The Ultimate Step by Step Guide to Preparing for the ASTB Math Test

Test taker's #1 Choice

ASTB Math 2024 for Beginners

Reza Nazari

✔ Recommended by Test Prep Experts

ASTB MATH FOR BEGINNERS

The Ultimate Step by Step Guide to Preparing for the ASTB Math Test

Answers and Solutions

By

Reza Nazari

Effortless Math's ASTB Online Center

… So Much More Online!

Effortless Math Online ASTB Center offers a complete study program, including the following:

- ✓ Step-by-step instructions on how to prepare for the ASTB Math test
- ✓ Numerous ASTB Math worksheets to help you measure your math skills
- ✓ Complete list of ASTB Math formulas
- ✓ Video lessons for all ASTB Math topics
- ✓ Full-length ASTB Math practice tests
- ✓ And much more…

No Registration Required.

Visit **EffortlessMath.com/ASTB** to find your online ASTB Math resources.

Contents

CHAPTER

1 Fractions and Mixed Numbers

Math topics in this chapter:

- ☑ Simplifying Fractions
- ☑ Adding and Subtracting Fractions
- ☑ Multiplying and Dividing Fractions
- ☑ Adding Mixed Numbers
- ☑ Subtracting Mixed Numbers
- ☑ Multiplying Mixed Numbers
- ☑ Dividing Mixed Numbers

Practices

Simplify each fraction.

1) $\frac{2}{8} =$
2) $\frac{5}{15} =$
3) $\frac{10}{90} =$
4) $\frac{12}{16} =$
5) $\frac{25}{45} =$
6) $\frac{42}{54} =$
7) $\frac{48}{60} =$
8) $\frac{52}{169} =$

Find the sum or difference.

9) $\frac{3}{10} + \frac{2}{10} =$
10) $\frac{4}{9} - \frac{1}{9} =$
11) $\frac{2}{3} + \frac{6}{15} =$
12) $\frac{17}{24} - \frac{5}{8} =$
13) $\frac{7}{54} - \frac{1}{9} =$
14) $\frac{4}{5} - \frac{1}{6} =$
15) $\frac{6}{7} - \frac{3}{8} =$
16) $\frac{2}{13} + \frac{1}{4} =$

Find the products or quotients.

17) $\frac{2}{9} \div \frac{4}{3} =$
18) $\frac{14}{5} \div \frac{28}{35} =$
19) $\frac{9}{25} \times \frac{5}{27} =$
20) $\frac{65}{72} \times \frac{12}{15} =$

Find the sum.

21) $2\frac{1}{5} + 1\frac{2}{5} =$
22) $5\frac{1}{9} + 2\frac{7}{9} =$
23) $2\frac{3}{4} + 1\frac{1}{8} =$
24) $2\frac{2}{7} + 4\frac{1}{21} =$
25) $5\frac{3}{5} + 1\frac{4}{9} =$
26) $3\frac{3}{11} + 4\frac{6}{7} =$

Find the difference.

27) $5\frac{1}{3} - 4\frac{2}{3} =$

28) $4\frac{7}{10} - 1\frac{3}{10} =$

29) $3\frac{1}{3} - 2\frac{2}{9} =$

30) $6\frac{1}{2} - 3\frac{1}{3} =$

31) $4\frac{3}{4} - 2\frac{1}{28} =$

32) $4\frac{2}{7} - 3\frac{1}{6} =$

33) $5\frac{3}{10} - 3\frac{3}{4} =$

34) $6\frac{9}{20} - 2\frac{1}{3} =$

Find the products.

35) $1\frac{1}{2} \times 2\frac{3}{7} =$

36) $1\frac{3}{4} \times 1\frac{3}{5} =$

37) $4\frac{1}{2} \times 1\frac{5}{6} =$

38) $1\frac{2}{7} \times 3\frac{1}{5} =$

39) $2\frac{1}{5} \times 5\frac{1}{2} =$

40) $2\frac{1}{2} \times 4\frac{4}{5} =$

41) $3\frac{1}{5} \times 4\frac{1}{2} =$

42) $4\frac{9}{10} \times 4\frac{1}{2} =$

Solve.

43) $1\frac{1}{3} \div 1\frac{2}{3} =$

44) $2\frac{1}{4} \div 1\frac{1}{2} =$

45) $5\frac{1}{3} \div 3\frac{1}{2} =$

46) $3\frac{2}{7} \div 1\frac{1}{8} =$

47) $4\frac{1}{5} \div 2\frac{2}{3} =$

48) $1\frac{2}{3} \div 1\frac{3}{8} =$

49) $4\frac{1}{2} \div 2\frac{2}{3} =$

50) $1\frac{2}{11} \div 1\frac{1}{8} =$

Answers

1) $\frac{1}{4}$
2) $\frac{1}{3}$
3) $\frac{1}{9}$
4) $\frac{3}{4}$
5) $\frac{5}{9}$
6) $\frac{7}{9}$
7) $\frac{4}{5}$
8) $\frac{4}{13}$
9) $\frac{1}{2}$
10) $\frac{1}{3}$
11) $\frac{16}{15} = 1\frac{1}{15}$
12) $\frac{1}{12}$
13) $\frac{1}{54}$
14) $\frac{19}{30}$
15) $\frac{27}{56}$
16) $\frac{21}{52}$
17) $\frac{1}{6}$
18) $\frac{7}{2} = 3\frac{1}{2}$
19) $\frac{1}{15}$
20) $\frac{13}{18}$
21) $3\frac{3}{5}$
22) $7\frac{8}{9}$
23) $3\frac{7}{8}$
24) $6\frac{1}{3}$
25) $7\frac{2}{45}$
26) $8\frac{10}{77}$
27) $\frac{2}{3}$
28) $3\frac{2}{5}$
29) $1\frac{1}{9}$
30) $3\frac{1}{6}$
31) $2\frac{5}{7}$
32) $1\frac{5}{42}$
33) $1\frac{11}{20}$
34) $4\frac{7}{60}$
35) $3\frac{9}{14}$
36) $2\frac{4}{5}$
37) $8\frac{1}{4}$
38) $4\frac{4}{35}$
39) $12\frac{1}{10}$
40) 12
41) $14\frac{2}{5}$
42) $22\frac{1}{20}$
43) $\frac{4}{5}$
44) $1\frac{1}{2}$
45) $1\frac{11}{21}$
46) $2\frac{58}{63}$
47) $1\frac{23}{40}$
48) $1\frac{7}{33}$
49) $1\frac{11}{16}$
50) $1\frac{5}{99}$

Answers and Explanations

1. We can simplify the fraction $\frac{2}{8}$ by finding a common factor of both numbers and dividing them by it. For 2 and 8, the common factor is 2. $2 \div 2 = 1$, and $8 \div 2 = 4$. So, $\frac{2}{8}$ simplifies to $\frac{1}{4}$.

2. Here, we can observe that both numbers are multiples of 5: $5 \div 5 = 1$, and $15 \div 5 = 3$. Thus, $\frac{5}{15}$ is equivalent to $\frac{1}{3}$.

3. For 10 and 90, they share a factor of 10. Then, we have: $10 \div 10 = 1$, and $90 \div 10 = 9$. Therefore, $\frac{10}{90}$ reduces to $\frac{1}{9}$.

4. To simplify $\frac{12}{16}$, we can notice that both numbers are even. The highest even number that can divide both is 4. So, $12 \div 4 = 3$, and $16 \div 4 = 4$. This means $\frac{12}{16}$ can be simplified to $\frac{3}{4}$.

5. 25 and 45 have a common factor of 5. We get: $25 \div 5 = 5$, and $45 \div 5 = 9$. Hence, $\frac{25}{45}$ becomes $\frac{5}{9}$.

6. Both 42 and 54 can be divided by 6. We have: $42 \div 6 = 7$, and $54 \div 6 = 9$. So, $\frac{42}{54}$ simplifies to $\frac{7}{9}$.

7. The biggest number that can evenly divide both 48 and 60 is 12. So, $48 \div 12 = 4$, and $60 \div 12 = 5$. Thus, $\frac{48}{60}$ can be represented as $\frac{4}{5}$.

8. Recognizing that 169 is 13 squared, we can see that 52 is divisible by 13. $52 \div 13 = 4$, and also $169 \div 13 = 13$. So, $\frac{52}{169}$ is simplified to $\frac{4}{13}$.

9. When the denominators (the bottom numbers) are the same, you can simply add the numerators (the top numbers). Here, both fractions have a denominator of 10: $3+2=5$. So, $\frac{3}{10}+\frac{2}{10}=\frac{5}{10}$. Simplifying $\frac{5}{10}$ gives $\frac{1}{2}$ because both 5 and 10 are divisible by 5.

10. Similarly, with the same denominators, just subtract the numerators. $4-1=3$. So, $\frac{4}{9}-\frac{1}{9}=\frac{3}{9}$. When simplified, $\frac{3}{9}$ becomes $\frac{1}{3}$ as both 3 and 9 are divisible by 3.

11. To add fractions with different denominators, find a common denominator. The smallest common multiple of 3 and 15 is 15. Convert $\frac{2}{3}$ to have a denominator of 15 by multiplying top and bottom by 5. So, $\frac{2}{3}\times\frac{5}{5}=\frac{10}{15}$. Now, add the numerators: $10+6=16$.

Therefore, $\frac{2}{3}+\frac{6}{15}=\frac{10}{15}+\frac{6}{15}=\frac{16}{15}$ or $1\frac{1}{15}$.

12. Convert both fractions to have a common denominator, which is 24. $\frac{5}{8}$ can be changed to $\frac{15}{24}$ by multiplying by $\frac{3}{3}$. Now, subtract the numerators: $17-15=2$. So, $\frac{17}{24}-\frac{5}{8}=\frac{17}{24}-\frac{15}{24}=\frac{2}{24}$, which simplifies to $\frac{1}{12}$.

13. To make the denominators match, convert $\frac{1}{9}$ into a fraction with a 54 denominator. Multiply $\frac{1}{9}$ by $\frac{6}{6}$ to get $\frac{6}{54}$. Now, $7-6=1$. So, $\frac{7}{54}-\frac{1}{9}=\frac{7}{54}-\frac{6}{54}=\frac{1}{54}$.

14. The least common multiple of 5 and 6 is 30. Convert $\frac{4}{5}$ to $\frac{24}{30}$ and $\frac{1}{6}$ to $\frac{5}{30}$. So, $\frac{4}{5}-\frac{1}{6}=\frac{24}{30}-\frac{5}{30}=\frac{24-5}{30}=\frac{19}{30}$.

15. The least common multiple of 7 and 8 is 56. Convert $\frac{6}{7}$ to $\frac{48}{56}$ and $\frac{3}{8}$ to $\frac{21}{56}$. Thus, $\frac{6}{7}-\frac{3}{8}=\frac{48}{56}-\frac{21}{56}=\frac{48-21}{56}=\frac{27}{56}$.

16. For denominators of 13 and 4, the smallest common multiple is 52. Convert $\frac{2}{13}$ to $\frac{8}{52}$ and $\frac{1}{4}$ to $\frac{13}{52}$. Then, $8+13=21$, resulting in $\frac{2}{13}+\frac{1}{4}=\frac{21}{52}$.

17. For dividing fractions, you can multiply the first fraction by the reciprocal of the second fraction. The reciprocal is simply flipping the numerator and the denominator. $\frac{2}{9}\times\frac{3}{4}$. Now, multiply the numerators together and the denominators together: $\frac{2}{9}\times\frac{3}{4}=\frac{6}{36}$. Simplify: $\frac{6}{36}=\frac{1}{6}$ (since 6 can be divided from both the numerator and the denominator).

18. For this division, multiply the first fraction by the reciprocal of the second fraction. $\frac{14}{5}\times\frac{35}{28}=\frac{490}{140}$. But this fraction can be made simpler! Both 490 and 140 can be divided by 70. Doing that gives us $\frac{7}{2}=3\frac{1}{2}$.

19. For multiplying fractions, simply multiply the numerators together and the denominators together. $\frac{9}{25}\times\frac{5}{27}=\frac{9}{5\times5}\times\frac{5}{3\times9}=\frac{1}{5}\times\frac{1}{3}=\frac{1}{15}$.

20. Before multiplying, let's simplify the fractions to make our multiplication easier. $\frac{12}{15}$ can be simplified to $\frac{4}{5}$ by dividing both the numerator and the denominator by 3. Multiply the simplified fractions: $\frac{65}{72}\times\frac{4}{5}=\frac{13\times5}{4\times18}\times\frac{4}{5}=\frac{13}{18}$.

21. When adding mixed numbers, we add whole numbers together and then fractions separately. $2+1=3$ (Whole numbers), $\frac{1}{5}+\frac{2}{5}=\frac{3}{5}$ (fractions). So, the result is $3\frac{3}{5}$.

22. For the whole number part, $5+2=7$. When you add the fractions $\frac{1}{9}$ and $\frac{7}{9}$, you get $\frac{8}{9}$. So, the result is $7\frac{8}{9}$.

23. Adding the whole numbers first: $2+1=3$. Then, for the fractions: $\frac{3}{4}$ is the same as $\frac{6}{8}$. So, $\frac{6}{8}+\frac{1}{8}=\frac{7}{8}$. Combining, we get $3\frac{7}{8}$.

24. Combine the whole numbers: $2 + 4 = 6$. For the fractions, $\frac{2}{7}$ can be expressed as $\frac{6}{21}$. So, $\frac{6}{21} + \frac{1}{21} = \frac{7}{21}$, which simplifies to $\frac{1}{3}$. Thus, the sum is $6\frac{1}{3}$.

25. Begin with the whole numbers: $5 + 1 = 6$. Now, for the fractions: convert $\frac{3}{5}$ to $\frac{27}{45}$ and $\frac{4}{9}$ to $\frac{20}{45}$. Adding these gives $\frac{47}{45}$, which is 1 and $\frac{2}{45}$ when simplified. Adding the 1 to the 6, we get $7\frac{2}{45}$.

26. First, total the whole numbers: $3 + 4 = 7$. Next, convert the fractions to have common denominators. $\frac{3}{11}$ is equivalent to $\frac{21}{77}$, and $\frac{6}{7}$ equals $\frac{66}{77}$. Adding these fractions results in $\frac{87}{77}$, which is 1 and $\frac{10}{77}$. Including this to the whole number gives $8\frac{10}{77}$.

27. Whole numbers: $5 - 4 = 1$. Fractions: $\frac{1}{3} - \frac{2}{3} = -\frac{1}{3}$. Since this is negative, we'll borrow 1 from our whole number result. This makes our whole number 0 and our fraction $\frac{4}{3}$. Now, $\frac{4}{3} - \frac{2}{3} = \frac{2}{3}$.

28. Start by subtracting the fractions. $\frac{7}{10} - \frac{3}{10} = \frac{4}{10}$, which can be simplified to $\frac{2}{5}$. Then subtract the whole numbers: $4 - 1 = 3$. So, the answer is $3\frac{2}{5}$.

29. To subtract the fractions, find a common denominator, which is 9. $\frac{1}{3}$ is the same as $\frac{3}{9}$. Now, $\frac{1}{3} - \frac{2}{9} = \frac{3}{9} - \frac{2}{9} = \frac{1}{9}$. Subtract the whole numbers: $3 - 2 = 1$. So, the result is $1\frac{1}{9}$.

30. Using the knowledge from the previous steps, first transform $\frac{1}{2}$ to $\frac{3}{6}$ and $\frac{1}{2}$ to $\frac{2}{6}$. Now, $\frac{3}{6} - \frac{2}{6} = \frac{1}{6}$. Subtracting whole numbers, $6 - 3 = 3$. So, the answer is $3\frac{1}{6}$.

31. The denominators 4 and 28 aren't as straightforward. Convert $\frac{3}{4}$ to $\frac{21}{28}$. Now, $\frac{21}{28} - \frac{1}{28} = \frac{20}{28}$, which simplifies to $\frac{5}{7}$. Subtract the whole numbers: $4 - 2 = 2$. Answer: $2\frac{5}{7}$.

32. With different denominators, convert $\frac{2}{7}$ to $\frac{12}{42}$ and $\frac{1}{6}$ to $\frac{7}{42}$. Now, $\frac{12}{42}-\frac{7}{42}=\frac{5}{42}$. For the whole numbers: $4-3=1$. So, the answer is $1\frac{5}{42}$.

33. First, find a common denominator. In this case, it´s 20. $\frac{3}{10}$ is equivalent to $\frac{6}{20}$ and $\frac{3}{4}$ is equivalent to $\frac{15}{20}$. Now, $\frac{6}{20}-\frac{15}{20}=-\frac{9}{20}$, which is negative, so we borrow 1 from the whole number. $5-1=4$ (After borrowing). And $1+\frac{6}{20}=\frac{20+6}{20}=\frac{26}{20}$. Next, $\frac{26}{20}-\frac{15}{20}=\frac{11}{20}$. Now, subtract the whole numbers: $4-3=1$. So, the final answer is $1\frac{11}{20}$.

34. Convert $\frac{1}{3}$ to $\frac{20}{60}$. Convert $\frac{9}{20}$ to $\frac{27}{60}$. Subtracting, $\frac{27}{60}-\frac{20}{60}=\frac{7}{60}$. For whole numbers: $6-2=4$. So, the result is $4\frac{7}{60}$.

35. First, convert the mixed numbers to improper fractions. $1\frac{1}{2}=\frac{3}{2}$ and $2\frac{3}{7}=\frac{17}{7}$. Multiply the numerators $(3\times 17=51)$ and denominators $(2\times 7=14)$. This gives $\frac{51}{14}$, which simplifies to $3\frac{9}{14}$.

36. Convert: $1\frac{3}{4}=\frac{7}{4}$ and $1\frac{3}{5}=\frac{8}{5}$. Multiplying the numerators $(7\times 8=56)$ and denominators $(4\times 5=20)$ yields $\frac{56}{20}$, which is $2\frac{16}{20}$ or $2\frac{4}{5}$ when simplified.

37. For this, convert and then multiply. $4\frac{1}{2}$ becomes $\frac{9}{2}$ and $1\frac{5}{6}$ becomes $\frac{11}{6}$. Our result is $\frac{99}{12}$. Breaking that down, we get $8\frac{3}{12}$, which is $8\frac{1}{4}$ in its simplest form.

38. Make them improper: $1\frac{2}{7}=\frac{9}{7}$ and $3\frac{1}{5}=\frac{16}{5}$. After multiplication, we get $\frac{144}{35}$. This equates to $4\frac{4}{35}$.

39. Transforming: $2\frac{1}{5}=\frac{11}{5}$ and $5\frac{1}{2}=\frac{11}{2}$. Multiplying yields $\frac{121}{10}$, which is the same as $12\frac{1}{10}$.

40. Upon conversion, $2\frac{1}{2}$ is $\frac{5}{2}$ and $4\frac{4}{5}$ is $\frac{24}{5}$. The product is $\frac{120}{10}$, which simplifies to 12.

41. In improper form: $3\frac{1}{5} = \frac{16}{5}$ and $4\frac{1}{2} = \frac{9}{2}$. Multiplying, we get $\frac{144}{10}$, which is $14\frac{4}{10}$ or $14\frac{2}{5}$.

42. This turns into $\frac{49}{10}$ and $\frac{9}{2}$. The multiplication results in $\frac{441}{20}$, which breaks down to $22\frac{1}{20}$.

43. First, convert both mixed numbers to improper fractions. $1\frac{1}{3} = \frac{4}{3}$ and $1\frac{2}{3} = \frac{5}{3}$. Now, divide by multiplying with the reciprocal of the second fraction: $\frac{4}{3} \times \frac{3}{5} = \frac{12}{15}$. Simplifying gives: $\frac{4}{5}$.

44. Transform to improper fractions: $2\frac{1}{4} = \frac{9}{4}$, $1\frac{1}{2} = \frac{3}{2}$. Perform division: $\frac{9}{4} \times \frac{2}{3} = \frac{18}{12}$. On simplification: $\frac{3}{2}$ or $1\frac{1}{2}$.

45. Change to improper fractions: $5\frac{1}{3} = \frac{16}{3}$, $3\frac{1}{2} = \frac{7}{2}$. Divide the two: $\frac{16}{3} \times \frac{2}{7} = \frac{32}{21}$.

Simplified form: $1\frac{11}{21}$.

46. Convert: $3\frac{2}{7} = \frac{23}{7}$, $1\frac{1}{8} = \frac{9}{8}$. Perform division: $\frac{23}{7} \times \frac{8}{9} = \frac{184}{63}$. This is equal to $2\frac{58}{63}$.

47. Change numbers: $4\frac{1}{5} = \frac{21}{5}$, $2\frac{2}{3} = \frac{8}{3}$. Execute division: $\frac{21}{5} \times \frac{3}{8} = \frac{63}{40}$. Final result is $1\frac{23}{40}$.

48. Adjust to improper form: $1\frac{2}{3} = \frac{5}{3}$, $1\frac{3}{8} = \frac{11}{8}$. Carry out division: $\frac{5}{3} \times \frac{8}{11} = \frac{40}{33}$. The result is $1\frac{7}{33}$.

49. Modify to improper fractions: $4\frac{1}{2} = \frac{9}{2}$, $2\frac{2}{3} = \frac{8}{3}$. Implement division: $\frac{9}{2} \times \frac{3}{8} = \frac{27}{16}$. That's $1\frac{11}{16}$.

50. Turn to improper fractions: $1\frac{2}{11} = \frac{13}{11}$, $1\frac{1}{8} = \frac{9}{8}$. Execute division: $\frac{13}{11} \times \frac{8}{9} = \frac{104}{99}$. Concluding result: $1\frac{5}{99}$.

CHAPTER

2 Decimals

Math topics in this chapter:

- ☑ Comparing Decimals
- ☑ Rounding Decimals
- ☑ Adding and Subtracting Decimals
- ☑ Multiplying and Dividing Decimals

Practices

Compare. Use >, =, and <

1) 0.5 ☐ 0.6
2) 0.9 ☐ 0.8
3) 0.1 ☐ 0.2
4) 0.02 ☐ 0.06
5) 0.05 ☐ 0.08
6) 0.12 ☐ 0.09
7) 3.2 ☐ 2.5
8) 4.8 ☐ 8.4
9) 0.005 ☐ 0.05
10) 2.02 ☐ 20.020
11) 55.100 ☐ 55.10
12) 0.44 ☐ 0.440
13) 6.01 ☐ 6.0100
14) 0.77 ☐ 77.0

Round each decimal to the nearest whole number.

15) 5.8
16) 6.4
17) 12.3
18) 9.2
19) 7.6
20) 22.4
21) 6.8
22) 15.9
23) 13.41
24) 16.78
25) 67.58
26) 42.67
27) 55.89
28) 14.32
29) 78.88
30) 98.29

Find the sum or difference.

31) $12.1 + 36.2 =$
32) $56.3 - 22.2 =$
33) $45.1 + 12.8 =$
34) $27.9 - 16.4 =$
35) $98.8 - 56.6 =$
36) $28.45 + 13.22 =$
37) $16.78 + 45.11 =$
38) $86.16 - 72.12 =$
39) $96.23 - 28.32 =$
40) $57.33 + 67.46 =$
41) $46.26 - 39.49 =$
42) $44.95 + 76.53 =$
43) $79.37 - 52.89 =$
44) $19.99 + 28.7 =$
45) $83.48 - 49.3 =$
46) $19.6 + 42.98 =$

Find the product or quotient.

47) $3.3 \times 0.2 =$
48) $2.4 \div 0.3 =$
49) $8.1 \times 1.4 =$
50) $4.8 \div 0.2 =$
51) $4.1 \times 0.3 =$
52) $8.6 \div 0.2 =$
53) $9.9 \times 0.8 =$
54) $1.84 \div 0.2 =$
55) $2.1 \times 8.4 =$
56) $1.6 \times 4.5 =$
57) $9.2 \times 3.1 =$
58) $36.6 \div 1.6 =$
59) $1.91 \times 5.2 =$
60) $3.65 \times 1.4 =$
61) $24.82 \div 0.4 =$
62) $12.4 \times 4.20 =$

Answers

1) <
2) >
3) <
4) <
5) <
6) >
7) >
8) <
9) <
10) <
11) =
12) =
13) =
14) <
15) 6
16) 6
17) 12
18) 9
19) 8
20) 22
21) 7
22) 16
23) 13
24) 17
25) 68
26) 43
27) 56
28) 14
29) 79
30) 98
31) 48.3
32) 34.1
33) 57.9
34) 11.5
35) 42.2
36) 41.67
37) 61.89
38) 14.04
39) 67.91
40) 124.79
41) 6.77
42) 121.48
43) 26.48
44) 48.69
45) 34.18
46) 62.58
47) 0.66
48) 8
49) 11.34
50) 24
51) 1.23
52) 43
53) 7.92
54) 9.2
55) 17.64
56) 7.2
57) 28.52
58) 22.875
59) 9.932
60) 5.11
61) 62.05
62) 52.08

Answers and Explanations

1. Look at the first number after the decimal point: 0.5 has 5 while 0.6 has 6. Since 5 is smaller than 6, 0.5 is less than 0.6. So, $0.5 < 0.6$.

2. Examine the first digit after the point: 0.9 has 9 and 0.8 has 8. As 9 is greater than 8, 0.9 is bigger than 0.8. So, $0.9 > 0.8$.

3. Focus on the initial digit post the dot: for 0.1 it's 1 and for 0.2 it's 2. Clearly, 1 is not as big as 2, so 0.1 is smaller and the answer is: $0.1 < 0.2$.

4. Moving to the second place after the decimal: 0.02 has 2, while 0.06 has 6. Given that 2 is not as high as 6, 0.02 is less. So, $0.02 < 0.06$.

5. Again, observe the second digit after the point: in 0.05, it's 5, whereas in 0.08, it's 8. Since 5 doesn't exceed 8, 0.05 is the smaller number. Answer: $0.05 < 0.08$.

6. Initially, focus on the first digit after the point: 0.12 has 1 and 0.09 has 0. Since $1 > 0$, you might think 0.12 is greater, but to be thorough, check the next digit. For 0.12, it's 2 and for 0.09, it's 9. But since the first digit already determined the larger number, no need to compare further. So, $0.12 > 0.09$.

7. First, compare the whole numbers: 3 in 3.2 and 2 in 2.5. As 3 surpasses 2, 3.2 is certainly bigger than 2.5 without needing to look at the decimals. Answer: $3.2 > 2.5$.

8. Start by looking at the whole numbers: 4 in 4.8 and 8 in 8.4. Given that 4 doesn't come close to 8, 4.8 is evidently smaller than 8.4. Answer: $4.8 < 8.4$.

9. When comparing these two decimals, we look at each digit's position. The first number has its highest value in the thousandths place, while the second has its highest value in the hundredths place. Any non-zero digit in the hundredths place is larger than any digit in the thousandths place. Thus, $0.005 < 0.05$.

10. Starting from the left, the first number starts with a 2 in the ones place, while the second number starts with a 20 in the tens place. This immediately makes the second number ten times larger than the first. The decimal portions only reinforce this difference. So: $2.02 < 20.020$.

11. Decimal numbers can have trailing zeros after the decimal point without changing their value. In this case, 55.100 and 55.10 represent the same value. Thus, $55.100 = 55.10$.

12. Both numbers have a 4 in the tenths place. Moving to the hundredths place, they both have a 4 again. Even though 0.440 has an extra 0 in the thousandths place, this does not change its value, so the two numbers are equivalent. $0.44 = 0.440$

13. Considering the place values, both numbers have a 6 in the ones place. Moving to the right, both have a 0 in the tenths and a 1 in the hundredths place. The additional zeros in 6.0100 at the thousandths and ten-thousandths places do not alter its value. Hence, $6.01 = 6.0100$.

14. In the number 0.77, the 7 is in the tenths place, meaning it's less than one. In contrast, for 77.0, the first 7 is in the tens place, representing a value of seventy. Clearly, seventy is much greater than a fraction that's less than one. So, $0.77 < 77.0$.

15. Rounding involves looking at the number immediately to the right of the decimal point. If it's 5 or greater, we increase the whole number by 1.

Here, 8 is greater than 5, so 5.8 rounds up to 6.

16. For rounding, a key number to remember is 5. Numbers less than 5 cause the whole number to remain the same. Since 4 is less than 5, 6.4 rounds down to 6.

17. We're focusing on the first digit after the decimal point, which is 3. As it's below 5, the number stays as 12 when rounded.

18. The number immediately after the decimal is 2. Given that 2 is smaller than 5, we don't add anything to the whole number. So, 9.2 remains 9.

19. By observing the digit right after the decimal (6 in this case), and noting that it's 5 or more, we bump the whole number up. So, 7 becomes 8.

20. When the number after the decimal is smaller than 5, like the 4 here, we keep the whole number as is. Thus, 22.4 rounds to 22.

21. Here, the number 8 is greater than 5. This means we raise the whole number part up by one, so 6 turns into 7.

22. We determine the rounding based on the first number after the decimal. With 9 being greater than 5, 15 increases to 16.

23. Although there are more numbers after the decimal, we only need to consider the first one for rounding. Here, 4 causes 13 to remain the same.

24. The first digit after the point is 7. As it's over 5, we elevate the 16 to 17.

25. We're concerned with the 5 immediately following the decimal. Given that it's exactly 5, we raise 67 by one, resulting in 68.

26. Checking the first digit after the decimal, we see it's 6. This pushes 42 up to 43.

27. The number 8 is greater than 5. Therefore, the whole part, 55, gets a boost of one, turning it into 56.

28. With 3 being our key number (as it's directly after the decimal), and it being less than 5, 14 remains unchanged.

29. Observing the first digit after the point, 8 tells us to increment 78 by one, so it becomes 79.

30. By focusing on the 2, which is less than 5, 98 remains the same when rounded.

31. When you add numbers with decimals, line up the decimal points. Start by adding the numbers to the right of the decimal ($0.1 + 0.2 = 0.3$). Next, add the whole numbers ($12 + 36 = 48$). Put them together, and you get 48.3.

32. For subtraction, also line up the decimal points. Subtract the numbers to the right of the decimal ($0.3 - 0.2 = 0.1$). Subtract the whole numbers ($56 - 22 = 34$). Combine to get 34.1.

33. Adding from the right, $0.1 + 0.8 = 0.9$. Add the whole numbers: $45 + 12 = 57$. So, 57.9 is the answer.

34. Begin from the decimals: $0.9 - 0.4 = 0.5$. For whole numbers: $27 - 16 = 11$. Together, the answer is 11.5.

35. Subtracting the decimals: $0.8 - 0.6 = 0.2$. Subtracting the whole numbers: $98 - 56 = 42$. In total, the answer is 42.2.

36. Starting from the rightmost decimal: $0.05 + 0.02 = 0.07$. For the next position, $0.4 + 0.2 = 0.6$. Now, add the whole numbers: $28 + 13 = 41$. Summing them up, the result is 41.67.

37. Rightmost decimal addition: $0.08 + 0.01 = 0.09$. Next, $0.7 + 0.1 = 0.8$. For the whole numbers: $16 + 45 = 61$. Combined, the result is 61.89.

38. Starting from the rightmost decimal: $0.06 - 0.02 = 0.04$. Then, $0.1 - 0.1 = 0$. For the whole numbers: $86 - 72 = 14$. Altogether, the result is 14.04.

39. Beginning with the decimals: $0.03 - 0.02 = 0.01$. Next, $0.2 - 0.3 = -0.1$. Since you're borrowing, this makes the 96 become 95 and the 0.2 becomes 1.2. Now, $1.2 - 0.3 = 0.9$. For the whole numbers: $95 - 28 = 67$. So, 67.91 is the answer.

40. Starting rightmost: $0.03 + 0.06 = 0.09$. Then, $0.3 + 0.4 = 0.7$. For whole numbers: $57 + 67 = 124$. The result is 124.79.

41. Starting with decimals: $0.06 - 0.09$ needs borrowing. $0.16 - 0.09 = 0.07$. Now, $0.2 - 0.4 = -0.2$, requiring another borrow. $1.2 - 0.4 = 0.8$. Whole numbers: $45 - 39 = 6$. The result is 6.77.

42. Rightmost addition: $0.05 + 0.03 = 0.08$. Then, $0.9 + 0.5 = 1.4$ (carry the 1). Whole numbers with carry: $45 + 76 = 121$. So, 121.48 is the answer.

43. Starting with decimals: $0.07 - 0.09$ needs borrowing. $0.17 - 0.09 = 0.08$. Next, $0.2 - 0.8 = -0.5$, requiring a borrow. $1.2 - 0.8 = 0.5$. Whole numbers: $78 - 52 = 26$. Result is 26.48.

44. Rightmost addition: $0.09 + 0 = 0.09$. Then, $0.9 + 0.7 = 1.6$ (carry the 1). Whole numbers with carry: $20 + 28 = 48$. The result is 48.69.

45. Starting from the right, $0.08 - 0 = 0.08$. Then, $0.4 - 0.3 = 0.1$. Whole numbers: $83 - 49 = 34$. Result is 34.18.

46. Beginning with rightmost: $0 + 0.08 = 0.08$. Then, $0.6 + 0.9 = 1.5$ (carry the 1). Whole numbers with carry: $20 + 42 = 62$. The result is 62.58.

47. Multiplying whole numbers is straightforward. When multiplying decimals, ignore the decimal points initially, and then place the decimal back in the final answer. For this problem, treat it as $33 \times 2 = 66$. Since there are 2 total decimal places in the original numbers (1 in 3.3 and 1 in 0.2), the answer will also have 2 decimal places. Thus, 0.66 is the answer.

48. Think of division as "how many times does 0.3 fit into 2.4? "or" distribute 2.4 into 0.3-sized groups. "Dividing without decimals, it's $24 \div 3$ which is 8. Since the decimals do not affect this specific division, the answer remains 8.

49. This is similar to multiplying 81 by 14. That's $1{,}134$. There are two decimal places across the original numbers (1 in 8.1 and 1 in 1.4). So, your answer should have two decimal places: 11.34.

50. Here, think of distributing 4.8 into 0.2-sized portions. Without decimals, $48 \div 2$ is 24. So, the answer is 24.

51. For 41×3, you get 123. With 2 decimal places in total (1 in each number), the answer is 1.23.

52. You're asking "How many times does 0.2 fit into 8.6?". Without decimals, $86 \div 2$ is 43. Thus, the answer is 43.

53. This resembles 99×8, which gives 792. Two decimal places in total mean the answer is 7.92.

54. Here, distribute 1.84 into 0.2-sized groups. For $184 \div 2$, you get 92. So, the answer is 9.2.

55. Similar to 21×84 which is $1{,}764$. Two decimal places total means the answer is 17.64.

56. Like multiplying 16 and 45, you get 720. With two decimal places in total, it's 7.2.

57. This is akin to 92×31, which is $2{,}852$. Again, two decimals mean it's 28.52.

58. You're checking how many times 1.6 fits into 36.6. This is trickier; division gives you about 22.875.

59. View it as 191×52 which is $9{,}932$. Counting 3 decimals in total gives 9.932.

60. Think 365×14, yielding $5{,}110$. With three decimals, the answer is 5.11.

61. Dividing 2482 by 4, you get 620.5. With two decimals, the answer is 62.05.

62. This is like 1240×42, which is $52{,}080$. Counting 4 decimals

yield 52.08.

CHAPTER

3 Integers and Order of Operations

Math topics in this chapter:

- ☑ Adding and Subtracting Integers
- ☑ Multiplying and Dividing Integers
- ☑ Order of Operations
- ☑ Integers and Absolute Value

Practices

Find each sum or difference.

1) $-9 + 16 =$
2) $-18 - 6 =$
3) $-24 + 10 =$
4) $30 + (-5) =$
5) $15 + (-3) =$
6) $(-13) + (-4) =$
7) $25 + (3 - 10) =$
8) $12 - (-6 + 9) =$
9) $5 - (-2 + 7) =$
10) $(-11) + (-5 + 6) =$
11) $(-3) + (9 - 16) =$
12) $(-8) - (13 + 4) =$
13) $(-7 + 9) - 39 =$
14) $(-30 + 6) - 14 =$
15) $(-5 + 9) + (-3 + 7) =$
16) $(8 - 19) - (-4 + 12) =$
17) $(-9 + 2) - (6 - 7) =$
18) $(-12 - 5) - (-4 - 14) =$

Solve.

19) $3 \times (-6) =$
20) $(-32) \div 4 =$
21) $(-5) \times 4 =$
22) $(25) \div (-5) =$
23) $(-72) \div 8 =$
24) $(-2) \times (-6) \times 5 =$
25) $(-2) \times 3 \times (-7) =$
26) $(-1) \times (-3) \times (-5) =$
27) $(-2) \times (-3) \times (-6) =$
28) $(-12 + 3) \times (-5) =$
29) $(-3 + 4) \times (-11) =$
30) $(-9) \times (6 - 5) =$
31) $(-3 - 7) \times (-6) =$
32) $(-7 + 3) \times (-9 + 6) =$
33) $(-15) \div (-17 + 12) =$
34) $(-3 - 2) \times (-9 + 7) =$
35) $(-15 + 31) \div (-2) =$
36) $(-64) \div (-16 + 8) =$

Evaluate each expression.

37) $3 + (2 \times 5) =$

38) $(5 \times 4) - 7 =$

39) $(-9 \times 2) + 6 =$

40) $(7 \times 3) - (-5) =$

41) $(-8) + (2 \times 7) =$

42) $(9 - 6) + (3 \times 4) =$

43) $(-19 + 5) + (6 \times 2) =$

44) $(32 \div 4) + (1 - 13) =$

45) $(-36 \div 6) - (12 + 3) =$

46) $(-16 + 5) - (54 \div 9) =$

47) $(-20 + 4) - (35 \div 5) =$

48) $(42 \div 7) + (2 \times 3) =$

49) $(28 \div 4) + (2 \times 6) =$

50) $2[(3 \times 3) - (4 \times 5)] =$

51) $3[(2 \times 8) + (4 \times 3)] =$

52) $2[(9 \times 3) - (6 \times 4)] =$

53) $4[(4 \times 8) \div (4 \times 4)] =$

54) $-5[(10 \times 8) \div (5 \times 8)] =$

Find the answers.

55) $|-5| + |7 - 10| =$

56) $|-4 + 6| + |-2| =$

57) $|-9| + |1 - 9| =$

58) $|-7| - |8 - 12| =$

59) $|9 - 11| + |8 - 15| =$

60) $|-7 + 10| - |-8 + 3| =$

61) $|-12 + 6| - |3 - 9| =$

62) $5 + |2 - 6| + |3 - 4| =$

63) $-4 + |2 - 6| + |1 - 9| =$

64) $\frac{|-42|}{7} \times \frac{|-64|}{8} =$

65) $\frac{|-100|}{10} \times \frac{|-36|}{6} =$

66) $|4 \times (-2)| \times \frac{|-27|}{3} =$

67) $|-3 \times 2| \times \frac{|-40|}{8} =$

68) $\frac{|-54|}{6} - |-3 \times 7| =$

69) $\frac{|-72|}{8} + |-7 \times 5| =$

70) $\frac{|-121|}{11} + |-6 \times 4| =$

71) $\frac{|(-6)\times(-3)|}{9} \times \frac{|2\times(-20)|}{5} =$

72) $\frac{|(-3)\times(-8)|}{6} \times \frac{|9\times(-4)|}{12} =$

Answers

1) 7
2) −24
3) −14
4) 25
5) 12
6) −17
7) 18
8) 9
9) 0
10) −10
11) −10
12) −25
13) −37
14) −38
15) 8
16) −19
17) −6
18) 1
19) −18
20) −8
21) −20
22) −5
23) −9
24) 60
25) 42
26) −15
27) −36
28) 45
29) −11
30) −9
31) 60
32) 12
33) 3
34) 10
35) −8
36) 8
37) 13
38) 13
39) −12
40) 26
41) 6
42) 15
43) −2
44) −4
45) −21
46) −17
47) −23
48) 12
49) 19
50) −22
51) 84
52) 6
53) 8
54) −10
55) 8
56) 4
57) 17
58) 3
59) 9
60) −2
61) 0
62) 10
63) 8
64) 48
65) 60
66) 72
67) 30
68) −12
69) 44
70) 35
71) 16
72) 12

Answers and Explanations

1. Start with -9. Moving to the right on the number line by 16 units will take you to $+7$. So, $-9 + 16 = 7$.

2. From -18, moving 6 units further to the left on the number line will take you to -24. Thus, $-18 - 6 = -24$.

3. Picture -24 as being 24 units to the left of zero. If you then move 10 units to the right, you would land on -14. So, $-24 + 10 = -14$.

4. Think of 30 as a foundation. Adding a negative is like taking away, so you're removing 5 from 30. This results in 25. Hence, $30 + (-5) = 25$.

5. You're at 15 and you're moving backwards (or subtracting) by 3. This means you decrease the 15 by 3 to get 12. Therefore, $15 + (-3) = 12$.

6. Combine two debts: If you owe 13 dollars and then owe another 4 dollars, you end up owing 17 dollars in total. So, $(-13) + (-4) = -17$.

7. Inside the parentheses, we subtract 10 from 3, which is -7. Adding 25 to -7, you're essentially taking 7 away from 25. The result is 18. So, $25 + (3 - 10) = 25 - 7 = 18$.

8. Within the parentheses, $-6 + 9$ equals 3. Then, 12 minus this 3 is 9. Thus, $12 - (-6 + 9) = 12 - 3 = 9$.

9. Resolving inside the parentheses first, $-2 + 7$ equals 5. Now, subtracting 5 from 5 gives 0. Therefore, $5 - (-2 + 7) = 5 - 5 = 0$.

10. First, calculate what is inside the parentheses. $-5 + 6 = 1$. Next, add this result to -11: $-11 + 1 = -10$. So, the final answer is: -10.

11. Tackle the equation inside the parentheses $(9 - 16)$ first. You are taking away 16 from 9. This gives you -7. Then, you're adding this result to -3. Combining -3 and -7 gives -10.

12. Firstly, resolve the addition inside the parentheses $(13 + 4)$. That's simple addition and gives 17. Now, subtract this number from -8. Instead of subtracting 17, you can think of it as adding its negative, which means $(-8) + (-17) = -25$.

13. Starting with $(-7 + 9)$, you are adding a smaller negative number to a positive one, so it will be closer to the positive number. The result is 2. Then, subtract 39 from 2 to get -37.

14. Break it down: $(-30 + 6)$ gives -24 because you're reducing a large negative number by a smaller positive one. Then, subtracting 14 from -24 takes it further negative to -38.

15. Evaluate each pair inside the parentheses: $(-5 + 9) = 4$ and $(-3 + 7) = 4$. Summing those two results gives 8.

16. Working with the first set, $(8 - 19)$ is -11 since you're taking a larger number from a smaller one. For the second set, $(-4 + 12)$ is 8. Subtract 8 from -11, and you get $-11 - 8 = -19$.

17. Initially, $(-9 + 2)$ results in -7. For the second set, $(6 - 7)$ equals -1. Subtracting -1 is the same as adding 1, so $(-7) + 1 = -6$.

18. Starting with the first parentheses, $-12 - 5 = -17$. For the second, $-4 - 14 = -18$. Subtracting -18 is like adding 18 to -17, resulting in $-17 - (-18) = -17 + 18 = 1$.

19. When you multiply a positive number with a negative number, the result is always negative. Here, 3 (positive) times 6 is 18. Because one of the numbers is negative, the result is -18.

20. Division distributes the negative sign as you'd expect: $-32 \div 4 = -8$.

21. Imagine owing 5 dollars (which is -5) and you owe it to 4 people. You'd owe 20 dollars in total. So, -5 multiplied by 4 is -20.

22. Here, we have a positive number divided by a negative number. If you had 25 apples and needed to split them into groups of -5 (like owing 5 apples), you would have -5 groups.

23. Consider having a debt of 72 dollars. If you split or distribute this debt among 8 people, each person would share an equal debt. 72 divided by 8 is 9. Since it's a debt (negative), each person would have a debt of 9 dollars. $(-72) \div 8 = -9$.

24. When you multiply two negative numbers, they become positive. So, -2 times -6 is 12. Now, take this positive 12 and multiply it by 5. This gives you 60.

25. Starting with the first two numbers: -2 multiplied by 3 gives -6 (a negative times a positive is negative). Now, multiply -6 by -7. Two negatives multiplied give a positive: 6 times 7 is 42.

26. First, multiplying -1 and -3 yields 3, because the product of two negatives is positive. However, when you then multiply this positive 3 by -5, you return to a negative value. 3 times 5 is 15, and since one number is negative, the result is -15.

27. When multiplying two negative numbers, the result is positive. So, $(-2) \times (-3) = 6$. Now, when we multiply this result (6) with another negative number (-6), the result becomes negative. Hence, $6 \times (-6) = -36$.

28. Begin by solving the expression inside the parentheses. $-12 + 3 = -9$. Now, we have to multiply this result with -5. When you multiply a negative number by a negative number, the result is positive. Therefore, $-9 \times (-5) = 45$.

29. Start with the arithmetic inside the parentheses. $-3 + 4 = 1$. Then, multiply this number by -11. Multiplying a positive number with a negative number gives a negative result. Thus, $1 \times (-11) = -11$.

30. Address the equation within the parentheses first. $6 - 5 = 1$. Now, multiply this value with -9. When a negative number is multiplied with a positive number, the result is negative. As such, $-9 \times 1 = -9$.

31. Compute the sum within the parentheses first: $-3 - 7 = -10$. Then, multiply this result by -6. As established, the product of two negative numbers is positive. Hence, $-10 \times (-6) = 60$.

32. Calculate the sums inside both sets of parentheses: $-7 + 3 = -4$ and $-9 + 6 = -3$. Now, multiplying these results, $-4 \times (-3) = 12$, as a negative time a negative produces a positive outcome.

33. First, figure out the value inside the parentheses: $-17 + 12 = -5$. Now, dividing -15 by this result gives 3, because when you divide a negative number by another negative number, the outcome is positive. Therefore, $-15 \div (-5) = 3$.

34. Start with the arithmetic inside the parentheses: $-3 - 2 = -5$ and $-9 + 7 = -2$. Multiply these two values together. As you already know, a negative multiplied by a negative result in a positive. This gives $-5 \times (-2) = 10$.

35. First, simplify the addition: $-15 + 31 = 16$. Next, divide this value by -2. When a positive number is divided by a negative number, the outcome is negative. Thus, $16 \div (-2) = -8$.

36. Work out the sum inside the parentheses: $-16 + 8 = -8$. Now, when dividing -64 by this result, you get a positive 8, because dividing one negative number by another negative number yields a positive outcome.

37. First, perform the multiplication. 2 multiplied by 5 is 10. Then, add 10 to 3. The answer is 13.

38. You start by multiplying 5 and 4, which gives you 20. Afterward, you subtract 7 from the result. Hence, 20 minus 7 is 13.

39. Multiplication is the first operation to consider here. -9 times 2 gives -18. Now, if you add 6 to -18, you will get -12.

40. Begin by multiplying 7 by 3 to get 21. Subtracting a negative is equivalent to adding its positive counterpart. So, 21 added to 5 is 26.

41. Firstly, 2 multiplied by 7 yields 14. Combine this result with −8. It's like having 14 and owing 8, leaving you with 6.

42. Deduct 6 from 9 first, which equals 3. Then multiply 3 by 4 to get 12. Add the two results, 3 and 12, together to obtain 15.

43. Simplify the addition inside the parentheses to get −14. Separately, 6 times 2 is 12. Combining −14 and 12 gives −2.

44. Divide 32 by 4 to receive 8. In the second set of parentheses, subtract 13 from 1 to get −12. Summing 8 and −12 results in −4.

45. The division of −36 by 6 results in −6. Add 12 and 3 together to get 15. Now, subtract 15 from −6, leading to −21.

46. Begin with the addition inside the parentheses to get −11. Separately, divide 54 by 9 to find 6. Now, subtract 6 from −11 to get −17.

47. Add 4 to −20, resulting in −16. Next, divide 35 by 5 to obtain 7. Taking 7 away from −16 gives −23.

48. Start by dividing 42 by 7, which is 6. Multiply 2 by 3 to get 6. Summing both results, 6 and 6, you get 12.

49. Divide 28 by 4 to yield 7. Multiplying 2 and 6 results in 12. Combine 7 and 12 for a total of 19.

50. Inside the parentheses, 3 times 3 is 9, and 4 times 5 is 20. Subtracting the latter from the former gives −11. Multiplying −11 by 2 results in −22.

51. 2 times 8 is 16, and 4 times 3 is 12. Combining 16 and 12 results in 28. When you multiply 28 by 3, you get 84.

52. In the parentheses, 9 multiplied by 3 equals 27. Then, 6 times 4 is 24. The difference between 27 and 24 is 3. When 3 is doubled, it becomes 6.

53. Within the brackets, 4 times 8 is 32, and 4 times 4 is 16. Now, 32 divided by 16 is 2. Quadrupling 2 gives 8.

54. 10 multiplied by 8 yields 80. On the other hand, 5 times 8 is 40.Now, 80 divided by 40 is 2. Multiplying 2 by -5 results in -10.

55. Absolute value is the distance of a number from zero. Thus, $|-5|$ is 5 because the distance of -5 from zero is 5 units. For $|7-10|$, perform the subtraction first: $7-10=-3$. $|-3|$ is 3. So, the answer is $5+3=8$.

56. $|-4+6|$ is the absolute value of 2, which is 2. $|-2|$ is 2. Summing them gives $2+2=4$.

57. $|-9|$ is 9. For $|1-9|$, perform subtraction: $1-9=-8$. $|-8|$ is 8. So, $9+8=17$.

58. $|-7|$ is 7. $|8-12|=|-4|$ is 4. Subtracting gives $7-4=3$.

59. $|9-11|$ is $|-2|$ which is 2. $|8-15|$ is $|-7|$ which is 7. Summing them gives $2+7=9$.

60. $|-7+10|=|3|$ is 3. $|-8+3|=|-5|$ is 5. Subtracting gives $3-5=-2$.

61. $|-12+6|=|-6|$ which is 6. $|3-9|=|-6|$ which is 6. The result is $6-6=0$.

62. $|2-6|=|-4|$ which is 4. $|3-4|=|-1|$ which is 1. Adding gives $5+4+1=10$.

63. Following the previous methodology, $|2-6|$ is 4 and $|1-9|$ is 8. Thus, $-4+4+8=8$.

64. $|-42|$ is 42 and $|-64|$ is 64. So, $\left(\frac{42}{7}\right)\times\left(\frac{64}{8}\right)=6\times8=48$.

65. $|-100|$ is 100 and $|-36|$ is 36. Then, $\left(\frac{100}{10}\right)\times\left(\frac{36}{6}\right)=10\times6=60$.

66. $|4\times(-2)|=|-8|$ which is 8. $|-27|$ is 27. So, $8\times\left(\frac{27}{3}\right)=8\times9=72$.

67. $|-3\times2|$ is $|-6|$ which is 6. $|-40|$ is 40. Thus, $6\times\left(\frac{40}{8}\right)=6\times5=30$.

68. $|-54|$ is 54 and $|-3\times7|$ is $|-21|$ which is 21. So, $\left(\frac{54}{6}\right)-21=9-21=-12$.

69. $|-72|$ is 72 and $|-7\times5|$ is $|-35|$ which is 35. Thus, $\left(\frac{72}{8}\right)+35=9+35=44$.

70. $|-121|$ is 121 and $|-6\times4|$ is $|-24|$ which is 24. So, $\left(\frac{121}{11}\right)+24=11+24=35$.

71. $|(-6) \times (-3)|$ is $|18|$ which is 18. $|2 \times (-20)|$ is $|-40|$ which is 40. Thus, $\left(\frac{18}{9}\right) \times \left(\frac{40}{5}\right) = 2 \times 8 = 16$.

72. $|(-3) \times (-8)|$ is $|24|$ which is 24. $|9 \times (-4)|$ is $|-36|$ which is 36. So, $\left(\frac{24}{6}\right) \times \left(\frac{36}{12}\right) = 4 \times 3 = 12$.

CHAPTER

4 Ratios and Proportions

Math topics in this chapter:

- ☑ Simplifying Ratios
- ☑ Proportional Ratios
- ☑ Similarity and Ratios

Practices

Reduce each ratio.

1) $2:18 =$ ___:___
2) $5:35 =$ ___:___
3) $8:72 =$ ___:__
4) $24:36 =$ ___:___
5) $25:40 =$ ___:___
6) $40:72 =$ ___:___
7) $28:63 =$ ___:___
8) $18:81 =$ ___:___
9) $13:52 =$ ___:___
10) $56:72 =$ ___:___
11) $42:63 =$ ___:___
12) $32:96 =$ ___:___

Solve.

13) Bob has 16 red cards and 20 green cards. What is the ratio of Bob's red cards to his green cards? ________
14) In a party, 34 soft drinks are required for every 20 guests. If there are 260 guests, how many soft drinks are required? ________
15) Sara has 56 blue pens and 28 black pens. What is the ratio of Sara's black pens to her blue pens? ________
16) In Jack's class, 48 of the students are tall and 20 are short. In Michael's class 28 students are tall and 12 students are short. Which class has a higher ratio of tall to short students? ________
17) The price of 6 apples at the Quick Market is $1.52. The price of 5 of the same apples at Walmart is $1.32. Which place is the better buy? _______
18) The bakers at a Bakery can make 180 bagels in 6 hours. How many bagels can they bake in 16 hours? What is that rate per hour? ________
19) You can buy 6 cans of green beans at a supermarket for $3.48. How much does it cost to buy 38 cans of green beans? ________

Solve each proportion.

20) $\frac{3}{2}=\frac{9}{x}\Rightarrow x=$ ____

21) $\frac{7}{2}=\frac{x}{4}\Rightarrow x=$ ____

22) $\frac{1}{3}=\frac{2}{x}\Rightarrow x=$ ____

23) $\frac{1}{4}=\frac{5}{x}\Rightarrow x=$ ____

24) $\frac{9}{6}=\frac{x}{2}\Rightarrow x=$ ____

25) $\frac{3}{6}=\frac{5}{x}\Rightarrow x=$ ____

26) $\frac{7}{x}=\frac{2}{6}\Rightarrow x=$ ____

27) $\frac{2}{x}=\frac{4}{10}\Rightarrow x=$ ____

28) $\frac{3}{2}=\frac{x}{8}\Rightarrow x=$ ____

29) $\frac{x}{6}=\frac{5}{3}\Rightarrow x=$ ____

30) $\frac{3}{9}=\frac{5}{x}\Rightarrow x=$ ____

31) $\frac{4}{18}=\frac{2}{x}\Rightarrow x=$ ____

32) $\frac{6}{16}=\frac{3}{x}\Rightarrow x=$ ____

33) $\frac{2}{5}=\frac{x}{20}\Rightarrow x=$ ____

34) $\frac{28}{8}=\frac{x}{2}\Rightarrow x=$ ____

35) $\frac{3}{5}=\frac{x}{15}\Rightarrow x=$ ____

36) $\frac{2}{7}=\frac{x}{14}\Rightarrow x=$ ____

37) $\frac{x}{18}=\frac{3}{2}\Rightarrow x=$ ____

38) $\frac{x}{24}=\frac{2}{6}\Rightarrow x=$ ____

39) $\frac{5}{x}=\frac{4}{20}\Rightarrow x=$ ____

40) $\frac{10}{x}=\frac{20}{80}\Rightarrow x=$ ____

41) $\frac{90}{6}=\frac{x}{2}\Rightarrow x=$ ____

Solve each problem.

42) Two rectangles are similar. The first is 8 $feet$ wide and 32 $feet$ long. The second is 12 $feet$ wide. What is the length of the second rectangle?

____

43) Two rectangles are similar. One is 4.6 $meters$ by 7 $meters$. The longer side of the second rectangle is 28 $meters$. What is the other side of the second rectangle? _________________

Answers

1) $1:9$
2) $1:7$
3) $1:9$
4) $2:3$
5) $5:8$
6) $5:9$
7) $4:9$
8) $2:9$
9) $1:4$
10) $7:9$
11) $2:3$
12) $1:3$
13) $4:5$
14) 442
15) $1:2$

16) $Jack's\ class: \frac{48}{20} = \frac{12}{5}$ $Michael's\ class: \frac{28}{12} = \frac{7}{3}$ Jack's class has a higher ratio of tall to short student: $\frac{12}{5} > \frac{7}{3}$

17) Quick market
18) 480, 30 bagels per hour
19) $22.04
20) 6
21) 14
22) 6
23) 20
24) 3
25) 10
26) 21
27) 5
28) 12
29) 10
30) 15
31) 9
32) 8
33) 8
34) 7
35) 9
36) 4
37) 27
38) 8
39) 25
40) 40
41) 30
42) $48\ feet$
43) $18.4\ meters$

Answers and Explanations

1. The common factor of 2 and 18 is 2. Divide both numbers by 2: $2 \div 2 = 1$, and $18 \div 2 = 9$. So, $2:18$ is reduced to $1:9$.

2. Looking for the largest number that both 5 and 35 are divisible by, it's 5. Dividing both sides of the ratio: $5 \div 5 = 1$, and $35 \div 5 = 7$. Therefore, $5:35$ is $1:7$.

3. The common factor between 8 and 72 is 8: $8 \div 8 = 1$, and $72 \div 8 = 9$. The reduced ratio is $1:9$.

4. Recognizing both numbers are divisible by 12, we get: $24 \div 12 = 2$, $36 \div 12 = 3$. The simplified ratio is $2:3$.

5. These numbers can both be divided by 5: $25 \div 5 = 5$, $40 \div 5 = 8$. So, $25:40$ becomes $5:8$.

6. Both numbers share 8 as a common factor: $40 \div 8 = 5$, $72 \div 8 = 9$. Resulting in a ratio of $5:9$.

7. Considering 7 as their common divisor: $28 \div 7 = 4$, $63 \div 7 = 9$. We get a ratio of $4:9$.

8. By noting that both are divisible by 9: $18 \div 9 = 2$, $81 \div 9 = 9$. This simplifies to $2:9$.

9. Observing that 13 goes into both: $13 \div 13 = 1$, $52 \div 13 = 4$. The ratio is $1:4$.

10: Using 8, their shared factor: $56 \div 8 = 7$, $72 \div 8 = 9$. It simplifies to $7:9$.

11. Recognizing 21 as the largest common divisor: $42 \div 21 = 2$, $63 \div 21 = 3$. The ratio is $2:3$.

12. 32 itself is the common factor here: $32 \div 32 = 1$, $96 \div 32 = 3$. The simplified ratio is $1:3$.

13. To find the ratio, you'll want to write the number of red cards to green cards. Bob has 16 red cards and 20 green cards. This can be represented as $16:20$.

To simplify this ratio, you need to find the common factor of these two numbers. The common factor of 16 and 20 is 4. Now, divide both numbers by 4: $16 \div 4 = 4$, and $20 \div 4 = 5$. Thus, the simplest form of the ratio is $4:5$.

14. The question tells us that for every 20 guests, 34 soft drinks are required. To determine the number of soft drinks for 260 guests, let's first find out the soft drinks required for 1 guest.

$Soft\ drinks\ per\ guest = Total\ soft\ drinks\ divided\ by\ 20\ guests\ = 34 \div 20 = 1.7$

So, 1 guest requires 1.7 soft drinks.

Now, for 260 guests, you multiply the number of guests by the soft drinks each guest requires.

$Total\ soft\ drinks = 260\ guests \times 1.7 \frac{soft\ drinks}{guest} = 442\ soft\ drinks$

Therefore, for 260 guests, 442 soft drinks are required.

15. To find the ratio of Sara's black pens to her blue pens, you can simply divide the number of black pens by the number of blue pens:

$Ratio\ of\ black\ pens\ to\ blue\ pens = \frac{Number\ of\ black\ pens}{Number\ of\ blue\ pens}$

$Ratio\ of\ black\ pens\ to\ blue\ pens = \frac{28\ black\ pens}{56\ blue\ pens}$

Now, simplify this ratio by dividing both the numerator and denominator by their greatest common divisor, which is 28:

$Ratio\ of\ black\ pens\ to\ blue\ pens = \frac{28\ black\ pens}{56\ blue\ pens} = \frac{1\ black\ pens}{2\ blue\ pens}$

So, the ratio of Sara's black pens to her blue pens is $1:2$.

16. To determine which class has a higher ratio of tall to short students, you need to calculate the ratios for both classes and then compare them.

In Jack's class: (Tall students: 48), and (Short students: 20)

$Ratio\ of\ tall\ to\ short\ students\ in\ Jack's\ class = \frac{Tall\ students}{Short\ students} \Rightarrow Ratio = \frac{48}{20}$

In Michael's class: (Tall students: 28), and (Short students: 12)

$Ratio\ of\ tall\ to\ short\ students\ in\ Michael's\ class = \frac{Tall\ students}{Short\ students} \Rightarrow Ratio = \frac{28}{12}$

Now, compare the two ratios. Jack's class ratio is $\frac{48}{20} = 2.4$. Michael's class ratio is $\frac{28}{12} = 2.333\cdots$.

So, Jack's class has a higher ratio of tall to short students.

17. To determine which place is the better buy for apples, you can calculate the price per apple at each store:

At Quick Market: Price for 6 apples = \$1.52.

$Price\ per\ apple = \frac{\$1.52}{6\ apples} = \$0.25\overline{3}$ (rounded to two decimal places)

At Walmart: Price for 5 apples = \$1.32.

$Price\ per\ apple = \frac{\$1.32}{5\ apples} = \$0.264$ (rounded to two decimal places)

So, the price per apple at Quick Market is approximately \$0.25, while the price per apple at Walmart is approximately \$0.26. Therefore, Quick Market is the better buy for apples.

18. To find out how many bagels the bakers can bake in 16 hours and the rate per hour, you can use the information that they can make 180 bagels in 6 hours. First, let's find out how many bagels they can make in 1 hour:

$Bagels\ per\ hour = \frac{Total\ bagels}{Total\ hours} \Rightarrow Bagels\ per\ hour = \frac{180}{6} = 30$

Now, to find out how many bagels they can make in 16 hours, simply multiply the rate per hour by the number of hours:

$Bagels\ in\ N\ hours = Bagels\ per\ hour \times N\ hours$

$Bagels\ in\ 16\ hours = 30\ bagels\ per\ hour \times 16\ hours = 480\ bagels$

So, the bakers can bake 480 bagels in 16 hours, and their rate is 30 bagels per hour.

19. To find out how much it costs to buy 38 cans of green beans at the supermarket, you can first find the cost per can and then multiply it by the number of cans. Cost for 6 cans = \$3.48.

$Cost\ per\ can = \frac{\$3.48}{6\ cans} = \$0.58\ per\ can$

Now, multiply the cost per can by the number of cans you want to buy (38 cans):

$Cost\ for\ 38\ cans = \$0.58\ per\ can \times 38\ cans = \$22.04$

So, it would cost \$22.04 to buy 38 cans of green beans at the supermarket.

20. To solve for x, we can cross-multiply: $3x = 2 \times 9 \Rightarrow 3x = 18$. Now, divide both sides by 3 to isolate x: $x = \frac{18}{3} \Rightarrow x = 6$.

21. Cross-multiply to solve for x: $7 \times 4 = 2x \Rightarrow 28 = 2x$. Divide both sides by 2: $x = \frac{28}{2} \Rightarrow x = 14$.

22. Cross-multiply: $1 \times x = 3 \times 2 \Rightarrow x = 6$.

23. Cross-multiply: $1 \times x = 4 \times 5 \Rightarrow x = 20$.

24. Cross-multiply: $9 \times 2 = 6x \Rightarrow 18 = 6x$. Divide both sides by 6: $x = \frac{18}{6} \Rightarrow x = 3$.

25. Simplify $\frac{3}{6}$ to $\frac{1}{2}$: $\frac{1}{2} = \frac{5}{x}$. Cross-multiply: $1 \times x = 2 \times 5 \Rightarrow x = 10$.

26. Cross-multiply: $7 \times 6 = 2 \times x \Rightarrow 42 = 2x$. Divide both sides by 2: $x = \frac{42}{2} \Rightarrow x = 21$.

27. Cross-multiply: $2 \times 10 = 4 \times x \Rightarrow 20 = 4x$. Divide both sides by 4: $x = \frac{20}{4} \Rightarrow x = 5$.

28. Cross-multiply: $3 \times 8 = 2 \times x \Rightarrow 24 = 2x$. Divide both sides by 2: $x = \frac{24}{2} \Rightarrow x = 12$.

29. Cross-multiply: $x \times 3 = 6 \times 5 \Rightarrow 3x = 30$. Divide both sides by 3: $x = \frac{30}{3} \Rightarrow x = 10$.

30. Simplify $\frac{3}{9}$ to $\frac{1}{3}$: $\frac{1}{3} = \frac{5}{x}$. Cross-multiply: $1 \times x = 3 \times 5 \Rightarrow x = 15$.

31. Simplify $\frac{4}{18}$ to $\frac{2}{9}$: $\frac{2}{9} = \frac{2}{x}$. Cross-multiply: $2 \times x = 2 \times 9 \Rightarrow 2x = 18$. Divide both sides by 2: $x = \frac{18}{2} \Rightarrow x = 9$.

32. Simplify $\frac{6}{16}$ to $\frac{3}{8}$: $\frac{3}{8} = \frac{3}{x}$. Cross-multiply: $3 \times x = 3 \times 8 \Rightarrow 3x = 24$. Divide both sides by 3: $x = \frac{24}{3} \Rightarrow x = 8$.

33. Cross-multiply: $2 \times 20 = 5 \times x \Rightarrow 40 = 5x$. Divide both sides by 5: $x = \frac{40}{5} \Rightarrow x = 8$.

34. Cross-multiply: $28 \times 2 = 8 \times x \Rightarrow 56 = 8x$. Divide both sides by 8: $x = \frac{56}{8} \Rightarrow x = 7$.

35. Cross-multiply: $3 \times 15 = 5 \times x \Rightarrow 45 = 5x$. Divide both sides by 5: $x = \frac{45}{5} \Rightarrow x = 9$.

36. Cross-multiply: $2 \times 14 = 7 \times x \Rightarrow 28 = 7x$. Divide both sides by 7: $x = \frac{28}{7} \Rightarrow x = 4$.

37. Cross-multiply: $x \times 2 = 18 \times 3 \Rightarrow 2x = 54$. Divide both sides by 2: $x = \frac{54}{2} \Rightarrow x = 27$.

38. Simplify $\frac{2}{6}$ to $\frac{1}{3}$: $\frac{x}{24} = \frac{1}{3}$. Cross-multiply: $x \times 3 = 24 \times 1 \Rightarrow 3x = 24$. Divide both sides by 3: $x = \frac{24}{3} \Rightarrow x = 8$.

39. Simplify $\frac{4}{20}$ to $\frac{1}{5}$: $\frac{5}{x} = \frac{1}{5}$. Cross-multiply: $5 \times 5 = 1 \times x \Rightarrow x = 25$.

40. Simplify $\frac{20}{80}$ to $\frac{1}{4}$: $\frac{10}{x} = \frac{1}{4}$. Cross-multiply: $10 \times 4 = 1 \times x \Rightarrow x = 40$.

41. Simplify $\frac{90}{6}$ to 15: $15 = \frac{x}{2}$. Multiply both sides by 2 to isolate x: $x = 15 \times 2 \Rightarrow x = 30$.

42. If two rectangles are similar, the ratios of their corresponding sides are equal.

$$\frac{Width\ 1}{Width\ 2} = \frac{Length\ 1}{Length\ 2} \Rightarrow \frac{8}{12} = \frac{32}{L_2}$$

Cross-multiplying: $8 \times L_2 = 12 \times 32 \Rightarrow 8L_2 = 384 \Rightarrow L_2 = 48$. Length of the second rectangle is 48 feet.

43. Given the longer side of the second rectangle is 28 meters, and considering the longer side of the first rectangle is 7 meters, we can set up a proportion to find the shorter side (width) of the second rectangle. $\frac{Length\ 1}{Length\ 2} = \frac{Width\ 1}{Width\ 2} \Rightarrow \frac{7}{28} = \frac{4.6}{w_2}$.

Cross-multiplying:

$7 \times w_2 = 4.6 \times 28 \Rightarrow 7w_2 = 128.8 \Rightarrow w_2 = 18.4$

The other side (width) of the second rectangle is 18.4 meters.

CHAPTER

5 Percentage

Math topics in this chapter:

- ☑ Percent Problems
- ☑ Percent of Increase and Decrease
- ☑ Discount, Tax and Tip
- ☑ Simple Interest

Practices

Solve each problem.

1) What is 15% of 60? ____
2) What is 55% of 800? ____
3) What is 22% of 120? ____
4) What is 18% of 40? ____
5) 90 is what percent of 200? ____%
6) 30 is what percent of 150? ____%
7) 14 is what percent of 250? ____%
8) 60 is what percent of 300? ____%
9) 30 is 120 percent of what number? ____
10) 120 is 20 percent of what number? ____
11) 15 is 5 percent of what number? ____
12) 22 is 20% of what number? ____

Solve each problem.

13) Bob got a raise, and his hourly wage increased from $15 to $21. What is the percent increase? _____ %
14) The price of a pair of shoes increases from $32 to $36. What is the percent increase? ___ %
15) At a Coffee Shop, the price of a cup of coffee increased from $1.35 to $1.62. What is the percent increase in the cost of the coffee? _____ %
16) A $45 shirt now selling for $36 is discounted by what percent? _____ %
17) Joe scored 30 out of 35 marks in Algebra, 20 out of 30 marks in science and 58 out of 70 marks in mathematics. In which subject his percentage of marks is best? _____
18) Emma purchased a computer for $420. The computer is regularly priced at $480. What was the percent discount Emma received on the computer? _____
19) A chemical solution contains 15% alcohol. If there is 54 ml of alcohol, what is the volume of the solution? _____

Find the selling price of each item.

20) Original price of a computer: $600

Tax: 8%, Selling price: $_______

21) Original price of a laptop: $450

Tax: 10%, Selling price: $_______

22) Nicolas hired a moving company. The company charged $500 for its services, and Nicolas gives the movers a 14% tip. How much does Nicolas tip the movers? $_________

23) Mason has lunch at a restaurant and the cost of his meal is $40. Mason wants to leave a 20% tip. What is Mason's total bill, including tip? $_________

Determine the simple interest for the following loans.

24) $\$1{,}000\ at\ 5\%\ for\ 4\ years.\ \$$__

25) $\$400\ at\ 3\%\ for\ 5\ years.\ \$$__

26) $\$240\ at\ 4\%\ for\ 3\ years.\ \$$__

27) $500 at 4.5% for 6 years. $__

Solve.

28) A new car, valued at $20,000, depreciates at 8% per year. What is the value of the car one year after purchase? $_____________

29) Sara puts $7,000 into an investment yielding 3% annual simple interest; she left the money in for five years. How much interest does Sara get at the end of those five years? $_____________

Answers

1) 9
2) 440
3) 26.4
4) 7.2
5) 45%
6) 20%
7) 5.6%
8) 20%
9) 25
10) 600
11) 300
12) 110
13) 40%
14) 12.5%
15) 20%
16) 20%
17) Algebra
18) 12.5%
19) 360 ml
20) $648.00
21) $495.00
22) $70.00
23) $48.00
24) $200.00
25) $60.00
26) $28.80
27) $135.00
28) $18.400
29) $1,050

Answers and Explanations

1. To find 15% of 60, multiply 60 by 0.15: $60 \times 0.15 = 9$.

2. Think of "percent" as "out of 100." Thus, 55% is equivalent to $\frac{55}{100}$. Multiply 800 by $\frac{55}{100}$: $800 \times \frac{55}{100} = 440$.

3. Another way to find a percentage is to divide the percentage by 100 and then multiply by the number: $\frac{22}{100} \times 120 = 26.4$.

4. Multiply 40 by 18 divided by 100: $40 \times \frac{18}{100} = 7.2$.

5. To find the percentage, divide 90 by 200 and then multiply by 100: $\frac{90}{200} \times 100 = 45\%$.

6. This means "30 is how much out of 150 in terms of 100": $\frac{30}{150} \times 100 = 20\%$.

7. Divide 14 by 250, and then turn it into a percentage: $\frac{14}{250} \times 100 = 5.6\%$.

8. Find the ratio of 60 to 300 and then express it as a percentage: $\frac{60}{300} \times 100 = 20\%$.

9. Set up the equation: $number \times 1.20 = 30$. Divide both sides by 1.20 to solve for the number: $number = \frac{30}{1.2} = 25$.

10. Using a proportion: $\frac{20}{100} = \frac{120}{number}$. Cross-multiplying gives: $20 \times number = 120 \times 100$. Thus, $number = \frac{120 \times 100}{20} = 600$.

11. Imagine the number you seek is a big container. 5% of this container is 15 units. The equation becomes: $number \times 0.05 = 15$. Solve for the number: $number = \frac{15}{0.05} = 300$.

12. Reverse the thought: If 22 is 20% (or 0.20), what's the full value (100%)? Using the equation:

$\frac{20}{100} = \frac{22}{number} \Rightarrow number = \frac{22}{0.2} = 110.$

13. Use this formula:

$$Percent\ of\ change = \frac{new\ number - original\ number}{original\ number} \times 100 = \frac{21-15}{15} \times 100 = 40\%$$

14. Use this formula:

$$Percent\ of\ change = \frac{new\ number - original\ number}{original\ number} \times 100 = \frac{36-32}{32} \times 100 = 12.5\%$$

15. Use this formula:

$$Percent\ of\ change = \frac{new\ number - original\ number}{original\ number} \times 100 = \frac{1.62-1.35}{1.35} \times 100 = 20\%$$

16. Using the formula:

$$Percent\ of\ decrease = \frac{original\ number - new\ number}{original\ number} \times 100 = \frac{45-36}{45} \times 100 = 20\%$$

17. $Algebra\ percentage = 30/35 \times 100 \approx 85.71\%$

$$Science\ percentage = \frac{20}{30} \times 100 \approx 66.67\%$$

$$Mathematics\ percentage = \frac{58}{70} \times 100 \approx 82.86\%$$

So, Joe's percentage of marks is best in Algebra.

18. Using the formula for percent discount:

$$Percent\ of\ decrease = \frac{original\ number - new\ number}{original\ number} \times 100 = \frac{480-420}{480} \times 100 = 12.5\%$$

19. Given that the solution contains 15% alcohol and there is $54\ ml$ of alcohol, we can set up the equation: $0.15 \times Volume\ of\ Solution = 54\ ml$. To find the volume of the solution, divide both sides by 0.15: $Volume\ of\ Solution = \frac{54\ ml}{0.15} = 360\ ml$.

20. Tax amount = Original price × Tax rate ⇒ $\$600 \times 0.08 = \$48$.

Selling price = Original price + Tax amount ⇒ $\$600 + \$48 = \$648$.

So, the selling price of the computer is $\$648$.

21. Tax amount = Original price × Tax rate ⇒ $\$450 \times 0.1 = \$45$.

Selling price = Original price + Tax amount ⇒ $\$450 + \$45 = \$495$.

So, the selling price of the laptop is $\$495$.

22. To find out how much Nicolas tips the movers; you need to calculate 14% of the service cost.

Tip amount = Cost of service × Tip percentage ⇒ $\$500 \times 0.14 = \$70$.

So, Nicolas tips the movers $\$70$.

23. First, we need to find out how much Mason will tip for his meal.

Tip amount = Cost of meal × Tip percentage ⇒ $\$40 \times 0.20 = \$8$. To find the total bill including tip, you simply add the cost of the meal to the tip amount.

Total bill = Cost of meal + Tip amount ⇒ $\$40 + \$8 = \$48$. Therefore, Mason's total bill, including tip, is $\$48$.

24. Simple interest is calculated as the principal (or initial amount) multiplied by the rate of interest, and then by the time period (usually in years).

Simple Interest = $\$1{,}000 \times 0.05 \times 4 = \$200$. The interest for this loan is $\$200$.

25. Using the formula: $I = prt \Rightarrow 400 \times 0.03 \times 5 = 60$. The interest for this loan is $60.

26. Using the formula: $I = prt \Rightarrow 240 \times 0.04 \times 3 = 28.8$. The interest for this loan is $\$28.80$.

27. Using the formula: $I = prt \Rightarrow 500 \times 0.045 \times 6 = 135$. The interest for this loan is $\$135$.

28. Depreciation means the loss in value. To find out how much the car depreciates in one year, you'll multiply its value by the depreciation rate.

Depreciation for one year $= \$20{,}000 \times 0.08 = \$1{,}600$.

Now, to find the car's value after one year, subtract this depreciation from the original value:

Value after one year $=$ Original value $-$ Depreciation $\Rightarrow \$20{,}000 - \$1{,}600 = \$18{,}400$.

So, one year after purchase, the car is worth $\$18{,}400$.

29. Using the formula: $I = prt \Rightarrow 7{,}000 \times 0.03 \times 5 = 1{,}050$. At the end of five years, Sara gets $\$1{,}050$ in interest.

CHAPTER

6 Exponents and Variables

Math topics in this chapter:

- ☑ Multiplication Property of Exponents
- ☑ Division Property of Exponents
- ☑ Powers of Products and Quotients
- ☑ Zero and Negative Exponents
- ☑ Negative Exponents and Negative Bases
- ☑ Scientific Notation
- ☑ Radicals

Practices

Find the products.

1) $x^2 \times 4xy^2 =$

2) $3x^2y \times 5x^3y^2 =$

3) $6x^4y^2 \times x^2y^3 =$

4) $7xy^3 \times 2x^2y =$

5) $-5x^5y^5 \times x^3y^2 =$

6) $-8x^3y^2 \times 3x^3y^2 =$

7) $-6x^2y^6 \times 5x^4y^2 =$

8) $-3x^3y^3 \times 2x^3y^2 =$

9) $-6x^5y^3 \times 4x^4y^3 =$

10) $-2x^4y^3 \times 5x^6y^2 =$

11) $-7y^6 \times 3x^6y^3 =$

12) $-9x^4 \times 2x^4y^2 =$

Simplify.

13) $\frac{5^3\times5^4}{5^9\times5} =$

14) $\frac{3^3\times3^2}{7^2\times7} =$

15) $\frac{15x^5}{5x^3} =$

16) $\frac{16x^3}{4x^5} =$

17) $\frac{72y^2}{8x^3y^6} =$

18) $\frac{10x^3y^4}{50x^2y^3} =$

19) $\frac{13y^2}{52x^4y^4} =$

20) $\frac{50xy^3}{200x^3y^4} =$

21) $\frac{48x^2}{56x^2y^2} =$

22) $\frac{81y^6x}{54x^4y^3} =$

Solve.

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

24) $(3x^3y^4)^3 =$

25) $(4x \times 6xy^3)^2 =$

26) $(5x \times 2y^3)^3 =$

27) $\left(\frac{9x}{x^3}\right)^2 =$

28) $(\frac{3y}{18y^2})^2 =$

29) $\left(\frac{3x^2y^3}{24x^4y^2}\right)^3 =$

30) $\left(\frac{26x^5y^3}{52x^3y^5}\right)^2 =$

31) $\left(\frac{18x^7y^4}{72x^5y^2}\right)^2 =$

32) $\left(\frac{12x^6y^4}{48x^5y^3}\right)^2 =$

Evaluate each expression. (Zero and Negative Exponents)

33) $(\frac{1}{4})^{-2} =$

34) $(\frac{1}{3})^{-2} =$

35) $(\frac{1}{7})^{-3} =$

36) $(\frac{2}{5})^{-3} =$

37) $(\frac{2}{3})^{-3} =$

38) $(\frac{3}{5})^{-4} =$

Write each expression with positive exponents.

39) $x^{-7} =$

40) $3y^{-5} =$

41) $15y^{-3} =$

42) $-20x^{-4} =$

43) $12a^{-3}b^{5} =$

44) $25a^{3}b^{-4}c^{-3} =$

45) $-4x^{5}y^{-3}z^{-6} =$

46) $\frac{18y}{x^{3}y^{-2}} =$

47) $\frac{20a^{-2}b}{-12c^{-4}}$

Write each number in scientific notation.

48) $0.00412 =$

49) $0.000053 =$

50) $66{,}000 =$

51) $72{,}000{,}000 =$

Evaluate.

52) $\sqrt{8} \times \sqrt{8} =$..................

53) $\sqrt{36} - \sqrt{9} =$.............

54) $\sqrt{81} + \sqrt{16} =$............

55) $\sqrt{4} \times \sqrt{25} =$.............

56) $\sqrt{2} \times \sqrt{32} =$.............

57) $4\sqrt{3} + 5\sqrt{3} =$...........

Answers

1) $4x^3y^2$
2) $15x^5y^3$
3) $6x^6y^5$
4) $14x^3y^4$
5) $-5x^8y^7$
6) $-24x^6y^4$
7) $-30x^6y^8$
8) $-6x^6y^5$
9) $-24x^9y^6$
10) $-10x^{10}y^5$
11) $-21x^6y^9$
12) $-18x^8y^2$
13) $\frac{1}{125}$
14) $\frac{243}{343}$
15) $3x^2$
16) $\frac{4}{x^2}$
17) $\frac{9}{x^3y^4}$
18) $\frac{xy}{5}$
19) $\frac{1}{4x^4y^2}$
20) $\frac{1}{4x^2y}$
21) $\frac{6}{7y^2}$
22) $\frac{3y^3}{2x^3}$
23) x^6y^6
24) $27x^9y^{12}$
25) $576x^4y^6$
26) $1{,}000x^3y^9$
27) $\frac{81}{x^4}$
28) $\frac{1}{36y^2}$
29) $\frac{y^3}{512x^6}$
30) $\frac{x^4}{4y^4}$
31) $\frac{x^4y^4}{16}$
32) $\frac{x^2y^2}{16}$
33) 16
34) 9
35) 343
36) $\frac{125}{8}$
37) $\frac{27}{8}$
38) $\frac{625}{81}$
39) $\frac{1}{x^7}$
40) $\frac{3}{y^5}$
41) $\frac{15}{y^3}$
42) $-\frac{20}{x^4}$
43) $\frac{12b^5}{a^3}$
44) $\frac{25a^3}{b^4c^3}$
45) $-\frac{4x^5}{y^3z^6}$
46) $\frac{18y^3}{x^3}$
47) $-\frac{5bc^4}{3a^2}$
48) 4.12×10^{-3}
49) 5.3×10^{-5}
50) 6.6×10^4
51) 7.2×10^7
52) 8
53) 3
54) 13
55) 10
56) 8
57) $9\sqrt{3}$

Answers and Explanations

1. We multiply coefficients (numbers) and add the exponents when bases (the letters) are the same: $x^2 \times 4xy^2 = 4x^{2+1}y^2 = 4x^3y^2$.

2. Coefficients 3 and 5 multiply to give 15. For the x's, $2 + 3 = 5$. For the y's, $1 + 2 = 3$. Result is $15x^5y^3$.

3. There's no coefficient on the second term, so it's understood as 1. The x exponents sum up to 6, and the y exponents total 5. Therefore, $6x^6y^5$.

4. 7 and 2 multiply to give 14. The x terms combine to x^{1+2} and the y terms give y^{3+1}. This result is: $14x^3y^4$.

5. The negative sign from the first term remains. The x exponents combine to 8, and the y exponents sum to 7. Thus, $-5x^8y^7$.

6. The multiplication of coefficients -8 and 3 yields -24. Both x's and y's have the same exponents, so we simply add them up. This becomes $-24x^6y^4$.

7. The coefficients -6 and 5 combine to -30. The x's add to an exponent of 6 and the y's to 8. Resulting in $-30x^6y^8$.

8. Coefficients -3 and 2 provide -6. x's combine to x^{3+3} and y's to y^{3+2}. The result is $-6x^6y^5$.

9. -6 and 4 give -24 when multiplied. The x exponents total 9, and y exponents also 6. The outcome is $-24x^9y^6$.

10. -2 and 5 give -10. The x's sum to x^{4+6} and y's to y^{3+2}. This leads to $-10x^{10}y^5$.

11. -7 and 3 multiply to give -21. There's no x in the first term, so only the x from the second term remains. For y's, $6 + 3 = 9$. This is $-21x^6y^9$.

12. Coefficients -9 and 2 result in -18. For the x's, $4 + 4 = 8$. The final product is $-18x^8y^2$.

13. For any positive number a, and any positive integers n, and m: $a^n \times a^m = a^{n+m}$. Using this rule: $5^3 \times 5^4 = 5^{3+4} = 5^7$, and $5^9 \times 5 = 5^{9+1} = 5^{10}$. Therefore, the expression simplifies to: $\frac{5^7}{5^{10}}$. Using another rule of exponents: $\frac{a^n}{a^m} = a^{n-m}$. Our simplified answer is 5^{-3} or $\frac{1}{5^3}$ or $\frac{1}{125}$.

14. Using the rules of exponents: $\frac{3^3 \times 3^2}{7^2 \times 7} = \frac{3^{3+2}}{7^{2+1}} = \frac{3^5}{7^3}$. The simplified expression is $\frac{3^5}{7^3}$ or $\frac{243}{343}$.

15. First, $\frac{15}{5} = 3$. Using the rule $\frac{a^n}{a^m} = a^{n-m}$, we have $\frac{x^5}{x^3} = x^2$. The simplified expression is $3x^2$.

16. First, $\frac{16}{4} = 4$. Using the exponents rule: $\frac{x^3}{x^5} = x^{3-5} = x^{-2}$ (which is $\frac{1}{x^2}$). The simplified expression is $4x^{-2}$ or $\frac{4}{x^2}$.

17. First, $\frac{72}{8} = 9$. For the variable parts: $\frac{y^2}{y^6} = y^{2-6} = y^{-4}$ (which is $\frac{1}{y^4}$). Thus, our simplified expression is $\frac{9}{x^3y^4}$.

18. First, $\frac{10}{50} = \frac{1}{5}$. For the x variable: $\frac{x^3}{x^2} = x^{3-2} = x^1 = x$. For the y variable: $\frac{y^4}{y^3} = y^{4-3} = y^1 = y$. The simplified expression is $\frac{xy}{5}$.

19. First, $\frac{13}{52} = \frac{1}{4}$. For the y variable: $\frac{y^2}{y^4} = y^{2-4} = y^{-2}$ (which is $\frac{1}{y^2}$). The simplified expression is $\frac{1}{4x^4y^2}$.

20. First, $\frac{50}{200} = \frac{1}{4}$. For the x variable, since the numerator has x and the denominator has x^3, the fraction becomes $\frac{1}{x^2}$. For the y variable: $\frac{y^3}{y^4} = y^{3-4} = y^{-1} = y$ (which is $\frac{1}{y}$). The simplified expression is $\frac{1}{4x^2y}$.

21. First, $\frac{48}{56} = \frac{6}{7}$. The x^2 term in the numerator and denominator cancel out. The simplified expression is $\frac{6}{7y^2}$.

22. First, $\frac{81}{54} = \frac{3}{2}$. For the x variable, since the numerator has x and the denominator has x^4, the fraction becomes $\frac{1}{x^3}$. For the y variable: $\frac{y^6}{y^3} = y^{6-3} = y^3$. The simplified expression is $\frac{3y^3}{2x^3}$.

23. When you have a power raised to another power, you multiply the exponents. The answer is x^6y^6.

24. The exponent outside applies to everything inside the bracket. For the coefficient (3), $3^3 = 27$. For the variables, multiply their exponents by 3. Thus, $27x^9y^{12}$.

25. First, $4x$ multiplied by $6xy^3$ is $24x^2y^3$. Raising that to the second power means squaring each individual part. So, $576x^4y^6$.

26. $5x$ multiplied by $2y^3$ is $10xy^3$. Cube each part inside the bracket for the answer. So, the final answer is $1{,}000x^3y^9$.

27. Subtract the exponent of the denominator from the exponent of the numerator. And square each part for the answer. Thus, $\frac{81}{x^4}$.

28. Reduce the fraction first. $3y$ divided by $18y^2$ is $\frac{1}{6y}$. When squared, $\frac{1}{6y}$ becomes $\left(\frac{1}{6y}\right)^2 = \frac{1}{36y^2}$.

29. Simplify the expression inside the brackets before raising it to the power of 3. $\frac{3x^2}{24x^4}$ simplifies to $\frac{1}{8x^2}$. $\frac{y^3}{y^2}$ simplifies to y. Putting it together: $\frac{y}{8x^2}$. Now, raise the simplified expression to the power of 3. So, the final answer is $\frac{y^3}{512x^6}$.

30. First, simplify inside the brackets. $\frac{26x^5}{52x^3}$ reduces to $\frac{x^2}{2}$. Next, $\frac{y^3}{y^5}$ simplifies to $\frac{1}{y^2}$. Now, square the result: $\left(\frac{x^2}{2y^2}\right)^2 = \frac{x^{2\times2}}{2^2y^{2\times2}}$. Thus, $\frac{x^4}{4y^4}$.

31. Simplify the expression inside the brackets. $\frac{18x^7}{72x^5}$ boils down to $\frac{x^2}{4}$. Also, $\frac{y^4}{y^2}$ becomes y^2. Square the result $\left(\frac{x^2y^2}{4}\right)^2$. The final answer is: $\frac{x^4y^4}{16}$.

32. Simplify the fraction inside the brackets. $\frac{12x^6}{48x^5}$ is $\frac{x}{4}$. Next, $\frac{y^4}{y^3}$ is y. Putting it together: $\frac{xy}{4}$. Square the simplified expression $\left(\frac{xy}{4}\right)^2 = \frac{(xy)^2}{4^2}$. Thus, $\frac{x^2y^2}{16}$.

33. The negative exponent essentially "flips" the fraction and turns the exponent into its positive counterpart. So, $\left(\frac{1}{4}\right)^{-2}$ is the same as $\left(\frac{4}{1}\right)^2 = 4^2$. Now, squaring 4, we get 16.

34. When you see a negative exponent, think of it as a command to take the reciprocal of the base. Thus, raising $\left(\frac{1}{3}\right)$ to the power of -2 is akin to squaring the reciprocal of $\frac{1}{3}$, which is $\frac{3}{1}$. This gives us 9.

35. Negative exponents invite us to invert the fraction. For $\left(\frac{1}{7}\right)^{-3}$, we're cubing the inverse of $\frac{1}{7}$, which is $\frac{7}{1}$. Cubing 7 gives 343.

36. Begin by raising the numerator and denominator separately to the power of -3, 2^{-3} is $\frac{1}{2^3}$ and $\frac{1}{5^{-3}}$ is 5^3. Swap the positions, and you get $\frac{5^3}{2^3}$. Calculating, we have $\frac{125}{8}$.

37. Using the concept of reciprocation and exponentiation, flip the fraction to get $\frac{3}{2}$ and then cube each part. 3 cubed is 27 and 2 cubed is 8. The result is $\frac{27}{8}$.

38. For this, imagine the fraction as a division problem. Raising a division to a negative exponent is like flipping the division order and using the positive exponent. So, 5^4 divided by 3^4 is our target. That's $\frac{625}{81}$.

39. For any number, a negative exponent means you'll take its reciprocal. So, $x^{-7} = \frac{1}{x^7}$.

40. Think of the number and variable separately. Leave the number alone and focus on the variable. The 3 remains as is, while y^{-5} becomes $\frac{1}{y^5}$. So, $3y^{-5} = \frac{3}{y^5}$.

41. Negative exponents make terms "dive" to the other side of a fraction. So, $15y^{-3}$ is like 15 multiplied by the reciprocal of y^3, which is $\frac{15}{y^3}$.

42. View the negative exponent as an instruction: "Move me to the denominator!" Following that instruction, $-20x^{-4}$ becomes $\frac{-20}{x^4}$.

43. Treating each term, we get 12 (unchanged), $\frac{1}{a^3}$ (flipped due to the negative exponent), and b^5 (unchanged). Combined, it becomes $\frac{12b^5}{a^3}$.

44. Pulling down the negatively exponentiated terms, we get $25a^3$ over b^4c^3, which is $\frac{25a^3}{b^4c^3}$.

45. Negative exponents shout, "Put me in the basement!" meaning move them to the denominator. Answering that call, the expression is $-\frac{4x^5}{y^3z^6}$.

46. When dividing, imagine giving the negatively exponentiated term wings to fly to the numerator. Allowing y^{-2} to soar up, we get $\frac{18y^3}{x^3}$.

47. Think of flipping terms with negative exponents like flipping pancakes. If it's on top, it goes below, and vice-versa. Flipping them, we get $-\frac{5bc^4}{3a^2}$.

48. To convert 0.00412, shift the decimal three places to the right, making it 4.12. The number of places moved becomes the negative exponent of 10 since we moved to the right. So, the answer is: 4.12×10^{-3}.

49. We shift the decimal five places to the right to get 5.3. That five-jump shift implies a multiplier of 10^{-5}. Hence, $0.000053 = 5.3 \times 10^{-5}$.

50. Move the decimal between 6 and 6, so it becomes 6.6. The decimal was shifted four places to the left. This results in $66{,}000 = 6.6 \times 10^4$.

51. Sliding the decimal between 7 and 2 gives 7.2. The shift was seven places to the left, so it's multiplied by 10^7. The number is expressed as 7.2×10^7.

52. The square root of a number times itself will give you the original number. So, $\sqrt{8}$ multiplied by $\sqrt{8}$ will give you 8.

53. First, we need to find the square root of each number. $\sqrt{36} = 6$ because $6 \times 6 = 36$, $\sqrt{9} = 3$ because $3 \times 3 = 9$. Now, subtract the second value from the first: $6 - 3 = 3$.

54. Start by finding the square root of each number. $\sqrt{81} = 9$ because $9 \times 9 = 81$, $\sqrt{16} = 4$ because $4 \times 4 = 16$. Now, add the two values together: $9 + 4 = 13$.

55. When you multiply two square roots, you can also multiply the numbers inside the roots and then take the square root of the result. But here, we'll solve each square root separately.

$\sqrt{4} = 2$ because $2 \times 2 = 4$, and $\sqrt{25} = 5$ because $5 \times 5 = 25$. Multiply the results: $2 \times 5 = 10$.

56. $\sqrt{32}$ can be simplified to $\sqrt{2 \times 16}$ or $\sqrt{2} \times \sqrt{16}$. Now, combining with our original expression, we get $\sqrt{2} \times (\sqrt{2} \times \sqrt{16})$. This becomes $\sqrt{2} \times \sqrt{2} \times \sqrt{16}$. We already know $\sqrt{2} \times \sqrt{2} = 2$ and $\sqrt{16} = 4$. Therefore, $2 \times 4 = 8$.

57. When you have like terms with radicals, you can combine them in a similar fashion as you do with algebraic terms. Think of the $\sqrt{3}$ as a common variable. Combining $4\sqrt{3}$ and $5\sqrt{3}$ is $9\sqrt{3}$.

CHAPTER 7 Expressions and Variables

Math topics in this chapter:

- ☑ Simplifying Variable Expressions
- ☑ Simplifying Polynomial Expressions
- ☑ The Distributive Property
- ☑ Evaluating One Variable
- ☑ Evaluating Two Variables

Practices

Simplify each expression.

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

2) $(-5 - 2x + 7) =$

3) $(12x - 5x - 4) =$

4) $(-16x + 24x - 9) =$

5) $(6x + 5 - 15x) =$

6) $2 + 5x - 8x - 6 =$

7) $5x + 10 - 3x - 22 =$

8) $-5 - 3x^2 - 6 + 4x =$

9) $-6 + 9x^2 - 3 + x =$

10) $5x^2 + 3x - 10x - 3 =$

11) $4x^2 - 2x - 6x + 5 - 8 =$

12) $3x^2 - 5x - 7x + 2 - 4 =$

13) $9x^2 - x - 5x + 3 - 9 =$

14) $2x^2 - 7x - 3x^2 + 4x + 6 =$

Simplify each polynomial.

15) $5x^2 + 3x^3 - 9x^2 + 2x =$ ____________________

16) $8x^4 + 2x^5 - 7x^4 + 3x^2 =$ ____________________

17) $15x^3 + 11x - 5x^2 - 9x^3 =$ ____________________

18) $(7x^3 - 3x^2) + (5x^2 - 13x) =$ ____________________

19) $(12x^4 + 6x^3) + (x^3 - 5x^4) =$ ____________________

20) $(15x^5 - 8x^3) - (4x^3 + x^2) =$ ____________________

21) $(14x^4 + 7x^3) - (x^3 - 24) =$ ____________________

22) $(20x^4 + 6x^3) - (-x^3 - 2x^4) =$ ____________________

23) $(x^2 + 9x^3) + (-22x^2 + 6x^3) =$ ____________________

24) $(4x^4 - 2x^3) + (-5x^3 - 8x^4) =$ ____________________

Use the distributive property to simply each expression.

25) $2(6+x) =$ ________
26) $5(3-2x) =$ ________
27) $7(1-5x) =$ ________
28) $(3-4x)7 =$ ________
29) $6(2-3x) =$ ________
30) $(-1)(-9+x) =$ ________
31) $(-6)(3x-2) =$ ________
32) $(-x+12)(-4) =$ ________
33) $(-2)(1-6x) =$ ________
34) $(-5x-3)(-8) =$ ______

Evaluate each expression using the value given.

35) $x = 4 \rightarrow 10 - x =$ ____
36) $x = 6 \rightarrow x + 8 =$ ____
37) $x = 3 \rightarrow 2x - 6 =$ ____
38) $x = 2 \rightarrow 10 - 4x =$ ____
39) $x = 7 \rightarrow 8x - 3 =$ ____
40) $x = 9 \rightarrow 20 - 2x =$ ____
41) $x = 5 \rightarrow 10x - 30 =$ ___
42) $x = -6 \rightarrow 5 - x =$ ____
43) $x = -3 \rightarrow 22 - 3x =$ ____
44) $x = -7 \rightarrow 10 - 9x =$ ____
45) $x = -10 \rightarrow 40 - 3x =$ ____
46) $x = -2 \rightarrow 20x - 5 =$ ____
47) $x = -5 \rightarrow -10x - 8 =$ ___
48) $x = -4 \rightarrow -1 - 4x =$ ___

Evaluate each expression using the values given.

49) $x = 2, y = 1 \rightarrow 2x + 7y =$ _____
50) $a = 3, b = 5 \rightarrow 3a - 5b =$ _____
51) $x = 6, y = 2 \rightarrow 3x - 2y + 8 =$ _____
52) $a = -2, b = 3 \rightarrow -5a + 2b + 6 =$ _____
53) $x = -4, y = -3 \rightarrow -4x + 10 - 8y =$ _____

Answers

1) $4x+2$
2) $-2x+2$
3) $7x-4$
4) $8x-9$
5) $-9x+5$
6) $-3x-4$
7) $2x-12$
8) $-3x^2+4x-11$
9) $9x^2+x-9$
10) $5x^2-7x-3$
11) $4x^2-8x-3$
12) $3x^2-12x-2$
13) $9x^2-6x-6$
14) $-x^2-3x+6$
15) $3x^3-4x^2+2x$
16) $2x^5+x^4+3x^2$
17) $6x^3-5x^2+11x$
18) $7x^3+2x^2-13x$
19) $7x^4+7x^3$
20) $15x^5-12x^3-x^2$
21) $14x^4+6x^3+24$
22) $22x^4+7x^3$
23) $15x^3-21x^2$
24) $-4x^4-7x^3$
25) $2x+12$
26) $-10x+15$
27) $-35x+7$
28) $-28x+21$
29) $-18x+12$
30) $-x+9$
31) $-18x+12$
32) $4x-48$
33) $12x-2$
34) $40x+24$
35) 6
36) 14
37) 0
38) 2
39) 53
40) 2
41) 20
42) 11
43) 31
44) 73
45) 70
46) -45
47) 42
48) 15
49) 11
50) -16
51) 22
52) 22
53) 50

Answers and Explanations

1. Combine the constants: $3 - 1 = 2$. The term $4x$ remains unchanged. So, the expression simplifies to: $4x + 2$.

2. Combine the constants: $-5 + 7 = 2$. The term $-2x$ remains unchanged. Thus, $-2x + 2$.

3. Combine like terms (terms with x): $12x - 5x = 7x$. The constant -4 remains unchanged. So, the final answer is: $7x - 4$.

4. Combine the x terms: $-16x + 24x = 8x$. The constant -9 remains unchanged. So, the result is: $8x - 9$.

5. Combine the x terms: $6x - 15x = -9x$. The constant 5 remains unchanged. Thus, $-9x + 5$.

6. Group and combine like terms: $5x - 8x = -3x$ and $2 - 6 = -4$. The answer is: $-3x - 4$.

7. Combine the x terms: $5x - 3x = 2x$. Now, Combine the constants: $10 - 22 = -12$. Answer is: $2x - 12$.

8. Combine the constants: $-5 - 6 = -11$. The terms $-3x^2$ and $4x$ remain as they are, since they are not like terms. So, the result is: $-3x^2 + 4x - 11$.

9. Start with the highest power of x, which is x^2, so $9x^2$ stays as is. The term x remains unchanged. Lastly, combine the numbers: -6 and -3 give $-6 - 3 = -9$.

Answer is: $9x^2 + x - 9$.

10. Consider this equation as a puzzle; you want to piece together similar items: For x's, $3x - 10x$ results in $-7x$. The squares, $5x^2$, remain as they are. The number, -3, doesn't have a pair, so it stays as is. Thus, $5x^2 - 7x - 3$.

11. Imagine the terms as different categories of objects: Squares are one category. Here, you only have $4x^2$. For simple x's, you combine them: $-2x - 6x = -8x$. And for numbers: $5 - 8 = -3$. So, $4x^2 - 8x - 3$.

12. Think of this as merging similar boxes: You have a box of x^2, which is just $3x^2$. For the x terms, merge $-5x$ and $-7x$ to get $-12x$. Lastly, combine the two numbers: $2 - 4 = -2$. Thus, $3x^2 - 12x - 2$.

13. Envision every term as a different type of coin: The highest valued coin is $9x^2$. It stands alone. For the x-coins, $-x - 5x$ yields $-6x$. Summing up the constants: $3 - 9 = -6$. So, $9x^2 - 6x - 6$.

14. To simplify, we need to group and combine like terms. Starting with the terms involving x^2, we have $2x^2$ and $-3x^2$. When combined, they result in $-x^2$. Next, we group the x terms: combining $-7x$ and $4x$ gives us $-3x$. The constant, 6, remains as it is since there are no other constant terms to combine with. Bringing all these simplified terms together, the expression condenses to $-x^2 - 3x + 6$.

15. To simplify, group like terms: $(5x^2 - 9x^2) + 3x^3 + 2x$. This becomes: $3x^3 - 4x^2 + 2x$.

16. Grouping like terms: $(8x^4 - 7x^4) + 2x^5 + 3x^2$. This results in: $2x^5 + x^4 + 3x^2$.

17. First, group like terms: $(15x^3 - 9x^3) + 11x - 5x^2$. The answer is: $6x^3 - 5x^2 + 11x$.

18. Combine like terms: $7x^3 + (-3x^2 + 5x^2) - 13x$. Result: $7x^3 + 2x^2 - 13x$.

19. Combine like terms: $(12x^4 - 5x^4) + (6x^3 + x^3)$. This results in: $7x^4 + 7x^3$.

20. Distribute the negative sign and combine like terms: $15x^5 + (-8x^3 - 4x^3) - x^2$. The answer is: $15x^5 - 12x^3 - x^2$.

21. First, distribute the negative sign then combine like terms: $14x^4 + (7x^3 - x^3) + 24$. This becomes: $14x^4 + 6x^3 + 24$.

22. To solve this problem, distribute the negative sign and combine: $(20x^4 + 2x^4) + (6x^3 + x^3)$. Result $22x^4 + 7x^3$.

23. To simplify this expression, you'll combine the like terms. Begin by combining the x^3 terms and then the x^2 terms. $(9x^3 + 6x^3) + (x^2 - 22x^2)$. Putting them together, the result is: $15x^3 - 21x^2$.

24. Again, you'll need to combine the like terms. Start by combining the x^4 terms and then the x^3 terms. Grouping them together, the result is: $-4x^4 - 7x^3$.

25. Using the distributive property: $(2 \times 6 + 2 \times x) = 2x + 12$.

26. Expand the expression: multiply 5 with 3 and then 5 with $-2x$. This results in $15 - 10x$ or $-10x + 15$.

27. Breaking it down: 7 multiplied by 1 is 7. Next, 7 multiplied by $-5x$ is $-35x$. Combine the results $-35x + 7$.

28. Take the number outside the parentheses (7) and distribute it: 7 times 3 is 21. 7 times $-4x$ is $-28x$. Add them together: $-28x + 21$.

29. Expand the terms: $(6 \times 2 = 12)$, and $(6 \times (-3x) = -18x)$. Combine these: $-18x + 12$.

30. -1 times -9 is 9. Also, -1 times x is $-x$. Combine for $-x + 9$.

31. For this one: multiply -6 by $3x$, which is $-18x$. Next, -6 multiplied by -2 is 12. Together:

$-18x + 12$.

32. Working through: -4 times $-x$ is $4x$, and -4 times 12 is -48. This gives: $4x - 48$.

33. Process the multiplication: -2 times 1 is -2. Next, -2 times $-6x$ results in $12x$. Final expression: $12x - 2$.

34. Distribute the outside number: -8 times $-5x$ equals $40x$. Next, -8 times -3 is 24. Sum these for $40x + 24$.

35. By replacing the variable with the given value, we find the difference between 10 and 4. Substitute 4 for x: $10 - 4 = 6$.

36. Insert the specified number and calculate the sum of 6 and 8. Placing 6 in the equation: $6 + 8 = 14$.

37. Double the given number (which is 3 in this case) and then subtract 6. Input 3 for x: $2(3) - 6 = 6 - 6 = 0$.

38. Replace x with 2: $10 - 4(2) = 10 - 8 = 2$.

39. Substitute in 7: $8(7) - 3 = 56 - 3 = 53$.

40. Deduct twice the value of the given number (9) from 20: $20 - 2(9) = 20 - 18 = 2$.

41. Ten times our given value, 5, minus 30 is the final outcome: $10(5) - 30 = 50 - 30 = 20$.

42. Add 6 to 5 because subtracting a negative number is the same as adding its positive counterpart: $5 - (-6) = 5 + 6 = 11$.

43. Triple the positive value of the given number (3) and add it to 22: $22 - 3(-3) = 22 + 9 = 31$.

44. When you multiply 9 by 7 and subtract it from 10 with a negative sign, you're essentially adding: $10 - 9(-7) = 10 + 63 = 73$.

45. Place -10: $40 - 3(-10) = 40 + 30 = 70$.

46. Multiply 20 by the number (−2) and then decrease this product by 5:

$$20(-2) - 5 = -40 - 5 = -45$$

47. The equation asks us to take the opposite of 10 times 5 and then subtract 8:

$$-10(-5) - 8 = 50 - 8 = 42$$

48. Put -4 in the given equation, then we get: $-1 - 4(-4) = -1 + 16 = 15$.

49. To solve this, substitute x with 2 and y with 1. $2x$ becomes $2(2)$ which equals 4. $7y$ becomes $7(1)$ which equals 7. Now add these results together: $4 + 7 = 11$.

Answer: $2x + 7y = 11$.

50. Substitute a with 3 and b with 5. $3a$ becomes $3(3)$ which equals 9. $5b$ becomes $5(5)$ which equals 25. Now subtract the second result from the first: $9 - 25 = -16$.

Answer: $3a - 5b = -16$.

51. Replace x with 6 and y with 2. $3x$ becomes $3(6)$ which is 18. $2y$ becomes $2(2)$ which is 4. Combine these values: $18 - 4 + 8 = 22$.

52. Swap a with -2 and b with 3. $-5a$ becomes $-5(-2)$ which equals 10. $2b$ becomes $2(3)$ which equals 6. Now, sum these results with 6: $10 + 6 + 6 = 22$.

53. Insert -4 for x and -3 for y. $-4x$ becomes $-4(-4)$ which is 16. $8y$ becomes $8(-3)$ which is -24. Combine these values: $16 + 10 - (-24) = 16 + 10 + 24 = 50$.

CHAPTER

8 Equations and Inequalities

Math topics in this chapter:

- ☑ One-Step Equations
- ☑ Multi-Step Equations
- ☑ System of Equations
- ☑ Graphing Single–Variable Inequalities
- ☑ One-Step Inequalities
- ☑ Multi-Step Inequalities

Practices

Solve each equation. (One–Step Equations)

1) $x + 6 = 3 \rightarrow x =$ ____
2) $5 = 11 - x \rightarrow x =$ ____
3) $-3 = 8 + x \rightarrow x =$ ____
4) $x - 2 = -7 \rightarrow x =$ ____
5) $-15 = x + 6 \rightarrow x =$ ____
6) $10 - x = -2 \rightarrow x =$ ____
7) $22 - x = -9 \rightarrow x =$ ____
8) $-4 + x = 28 \rightarrow x =$ ____
9) $11 - x = -7 \rightarrow x =$ ____
10) $35 - x = -7 \rightarrow x =$ ____

Solve each equation. (Multi–Step Equations)

11) $4(x + 2) = 12 \rightarrow x =$ ____
12) $-6(6 - x) = 12 \rightarrow x =$ ____
13) $5 = -5\,(x + 2) \rightarrow x =$ ____
14) $-10 = 2(4 + x) \rightarrow x =$ ____
15) $4(x + 2) = -12,\ x =$ ____
16) $-6(3 + 2x) = 30,\ x =$ ____
17) $-3(4 - x) = 12,\ x =$ ____
18) $-4(6 - x) = 16,\ x =$ ____

Solve each system of equations.

19) $\begin{cases} x + 6y = 32 \\ x + 3y = 17 \end{cases}$ $x =$ ____ $y =$ ____

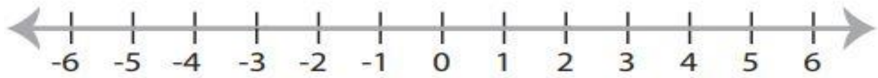
20) $\begin{cases} 3x + y = 15 \\ x + 2y = 10 \end{cases}$ $x =$ ____ $y =$ ____

21) $\begin{cases} 3x + 5y = 17 \\ 2x + y = 9 \end{cases}$ $x =$ ____ $y =$ ____

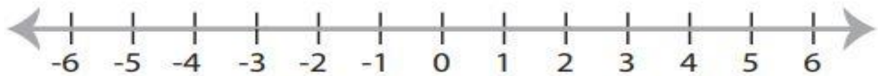
22) $\begin{cases} 5x - 2y = -8 \\ -6x + 2y = 10 \end{cases}$ $x =$ ____ $y =$ ____

Draw a graph for each inequality.

23) $x \leq -3$

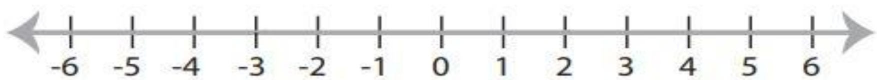


24) $x > -5$

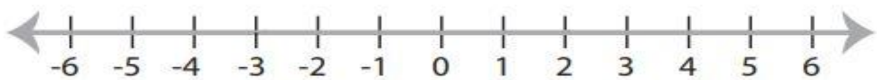


Solve each inequality and graph it.

25) $x - 2 \geq -2$



26) $2x - 3 < 9$



Solve each inequality.

27) $x + 13 > 4$

28) $x + 6 > 5$

29) $-12 + 2x \leq 26$

30) $-2 + 8x \leq 14$

31) $6 + 4x \leq 18$

32) $4(x + 3) \geq -12$

33) $2(6 + x) \geq -12$

34) $3(x - 5) < -6$

35) $10 + 5x < -15$

36) $6(6 + x) \geq -18$

37) $2(x - 5) \geq -14$

38) $6(x + 4) < -12$

39) $3(x - 8) \geq -48$

40) $-(6 - 4x) > -30$

41) $2(2 + 2x) > -60$

42) $-3(4 + 2x) > -24$

Answers

1) -3

2) 6

3) -11

4) -5

5) -21

6) 12

7) 31

8) 32

9) 18

10) 42

11) 1

12) 8

13) -3

14) -9

15) -5

16) -4

17) 8

18) 10

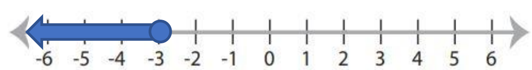
19) $x = 2, y = 5$

20) $x = 4, y = 3$

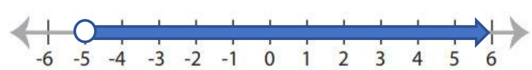
21) $x = 4, y = 1$

22) $x = -2, y = -1$

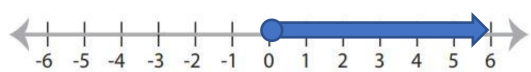
23) $x \leq -3$



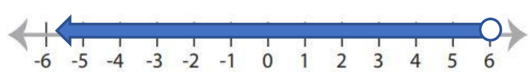
24) $x > -5$



25) $x \geq 0$



26) $x < 6$



27) $x > -9$

28) $x > -1$

29) $x \leq 19$

30) $x \leq 2$

31) $x \leq 3$

32) $x \geq -6$

33) $x \geq -12$

34) $x < 3$

35) $x < -5$

36) $x \geq -9$

37) $x \geq -2$

38) $x < -6$

39) $x \geq -8$

40) $x > -6$

41) $x > -16$

42) $x < 2$

Answers and Explanations

1. You want to get x by itself. Start by subtracting 6 from both sides to undo the addition:

$$x+6=3 \Rightarrow x+6-6=3-6 \Rightarrow x=-3$$

2. If you start at 11 and go backwards (subtract) by a certain number to reach 5, that number is 6: $5=11-x \Rightarrow 5-11=11-x-11 \Rightarrow -6=-x \Rightarrow x=6$.

3. To balance the equation, think of taking away 8 from both sides:

$$-3=8+x \Rightarrow -3-8=8+x-8 \Rightarrow x=-11$$

4. Think of adding 2 to both sides to compensate for the subtraction in the equation:

$$x-2=-7 \Rightarrow x-2+2=-7+2 \Rightarrow x=-5$$

5. Consider what number when added to 6 will result in -15:

$$-15=x+6 \Rightarrow x=-15-6=-21$$

6. If you think of x as being on the left side, then, $10-x=-2 \Rightarrow x=10+2=12$.

7. Rearrange the equation to make x the subject. $22-x=-9 \Rightarrow x=22+9=31$.

8. Starting at -4, how much do you need to add to reach 28?

$$-4+x=28 \Rightarrow x=28+4=32$$

9. If removing x from 11 gives -7, then adding back will give you x's value:

$$11-x=-7 \Rightarrow x=11+7=18$$

10. Determine the difference between 35 and -7 to find x: $x=35+7=42$.

11. Multiply 4 with each term inside the parentheses. $4(x+2)=12 \Rightarrow 4x+8=12$. Subtract 8 from both sides: $4x=4$. Now, divide by 4: $x=1$.

12. Multiplying through, -6 times 6 gives -36, and -6 times $-x$ gives $6x$. $-36+6x=12$. Combine terms: $6x=48$. Divide both sides by 6: $x=8$.

13. Divide both sides by -5: $x+2=-1$. subtract 2 from both sides: $x=-3$.

14. Multiply 2 with 4 and x: $8+2x=-10$. Subtract 8: $2x=-18$. Then divide by 2: $x=-9$.

15. Multiplying through by 4 yields: $4x+8=-12$. Isolating x: subtract 8, $4x=-20$. Divide by 4: $x=-5$.

16. Multiply through by -6: $-18-12x=30$. Combine like terms: $-12x=48$. Finally, divide by -12: $x=-4$.

17. Multiplying, we get $-12+3x=12$. Combining gives $3x=24$, so $x=8$.

18. Multiplication yields $-24+4x=16$. Moving terms around, $4x=40$. Then, $x=10$.

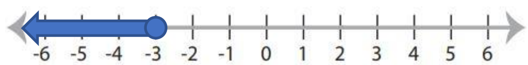
19. Subtract the second equation from the first to eliminate x: $3y=15$. Divide by 3: $y=5$. Plugging this value into the second equation to solve for x: $x+15=17$ gives $x=2$. So, $x=2, y=5$.

20. From the first equation, solve for y: $y=15-3x$. Substitute this expression into the second equation: $x+2(15-3x)=10$. Solving yields $x+30-6x=10 \Rightarrow -5x=-20 \Rightarrow x=4$. Plugging this into the first equation gives $x=4 \Rightarrow 3(4)+y=15 \Rightarrow 12+y=15 \Rightarrow y=3$. Thus, $x=4, y=3$.

21. Multiply the second equation by 5 to make the coefficients of y the same: $10x + 5y = 45$. Now, subtract the first equation from this: $7x = 28$. Hence, $x = 4$. Using this x −value in the second equation, we find $2(4) + y = 9 \Rightarrow 8 + y = 9 \Rightarrow y = 1$. So, $x = 4$, $y = 1$.

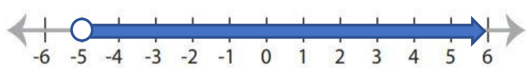
22. Adding the two equations directly, the y terms cancel out: $-x = 2$. So, $x = -2$. Plugging this into the first equation, we get $5(-2) - 2y = -8 \Rightarrow -10 - 2y = -8 \Rightarrow 2y = -2 \Rightarrow y = -1$. Thus, $x = -2$, $y = -1$.

23. Imagine a number line. Place a solid circle at -3, because our number can be exactly -3. Then shade or mark everything to the left (or in the direction of smaller numbers) of

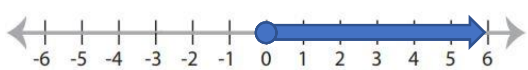


-3.

24. On the same number line, make an open circle (or an empty dot) at -5. This indicates that -5 is not part of our solution. Shade or mark everything to the right (or in the direction of bigger numbers) of -5.

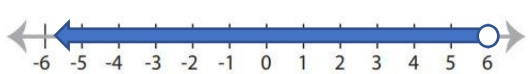


25. Start by adding 2 to both sides of the inequality to isolate x: $x - 2 + 2 \geq -2 + 2$. This simplifies to: $x \geq 0$. On a number line, place a solid circle at 0 (indicating that x can be exactly 0) and shade everything to the right of 0 (representing all numbers greater than 0).



This shaded portion is the solution set for the inequality.

26. Start by adding 3 to both sides of the inequality to isolate the term with x: $2x - 3 + 3 < 9 + 3$. This becomes: $2x < 12$. Now, divide both sides by 2 to solve for x: $\frac{2x}{2} < \frac{12}{2}$. This simplifies to: $x < 6$. On a number line, make an open circle at 6 (indicating x cannot be



exactly 6) and shade everything to the left of 6, representing all numbers less than 6. This shaded section represents the solution set for the inequality.

27. Subtract 13 from both sides to isolate x: $x > -9$.

28. Subtract 6 from each side: $x > -1$.

29. Add 12 to both sides: $2x \leq 38$. Now, divide by 2: $x \leq 19$.

30. Start by adding 2 to each side: $8x \leq 16$. Then, divide both sides by 8: $x \leq 2$.

31. Subtract 6: $4x \leq 12$. Divide by 4: $x \leq 3$.

32. Distribute the 4: $4x + 12 \geq -12$. Subtracting 12: $4x \geq -24$. Divide both sides by 4: $x \geq -6$.

33. Distribute the 2: $12 + 2x \geq -12$. Subtract 12: $2x \geq -24$. Divide by 2: $x \geq -12$.

34. Expand: $3x - 15 < -6$. Add 15 to both sides: $3x < 9$. Now, divide by 3: $x < 3$.

35. Subtract 10: $5x < -25$. Divide both sides by 5: $x < -5$.

36. Distribute the 6: $36 + 6x \geq -18$. Subtract 36: $6x \geq -54$. Divide by 6: $x \geq -9$.

37. Expand: $2x - 10 \geq -14$. Add 10: $2x \geq -4$. Now, divide by 2: $x \geq -2$.

38. Expand: $6x + 24 < -12$. Subtract 24: $6x < -36$. Divide by 6: $x < -6$.

39. Expand: $3x - 24 \geq -48$. Add 24: $3x \geq -24$. Divide by 3: $x \geq -8$.

40. Distribute the negative sign: $-6 + 4x > -30$. Add 6: $4x > -24$. Divide by 4: $x > -6$.

41. Expand: $4 + 4x > -60$. Subtract 4: $4x > -64$. Divide by 4: $x > -16$.

42. Distribute the -3: $-12 - 6x > -24$. Add 12: $-6x > -12$. Divide by -6 (remember, when multiplying or dividing by a negative number, the direction of the inequality changes): $x < 2$.

Chapter 9 Lines and Slope

Math topics in this chapter:

- ☑ Finding Slope
- ☑ Graphing Lines Using Slope–Intercept Form
- ☑ Writing Linear Equations
- ☑ Finding Midpoint
- ☑ Finding Distance of Two Points
- ☑ Graphing Linear Inequalities

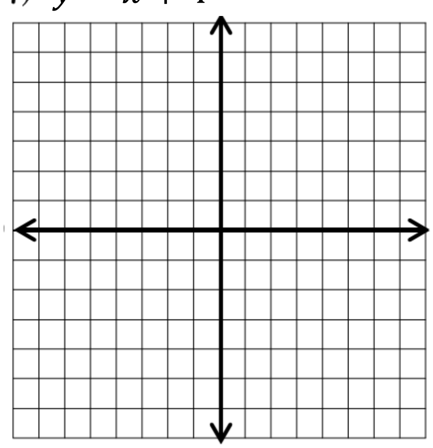
Practices

Find the slope of each line.

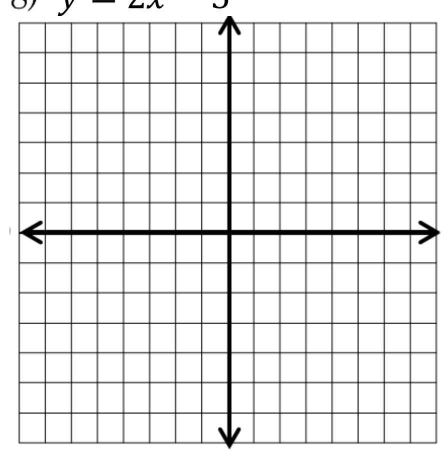
1) $y = x - 5$
2) $y = 2x + 6$
3) $y = -5x - 8$
4) Line through $(2,6)$ *and* $(5,0)$
5) Line through $(8,0)$ *and* $(-4,3)$
6) Line through $(-2,-4)$ *and* $(-4,8)$

Sketch the graph of each line. (Using Slope–Intercept Form)

7) $y = x + 4$



8) $y = 2x - 5$

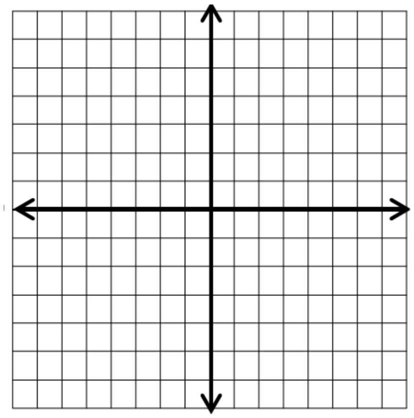


Solve.

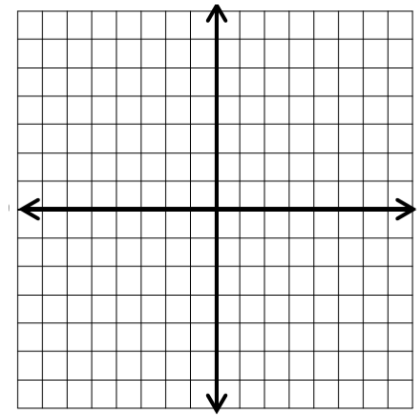
9) What is the equation of a line with slope 4 and intercept 16? ________________
10) What is the equation of a line with slope 3 and passes through point $(1,5)$? ________________
11) What is the equation of a line with slope -5 and passes through point $(-2,7)$? ________________
12) The slope of a line is -4 and it passes through point $(-6,2)$. What is the equation of the line? ________________
13) The slope of a line is -3 and it passes through point $(-3,-6)$. What is the equation of the line? ________________

Sketch the graph of each linear inequality.

14) $y > 2x - 2$



15) $y < -x + 3$



Find the midpoint of the line segment with the given endpoints.

16) $(5, 0), (1, 4)$

17) $(2, 3), (4, 7)$

18) $(8, 1), (2, 5)$

19) $(5, 10), (3, 6)$

20) $(4, -1), (-2, 7)$

21) $(2, -5), (4, 1)$

22) $(7, 6), (-5, 2)$

23) $(-2, 8), (4, -6)$

Find the distance between each pair of points.

24) $(-2, 8), (-6, 8)$

25) $(4, -4), (14, 20)$

26) $(-1, 9), (-5, 6)$

27) $(0, 3), (4, 3)$

28) $(0, -2), (5, 10)$

29) $(4, 3), (7, -1)$

30) $(2, 6), (10, -9)$

31) $(3, 3), (6, -1)$

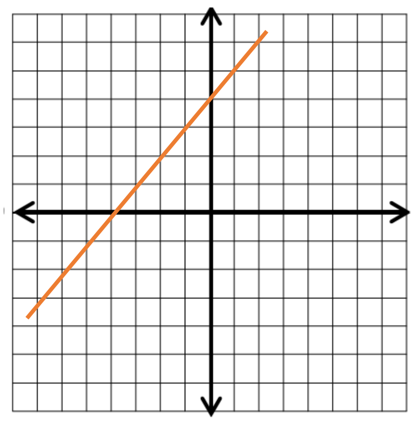
32) $(-2, -12), (14, 18)$

33) $(2, -2), (12, 22)$

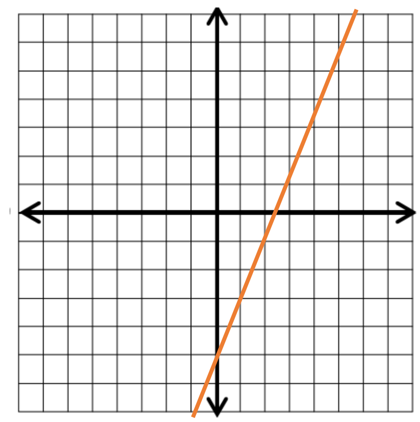
Answers

1) 1
2) 2
3) -5
4) -2
5) $-\frac{1}{4}$
6) -6

7) $y = x + 4$

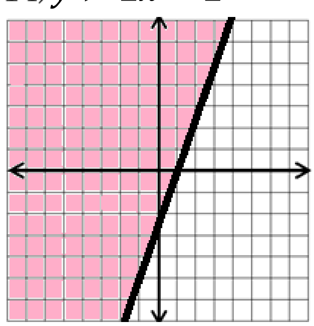


8) $y = 2x - 5$

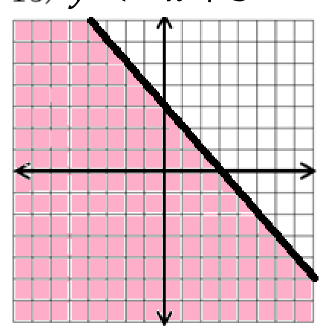


9) $y = 4x + 16$
10) $y = 3x + 2$
11) $y = -5x - 3$
12) $y = -4x - 22$
13) $y = -3x - 15$

14) $y > 2x - 2$



15) $y < -x + 3$



16) $(3,2)$
17) $(3,5)$
18) $(5,3)$
19) $(4,8)$
20) $(1,3)$
21) $(3,-2)$
22) $(1,4)$
23) $(1,1)$
24) 4
25) 26
26) 5
27) 4
28) 13
29) 5
30) 17
31) 5
32) 34
33) 26

Answers and Explanations

1. The equation is in the slope-intercept form $y = mx + b$, where m is the slope and b is the y −intercept. Here, $m = 1$. Therefore, the slope of the line is 1.

2. Looking at the equation, you can immediately pick out the number in front of the x, which represents the steepness or incline of the line. Here, that number is 2. Thus, the slope of the line is 2.

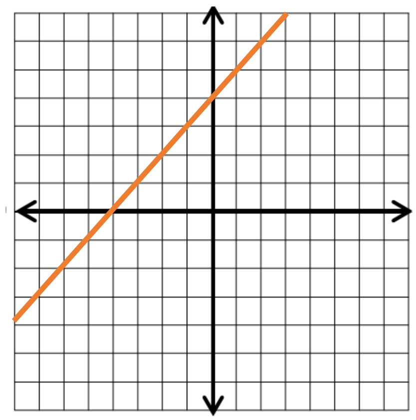
3. For this equation, ask yourself: "If I move 1 unit to the right, how much do I move up or down?" Since the coefficient of x is -5, you would move down 5 units. This means the slope is -5.

4. To find the slope for two given points, use the formula: $m = \frac{y_2-y_1}{x_2-x_1}$. Plugging in the given points: $m = \frac{0-6}{5-2} = \frac{-6}{3} = -2$. The slope is -2.

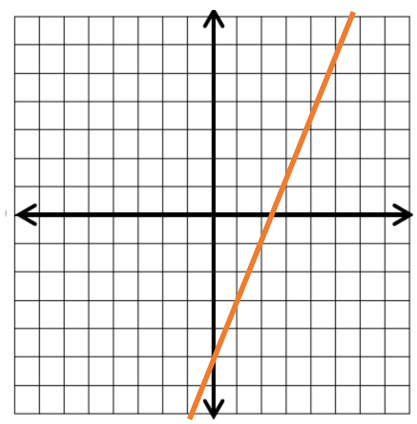
5. Consider the difference in y −values and divide it by the difference in x −values. Here, the change in y is -3 (from 3 to 0) and the change in x is 12 (from 8 to -4). The slope is $\frac{-3}{12}$, which simplifies to $-\frac{1}{4}$.

6. To find the slope of the line passing through two points, use the slope formula: $m = \frac{y_2-y_1}{x_2-x_1}$. Plugging in these values: $m = \frac{-4-8}{-2-(-4)} = \frac{-12}{2} = -6$.

7. For this equation, our y −intercept is 4, which means the line crosses the y −axis at the point $(0,4)$. The x −intercept is -4, which means the line crosses the x −axis at the point $(-4,0)$. By connecting these two points, you get the line for $y = x + 4$.



8. In this equation, $b = -5$, so the y −intercept is at the point $(0, -5)$. The x −intercept is $\frac{5}{2}$, which means the line crosses the x −axis at the point $\left(\frac{5}{2}, 0\right)$.



9. For a line in slope-intercept form, $y = mx + b$, "m" is the slope and "b" is the y −intercept. Plugging in the given values, we get: $y = 4x + 16$.

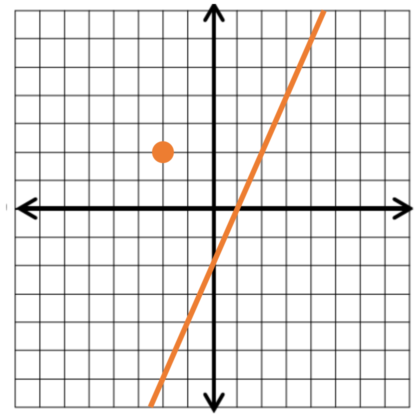
10. Given that the slope m is 3 and the line passes through the point $(1,5)$, we can substitute these values into the equation to solve for b: $5 = 3(1) + b$. Subtracting 3 from each side to solve for b: $b = 2$. So, the y −intercept b is 2. Given the slope $m = 3$ and y −intercept $b = 2$, the equation of the line is: $y = 3x + 2$.

11. To find the y −intercept, b, we can substitute the given point and slope into the equation $y = mx + b$: $7 = -5(-2) + b$, $7 = 10 + b$. Now, subtract 10 from both sides to solve for b: $b = -3$. Thus, the y −intercept b is -3. Given the slope $m = -5$ and y −intercept $b = -3$, the equation of the line is: $y = -5x - 3$.

12. We'll substitute the provided point and slope into the equation $y = mx + b$ to solve for b, the y −intercept. $2 = -4(-6) + b$, $2 = 24 + b$. Now, subtract 24 from each side to determine b: $b = -22$. Thus, the y −intercept b is -22. With a slope $m = -4$ and y −intercept $b = -22$, the equation of the line becomes: $y = -4x - 22$.

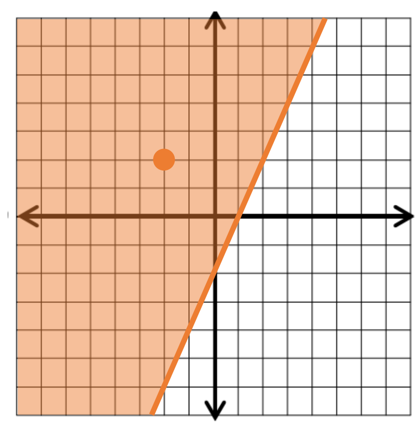
13. To determine the y −intercept b, we can substitute in the given point and slope into our equation: $-6 = -3(-3) + b \Rightarrow -6 = 9 + b$. Subtract 9 from each side to solve for b: $b = -15$. Given the slope $m = -3$ and y −intercept $b = -15$, the equation of the line is: $y = -3x - 15$.

14. In order to draw the area related to the given inequality, first we draw the equation of the line corresponding to $y = 2x - 2$. As follows:

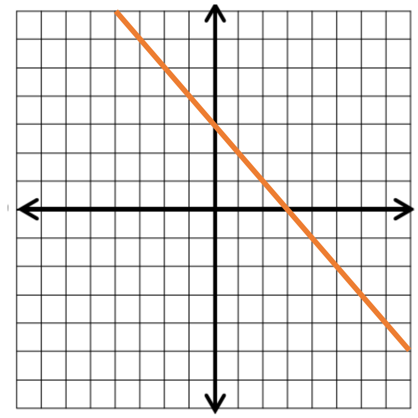


Now, according to the inequality sign i.e., $>$, we use dashed line.

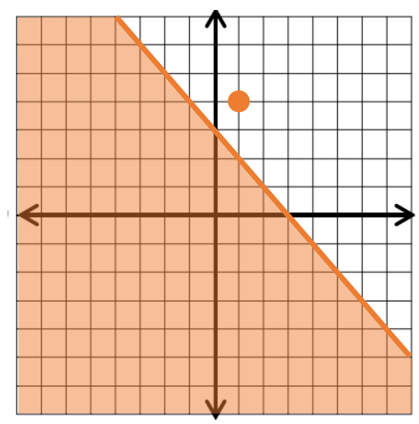
Finally, to determine the area, we place a point on one side of the line in the inequality. For example: $(-2,2)$. If the point in the inequality applies, the region in which the point is located is the appropriate solution set. Otherwise, we determine the other side of the line as the answer set. Then we have: $(-2,2) \Rightarrow 2 > 2(-2) - 2 \Rightarrow 2 > -6$.



15. Draw the line $y = -x + 3$.



Since the inequality sign is $<$, use a dashed line to display. To determine the area, put some points in the equation. Like the point $(1,4)$. So, we have: $(1,4) \Rightarrow 4 \nless -1 + 3$. It is not true. So, the other side of the line is the right area.



16. The formula for the midpoint is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$. For these points: $M = \left(\frac{5+1}{2}, \frac{0+4}{2}\right) = (3,2)$.

17. $M = \left(\frac{2+4}{2}, \frac{3+7}{2}\right) = (3,5)$. This is the center point along the segment from $(2,3)$ to $(4,7)$.

18. $M = \left(\frac{8+2}{2}, \frac{1+5}{2}\right) = (5,3)$. This point divides the segment from $(8,1)$ to $(2,5)$ into two equal parts.

19. $M = \left(\frac{5+3}{2}, \frac{10+6}{2}\right) = (4,8)$. This is the halfway point between the coordinates $(5,10)$ and $(3,6)$.

20. $M = \left(\frac{4-2}{2}, \frac{-1+7}{2}\right) = (1,3)$. The segment's midpoint between $(4,-1)$ and $(-2,7)$ is $(1,3)$.

21. $M = \left(\frac{2+4}{2}, \frac{-5+1}{2}\right) = (3,-2)$. $(3,-2)$ is the center point on the line segment joining $(2,-5)$ and $(4,1)$.

22. $M = \left(\frac{7-5}{2}, \frac{6+2}{2}\right) = (1,4)$. $(1,4)$ is equidistant from both $(7,6)$ and $(-5,2)$.

23. $M = \left(\frac{-2+4}{2}, \frac{8-6}{2}\right) = (1,1)$. This point divides the segment between $(-2,8)$ and $(4,-6)$ into two equal halves.

24. The formula to calculate the distance between two points (x_1, y_1) and (x_2, y_2) in a Cartesian plane is given by: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(-6+2)^2 + (8-8)^2} = \sqrt{4^2 + 0} = 4$. The distance between the points is 4 units.

25. $d = \sqrt{(14-4)^2 + (20+4)^2} = \sqrt{10^2 + 24^2} = 26$. The distance between the points is 26 units.

26. $d = \sqrt{(-5+1)^2 + (6-9)^2} = \sqrt{(-4)^2 + (-3)^2} = 5$. The distance between the points is 5 units.

27. $d = \sqrt{(4-0)^2 + (3-3)^2} = \sqrt{4^2 + 0} = 4$. The distance between the points is 4 units.

28. $d = \sqrt{(5-0)^2 + (10+2)^2} = \sqrt{5^2 + 12^2} = 13$. The distance between the points is approximately 13 units.

29. $d = \sqrt{(7-4)^2 + (-1-3)^2} = \sqrt{3^2 + (-4)^2} = 5$. The distance between the points is 5 units.

30. $d = \sqrt{(10-2)^2 + (-9-6)^2} = \sqrt{8^2 + (-15)^2} = 17$. The distance between the points is 17 units.

31. $d = \sqrt{(6-3)^2 + (-1-3)^2} = \sqrt{3^2 + (-4)^2} = 5$. The distance between the points is 5 units.

32. $d = \sqrt{(14+2)^2 + (18+12)^2} = \sqrt{16^2 + 30^2} = 34$. The distance between the points is 34 units.

33. $d = \sqrt{(12-2)^2 + (22+2)^2} = \sqrt{10^2 + 24^2} = 26$. The distance between the points is 26 units.

CHAPTER

10 Polynomials

Math topics in this chapter:

- ☑ Simplifying Polynomials
- ☑ Adding and Subtracting Polynomials
- ☑ Multiplying Monomials
- ☑ Multiplying and Dividing Monomials
- ☑ Multiplying a Polynomial and a Monomial
- ☑ Multiplying Binomials
- ☑ Factoring Trinomials

Practices

Simplify each polynomial.

1) $3(6x+4)=$
2) $5(3x-8)=$
3) $x(7x+2)+9x=$
4) $6x(x+3)+5x=$
5) $6x(3x+1)-5x=$
6) $x(3x-4)+3x^2-6=$
7) $x^2-5-3x(x+8)=$
8) $2x^2+7-6x(2x+5)=$

Add or subtract polynomials.

9) $(x^2+3)+(2x^2-4)=$
10) $(3x^2-6x)-(x^2+8x)=$
11) $(4x^3-3x^2)+(2x^3-5x^2)=$
12) $(6x^3-7x)-(5x^3-3x)=$
13) $(10x^3+4x^2)+(14x^2-8)=$
14) $(4x^3-9)-(3x^3-7x^2)=$
15) $(9x^3+3x)-(6x^3-4x)=$
16) $(7x^3-5x)-(3x^3+5x)=$

Find the products. (Multiplying Monomials)

17) $3x^2\times 8x^3=$
18) $2x^4\times 9x^3=$
19) $-4a^4b\times 2ab^3=$
20) $(-7x^3yz)\times(3xy^2z^4)=$
21) $-2a^5bc\times 6a^2b^4=$
22) $9u^3t^2\times(-2ut)=$
23) $12x^2z\times 3xy^3=$
24) $11x^3z\times 5xy^5=$
25) $-6a^3bc\times 5a^4b^3=$
26) $-4x^6y^2\times(-12xy)=$

Simplify each expression. (Multiplying and Dividing Monomials)

27) $(7x^2y^3)(3x^4y^2) =$

28) $(6x^3y^2)(4x^4y^3) =$

29) $(10x^8y^5)(3x^5y^7) =$

30) $(15a^3b^2)(2a^3b^8) =$

31) $\frac{42x^4y^2}{6x^3y} =$

32) $\frac{49x^5y^6}{7x^2y} =$

33) $\frac{63x^{15}y^{10}}{9x^8y^6} =$

34) $\frac{35x^8y^{12}}{5x^4y^8} =$

Find each product. (Multiplying a Polynomial and a Monomial)

35) $3x(5x - y) =$

36) $2x(4x + y) =$

37) $7x(x - 3y) =$

38) $x(2x^2 + 2x - 4) =$

39) $5x(3x^2 + 8x + 2) =$

40) $7x(2x^2 - 9x - 5) =$

Find each product. (Multiplying Binomials)

41) $(x - 3)(x + 3) =$

42) $(x - 6)(x + 6) =$

43) $(x + 10)(x + 4) =$

44) $(x - 6)(x + 7) =$

45) $(x + 2)(x - 5) =$

46) $(x - 10)(x + 3) =$

Factor each trinomial.

47) $x^2 + 6x + 8 =$

48) $x^2 + 3x - 10 =$

49) $x^2 + 2x - 48 =$

50) $x^2 - 10x + 16 =$

51) $2x^2 - 10x + 12 =$

52) $3x^2 - 10x + 3 =$

Answers

1) $18x + 12$
2) $15x - 40$
3) $7x^2 + 11x$
4) $6x^2 + 23x$
5) $18x^2 + x$
6) $6x^2 - 4x - 6$
7) $-2x^2 - 24x - 5$
8) $-10x^2 - 30x + 7$
9) $3x^2 - 1$
10) $2x^2 - 14x$
11) $6x^3 - 8x^2$
12) $x^3 - 4x$
13) $10x^3 + 18x^2 - 8$
14) $x^3 + 7x^2 - 9$
15) $3x^3 + 7x$
16) $4x^3 - 10x$
17) $24x^5$
18) $18x^7$
19) $-8a^5b^4$
20) $-21x^4y^3z^5$
21) $-12a^7b^5c$
22) $-18u^4t^3$
23) $36x^3y^3z$
24) $55x^4y^5z$
25) $-30a^7b^4c$
26) $48x^7y^3$
27) $21x^6y^5$
28) $24x^7y^5$
29) $30x^{13}y^{12}$
30) $30a^6b^{10}$
31) $7xy$
32) $7x^3y^5$
33) $7x^7y^4$
34) $7x^4y^4$
35) $15x^2 - 3xy$
36) $8x^2 + 2xy$
37) $7x^2 - 21xy$
38) $2x^3 + 2x^2 - 4x$
39) $15x^3 + 40x^2 + 10x$
40) $14x^3 - 63x^2 - 35x$
41) $x^2 - 9$
42) $x^2 - 36$
43) $x^2 + 14x + 40$
44) $x^2 + x - 42$
45) $x^2 - 3x - 10$
46) $x^2 - 7x - 30$
47) $(x + 4)(x + 2)$
48) $(x + 5)(x - 2)$
49) $(x - 6)(x + 8)$
50) $(x - 8)(x - 2)$
51) $(2x - 4)(x - 3)$
52) $(3x - 1)(x - 3)$

Answers and Explanations

1. Distribute the 3 to both terms inside the parenthesis: $3 \times 6x = 18x$, $3 \times 4 = 12$. The result is: $18x + 12$.

2. Multiply the 5 with every term inside the parentheses: $5 \times 3x = 15x, 5 \times (-8) = -40$. Answer: $15x - 40$.

3. First, let's handle the multiplication between x and everything inside the parenthesis, and then we'll deal with the $9x$. So, we have: $x \times 7x = 7x^2$, and $x \times 2 = 2x$. Now, combine the $2x$ and $9x$. Then, $2x + 9x = 11x$. The final answer is: $7x^2 + 11x$.

4. Start by multiplying the $6x$ to each term in the parenthesis. Then, add the resulting x term to $5x$. Then, $6x \times x = 6x^2$, and $6x \times 3 = 18x$. Add $18x$ to $5x$ to get $23x$. The result is: $6x^2 + 23x$.

5. Distribute $6x$ into the parenthesis, and afterwards subtract $5x$ from the resulting x term. $6x \times 3x = 18x^2$, and $6x \times 1 = 6x$. Now, take away $5x$ from $6x$ to get $6x - 5x = x$. Answer: $18x^2 + x$.

6. First, multiply x with the terms inside the parenthesis. Then, combine the terms. Now, $x \times 3x = 3x^2$, and $x \times (-4) = -4x$. Add the new $3x^2$ to the given $3x^2$ for a total of $3x^2 + 3x^2 = 6x^2$. Answer: $6x^2 - 4x - 6$.

7. Begin by multiplying $-3x$ with everything inside the parenthesis. Then, combine like terms. $-3x \times x = -3x^2$, and $-3x \times 8 = -24x$. Subtracting, $x^2 - 3x^2 = -2x^2$. The result is: $-2x^2 - 24x - 5$.

8. Distribute the $-6x$ to every term inside the brackets: $-6x \times 2x = -12x^2$, and $-6x \times 5 = -30x$. Combine the $2x^2$ and $-12x^2$ to get $2x^2 - 12x^2 = -10x^2$. Answer: $-10x^2 - 30x + 7$.

9. Combine the terms with the same exponent. x^2 and $2x^2$ become $3x^2$. Then, combine the constants: 3 and -4 to get -1. The final answer is: $3x^2 - 1$.

On the other hand, $(x^2 + 3) + (2x^2 - 4) = (x^2 + 2x^2) + (3 - 4) = 3x^2 - 1$.

10. Subtract the x^2 from $3x^2$ to get $2x^2$. Next, subtract $8x$ from $-6x$ which results in $(-6x) - 8x = -14x$. The result is: $2x^2 - 14x$.

11. Adding together the terms of x^3: $4x^3 + 2x^3 = 6x^3$. Then, combining the x^2 terms: $-3x^2 - 5x^2 = -8x^2$. Answer: $6x^3 - 8x^2$.

12. By subtracting the x^3 terms: $6x^3 - 5x^3 = x^3$. Then, when you subtract the x terms: $-7x - (-3x) = -7x + 3x = -4x$. The final answer is: $x^3 - 4x$.

13. The x^3 term is only in the first polynomial, so it stays as $10x^3$. Summing the x^2 terms: $4x^2 + 14x^2 = 18x^2$. The constant -8 remains as it is. Answer: $10x^3 + 18x^2 - 8$.

14. Subtracting the x^3 terms: $4x^3 - 3x^3 = x^3$. The x^2 terms term from the second polynomial is subtracted, giving $-(-7x^2) = 7x^2$. The constant -9 remains. The result is: $x^3 + 7x^2 - 9$.

15. Find the difference between the x^3 terms: $9x^3 - 6x^3 = 3x^3$. Subtract the x terms: $3x - (-4x) = 7x$. The final answer is: $3x^3 + 7x$.

16. Subtract the x^3 terms: $7x^3 - 3x^3 = 4x^3$. Now, handle the x terms: $-5x - 5x = -10x$. Answer: $4x^3 - 10x$.

17. In multiplication, the powers of like bases are added together. Multiplying the coefficients (the numbers): $3 \times 8 = 24$. For the powers of x, add the exponents: $x^2 \times x^3 = x^{2+3} = x^5$. The result is $24x^5$.

18. Multiplying terms involves multiplying their coefficients and summing the exponents of like variables. Here, we have $2 \times 9 = 18$ for the coefficients. For the x terms: $x^4 \times x^3 = x^{4+3} = x^7$. So, $18x^7$.

19. Whenever we multiply terms with the same base, we combine their exponents by adding. For the numbers: $-4 \times 2 = -8$. For the 'a' terms: $a^4 \times a = a^{4+1} = a^5$. For the '$b$' terms: $b \times b^3 = b^{1+3} = b^4$. Thus, $-8a^5b^4$.

20. Multiplication means combining powers of similar variables by summing their exponents. Numbers: $-7 \times 3 = -21$. x terms: $x^3 \times x = x^{3+1} = x^4$. y terms: $y \times y^2 = y^{1+2} = y^3$. z terms: $z \times z^4 = z^{1+4} = z^5$. Answer: $-21x^4y^3z^5$.

21. Numbers: $-2 \times 6 = -12$. a terms: $a^5 \times a^2 = a^{5+2} = a^7$. b terms: $b \times b^4 = b^{1+5} = b^5$. c remains unchanged. Thus: $-12a^7b^5c$.

22. For each variable, sum up the powers when multiplying. Numbers: $9 \times -2 = -18$. u terms: $u^3 \times u = u^{3+1} = u^4$. t terms: $t^2 \times t = t^{2+1} = t^3$. Answer: $-18u^4t^3$.

23. Variables with no shown exponent have an understood exponent of 1, and these are added to any other exponents during multiplication. Numbers: $12 \times 3 = 36$. x terms: $x^2 \times x = x^{2+1} = x^3$. y and z remain unchanged. So, $36x^3y^3z$.

24. Numbers: $11 \times 5 = 55$. x terms: $x^3 \times x = x^{3+1} = x^4$. y^5 remains as it is. z remains unchanged. Answer: $55x^4y^5z$.

25. Combine the powers of each variable by adding the exponents together. Numbers: $-6 \times 5 = -30$. a terms: $a^3 \times a^4 = a^{3+4} = a^7$. b terms: $b \times b^3 = b^{1+3} = b^4$. c remains unchanged. So: $-30a^7b^4c$.

26. Multiply coefficients and add exponents for like terms to get the result. Numbers: $-4 \times (-12) = 48$ (two negatives multiplied result in a positive). x terms: $x^6 \times x = x^{6+1} = x^7$. y terms: $y^2 \times y = y^{2+1} = y^3$. Answer: $48x^7y^3$.

27. When multiplying terms, you simply combine the like terms. Here, $7 \times 3 = 21$. For x's, when bases are the same, you add the exponents: $x^2 \times x^4 = x^{2+4} = x^6$. Similarly, for y: $y^2 \times y^3 = y^{2+3} = y^5$. The final answer is: $21x^6y^5$.

28. Combine numerical coefficients: $6 \times 4 = 24$. For the variable x: $x^3 \times x^4 = x^{3+4} = x^7$. For y: $y^2 \times y^3 = y^{2+3} = y^5$. So, $24x^7y^5$.

29. Taking the numbers first: $10 \times 3 = 30$. For x: $x^8 \times x^5 = x^{8+5} = x^{13}$. Then for y: $y^5 \times y^7 = y^{5+7} = y^{12}$. Thus, $30x^{13}y^{12}$.

30. Start with the numbers: $15 \times 2 = 30$. For the variable a: $a^3 \times a^3 = a^{3+3} = a^6$. For b: $b^2 \times b^8 = b^{2+8} = b^{10}$. So, $30a^6b^{10}$.

31. For division, divide coefficients and subtract exponents. So, $\frac{42}{6} = 7$. For x: $\frac{x^4}{x^3} = x^{4-3} = x$. For y: $\frac{y^2}{y} = y^{2-1} = y$. So, the answer is: $7xy$.

32. For the numbers: $\frac{49}{7} = 7$. For x: $\frac{x^5}{x^2} = x^{5-2} = x^3$. For y: $\frac{y^6}{y} = y^{6-1} = y^5$. Thus, $7x^3y^5$.

33. Numerically, $\frac{63}{9} = 7$. For x: $\frac{x^{15}}{x^8} = x^{15-8} = x^7$. For y: $\frac{y^{10}}{y^6} = y^{10-6} = y^4$. So, $7x^7y^4$.

34. Starting with the numbers: $\frac{35}{5} = 7$. For x: $\frac{x^8}{x^4} = x^{8-4} = x^4$. For y: $\frac{y^{12}}{y^8} = y^{12-8} = y^4$. So, the final answer is $7x^4y^4$.

35. Distribute $3x$ to both terms inside the parentheses: $3x \times 5x = 15x^2$, and $3x \times (-y) = -3xy$. Thus, $15x^2 - 3xy$.

36. Apply the distributive property: Multiplying $2x$ with $4x$, you get $8x^2$. Next, $2x$ multiplied by y results in $2xy$. So, $8x^2 + 2xy$.

37. For this, let's spread out the $7x$ to each term: For the term with x: $7x \times x = 7x^2$. For the term with $-3y$: $7x \times (-3y) = -21xy$. Answer: $7x^2 - 21xy$.

38. Now, multiply x to each term inside the brackets: $x \times 2x^2 = 2x^3$, and $x \times 2x = 2x^2$. Lastly, $x \times (-4) = -4x$. So, the result is: $2x^3 + 2x^2 - 4x$.

39. Proceed with distribution: multiplying $5x$ with $3x^2$ results in $15x^3$. With $8x$: $5x \times 8x = 40x^2$. And with 2: $5x \times 2 = 10x$. Thus, $15x^3 + 40x^2 + 10x$.

40. Again, employ the distributive method: starting with $2x^2$: $7x \times 2x^2 = 14x^3$. Then with $-9x$: $7x \times (-9x) = -63x^2$. Finally, with -5: $7x \times (-5) = -35x$. Answer: $14x^3 - 63x^2 - 35x$.

41. When multiplying binomials, the distributive property (or FOIL method) is used. Starting with the first terms: $x \times x = x^2$. Next, x times 3 gives $3x$. Then -3 times x results in $-3x$. Lastly, -3 times 3 is -9. Combining like terms, $3x$ and $-3x$ cancel out. So, $x^2 - 9$.

42. Following the pattern, $x \times x = x^2$. Multiplying the outside terms, $x \times 6 = 6x$. The inside terms, $-6 \times x = -6x$. The last terms,$-6 \times 6 = -36$. After combining, $6x$ and $-6x$ negate each other. Answer: $x^2 - 36$.

43. Begin with the first terms: $x \times x = x^2$. Then, considering the outside terms, $x \times 4 = 4x$. Moving to the inside, $10 \times x = 10x$. Lastly, the constant terms, $10 \times 4 = 40$. Combining $4x$ and $10x$, we get $14x$. Thus, $x^2 + 14x + 40$.

44. Multiplying first terms, we have $x \times x = x^2$. Outside, $x \times 7 = 7x$. Inside, $-6 \times x = -6x$. The constants, $-6 \times 7 = -42$. Merging $7x$ and $-6x$ we have x. So, $x^2 + x - 42$.

45. Starting with the first terms, $x \times x = x^2$. The outside terms result in $x \times (-5) = -5x$. For the inside, $2 \times x = 2x$. For the constant terms, $2 \times (-5) = -10$. After combination, $-5x$ and $2x$ give $-3x$. So, the result is: $x^2 - 3x - 10$.

46. Firstly, $x \times x = x^2$. For the outside terms, $x \times 3 = 3x$. Inside multiplication yields $-10 \times x = -10x$. For the constants, $-10 \times 3 = -30$. Merging $3x$ and $-10x$, we get $-7x$. So, the final answer is $x^2 - 7x - 30$.

47. To factor this trinomial, you are looking for two numbers that multiply to give 8 and add to give 6. The numbers 4 and 2 fit this criterion. Factored form: $(x + 4)(x + 2)$.

48. Here, we need numbers that multiply to give -10 and add up to 3. The numbers 5 and -2 do the trick. Factored form: $(x + 5)(x - 2)$.

49. For this trinomial, you want numbers that multiply to -48 and sum to 2. The numbers 8 and -6 fit. Factored form: $(x - 6)(x + 8)$.

50. Here, you're after numbers that multiply to give 16 and, when added, provide -10. The numbers -8 and -2 are the ones. Factored form: $(x - 8)(x - 2)$.

51. This one's a bit different as the leading coefficient is 2. To tackle this, consider the numbers that multiply to give $2 \times 12 = 24$ and sum up to -10. These numbers are -6 and -4. Now, rewrite the middle term using these numbers and factor by grouping: $2x^2 - 6x - 4x + 12$ becomes $2x(x - 3) - 4(x - 3)$. Factored form: $(2x - 4)(x - 3)$.

52. We have a non-one leading coefficient. Seek numbers multiplying to $3 \times 3 = 9$ and summing to -10. The numbers -9 and -1 work. Rewrite and group: $3x^2 - 10x + 3 = 3x^2 - 9x - x + 3$ transform to $3x(x - 3) - 1(x - 3)$. Factored form: $(3x - 1)(x - 3)$.

CHAPTER 11 Geometry and Solid Figures

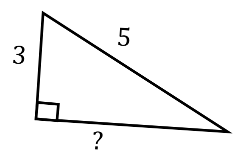
Math topics in this chapter:

- ☑ The Pythagorean Theorem
- ☑ Complementary and Supplementary angles
- ☑ Parallel lines and Transversals
- ☑ Triangles
- ☑ Special Right Triangles
- ☑ Polygons
- ☑ Circles
- ☑ Trapezoids
- ☑ Cubes
- ☑ Rectangle Prisms
- ☑ Cylinder

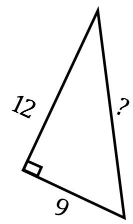
Practices

Find the missing side?

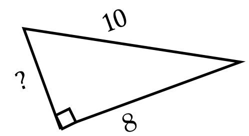
1)



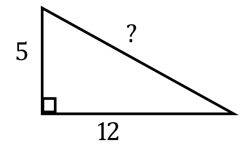
2)



3)

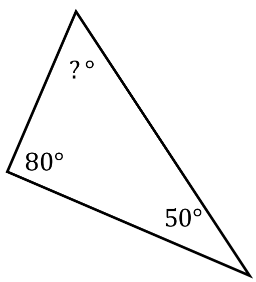


4)

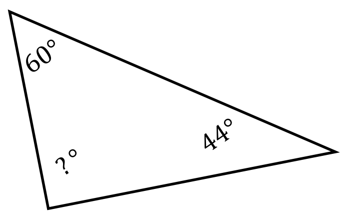


Find the measure of the unknown angle in each triangle.

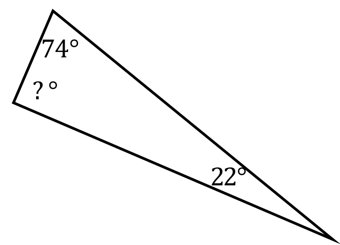
5)



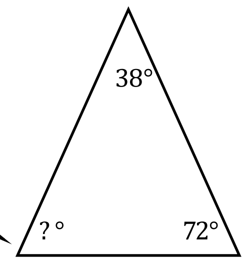
6)



7)

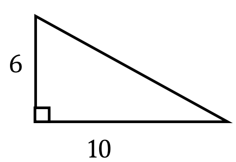


8)

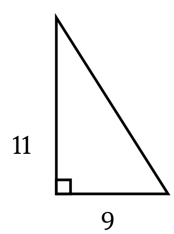


Find the area of each triangle.

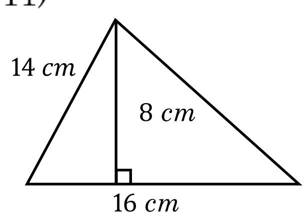
9)



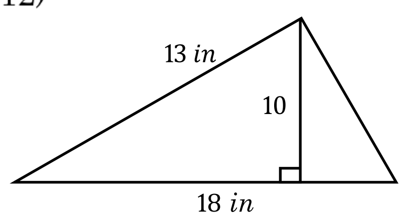
10)



11)

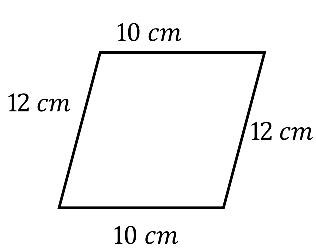


12)

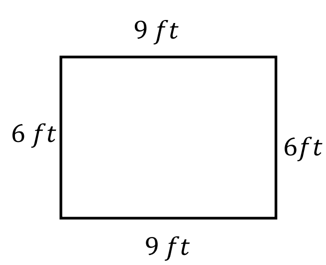


Find the perimeter or circumference of each shape.

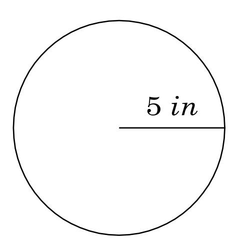
13)



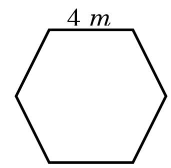
14)



15)

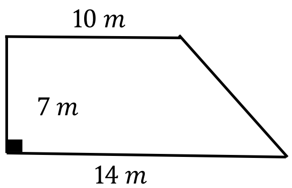


16) *regular hexagon*

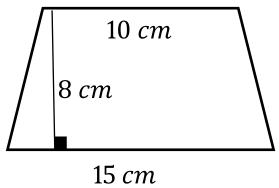


Find the area of each trapezoid.

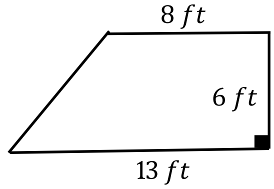
17)



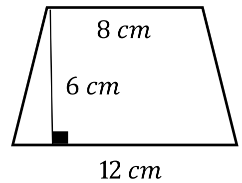
18)



19)

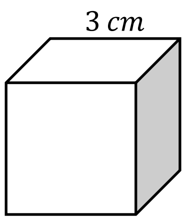


20)

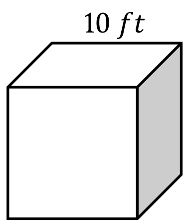


Find the volume of each cube.

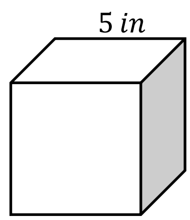
21)



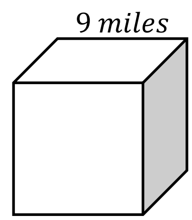
22)



23)

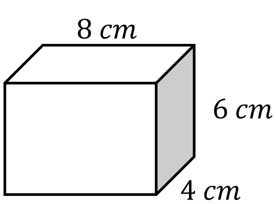


24)

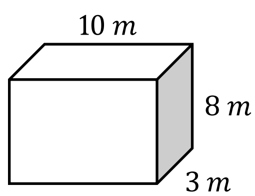


Find the volume of each Rectangular Prism.

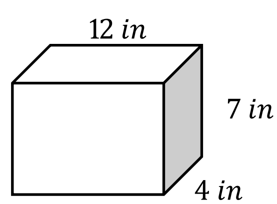
25)



26)

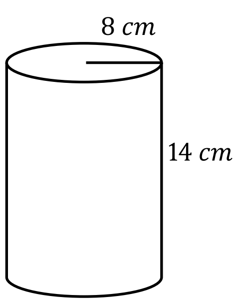


27)

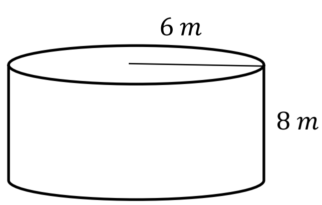


Find the volume of each Cylinder. Round your answer to the nearest tenth. ($\pi = 3.14$)

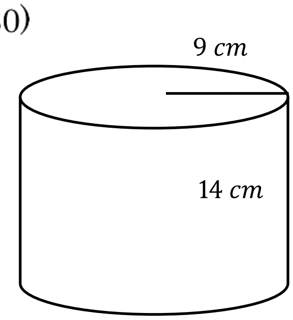
28)



29)



30)

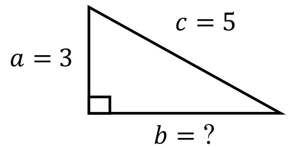


Answers

1) 4
2) 15
3) 6
4) 13
5) 50
6) 76
7) 84
8) 70
9) 30
10) 49.5
11) $64\ cm^2$
12) $90\ in^2$
13) $44\ cm$
14) $30\ ft$
15) $10\ \pi \approx 31.4\ in$
16) $24\ m$
17) $84\ m^2$
18) $100\ cm^2$
19) $63\ ft^2$
20) $60\ cm^2$
21) $27\ cm^3$
22) $1{,}000\ ft^3$
23) $125\ in^3$
24) $729\ mi^3$
25) $192\ cm^3$
26) $240\ m^3$
27) $336\ in^3$
28) $2{,}813.44\ cm^3$
29) $904.32\ m^3$
30) $3{,}560.76\ cm^3$

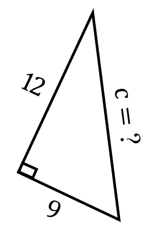
Answers and Explanations

1. The first triangle is a right triangle, which means we can use the Pythagorean theorem. This theorem states that in a right triangle, $a^2 + b^2 = c^2$. Use this formula to find side b: $5^2 = 3^2 + b^2 \Rightarrow 25 = 9 + b^2$.

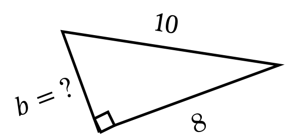


From this, $b^2 = 16$. Taking the square root of both sides, b is approximately 4.

2. Using the Pythagorean theorem: $c^2 = 9^2 + 12^2$. This simplifies to $c^2 = 81 + 144$, which is $c^2 = 225$. Taking the square root, $c = 15$.

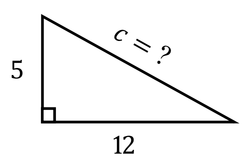


3. Applying the Pythagorean theorem: $10^2 = 8^2 + b^2$.



This results in $100 = 64 + b^2$. From this, $b^2 = 36$, and taking the square root, $b = 6$.

4. Using the theorem: $c^2 = 5^2 + 12^2$. From this equation, $25 + 144 = c^2$. This leads to $c =$



13.

5. In any triangle, the total of all angles is 180°. For the triangle shown: given angles: 80° and 50°. To find the unknown angle, subtract the sum of the given angles from 180°.

$$180^\circ - (80^\circ + 50^\circ) = 50^\circ$$

6. Subtract the sum of 60° and 44° from 180°. By performing the calculation, $180^\circ - (60^\circ + 44^\circ) = 76^\circ$. Thus, the unknown angle is 76°.

7. Find the difference between 180° and the total of 74° and 22°. After doing the math, $180^{\circ} - (74^{\circ} + 22^{\circ}) = 84^{\circ}$. This means our missing angle measures 84°.

8. To determine the third angle: deduct the sum of 38° and 72° from 180°. Working it out gives us: $180^{\circ} - (38^{\circ} + 72^{\circ}) = 70^{\circ}$.

9. The area of a triangle is given by the formula: $Area = 0.5 \times base \times height$. Here, the base is 10 units, and the height is 6 units. $Area = 0.5 \times 10 \times 6 = 30$ square units.

10. To find the area, multiply the base and height together and then divide by 2:

$Area = (9 \times 11) \div 2 = 49.5$ square units

11. In this triangle, the base measures $16\ cm$ and the height is $8\ cm$. Find the area by taking the base and height, multiplying them, and then halving the result.

$$Area = 0.5 \times 16\ cm \times 8\ cm = 64\ cm^2$$

12. To determine the area, we combine the base and height values, take their product, and then split it in two: $Area = 0.5 \times 18\ in \times 10\ in = 90\ in^2$.

13. For a parallelogram, the perimeter is the sum of all its sides. Here, two sides are $10\ cm$ each and two sides are $12\ cm$ each.

$$Perimeter = (2 \times 10\ cm) + (2 \times 12\ cm) = 20\ cm + 24\ cm = 44\ cm$$

14. For a square, all four sides are equal. Given two sides are $9\ ft$ each, and two sides are $6\ ft$ each. Therefore, $Perimeter = (2 \times 9\ ft) + (2 \times 6\ ft) = 30\ ft$.

15. Circles have a unique calculation called circumference, determined using the formula: $Circumference = 2\pi r$. Here, the radius is $5\ in$. So, we have:

$$Circumference = 2 \times \pi \times 5\ in = 10\pi\ in \approx 10 \times 3.14\ in = 31.4\ in$$

16. A regular hexagon has six equal sides. With each side being $4\ m$,

$$Perimeter = 6 \times 4\ m = 24\ m$$

17. A trapezoid's area is calculated as half the sum of its parallel sides (bases) multiplied by its height. The formula is: $Area = \frac{1}{2} \times (sum\ of\ bases) \times height$. For this shape, the bases are $10\ m$ and $14\ m$. The distance between them (height) is $7\ m$.

$$Area = 0.5 \times (10\ m + 14\ m) \times 7m = 0.5 \times 24\ m \times 7\ m = 84\ m^2$$

18. For this trapezoid, the bases are $10\ cm$ and $15\ cm$, and the height is $8\ cm$.

$$Area = 0.5 \times (10\ cm + 15\ cm) \times 8\ cm = 0.5 \times 25\ cm \times 8\ cm = 100\ cm^2$$

19. Here, the bases are $8\ ft$ and $13\ ft$, with a height of $6\ ft$.

$$Area = 0.5 \times (8\ ft + 13\ ft) \times 6\ ft = 0.5 \times 21\ ft \times 6\ ft = 63\ ft^2$$

20. For this last trapezoid, the bases are $8\ cm$ and $12\ cm$, and the height is $6\ cm$.

$$Area = 0.5 \times (8\ cm + 12\ cm) \times 6\ cm = 0.5 \times 20\ cm \times 6\ cm = 60\ cm^2$$

21. The volume of a cube is calculated by raising the length of one side to the third power. For the first cube with a side length of $3\ cm$: $Volume = 3\ cm \times 3\ cm \times 3\ cm = 27\ cm^3$.

22. For the second cube with a side length of $10\ ft$:

$$Volume = 10\ ft \times 10\ ft \times 10\ ft = 1{,}000\ ft^3$$

23. For the third cube, which is $5\ in$ on each side: $Volume = 5\ in \times 5\ in \times 5\ in = 125\ in^3$.

24. For the cube that's 9 miles on each side: $Volume = 9\ mi \times 9\ mi \times 9\ mi = 729\ mi^3$.

25. The volume of a rectangular prism is determined by multiplying its length, width, and height. For the first prism, with dimensions $8\,cm$ by $6\,cm$ by $4\,cm$: $Volume = 8\,cm \times 6\,cm \times 4\,cm = 192\,cm^3$.

26. $Volume = 10\,m \times 8\,m \times 3\,m = 240\,m^3$.

27. For the prism, having dimensions $12\,in$ by $7\,in$ by $4\,in$: $Volume = 12\,in \times 7\,in \times 4\,in = 336\,in^3$.

28. To determine the volume of a cylinder, we utilize the formula:

$$Volume\ of\ \text{a}\ Cylinder = \pi(radius)^2 \times height$$

$$Volume = 3.14 \times (8\,cm \times 8\,cm) \times 14\,cm = 3.14 \times 64\,cm^2 \times 14\,cm = 2{,}813.4\,cm^3$$

29. $Volume = 3.14 \times (6\,m \times 6\,m) \times 8\,m = 3.14 \times 36\,m^2 \times 8\,m = 904.3\,m^3$.

30. $Volume = 3.14 \times (9\,cm \times 9\,cm) \times 14\,cm = 3.14 \times 81\,cm^2 \times 14\,cm = 3{,}560.8\,cm^3$.

CHAPTER

12 Statistics

Math topics in this chapter:

- ☑ Mean, Median, Mode, and Range of the Given Data
- ☑ Pie Graph
- ☑ Probability Problems
- ☑ Permutations and Combinations

Practices

Find the values of the Given Data.

1) 6, 11, 5, 3, 6

Mode: _____ Range: _____

Mean: _____ Median: _____

2) 4, 9, 1, 9, 6, 7

Mode: _____ Range: _____

Mean: _____ Median: _____

3) 10, 3, 6, 10, 4, 15

Mode: _____ Range: _____

Mean: _____ Median: _____

4) 12, 4, 8, 9, 3, 12, 15

Mode: _____ Range: _____

Mean: _____ Median: _____

The circle graph below shows all Bob's expenses for last month. Bob spent $790 on his Rent last month.

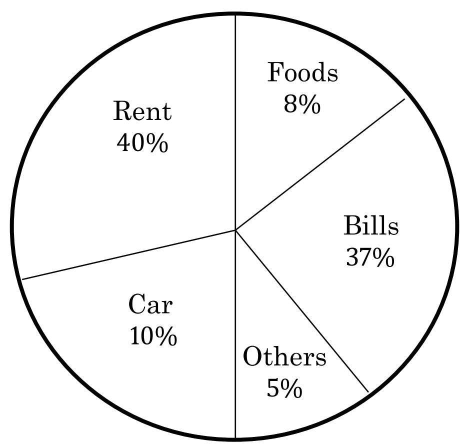
5) How much did Bob's total expenses last month? ________

6) How much did Bob spend for foods last month? ________

7) How much did Bob spend for his bills last month? ________

8) How much did Bob spend on his car last month? ________

Bob's last month expenses



Solve.

9) Bag A contains 8 red marbles and 6 green marbles. Bag B contains 5 black marbles and 7 orange marbles. What is the probability of selecting a green marble at random from bag A? What is the probability of selecting a black marble at random from Bag B?

_______________ _______________

Solve.

10) Susan is baking cookies. She uses sugar, flour, butter, and eggs. How many different orders of ingredients can she try? _______________

11) Jason is planning for his vacation. He wants to go to museum, go to the beach, and play volleyball. How many different ways of ordering are there for him? _______________

12) In how many ways can a team of 6 basketball players choose a captain and co-captain? _______________

13) How many ways can you give 5 balls to your 8 friends? _______________

14) A professor is going to arrange her 5 students in a straight line. In how many ways can she do this? _______________

15) In how many ways can a teacher chooses 12 out of 15 students? _______________

Answers

1) Mode: 6, Range: 8, Mean: 6.2, Median: 6
2) Mode: 9, Range:8, Mean: 6, Median: 6.5
3) Mode: 10, Range: 12, Mean: 8, Median: 8
4) Mode: 12, Range: 12, Mean: 9, Median: 9
5) $1,975
6) $158
7) $730.75
8) $197.50
9) $\frac{3}{7}, \frac{5}{12}$
10) 24
11) 6
12) 30 (it's a permutation problem)
13) 56 (it's a combination problem)
14) 120
15) 455 (it's a combination problem)

Answers and Explanations

1. The mode is the number that appears most frequently. For this set, 6 appears twice which is more than any other number. Thus, the mode is 6.

The range is found by subtracting the smallest number from the largest number. Here, the smallest is 3 and the largest is 11. Range: $11 - 3 = 8$.

To find the mean, sum up all the numbers and then divide by the number of numbers. In this case, the total sum is 31 and there are 5 numbers. Mean: $31 \div 5 = 6.2$.

The median is the middle value when numbers are in order. As there are 5 numbers, the third number when sorted is the median. The sorted set is 3, 5, 6, 6, 11. Median: 6.

2. Here, the number 9 appears twice, which is more frequent than any other number. Mode: 9.

With 9 as the largest and 1 as the smallest, range: $9 - 1 = 8$.

Total sum is 36, and there are 6 numbers. Mean: $36 \div 6 = 6$.

With 6 numbers, the median is the average of the third and fourth numbers when sorted. Our sorted set is 1, 4, 6, 7, 9, 9. Median: $(6 + 7) \div 2 = 6.5$.

3. The number 10 appears twice. Mode: 10.

Largest is 15 and smallest is 3. Range: $15 - 3 = 12$.

Sum is 48, and there are 6 numbers. Mean: $48 \div 6 = 8$.

Like before, it's the average of third and fourth numbers when sorted. Our sorted list is 3, 4, 6, 10, 10, 15. Median: $(6 + 10) \div 2 = 8$.

4. 12 appears twice here. Mode: 12.

Largest is 15, smallest is 3. Range: $15 - 3 = 12$.

Mean: Sum is 63 and there are 7 numbers. Mean: $63 \div 7 = 9$.

Median: As there are 7 numbers, the fourth number when sorted is the median. Sorted, it's $3, 4, 8, 9, 12, 12, 15$. Median: 9.

5. Let x be Bob's total expenses. Therefore, 40% of $x = \$790$. To represent 40% in decimal form, it is (0.40). So, $0.40x = \$790 \Rightarrow x = \$790 \div 0.40 \Rightarrow x = \$1{,}975$. Bob's total expenses last month were $\$1{,}975$.

6. 8% of $\$1{,}975$ is the amount spent on food. To find 8% in decimal form, it's 0.08: $0.08 \times \$1{,}975 = \$158$. Bob spent $\$158$ on food last month.

7. 37% of $\$1{,}975$ is the amount spent on bills. To convert 37% to decimal form, it's 0.37: $0.37 \times \$1{,}975 = \$730.75$. Bob spent $\$730.75$ on bills last month.

8. 10% of $\$1{,}975$ is the amount spent on the car. 10% in decimal form is 0.10: $0.10 \times \$1975 = \ \$197.50$. Bob spent $\$197.50$ on his car last month.

9. There are a total of $8 + 6 = 14$ marbles in Bag A. The probability of an event happening is given by the formula: $Probability = \frac{number\ of\ desired\ outcomes}{number\ of\ total\ outcomes}$. For selecting a green marble from Bag A: $p(green) = \frac{6}{14} = \frac{3}{7}$. So, the probability of selecting a green marble from Bag A is $\frac{3}{7}$.

There are a total of $5 + 7 = 12$ marbles in Bag B. For selecting a black marble from Bag B: $p(black) = \frac{5}{12}$. So, the probability of selecting a black marble from Bag B is $\frac{5}{12}$.

10. The formula for the number of permutations of n items taken k at a time is $_{n}P_{k} = \frac{n!}{(n-k)!}$. Using the permutation formula, we get: $P(4,4) = \frac{4!}{(4-4)!} = \frac{4!}{0!} = \frac{4\times3\times2\times1}{1} = 24$.

11. Consider Jason's activities as positions in a sequence: first, second, and third. For the first position, he can choose any of the 3 activities (museum, beach, or volleyball). Once he's picked the first activity, he has 2 remaining options for the second position. And for the third position, he's left with just the last unchosen activity. To find the total number of possible sequences, multiply the choices for each position together: 3 (choices for first) $\times$ 2 (choices for second) $\times$ 1 (choice for third) $= 6$ different sequences or orders for his activities.

12. When the basketball team decides to choose a captain, any of the 6 players could potentially be selected. So, there are 6 possibilities for the captain. After the captain has been chosen, only 5 players remain to be selected as the co-captain. Therefore, the total number of ways to choose both a captain and a co-captain from the team is given by multiplying the choices for each position: 6 (choices for captain) $\times$ 5 (choices for co-captain) $= 30$ different ways.

13. The number of ways to arrange these balls and dividers is the combination of 12 items, choosing 5 to be balls, or $C(8,5)$. The number of ways is thus $C(8,5) = \frac{8!}{5!3!} = \frac{8\times7\times6\times5!}{5!\times3\times2\times1} = 56$. So, there are 792 ways to distribute the 5 balls among the 8 friends.

14. When the professor arranges her 5 students in a straight line, the order in which they are placed matters. This is a permutation problem. For the first position, the professor has 5 choices (any of the 5 students). Once a student is placed in the first position, 4 students remain for the second position. For the third position, there are 3 students left. Then, 2 students for the fourth position, and finally, 1 student for the last position. To find the total number of arrangements, multiply the choices for each position:

5 (Choices for the first position) $\times$ 4 (choices for the second) $\times$ 3 (for the third) $\times$ 2 (for the fourth) $\times$ 1 (for the last) $= 5! \Rightarrow$ (5 factorial) $= 120$. Thus, the professor can arrange her 5 students in 120 different ways.

15. The number of ways to choose 12 students out of 15 is given by the combination formula: ${}_nC_r = \frac{n!}{(n-r)!}$. Plugging in our values: ${}_nC_r = C(15,12) = \frac{15!}{12!(15-12)!} = \frac{15!}{12!3!}$. When you compute this, you get: $\frac{15\times14\times13}{3\times2\times1} = 455$. So, the teacher can choose 12 students out of 15 in 455 different ways.

CHAPTER

13 Functions Operations

Math topics in this chapter:

- ☑ Function Notation and Evaluation
- ☑ Adding and Subtracting Functions
- ☑ Multiplying and Dividing Functions
- ☑ Composition of Functions

Practices

Evaluate each function.

1) $g(n) = 2n + 5$, find $g(2)$

____

2) $h(x) = 5x - 9$, find $h(4)$

____

3) $k(n) = 10 - 6n$, find $k(2)$

____

4) $g(x) = -5x + 6$, find $g(-2)$

____

5) $k(n) = -8n + 3$, find $k(-6)$

____

6) $w(n) = -2n - 9$, find $w(-5)$

____

Perform the indicated operation.

7) $f(x) = x + 6$
$g(x) = 3x + 2$
Find $(f - g)(x)$

_____

8) $g(x) = x - 9$
$f(x) = 2x - 1$
Find $(g - f)(x)$

_____

9) $h(t) = 5t + 6$
$g(t) = 2t + 4$
Find $(h + g)(x)$

_____

10) $g(a) = -6a + 1$
$f(a) = 3a^2 - 3$
Find $(g + f)(5)$

_____

11) $g(x) = 7x - 1$
$h(x) = -4x^2 + 2$
Find $(g - h)(-3)$

_____

12) $h(x) = -x^2 - 1$
$g(x) = -7x - 1$
Find $(h - g)(-5)$

_____

Perform the indicated operation.

13) $g(x) = x + 3$

$f(x) = x + 1$

Find $(g.f)(x)$

_____

14) $f(x) = 4x$

$h(x) = x - 6$

Find $(f.h)(x)$

_____

15) $g(a) = a - 8$

$h(a) = 4a - 2$

Find $(g.h)(3)$

_____

16) $f(x) = 6x + 2$

$h(x) = 5x - 1$

Find $\left(\frac{f}{h}\right)(-2)$

_____

17) $f(x) = 7a - 1$

$g(x) = -5 - 2a$

Find $\left(\frac{f}{g}\right)(-4)$

_____

18) $g(a) = a^2 - 4$

$f(a) = a + 6$

Find $\left(\frac{g}{f}\right)(-3)$

_____

Using $f(x) = 4x + 3$ and $g(x) = x - 7$, find:

19) $g(f(2)) =$_____

20) $g(f(-2)) =$_____

21) $f(g(4)) =$_____

22) $f(f(7)) =$_____

23) $g(f(5)) =$_____

24) $g(f(-5)) =$_____

25) $g(f(7)) =$ ____

26) $g(f(-3)) =$ ____

27) $f(g(-6)) =$ ____

Answers

1) 9
2) 11
3) -2
4) 16
5) 51
6) 1
7) $-2x+4$
8) $-x-8$
9) $7t+10$
10) 43
11) 12
12) -60
13) x^2+4x+3
14) $4x^2-24x$
15) -50
16) $\frac{10}{11}$
17) $-\frac{29}{3}$
18) $\frac{5}{3}$
19) 4
20) -12
21) -9
22) 127
23) 16
24) -24
25) 24
26) -16
27) -49

Answers and Explanations

1. For the function $g(n) = 2n + 5$, we want to find $g(2)$. This means we substitute 2 in place of n. Doing this, we get: $g(2) = 2(2) + 5 = 4 + 5 = 9$. So, $g(2) = 9$.

2. In the function $h(x) = 5x - 9$, to determine $h(4)$, replace x with 4. When you do: $h(4) = 5(4) - 9 = 20 - 9 = 11$. Thus, $h(4) = 11$.

3. For $k(n) = 10 - 6n$, find $k(2)$ by plugging 2 in for n: $k(2) = 10 - 6(2) = 10 - 12 = -2$. This gives $k(2) = -2$.

4. With the equation $g(x) = -5x + 6$, to ascertain $g(-2)$, input -2 as the value of x: $g(-2) = -5(-2) + 6 = 10 + 6 = 16$. So, $g(-2) = 16$.

5. Given $k(n) = -8n + 3$, when evaluating $k(-6)$, incorporate -6 for n: $k(-6) = -8(-6) + 3 = 48 + 3 = 51$. This results in $k(-6) = 51$.

6. For the function $w(n) = -2n - 9$, to solve $w(-5)$, think of it as inversely affecting the -2 coefficient: $w(-5) = -2(-5) - 9 = 10 - 9 = 1$. Thus, $w(-5) = 1$.

7. To find $(f - g)(x)$, subtract $g(x)$ from $f(x)$: $(f - g)(x) = (x + 6) - (3x + 2) = x + 6 - 3x - 2 = -2x + 4$. Thus, $(f - g)(x) = -2x + 4$.

8. To determine $(g - f)(x)$, subtract $f(x)$ from $g(x)$: $(g - f)(x) = (x - 9) - (2x - 1) = x - 9 - 2x + 1 = -x - 8$. So, $(g - f)(x) = -x - 8$.

9. To get $(h + g)(x)$, simply add the two functions: $(h + g)(x) = (5t + 6) + (2t + 4) = 7t + 10$. This implies $(h + g)(t) = 7t + 10$.

10. For $g(a) = -6a + 1$ and $f(a) = 3a^2 - 3$. To find $(g + f)(5)$, first get $g(5)$ and $f(5)$, then add: $g(5) = -6(5) + 1 = -30 + 1 = -29$, and $f(5) = 3(5^2) - 3 = 75 - 3 = 72$. Since we know that $(g + f)(a) = g(a) + f(a)$, adding these together:

$$(g + f)(5) = g(5) + f(5) = -29 + 72 = 43$$

Thus, $(g + f)(5) = 43$.

11. With $g(x) = 7x - 1$ and $h(x) = -4x^2 + 2$. To calculate $(g - h)(-3)$, use the formula $(g - h)(x) = g(x) - h(x)$. Next, evaluate $g(-3)$ and $h(-3)$. Then, subtract: $g(-3) = 7(-3) - 1 = -21 - 1 = -22$, and $h(-3) = -4(-3^2) + 2 = -4(9) + 2 = -36 + 2 = -34$. Subtracting: $-22 - (-34) = 12$. So, $(g - h)(-3) = 12$.

12. To determine $(h - g)(-5)$, evaluate $h(-5)$ and $g(-5)$, then subtract: $h(-5) = -(-5^2) - 1 = -25 - 1 = -26$, and $g(-5) = -7(-5) - 1 = 35 - 1 = 34$. Subtracting: $-26 - 34 = -60$. Hence, $(h - g)(-5) = -60$.

13. To find the product, simply multiply $g(x)$ and $f(x)$ together:

$$(g \times f)(x) = g(x) \times f(x) = (x + 3)(x + 1) = x^2 + 4x + 3$$

14. Multiply the functions: $(f \times h)(x) = 4x(x - 6)$. Expanding: $4x^2 - 24x$. So, $(f \times h)(x) = 4x^2 - 24x$.

15. First, compute $g(3)$ and $h(3)$: $g(3) = 3 - 8 = -5$, and $h(3) = 4(3) - 2 = 10$. Now, multiply the results: $(g \times h)(3) = g(3) \times h(3) = (-5)(10) = -50$.

16. First, we need to find $f(-2)$ and $h(-2)$: $f(-2) = 6(-2) + 2 = -12 + 2 = -10$, and $h(-2) = 5(-2) - 1 = -10 - 1 = -11$. Now, divide $f(-2)$ by $h(-2)$:

$$\left(\frac{f}{h}\right)(-2) = \frac{f(-2)}{h(-2)} = \frac{-10}{-11} = \frac{10}{11}$$

17. Find $f(-4)$ and $g(-4)$: $f(-4) = 7(-4) - 1 = -28 - 1 = -29$, and $g(-4) = -5 - 2(-4) = -5 + 8 = 3$. Divide $f(-4)$ by $g(-4)$: $\left(\frac{f}{g}\right)(-4) = \frac{f(-4)}{g(-4)} = \frac{-29}{3} = -\frac{29}{3}$.

18. Find $g(-3)$ and $f(-3)$: $g(-3) = (-3)^2 - 4 = 9 - 4 = 5$, and $f(-3) = (-3) + 6 = 3$. Now, divide $g(-3)$ by $f(-3)$: $\left(\frac{g}{f}\right)(-3) = \frac{g(-3)}{f(-3)} = \frac{5}{3}$.

19. First, find $f(2)$: $f(2) = 4(2) + 3 = 8 + 3 = 11$. Now, plug this into $g(x)$: $g(11) = 11 - 7 = 4$. So, $g(f(2)) = 4$.

20. First, find $f(-2)$: $f(-2) = 4(-2) + 3 = -8 + 3 = -5$. Now, plug this into $g(x)$: $g(-5) = -5 - 7 = -12$. Thus, $g(f(-2)) = -12$.

21. Starting with $g(4)$: $g(4) = 4 - 7 = -3$. Using this in $f(x)$: $f(-3) = 4(-3) + 3 = -12 + 3 = -9$. Thus, $f(g(4)) = -9$.

22. For the inner $f(7)$: $f(7) = 4(7) + 3 = 28 + 3 = 31$. Now, for $f(31)$: $f(31) = 4(31) + 3 = 124 + 3 = 127$. Hence, $f(f(7)) = 127$.

23. Evaluate $f(5)$ first: $f(5) = 4(5) + 3 = 20 + 3 = 23$. Then, use this result in $g(x)$: $g(23) = 23 - 7 = 16$. So, $g(f(5)) = 16$.

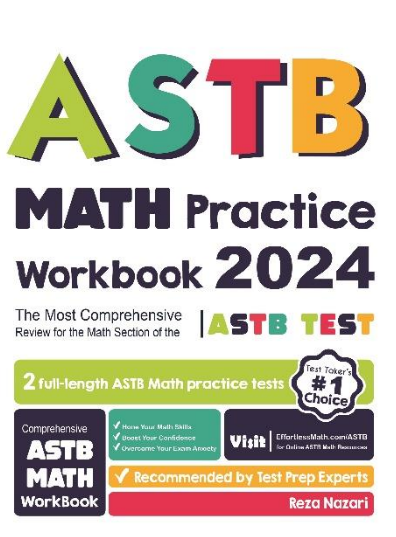
24. Firstly, calculate $f(-5)$: $f(-5) = 4(-5) + 3 = -20 + 3 = -17$. Now, find $g(-17)$: $g(-17) = -17 - 7 = -24$. Thus, $g(f(-5)) = -24$.

25. First, find $f(7)$: $f(7) = 4(7) + 3 = 28 + 3 = 31$. $g(31) = 31 - 7 = 24$. So, $g(f(7)) = 24$.

26. Compute $f(-3)$: $f(-3) = 4(-3) + 3 = -12 + 3 = -9$. Then, use this in $g(x)$: $g(-9) = -9 - 7 = -16$. Therefore, $g(f(-3)) = -16$.

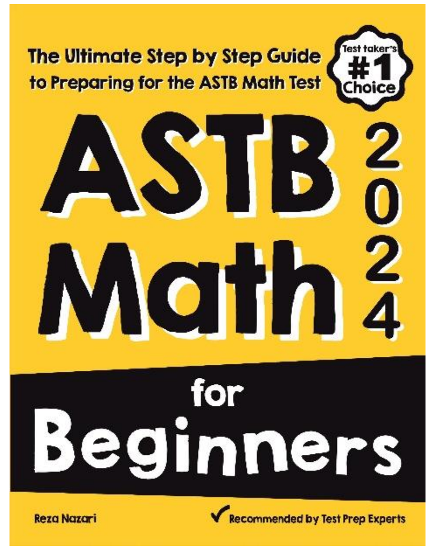
27. Start with $g(-6)$: $g(-6) = -6 - 7 = -13$. With this, find $f(-13)$: $f(-13) = 4(-13) + 3 = -52 + 3 = -49$. Hence, $f\left(g(-6)\right) = -49$.

Most Popular ASTB Math Books!



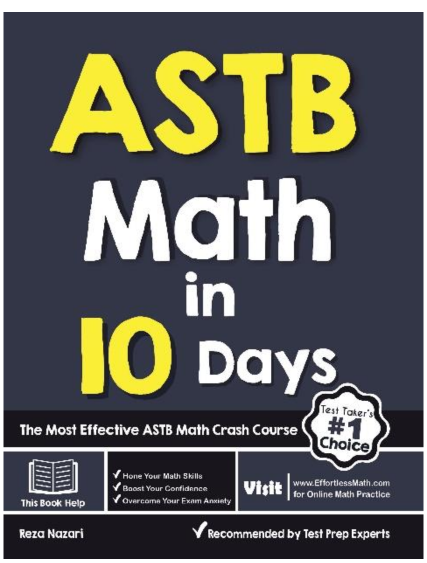
Download at

Download



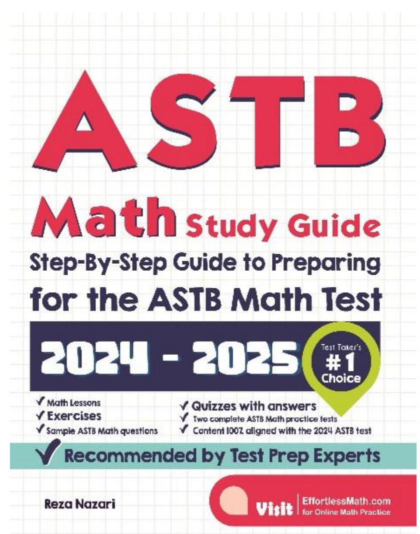
Download at

Download



Download at

Download



Download at

Download

Effortless Math's ASTB Online Center

… So Much More Online!

Effortless Math Online ASTB Center offers a complete study program, including the following:

- ✓ Step-by-step instructions on how to prepare for the ASTB Math test
- ✓ Numerous ASTB Math worksheets to help you measure your math skills
- ✓ Complete list of ASTB Math formulas
- ✓ Video lessons for all ASTB Math topics
- ✓ Full-length ASTB Math practice tests
- ✓ And much more…

No Registration Required.

Visit EffortlessMath.com/ASTB to find your online ASTB Math resources.

ASTB Math for Beginners

A Comprehensive ASTB Math Prep Book!

The perfect guide for students of every level, ***ASTB Math for Beginners*** will help you incorporate the most effective methods and all the right strategies to get ready for your ASTB Math test!
ASTB Math for Beginners creates confident, knowledgeable students that have all the skills they need to succeed on the ASTB. It builds a solid foundation of mathematical concepts through easy-to-understand lessons and basic study guides. Not only does this all-inclusive study guide offer everything you will ever need to conquer the ASTB Math test, but it also contains two full-length and realistic ASTB Math tests that reflect the format and question types on the ASTB to help you check your exam-readiness and identify where you need more practice.
With this book, students will learn math through structured lessons, complete with a study guide for each segment to help understand and retain concepts after the lesson is complete. It includes everything from:

- ☑ Content 100% aligned with the **2024 ASTB test**
- ☑ Written by a ASTB Math tutor and test expert
- ☑ **Complete coverage of all ASTB Math concepts** and topics on the 2024 ASTB test
- ☑ **Step-by-step guide** for all ASTB Math topics
- ☑ Over 500 additional ASTB math practice questions in both multiple-choice and grid-in formats with answers grouped by topic (so you can focus on your weak areas)
- ☑ Abundant Math skills building exercises to help test-takers approach unfamiliar question types
- ☑ **2 full-length practice tests** (featuring new question types) with detailed answers
- ☑ And much more!

The Most Effective ASTB Math Study Guide

Test Taker's #1 Choice

This Book Will Help You

- ✓ Hone Your Math Skills
- ✓ Boost Your Confidence
- ✓ Overcome Your Exam Anxiety

Visit EffortlessMath.com/ASTB for Online ASTB Math Resources