Basic Skills Test Practice Problems

The Basic Skills Test consists of 25 problems that are similar to, but not limited to, the following sample problems. The actual exam questions do not have multiple parts. A passing score is 80% (20 correct). Calculators are NOT permitted on this test.

1. Add, subtract whole numbers
   a. $1428 + 532 = 1960$
   b. $1428 - 1539 = -111$
   c. $6523 - 734 = 5789$
   d. $3217 - 234 = 2983$
   e. $4343 - 654 = 3689$
   f. $3253 + 754 = 4007$
   g. $1756 - 374 = 1382$
   h. $5523 - 734 = 4789$
   i. $6553 - 674 = 5879$
   j. $5453 - 774 = 4679$

2. Multiply, divide whole numbers
   In cases with division, your first step can be to write your problem as a fraction, then reduce the fraction before using long division.
   a. $8428 \div 28 = 301$
   b. $68 \times 135 = 9180$
   c. $1035 \div 45 = 23$
   d. $1575 \div 63 = 25$
   e. $1368 \div 24 = 57$
   f. $2562 \div 42 = 61$
   g. $3060 \div 85 = 36$
   h. $4960 \div 31 = 160$
   i. $2331 \div 63 = 37$
   j. $103 \times 45 = 4635$

3. Add, subtract simple fractions
   Step 1: Rewrite fractions so they have a common denominators
   Step 2: Add the numerators only, and use the common denominator
   Step 3: Reduce the fraction if necessary

   a. $\frac{2}{3}+\frac{5}{8}-\frac{1}{2}=\frac{2}{3}\cdot\frac{8}{8}+\frac{5}{8}\cdot\frac{3}{3}-\frac{1}{2}\cdot\frac{12}{12}=\frac{16}{24}+\frac{15}{24}-\frac{12}{24}=\frac{19}{24}$

   b. $\frac{5}{6}+\frac{3}{4}+\frac{2}{3}=\frac{5}{6}\cdot\frac{2}{2}+\frac{3}{4}\cdot\frac{3}{3}+\frac{2}{3}\cdot\frac{4}{4}=\frac{10}{12}+\frac{9}{12}+\frac{8}{12}=\frac{27}{12}=\frac{9}{4}$ or $2\frac{1}{4}$

   c. $\frac{3}{8}+\frac{1}{2}-\frac{1}{6}=\frac{3}{8}\cdot\frac{3}{3}+\frac{1}{2}\cdot\frac{12}{12}-\frac{1}{6}\cdot\frac{4}{4}=\frac{9}{24}+\frac{12}{24}-\frac{4}{24}=\frac{17}{24}$

   d. $\frac{2}{5}+\frac{3}{4}-\frac{1}{3}=\frac{2}{5}\cdot\frac{12}{12}+\frac{3}{4}\cdot\frac{15}{15}-\frac{1}{3}\cdot\frac{20}{20}=\frac{24}{60}+\frac{45}{60}-\frac{20}{60}=\frac{49}{60}$

   e. $\frac{7}{8}+\frac{3}{4}-\frac{11}{12}=\frac{7}{8}\cdot\frac{3}{3}+\frac{3}{4}\cdot\frac{6}{6}-\frac{11}{12}\cdot\frac{2}{2}=\frac{21}{24}+\frac{18}{24}-\frac{22}{24}=\frac{17}{24}$

   f. $\frac{17}{10}-\frac{2}{3}-\frac{7}{15}=\frac{17}{10}\cdot\frac{3}{3}-\frac{2}{3}\cdot\frac{10}{10}-\frac{7}{15}\cdot\frac{2}{2}=\frac{51}{30}-\frac{20}{30}-\frac{14}{30}=\frac{17}{30}$

   g. $-\frac{3}{8}-\frac{3}{5}+\frac{5}{4}=-\frac{3}{8}\cdot\frac{5}{5}-\frac{3}{5}\cdot\frac{8}{8}+\frac{5}{4}\cdot\frac{10}{10}=-\frac{15}{40}-\frac{24}{40}+\frac{50}{40}=\frac{11}{40}$

   h. $\frac{7}{10}-\frac{3}{4}+\frac{3}{8}=\frac{7}{10}\cdot\frac{4}{4}-\frac{3}{4}\cdot\frac{10}{10}+\frac{3}{8}\cdot\frac{5}{5}=\frac{28}{40}-\frac{30}{40}+\frac{15}{40}=\frac{13}{40}$

   i. $\frac{3}{5}+\frac{7}{10}-\frac{13}{20}=\frac{3}{5}\cdot\frac{4}{4}+\frac{7}{10}\cdot\frac{2}{2}-\frac{13}{20}=\frac{12}{20}+\frac{14}{20}-\frac{13}{20}=\frac{13}{20}$

   j. $\frac{5}{9}-\frac{3}{4}-\frac{5}{12}=\frac{5}{9}\cdot\frac{4}{4}-\frac{3}{4}\cdot\frac{9}{9}-\frac{5}{12}\cdot\frac{3}{3}=\frac{20}{36}-\frac{27}{36}-\frac{15}{36}=-\frac{22}{36}=-\frac{11}{18}$

4. Add, subtract mixed numbers (leave answer as a mixed number)

The method below is to help avoid using improper fractions with large numerators. It is only one of many ways that you can solve the problem, and many of you can do these with fewer steps.

Step 1: Group whole numbers together and fractional parts together.
Step 2: Add/subtract each group. Add/subtract the fractional part as in practice problem #3 (step not shown below).
Step 3: Combine the whole part and the fractional part back together again.

a. $248\frac{1}{3}+14\frac{5}{6}=(248+14)+\left(\frac{1}{3}+\frac{5}{6}\right)=262+\frac{7}{6}=262+1\frac{1}{6}=263\frac{1}{6}$

b. $114\frac{3}{4}+205\frac{1}{3}=(114+205)+\left(\frac{3}{4}+\frac{1}{3}\right)=319+\frac{13}{12}=319+1\frac{1}{12}=320\frac{1}{12}$

c. $193\frac{1}{3}-28\frac{1}{2}=(193-28)+\left(\frac{1}{3}-\frac{1}{2}\right)=165+\left(-\frac{1}{6}\right)=(164+1)+\left(-\frac{1}{6}\right)=\left(164+\frac{6}{6}\right)+\left(-\frac{1}{6}\right)=164+\left(\frac{6}{6}-\frac{1}{6}\right)=164+\frac{5}{6}=164\frac{5}{6}$

d. $413\frac{2}{5}-117\frac{1}{2}=(413-117)+\left(\frac{2}{5}-\frac{1}{2}\right)=296+\left(-\frac{1}{10}\right)=(295+1)+\left(-\frac{1}{10}\right)=\left(295+\frac{10}{10}\right)+\left(-\frac{1}{10}\right)=295+\left(\frac{10}{10}-\frac{1}{10}\right)=295+\frac{9}{10}=295\frac{9}{10}$

e. $52\frac{1}{2}-23\frac{2}{5}=(52-23)+\left(\frac{1}{2}-\frac{2}{5}\right)=29+\frac{1}{10}=29\frac{1}{10}$

f. $53\frac{2}{7}-35\frac{1}{2}=(53-35)+\left(\frac{2}{7}-\frac{1}{2}\right)=18+\left(-\frac{3}{14}\right)=(17+1)+\left(-\frac{3}{14}\right)=\left(17+\frac{14}{14}\right)+\left(-\frac{3}{14}\right)=17+\left(\frac{14}{14}-\frac{3}{14}\right)=17+\frac{11}{14}=17\frac{11}{14}$

g. $68\frac{4}{5}-29\frac{3}{4}=(68-29)+\left(\frac{4}{5}-\frac{3}{4}\right)=39+\frac{1}{20}=39\frac{1}{20}$

h. $73\frac{2}{3}-25\frac{4}{7}=(73-25)+\left(\frac{2}{3}-\frac{4}{7}\right)=48+\left(\frac{2}{21}\right)=48\frac{2}{21}$

i. $83\frac{1}{4}-37\frac{1}{3}=(83-37)+\left(\frac{1}{4}-\frac{1}{3}\right)=46+\left(-\frac{1}{12}\right)=(45+1)+\left(-\frac{1}{12}\right)=\left(45+\frac{12}{12}\right)+\left(-\frac{1}{12}\right)=45+\left(\frac{12}{12}-\frac{1}{12}\right)=45+\frac{11}{12}=45\frac{11}{12}$

j. $53\frac{3}{5}-64\frac{5}{6}=(53-64)+\left(\frac{3}{5}-\frac{5}{6}\right)=-11+\left(-\frac{7}{30}\right)=-11\frac{7}{30}$

5. Add, subtract integers

The procedure is to rewrite without the parentheses and change numbers affected by negatives. Then, add or subtract from left to right.

a. $45+(-34)+(-75)=45-34-75=11-75=-64$
b. $-53-(-32)=-53+32=-21$
c. $124+(-43)-27=124-43-27=81-27=54$
d. $-15+12-(-73)=-15+12+73=-3+73=70$
e. $-23+(-31)-(-73)=-23-31+73=-54+73=19$
f. $-15+12-72=-3-72=-75$
g. $16-34-(-72)=16-34+72=-18+72=54$
h. $115-12+(-43)=115-12-43=103-43=60$
i. $-45+15-(-23)=-45+15+23=-30+23=-7$
j. $-15+15-(-23)=-15+15+23=0+23=23$

6. Add, subtract decimals

The procedure is to align the decimals if you are solving this in a vertical format. Many students prefer to include additional zeros to help with the alignment.

a. $0.510-0.013=0.497$
b. $2.800-1.007=1.793$
c. $35.00-0.73=34.27$
d. $0.0530-0.0084+0.0309=0.0755$
e. $0.2000+0.0300+0.0007=0.2307$
f. $0.1400+0.3000-0.0071=0.4329$
g. $0.270+0.093-0.303=0.06$
h. $0.700+2.093-1.030=1.763$
i. $1.270+0.093-0.301=1.062$
j. $0.127-0.930+0.323=-0.48$
k. $0.200+1.093-0.030=1.263$
l. $0.056+0.930-0.203=0.783$

7. Multiply, divide fractions (reduce to lowest terms)

Step 1: If necessary, change the fraction following a division symbol to a product with the reciprocal (for example, see #7e below.)

Step 2: Reduce factors in the numerator with common factors in the denominator.

Step 3: Multiply the numerators together and multiply the denominators together.

Note: You could first multiply across and then reduce, but your numbers will be very large.

Below, the intermediate step shows reduction. Try to see how the factors divided out as you work each problems.

a. $\frac{4}{5}\times\frac{20}{7}\times\frac{7}{16}=\frac{1}{1}\times\frac{1}{1}\times\frac{1}{1}=\frac{1}{1}=1$

b. $\frac{2}{3}\times\frac{6}{5}\times\frac{11}{12}=\frac{1}{1}\times\frac{1}{5}\times\frac{11}{3}=\frac{11}{15}$

c. $\frac{4}{7}\times\frac{4}{3}\times\frac{11}{4}=\frac{4}{7}\times\frac{1}{3}\times\frac{11}{1}=\frac{44}{21}$

d. $\frac{10}{7}\times\frac{4}{5}\times\frac{14}{8}=\frac{1}{1}\times\frac{1}{1}\times\frac{2}{1}=\frac{2}{1}=2$

e. $\frac{3}{4}\div\frac{7}{5}=\frac{3}{4}\times\frac{5}{7}=\frac{15}{28}$

f. $\frac{7}{5}\div\frac{3}{4}=\frac{7}{5}\times\frac{4}{3}=\frac{28}{15}$

g. Divide $\frac{7}{5}$ into $\frac{3}{4}$. Same as 7e.

h. $\frac{10}{3}\div\frac{3}{2}\times\frac{5}{18}=\frac{10}{3}\times\frac{2}{3}\times\frac{5}{18}=\frac{10}{3}\times\frac{1}{3}\times\frac{5}{9}=\frac{50}{81}$

i. $\frac{2}{5}\times\frac{3}{4}\div\frac{3}{20}=\frac{2}{5}\times\frac{3}{4}\times\frac{20}{3}=\frac{2}{1}\times\frac{1}{1}\times\frac{1}{1}=\frac{2}{1}=2$

j. $\frac{3}{4}\div\frac{3}{20}\times\frac{4}{5}=\frac{3}{4}\times\frac{20}{3}\times\frac{4}{5}=\frac{1}{1}\times\frac{1}{1}\times\frac{4}{1}=\frac{4}{1}=4$

k. $\frac{2}{5}\times\frac{7}{8}\div\frac{14}{25}=\frac{2}{5}\times\frac{7}{8}\times\frac{25}{14}=\frac{1}{1}\times\frac{1}{8}\times\frac{5}{1}=\frac{5}{8}$

l. $\frac{2}{3}\div\frac{6}{5}\div\frac{3}{20}=\frac{2}{3}\times\frac{5}{6}\times\frac{20}{3}=\frac{1}{3}\times\frac{5}{3}\times\frac{20}{3}=\frac{100}{27}$

m. $\frac{10}{3}\div\frac{3}{4}\div\frac{5}{3}=\frac{10}{3}\times\frac{4}{3}\times\frac{3}{5}=\frac{2}{3}\times\frac{4}{1}\times\frac{1}{1}=\frac{8}{3}$

n. Divide $\frac{3}{4}$ into $\frac{7}{5}$. Same as 7f.

8. Multiply, divide integers

Step 1: Multiply or divide (reduce). Be careful with the negatives.

Step 2: Complete the problem as done in practice problem #5 above.

a. $(-3)(-1)+(-2)(2)=3-4=-1$

b. $(-4)(2)-(-3)(-2)=-8-6=-14$

c. $(1)(-5)+(-2)(0)=-5+0=-5$

d. $-\frac{16}{4(-2)}=\frac{-16}{-8}=2$

e. $\frac{36}{-4(-3)}=\frac{36}{12}=3$

f. $(-10)(2)-3(7)=-20-21=-41$

g. $(-6)(-2)-(9)(-3)=12+27=39$

h. $(3)(-6)+(-3)(20)=-18-60=-78$

i. $(-5)(-4)-(-2)(10)=20+20=40$

j. $(5)(-4)-(-2)(11)=-20+22=2$

9. Multiply, divide decimals

You must know how to do these exercises without a calculator. Review long division. For many division questions, consider converting the question to a fraction, reduce the fraction, then use long division with smaller numbers. There are many online resources to remind you how to multiply and divide decimals as well as the long division algorithm.

a. $2.16\times6.7=14.472$

b. $0.7452\div0.36=2.07$

c. $0.04935\div0.21=0.235$

d. $0.015\times117.5=1.7625$

e. $1603.8\div121.5=13.2$

f. $1788.5\div122.5=14.6$

g. $1403.75\div112.3=12.5$

h. $1593.9\div103.5=15.4$

i. $1629.25\div122.5=13.3$

j. $14.8\times13.25=196.1$

10. Simplify an expression involving exponents

Simplify each according to the order of operations:

1. Parentheses and other grouping symbols
2. Exponents
3. Multiplication and division from left to right
4. Addition and subtraction from left to right

a. $2^5+3^2=32+9=41$

b. $(2^3+3)^2=(8+3)^2=11^2=121$

c. $2^3-3^2=8-9=-1$

d. $(2^4)(3^3)=(16)(27)=432$

e. $(3^2\times3^3)+3=(9\times27)+3=243+3=246$

f. $8^2-2^4+1^{13}=64-16+1=49$

g. $(5-2)^2-2^4-3^2=3^2-2^4-3^2=9-16-9=-16$

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

i. $(-8)^2+2^4-1^3=64+16-1=79$

j. $-2^2-2^4+2^0=-4-16+1=-19$

k. $3^2+2^3-(10-7)^2=3^2+2^3-3^2=2^3=8$

l. $-2^2+4^3-(9-7)^2=-4+64-2^2=60-4=56$

11. Simplify an expression using order of operations

Simplify each according to the order of operations as in #10.

a. $21 + 11 \times 0 = 21 + 0 = 21$

b. $(21 + 11) \times 0 = 32 \times 0 = 0$

c. $21 + (11 \times 0) = 21 + 0 = 21$

d. $15 + 2 \times 7 = 15 + 14 = 29$

e. $4 \div 2 \times 8 + 3 = 2 \times 8 + 3 = 16 + 3 = 19$

f. $4 \times 2 \div 8 = 8 \div 8 = 1$

g. $24 \div (5 - 2) \times 11 = 24 \div 3 \times 11 = 8 \times 11 = 88$

h. $12 \div (6 - 2) \times 7 = 12 \div 4 \times 7 = 3 \times 7 = 21$

i. $4 \div (-5 + 2) \times 12 = 4 \div (-3) \times 12 = \frac{4}{-3} \times \frac{12}{1} = \frac{4}{-1} \times \frac{4}{1} = -16$

j. $20 \div (-2 + 4) \times 3 - 1 = 20 \div 2 \times 3 - 1 = 10 \times 3 - 1 = 30 - 1 = 29$

k. $2 - 24(5 - 4) + 10^2 = 2 - 24(1) + 100 = 2 - 24 + 100 = -22 + 100 = -78$

12. Ordering of rational numbers: Which of the following is greater?

a. $\frac{13}{14}, \frac{14}{15}$ Since $\frac{1}{14} > \frac{1}{15}$, $\frac{13}{14}$ is further from 1. Therefore, $\frac{14}{15}$ is greater.

b. $\frac{11}{12}, \frac{7}{8}$ Since $\frac{1}{12} < \frac{1}{8}$, $\frac{7}{8}$ is further from 1. Therefore, $\frac{11}{12}$ is greater.

c. $\frac{118}{203}, \frac{117}{200}$ Here it is easy to use a common denominator for comparison. $\frac{118}{203} \cdot \frac{200}{200} = \frac{23{,}600}{(203)(200)}$, while $\frac{117}{200} \cdot \frac{203}{203} = \frac{23{,}751}{(203)(200)}$. Since 23,600 < 23,751 then $\frac{117}{200}$ is greater. Note: to save time, don't multiply out the denominators.

d. $\frac{23}{31}, 0.75$ Multiply both by 31 and compare. $\frac{23}{31} \times 31 = 23$, while $0.75 \times 31 = 23.25$. Therefore, 0.75 is greater.

e. $\frac{5}{8}, 0.63$ Multiply both by 8 and comparison. $\frac{5}{8} \times 8 = 5$, while $0.63 \times 8 = 5.04$. Therefore, 0.63 is greater.

f. $\frac{7}{9}, 0.79$ Multiply both by 9 and comparison. $\frac{7}{9} \times 9 = 7$, while $0.79 \times 9 = 7.11$. Therefore, 0.79 is greater.

13. Convert fractions to decimals

The goal here is to use long division only when necessary. Instead, look for a factor to make the denominator 10, 100, 1000, etc. If you feel comfortable with long division, it will always give you the correct result. Below are alternative methods.

a. $\frac{7}{5} = \frac{7}{5} \times \frac{2}{2} = \frac{14}{10} = 1.4$

b. $\frac{3}{4} = \frac{3}{4} \times \frac{25}{25} = \frac{75}{100} = 0.75$

c. $\frac{11}{40} = \frac{1.1}{4} \times \frac{25}{25} = \frac{27.5}{100} = 0.275$

d. $\frac{5}{8} = \frac{2.5}{4} \times \frac{25}{25} = \frac{62.5}{100} = 0.625$

e. $\frac{39}{60} = \frac{13}{20} = \frac{13}{20} \times \frac{5}{5} = \frac{65}{100} = 0.65$

f. $\frac{9}{8} = 1 + \frac{1}{8} = 1 + \frac{0.5}{4} \times \frac{25}{25} = 1 + \frac{12.5}{100} = 1 + 0.125 = 1.125$

14. Write the prime factorization of each of the following

Your answer is not complete if it does not contain the multiplication symbol.

a. $126 = 2 \times 3^2 \times 7$

b. $189 = 3^3 \times 7$

c. $252 = 2^2 \times 3^2 \times 7$

d. $234 = 2 \times 3^2 \times 13$

e. $378 = 2 \times 3^3 \times 7$

f. $162 = 2 \times 3^4$

15. Using percents to find part or whole

There are many ways to solve percentage problems. Remember to use a decimal for percentages (move the decimal by two positions). The method used below translates the question to mathematics using *p* or *n* for the variable, × for the word *of* and = for the word *is*. Steps were omitted, but the final answer is provided. For questions that ask for the percentage, you need convert and use the % symbol. Some like to remember, "*Is* over *of* equals *percent* over *100*."

a. What percent of 9 is 6? $p \times 9 = 6$; $66\frac{2}{3}\%$

b. What percent of 9 is 12? $p \times 9 = 12$; $133\frac{1}{3}\%$

c. What is 11% of 93? $n = 0.11 \times 93 = 10.23$

d. 96 is 12% of what number? $96 = 0.12 \times n$; 800

e. 135% of 83 is what number? $1.35 \times 83 = n$; 112.05

f. 180% of what number is 810? $1.80 \times n = 810$; 450

g. 250 is 250% of what number? $250 = 2.50 \times n$; 100

h. 75 is what percent of 50? $75 = p \times 50$; 150%

i. 180% of what number is 612? $1.80 \times n = 612$; 340

j. 90% of what number is 117? $0.90 \times n = 117$; 130

k. What number is 140% of 250? $n = 1.40 \times 250 = 350$

l. What number is 130% of 250? $n = 1.30 \times 250 = 325$

m. 80% of what number is 420? $0.80 \times n = 420$; 525

n. 120% of what number is 300? $1.20 \times n = 300$; 250

o. 120% of what number is 480? $1.20 \times n = 480$; 400

16. Solving a linear equation in one variable

Step 1: Add or subtract both sides by the constant that is on the left (in green).

Step 2: Divide both sides by the coefficient (reduced final answer is shown in red).

a. $3x - 2 = 16$; $3x = 18$; $x = 6$
b. $4x + 21 = 57$; $4x = 36$; $x = 9$
c. $9x + 16 = -11$; $9x = -27$; $x = -3$
d. $8x - 22 = 82$; $8x = 104$; $x = 13$
e. $7x + 16 = 233$; $7x = 217$; $x = 31$
f. $3x - 12 = 57$; $3x = 69$; $x = 23$
g. $8x + 17 = 145$; $8x = 128$; $x = 16$
h. $6x - 18 = 72$; $6x = 90$; $x = 15$
i. $5x + 16 = 131$; $5x = 115$; $x = 23$
j. $-2x + 16 = 28$; $-2x = 12$; $x = -6$

17. Estimation of Roots: Between what two integers is each of the following?

First, find two perfect square so that your radical is between them (in green), then use the roots of those radicals (red).

a. Since $\sqrt{49} < \sqrt{53} < \sqrt{64}$, $7 < \sqrt{53} < 8$
b. Since $\sqrt{64} < \sqrt{78} < \sqrt{81}$, $8 < \sqrt{78} < 9$
c. Since $-\sqrt{81} < -\sqrt{67} < -\sqrt{64}$, $-9 < -\sqrt{67} < -8$
d. Since $-\sqrt{100} < -\sqrt{89} < -\sqrt{81}$, $-10 < -\sqrt{89} < -9$

18. Application: Fractions to decimals to percents

You can use long division on any of the questions below. An alternative method is used below. Basically, first reduce the fraction if possible, then convert it so it has a denominator of 100.

a. $\frac{7}{8}$ of a pizza is what percent of a pizza?

$$\frac{7}{8} \times \frac{12.5}{12.5} = \frac{87.5}{100} = 87.5\%$$

b. $\frac{4}{5}$ of a class is what percent of a class?

$$\frac{4}{5} \times \frac{20}{20} = \frac{80}{100} = 80\%$$

c. $\frac{3}{60}$ of an arc is what percentage of an arc?

$$\frac{3}{60} = \frac{1}{20} = \frac{1}{20} \times \frac{5}{5} = \frac{5}{100} = 5\%$$

d. $\frac{11}{20}$ of a pie is what percentage of a pie?

$$\frac{11}{20} \times \frac{5}{5} = \frac{55}{100} = 55\%$$

e. $\frac{6}{15}$ of a pint is what percentage of a pint?

$$\frac{6}{15} = \frac{2}{5} = \frac{2}{5} \times \frac{20}{20} = \frac{40}{100} = 40\%$$

f. $\frac{5}{4}$ of a mile is what percentage of a mile?

$$\frac{5}{4} \times \frac{25}{25} = \frac{125}{100} = 125\%$$

g. $\frac{9}{8}$ of an hour is what percentage of an hour?

$$\frac{9}{8} \times \frac{12.5}{12.5} = \frac{112.5}{100} = 112.5\%$$

h. $\frac{12}{12}$ of a foot is what percentage of a foot?

$$\frac{12}{12} = 1 = 1 \times \frac{100}{100} = \frac{100}{100} = 100\%$$

19. Application: Percents to decimals to fractions (reduce to simplest form)

Write the percentage as a fraction out of 100, then reduce.

a. 55% of an acre is what fraction of an acre? $\frac{55}{100} = \frac{11}{20}$
b. 36% of a kilometer is what fraction of a kilometer? $\frac{36}{100} = \frac{9}{25}$
c. 84% of a loaf of bread is what fraction of a loaf of bread? $\frac{84}{100} = \frac{21}{25}$
d. 140% increase in the size of a cereal box is what fraction of an increase in size? $\frac{140}{100} = \frac{7}{5}$

20. Multiplication and Division involving zero

Keep in mind that dividing by zero is not possible. We say it is *undefined*. A way to remember this is that when zero is *underneath* the fraction bar, the answer is *undefined*.

a. $0 \div 6 = 0$
b. $6 \div 0$ *undefined*
c. $0 \div 0$ *undefined*
d. $0 \times 6 = 0$
e. $6 \times 0 = 0$
f. $0 \times 0 = 0$
g. Simplify: $\frac{-5\times3+11}{1-(8-7)} = \frac{-4}{0}$ *undefined*
h. Simplify: $\frac{7\times2-2-12}{-4\times6} = \frac{0}{-24} = 0$
i. Simplify: $\frac{6\times(-2)+12}{8\times3} = \frac{0}{24} = 0$
j. Simplify: $\frac{7-2\times0+11}{9-9} = \frac{18}{0}$ *undefined*

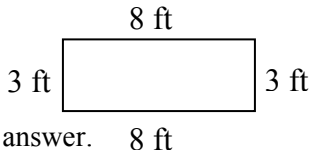
21. Elapsed time
    a. Jill began her yard work at 11:15 a.m. and ended at 4:05 p.m. She worked 4 hours and 50 minutes.
    b. John finished his 4 hour and 25 minute bicycle trip at 3:40 p.m. He began his trip at 11:15 a.m.
    c. If Sally will spend 15 hours and 38 minutes traveling from Washington to Miami and starts her trip at 2:15 p.m., when will she arrive? 5:53 a.m. (the next day)
    d. Phil drove for 6 hours and 28 minutes. If he left at 8:42 a.m., what time did he arrive? 3:10 p.m.
    e. Chris went to sleep at 10:42 p.m. He woke up at 6:19 a.m. He slept for 7 hours and 37 minutes.
    f. Sarah drove for 9 hours and 48 minutes. If she arrived at 8:42 p.m. She left at 10:54 a.m.
    g. Justin went outside to play at 11:25 a.m. He came in for dinner at 5:42 p.m. Outside: 6 hrs. 17 min.
    h. Mark hiked for 5 hours and 18 minutes. If he started at 7:52 a.m., what time did he end? 1:10 p.m.
    i. Matt studied from 11:53 a.m. to 1:52 a.m. He studied for 13 hours and 59 minutes.

22. Representation of money
    a. Express 7 quarters, 27 dimes, 5 nickels and 11 pennies in terms of dollars and cents. $4.81
    b. Express 3 quarters, 17 dimes, 15 nickels and 6 pennies in terms of dollars and cents. $3.26
    c. Express 9 quarters, 24 dimes, 14 nickels and 28 pennies in terms of dollars and cents. $5.63

23. Ratio/proportion
    You are encouraged to write the proportions as demonstrated below. Observe the denominators and use the multiplier from the denominator with the numerator to arrive at the solution. Only use the whole number as the answer (in red).
    a. $\frac{3}{5}$ of a pizza is how many 15ths? $\frac{3}{5} = \frac{x}{15}$; 9
    b. $\frac{3}{8}$ of a pie is how many 8ths? $\frac{3}{8} = \frac{x}{8}$; 3
    c. $\frac{2}{7}$ is how many twenty-eighths? $\frac{2}{7} = \frac{x}{28}$; 8
    d. $\frac{3}{8}$ is how many sixty-fourths? $\frac{3}{8} = \frac{x}{64}$; 24

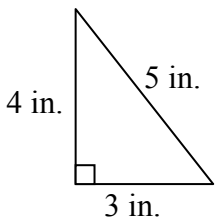
24. Unit pricing
    Make sure that you round as required.
    a. How much is 4.53 pounds of meat at $1.39 per pound (to the nearest cent)? $6.30
    b. 3.89 pounds of meat costs $5.29. To the nearest cent, what is the price per pound? $1.36/lb.
    c. To the nearest hundredths of a pound, how much meat at $1.48 per pound can be bought for $5.00? 3.38 lbs.
    d. At $3.12 per pound, how many pounds of sugar can be purchased with $21.21? *Round to tenth.* 6.8

25. Area, perimeter
    a. What is the area of the rectangle shown? Include proper units in your answer.



$$Area = length \times width = (8\ ft) \times (3\ ft) = 24\ ft^2$$

    b. What is the perimeter of the rectangle shown in part (a)? Include proper units in your answer.
$$Perimeter = 2l + 2w = 2(8\ ft) + 2(3\ ft) = 16\ ft + 6\ ft = 22\ ft$$
    c. What is the area of a circle with a diameter of 6 cm? Include proper units in your answer, and round your answer to the nearest hundredth, if necessary. (Use the approximation that pi = 3.14). Note: radius = 3 cm.
$$Area = \pi r^2 = (3.14)(3\ cm)^2 = 3.14 \times 9\ cm^2 = 28.26\ cm^2$$
    d. What is the circumference of a circle with a diameter of 6 cm? Include proper units in your answer, and round your answer to the nearest hundredth, if necessary. (Use the approximation that pi = 3.14). r = 3 cm.
$$Circumference = 2\pi r = 2(3.14)(3\ cm) = 3.14 \times 6\ cm = 18.84\ cm$$
    e. What is the area of the triangle shown? Include proper units in your answer, and round your answer to the nearest hundredth, if necessary.



$$Area = \frac{1}{2}(base\ \times height) = \frac{1}{2}(3\ in.)(4\ in.) = 6\ in.^2$$
    f. What is the perimeter of the triangle shown in part (e)? Include proper units in your answer, and round your answer to the nearest hundredth, if necessary.
$$Perimeter = sum\ of\ the\ sides = 3\ in. + 4\ in. + 5\ in. = 12\ in.$$
    g. Find the area of a circle with radius 4 cm. Include proper units in your answer, and round your answer to the nearest hundredth, if necessary. (Use the approximation that pi = 3.14).
$$Area = \pi r^2 = (3.14)(4\ cm)^2 = 3.14 \times 16\ cm^2 = 50.24\ cm^2$$
    h. Determine the circumference of a circle with radius 8 cm. Include proper units in your answer, and round your answer to the nearest hundredth, if necessary. (Use the approximation that pi = 3.14).
$$Circumference = 2\pi r = 2(3.14)(8\ cm) = 2 \times 3.14 \times 8\ cm = 50.24\ cm$$