9$

$-2x \quad -3 \quad -2x \quad -3$

$\frac{-x}{-1} < \frac{-12}{-1}$

$x > 12$

7. $-(-4x - 12) \geq 5(4x - 6)$

$4x + 12 \geq 20x - 30$

$-20x \quad -12 \quad -20x \quad -12$

$\frac{-16x}{-16} \geq \frac{-42}{-16}$

$x \leq \frac{21}{8}$

8. $-0.3(1 + 0.2x) + 5.2 > -1.3 - 0.5x + 10.6$

$-.3 - .06x + 5.2 > -.5x + 9.3$

$-.06x + 4.9 > -.5x + 9.3$

$+.5x \quad -4.9 \quad +.5x \quad -4.9$

$\frac{.44x}{.44} > \frac{4.4}{.44}$

$x > 10$

9. $\frac{1}{2}a - 7 < \frac{2}{3}(a - 9)$

$6\left(\frac{1}{2}a - 7\right) < \left(\frac{2}{3}a - 6\right)6$

$3a - 42 < 4a - 36$

$-4a + 42 \quad -4a + 42$

$\frac{+a}{-1} < \frac{6}{-1}$

$a > -6$

10. $4 - \frac{1}{2}(4h - 2) > 6h - 4h + 5$

$4 - 2h + 1 > 2h + 5$

$-2h + 5 > 2h + 5$

$-2h \quad +5 \quad -2h \quad +5$

$\frac{-4h}{-4} > \frac{0}{-4}$

$h < 0$

Squares and Square Roots

We suggest you know most of these without the use of the calculator.

$1^2 = 1, \sqrt{1} = 1$

$2^2 = 4, \sqrt{4} = 2$

$3^2 = 9, \sqrt{9} = 3$

$4^2 = 16, \sqrt{16} = 4$

$5^2 = 25, \sqrt{25} = 5$

$6^2 = 36, \sqrt{36} = 6$

$7^2 = 49, \sqrt{49} = 7$

$8^2 = 64, \sqrt{64} = 8$

$9^2 = 81, \sqrt{81} = 9$

$10^2 = 100, \sqrt{100} = 10$

$11^2 = 121, \sqrt{121} = 11$

$12^2 = 144, \sqrt{144} = 12$

$13^2 = 169, \sqrt{169} = 13$

$14^2 = 196, \sqrt{196} = 14$

$15^2 = 225, \sqrt{225} = 15$

$16^2 = 256, \sqrt{246} = 16$

$17^2 = 289, \sqrt{289} = 17$

$18^2 = 324, \sqrt{324} = 18$

$19^2 = 361, \sqrt{361} = 19$

$20^2 = 400, \sqrt{400} = 20$

$25^2 = 625, \sqrt{625} = 25$

$30 = 900, \sqrt{900} = 30$

Answer the questions that follow based on these squares and square roots.

1. $\sqrt{90}$ is between what two integers?

2. $-\sqrt{370}$ is between what two integers?

3. $\sqrt{136}$ is between what two integers?

4. $-\sqrt{24}$ is between what two integers?

5. $-\sqrt{294}$ is between what two integers?

6. $\sqrt{2.9}$ is between what two integers?

Squares and Square Roots

We suggest you know most of these without the use of the calculator.

$1^2 = 1, \sqrt{1} = 1$

$2^2 = 4, \sqrt{4} = 2$

$3^2 = 9, \sqrt{9} = 3$

$4^2 = 16, \sqrt{16} = 4$

$5^2 = 25, \sqrt{25} = 5$

$6^2 = 36, \sqrt{36} = 6$

$7^2 = 49, \sqrt{49} = 7$

$8^2 = 64, \sqrt{64} = 8$

$9^2 = 81, \sqrt{81} = 9$

these will help you!

$10^2 = 100, \sqrt{100} = 10$

$11^2 = 121, \sqrt{121} = 11$

$12^2 = 144, \sqrt{144} = 12$

$13^2 = 169, \sqrt{169} = 13$

$14^2 = 196, \sqrt{196} = 14$

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$30 = 900, \sqrt{900} = 30$

Answer the questions that follow based on these squares and square roots.

1. $\sqrt{90}$ is between what two integers?

$\sqrt{81} < \sqrt{90} < \sqrt{100}$

$9 < ? < 10$

9 and 10

2. $-\sqrt{370}$ is between what two integers?

$-\sqrt{400} < -\sqrt{370} < -\sqrt{361}$

$-20 < ? < -19$

-20 and -19

3. $\sqrt{136}$ is between what two integers?

$\sqrt{121} < \sqrt{136} < \sqrt{144}$

$11 < ? < 12$

11 and 12

4. $-\sqrt{24}$ is between what two integers?

$-\sqrt{25} < -\sqrt{24} < -\sqrt{16}$

$-5 < ? < -4$

-5 and -4

5. $-\sqrt{294}$ is between what two integers?

$-\sqrt{324} < -\sqrt{294} < -\sqrt{289}$

$-18 < ? < -17$

-18 and -17

6. $\sqrt{2.9}$ is between what two integers?

$\sqrt{1} < \sqrt{2.9} < \sqrt{4}$

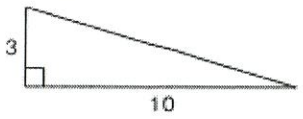
$1 < ? < 2$

1 and 2

Pythagorean Theorem

Find the missing measurement(s) for each figure. Round to the hundredths if necessary.

1.



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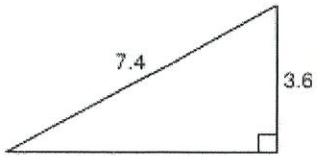

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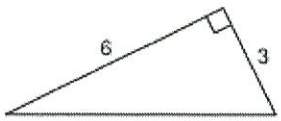

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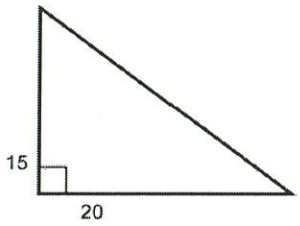

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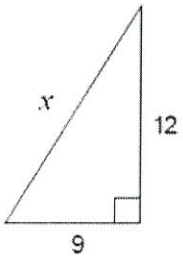

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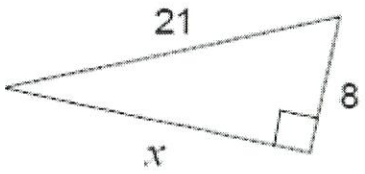

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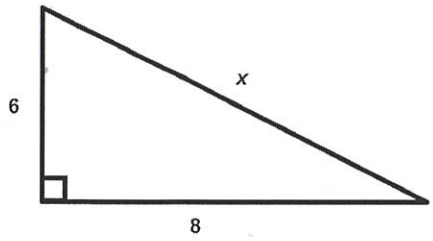

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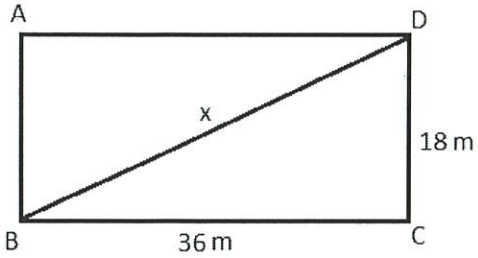

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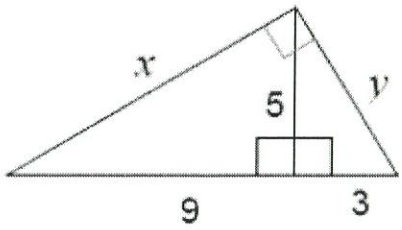
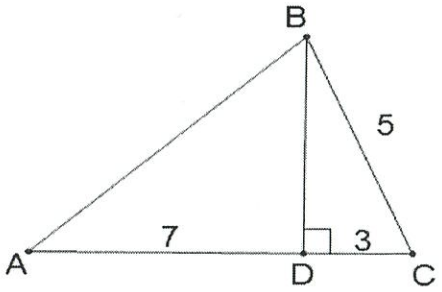


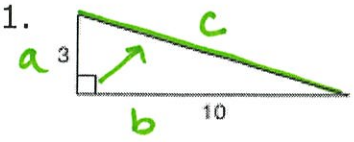
10.



Pythagorean Theorem $a^2+b^2=c^2$

Find the missing measurement(s) for each figure. Round to the hundredths if necessary.

1.



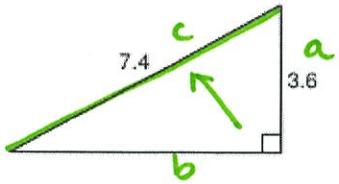
$a^2+b^2=c^2$

$3^2+10^2=c^2$

$\sqrt{109}=\sqrt{c^2}$

$c=10.44$

2.



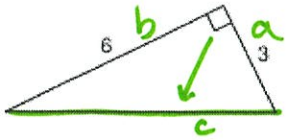
$a^2+b^2=c^2$

$3.6^2+b^2=7.4^2$

$b^2=7.4^2-3.6^2$

$\sqrt{b^2}=\sqrt{41.8}$ $b=6.47$

3.



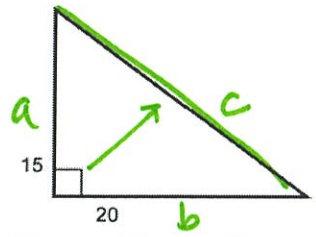
$a^2+b^2=c^2$

$3^2+b^2=c^2$

$\sqrt{45}=\sqrt{c^2}$

$c=6.71$

4.



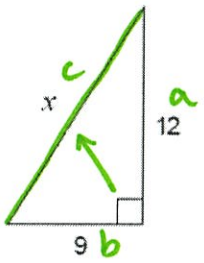
$a^2+b^2=c^2$

$15^2+20^2=c^2$

$\sqrt{625}=\sqrt{c^2}$

$c=25$

5.

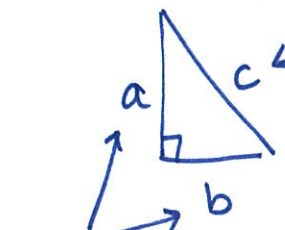


$a^2+b^2=c^2$

$12^2+9^2=c^2$

$\sqrt{225}=\sqrt{c^2}$

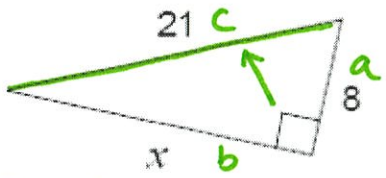
$c=15$



hypotenuse (longest side, across from right angle)

leg (right angle is between the two legs)

6.



$a^2+b^2=c^2$

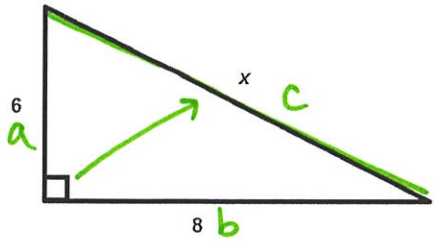
$8^2+b^2=21^2$

$b^2=21^2-8^2$

$\sqrt{b^2}=\sqrt{377}$

$b=19.42$

7.



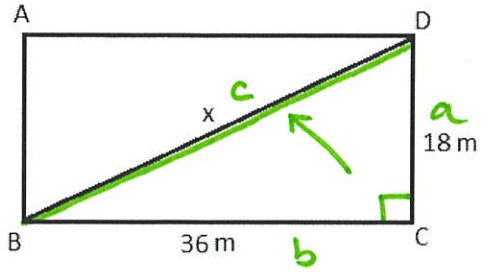
$a^2+b^2=c^2$

$6^2+8^2=c^2$

$\sqrt{100}=\sqrt{c^2}$

$c=10$

8.



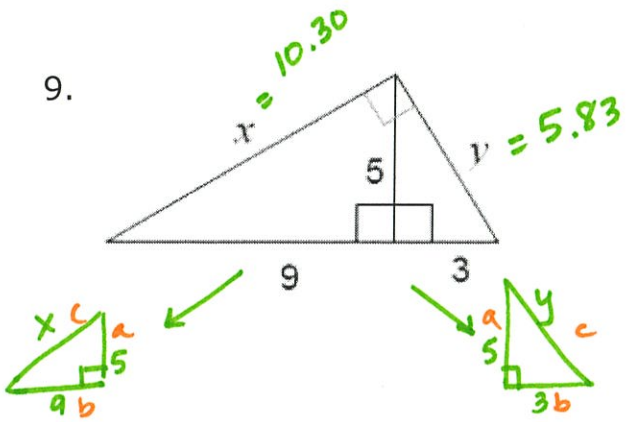
$a^2+b^2=c^2$

$18^2+36^2=c^2$

$\sqrt{1620}=\sqrt{c^2}$

$c=40.25\text{ m}$

9.



$a^2+b^2=c^2$

$5^2+9^2=c^2$

$\sqrt{106}=\sqrt{c^2}$

$c=10.30$

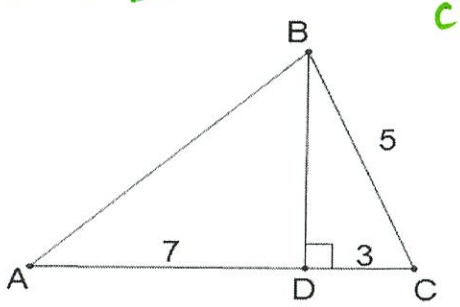
$a^2+b^2=c^2$

$5^2+3^2=c^2$

$\sqrt{34}=\sqrt{c^2}$

$c=5.83$

10.



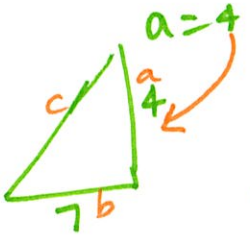
$a^2+b^2=c^2$

$a^2+3^2=5^2$

$a^2=5^2-3^2$

$\sqrt{a^2}=\sqrt{16}$

$a=4$



$a^2+b^2=c^2$

$4^2+7^2=c^2$

$\sqrt{65}=\sqrt{c^2}$

$c=8.06$

Literal Equations

Solve each equation for the specified variable.

1. P = IRT for T

2. y = 5x - 6 for x

3. ax +by = c for y

4. V = LWH for L

5. $V = \pi r^2 h$ for h

6. A = 2L + W for W

7. $A = \frac{1}{2}hb + c$ for b

8. $W = 4\pi r$ for r

9. $A = \frac{x+y}{2}$ for y

10. $x = \frac{yz}{6}$ for z

11. $R = \frac{E}{I}$ for I

12. $F = \frac{a+b+c}{4}$ for b

Literal Equations

Solve each equation for the specified variable.

1. $P = IRT$ for T

$\frac{P}{IR} = \frac{IRT}{IR}$

$T = \frac{P}{IR}$

2. $y = 5x - 6$ for x

$+6 \quad +6$

$y + 6 = 5x$

$\frac{y+6}{5} = \frac{5x}{5}$

$x = \frac{y+6}{5}$

3. $ax + by = c$ for y

$-ax \quad -ax$

$by = -ax + c$

$\frac{by}{b} = \frac{-ax+c}{b}$

$y = \frac{-ax+c}{b}$

4. $V = LWH$ for L

$\frac{V}{WH} = \frac{LWH}{WH}$

$L = \frac{V}{WH}$

5. $V = \pi r^2 h$ for h

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

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

6. $A = 2L + W$ for W

$-2L \quad -2L$

$W = A - 2L$

7. $A = \frac{1}{2}hb + c$ for b

$-c \quad -c$

$2(A-c) = (\frac{1}{2}hb)2$

$\frac{2(A-c)}{h} = \frac{hb}{h}$

$b = \frac{2(A-c)}{h}$

8. $W = 4\pi r$ for r

$\frac{W}{4\pi} = \frac{4\pi r}{4\pi}$

$r = \frac{W}{4\pi}$

9. $A = \left(\frac{x+y}{2}\right)2$ for y

$2A = x + y$

$-x \quad -x$

$y = 2A - x$

10. $x = \left(\frac{yz}{6}\right)6$ for z

$\frac{6x}{y} = \frac{yz}{y}$

$z = \frac{6x}{y}$

11. $R = \left(\frac{E}{I}\right)I$ for I

$\frac{IR}{R} = \frac{E}{R}$

$I = \frac{E}{R}$

12. $F = \left(\frac{a+b+c}{4}\right)4$ for b

$4F = a + b + c$

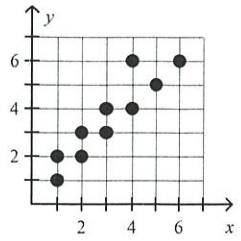
$-a-c \quad +a \quad -c$

$b = -a - c + 4F$

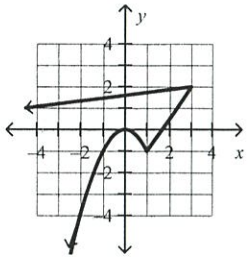
Functions

Determine if each representation is a function. Explain why.

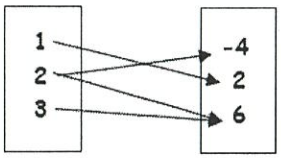
1.



2.

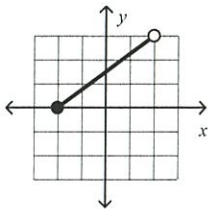


3.



4. $\left\{\left(\frac{1}{2},\frac{1}{2}\right),\left(\frac{3}{5},\frac{4}{3}\right),\left(\frac{1}{2},\frac{1}{9}\right),\left(\frac{-2}{3},\frac{8}{7}\right)\right\}$

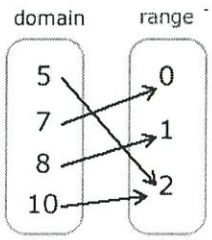
5.



6.

x	y
0.2	3.6
0.4	4.9
0.6	5.2
0.2	3.6

7.

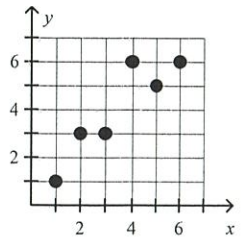


8. {(4, -3), (1.5, 4), (-12, 3), (0, 10), (0, 10)}

9.

x	-5	-5	-5	-5
y	0	1	2	3

10.



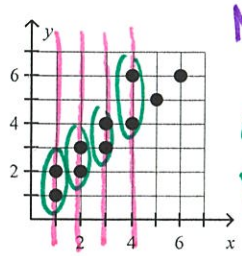
11.

x	-2	-1	0	1	2	3
y	-1.5	1	2.5	3	2.5	1

Functions → each input (x) has exactly one output (y)

Determine if each representation is a function. Explain why.

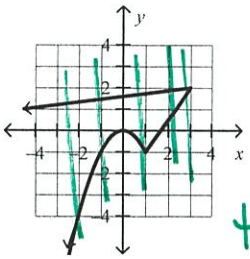
1.



Not a function

does not pass vertical line test, each input does not have exactly one output

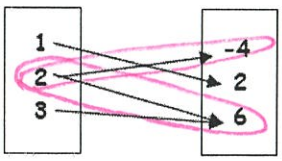
2.



Not a function

does not pass vertical line test, each input does not have exactly one output

3.



Not a function

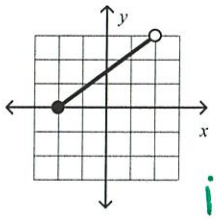
each input does not have exactly one output

4. $\left\{\left(\frac{1}{2},\frac{1}{2}\right),\left(\frac{3}{5},\frac{4}{3}\right),\left(\frac{1}{2},\frac{1}{9}\right),\left(\frac{-2}{3},\frac{8}{7}\right)\right\}$

Not a function

each input does not have exactly one output

5.



Function

passes vertical line test, each input has exactly one output

6.

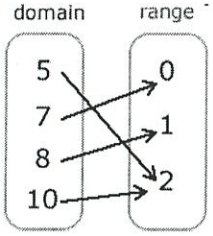
x	y
0.2	3.6
0.4	4.9
0.6	5.2
0.2	3.6

ok, same point

Function

each input has exactly one output

7.



Function

each input has exactly one output

8. {(4, -3), (1.5, 4), (-12, 3), (0, 10), (0, 10)}

same

Function

each input has exactly one output

9.

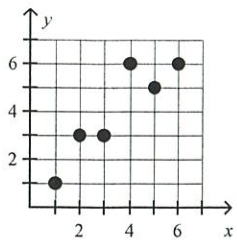
x	-5	-5	-5	-5
y	0	1	2	3

vertical line

Not a function

each input does not have exactly one output

10.



Function passes vertical line test, each input has exactly one output

11.

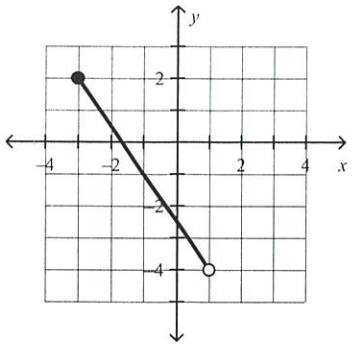
x	-2	-1	0	1	2	3
y	-1.5	1	2.5	3	2.5	1

Function each input has exactly one output

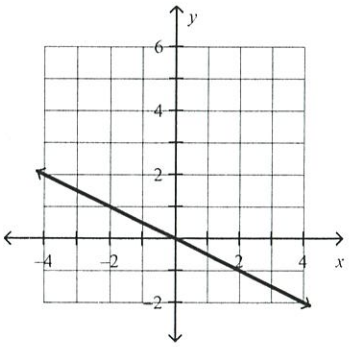
Domain and Range of Linear Graphs

Find the domain and range for each graph.

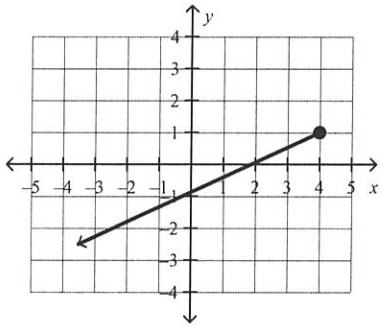
1.



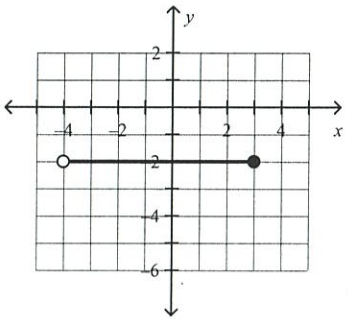
2.



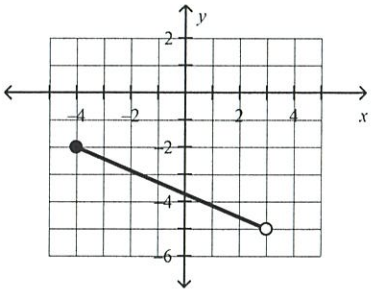
3.



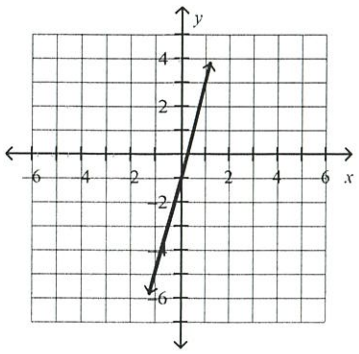
4.



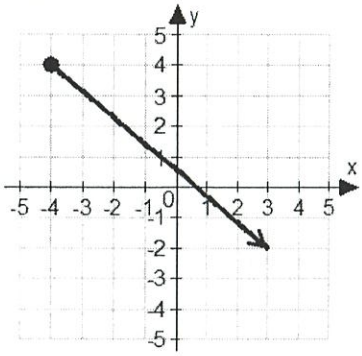
5.



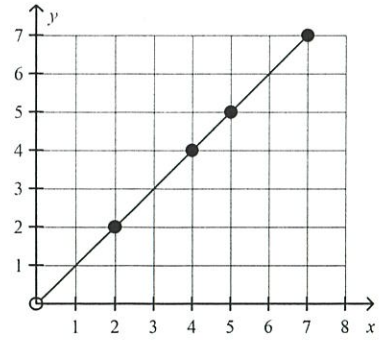
6.


y
x
4
2
-2
-6
-6
-4
2
2
4
6

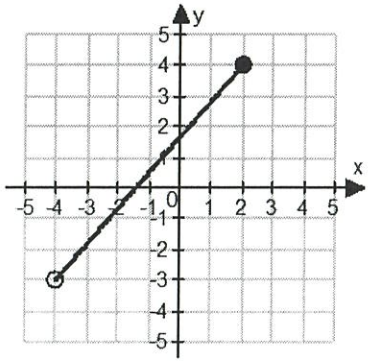
7.


y
x
5
4
3
2
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5

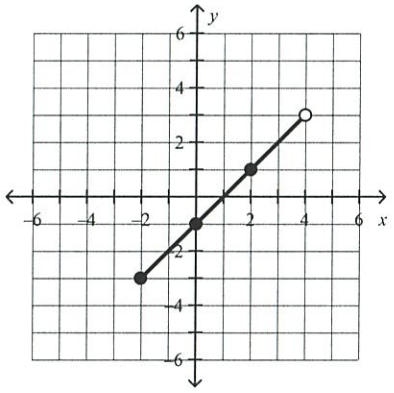
8.


y
x
7
6
5
4
3
2
1
1 2 3 4 5 6 7 8

9.


y
x
5
4
3
2
1
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 0 1 2 3 4 5

10.


y
x
6
4
2
-2
-4
-6
-6
-4
-2
2
4
6

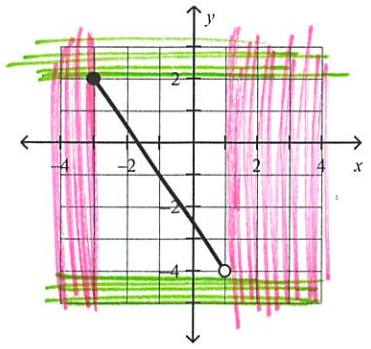
Domain and Range of Linear Graphs

x-values y-values

Find the domain and range for each graph.

"box it in"

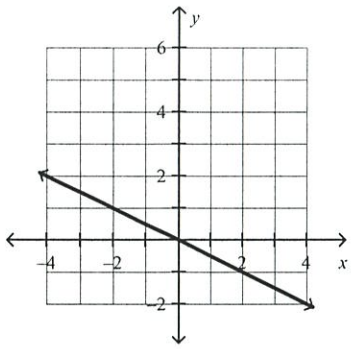
1.



domain: $-3 \leq x < 1$

range: $-4 < y \leq 2$

2.



domain: $\mathbb{R}$ or $-\infty < x < \infty$

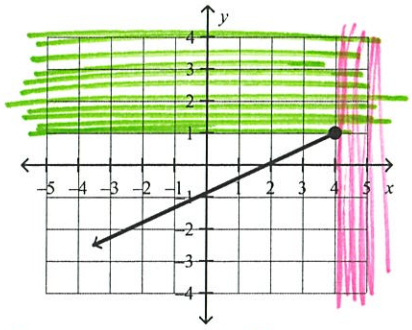
range: $\mathbb{R}$ or $-\infty < y < \infty$

all real number — negative infinity — positive infinity

○ = > or <

● = ≥ or ≤

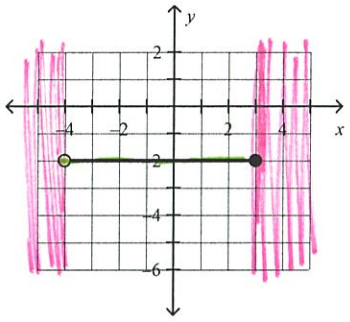
3.



domain: $x \leq 4$

range: $y \leq 1$

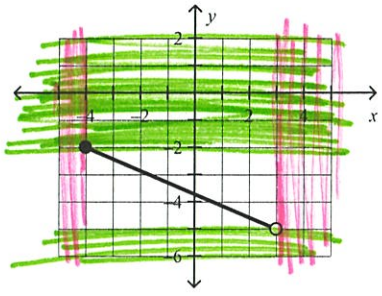
4.



domain: $-4 < x \leq 3$

range: $y = -2$

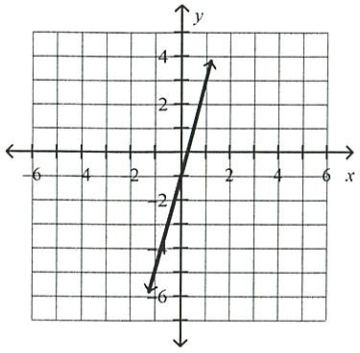
5.



domain: $-4 \leq x < 3$

range: $-5 < y \leq -2$

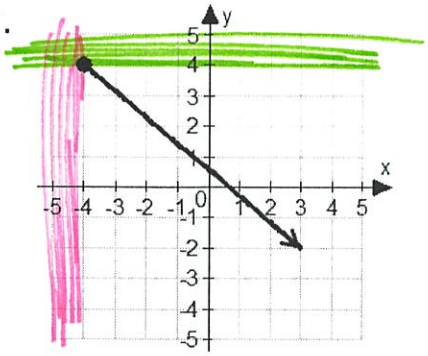
6.



domain: $\mathbb{R}$ or $-\infty < x < \infty$

range: $\mathbb{R}$ or $-\infty < y < \infty$

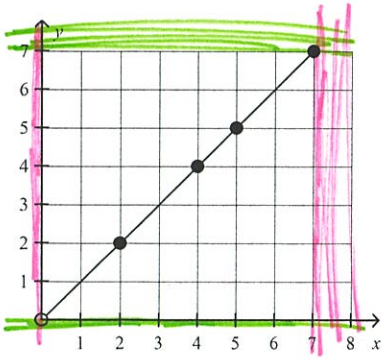
7.



domain: $x \geq -4$

range: $y \leq 4$

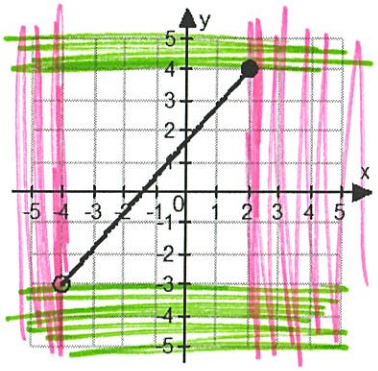
8.



domain: $0 < x \leq 7$

range: $0 < y \leq 7$

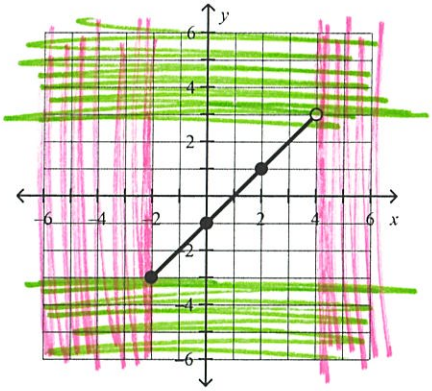
9.



domain: $-4 < x \leq 2$

range: $-3 < y \leq 4$

10.



domain: $-2 \leq x < 4$

range: $-3 \leq y < 3$

Calculating Slope from Two Points

Find the slope of the line that passes through the given points using the formula $\frac{y_2 - y_1}{x_2 - x_1}$. Always simplify your answer to a whole number or fraction. Do not write your answer as a decimal.

1. (3, -2) and (3, 4)

2. (-9, 4) and (0, -3)

3. (-3, -10) and (8, -10)

4. $\left(-\frac{1}{2}, -\frac{3}{4}\right)$ and $\left(-\frac{5}{4}, -\frac{3}{2}\right)$

5. (-5, -9) and (12, 9)

6. (3, -11) and (-9, -3)

7. (-8, -9) and (2, -19)

8. $\left(-\frac{5}{3}, -\frac{7}{3}\right)$ and $\left(\frac{1}{3}, \frac{10}{3}\right)$

9.

x	y
-1	5
-1	6
-1	7
-1	8

10.

x	y
-5	0.25
-4	0
-3	-0.25
-2	-0.5
-1	-0.75
0	-1

reminder: $\frac{0}{\#} = 0$ and $\frac{\#}{0}$ = undefined

Calculating Slope from Two Points

Find the slope of the line that passes through the given points using the formula $\frac{y_2 - y_1}{x_2 - x_1}$. Always simplify your answer to a whole number or fraction. Do not write your answer as a decimal.

1. (3, -2) and (3, 4)

$x_1\ y_1$ $x_2\ y_2$

$\frac{y_2-y_1}{x_2-x_1} = \frac{4+(+2)}{3-3} = \frac{6}{0}$ = undefined

↑ zero in denominator

2. (-9, 4) and (0, -3)

$x_1\ y_1$ $x_2\ y_2$

$\frac{y_2-y_1}{x_2-x_1} = \frac{-3-4}{0+(+9)} = \frac{-7}{9}$

3. (-3, -10) and (8, -10)

$x_1\ y_1$ $x_2\ y_2$

$\frac{y_2-y_1}{x_2-x_1} = \frac{-10+(+10)}{8+(+3)} = \frac{0}{11} = 0$

← zero in numerator

4. $\left(-\frac{1}{2}, -\frac{3}{4}\right)$ and $\left(-\frac{5}{4}, -\frac{3}{2}\right)$

$x_1\ y_1$ $x_2\ y_2$

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

5. (-5, -9) and (12, 9)

$x_1\ y_1$ $x_2\ y_2$

$\frac{9+(+9)}{12+(+5)} = \frac{18}{17}$

↑ leave improper fraction

6. (3, -11) and (-9, -3)

$\frac{-3+(+11)}{-9-3} = \frac{8}{-12} = \frac{-2}{3}$

← simplify!

7. (-8, -9) and (2, -19)

$\frac{-19+(+9)}{2+(+8)} = \frac{-10}{10} = -1$

8. $\left(-\frac{5}{3}, -\frac{7}{3}\right)$ and $\left(\frac{1}{3}, \frac{10}{3}\right)$

$\frac{\frac{10}{3}+(+\frac{7}{3})}{\frac{1}{3}+(+\frac{5}{3})} = \frac{\frac{17}{3}}{2} = \frac{17}{6}$

9.

x	y
-1	5
-1	6
-1	7
-1	8

$x_1\ y_1$ $(-1, 5)$ $x_2\ y_2$ $(-1, 6)$

$\frac{6-5}{-1+(+1)} = \frac{1}{0}$ = undefined

10.

x	y
-5	0.25
-4	0
-3	-0.25
-2	-0.5
-1	-0.75
0	-1

$x_1\ y_1$ $(-4, 0)$ $x_2\ y_2$ $(0, -1)$

$\frac{-1-0}{0+(+4)} = \frac{-1}{4}$

* for multiple points / tables, pick any two points (pick easy points)

Write Equations in Slope Intercept Form

Write an equation in slope intercept form that passes through the given points. Always simplify your slope to a whole number or fraction. Do not use decimals.

1. (-4, -10) and (6, -25)

2. (9, -55) and (14, -90)

3. (-9, 4) and (18, -8)

4. (5, -7) and (12, -7)

5. (-3, -6) and (0, -4)

6. $\left(-\frac{3}{2}, \frac{11}{4}\right)$ and $\left(-\frac{1}{2}, \frac{1}{4}\right)$

7. (2, 1) and (-16, -1)

8. (-16, -39) and (-12, -31)

9. (-15, 7) and (5, -3)

10. (-3, 9) and (-17, 9)

Write Equations in Slope Intercept Form

$y = mx + b$

① Slope (m)

② y-int (b) → choose one point to substitute in and solve for b

Write an equation in slope intercept form that passes through the given points. Always simplify your slope to a whole number or fraction. Do not use decimals.

1. (-4, -10) and (6, -25)

$\frac{-25-(-10)}{6-(-4)} = \frac{-15}{10} = \frac{-3}{2}$

$y = -\frac{3}{2}x + b$

$-10 = -\frac{3}{2}(-4) + b$

$-10 = 6 + b$

$-6 \quad -6$

$b = -16$

$y = -\frac{3}{2}x - 16$

2. (9, -55) and (14, -90)

$\frac{-90-(-55)}{14-9} = \frac{-35}{5} = -7$

$y = -7x + b$

$-55 = -7(9) + b$

$-55 = -63 + b$

$+63 \quad +63$

$b = 8$

$y = -7x + 8$

3. (-9, 4) and (18, -8)

$\frac{-8-4}{18-(-9)} = \frac{-12}{27} = \frac{-4}{9}$

$y = -\frac{4}{9}x + b$

$4 = -\frac{4}{9}(-9) + b$

$4 = 4 + b$

$-4 \quad -4$

$b = 0$

$y = -\frac{4}{9}x$

don't write +0

4. (5, -7) and (12, -7)

$\frac{-7-(-7)}{12-5} = \frac{0}{7} = 0$

$y = 0x + b$

$-7 = 0(12) + b$

$-7 = b$

$y = 0x - 7$

don't write 0x

$y = -7$ ← better

5. (-3, -6) and (0, -4)

$\frac{-4-(-6)}{0-3} = \frac{2}{3} = \frac{2}{3}$

this is the y-intercept

$y = \frac{2}{3}x + b$

$y = \frac{2}{3}x - 4$

6. $\left(-\frac{3}{2}, \frac{11}{4}\right)$ and $\left(-\frac{1}{2}, \frac{1}{4}\right)$

$\frac{\frac{11}{4} - \frac{1}{4}}{-\frac{3}{2} - -\frac{1}{2}} = \frac{\frac{10}{4}}{-\frac{2}{2}} = \frac{\frac{10}{4}}{-1} = -\frac{5}{2}$

$y = -\frac{5}{2}x + b$

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

$\frac{1}{4} = \frac{5}{4} + b$

$-\frac{5}{4} \quad -\frac{5}{4}$

$b = -1$

$y = -\frac{5}{2}x - 1$

7. (2, 1) and (-16, -1)

$\frac{1--1}{2--16} = \frac{2}{18} = \frac{1}{9}$

$y = \frac{1}{9}x + b$

$1 = \frac{1}{9}(2) + b$

$1 = \frac{2}{9} + b$

$-\frac{2}{9} \quad -\frac{2}{9}$

$b = \frac{7}{9}$

$y = \frac{1}{9}x + \frac{7}{9}$

8. (-16, -39) and (-12, -31)

$\frac{-39-(-31)}{-16-(-12)} = \frac{-8}{-4} = 2$

$y = 2x + b$

$-31 = 2(-12) + b$

$-31 = -24 + b$

$+24 \quad +24$

$b = -7$

$y = 2x - 7$

9. (-15, 7) and (5, -3)

$\frac{7--3}{-15-5} = \frac{10}{-20} = -\frac{1}{2}$

$y = -\frac{1}{2}x + b$

$-3 = -\frac{1}{2}(5) + b$

$-3 = -\frac{5}{2} + b$

$+\frac{5}{2} \quad +\frac{5}{2}$

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

$y = -\frac{1}{2}x - \frac{1}{2}$

10. (-3, 9) and (-17, 9)

$\frac{9-9}{-3--17} = \frac{0}{14} = 0$

$y = 0x + b$

$9 = 0(-3) + b$

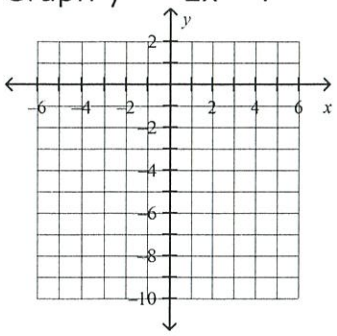
$9 = b$

$y = 9$

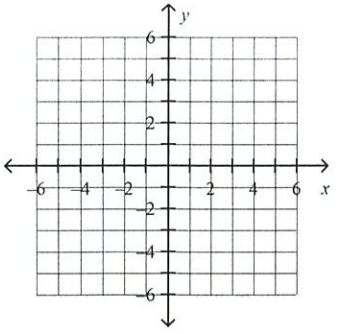
Graph in Slope Intercept Form

Graph each equation. Graph at least 3 points, connect the points with a straight line, and put arrows on both ends. Watch the scale of your graph.

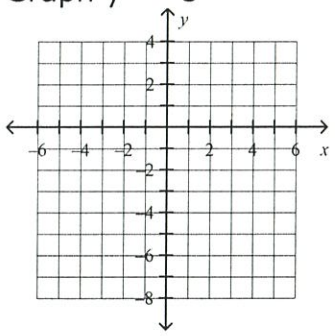
1. Graph y = -2x - 4



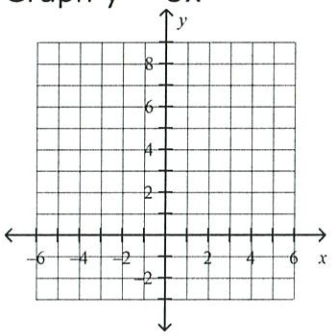
2. Graph y = $-\frac{1}{3}x + 5$



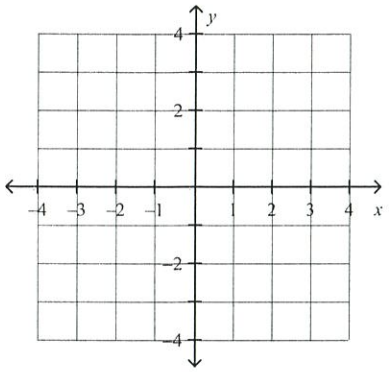
3. Graph y = -3



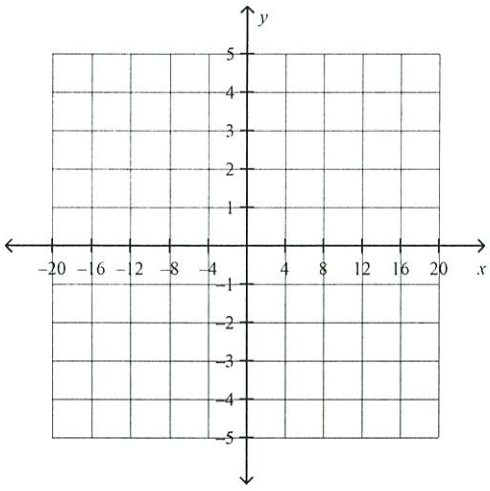
4. Graph y = 3x



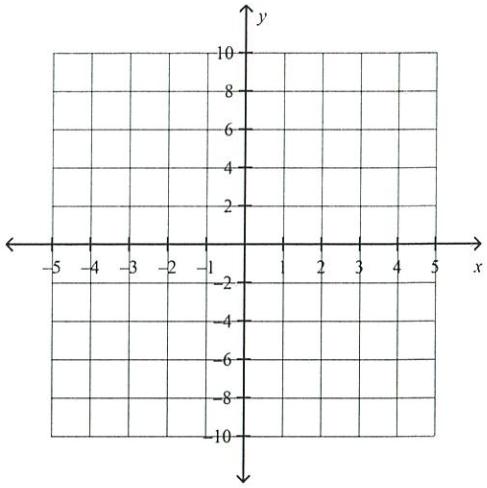
5. Graph $y = \frac{5}{2}x - 3$



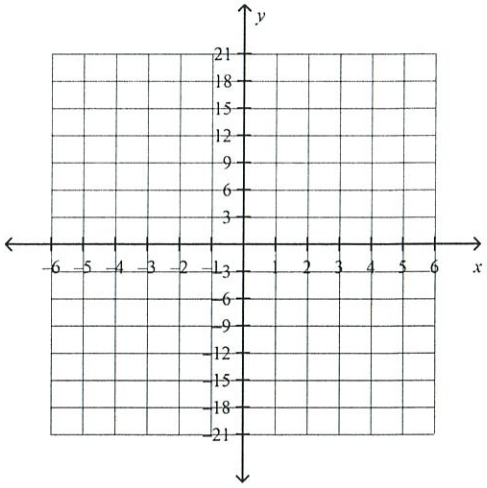
6. Graph $y = -\frac{3}{4}x + 5$



7. Graph $y = \frac{1}{2}x - 6$



8. Graph $y = 6x - 3$



Graph in Slope Intercept Form

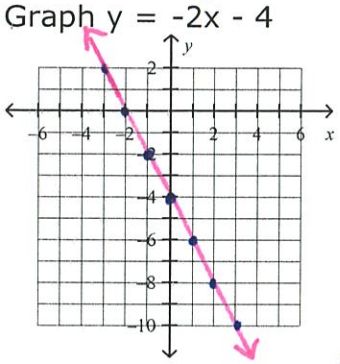
$y = mx + b$ — m: slope, rise/run; b: y-intercept, on y-axis

Graph each equation. Graph at least 3 points, connect the points with a straight line, and put arrows on both ends. Watch the scale of your graph.

Sometimes 3 points do not fit

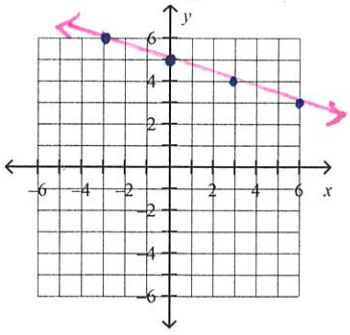
1. Graph $y = -2x - 4$

$-\frac{2}{1}$ = down 2 right 1

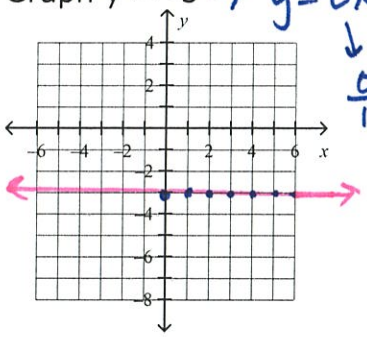


2. Graph $y = -\frac{1}{3}x + 5$

move negative to numerator $= -\frac{1}{3}$

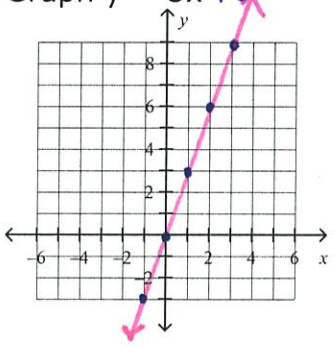


3. Graph $y = -3$ → $y = 0x - 3$ → $\frac{0}{1}$



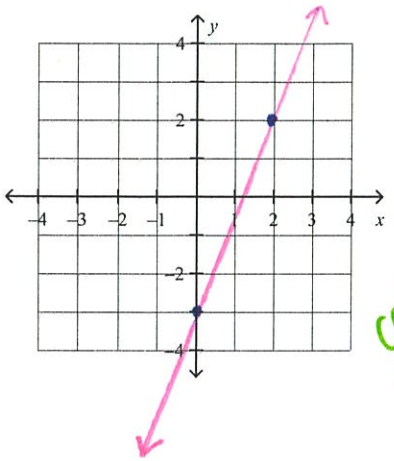
4. Graph $y = 3x + 0$

$\frac{3}{1}$



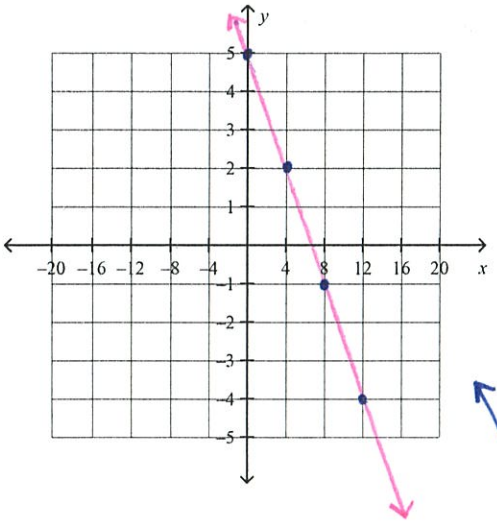
always connect your points with a straight line (use a ruler or straight edge) and put arrows on both ends!

5. Graph $y = \frac{5}{2}x - 3$

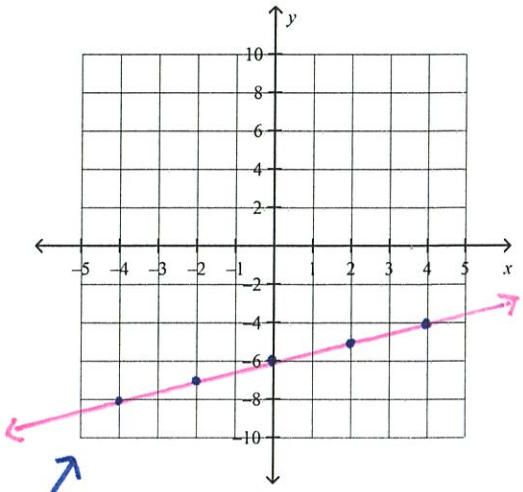


Cannot fit 3 points, that is okay

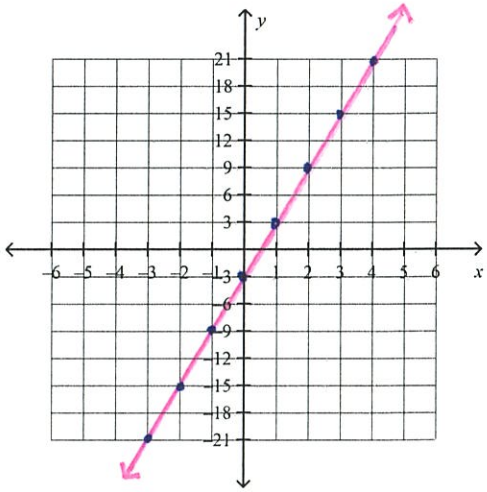
6. Graph $y = -\frac{3}{4}x + 5$



7. Graph $y = \frac{1}{2}x - 6$



8. Graph $y = 6x - 3$

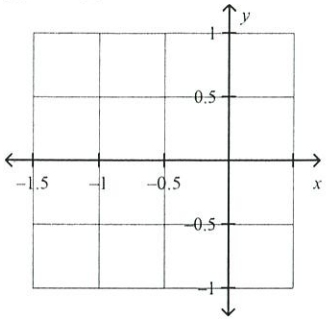


look at the scale of the graph!

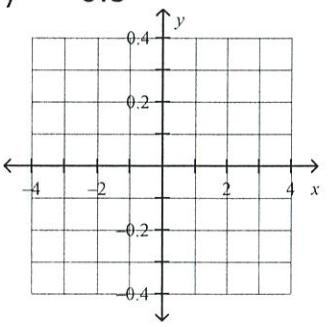
Horizontal and Vertical Lines - Graph

Write the equation of each line.

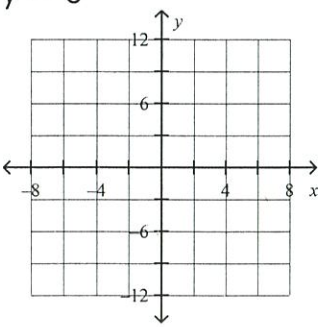
1. x = -1



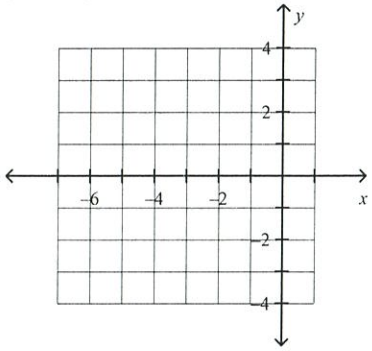
2. y = -0.3



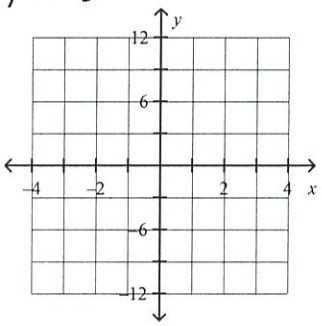
3. y = 6



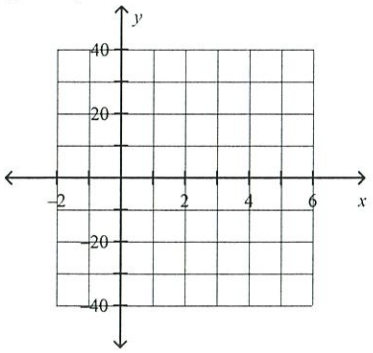
4. x = -5



5. y = -9



6. x = 4



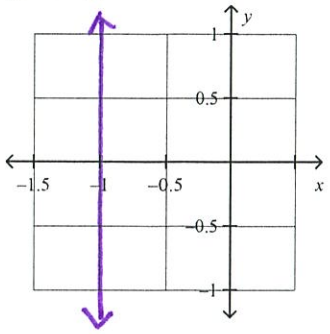
crosses y-axis

crosses x-axis

Horizontal and Vertical Lines - Graph

Write the equation of each line.

1. x = -1

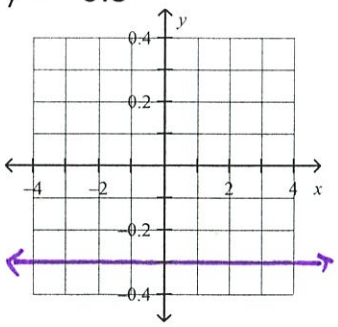


Horizontal

zero slope

crosses y-axis

2. y = -0.3

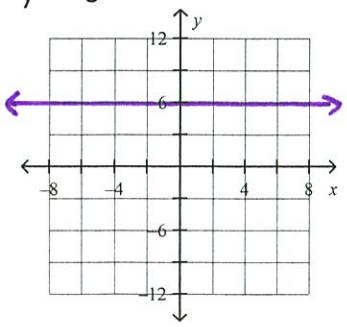


Vertical

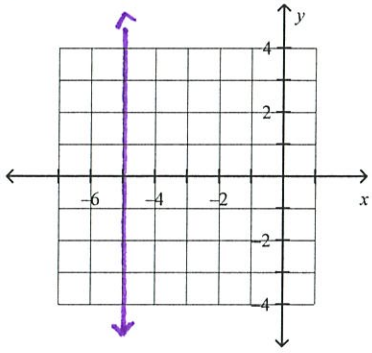
Undefined slope

crosses x-axis

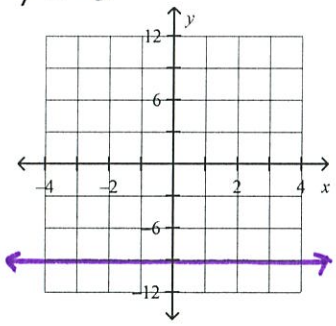
3. y = 6



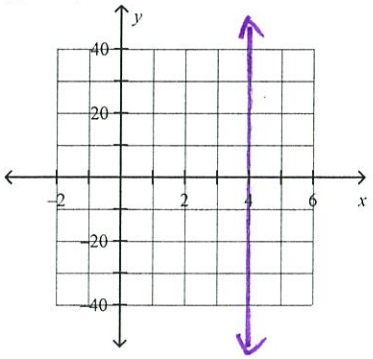
4. x = -5



5. y = -9



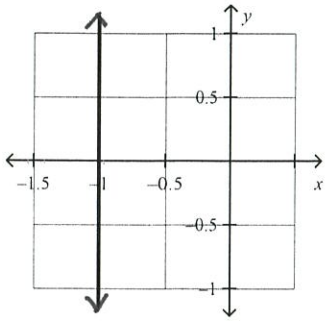
6. x = 4



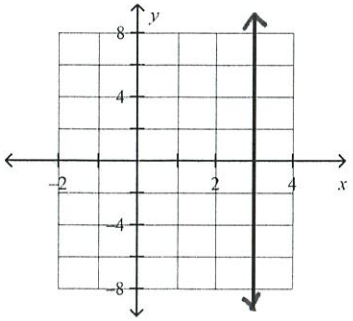
Horizontal and Vertical Lines - Write the Equation

Write the equation from each representation.

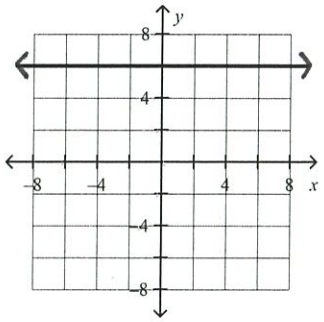
1.



2.



3.



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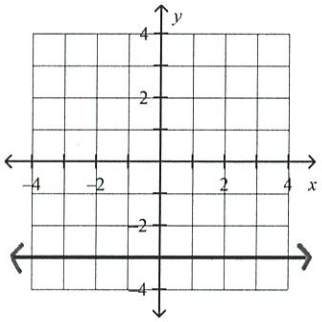


5.

x	-12	0	2	107
y	5	5	5	5

6.

x	$-\frac{3}{2}$	$-\frac{3}{2}$	$-\frac{3}{2}$	$-\frac{3}{2}$
y	4	1	-2	-7

7.

x	0	0	0	0
y	-429	-13	0	47

8. Write the equation of a vertical line that crosses through the point (3, 7).

9. Write the equation of a horizontal line that crosses through the point (-12, 28).

10. Write the equation of a vertical line that contains the point (-2, -3).

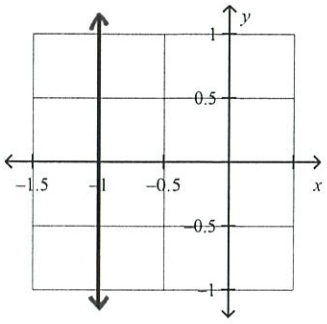
crosses y-axis

crosses x-axis

Horizontal and Vertical Lines - Write the Equation

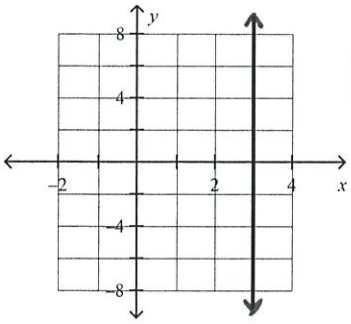
Write the equation from each representation.

1.



$x = -1$

2.



$x = 3$

Horizontal

zero slope

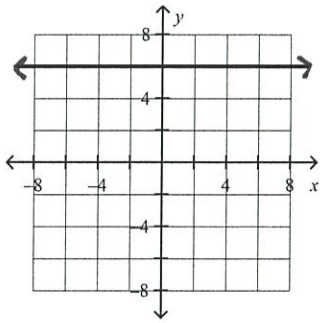
crosses y-axis

Vertical

Undefined slope

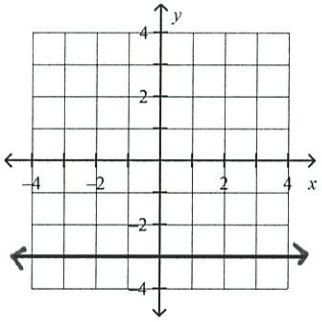
crosses x-axis

3.



$y = 6$

4.



$y = -3$

5.

x	-12	0	2	107
y	5	5	5	5

$y = 5$

6.

x	$-\frac{3}{2}$	$-\frac{3}{2}$	$-\frac{3}{2}$	$-\frac{3}{2}$
y	4	1	-2	-7

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

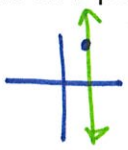
7.

x	0	0	0	0
y	-429	-13	0	47

$X = 0$

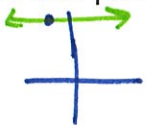
8. Write the equation of a vertical line that crosses through the point (3, 7).

$X = 3$



9. Write the equation of a horizontal line that crosses through the point (-12, 28).

$y = 28$



10. Write the equation of a vertical line that contains the point (-2, -3).

$X = -2$

Write Equations as a Function of x

Write each eqaution as a function of x. This means isolate y. Your final answer should be in slope intercept form.

1. $3x + 5y = 28$

2. $3x - 2y = -16$

3. $9x - 7y + 7 = 0$

4. $-\frac{1}{2}y + 2x = 5$

5. $8(x - 7) = y + 6$

6. $6x + 7 = 5y - 8$

7. $4x - y = 1$

8. $-11y + 13x + 12 = 0$

9. $\frac{1}{3}y + 7x = -2x + 12$

10. $-7x + 2y = 8 + 3x$

"y is a function of x" → {y =

Write Equations as a Function of x

Write each eqaution as a function of x. This means isolate y. Your final answer should be in slope intercept form.

$y = mx + b$

1. $3x + 5y = 28$

$-3x \quad -3x$

$\frac{5y}{5} = \frac{-3x+28}{5}$

$y = -\frac{3}{5}x + \frac{28}{5}$

2. $3x - 2y = -16$

$-3x \quad -3x$

$\frac{-2y}{-2} = \frac{-3x-16}{-2}$

$y = \frac{3}{2}x + 8$

3. $9x - 7y + 7 = 0$

$-9x \quad -7 \quad -9x - 7$

$\frac{-7y}{-7} = \frac{-9x-7}{-7}$

$y = \frac{9}{7}x + 1$

4. $-\frac{1}{2}y + 2x = 5$

$-2x \quad -2x$

$-2\left(-\frac{1}{2}y\right) = (-2x+5)-2$

$y = 4x - 10$

multiply by the reciprocal then distribute to both terms

5. $8(x - 7) = y + 6$

$8x - 56 = y + 6$

$-6 \quad -6$

$y = 8x - 62$

6. $6x + 7 = 5y - 8$

$+8 \quad +8$

$\frac{5y}{5} = \frac{6x+15}{5}$

$y = \frac{6}{5}x + 3$

7. $4x - y = 1$

$-4x \quad -4x$

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

$y = 4x - 1$

8. $-11y + 13x + 12 = 0$

$-13x \quad -12 \quad -13x - 12$

$\frac{-11y}{-11} = \frac{-13x-12}{-11}$

$y = \frac{13}{11}x + \frac{12}{11}$

9. $\frac{1}{3}y + 7x = -2x + 12$

$-7x \quad -7x$

$3\left(\frac{1}{3}y\right) = (-9x+12)3$

$y = -27x + 36$

10. $-7x + 2y = 8 + 3x$

$+7x \quad +7x$

$\frac{2y}{2} = \frac{10x+8}{2}$

$y = 5x + 4$

Direct Variation

For each question, find the constant of proportionality (k), write the direct variation equation, and then find the new value.

1. If y varies directly with x when x = -1 and y = -8, write an equation to model the given relationship. Then find the value of x if y = -16.

   k =

   equation:

   new value:

2. The value of y varies directly with x. When y is 75 and x = $\frac{1}{2}$. Write an equation that relates x and y. The find the value of y when x is $2\frac{1}{4}$.

   k =

   equation:

   new value:

3. Given that y is directly proportional to x, and y = 7 and x = 14, write a direct variation equation. Then find the value of x when y = -22.

   k =

   equation:

   new value:

4. If y varies directly with x when y = 30 and x = -2, write an equation to model the given relationship. Then find the value of y if x = $\frac{1}{3}$.

   k =

   equation:

   new value:

5. Y varies directly with x when $x = -\frac{2}{3}$ and $y = 4$. Write a direct variation equation and then find the value of x when y is $\frac{1}{2}$.

k =

equation:

new value:

6. Suppose y varies directly as x. If $x = 24$ when $y = 8$, write a direct variation equation and then find the value of x when y is -32.

k =

equation:

new value:

7. If y varies directly with x when $y = -7$ and $x = 10$, write an equation to model the given relationship. Then find the value of y if $x = -14$.

k =

equation:

new value:

8. The value of y varies directly with x. When y is 12 and $x = 15$. Write an equation that relates x and y. The find the value of x when y is 21.

k =

equation:

new value:

Direct Variation → $y = kx$ ($b = 0$) $\quad \frac{y}{x} = \frac{kx}{x} \quad k = \frac{y}{x}$ (slope or constant of proportionality)

For each question, find the constant of proportionality (k), write the direct variation equation, and then find the new value.

1. If y varies directly with x when x = -1 and y = -8, write an equation to model the given relationship. Then find the value of x if y = -16.

   $k = \frac{y}{x} = \frac{-8}{-1} = 8$

   equation: $y = 8x$

   new value:

   $\frac{-16}{8} = \frac{8x}{8}$

   $x = -2$

2. The value of y varies directly with x. When y is 75 and x = $\frac{1}{2}$. Write an equation that relates x and y. The find the value of y when x is $2\frac{1}{4}$.

   $k = \frac{y}{x} = \frac{75}{\frac{1}{2}} = 150$

   equation: $y = 150x$

   new value:

   $y = 150(2\frac{1}{4})$

   $y = 150(\frac{9}{4})$

   $y = \frac{675}{2}$

3. Given that y is directly proportional to x, and y = 7 and x = 14, write a direct variation equation. Then find the value of x when y = -22.

   $k = \frac{y}{x} = \frac{7}{14} = \frac{1}{2}$

   equation: $y = \frac{1}{2}x$

   new value:

   $2(-22) = (\frac{1}{2}x)2$

   $x = -44$

4. If y varies directly with x when y = 30 and x = -2, write an equation to model the given relationship. Then find the value of y if x = $\frac{1}{3}$.

   $k = \frac{y}{x} = \frac{30}{-2} = -15$

   equation: $y = -15x$

   new value:

   $y = -15(\frac{1}{3})$

   $y = -5$

direct variation - straight line (constant rate of change) that passes through the origin (0,0)

5. Y varies directly with x when $x = -\frac{2}{3}$ and $y = 4$. Write a direct variation equation and then find the value of x when y is $\frac{1}{2}$.

k = $\frac{y}{x} = \frac{4}{-\frac{2}{3}} = -6$

equation: $y = -6x$

new value:

$-\frac{1}{6}\left(\frac{1}{2}\right) = (6x)-\frac{1}{6}$

$x = -\frac{1}{12}$

6. Suppose y varies directly as x. If $x = 24$ when $y = 8$, write a direct variation equation and then find the value of x when y is -32.

k = $\frac{y}{x} = \frac{8}{24} = \frac{1}{3}$

equation: $y = \frac{1}{3}x$

new value:

$3(-32) = \left(\frac{1}{3}x\right)3$

$x = -96$

must by the reciprocal

7. If y varies directly with x when $y = -7$ and $x = 10$, write an equation to model the given relationship. Then find the value of y if $x = -14$.

k = $\frac{y}{x} = \frac{-7}{10}$

equation: $y = \frac{-7}{10}x$

new value:

$y = \frac{-7}{10}(-14)$

$y = \frac{49}{5}$

8. The value of y varies directly with x. When y is 12 and $x = 15$. Write an equation that relates x and y. The find the value of x when y is 21.

k = $\frac{y}{x} = \frac{12}{15} = \frac{4}{5}$

equation: $y = \frac{4}{5}x$

new value:

$\frac{5}{4}(21) = \left(\frac{4}{5}x\right)\frac{5}{4}$

$x = \frac{105}{4}$

Writing Equations and Inequalities from Word Problems

Write an equation or inequality for each problem and then solve.

>		<	
is greater than is more than		is less than is fewer than	
≥		≤	
is greater than or equal to	is at least is no less than ****inequality flip words****	is less than or equal to	is at most if no more than ****inequality flip words****

1. Yellow Cab Company charges a $1.75 flat fee in addition to $0.50 per mile. Alan has no more than $10 to spend on the ride. How many miles can Alan travel without exceeding his limit?

2. At a lake it costs $9 per hour to rent a paddleboat and $6.50 per hour to rent a kayak. You have a coupon for a $5 discount on the cost of renting a paddleboat. After how many hours would it cost more to rent a paddleboat than to rent a kayak?

3. A 1200 gallon pool drains water at a rate of 15 gallons an hour. How long it would take for the pool to contain 720 gallons?

4. Allison has $525 in her bank account at the beginning of the summer. She withdraws $25 each week for going out with friends to movies and dinner. If she wants to have at least $175 at the end of summer, how many weeks can she spend the $25?

5. At the beginning of the year, Jackie has $450 in her savings account and Ernie has $1,140 in his. Jackie deposits an additional $25 in her account every month while Ernie withdraws $5 from his. Ignoring interest earned, after how many months Jackie's account have a greater balance than Ernie?

6. The sum of twice a number and 5 is 15. What is the number?

7. Tank A holds 28.62 gallons of water and Tank B holds 31.2 gallons of water. The larger tank is leaking at a rate of 0.12 gallons per hour and the smaller tank is leaking at a rate of 0.08 gallons per hour. After how many hours, y, will there be less water in Tank B than in Tank A?

8. A rectangle's perimeter and its area have the same numerical value. The width of the rectangle is 3 inches. What is the length of the rectangle?

9. Sierra has a bucket that originally contained 340 fluid ounces of water and is being filled at a rate of 5 fluid ounces per minute. Brian has a bucket that originally contained 639 fluid ounces of water and is being drained at a rate of 8 fluid ounces per minute. What is x, the number of minutes that need to pass in order for the two buckets to contain the same amount of water?

10. The school math team has found two different places from which they may place an order for t-shirts. Larry's Printing will make their shirts for $3.25 a shirt after an initial design fee of $56. Awesome T-Shirt Shop will make the shirts for $5 each. At what point would the prices would be the same?

Writing Equations and Inequalities from Word Problems

Write an equation or inequality for each problem and then solve.

$>$ is greater than is more than	$<$ is less than is fewer than
$\geq$ is greater than or equal to is at least is no less than ***inequality flip words***	$\leq$ is less than or equal to is at most if no more than ***inequality flip words***

1. Yellow Cab Company charges a $1.75 flat fee in addition to $0.50 per mile. Alan has no more than $\leq$ $10 to spend on the ride. How many miles can Alan travel without exceeding his limit?

$0.5m + 1.75 \leq 10$

$-1.75 \quad -1.75$

$\frac{0.5m}{.5} \leq \frac{8.25}{.5}$

$m \leq 16.5$

16.5 miles or less

2. At a lake it costs $9 per hour to rent a paddleboat and $6.50 per hour to rent a kayak. You have a coupon for a $5 discount on the cost of renting a paddleboat. After how many hours would it cost more to rent a paddleboat than to rent a kayak?

$P > K$

$9h - 5 > 6.5h$

$-9h \quad -9h$

$\frac{-5}{-2.5} > \frac{-2.5h}{-2.5}$

$2 < h$

$h > 2$

2 hours or more

3. A 1200 gallon pool drains water at a rate of 15 gallons an hour. How long it would take for the pool to contain 720 gallons?

$1200 - 15h = 720$
$-1200 \quad -1200$
$-15h = -480$
$\frac{-15h}{-15} = \frac{-480}{-15}$
$h = 32$

32 hours

4. Allison has $525 in her bank account at the beginning of the summer. She withdraws $25 each week for going out with friends to movies and dinner. If she wants to have at least $175 at the end of summer, how many weeks can she spend the $25?

$525 - 25w \geq 175$
$-525 \quad -525$
$-25w \geq -350$
$\frac{-25w}{-25} \geq \frac{-350}{-25}$
$w \leq 14$

14 weeks or less

5. At the beginning of the year, Jackie has $450 in her savings account and Ernie has $1,140 in his. Jackie deposits an additional $25 in her account every month while Ernie withdraws $5 from his. Ignoring interest earned, after how many months Jackie's account have a greater balance than Ernie?

$J > E$
$450 + 25m > 1140 - 5m$
$-450 \quad +5m \quad -450 + 5m$
$30m > 690$
$\frac{30m}{30} > \frac{690}{30}$
$m > 23$

23 months

6. The sum of twice a number and 5 is 15. What is the number?

$2x + 5 = 15$
$-5 \quad -5$
$2x = 10$
$\frac{2x}{2} = \frac{10}{2}$
$x = 5$

7. Tank A holds 28.62 gallons of water and Tank B holds 31.2 gallons of water. The larger tank is leaking at a rate of 0.12 gallons per hour and the smaller tank is leaking at a rate of 0.08 gallons per hour. After how many hours, y, will there be less water in Tank B than in Tank A?

$A > B$

$28.62 - .08h > 31.2 - .12h$

$-28.62 + .12h \quad -28.62 + .12h$

$\frac{.04h}{.04} > \frac{2.58}{.04}$

$h > 64.5$

64.5 hours

8. A rectangle's perimeter and its area have the same numerical value. The width of the rectangle is 3 inches. What is the length of the rectangle?

$P = A$

$2L + 2W = LW$

$2L + 2(3) = L(3)$

$2L + 6 = 3L$

$-2L \quad -2L$

$6 = L$

length is 6 inches

9. Sierra has a bucket that originally contained 340 fluid ounces of water and is being filled at a rate of 5 fluid ounces per minute. Brian has a bucket that originally contained 639 fluid ounces of water and is being drained at a rate of 8 fluid ounces per minute. What is x, the number of minutes that need to pass in order for the two buckets to contain the same amount of water?

$S = B$

$340 + 5m = 639 - 8m$

$-340 + 8m \quad -340 + 8m$

$\frac{13m}{13} = \frac{299}{13}$

$m = 23$

23 minutes

10. The school math team has found two different places from which they may place an order for t-shirts. Larry's Printing will make their shirts for $3.25 a shirt after an initial design fee of $56. Awesome T-Shirt Shop will make the shirts for $5 each. At what point would the prices would be the same?

$L = A$

$3.25x + 56 = 5x$

$-3.25x \quad -3.25$

$\frac{56}{1.75} = \frac{1.75x}{1.75}$

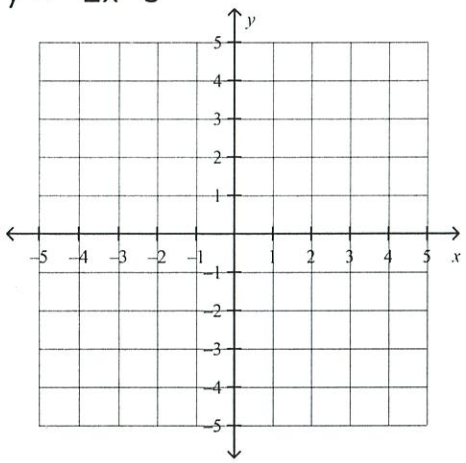
$x = 32$

32 shirts

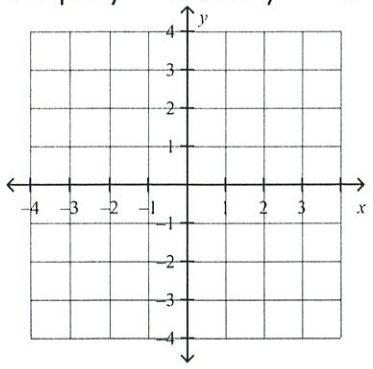
Solve Systems by Graphing

Solve each system by graphing. You are looking for the point where the two lines intersect. Write your answer, a coordinate point, to the side of the graph.

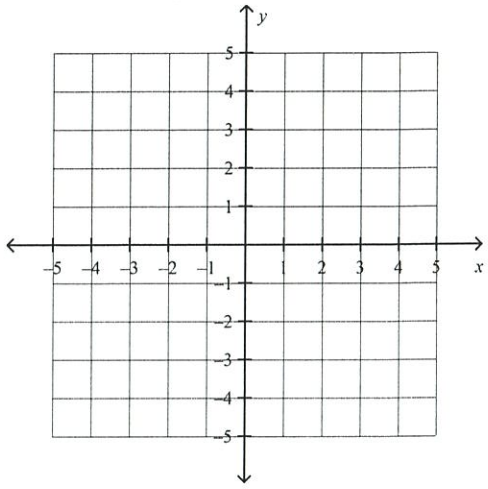
1. Graph the system: y = -x - 3 and y = -2x -3



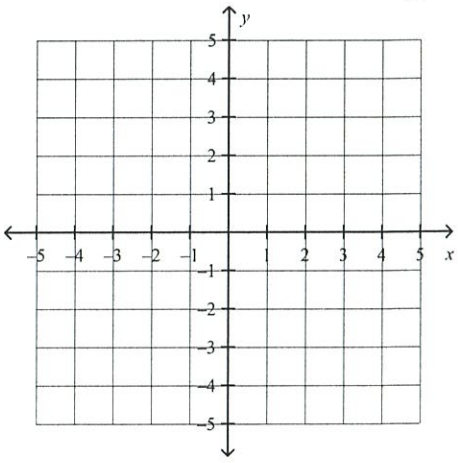
2. Graph y = 1 and y = -x + 2.



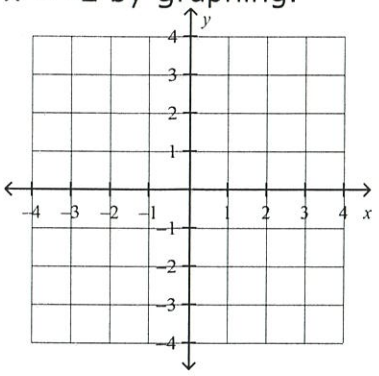
3. Graph $y = \frac{1}{3}x - 3$ and y = -x + 1.



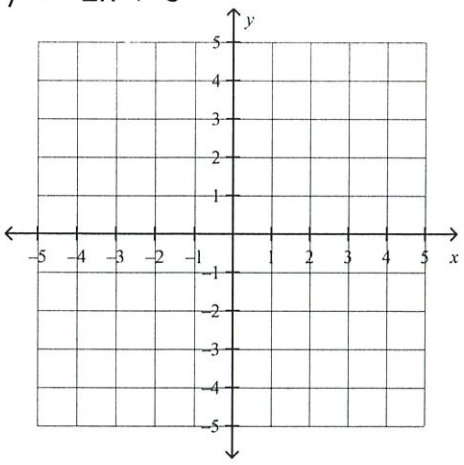
4. Graph y = 3x - 4 and $y = -\frac{1}{2}x + 3$.



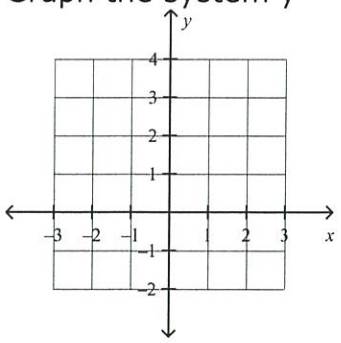
5. Solve the system $y = 2x + 1$ and $x = -2$ by graphing.



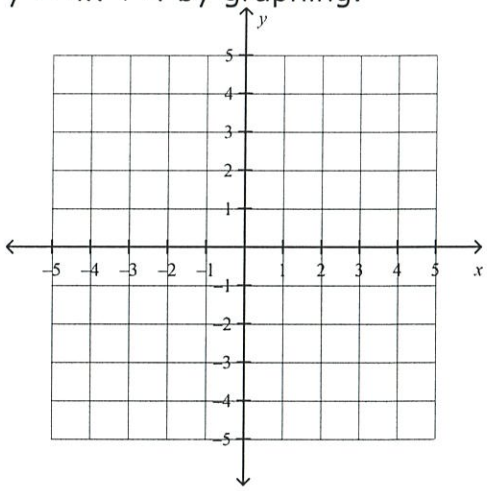
6. Graph the system: $y = 0$ and $y = -2x + 6$



7. Graph the system $y = 1$ and $y = 3$.



8. Solve the system $y = -3x - 3$ and $y = 4x + 4$ by graphing.

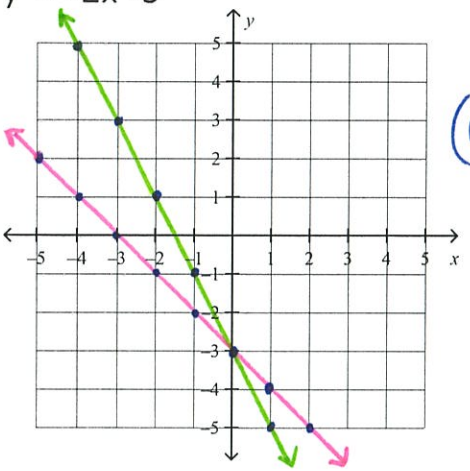


Solve Systems by Graphing

graph both lines on the same coordinate plane

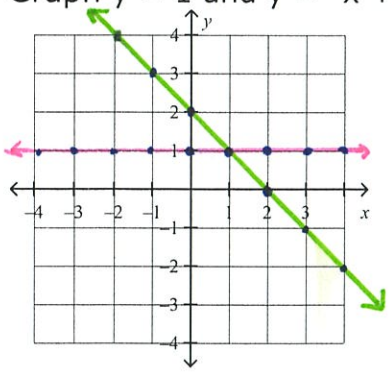
Solve each system by graphing. You are looking for the point where the two lines intersect. Write your answer, a coordinate point, to the side of the graph.

1. Graph the system: y = -x - 3 and y = -2x -3



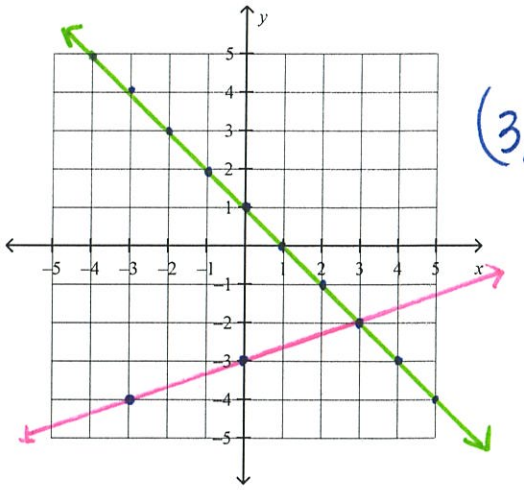
(0, -3)

2. Graph y = 1 and y = -x + 2.



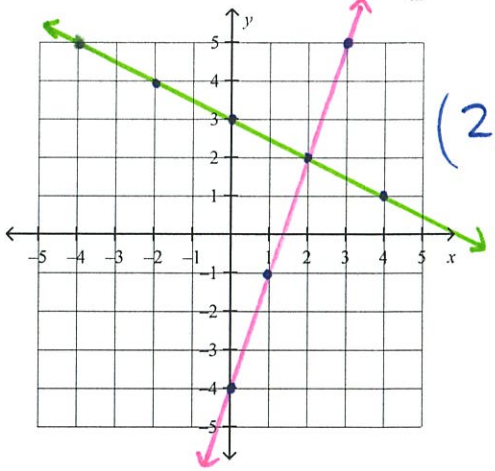
(1, 1)

3. Graph $y = \frac{1}{3}x - 3$ and y = -x + 1.



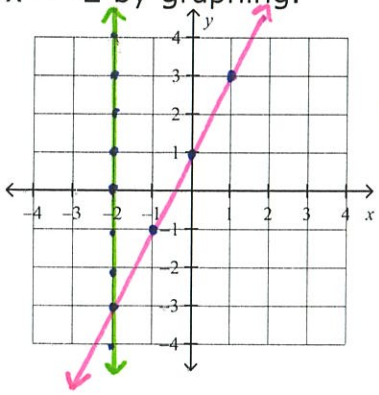
(3, -2)

4. Graph y = 3x - 4 and $y = -\frac{1}{2}x + 3$.



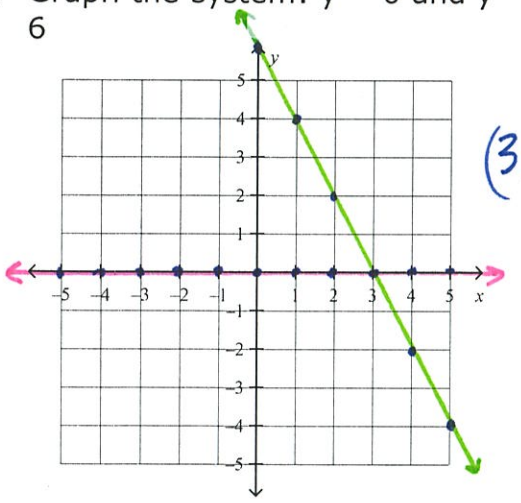
(2, 2)

5. Solve the system $y = 2x + 1$ and $x = -2$ by graphing.



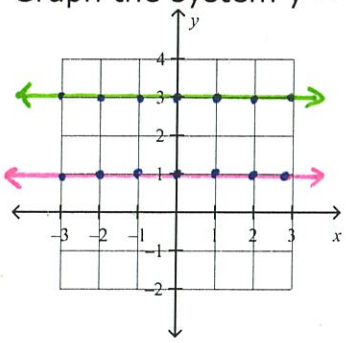
(-2, -3)

6. Graph the system: $y = 0$ and $y = -2x + 6$



(3, 0)

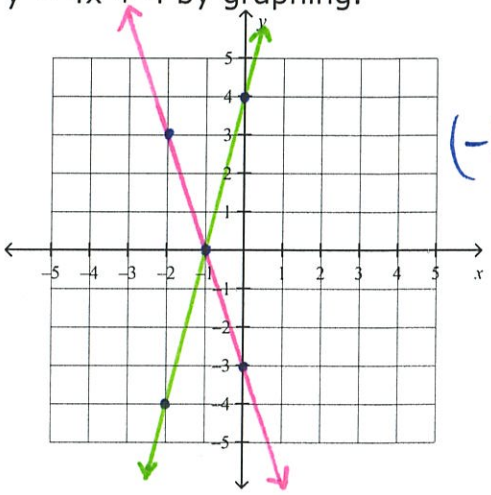
7. Graph the system $y = 1$ and $y = 3$.



No solution

(the lines do not intersect)

8. Solve the system $y = -3x - 3$ and $y = 4x + 4$ by graphing.

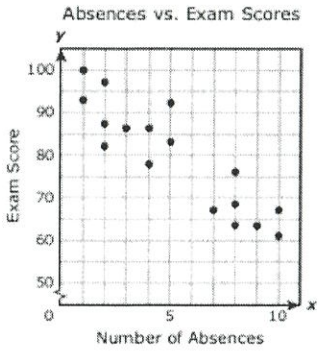


(-1, 0)

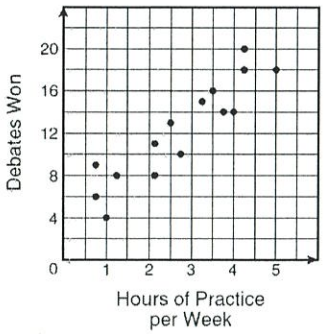
Trends of Scatterplots

For each scatterplot, determine if the data is linear or non linear trend. If it is is linear, determine if the trend is positive or negative.

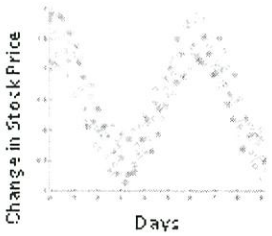
1.



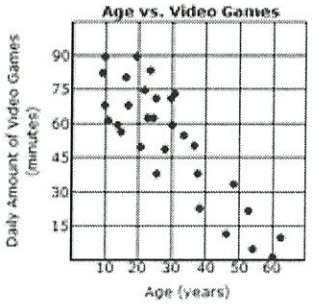
2.



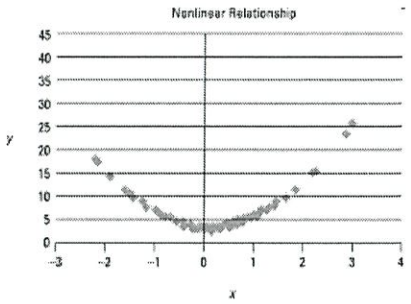
3.



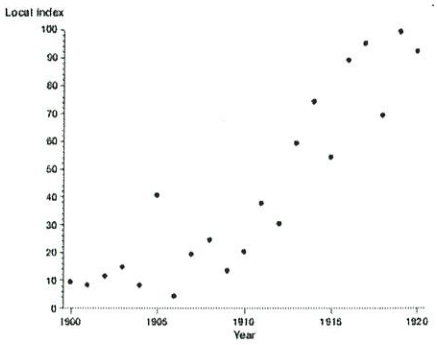
4.



5.



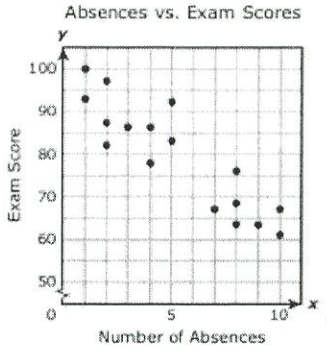
6.



Trends of Scatterplots → follow a general trend, not a perfect line

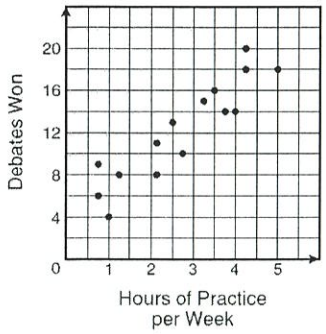
For each scatterplot, determine if the data is linear or non linear trend. If it is is linear, determine if the trend is positive or negative.

1.



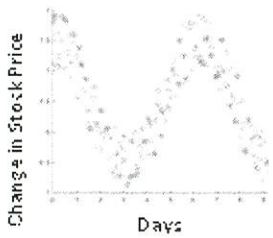
linear, negative

2.



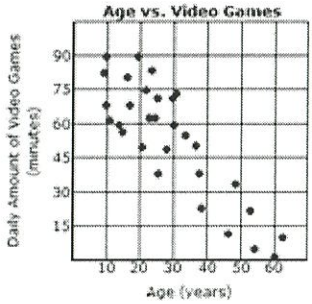
linear, positive

3.



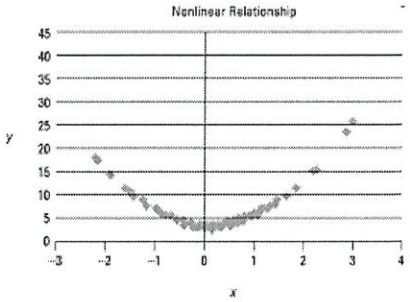
non-linear

4.



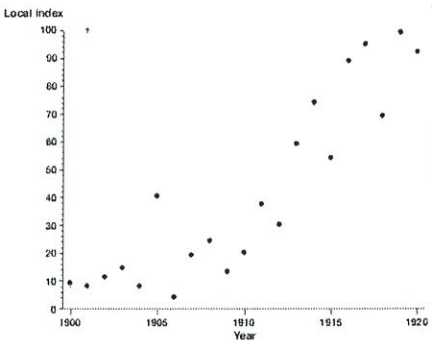
linear, negative

5.



non-linear

6.



Linear, positive

Add and Subtract Polynomials

Simplify each expression. Write each polynomial so that exponents are in descending order.

1. $\left(6c^2+3c+9\right)-(3c-5)$

2. $\left(19x^2+12x-2\right)+\left(-7x^2+10x-13\right)$

3. $\left(-18x^2+4x-16\right)-\left(-15x^2-13+4x\right)$

4. $\left(4m^2-m+2\right)+\left(-3m^2+10m+7\right)$

5. $(4+t)+\left(-4t+8t^2-9\right)$

6. $\left(2y^2+3\right)+\left(4y-5\right)-\left(3y^2+5y-1\right)$

7. $(4x-6)-(-3x+1)-(-2x-9)$

8. $-2\left(x^2+3\right)-(4x-7)+\left(9x^2-7x+1\right)$

9. $(4x-6)-3\left(-x^2+6x-1\right)$

10. $2\left(4x^2-4x-4\right)+3\left(-3x^2+4\right)$

Add and Subtract Polynomials

ex: $2x^2+3x-1$ ← x^2 terms come before x terms

Simplify each expression. Write each polynomial so that exponents are in descending order.

1. $(6c^2+3c+9)-(3c-5)$

$6c^2+3c+9-3c+5$

$6c^2+14$

2. $(19x^2+12x-2)+(-7x^2+10x-13)$

$12x^2+22x-15$

3. $(-18x^2+4x-16)-(-15x^2-13+4x)$

$-18x^2+4x-16+15x^2+13-4x$

$-3x^2-3$

zero pair, they cancel

4. $(4m^2-m+2)+(-3m^2+10m+7)$

m^2+9m+9

write m^2 instead of $1m^2$

5. $(4+t)+(-4t+8t^2-9)$

$8t^2-3t-5$

6. $(2y^2+3)+(4y-5)-(3y^2+5y-1)$

$2y^2+3+4y-5-3y^2-5y+1$

$-y^2-y-1$

7. $(4x-6)-(-3x+1)-(-2x-9)$

$4x-6+3x-1+2x+9$

$9x+2$

8. $-2(x^2+3)-(4x-7)+(9x^2-7x+1)$

$-2x^2-6-4x+7+9x^2-7x+1$

$7x^2-11x+2$

9. $(4x-6)-3(-x^2+6x-1)$

$4x-6+3x^2-18x+3$

$3x^2-14x-3$

10. $2(4x^2-4x-4)+3(-3x^2+4)$

$8x^2-8x-8-9x^2+12$

$-x^2-8x+4$

Scientific Notation - Scientific Notation to Standard Form

Convert each scientific notation to standard form.

1. 3.9×10^{-3}

2. 7.8×10^{1}

3. 1.2×10^{5}

4. 9.1×10^{-7}

5. 2.05×10^{9}

6. 5×10^{-2}

7. 6.34×10^{4}

8. 4.537×10^{2}

9. 5.003×10^{-4}

10. 8.2×10^{-10}

← negative positive →

Scientific Notation - Scientific Notation to Standard Form

Convert each scientific notation to standard form.

1. 3.9×10^{-3}

3,9

.0039

2. 7.8×10^{1}

7,8

78

3. 1.2×10^{5}

1,2

120,000

4. 9.1×10^{-7}

9 1

.00000091

5. 2.05×10^{9}

2,05

2,050,000,000

6. 5×10^{-2}

5

.05

7. 6.34×10^{4}

6,34

63,400

8. 4.537×10^{2}

4,53.7

453.7

9. 5.003×10^{-4}

5,003

.0005003

10. 8.2×10^{-10}

8 2

.000000000082

Scientific Notation - Standard Form to Scientific Notation

Convert each standard form number to scientific notation.

1. 12,000

2. 109

3. 0.00034

4. 0.0907

5. 107,600

6. 0.0000000082

7. 9,700

8. 0.13

9. 0.0000046

10. 3,100,000

$\#. \_\_\_\_ \times 10^{\square}$ ← + → greater than 1, ← − → less than 1

Scientific Notation - Standard Form to Scientific Notation

Convert each standard form number to scientific notation.

1. 12,000.

1.2×10^{4}

2. 109.

1.09×10^{2}

3. 0.00034

3.4×10^{-4}

4. 0.0907

9.07×10^{-2}

5. 107,600.

1.076×10^{5}

6. 0.0000000082

8.2×10^{-9}

7. 9,700.

9.7×10^{3}

8. 0.13

1.3×10^{-1}

9. 0.0000046

4.6×10^{-6}

10. 3,100,000.

3.1×10^{6}

Integral Exponents

Simplify each expression. The rules are below as well as one process that has helped students. There is usually more than one way to simplify a problem.

Product of powers	$a^m a^n = a^{(m+n)}$
Quotient of powers	$\frac{a^m}{a^n} = a^{(m-n)}$
Power of a power	$(a^m)^n = a^{mn}$
Power of quotient	$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$
Zero Exponents	$a^0 = 1$
Negative exponent	$a^{-n} = \frac{1}{a^n}$

Process:
1. Parenthesis
2. Make exponents positive
3. Simplify horizontally
4. Simplify vertically

1. x^2x^3

2. $x^9x^3y^4$

3. $\left(x^3\right)^2$

4. $\left(x^5\right)^4 y^6 y^9$

5. $\frac{\left(x^3\right)\left(x^2\right)}{x}$

6. $\left(x^3\right)^4 x^5$

7. $x^{-5}y^{7}$

8. $\dfrac{x^{-9}y^{4}}{x^{5}y}$

9. $\left(x^{6}\right)^{-2}$

10. $\dfrac{x^{3}x^{-2}}{x}$

11. $\dfrac{2x^{3}y^{2}}{6x^{-2}}$

12. $\left(\dfrac{x^{4}x^{-3}}{x}\right)^{4}$

13. $\left(\dfrac{x^{2}y^{-3}}{x}\right)^{-2}$

14. $\left(\dfrac{4x^{-2}y^{3}}{xy^{-1}}\right)^{-2}$

15. $\left(\dfrac{2y^{4}}{x^{2}}\right)\left(\dfrac{5xy}{4xy^{3}}\right)$

16. $\left(\dfrac{3x^{-2}}{y^{4}}\right)^{-2}\left(\dfrac{x^{3}y^{2}}{y^{-3}}\right)^{-1}$

Integral Exponents

Simplify each expression. The rules are below as well as one process that has helped students. There is usually more than one way to simplify a problem.

Product of powers	$a^m a^n = a^{(m+n)}$
Quotient of powers	$\frac{a^m}{a^n} = a^{(m-n)}$
Power of a power	$(a^m)^n = a^{mn}$
Power of quotient	$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$
Zero Exponents	$a^0 = 1$
Negative exponent	$a^{-n} = \frac{1}{a^n}$

negative exponents are 'bad form' and must be made positive

Process:
1. Parenthesis
2. Make exponents positive
3. Simplify horizontally
4. Simplify vertically

1. x^2x^3

x^{2+3}

x^5

this is not the only way you can simplify these questions but it does work everytime

2. $x^9x^3y^4$

$x^{9+3}y^4$

$x^{12}y^4$

3. $\left(x^3\right)^2$

$x^{3\cdot 2}$

x^6

4. $\left(x^5\right)^4y^6y^9$

$x^{5\cdot 4}y^{6+9}$

$x^{20}y^{15}$

5. $\frac{\left(x^3\right)\left(x^2\right)}{x}$

$\frac{x^{3+2}}{x} = \frac{x^5}{x^1} = x^{5-1} = x^4$

6. $\left(x^3\right)^4x^5$

$x^{3\cdot 4}x^5 = x^{12}x^5 = x^{12+5} = x^{17}$

7. $x^{-5}y^{7} = \frac{y^7}{x^5}$

8. $\frac{x^{-9}y^4}{x^5 y} = \frac{y^4}{x^9 x^5 y} = \frac{y^4}{x^{14} y} = \frac{y^3}{x^{14}}$

9. $\left(x^6\right)^{-2} = x^{-12} = \frac{1}{x^{12}}$

10. $\frac{x^3 x^{-2}}{x} = \frac{x^3}{x^2 x} = \frac{x^3}{x^3} = 1$

11. $\frac{2x^3y^2}{6x^{-2}} = \frac{2x^3y^2x^2}{6} = \frac{2x^5y^2}{6}$ ← simplify $\frac{2}{6} = \frac{1}{3}$

$= \frac{x^5y^2}{3}$

12. $\left(\frac{x^4x^{-3}}{x}\right)^4 = \frac{x^{16}x^{-12}}{x^4} = \frac{x^{16}}{x^{12}x^4} = \frac{x^{16}}{x^{16}}$

$= 1$

13. $\left(\frac{x^2y^{-3}}{x}\right)^{-2} = \frac{x^{-4}y^6}{x^{-2}} = \frac{y^6x^2}{x^4} = \frac{y^6}{x^2}$

14. $\left(\frac{4x^{-2}y^3}{xy^{-1}}\right)^{-2} = \frac{4^{-2}x^4y^{-6}}{x^2y^2} = \frac{x^4x^2}{4^2y^6y^2}$

$= \frac{x^6}{16y^8}$

15. $\left(\frac{2y^4}{x^2}\right)\left(\frac{5xy}{4xy^3}\right) = \frac{2y^4 5xy}{x^2 4xy^3} =$

$= \frac{10xy^5}{4x^3y^3} = \frac{5y^2}{2x^2}$

16. $\left(\frac{3x^{-2}}{y^4}\right)^{-2}\left(\frac{x^3y^2}{y^{-3}}\right)^{-1} = \frac{3^{-2}x^4x^{-3}y^{-2}}{y^{-8}y^3}$

$= \frac{x^4y^8}{3^2x^3y^2y^3} = \frac{x^4y^8}{9x^3y^5} = \frac{xy^3}{9}$