

# Incoming Pre-Algebra

1) add and subtract fractions - need a common denominator

a.  $\frac{17}{45} + \frac{3}{5} = \frac{17}{45} + \frac{27}{45}$  Write  $\frac{3}{5}$  using LCD.

$= \frac{17 + 27}{45}$  Write sum of numerators over denominator.

$= \frac{44}{45}$  Add.

b.  $\frac{11}{15} - \frac{5}{12} = \frac{44}{60} - \frac{25}{60}$  Write fractions using LCD.

$= \frac{44 - 25}{60}$  Write difference of numerators over denominator.

$= \frac{19}{60}$  Subtract.

## Subtraction with Borrowing

Sometimes when subtracting you may find you don't have enough value in the top fraction's numerator to do the subtraction. When this happens we borrow from the whole number, adding the borrowed whole number to the existing fraction to increase its value.

$$4\frac{1}{5} \times \frac{3}{3} = \cancel{4}^3 \frac{3}{15} + \frac{15}{15} = 3\frac{18}{15}$$

$$\underline{- 1\frac{2}{3}} \times \frac{5}{5} = \underline{1\frac{10}{15}} \Rightarrow \underline{- 1\frac{10}{15}}$$

$$\textcircled{2\frac{8}{15}}$$

Note: When borrowing one from the whole number, it is written as fraction with the same numerator/same denominator (one whole). This whole is then ADDED to the existing fraction to combine the two into a new, improper fraction, which we then use for subtracting.

$$1) 2 - \frac{1}{4}$$

$$2) 3 - \frac{8}{5}$$

$$3) \frac{3}{2} - \frac{3}{5}$$

$$4) 8 + \frac{1}{7}$$

$$5) \frac{7}{4} + 3\frac{6}{7}$$

$$6) \frac{3}{2} + \frac{8}{5}$$

$$7) 3\frac{1}{8} + \frac{6}{5}$$

$$8) 3\frac{2}{3} - \frac{5}{3}$$

$$9) 4\frac{3}{5} + 4\frac{5}{6}$$

$$10) 1 + 2\frac{5}{7}$$

$$11) 1\frac{1}{2} + 3\frac{3}{4}$$

$$12) 2 - 1\frac{1}{3}$$

$$13) \frac{5}{6} + \frac{7}{4}$$

$$14) \frac{1}{3} + \frac{1}{6}$$

$$15) 2\frac{1}{2} - 2\frac{1}{5}$$

$$16) 2 - 1\frac{1}{7}$$

$$17) 2\frac{1}{5} - \frac{7}{8}$$

$$18) 1 - \frac{1}{6}$$

## II) Multiply fractions

Example for fractions

$$\begin{aligned} -\frac{8}{15} \cdot \left(-\frac{3}{8}\right) &= \frac{-8}{15} \cdot \left(\frac{-3}{8}\right) \\ &= \frac{-8 \cdot (-3)}{15 \cdot 8} \\ &= \frac{\cancel{-8}^1 \cdot \cancel{(-3)}_1}{15 \cdot \cancel{8}_1} \\ &= \frac{1}{5} \end{aligned}$$

Assign negative signs to numerators.

Use rule for multiplying fractions.

Divide out common factors.

Multiply.

Example for mixed numbers

$$\begin{aligned} 12\frac{3}{5} \cdot 3\frac{1}{3} &= \frac{63}{5} \cdot \frac{10}{3} \\ &= \frac{\cancel{21}^1 \cdot \cancel{2}_1}{\cancel{5}_1 \cdot \cancel{3}_1} \\ &= 42 \end{aligned}$$

Write mixed numbers as improper fractions

Use rule for multiplying fractions.

Divide out common factors.

Multiply.

$$19) -\frac{9}{5} \times -\frac{6}{5}$$

$$20) 1\frac{1}{4} \times -\frac{3}{8}$$

$$21) 1\frac{3}{8} \times -\frac{3}{2}$$

$$22) 3\frac{1}{9} \times -\frac{4}{3}$$

$$23) -\frac{9}{10} \times \frac{5}{4}$$

$$24) 5\frac{1}{4} \times -2\frac{3}{7}$$

### III.) Divide fractions

$$\begin{aligned}\frac{15}{16} \div \frac{10}{24} &= \frac{15}{16} \cdot \frac{24}{10} \\ &= \frac{\overset{3}{\cancel{15}} \cdot \overset{3}{\cancel{24}}}{\underset{2}{\cancel{16}} \cdot \underset{2}{\cancel{10}}} \\ &= \frac{9}{4} \\ &= 2\frac{1}{4}\end{aligned}$$

Multiply by reciprocal.

Use rule for multiplying fractions.  
Divide out common factors.

Multiply.

Write fraction as a mixed number.

#### Example for mixed numbers

$$\begin{aligned}-3\frac{1}{8} \div \left(-1\frac{1}{14}\right) &= -\frac{25}{8} \div \left(-\frac{15}{14}\right) \\ &= -\frac{25}{8} \cdot \left(-\frac{14}{15}\right) \\ &= \frac{\overset{-5}{\cancel{25}} \cdot (\overset{-7}{\cancel{14}})}{\underset{4}{\cancel{8}} \cdot \underset{3}{\cancel{15}}} \\ &= \frac{35}{12} \\ &= 2\frac{11}{12}\end{aligned}$$

Write mixed numbers as improper fractions.

Multiply by reciprocal.

Use rule for multiplying fractions.  
Divide out common factors.

Multiply.

Write fraction as a mixed number.

25)  $1\frac{1}{3} \div \frac{1}{3}$

26)  $\frac{11}{10} \div -7$

27)  $-2\frac{1}{2} \div \frac{1}{2}$

28)  $\frac{-3}{2} \div \frac{2}{3}$

29)  $-3\frac{7}{8} \div -1\frac{1}{6}$

30)  $\frac{-9}{8} \div \frac{4}{5}$

#### IV) Adding positive and negative integers

1. **Same Sign** Add the absolute values and use the common sign.

2. **Different Signs** Subtract the lesser absolute value from the greater absolute value and use the sign of the number with the greater absolute value.

Find the sum  $-32 + (-27)$ .

$$-32 + (-27) = -59$$

Same sign: Add  $|-32|$  and  $|-27|$ .

Both integers are negative, so the sum is negative.

Find the sum  $-63 + 39$ .

$$-63 + 39 = -24$$

Different signs: Subtract  $|39|$  from  $|-63|$ .

$|-63| > |39|$ , so the sum has the same sign as  $-63$ .

31)  $1 + (-1)$

32)  $(-8) + (-5)$

33)  $(-5) + (-1)$

34)  $2 + (-3)$

35)  $1 + (-3)$

36)  $1 + (-7)$

37)  $(-1) + 5$

38)  $7 + (-3)$

39)  $(-7) + (-4)$

40)  $(-8) + (-6)$

41)  $(-5) + 6$

42)  $(-3) + 6$

43)  $7 + (-7)$

44)  $(-3) + (-8)$

45)  $(-8) + 1$

46)  $2 + (-5)$

V) Subtracting positive and negative integers

**Words** To subtract an integer, add its opposite.

**Numbers**  $4 - 8 = 4 + (-8) = -4$

$$\begin{aligned} 9 - 20 &= 9 + (-20) \\ &= -11 \end{aligned}$$

To subtract 20, add its opposite,  $-20$ .  
Add 9 and  $-20$ .

$$\begin{aligned} 10 - (-3) &= 10 + 3 \\ &= 13 \end{aligned}$$

To subtract  $-3$ , add its opposite, 3.  
Add 10 and 3.

Remember two negatives next to each other make a positive!!
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$$\begin{aligned} -6 - (-4) &= -6 + 4 \\ &= -2 \end{aligned}$$

To subtract  $-4$ , add its opposite, 4.  
Add  $-6$  and 4.

47)  $3 - (-8)$

48)  $(-4) - 5$

49)  $(-2) - (-8)$

50)  $1 - (-3)$

51)  $7 - 2$

52)  $(-8) - (-4)$

53)  $(-3) - 8$

54)  $2 - (-3)$

55)  $7 - (-8)$

56)  $(-5) - 8$

57)  $2 - (-4)$

58)  $(-7) - (-5)$

59)  $(-3) - (-6)$

60)  $5 - (-5)$

61)  $2 - (-8)$

62)  $(-2) - 3$

VI.) Order of operations

1. Evaluate expressions inside grouping symbols. (Parentheses, brackets, and fraction bars are common grouping symbols.)
2. Evaluate powers.
3. Multiply and divide from left to right.
4. Add and subtract from left to right.

$$12 \cdot 3 - 18 \div 6 = 36 - 3 \\ = 33$$

Multiply and divide.  
Subtract.

63)  $(2 + 3) \div 5$

64)  $4 \times 5 - 6$

65)  $4 + 9 \div 3$

66)  $5 + 6 \times 6$

67)  $4 \times 5 + 1$

68)  $(9 - 5) \div 2$

69)  $2 \times 4 + 4 - (3 - 1)$

70)  $(6 + 6 \times 2 - 6) \div 2$

71)  $\frac{12}{4 + 5 - 5} + 4$

72)  $\frac{18}{4 - 1 + 3} + 2$

73)  $\frac{18 \times 2}{2 \times 3}$

VII. One step equations

Solve  $m + 12 = 7$ .

$$m + 12 = 7$$

$$m + 12 - 12 = 7 - 12$$

$$m = -5$$

Solve  $-2 = x - 9$ .

$$-2 = x - 9$$

$$-2 + 9 = x - 9 + 9$$

$$7 = x$$

Write original equation.

Subtract 12 from each side.

Simplify.

Write original equation.

Add 9 to each side.

Simplify.

Solve  $9x = -108$ .

$$9x = -108$$

$$\frac{9x}{9} = \frac{-108}{9}$$

$$x = -12$$

Solve  $\frac{k}{25} = 5$ .

$$\frac{k}{25} = 5$$

$$25 \cdot \frac{k}{25} = 25 \cdot 5$$

$$k = 125$$

74)  $\frac{n}{14} = -\frac{1}{2}$

76)  $144 = -12x$

78)  $n - 12 = -24$

80)  $\frac{a}{8} = -15$

82)  $35 = 16 + n$

84)  $11 = b - 2$

86)  $170 = 10k$

88)  $a - 11 = 9$

Write original equation.

Divide each side by 9.

Simplify.

Write original equation.

Multiply each side by 25.

Simplify.

75)  $-60 = 5x$

77)  $-3 = a - 4$

79)  $52 = -4n$

81)  $n - 8 = -1$

83)  $-12 = r - 7$

85)  $-38 = -19 + x$

87)  $5n = -85$

89)  $2 = k - 13$



### VIII.) Two step equations

Solve  $14x + 12 = 54$ . Check your solution.

$$14x + 12 = 54 \quad \text{Write original equation.}$$

$$14x + 12 - 12 = 54 - 12 \quad \text{Subtract 12 from each side.}$$

$$14x = 42 \quad \text{Simplify.}$$

$$\frac{14x}{14} = \frac{42}{14} \quad \text{Divide each side by 14.}$$

$$x = 3 \quad \text{Simplify.}$$

Solve  $\frac{x}{6} - 8 = 6$ .

$$\frac{x}{6} - 8 = 6 \quad \text{Write original equation.}$$

$$\frac{x}{6} - 8 + 8 = 6 + 8 \quad \text{Add 8 to each side.}$$

$$\frac{x}{6} = 14 \quad \text{Simplify.}$$

$$6\left(\frac{x}{6}\right) = 6(14) \quad \text{Multiply each side by 6.}$$

$$x = 84 \quad \text{Simplify.}$$

$$90) -37 = -2 + 5v$$

$$91) -1 + 5n = 34$$

$$92) -43 = -4 - 3n$$

$$93) 11 = 9 + \frac{k}{4}$$

$$94) \frac{v}{9} + 4 = 5$$

$$95) \frac{a}{2} - 7 = -10$$

$$96) \frac{k}{9} + 6 = 5$$

$$97) -9 = -9 + \frac{k}{1}$$

$$98) -4 + \frac{x}{10} = -3$$

$$99) -3 = -7 + \frac{k}{3}$$

$$100) -7 = \frac{r}{1} - 7$$

$$101) 111 = 7 - 8x$$

$$102) -5m + 9 = -41$$

$$103) \frac{m}{2} - 10 = -19$$

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### IX.) Percent of change

Find the percent of increase from 40 to 44.

#### Solution

$$p\% = \frac{\text{Amount of in change}}{\text{Original amount}} \quad \text{Write formula for percent of increase.}$$

$$= \frac{44 - 40}{40} \quad \text{Substitute.}$$

$$= \frac{4}{40} \quad \text{Subtract.}$$

$$= 0.1 \quad \text{Divide.}$$

$$= 10\% \quad \text{Write decimal as a percent.}$$

104) From 65 to 84

105) From 40 to 49

106) From 86 to 89

107) From 47 to 26

108) From 48 to 82

109) From 70 to 44

110) From 41 to 48

111) From 43 to 41

112) From 78 to 16

113) From 33 to 47

114) From 84 to 25

115) From 44 to 15

116) From 55 to 60

117) From 82 to 27

#### X. Percent problems

You can represent “ $a$  is  $p$  percent of  $b$ ” using the proportion

$$\frac{a}{b} = \frac{P}{100}$$

where  $a$  is a part of the base  $b$  and  $p\%$ , or  $\frac{P}{100}$ , is the percent.

What percent of 9 is 3?

#### **Solution**

$$\frac{a}{b} = \frac{P}{100}$$

$$\frac{3}{9} = \frac{P}{100}$$

$$100 \cdot \frac{3}{9} = 100 \cdot \frac{P}{100}$$

$$33\frac{1}{3} = P$$

Write proportion.

Substitute 3 for  $a$  and 9 for  $b$ .

Multiply each side by 100.

Simplify.

What number is 90% of 340?

**Solution**

$$\frac{a}{b} = \frac{p}{100}$$

$$\frac{a}{340} = \frac{90}{100}$$

$$340 \cdot \frac{a}{340} = 340 \cdot \frac{90}{100}$$

$$a = 306$$

Write proportion.

Substitute 340 for  $b$  and 90 for  $p$ .

Multiply each side by 340.

Simplify.

118) What is 92% of 41?

119) What is 44% of 6?

120) What is 98% of 5?

121) 40.8 is what percent of 69.9?

122) 17% of what is 77.3?

123) 59% of what is 4?

124) What is 8% of 67?

125) 6.4 is 5% of what?

126) What is 13% of 7?

127) 85% of what is 77?

128) 33% of what is 51?

129) 28 is what percent of 29.9?

130) 62% of 71 is what?

131) 5 is what percent of 38?

132) 42% of 17 is what?

133) What is 41% of 25?

134) What percent of 52 is 50?

135) What percent of 76 is 38?

136) 59 is 63% of what?

137) 69 is what percent of 79?

XII) Percent's as fractions and fractions as percent's  
Write 80% and 4% as fractions in simplest form.

a.  $80\% = \frac{80}{100} = \frac{4}{5}$

b.  $4\% = \frac{4}{100} = \frac{1}{25}$

Write  $\frac{19}{20}$  and  $\frac{13}{50}$  as percents.

a.  $\frac{19}{20} = \frac{19 \cdot 5}{20 \cdot 5} = \frac{95}{100} = 95\%$

b.  $\frac{13}{50} = \frac{13 \cdot 2}{50 \cdot 2} = \frac{26}{100} = 26\%$

$\frac{9}{32} = 0.28125$  Write fraction as a decimal.

$= 28.125\%$  Write decimal as a percent.

138) 56%

139)  $3\frac{1}{33}\%$

140) 34%

141) 47%

142)  $33\frac{1}{3}\%$

143)  $62\frac{1}{2}\%$

144) 50%

145) 30%

146)  $\frac{3}{5}$

147)  $\frac{23}{100}$

148)  $\frac{7}{8}$

149)  $\frac{9}{100}$

150)  $\frac{4}{25}$

151)  $\frac{2}{3}$

152)  $\frac{27}{50}$

153)  $\frac{3}{4}$

XII.) Decimals as percents and percents as decimals

a.  $0.35 = \underbrace{0.35}_{= 35\%}$       b.  $0.035 = \underbrace{0.035}_{= 3.5\%}$       c.  $5.7 = \underbrace{5.70}_{= 570\%}$

a.  $53\% = \underbrace{53\%}_{= 0.53}$       b.  $560\% = \underbrace{560\%}_{= 5.6}$       c.  $1.2\% = \underbrace{01.2\%}_{= 0.012}$

154) 0.7

155) 0.09

156) 0.341

157) 0.08

158) 0.002

159) 0.868

**Write each as a decimal. Round to the thousandths place.**

160) 570%

161) 6%

162) 0.7%

163) 7%

164) 8.2%

165) 256%

XIII.) Inequalities

**Just remember**

- if the symbol is ( $\geq$  or  $\leq$ ) then you **fill in the dot**
- if the symbol is ( $>$  or  $<$ ) then you **do not fill in the dot**

Inequality	Words	Graph
$x < 3$	All numbers less than 3	
$y > 2$	All numbers greater than 2	
$z \leq 4$	All numbers less than or equal to 4	
$n \geq 2$	All numbers greater than or equal to 2	

166)  $v \geq -6$



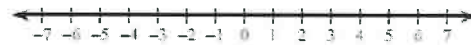
167)  $b > -6$



168)  $p \geq 1$



169)  $n \leq 5$



170)  $b \geq 0$



171)  $x \geq 4$



172)  $n \geq 3$



173)  $x < -2$



#### XIV. Word problems

174) How many boxes of cereal can you buy with \$24.84 if one box costs \$6.21?

175) A hungry elf ate 16 of your muffins. That was  $\frac{8}{9}$  of all of them! How many are left?

176) A recipe for a cake calls for 4 cups of sugar. Amy accidentally put in 9 cups. How many extra cups did she put in?

177) If the weight of a package is multiplied by  $\frac{7}{10}$  the result is 32.2 pounds. Find the weight of the package.

178) A stray dog ate 6 of your muffins. That was  $\frac{2}{9}$  of all of them! How many are left?

179) Nine workers are hired to harvest strawberries from a field. Each is given a plot which is  $10 \times 10$  feet in size. What is the total area of the field?

180) Mike ran 22.4 miles less than Ming last week. Mike ran 12.5 miles. How many miles did Ming run?

182) Natalie was 4 years old six years ago. How old is she now?

184) On Tuesday Imani bought four boxes. On Wednesday half of all the boxes that she had were destroyed. On Thursday there were only 10 left. How many did she have on Monday?

186) Jack spent half of his weekly allowance on candy. To earn more money his parents let him mow the lawn for \$9. What is his weekly allowance if he ended with \$17?

181) A stray dog ate 14 of your muffins. That was  $\frac{7}{8}$  of all of them! With how many did you start?




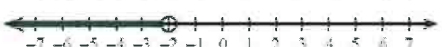
183) Jenny won 45 super bouncy balls playing horseshoes. After giving some away she only has 23 remaining. How many did she give away?

185) Norachai spent \$44 on a magazine and some notepads. If the magazine cost \$4 and each notepad cost \$5, then how many notepads did he buy?

187) Danielle won 88 super bouncy balls playing hoops at her school's game night. Later, she gave three to each of her friends. She only has 1 remaining. How many friends does she have?



Answers to the odds so you can check your answers

- |  |                     |   |                        |
|--|---------------------|---|------------------------|
| 1) $1\frac{3}{4}$  | 3) $\frac{9}{10}$   | 5) $5\frac{17}{28}$   | 7) $4\frac{13}{40}$    |
| 9) $9\frac{13}{30}$  | 11) $5\frac{1}{4}$  | 13) $2\frac{7}{12}$   | 15) $\frac{3}{10}$     |
| 17) $1\frac{13}{40}$   | 19) $2\frac{4}{25}$ | 21) $-2\frac{1}{16}$  | 23) $-1\frac{1}{8}$    |
| 25) 4  | 27) -5              | 29) $3\frac{9}{28}$   | 31) 0                  |
| 33) -6   | 35) -2              | 37) 4   | 39) -11                |
| 41) 1  | 43) 0               | 45) -7  | 47) 11                 |
| 49) 6  | 51) 5               | 53) -11   | 55) 15                 |
| 57) 6  | 59) 3               | 61) 10  | 63) 1                  |
| 65) 7  | 67) 21              | 69) 10  | 71) 7                  |
| 73) 6  | 75) $\{-12\}$       | 77) $\{1\}$   | 79) $\{-13\}$          |
| 81) $\{7\}$  | 83) $\{-5\}$        | 85) $\{-19\}$   | 87) $\{-17\}$          |
| 89) $\{15\}$   | 91) $\{7\}$         | 93) $\{8\}$   | 95) $\{-6\}$           |
| 97) $\{0\}$  | 99) $\{12\}$        | 101) $\{-13\}$  | 103) $\{-18\}$         |
| 105) 22.5% increase  | 107) 44.7% decrease | 109) 37.1% decrease   | 111) 4.7% decrease     |
| 113) 42.4% increase  | 115) 65.9% decrease | 117) 67.1% decrease   | 119) 2.6               |
| 121) 58.4%   | 123) 6.8            | 125) 128  | 127) 90.6              |
| 129) 93.6%   | 131) 13.2%          | 133) 10.3   | 135) 50%               |
| 137) 87.3%   | 139) $\frac{1}{33}$ | 141) $\frac{47}{100}$   | 143) $\frac{5}{8}$     |
| 145) $\frac{3}{10}$  | 147) 23%            | 149) 9%   | 151) $66\frac{2}{3}\%$ |
| 153) 75%   | 155) 9%             | 157) 8%   | 159) 86.8%             |
| 161) 0.06  | 163) 0.07           | 165) 2.56   |                        |
| 167)  |                     | 169)  |                        |
| 171)  |                     | 173)  |                        |
| 175) 2   | 177) 46             | 179) 900  | 181) 16                |
| 183) 22  | 185) 8              | 187) 29   |                        |