8th grade math worksheets

15 sheets, one of each skill, with the answer keys together from page 17.

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2.	Zero and negative exponents 8.EE.A.1	18	3
3.	Writing scientific notation 8.EE.A.3	19	4
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Multiplying and dividing powers

Write each as one power of the same number.

Name _____ Date _____

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

Zero and negative exponents

Find the value of each. Where there are two powers, write them as one power first.

Name _____ Date _____

1. $5^{6} \times 5^{-8} =$ _____
2. $48^{0} =$ _____
3. $8^{-2} =$ _____
4. $10^{-4} =$ _____
5. $9^{4} \div 9^{7} =$ _____
6. $7^{8} \div 7^{8} =$ _____
7. $8^{2} \times 8^{-4} =$ _____
8. $8^{6} \div 8^{8} =$ _____
9. $2^{-3} =$ _____
10. $8^{-1} =$ _____
11. $2^{-1} =$ _____
12. $7^{5} \times 7^{-8} =$ _____
13. $5^{8} \div 5^{8} =$ _____
14. $10^{-1} =$ _____
15. $2^{4} \times 2^{-6} =$ _____
16. $2^{-6} =$ _____
17. $4^{1} \div 4^{5} =$ _____
18. $6^{-2} =$ _____
19. $5^{6} \div 5^{10} =$ _____
20. $86^{0} =$ _____

Writing numbers in scientific notation

Write each number in scientific notation: a number from 1 up to 10, times a power of 10.

Name _____ Date _____

1. 10 = _____
2. 7.74 = _____
3. 0.001 = _____
4. 2,420,000,000 = _____
5. 0.934 = _____
6. 0.009897 = _____
7. 100,000 = _____
8. 60,600 = _____
9. 8,800 = _____
10. 0.00000225 = _____
11. 0.0000039 = _____
12. 66.1 = _____
13. 1,000 = _____
14. 4.44 = _____
15. 0.00000912 = _____
16. 0.0001 = _____
17. 68,300 = _____
18. 460,000 = _____
19. 0.0004412 = _____
20. 50,900 = _____

Scientific notation to standard form

Write each number out in full.

Name _____ Date _____

1. $9.47 \times 10^{4} =$ _____
2. $1 \times 10^{1} =$ _____
3. $4.89 \times 10^{-1} =$ _____
4. $5.3 \times 10^{0} =$ _____
5. $5.3 \times 10^{8} =$ _____
6. $2.923 \times 10^{-4} =$ _____
7. $1 \times 10^{-2} =$ _____
8. $8.904 \times 10^{4} =$ _____
9. $1 \times 10^{3} =$ _____
10. $3.59 \times 10^{-2} =$ _____
11. $4.87 \times 10^{0} =$ _____
12. $5.582 \times 10^{-5} =$ _____
13. $3.45 \times 10^{-5} =$ _____
14. $6.94 \times 10^{4} =$ _____
15. $1.06 \times 10^{-1} =$ _____
16. $1 \times 10^{2} =$ _____
17. $1.5 \times 10^{6} =$ _____
18. $3.8 \times 10^{1} =$ _____
19. $5.906 \times 10^{7} =$ _____
20. $1 \times 10^{-7} =$ _____

Multiplying and dividing in scientific notation

Multiply or divide the numbers, then the powers of 10. Give each answer in scientific notation.

Name _____ Date _____

1. $(6 \times 10^{3}) \times (1.5 \times 10^{5}) =$ _____
2. $(2 \times 10^{2}) \times (1.2 \times 10^{7}) =$ _____
3. $(6 \times 10^{4}) \times (4.5 \times 10^{3}) =$ _____
4. $(1.8 \times 10^{5}) \div (1.5 \times 10^{2}) =$ _____
5. $(1.6 \times 10^{2}) \times (2 \times 10^{-8}) =$ _____
6. $(6.4 \times 10^{2}) \div (1.6 \times 10^{5}) =$ _____
7. $(3.2 \times 10^{7}) \div (4 \times 10^{2}) =$ _____
8. $(4 \times 10^{9}) \times (6 \times 10^{8}) =$ _____
9. $(3.75 \times 10^{9}) \div (1.5 \times 10^{-4}) =$ _____
10. $(3.75 \times 10^{9}) \div (5 \times 10^{7}) =$ _____
11. $(7 \times 10^{4}) \times (3 \times 10^{2}) =$ _____
12. $(3.5 \times 10^{4}) \times (1.8 \times 10^{6}) =$ _____
13. $(1.25 \times 10^{6}) \div (5 \times 10^{3}) =$ _____
14. $(4.8 \times 10^{5}) \div (1.6 \times 10^{5}) =$ _____
15. $(1.2 \times 10^{9}) \times (3.5 \times 10^{-4}) =$ _____
16. $(1.25 \times 10^{8}) \div (5 \times 10^{4}) =$ _____
17. $(6 \times 10^{9}) \times (1.6 \times 10^{7}) =$ _____
18. $(4.2 \times 10^{2}) \div (1.2 \times 10^{2}) =$ _____
19. $(1.8 \times 10^{7}) \div (1.5 \times 10^{-2}) =$ _____
20. $(8 \times 10^{6}) \times (1.5 \times 10^{4}) =$ _____

Multi-step equations

Solve each equation. Show your working, and write the answer on the line.

Name _____ Date _____

1. $7x + 12 + 3x = 72$

x = _____

2. $6x - x + 10 = 40$

x = _____

3. $14 + 4x + x = 69$

x = _____

4. $5x + 14 - x = 54$

x = _____

5. $7x - 5x + 2 = 10$

x = _____

6. $20 + 8x - 5x = 47$

x = _____

7. $6x + 11 - 3x = 44$

x = _____

8. $7 + 6x - 2x = 55$

x = _____

9. $2 + 5x + x = 26$

x = _____

10. $11 + 7x - 3x = 51$

x = _____

Multi-step equations

Solve each equation. Show your working, and write the answer on the line.

Name _____ Date _____

1. $4(x + 5) - 3x = 27$

x = _____

2. $2(x + 7) + 6x = 94$

x = _____

3. $2(x + 7) + 3x = 24$

x = _____

4. $5(x + 8) + 4x = 103$

x = _____

5. $6(x + 7) + 2x = 74$

x = _____

6. $3(x + 4) + 3x = 36$

x = _____

7. $2(x + 9) - x = 26$

x = _____

8. $6(x + 1) + 2x = 38$

x = _____

9. $6(x + 2) + 5x = 56$

x = _____

10. $4(x + 1) - x = 13$

x = _____

Multi-step equations

Solve each equation. Show your working, and write the answer on the line.

Name _____ Date _____

1. $5x - 15 = 2x + 12$

x = _____

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

x = _____

3. $6x + 8 = 5x + 9$

x = _____

4. $9x - 10 = 3x + 44$

x = _____

5. $8x + 7 = x + 77$

x = _____

6. $6x + 6 = 3x + 9$

x = _____

7. $5x - 2 = 3x + 4$

x = _____

8. $9x - 7 = 2x + 70$

x = _____

9. $7x - 14 = x + 16$

x = _____

10. $3x + 14 = 2x + 23$

x = _____

Slope from two points

Find the slope of the line through each pair of points. Write a fraction in lowest terms.

Name _____ Date _____

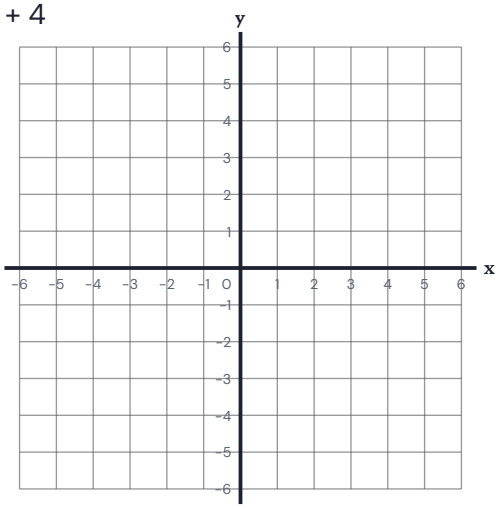
1. (−2, 1) and (0, 7) m = _____
2. (−1, 7) and (1, 1) m = _____
3. (7, −3) and (4, −4) m = _____
4. (4, −4) and (7, −5) m = _____
5. (−3, −9) and (6, −9) m = _____
6. (4, −8) and (3, −9) m = _____
7. (−4, −7) and (2, −9) m = _____
8. (−4, 7) and (−4, 5) m = _____
9. (3, 2) and (2, 4) m = _____
10. (2, 6) and (6, 8) m = _____
11. (8, 5) and (9, 7) m = _____
12. (6, −7) and (3, 2) m = _____
13. (3, −1) and (5, 0) m = _____
14. (1, 8) and (9, 2) m = _____
15. (0, −5) and (−8, −5) m = _____
16. (−8, −6) and (−7, −3) m = _____
17. (7, −4) and (9, −5) m = _____
18. (5, −6) and (5, 3) m = _____
19. (−6, 5) and (−5, 3) m = _____
20. (−6, −3) and (−4, 0) m = _____

Graphing lines in slope-intercept form

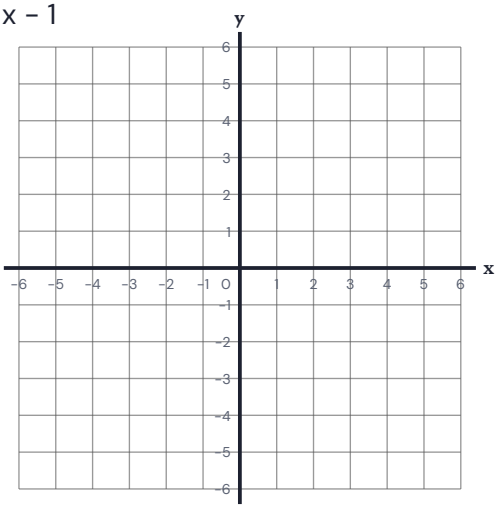
Graph each line: plot the y-intercept b, then use the slope m to find the next point.

Name _____ Date _____

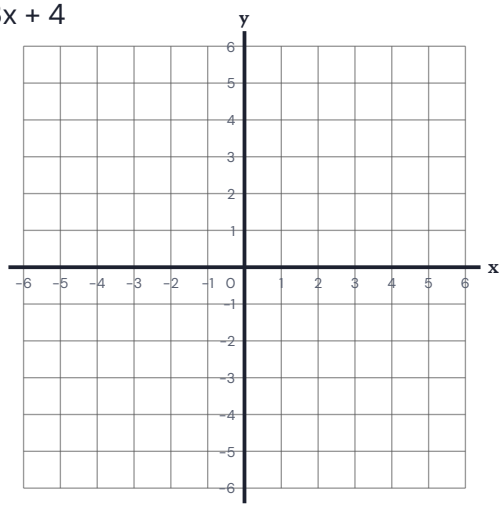
1. $y = 3x + 4$



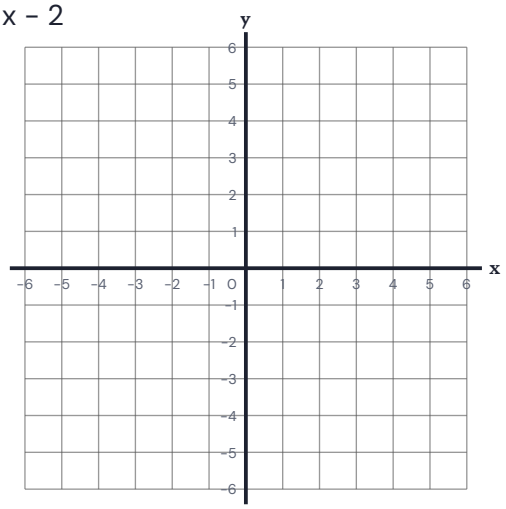
2. $y = \frac{-1}{2}x - 1$



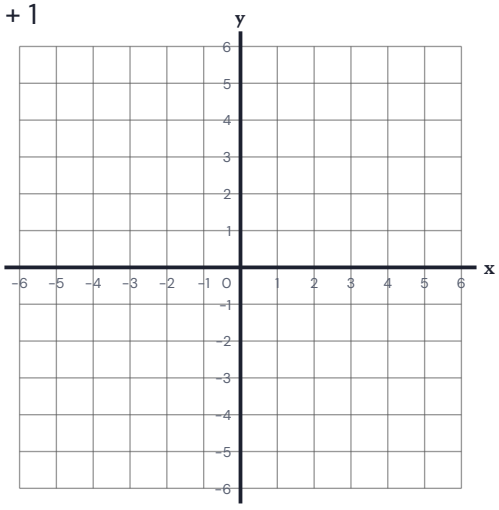
3. $y = -3x + 4$



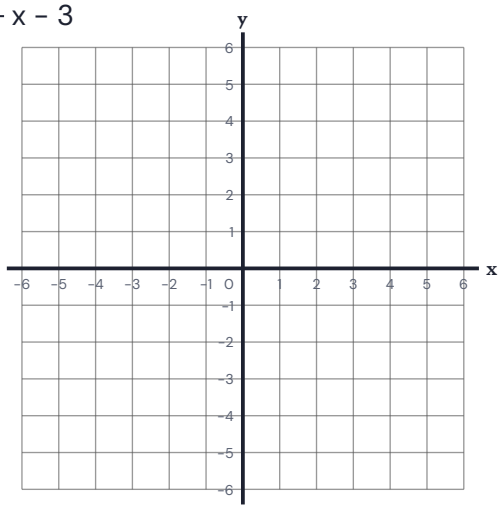
4. $y = \frac{3}{4}x - 2$



5. $y = 3x + 1$



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

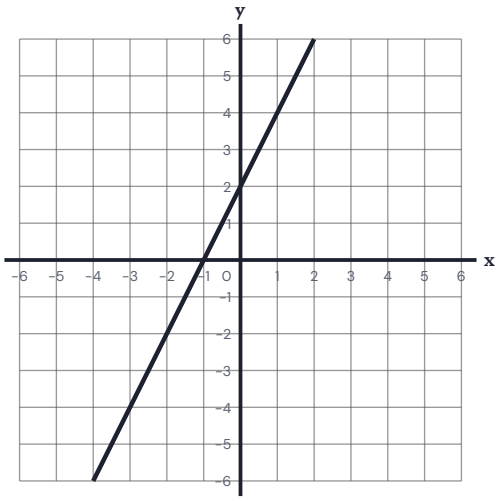


Writing the equation of a line

Write the equation of each line in slope-intercept form, y = mx + b.

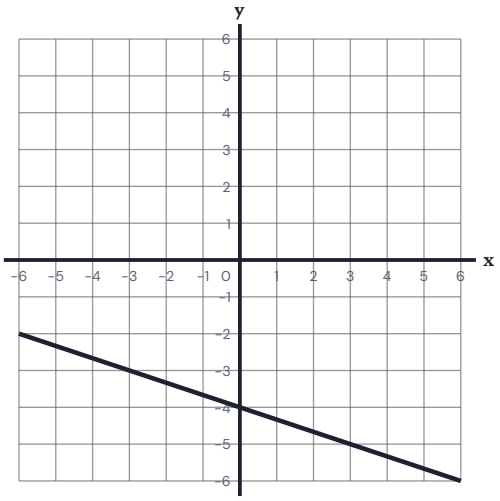
Name _____ Date _____

1.



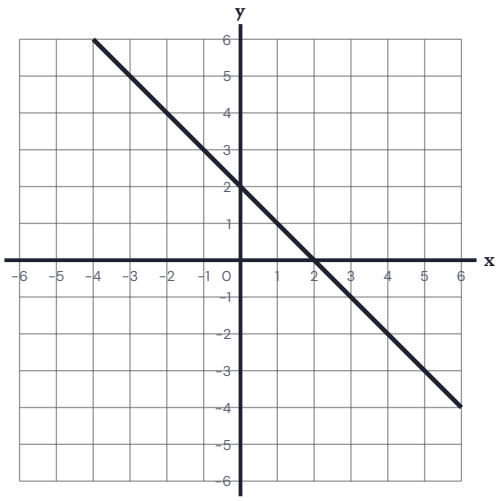
y = _____

2.



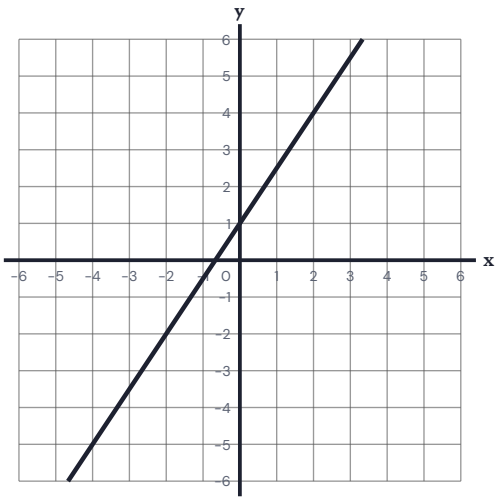
y = _____

3.



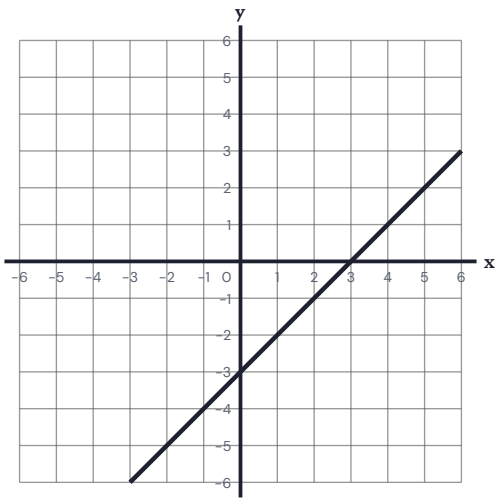
y = _____

4.



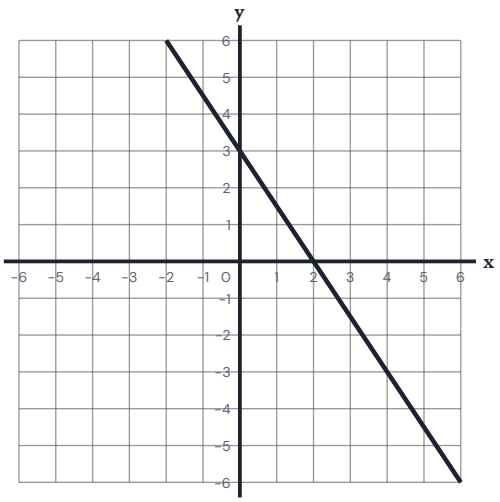
y = _____

5.



y = _____

6.



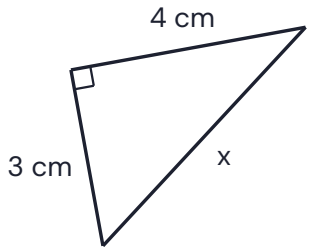
y = _____

Pythagorean theorem: find the missing side

Find x. The hypotenuse is across from the square corner: add the squares to find it, subtract to find a leg.

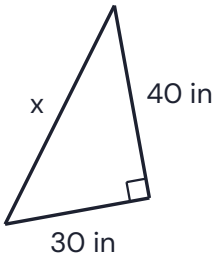
Name _____ Date _____

1.



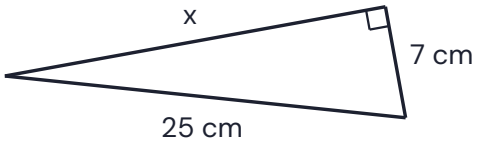
x = _____

2.



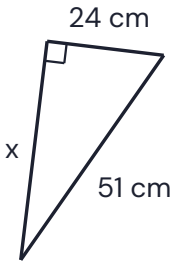
x = _____

3.



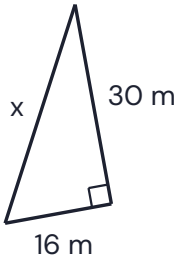
x = _____

4.



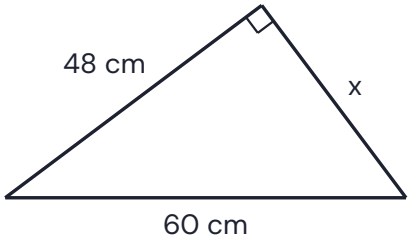
x = _____

5.



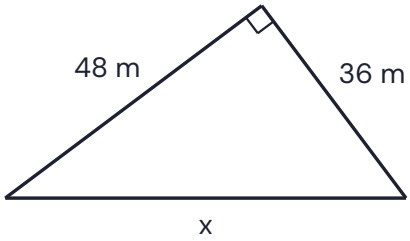
x = _____

6.



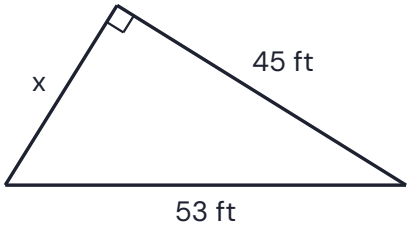
x = _____

7.



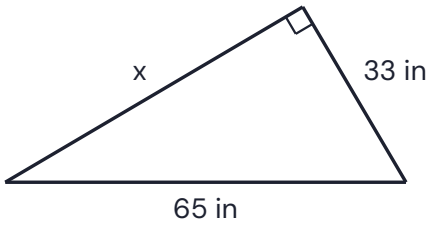
x = _____

8.



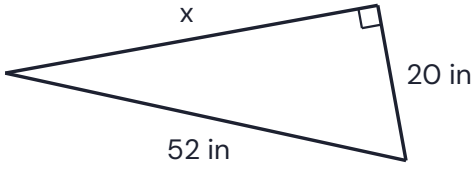
x = _____

9.



x = _____

10.



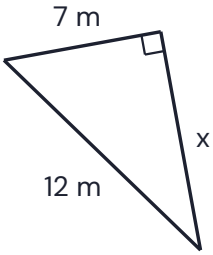
x = _____

Pythagorean theorem: to the nearest tenth

Find x. Give each answer to the nearest tenth.

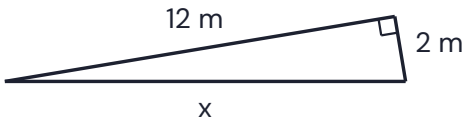
Name _____ Date _____

1.



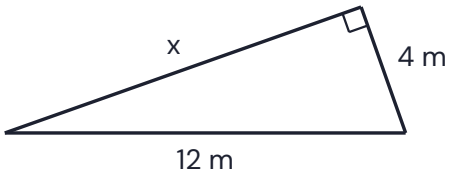
x = _____

2.



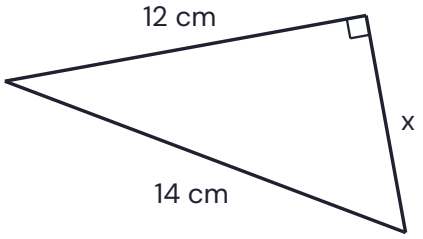
x = _____

3.



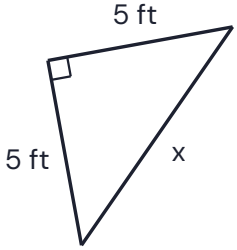
x = _____

4.



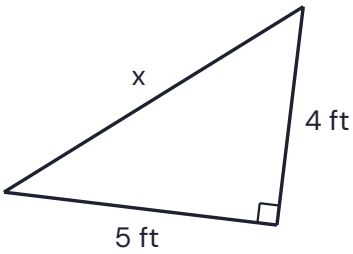
x = _____

5.



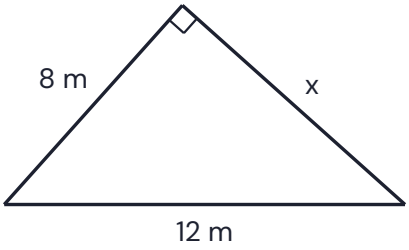
x = _____

6.



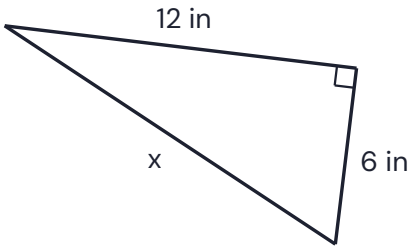
x = _____

7.



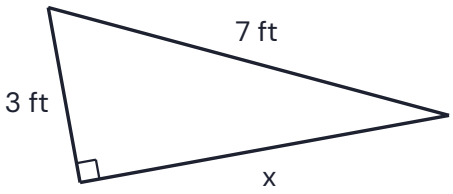
x = _____

8.



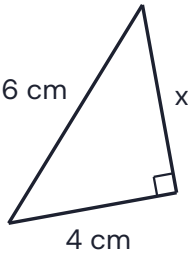
x = _____

9.



x = _____

10.



x = _____

Is it a right triangle?

Square the two shorter sides and add. A right triangle only if the sum is the longest side squared.

Name _____ Date _____

1. 6 ft, 8 ft, 10 ft yes no
2. 20 ft, 21 ft, 28 ft yes no
3. 16 in, 19 in, 29 in yes no
4. 39 cm, 52 cm, 66 cm yes no
5. 16 ft, 65 ft, 63 ft yes no
6. 9 cm, 9 cm, 15 cm yes no
7. 16 in, 30 in, 34 in yes no
8. 8 m, 15 m, 17 m yes no
9. 33 cm, 56 cm, 65 cm yes no
10. 3 ft, 5 ft, 4 ft yes no
11. 12 ft, 16 ft, 19 ft yes no
12. 3 in, 4 in, 5 in yes no
13. 53 m, 28 m, 45 m yes no
14. 11 ft, 21 ft, 30 ft yes no
15. 17 ft, 22 ft, 36 ft yes no
16. 5 in, 12 in, 13 in yes no
17. 9 cm, 40 cm, 42 cm yes no
18. 25 m, 60 m, 65 m yes no
19. 33 in, 44 in, 55 in yes no
20. 28 in, 53 in, 45 in yes no

Pythagorean theorem word problems

Sketch the right triangle, call the side you are finding x, then use $a^2 + b^2 = c^2$.

Name _____ Date _____

1. A hiker walks 20 km east, then 15 km north. How far is the hiker from the starting point, in a straight line?

x = _____

2. A 30 ft ladder leans against a wall, with its foot 18 ft from the wall. How high up the wall does the ladder reach?

x = _____

3. A wire runs from the top of a 12 ft pole to a stake in the ground 5 ft from the foot of the pole. How long is the wire?

x = _____

4. A 26 ft ladder leans against a wall, with its foot 10 ft from the wall. How high up the wall does the ladder reach?

x = _____

5. A rectangular garden is 8 m long and 6 m wide. How long is a straight path across it from one corner to the opposite corner?

x = _____

6. A hiker walks 16 km east, then 12 km north. How far is the hiker from the starting point, in a straight line?

x = _____

7. A kite flies on a tight string 30 m long. The kite is 18 m across from the hand holding the string, measured level with the hand. How high is the kite above the hand?

x = _____

8. A rectangular garden is 24 m long and 10 m wide. How long is a straight path across it from one corner to the opposite corner?

x = _____

Multiplying and dividing powers: answer key

Each question worked out, the answer in colour.

1. $3^2 \times 3^6 = 3^{2+6} = 3^8$
2. $5^6 \div 5^3 = 5^{6-3} = 5^3$
3. $(5^2)^2 = 5^{2\times2} = 5^4$
4. $2^6 \times 2^6 = 2^{6+6} = 2^{12}$
5. $4^5 \div 4^3 = 4^{5-3} = 4^2$
6. $(6^2)^3 = 6^{2\times3} = 6^6$
7. $7^4 \times 7^7 = 7^{4+7} = 7^{11}$
8. $8^6 \div 8^3 = 8^{6-3} = 8^3$
9. $(6^2)^4 = 6^{2\times4} = 6^8$
10. $7^8 \times 7^2 = 7^{8+2} = 7^{10}$
11. $8^5 \div 8^3 = 8^{5-3} = 8^2$
12. $(5^7)^3 = 5^{7\times3} = 5^{21}$
13. $3^4 \times 3^7 = 3^{4+7} = 3^{11}$
14. $7^8 \div 7^2 = 7^{8-2} = 7^6$
15. $(9^3)^7 = 9^{3\times7} = 9^{21}$
16. $7^5 \times 7^2 = 7^{5+2} = 7^7$
17. $3^7 \div 3^5 = 3^{7-5} = 3^2$
18. $(4^3)^6 = 4^{3\times6} = 4^{18}$
19. $8^3 \times 8^5 = 8^{3+5} = 8^8$
20. $7^3 \div 7^2 = 7^{3-2} = 7^1$

Zero and negative exponents: answer key

Each question worked out, the answer in colour.

1. $5^{6} \times 5^{-8} = 5^{6+(-8)} = 5^{-2} = 1/5^{2} = 1/25$
2. $48^{0} = 1$
3. $8^{-2} = 1/8^{2} = 1/64$
4. $10^{-4} = 1/10^{4} = 1/10{,}000 = 0.0001$
5. $9^{4} \div 9^{7} = 9^{4-7} = 9^{-3} = 1/9^{3} = 1/729$
6. $7^{8} \div 7^{8} = 7^{8-8} = 7^{0} = 1$
7. $8^{2} \times 8^{-4} = 8^{2+(-4)} = 8^{-2} = 1/8^{2} = 1/64$
8. $8^{6} \div 8^{8} = 8^{6-8} = 8^{-2} = 1/8^{2} = 1/64$
9. $2^{-3} = 1/2^{3} = 1/8$
10. $8^{-1} = 1/8$
11. $2^{-1} = 1/2$
12. $7^{5} \times 7^{-8} = 7^{5+(-8)} = 7^{-3} = 1/7^{3} = 1/343$
13. $5^{8} \div 5^{8} = 5^{8-8} = 5^{0} = 1$
14. $10^{-1} = 1/10^{1} = 1/10 = 0.1$
15. $2^{4} \times 2^{-6} = 2^{4+(-6)} = 2^{-2} = 1/2^{2} = 1/4$
16. $2^{-6} = 1/2^{6} = 1/64$
17. $4^{1} \div 4^{5} = 4^{1-5} = 4^{-4} = 1/4^{4} = 1/256$
18. $6^{-2} = 1/6^{2} = 1/36$
19. $5^{6} \div 5^{10} = 5^{6-10} = 5^{-4} = 1/5^{4} = 1/625$
20. $86^{0} = 1$

Writing numbers in scientific notation: answer key

Each question worked out, the answer in colour.

1. $10 = 1 \times 10 = 1 \times 10^{1}$
2. $7.74 = 7.74 \times 1 = 7.74 \times 10^{0}$
3. $0.001 = 1 \times 0.001 = 1 \times 10^{-3}$
4. $2{,}420{,}000{,}000 = 2.42 \times 1{,}000{,}000{,}000 = 2.42 \times 10^{9}$
5. $0.934 = 9.34 \times 0.1 = 9.34 \times 10^{-1}$
6. $0.009897 = 9.897 \times 0.001 = 9.897 \times 10^{-3}$
7. $100{,}000 = 1 \times 100{,}000 = 1 \times 10^{5}$
8. $60{,}600 = 6.06 \times 10{,}000 = 6.06 \times 10^{4}$
9. $8{,}800 = 8.8 \times 1{,}000 = 8.8 \times 10^{3}$
10. $0.00000225 = 2.25 \times 0.000001 = 2.25 \times 10^{-6}$
11. $0.0000039 = 3.9 \times 0.000001 = 3.9 \times 10^{-6}$
12. $66.1 = 6.61 \times 10 = 6.61 \times 10^{1}$
13. $1{,}000 = 1 \times 1{,}000 = 1 \times 10^{3}$
14. $4.44 = 4.44 \times 1 = 4.44 \times 10^{0}$
15. $0.00000912 = 9.12 \times 0.000001 = 9.12 \times 10^{-6}$
16. $0.0001 = 1 \times 0.0001 = 1 \times 10^{-4}$
17. $68{,}300 = 6.83 \times 10{,}000 = 6.83 \times 10^{4}$
18. $460{,}000 = 4.6 \times 100{,}000 = 4.6 \times 10^{5}$
19. $0.0004412 = 4.412 \times 0.0001 = 4.412 \times 10^{-4}$
20. $50{,}900 = 5.09 \times 10{,}000 = 5.09 \times 10^{4}$

Scientific notation to standard form: answer key

Each question worked out, the answer in colour.

1. $9.47 \times 10^{4} = 9.47 \times 10{,}000 = 94{,}700$
2. $1 \times 10^{1} = 1 \times 10 = 10$
3. $4.89 \times 10^{-1} = 4.89 \times 0.1 = 0.489$
4. $5.3 \times 10^{0} = 5.3 \times 1 = 5.3$
5. $5.3 \times 10^{8} = 5.3 \times 100{,}000{,}000 = 530{,}000{,}000$
6. $2.923 \times 10^{-4} = 2.923 \times 0.0001 = 0.0002923$
7. $1 \times 10^{-2} = 1 \times 0.01 = 0.01$
8. $8.904 \times 10^{4} = 8.904 \times 10{,}000 = 89{,}040$
9. $1 \times 10^{3} = 1 \times 1{,}000 = 1{,}000$
10. $3.59 \times 10^{-2} = 3.59 \times 0.01 = 0.0359$
11. $4.87 \times 10^{0} = 4.87 \times 1 = 4.87$
12. $5.582 \times 10^{-5} = 5.582 \times 0.00001 = 0.00005582$
13. $3.45 \times 10^{-5} = 3.45 \times 0.00001 = 0.0000345$
14. $6.94 \times 10^{4} = 6.94 \times 10{,}000 = 69{,}400$
15. $1.06 \times 10^{-1} = 1.06 \times 0.1 = 0.106$
16. $1 \times 10^{2} = 1 \times 100 = 100$
17. $1.5 \times 10^{6} = 1.5 \times 1{,}000{,}000 = 1{,}500{,}000$
18. $3.8 \times 10^{1} = 3.8 \times 10 = 38$
19. $5.906 \times 10^{7} = 5.906 \times 10{,}000{,}000 = 59{,}060{,}000$
20. $1 \times 10^{-7} = 1 \times 0.0000001 = 0.0000001$

Multiplying and dividing in scientific notation: answer key

Each question worked out, the answer in colour.

1. $(6 \times 10^3) \times (1.5 \times 10^5) = (6 \times 1.5) \times 10^{3+5} = 9 \times 10^8$
2. $(2 \times 10^2) \times (1.2 \times 10^7) = (2 \times 1.2) \times 10^{2+7} = 2.4 \times 10^9$
3. $(6 \times 10^4) \times (4.5 \times 10^3) = (6 \times 4.5) \times 10^{4+3} = 27 \times 10^7 = 2.7 \times 10^8$
4. $(1.8 \times 10^5) \div (1.5 \times 10^2) = (1.8 \div 1.5) \times 10^{5-2} = 1.2 \times 10^3$
5. $(1.6 \times 10^2) \times (2 \times 10^{-8}) = (1.6 \times 2) \times 10^{2+(-8)} = 3.2 \times 10^{-6}$
6. $(6.4 \times 10^2) \div (1.6 \times 10^5) = (6.4 \div 1.6) \times 10^{2-5} = 4 \times 10^{-3}$
7. $(3.2 \times 10^7) \div (4 \times 10^2) = (3.2 \div 4) \times 10^{7-2} = 0.8 \times 10^5 = 8 \times 10^4$
8. $(4 \times 10^9) \times (6 \times 10^8) = (4 \times 6) \times 10^{9+8} = 24 \times 10^{17} = 2.4 \times 10^{18}$
9. $(3.75 \times 10^9) \div (1.5 \times 10^{-4}) = (3.75 \div 1.5) \times 10^{9-(-4)} = 2.5 \times 10^{13}$
10. $(3.75 \times 10^9) \div (5 \times 10^7) = (3.75 \div 5) \times 10^{9-7} = 0.75 \times 10^2 = 7.5 \times 10^1$
11. $(7 \times 10^4) \times (3 \times 10^2) = (7 \times 3) \times 10^{4+2} = 21 \times 10^6 = 2.1 \times 10^7$
12. $(3.5 \times 10^4) \times (1.8 \times 10^6) = (3.5 \times 1.8) \times 10^{4+6} = 6.3 \times 10^{10}$
13. $(1.25 \times 10^6) \div (5 \times 10^3) = (1.25 \div 5) \times 10^{6-3} = 0.25 \times 10^3 = 2.5 \times 10^2$
14. $(4.8 \times 10^5) \div (1.6 \times 10^5) = (4.8 \div 1.6) \times 10^{5-5} = 3 \times 10^0$
15. $(1.2 \times 10^9) \times (3.5 \times 10^{-4}) = (1.2 \times 3.5) \times 10^{9+(-4)} = 4.2 \times 10^5$
16. $(1.25 \times 10^8) \div (5 \times 10^4) = (1.25 \div 5) \times 10^{8-4} = 0.25 \times 10^4 = 2.5 \times 10^3$
17. $(6 \times 10^9) \times (1.6 \times 10^7) = (6 \times 1.6) \times 10^{9+7} = 9.6 \times 10^{16}$
18. $(4.2 \times 10^2) \div (1.2 \times 10^2) = (4.2 \div 1.2) \times 10^{2-2} = 3.5 \times 10^0$
19. $(1.8 \times 10^7) \div (1.5 \times 10^{-2}) = (1.8 \div 1.5) \times 10^{7-(-2)} = 1.2 \times 10^9$
20. $(8 \times 10^6) \times (1.5 \times 10^4) = (8 \times 1.5) \times 10^{6+4} = 12 \times 10^{10} = 1.2 \times 10^{11}$

Multi-step equations: answer key

Each equation worked one step a line. What was done to both sides is beside each step.

1. **$7x + 12 + 3x = 72$**
   $10x + 12 = 72$ Combine like terms.
   $10x = 60$ Subtract 12 from both sides.
   $x = 6$ Divide both sides by 10.
   Check: $7(6) + 12 + 3(6) = 72$

2. **$6x - x + 10 = 40$**
   $5x + 10 = 40$ Combine like terms.
   $5x = 30$ Subtract 10 from both sides.
   $x = 6$ Divide both sides by 5.
   Check: $6(6) - 6 + 10 = 40$

3. **$14 + 4x + x = 69$**
   $5x + 14 = 69$ Combine like terms.
   $5x = 55$ Subtract 14 from both sides.
   $x = 11$ Divide both sides by 5.
   Check: $14 + 4(11) + 11 = 69$

4. **$5x + 14 - x = 54$**
   $4x + 14 = 54$ Combine like terms.
   $4x = 40$ Subtract 14 from both sides.
   $x = 10$ Divide both sides by 4.
   Check: $5(10) + 14 - 10 = 54$

5. **$7x - 5x + 2 = 10$**
   $2x + 2 = 10$ Combine like terms.
   $2x = 8$ Subtract 2 from both sides.
   $x = 4$ Divide both sides by 2.
   Check: $7(4) - 5(4) + 2 = 10$

6. **$20 + 8x - 5x = 47$**
   $3x + 20 = 47$ Combine like terms.
   $3x = 27$ Subtract 20 from both sides.
   $x = 9$ Divide both sides by 3.
   Check: $20 + 8(9) - 5(9) = 47$

7. **$6x + 11 - 3x = 44$**
   $3x + 11 = 44$ Combine like terms.
   $3x = 33$ Subtract 11 from both sides.
   $x = 11$ Divide both sides by 3.
   Check: $6(11) + 11 - 3(11) = 44$

8. **$7 + 6x - 2x = 55$**
   $4x + 7 = 55$ Combine like terms.
   $4x = 48$ Subtract 7 from both sides.
   $x = 12$ Divide both sides by 4.
   Check: $7 + 6(12) - 2(12) = 55$

9. **$2 + 5x + x = 26$**
   $6x + 2 = 26$ Combine like terms.
   $6x = 24$ Subtract 2 from both sides.
   $x = 4$ Divide both sides by 6.
   Check: $2 + 5(4) + 4 = 26$

10. **$11 + 7x - 3x = 51$**
    $4x + 11 = 51$ Combine like terms.
    $4x = 40$ Subtract 11 from both sides.
    $x = 10$ Divide both sides by 4.
    Check: $11 + 7(10) - 3(10) = 51$

Multi-step equations: answer key

Each equation worked one step a line. What was done to both sides is beside each step.

1. **$4(x + 5) - 3x = 27$**
   $4x + 20 - 3x = 27$ Multiply out the parentheses.
   $x + 20 = 27$ Combine like terms.
   $x = 7$ Subtract 20 from both sides.
   Check: $4(7 + 5) - 3(7) = 27$

2. **$2(x + 7) + 6x = 94$**
   $2x + 14 + 6x = 94$ Multiply out the parentheses.
   $8x + 14 = 94$ Combine like terms.
   $8x = 80$ Subtract 14 from both sides.
   $x = 10$ Divide both sides by 8.
   Check: $2(10 + 7) + 6(10) = 94$

3. **$2(x + 7) + 3x = 24$**
   $2x + 14 + 3x = 24$ Multiply out the parentheses.
   $5x + 14 = 24$ Combine like terms.
   $5x = 10$ Subtract 14 from both sides.
   $x = 2$ Divide both sides by 5.
   Check: $2(2 + 7) + 3(2) = 24$

4. **$5(x + 8) + 4x = 103$**
   $5x + 40 + 4x = 103$ Multiply out the parentheses.
   $9x + 40 = 103$ Combine like terms.
   $9x = 63$ Subtract 40 from both sides.
   $x = 7$ Divide both sides by 9.
   Check: $5(7 + 8) + 4(7) = 103$

5. **$6(x + 7) + 2x = 74$**
   $6x + 42 + 2x = 74$ Multiply out the parentheses.
   $8x + 42 = 74$ Combine like terms.
   $8x = 32$ Subtract 42 from both sides.
   $x = 4$ Divide both sides by 8.
   Check: $6(4 + 7) + 2(4) = 74$

6. **$3(x + 4) + 3x = 36$**
   $3x + 12 + 3x = 36$ Multiply out the parentheses.
   $6x + 12 = 36$ Combine like terms.
   $6x = 24$ Subtract 12 from both sides.
   $x = 4$ Divide both sides by 6.
   Check: $3(4 + 4) + 3(4) = 36$

7. **$2(x + 9) - x = 26$**
   $2x + 18 - x = 26$ Multiply out the parentheses.
   $x + 18 = 26$ Combine like terms.
   $x = 8$ Subtract 18 from both sides.
   Check: $2(8 + 9) - 8 = 26$

8. **$6(x + 1) + 2x = 38$**
   $6x + 6 + 2x = 38$ Multiply out the parentheses.
   $8x + 6 = 38$ Combine like terms.
   $8x = 32$ Subtract 6 from both sides.
   $x = 4$ Divide both sides by 8.
   Check: $6(4 + 1) + 2(4) = 38$

9. **$6(x + 2) + 5x = 56$**
   $6x + 12 + 5x = 56$ Multiply out the parentheses.
   $11x + 12 = 56$ Combine like terms.
   $11x = 44$ Subtract 12 from both sides.
   $x = 4$ Divide both sides by 11.
   Check: $6(4 + 2) + 5(4) = 56$

10. **$4(x + 1) - x = 13$**
    $4x + 4 - x = 13$ Multiply out the parentheses.
    $3x + 4 = 13$ Combine like terms.
    $3x = 9$ Subtract 4 from both sides.
    $x = 3$ Divide both sides by 3.
    Check: $4(3 + 1) - 3 = 13$

Multi-step equations: answer key

Each equation worked one step a line. What was done to both sides is beside each step.

1. **$5x - 15 = 2x + 12$**
   $3x - 15 = 12$ Subtract 2x from both sides.
   $3x = 27$ Add 15 to both sides.
   $x = 9$ Divide both sides by 3.
   Check: $5(9) - 15 = 30$ and $2(9) + 12 = 30$

2. **$4x - 6 = 3x + 6$**
   $x - 6 = 6$ Subtract 3x from both sides.
   $x = 12$ Add 6 to both sides.
   Check: $4(12) - 6 = 42$ and $3(12) + 6 = 42$

3. **$6x + 8 = 5x + 9$**
   $x + 8 = 9$ Subtract 5x from both sides.
   $x = 1$ Subtract 8 from both sides.
   Check: $6(1) + 8 = 14$ and $5(1) + 9 = 14$

4. **$9x - 10 = 3x + 44$**
   $6x - 10 = 44$ Subtract 3x from both sides.
   $6x = 54$ Add 10 to both sides.
   $x = 9$ Divide both sides by 6.
   Check: $9(9) - 10 = 71$ and $3(9) + 44 = 71$

5. **$8x + 7 = x + 77$**
   $7x + 7 = 77$ Subtract x from both sides.
   $7x = 70$ Subtract 7 from both sides.
   $x = 10$ Divide both sides by 7.
   Check: $8(10) + 7 = 87$ and $10 + 77 = 87$

6. **$6x + 6 = 3x + 9$**
   $3x + 6 = 9$ Subtract 3x from both sides.
   $3x = 3$ Subtract 6 from both sides.
   $x = 1$ Divide both sides by 3.
   Check: $6(1) + 6 = 12$ and $3(1) + 9 = 12$

7. **$5x - 2 = 3x + 4$**
   $2x - 2 = 4$ Subtract 3x from both sides.
   $2x = 6$ Add 2 to both sides.
   $x = 3$ Divide both sides by 2.
   Check: $5(3) - 2 = 13$ and $3(3) + 4 = 13$

8. **$9x - 7 = 2x + 70$**
   $7x - 7 = 70$ Subtract 2x from both sides.
   $7x = 77$ Add 7 to both sides.
   $x = 11$ Divide both sides by 7.
   Check: $9(11) - 7 = 92$ and $2(11) + 70 = 92$

9. **$7x - 14 = x + 16$**
   $6x - 14 = 16$ Subtract x from both sides.
   $6x = 30$ Add 14 to both sides.
   $x = 5$ Divide both sides by 6.
   Check: $7(5) - 14 = 21$ and $5 + 16 = 21$

10. **$3x + 14 = 2x + 23$**
    $x + 14 = 23$ Subtract 2x from both sides.
    $x = 9$ Subtract 14 from both sides.
    Check: $3(9) + 14 = 41$ and $2(9) + 23 = 41$

Slope from two points: answer key

The slope is the change in y over the change in x.

1. (−2, 1) and (0, 7)

   $m = \frac{7 - 1}{0 - (-2)} = \frac{6}{2} = 3$

2. (−1, 7) and (1, 1)

   $m = \frac{1 - 7}{1 - (-1)} = \frac{-6}{2} = -3$

3. (7, −3) and (4, −4)

   $m = \frac{-4 - (-3)}{4 - 7} = \frac{-1}{-3} = \frac{1}{3}$

4. (4, −4) and (7, −5)

   $m = \frac{-5 - (-4)}{7 - 4} = \frac{-1}{3}$

5. (−3, −9) and (6, −9)

   $m = \frac{-9 - (-9)}{6 - (-3)} = \frac{0}{9} = 0$

6. (4, −8) and (3, −9)

   $m = \frac{-9 - (-8)}{3 - 4} = \frac{-1}{-1} = 1$

7. (−4, −7) and (2, −9)

   $m = \frac{-9 - (-7)}{2 - (-4)} = \frac{-2}{6} = \frac{-1}{3}$

8. (−4, 7) and (−4, 5)

   $m = \frac{5 - 7}{-4 - (-4)}$ = not defined (a vertical line)

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

   $m = \frac{4 - 2}{2 - 3} = \frac{2}{-1} = -2$

10. (2, 6) and (6, 8)

    $m = \frac{8 - 6}{6 - 2} = \frac{2}{4} = \frac{1}{2}$

11. (8, 5) and (9, 7)

    $m = \frac{7 - 5}{9 - 8} = \frac{2}{1} = 2$

12. (6, −7) and (3, 2)

    $m = \frac{2 - (-7)}{3 - 6} = \frac{9}{-3} = -3$

13. (3, −1) and (5, 0)

    $m = \frac{0 - (-1)}{5 - 3} = \frac{1}{2}$

14. (1, 8) and (9, 2)

    $m = \frac{2 - 8}{9 - 1} = \frac{-6}{8} = \frac{-3}{4}$

15. (0, −5) and (−8, −5)

    $m = \frac{-5 - (-5)}{-8 - 0} = \frac{0}{-8} = 0$

16. (−8, −6) and (−7, −3)

    $m = \frac{-3 - (-6)}{-7 - (-8)} = \frac{3}{1} = 3$

17. (7, −4) and (9, −5)

    $m = \frac{-5 - (-4)}{9 - 7} = \frac{-1}{2}$

18. (5, −6) and (5, 3)

    $m = \frac{3 - (-6)}{5 - 5}$ = not defined (a vertical line)

19. (−6, 5) and (−5, 3)

    $m = \frac{3 - 5}{-5 - (-6)} = \frac{-2}{1} = -2$

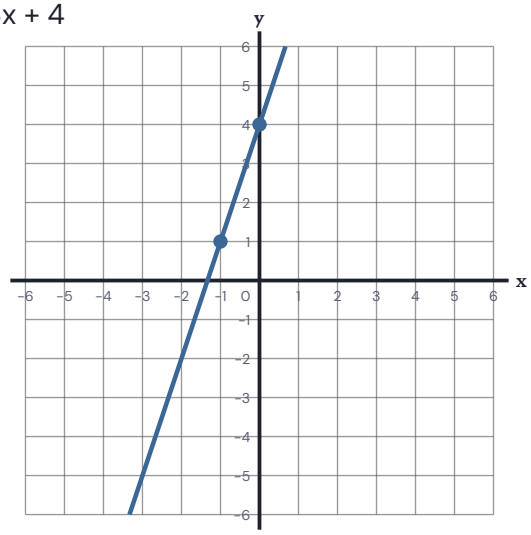
20. (−6, −3) and (−4, 0)

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

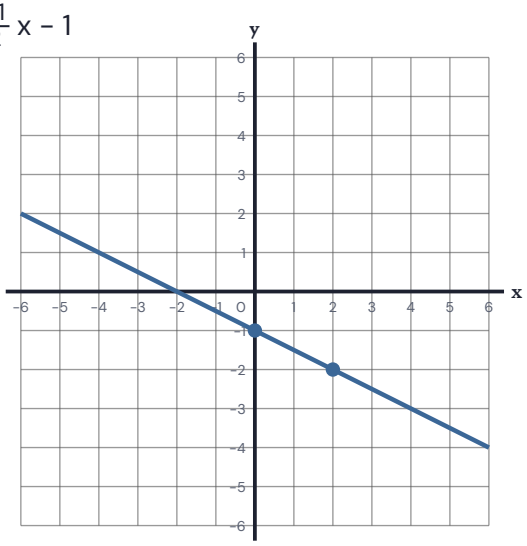
Graphing lines in slope-intercept form: answer key

Each line through its y-intercept and the next point the slope gives.

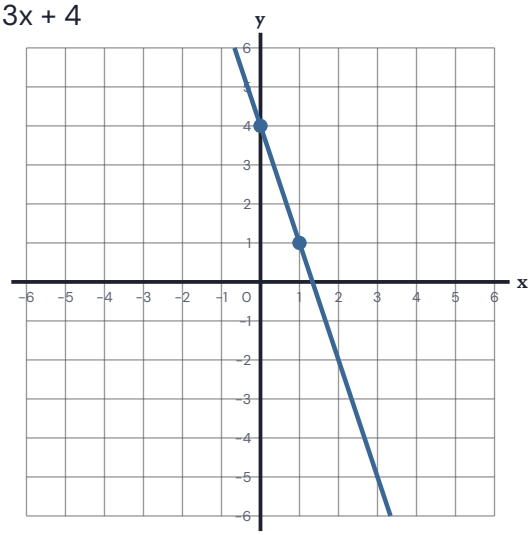
1. $y = 3x + 4$



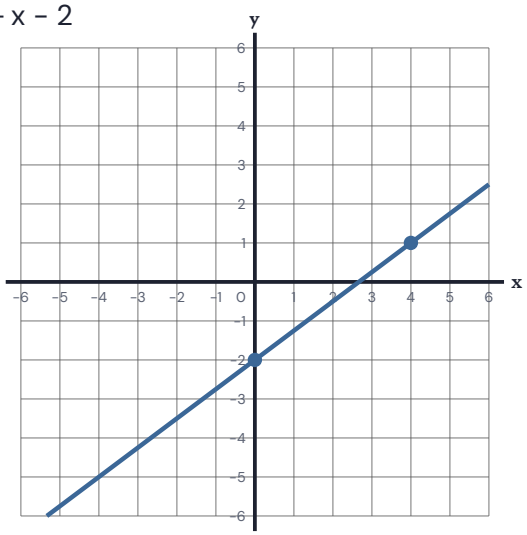
2. $y = \frac{-1}{2}x - 1$



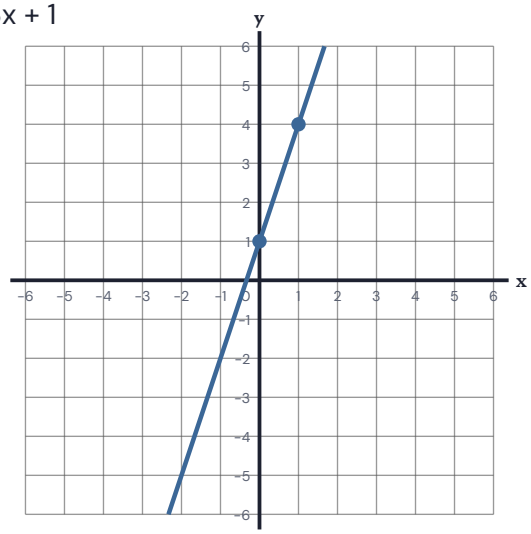
3. $y = -3x + 4$



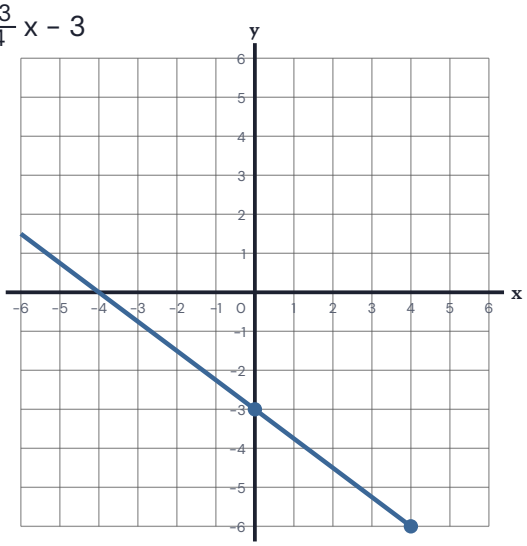
4. $y = \frac{3}{4}x - 2$



5. $y = 3x + 1$



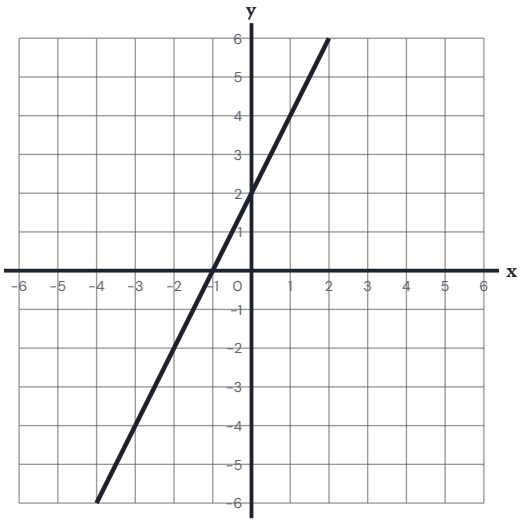
6. $y = \frac{-3}{4}x - 3$



Writing the equation of a line: answer key

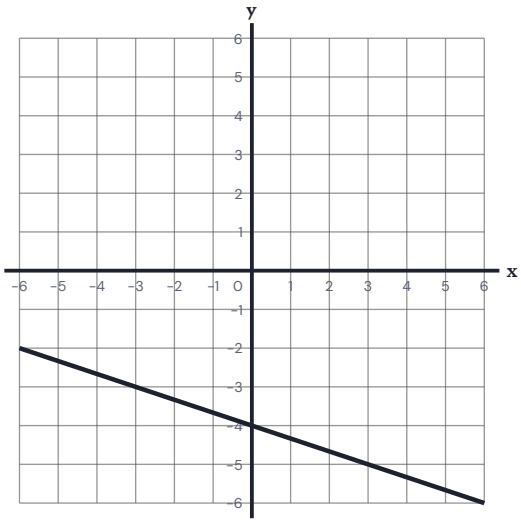
The slope m and the y-intercept b, read from the graph.

1.



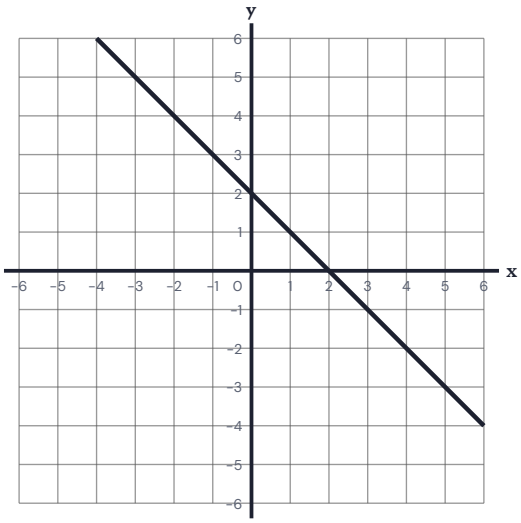
$y = 2x + 2$

2.



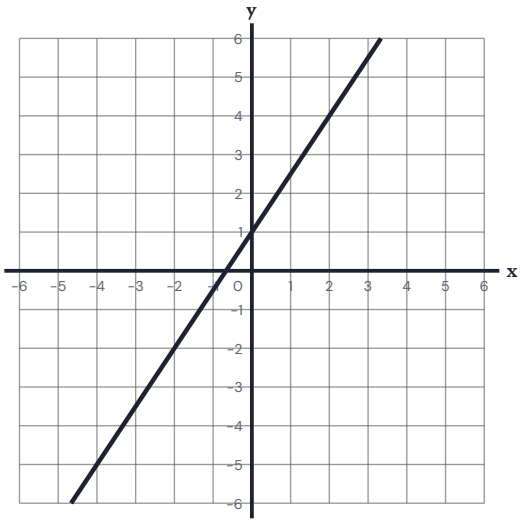
$y = \frac{-1}{3}x - 4$

3.



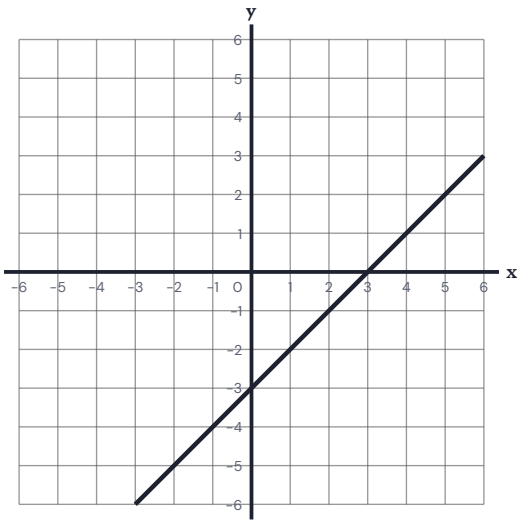
$y = -x + 2$

4.



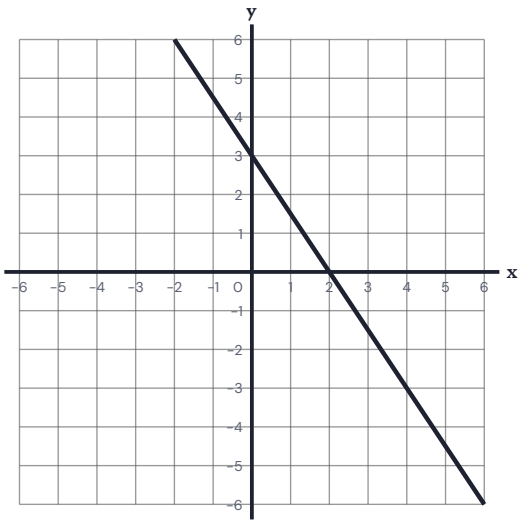
$y = \frac{3}{2}x + 1$

5.



$y = x - 3$

6.



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

Pythagorean theorem: find the missing side: answer key

Each answer in colour, with the working before it.

1. $3^2 + 4^2 = x^2$
   $9 + 16 = 25$
   $x = \sqrt{25} =$ **5 cm**

2. $40^2 + 30^2 = x^2$
   $1600 + 900 = 2500$
   $x = \sqrt{2500} =$ **50 in**

3. $x^2 + 7^2 = 25^2$
   $x^2 = 625 - 49 = 576$
   $x = \sqrt{576} =$ **24 cm**

4. $x^2 + 24^2 = 51^2$
   $x^2 = 2601 - 576 = 2025$
   $x = \sqrt{2025} =$ **45 cm**

5. $30^2 + 16^2 = x^2$
   $900 + 256 = 1156$
   $x = \sqrt{1156} =$ **34 m**

6. $x^2 + 48^2 = 60^2$
   $x^2 = 3600 - 2304 = 1296$
   $x = \sqrt{1296} =$ **36 cm**

7. $48^2 + 36^2 = x^2$
   $2304 + 1296 = 3600$
   $x = \sqrt{3600} =$ **60 m**

8. $x^2 + 45^2 = 53^2$
   $x^2 = 2809 - 2025 = 784$
   $x = \sqrt{784} =$ **28 ft**

9. $x^2 + 33^2 = 65^2$
   $x^2 = 4225 - 1089 = 3136$
   $x = \sqrt{3136} =$ **56 in**

10. $x^2 + 20^2 = 52^2$
    $x^2 = 2704 - 400 = 2304$
    $x = \sqrt{2304} =$ **48 in**

Pythagorean theorem: to the nearest tenth: answer key

Each answer in colour, with the working before it.

1. $x^2 + 7^2 = 12^2$
   $x^2 = 144 - 49 = 95$
   $x = \sqrt{95} \approx 9.7$ m

2. $12^2 + 2^2 = x^2$
   $144 + 4 = 148$
   $x = \sqrt{148} \approx 12.2$ m

3. $x^2 + 4^2 = 12^2$
   $x^2 = 144 - 16 = 128$
   $x = \sqrt{128} \approx 11.3$ m

4. $x^2 + 12^2 = 14^2$
   $x^2 = 196 - 144 = 52$
   $x = \sqrt{52} \approx 7.2$ cm

5. $5^2 + 5^2 = x^2$
   $25 + 25 = 50$
   $x = \sqrt{50} \approx 7.1$ ft

6. $5^2 + 4^2 = x^2$
   $25 + 16 = 41$
   $x = \sqrt{41} \approx 6.4$ ft

7. $x^2 + 8^2 = 12^2$
   $x^2 = 144 - 64 = 80$
   $x = \sqrt{80} \approx 8.9$ m

8. $12^2 + 6^2 = x^2$
   $144 + 36 = 180$
   $x = \sqrt{180} \approx 13.4$ in

9. $x^2 + 3^2 = 7^2$
   $x^2 = 49 - 9 = 40$
   $x = \sqrt{40} \approx 6.3$ ft

10. $x^2 + 4^2 = 6^2$
    $x^2 = 36 - 16 = 20$
    $x = \sqrt{20} \approx 4.5$ cm

Is it a right triangle: answer key

The two shorter sides squared and added, against the longest side squared.

1. $6^2 + 8^2 = 36 + 64 = 100$
   $10^2 = 100$
   $100 = 100$: yes, a right triangle

2. $20^2 + 21^2 = 400 + 441 = 841$
   $28^2 = 784$
   $841 \neq 784$: no, not a right triangle

3. $16^2 + 19^2 = 256 + 361 = 617$
   $29^2 = 841$
   $617 \neq 841$: no, not a right triangle

4. $39^2 + 52^2 = 1521 + 2704 = 4225$
   $66^2 = 4356$
   $4225 \neq 4356$: no, not a right triangle

5. $16^2 + 63^2 = 256 + 3969 = 4225$
   $65^2 = 4225$
   $4225 = 4225$: yes, a right triangle

6. $9^2 + 9^2 = 81 + 81 = 162$
   $15^2 = 225$
   $162 \neq 225$: no, not a right triangle

7. $16^2 + 30^2 = 256 + 900 = 1156$
   $34^2 = 1156$
   $1156 = 1156$: yes, a right triangle

8. $8^2 + 15^2 = 64 + 225 = 289$
   $17^2 = 289$
   $289 = 289$: yes, a right triangle

9. $33^2 + 56^2 = 1089 + 3136 = 4225$
   $65^2 = 4225$
   $4225 = 4225$: yes, a right triangle

10. $3^2 + 4^2 = 9 + 16 = 25$
    $5^2 = 25$
    $25 = 25$: yes, a right triangle

11. $12^2 + 16^2 = 144 + 256 = 400$
    $19^2 = 361$
    $400 \neq 361$: no, not a right triangle

12. $3^2 + 4^2 = 9 + 16 = 25$
    $5^2 = 25$
    $25 = 25$: yes, a right triangle

13. $28^2 + 45^2 = 784 + 2025 = 2809$
    $53^2 = 2809$
    $2809 = 2809$: yes, a right triangle

14. $11^2 + 21^2 = 121 + 441 = 562$
    $30^2 = 900$
    $562 \neq 900$: no, not a right triangle

15. $17^2 + 22^2 = 289 + 484 = 773$
    $36^2 = 1296$
    $773 \neq 1296$: no, not a right triangle

16. $5^2 + 12^2 = 25 + 144 = 169$
    $13^2 = 169$
    $169 = 169$: yes, a right triangle

17. $9^2 + 40^2 = 81 + 1600 = 1681$
    $42^2 = 1764$
    $1681 \neq 1764$: no, not a right triangle

18. $25^2 + 60^2 = 625 + 3600 = 4225$
    $65^2 = 4225$
    $4225 = 4225$: yes, a right triangle

19. $33^2 + 44^2 = 1089 + 1936 = 3025$
    $55^2 = 3025$
    $3025 = 3025$: yes, a right triangle

20. $28^2 + 45^2 = 784 + 2025 = 2809$
    $53^2 = 2809$
    $2809 = 2809$: yes, a right triangle

Pythagorean theorem word problems: answer key

Each answer in colour, with the working before it.

1. $20^2 + 15^2 = x^2$
   $400 + 225 = 625$
   $x = \sqrt{625} =$ **25 km**

2. $x^2 + 18^2 = 30^2$
   $x^2 = 900 - 324 = 576$
   $x = \sqrt{576} =$ **24 ft**

3. $5^2 + 12^2 = x^2$
   $25 + 144 = 169$
   $x = \sqrt{169} =$ **13 ft**

4. $x^2 + 10^2 = 26^2$
   $x^2 = 676 - 100 = 576$
   $x = \sqrt{576} =$ **24 ft**

5. $6^2 + 8^2 = x^2$
   $36 + 64 = 100$
   $x = \sqrt{100} =$ **10 m**

6. $16^2 + 12^2 = x^2$
   $256 + 144 = 400$
   $x = \sqrt{400} =$ **20 km**

7. $x^2 + 18^2 = 30^2$
   $x^2 = 900 - 324 = 576$
   $x = \sqrt{576} =$ **24 m**

8. $10^2 + 24^2 = x^2$
   $100 + 576 = 676$
   $x = \sqrt{676} =$ **26 m**